ISCTE ⬡ Business School
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THE EFFECT OF CREDIT RATING AGENCIES IN STOCK PRICES

EVENT STUDY IN GERMANY AND PORTUGAL

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The Effect of Credit Rating Agencies in Stock Prices

Event study in Germany and Portugal

Resumo

As Agências de Rating têm sido severamente criticadas pelo seu papel nas crises financeiras recentes. Durante estas situações, elas têm sido um elemento de pânico. Esta tese procura concluir se as reavaliações de ratings e outlooks por parte das Agências de Rating são relevantes no preço das acções dos índices Alemão e Português, DAX-30 e PSI-20. Estas economias foram escolhidas devido às suas díspares condições de crédito durante o período testado, de 2004 e 2014. Os retornos anormais para a janela de evento à volta da mudança de um rating ou outlook foram analisados usando o Modelo de Mercado como metodologia do estudo de evento. As conclusões seguiram a literatura: para a Alemanha os ratings e outlooks negativos apresentaram uma reacção substancial no preço das acções. As positivas não apresentaram uma reacção significativa. Em Portugal, nenhum dos tipos de evento teve relevância no preço das acções.

Palavras-chave: Classificação de crédito, Estudo de Evento, Retornos Anormais, Teoria do Mercado Eficiente

Classificação JEL: G1 General Financial Markets, G14 Information and Market Efficiency, Event Studies

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Abstract

Credit Rating Agencies (CRA) have been severely criticized on their role in recent financial crisis. During these situations, they have been an element of panic. This study assesses if CRA rating and outlook changes are relevant in the stock prices of Germany and Portugal Indices, DAX-30 and PSI-20. These economies were chosen based on their contrasting credit conditions during the time range studied, from 2004 to 2014. The abnormal returns for the event window around a rating or outlook changes were analyzed using the Market Model as event study methodology. The conclusions followed the literature: for Germany negative rating and outlook changes had significant effect, while positive had not. In Portugal, no change type had significant effect.

Keywords: Credit Rating, Event Study, Abnormal Returns, Efficient Market Theory

JEL Classification: G1 General Financial Markets, G14 Information and Market Efficiency, Event Study

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List of Abbreviations

AAR – Average Abnormal Returns

AR – Abnormal Returns

CAAR – Cumulative Average Abnormal Returns

CAPM – Capital Asset Pricing Model

CAR – Cumulative Abnormal Returns

CDS – Credit Default Swap

CRA – Credit Rating Agency

DT – Germany (Deutschland)

EMH – Efficient Market Hypothesis

ESMA – European Securities and Markets Authority

MBS – Mortgage-backed security

MM – Market Model

NRSRO - Nationally Recognized Statistical Rating Organization

PT – Portugal

US – United States (of America)

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1. Introduction

"If the market is god, ratings agencies are its high priests."[1]

Juliane Mendelsohn

Credit Rating Agencies (CRA) measure credit worthiness of a realm of borrowing entities, from individuals to sovereign governments. Through the assembly of financial and non-financial information they assign each entity a rating and outlook[2], which assess the capacity to repay its debt and allows a comparison among issuers. These are reviewed upon release of new relevant information for a given entity and possibly changed if the capability of the company to pay its debt was affected.

The older CRA were founded in the beginning of the 20th century. Since then, the financial sector has evolved substantially to adapt to an increasingly complex set of client needs (Sylla, 2001). Ratings reduce this complexity by providing investors with a quick access to the risk profile of a given entity's debt, helping them to "make important credit judgments"[3].

However, as much as ratings are useful for investors, there are several arguments that restrain investors' confidence on CRA. Failures on anticipating crisis all over the world, underestimating credit risk before the crisis and overestimating it once it happens, which happened in the Asian crisis in the 90's or the global financial crisis that was propelled by the bankruptcy of Lehman Brothers Holdings Inc., led previous authors to consider CRA's actions "as an element of panic" (Host, Cvečić, & Zaninović, 2012). Furthermore, changes made to the way CRA are financed between the 60's and the 70's, from an "investor-pay" to an "issuer-pay" perspective, created a conflict of interest on their operating model. Lastly, the way the market share is distributed within this industry suggest an oligopoly[4]. These arguments led to a situation where it is unclear if ratings are still relevant to stock prices.

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[1] Retrieved on the 25th October of 2015, from http://www.theeuropean-magazine.com/juliane-mendelsohn/7249-the-failure-of-rating-agencies

[2] Rating tables of each of the major CRA, the Big Three (Moody's, Standard and Poor's and Fitch), can be found on the Appendixes, section 9.2.

[3] Retrieved on the 21th September of 2015, from https://www.fitchratings.com/about

[4] Retrieved on the 25th September of 2015, from http://www.europarl.europa.eu/news/en/news-room/content/20111219IPR34550/html/Credit-rating-agencies-MEPs-want-less-reliance-on-big-three.

It is the aim of this dissertation to understand if investor's still have confidence on CRA. This will be done by verifying if there is a statistically significant impact of a rating or outlook announcement on company stocks on two distinct Eurozone economies: Germany and Portugal. These two countries were chosen due to their opposite economical relevance in the Eurozone. Germany transformed itself "from Sick Man of Europe to Economic Superstar" (Dustmann, Fitzenberger, Schönberg, & Spitz-Oener, 2014), representing 29% of Euro Area's GDP in 2014[5]. On the contrary, between 2000 and 2012 Portugal has seen its GDP grow at a slower pace than the US did on the Great Depression (1929-1941). (Reis, 2013) Even "before the global financial crisis there were warning signs about some of the countries in the euro area", being some of the "more pressing alerts" from Portugal (Reis, 2013). Hence the importance to study this fragile economy, responsible for only 1.7% of Euro Area's GDP in 2014[6]. With such contrasting reality when compared to Germany, it is most likely that the effect of the Big Three CRA (Moody's, Standard and Poor's (S&P) and Fitch) on each main Index, DAX-30 for Germany and PSI-20 for Portugal, will be substantially different.

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[5] Retrieved on the 22th October of 2015, from http://www.tradingeconomics.com.

[6] See footnote 4

2. Credit Rating Agencies and Corporate Credit Rating

2.1. CRA History

The need to create what would later be known as CRA came from the thriving railroad company based U.S. corporate bond market, which saw its booming on the second half of the nineteenth century. This boom, as well as the growing number of American middle class householders that wanted to participate on the bond market on the first quarter of the twentieth century, set the perfect conditions for the creation of commercial and financial services that would obtain and compile information that was until then scarce and unstandardized (Sylla, 2001).

One of the main changes in this industry during the 20th century was in the way the CRA are financed. At the end of the 60's and the beginning of the 70's, their business model changed from "investor-pay" to "issuer-pay" (White, 2013). Nowadays, the Big Three all show the latter model form, while some smaller companies still perserve a "investor-pay" model.

2.2. CRA Industry Criticism

2.2.1. Business Model

The change on the business model from "investor-pay" to "issuer-pay" created a clear conflict of interest, as an entity is receiving funds from other to do an impartial analysis of the latter. This problem became particularly flagrant since the subprime crisis in 2007, which severely affected the U.S. economy and where CRA were filed by investors for their grades, as several risky mortgage-backed securities (MBS) were given investment grades and later defaulted. As later discussed, this would have consequences such as the bankruptcy of one of the biggest financial services company, Lehman Brothers Holding Inc. Recent studies tried to prove if that turning point created a statistically significant difference on investors' confidence on CRA to evaluate US companies (e.g. Wu & Michaildis 2014). The conclusions are consistent across different markets and authors. Norden & Weber (2004) published a list of studies and their conclusions. All studies centered in stock prices concluded that upgrades have no effect on stock prices. Regarding downgrades, some defend they show some effect on stock prices. Other disagree, concluding that no CRA action is relevant to the stocks.

2.2.2. Market Distribution

Regarding CRA industry market share distribution, several references to the Big Three suggest an oligopoly. (European Parliament News, 2011) In December of both 2013 and 2014 the European Securities and Markets Authority (ESMA) released the market share list of all CRA of their activities and services in Europe. From the total of 22 companies acknowledged by ESMA the Big Three were accountable for around 87% of the market share in the first report, which would be related to operations done on 2012, and would climb to almost 90.5% on the following year (Table 1).

Company	Market Share (%)	
	2012	2013
Moody's	34.75	34.53
S&P	34.61	39.69
Fitch	17.66	16,22
Others	12.98	9.56

Table 1. Market share of the Big Three on 2012 and 2013. Source: ESMA
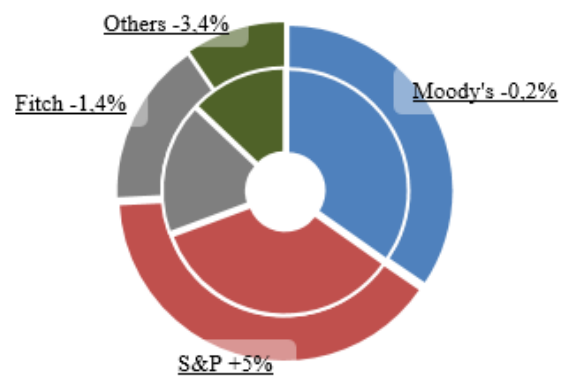
Figure 1. Pie chart showing market share evolution of the Big Three from 2013 (inside) to 2014 (outside).

Given their share of the industry, it is only natural that these companies are the main targets of investors' criticism. However, the path to create new CRA (and therefore diversify the market share) is difficult: there are several big barriers that one must overcome in order to enter in this industry. First, there is the need to build "reputational capital". In fact this industry was considered "reputation-driven" by several scholars (Partnoy, 2001). Also, a newcomer would need to compete with the "breadth of coverage [built] by successful rating agencies over time". (Katz, Salinas, & Stephanou, 2009) Finally, in order to create a CRA, there are several requirements it must achieve to be granted the status of Nationally Recognized Statistical Rating Organization (NRSRO), issued by the U.S. Securities and Exchange Commission (SEC), to be able to participate in the American market. The Ten Percent Rule7, e.g., prohibits an NRSRO from issuing or maintaining a rating to a person that provides the

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[7] E.g.: Rule 17g-5 promulgated by the SEC pursuant to the CRARA. Retrieved on the 26th October of 2015, from http://www.ecfr.gov/cgi-bin/text-idx?SID=8a4658437efc8cea70135da8e626012c&mc=true&node=se17.4.240_117g_65&rgn=div8

NRSRO with more than 10% of its revenue. While this limits conflicts of interest for big players in the industry, it also limits the growth of small NRSRO, that cannot accept potentially big projects. To participate in the European market, the equivalent institution would be ESMA, which has also been strengthening its legislation[8].

Although some of these difficulties could have been overcome by the motivation of "politicians and regulators to reassess regulation concerning CRA", which, among others, had the goal of incentivizing higher competition on the industry, the progress on this agenda is "limited" (Bongaerts, 2014). As an example, the initiative to establish an European Non-Profit CRA[9] was abandoned, as it was not able to reach the investment level needed.

So, while all these factors could create an opportunity for competition to grow, this does not reflect the industry's reality. As seen above, instead of having their market share decreased, the Big Three actually saw it increasing from 2012 to 2013.

2.2.3. Crisis Management

What was mentioned above is related to structural problems on the CRA industry. However, particular recent events further damaged CRA image. Previous literature consider that "[CRA did] not provide a reliable medium-term prognosis about risk investment trends, what should be their primary purpose" at both a micro and macro levels (Host, Cvečić, & Zaninović, 2012). The major flaws pointed at the micro level are the Enron case, in 2001, and the Lehman Brothers case, in 2007. These 2 US-based companies were, until the time of their bankruptcies, leaders on the energy and banking sectors, respectively. In both cases, the Big Three had assigned them investment-level ratings (Shorter & Seitzinger , 2009). In Enron's case, the companies would only downgrade its rating "four days before it declared bankruptcy – scarcely a ringing endorsement of the agencies' acumen" (Hill C. , 2009). In the Lehman Brothers case, the company had not even had a recent downgrade at the time of its bankruptcy (Shorter & Seitzinger , 2009). At a macro level CRA are deemed to have had an incorrect and/or late reaction to the Asian, Russian and Latin crisis of the 90's (Host,

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[8] Retrieved on the 26th October of 2015, from http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32013R0462

[9] European Rating Agency (ERA), a project by Markus Krall - Senior Executive at Roland Berger, a global consulting firm.

Cvečić, & Zaninović, 2012) and the global crisis of 2007. The conclusions of a study performed by Hill and Faff, 2010, was that CRA tend to "underestimated the risks (…) prior to the crisis, and in the midst of a crisis overestimated the credit risk which created additional difficulties and lengthened the process of recovery for the mentioned national economies".

To avoid responsibility of their actions, the Big Three published statements on their websites such as: [Ratings] should not be used alone as a basis for investment operations"(Moody's)[10], "unlike other types of opinions, such as, for example, those provided by doctors or lawyers, credit rating opinions are not intended to be a prognosis or recommendation" (S&P)[11], "Ratings are not facts, and therefore cannot be described as being accurate or inaccurate" (Fitch)[12]. In the same site, Fitch states that their ratings help investors "make important credit judgments"[13]. To take important judgments based on something that cannot be accountable as neither accurate nor inaccurate, along with the lack of assertiveness in these arguments when defending the own reason of existence of a company and the need to avoid responsibilities, reveals severe fragilities on these entities.

2.2. The Big Three –Financial Health and Ownership

The financial health of the Big Three is, at this point, not totally clear: while the market industry and barriers to enter the market are factors in favor of their good health, the misbelief on this industry could potentially hurt their income. In this chapter there will be an analysis to the number of ratings issued by each CRA, some key financials of their income statement. After, the main shareholders or owners of each will be analyzed.

The number of ratings issued by each of the Big Three can be found on Table 2. Between 2006 and 2015 all 3 CRA had an increase of 8% to 14% on total number of ratings issued.

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[10] Retrieved on the 7th September of 2015, from https://www.moodys.com/Pages/amr002002.aspx

[11] Retrieved on the 7th September of 2015, from http://www.standardandpoors.com/aboutcreditratings/RatingsManual_PrintGuide.html

[12] Retrieved on the 7th September of 2015, from https://www.fitchratings.com/site/fitch-home/definitions

[13] See footnote 3

	Moody's		S&P		Fitch	
	Nº of ratings	Dif	Nº of ratings	Dif	Nº of ratings	Dif
Jan-2006 [1]	4 079	-	6 560	-	2 878	-
Jan-2009	4 142	63	6 539	-21	3 331	453
Jan-2012	4 001	-141	6 280	-259	3 234	-97
Jan-2015	4 421	420	7 073	793	3 287	53
Total (Nº / %)	**342**	**8%**	**513**	**8%**	**409**	**14%**
Upgrades	519	11.5%	1 096	17.2%	466	16.1%
Downgrades	759	16.8%	1 254	19.7%	650	22.5%
Upgrade/downgrade ratio	68,4%		87,4%		71,7%	
Average Nº notches - Upgrades	2.24		2.31		1.96	
Average Nº notches - Downgrades	2.85		2.34		2.53	

Table 2. The Big Three ratings issued between 2006 and 2015
[1] This study uses data from Jan-2004 to Dec-2014, but there was no information for Fitch before 2006. However, as the subprime crisis would happen only later than 2006, it is expected that the data would not be substantially different.

For all the Big Three the number of Downgrades during the time range (2006-2015) was superior to the Upgrades – for each downgrade there was between 0,68 and 0,87 upgrades, depending on the company. Also, the number of notches on each downgrade was superior to the number of notches on each upgrade. A notch in this context is the minimum amount a rating can be up or downgraded. This means that each time a rating was reviewed negatively the difference from the previous to the new rating was superior when compared to a positive review.

Company	in Million $ (USD)	2012	2013	2014
Moody's [14]	Total Revenue	2730	2972	3334
	Operating Profit	1077	1235	1439
S&P [15]	Total Revenue	2 034	2 274	2 455
	Operating Profit	809	882	(583)
Fitch	Total Revenue			
	Operating Profit			

Table 3. The Big Three Total Revenue and Operating Profit from 2012 to 2014

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[14] Retrieved on the 20th October of 2015, from http://ir.moodys.com/GenPage.aspx?IID=108462&GKP=210475

[15] Retrieved on the 20th October of 2015, from http://investor.mhfi.com/phoenix.zhtml?c=96562&p=irol-reportsannual

To clarify the financial health of the Big Three, their Total Revenue and Operating Profits on the last 3 years is shown in Table 3. Moody's and S&P see both their stats increasing from 2012 to 2014. While there is a small decrease on the Operating Profit on S&P from 2013 to 2014, it is explained by a $1.6bn legal settlement. There are no values for Fitch, as no reliable source was able to provide an annual report for Fitch Ratings, which is explained by the ownership of this company. As Fitch is mainly owned by Hearst Corporation, which is one of the US "largest media, information and services company"[16], and not publicly traded, the access to its financial information is more restricted than the other 2 main CRA. Moody's is a public company and its main shareholder is Berkshire Hathaway INC, with 13% equity. S&P is owned by McGraw Hill Financial, Inc., a public financial services firm with main shareholders FMR LLC and Vanguard Group Inc. Therefore, all of the Big Three are owned by US large financial services or media groups. When downgrading European economies during the global financial crisis, "politicians in several Eurozone countries reacted by downplaying the role of rating announcements" (Baum, Karpava , Schäfer, & Stephan, 2013) and Rainer Brüderle, Germany's former Economy minister, went even further by saying that "it is hard to avoid the impression that some American ratings agencies and fund managers are working against the euro zone"[17]. Yet, as seen above, this was not enough incentive to the successful creation of an European CRA, that would be able to compete with the Big Three.

In short, the main CRA reveal decent and improving financial health despite the issues the CRA industry currently faces.

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[16] Retrieved on the 20th October of 2015, from https://www.hearst.com/about

[17] Retrieved on the 20th October of 2015, from http://www.weeklystandard.com/blogs/german-politician-euro-downgrade-american-plot_611697.html

3. Review of Literature

As this is an ongoing analysis, in the sense that the sovereign crisis still affects European economies, numerous studies on this field try to assess the effect of CRA on different economies and markets (e.g. Branco, 2012; Li, Visaltanachoti, & Kesayan, 2004).

3.1. Previous Literature

Previous studies analyzed the effect of CRA actions mainly on 3 different assets: Stocks, Bonds and credit default swaps (CDS). Branco (2012), based on Norden and Weber (2004) synthetized some of these studies into a table. Regarding samples, this sort of studies were mainly done in the US market, using the S&P500 or NASDAQ indices. In Europe, they were made for different indices, with no particular focus on a specific one. It is difficult to find studies for other economies. In the US, neither "positive or negative [rating changes had a] strong effect on the firms' stock price" when compared to previous analysis (Wu & Michaildis, 2014). Branco, 2012, when studying the effect of CRA on the NASDAQ, determined that, just like "previous studies", his conclusions "all point for completely inconclusive data" regarding CRA effect on American economy. In European countries, such as Sweden, rating agencies "are considered to have no informational value to investor" (Li, Visaltanachoti, & Kesayan, 2004). In Spain, Abad, Díaz, & Robles (2012) concluded that while upgrades have no effect, downgrades "convey pricing-relevant information". In short, the results for stocks were one of two: either the CRA would have no effect on any rating type, or negative changes would be significant while positive would not.

3.2. Efficient Market Hypothesis

Disregarding the differences on the data and methodology used, this thesis falls into the same category by addressing events that may not release completely new data to the market, but at least new compiled information in the form of a rating. The most important theory related to release of information to the market is the Efficient Market Hypothesis (EMH). An efficient market absorbs all the information and fully reflects it on securities' prices (Fama, 1970).

A follow up article from the same author distinguishes three forms to test this hypothesis: weak, semi-strong and strong. In the weak form tests the security price reflects only historical information. As a result, tomorrow prices will depend solely of

tomorrow's information (i.e. price changes are independent from each other), which enables the prediction of future price changes. Semi-strong tests incorporate weak tests, the speed of price adjustment and all information made public (besides price changes) as relevant factors. Lastly, strong tests integrate all above, and include all information, public and private, to explain stock prices. Also, this follow up article points out that the EM Hypothesis is just that, and should not be deemed true given its extreme simplicity. (Fama, 1991) However, 45 years later, it stood to the test of time and it is still one of the most important hypothesis in finance.

Being the aim of this thesis to assess how public information, in the form of ratings, affect the stock prices, the semi-strong form of efficiency will be assumed to support the event tests (being the event the rating announcement). The assumption that markets are efficient is vital for event study methodology, which will be stated on the following chapter.

4. Methodology

As explained above, an event study will be used to address the effect that CRA have on stock prices.

4.1. Abnormal Returns

To measure the impact of the event (rating or outlook announcement), the use of abnormal returns is crucial. The objective of this technique is to identify the effect of the specific event on the stock. For a given company i and event date t the abnormal return (AR_{it}) is the difference of the realized return (R_{it}) and the expected return had the event not occurred $(E[R_{it}|\,\Omega_{it}])$.

$$AR_{it} = R_{it} - E[R_{it}|\,\Omega_{it}] \tag{1}$$

As the event study will be performed under N rating and outlook announcements, the average abnormal returns (AAR), on (2), will be used to aggregate all the information, which facilitates taking conclusions about the effect of CRA on the two different economies. Besides, it minimizes the effect of possible outliers on the study.

$$AAR_t = \frac{1}{N}\sum_{i=1}^{N} AR_{it} \tag{2}$$

Finally, by summing these AAR across the time range where the event affects the stock, we get the cumulative average abnormal return (CAAR), which is a useful statistical tool to better understand the abnormal returns evolution.

$$CAAR_t = \sum_{t=1}^{T} AAR_t \tag{3}$$

4.2. Event Timeline

To analyze the abnormal returns, the event timeline should be set in accordance with Figure 2, beginning with the event.
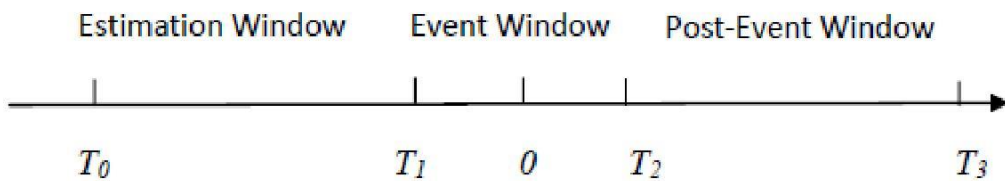

Figure 2. Event Study Timeline

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Represented by "0" on Figure 2, the event is the announcement of change of rating or outlook. Regarding the Event Window range, the literature is not consensual. Both the estimation and post-event window work just like a "control group" on a social experience: we can assess how the stock price is affected by the market it belongs to, and compare it to the "intervention group" - event window - which is the moment, or time range, in which the market absorbs the information released.

On previous literature, event windows can vary its range, but include a time range before the event date. (Branco, 2012) As the CRA inform the market when a rating is being revised, the investors should be expecting the event to happen. So, before the announcement, predictions and opinions flood the media, affecting the stock even before any actual change. After the announcement, depending on the difference between the expectations and the real change, if there is any, the price should adjust accordingly in the following trading days. Hence, including a time range before and after the event day, to create the event window, can lead to important conclusions. Adapting the event window to the study is crucial to achieve the best results: while a broader event window could better reflect the absorption of information it might also subject the data to other news and events that could affect the stock. Bearing this decision in mind, pre and post-event periods will have to be chosen in a consistent way. So, this choice depends on the objective and sample used: "a trade-off between improved estimation accuracy and relevance" (Sabel, 2012), and, periods can vary loosely. Comparing with other studies done during the crisis period, periods can vary from [-90, 90] or 181 days, (Galil & Soffer, 2011) to [-252, 5] or 258 days (Sabel, 2012).

Given the high volatility of the markets during the time range used (Figure 3.), having the above mentioned trade-off in mind, the window chosen for the present study was [-60, 30] from T_0 to T_3. As these values represent business days, this means that T_0 was set to nearly 3 months before the rating or outlook change. While this gives enough time to capture the market "normal" behavior before the event date, it also guarantees that the data is representative, in an attempt to reduce the effect of other events on this study.

To follow the earlier guidelines, to set up a small window that would still be able to capture the effect of the event on the stock prices, the event window, from T1 to T2, ranged [-15, 10].

Figure 3. EURO STOXX 50 Volatility of the last 10 years. Source: STOXX

4.3. Model

Event-study methodology is a well-recognized procedure in finance. According to Binder (1998) one of the first papers on this field, by Fama, Fisher, Jensen and Roll (1969), was cited more than 500 times over a 25-year period. Binder (1998) also compiles and discusses 5 different methods: mean-adjusted, market-adjusted, market model (MM), one-factor normal return estimate or Capital Asset Pricing Model (CAPM) and multifactor normal return estimate or Arbitrage Pricing Theory (APT).

According to the literature, market model is by far the most accepted model to follow: when compared to other models, authors show "slight preference for the Market Model". (Dickman, Philbrick, & Stephan, 1984) However, the same authors admit that the "difference [on the results] does not appear to be relevant". Binder (1998) concluded that [the other models] shown perform approximately as well as a market model by numerous studies, but the market model remains the most commonly used approach. Sorokina, Booth, & Thornton (2013) corroborate this in their study - "market model remains the most commonly used approach".

When compared to the Market Model, mean-adjusted and market-adjusted are

models simplified by the use of assumptions which can be valuable when the information is scarce or limited. While all these models use the equation (4) to calculate abnormal returns, the simpler ones assume values for some of the constants. Mean-adjust model considers that α_i and β_i are 0 and 1, respectively. This way, all stocks would have constant expected return. The market-adjusted establishes α_i and β_i as the average return over the estimation period and 0, respectively. So, this model does not take market factors into account.

$$AR_{it} = R_{it} - (\alpha_i + \beta_i R_{mt}) \qquad (4)$$

Where,

R_{mt} – Period-t returns on market portfolio;

α_i – Intercept value, value of the company when market has zero return;

β_i – Regression coefficient. Measure of volatility of a company in comparison to the market;

On the other side, CAPM imposes an additional restriction: the intercept (α_i) is equal to the risk-free rate, which may cause larger error variance, resulting in a less powerful test. Through the Market Model α_i and β_i are calculated for each stock, which should translate in a more powerful, since no assumptions are done. More recent tests, like Multi-factor Models or Portfolio Models add new layers of complexity that, according to the literature, do not "provide additional or confirmatory evidence". (Nekrasov, Shroff, & Singh, 2008) The complexity in Multi-factor Models is explained by the difficulty to assess which factors are relevant to the stock price behavior. Even if there are several relevant factors, if the selection is poorly made and the only explanatory variable would be the market, the results would be similar to a single-factor model (market model).

With the information above, the logical path to follow is to use the Market Model, which assumes linear correlation between individual stocks and the index return, according to the following formula.

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t}$$

$$E(\varepsilon_{i,t} = 0) \qquad Var(\varepsilon_{i,t}) = \sigma_{\varepsilon_i}^2$$

(5)

Where,

$\varepsilon_{i,t}$ − Expected residual or abnormal return for stock i in day t.

To test the effect on CRA we will focus on the abnormal returns caused by the event. Having all the information of the above formula, the market model will be used to calculate $\varepsilon_{i,t}$.

4.4. Hypothesis

In the null hypothesis (H$_0$) the mean and variance of the abnormal returns will be equal to zero. This would mean that the event (rating announcement) has no statistically significant effect on the stock returns, which could either be explained by investors' skepticism regarding CRA or lack of power from the test, although unlikely, since several publications defend the same methodology.

The alternative hypothesis (H1) admits that the value of the stocks react to the announcement of a rating or outlook change. This can occur if at least a part of the investors would keep using these announcements as trading advice and as extra information for the stock, regardless of the apparent skepticism on the CRA.

The author's expectations reside on the null hypothesis, which could prove that CRA announcements are not statistically relevant to stock prices.

To summarize,

H$_0$ - AAR for all events during period t are not statistically significant, i.e. are equal to zero.

H$_1$ - AAR for all events during period t are statistically significant, i.e. are different than zero.

These hypotheses will be tested by dividing the AAR by its own standard deviation, following the formula below.

$$\theta = \frac{AAR_{(t_1,t_2)}}{var\left(AAR_{(t_1,t_2)}\right)^{1/2}} \sim N(0,1) \qquad (6)$$

$$var(AAR_\tau) = \frac{1}{N^2} \sum_{i=1}^{N} \sigma_{\varepsilon_i}^2 \qquad (7)$$

As the variance, $\sigma_{\varepsilon i}^2$, is unknown, an approximation was used. In practice, the standard deviation for each company was squared, as variance has additive properties. Once all was summed up, the result was divided by the square of N, the number of companies[18], following the formula below.

The same hypotheses were tested for the CAAR, using the same methodology:

H$_0$ - CAAR for all events during period t are not statistically significant, i.e. are equal to zero.

H$_1$ - CAAR for all events during period t are statistically significant, i.e. are different than zero.

To perform the event study according to the guidelines set in this chapter there must be a clear definition of the data used. This can be found on the next chapter.

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[18] As this test will be performed for all four different rating types (rating up, outlook up, outlook down, rating down), the number of companies will be adapted for each, depending on how many actually showed the event type studied during the time range.

5. Data

To do this event test, the main types of date required are: daily stock prices and rating announcements information, which includes the type of change (positive/negative rating/outlook).

5.1 Daily Stock Prices

Since "the power of [the methodology] is greater with daily than with monthly data" (Brown & Warner, 1985), and daily stock prices data is easily accessible through various databases[19], the tests will be performed using this type of information. Both the prices for indexes and companies' stocks were taken from Yahoo Finance (http://finance.yahoo.com). This choice was merely practical, as this database facilitates the export of information to an Excel sheet. The quality of the information would not be an issue, as the markets studied have high trading volume and a mismatch on any stock price would have been fixed.

5.2. Rating Announcements Data

Given the market distribution of rating agencies studied before, it makes sense to test the effect of rating announcements of the Big Three. While these companies' websites provide rating announcements information, it is limited in time. As none of the Big Three freely provide data for long periods, such as 10 years, this information was retrieved from the Bloomberg server.

In other studies the sample period is variable but has some common ground. Since rating announcements are not the only explanation for price changes, periods of particular turmoil might not be representative or a healthy sample to use. In the present thesis, all the rating announcements comprehended between the 1st of January 2004 and 31st of December 2014 were taken in account. However, data related to events clearly defined and with substantial effects on the stock price was blacklisted, as the results obtained from those rating changes would not be reliant. This includes all events for companies that filed for bankruptcy or were forced to exit the Indices before 2011. Also, some particular rating changes where stock prices either doubled or were cut to half during the window were removed. Two cases would match these criteria:

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[19] Being the most relevant Yahoo Finance, Google and Bloomberg or Reuters servers.

Volkswagen AG's during the fall of 2008[20] and Banco Espírito Santo SA (BES) scandal during the summer of 2014[21], which affected the German and Portuguese Indeces, respectively.

5.3. Companies

While the indexes should have, on total, 50 companies[22], 30 from DAX (Germany) and 20 from PSI (Portugal), only 32 (24 from DAX, 8 from PSI) where used to perform this study. This is due to 2 main factors. First, the period tested is 10 years long (from 2004 to 2014), and some companies stopped trading during this time. Later substituted by newcomers, neither the former nor the latter would have enough, or relevant, rating changes information in order to make part of this study. Second, in much smaller number, some other companies simply had no actual rating changes during this period. In the annex 9.1 it is possible to find which companies made part of this study.

5.4. Sample discrimination

The objective of this thesis is to show the effect of CRA on Portuguese and German stock prices. As previously said, this effect may depend on the type of change – rating or outlook – and its direction – positive or negative.

Knowing the sample used is a step to better understand the results. Below, on Table 4, the total sample is divided per type of change and country.

	PT	DT	Total	Until 31-12-2008				Post-2008	
				PT	%	DT	%	PT	DT
Rating Up	3	24	**27**	2	67%	10	42%	1	14
Outlook Up	22	67	**89**	3	14%	21	31%	19	46
Outlook Down	68	78	**146**	9	13%	29	37%	59	49
Rating Down	42	39	**81**	3	7%	12	31%	39	27
Total	**135**	**208**	**343**	17	**13%**	72	**35%**	118	136

Table 4. Sample size by each country and event type, before and after 2008.

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[20] After Posche's move to seize control over the company, where the stock price rose over 100%.

[21] Financial scandal that led the bank off the index and rebranded to Novo Banco SA once its toxic assets were alienated.

[22] Actually, the PSI-20 is now composed by only 18 companies, as no other in Portugal meets the requirements to make part of the Index, after the exit of BES SA and BESI SA, in 2014.

Adding the number of changes from both countries, the number of negative changes is superior to the positive ones (227 against 116, respectively), which is not surprising given the time range of this study. For the same reason the number of changes before 2008 - when the financial crisis began, along with the growing scrutiny related to CRA – is massively inferior to the ones after that time (89 against 254, on the same order).

Summing all rating and outlook changes of both Portugal and Germany Indices (PSI 20 and DAX 30) for this period, there are 343 announcements, 135 for the first and 208 for the second. While one could see Portugal having a greater sample, as several companies had numerous rating and outlook changes across these years, it is important to keep in mind that the number of companies is inferior and, in some cases, the stock stopped being traded in the index during the study's time frame.

6. Results

CAAR can graphically show the average evolution of each type of rating or outlook change. Below, for each country, the effect of CRA on Portuguese and German stock prices will be illustrated on 3 phases: a graphic with the CAAR evolution during the event window and a table with the AAR, CAAR and t-test (θ) for each event type. As the crisis especially affected the former sector, it would be valuable to understand if the effect of CRA on this industry would be in any way different. The results will be analyzed on this section and conclusions will be discussed on the next chapter.

It is important to refer that this t-test has a distribution approximated to the normal distribution, as the standard deviation is also approximated. In a normal distribution, a value is statistically significant with a 95% confidence interval, if superior to 1.96 or inferior to -1.96 standard deviations. For this analysis the values that exceed these amounts will be shown in bold in Tables 5. and 6. Values in bold on the AAR t-test mean that in that particular day the stock prices were affected by the CRA action, in average, in a statistically significant way. CAAR t-test bold values mean that, when accumulating the effect of all previous days inside the event window, the total effect is statistically significant.

The criteria to consider that CRA have a strong effect on either economy resides on the AAR t-test values on the day of the event, the day before and the day after. CAAR t-test values are not as powerful as the portion related specifically to the CRA actions will be diluted among other factors when considering a multitude of days.

6.1. Results on German case

6.1.1. CAAR evolution
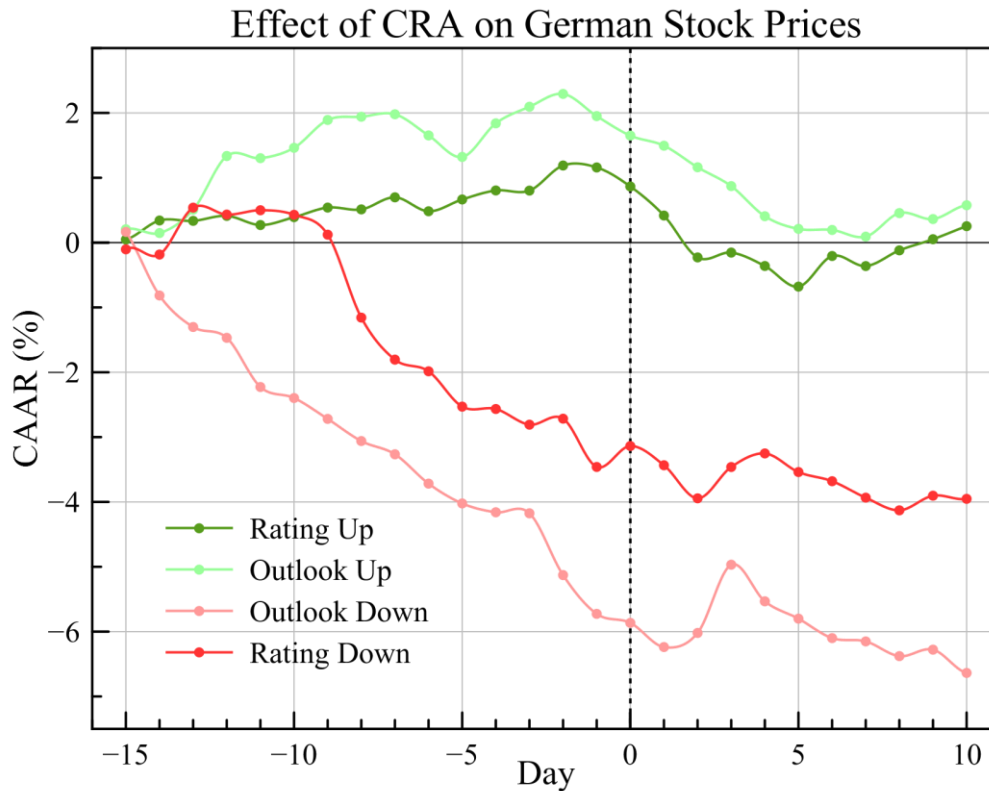
Figure 4. CAAR evolution during the event window for the 4 different even types

On Figure 4. one can find that CAAR, with a single value each day, represents the change (in percentage) of abnormal returns that, in average, a German company sees its stock endure, depending on the type of change. Although this is not yet conclusive, as one cannot tell if these values are significant, it can give a good idea to the reader of the behavior of the German market for each event type.

As expected and previously found on the literature (Hill & Faff, 2010), negative events seem to affect stock prices much more than positive ones: while an announcement of a negative outlook can mean -6.6% of abnormal returns to the company at the end of a 26-day period, the opposite event has barely any effect (0.58%). Also, a rating change on both ways represents less of a change to the stock price (-3.95% and 0.25%, respectively). Since these events are normally the result of a previous outlook change on the same direction, it is only normal that the investors could foresee this change, meaning it would be less of a surprise, ending up not affecting the stock price so much.

Finally, there is no evident behavior on the event day for any of the event types. While the effect on stock prices on the event day can be very significant in other kind of event studies where new information is released, such as yearly earnings or mergers and acquisitions announcements, that does not seem to be the case for this study. Rather, there is a continuous evolution of the CAAR in a given direction, being no day particularly significant. As ratings are more of an interpretation and inference of what has been the reality of the company recently, and by knowing that a company rating is being revised, an investor could expect this change, explaining the steady evolution of the CAAR during the window, particularly visible on the negative event types.

6.1.2. CAAR, AAR and t-test

Day	Rating Up				Outlook Up				Outlook Down				Rating Down			
	AAR	t-test	CAAR	t-test	AAR	t-test	CAAR	t-test	AAR	t-test	CAAR	t-test	AAR	t-test	CAAR	t-test
-15	0.047	0.079	0.047	0.079	0.205	0.454	0.205	0.454	0.165	0.363	0.165	0.363	-0.104	-0.203	-0.104	-0.203
-14	0.294	0.491	0.341	0.569	-0.058	-0.127	0.148	0.327	-0.981	**-2.160**	-0.816	-1.797	-0.080	-0.157	-0.184	-0.359
-13	-0.005	-0.009	0.335	0.560	0.360	0.796	0.508	1.122	-0.486	-1.071	-1.302	**-2.868**	0.723	1.411	0.539	1.052
-12	0.077	0.129	0.412	0.689	0.827	1.827	1.335	**2.949**	-0.167	-0.369	-1.469	**-3.237**	-0.107	-0.209	0.432	0.843
-11	-0.142	-0.237	0.271	0.452	-0.032	-0.072	1.302	**2.878**	-0.758	-1.669	-2.227	**-4.905**	0.067	0.132	0.499	0.975
-10	0.121	0.202	0.392	0.655	0.159	0.352	1.462	**3.229**	-0.171	-0.376	-2.397	**-5.281**	-0.070	-0.138	0.429	0.837
-9	0.149	0.248	0.540	0.903	0.430	0.949	1.891	**4.178**	-0.321	-0.707	-2.719	**-5.989**	-0.307	-0.599	0.122	0.238
-8	-0.028	-0.047	0.512	0.856	0.050	0.110	1.941	**4.288**	-0.343	-0.755	-3.061	**-6.744**	-1.279	**-2.497**	-1.157	**-2.259**
-7	0.186	0.311	0.698	1.166	0.038	0.084	1.979	**4.372**	-0.203	-0.448	-3.265	**-7.192**	-0.648	-1.265	-1.805	**-3.524**
-6	-0.215	-0.360	0.483	0.807	-0.326	-0.721	1.653	**3.652**	-0.452	-0.995	-3.717	**-8.187**	-0.180	-0.350	-1.985	**-3.875**
-5	0.183	0.305	0.665	1.112	-0.332	-0.733	1.321	**2.919**	-0.306	-0.675	-4.023	**-8.862**	-0.546	-1.065	-2.530	**-4.940**
-4	0.139	0.232	0.804	1.344	0.518	1.144	1.839	**4.063**	-0.135	-0.298	-4.159	**-9.161**	-0.035	-0.069	-2.566	**-5.009**
-3	-0.002	-0.004	0.802	1.340	0.256	0.565	2.095	**4.628**	-0.016	-0.035	-4.175	**-9.196**	-0.242	-0.472	-2.808	**-5.481**
-2	0.388	0.647	1.189	1.987	0.198	0.438	2.293	**5.066**	-0.954	**-2.101**	-5.128	**-11.297**	0.092	0.179	-2.716	**-5.302**
-1	-0.031	-0.051	1.159	1.936	-0.342	-0.756	1.951	**4.310**	-0.598	-1.316	-5.726	**-12.613**	-0.744	-1.453	-3.460	**-6.755**
0	-0.294	-0.491	0.865	1.445	-0.300	-0.664	1.650	**3.646**	-0.139	-0.306	-5.865	**-12.919**	0.323	0.630	-3.137	**-6.125**
1	-0.447	-0.747	0.417	0.697	-0.156	-0.346	1.494	**3.300**	-0.373	-0.822	-6.238	**-13.741**	-0.296	-0.578	-3.434	**-6.703**
2	-0.646	-1.080	-0.229	-0.383	-0.332	-0.733	1.162	**2.567**	0.218	0.479	-6.020	**-13.262**	-0.511	-0.997	-3.944	**-7.700**
3	0.075	0.126	-0.154	-0.257	-0.291	-0.644	0.871	1.923	1.052	**2.318**	-4.968	**-10.944**	0.483	0.943	-3.461	**-6.757**
4	-0.207	-0.346	-0.361	-0.603	-0.464	-1.024	0.407	0.899	-0.565	-1.245	-5.533	**-12.189**	0.209	0.408	-3.252	**-6.349**
5	-0.318	-0.531	-0.679	-1.134	-0.196	-0.433	0.211	0.466	-0.267	-0.588	-5.800	**-12.776**	-0.287	-0.560	-3.539	**-6.909**
6	0.472	0.789	-0.207	-0.345	-0.016	-0.035	0.195	0.431	-0.300	-0.660	-6.100	**-13.436**	-0.141	-0.276	-3.680	**-7.184**
7	-0.155	-0.259	-0.362	-0.605	-0.103	-0.228	0.092	0.203	-0.051	-0.113	-6.151	**-13.549**	-0.254	-0.496	-3.934	**-7.680**
8	0.242	0.404	-0.120	-0.201	0.363	0.802	0.455	1.005	-0.227	-0.500	-6.378	**-14.049**	-0.195	-0.380	-4.129	**-8.060**
9	0.172	0.288	0.052	0.088	-0.092	-0.204	0.363	0.801	0.099	0.219	-6.278	**-13.830**	0.225	0.439	-3.904	**-7.621**
10	0.200	0.334	0.253	0.422	0.213	0.470	0.576	1.272	-0.359	-0.791	-6.637	**-14.621**	-0.048	-0.094	-3.952	**-7.715**

Table 5. AAR, CAAR and t-test values for each event type on Germany Stock Prices.

Table 5 illustrates the effect of CRA on German stock prices, differentiating the effect through the 4 types of rating change. As the CAAR values were shown graphically on Figure 4., the value added here is on the t-test values. Discriminating the 4 different event types:

- ➢ Rating Up – There is no significant reaction to CRA actions, as there is not a single t-test value that would suggest it;

- ➢ Outlook Up – While the CAAR t-test values are relevant on days [-12;2], there is not a single AAR t-test value that would provide strong evidence of the effect of CRA actions.

- ➢ Outlook Down – CAAR t-test values are significant on days [-13;10] with very big values. Besides, 3 AAR t-test values, on {-14;-2;3} corroborate some effect from CRA on this event type. Positive value on 3 might be explained by a negative overreaction from the previous days.

- ➢ Rating Down – CAAR t-test values are significant on days [-8;10] with big values. A single day {-8} shows a relevant AAR t-test value. However, a positive AAR on day 0 weakens the relevance of the results for this event type.

6.2. Results on Portuguese case

6.2.1. CAAR Evolution
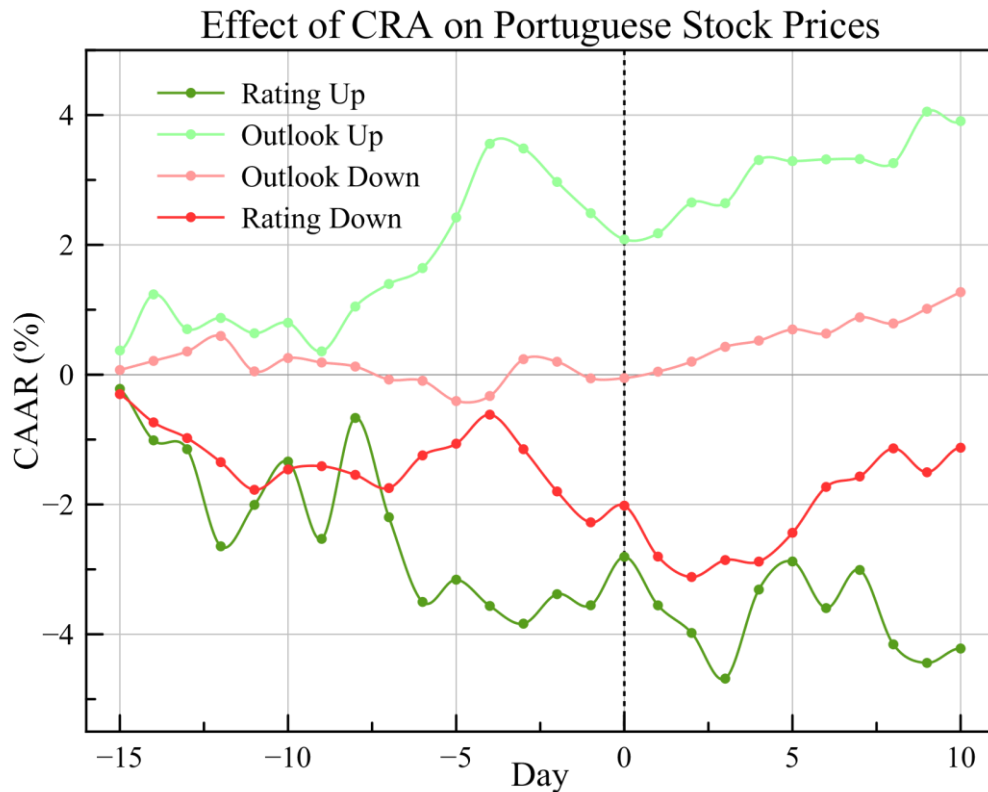
Figure 5. Effect of CRA on Portuguese Stock Prices

At the first look, the effect of CRA on Portuguese stock prices does not seem to be so clear.

As seen previously on the Data section, there were only 3 "Rating Up" events, during a 10-year range, on Portuguese companies tested. This is why its line has a different style: besides having a small sample, not sufficient to provide any significant conclusions, it has a highly negative value (-4.22%).

The remaining event types also present an unexpected behavior, which contradicts what has been concluded for the German case. The negative outlook not only is above the negative rating, it shows a positive value at the end of the window (1.27%) and a barely negative one at the event day (-0.05%).

Hopefully, not all is wrong with this plot: the values for the Outlook Up and Rating Down events are fairly positive and negative, respectively, with values at the event day of 2.08% and -2.02%.

The instability and contagion from external sources that the Portuguese market was, and still is, exposed to during the time studied might explain the lack of clarity from the data. The stock prices of Portuguese companies would fluctuate more, being dependent of the mainly bad news that were abundant during the crisis.

6.2.2. CAAR, AAR and t-test

Table 6. shows the results of AAR, CAAR and t-test values for each across the event window for Portuguese stock prices. Discriminating the 4 event types:

➢ Rating Up – Just as seen on the CAAR graphical demonstration, the effect for this event is highly negative. The small sample does not allow to any relevant interpretations.

➢ Outlook Up – While the CAAR t-test values are relevant on days [-7;10], there is not a single AAR t-test value that would provide strong evidence of the effect of CRA actions.

➢ Outlook Down – The only relevant CAAR t-test values is on the last day, {10}. Besides, it is positive, which reveals there is no relevant relation between the Portuguese stock prices tested and the CRA actions.

➢ Rating Down – CAAR t-test values are significant on days [-12;10]. However, there is not a single day showing a relevant AAR t-test value

The Effect of Credit Rating Agencies in Stock Prices

Event study in Germany and Portugal

Day	Rating Up				Outlook Up				Outlook Down				Rating Down			
	AAR	t-test	CAAR	t-test	AAR	t-test	CAAR	t-test	AAR	t-test	CAAR	t-test	AAR	t-test	CAAR	t-test
-15	-0,220	-0,202	-0,220	-0,202	0,372	0,579	0,372	0,579	0,072	0,120	0,072	0,120	-0,300	-0,504	-0,300	-0,504
-14	-0,792	-0,729	-1,012	-0,931	0,865	1,345	1,237	1,924	0,140	0,235	0,212	0,355	-0,435	-0,730	-0,735	-1,234
-13	-0,137	-0,126	-1,149	-1,056	-0,536	-0,833	0,701	1,091	0,146	0,245	0,358	0,601	-0,243	-0,407	-0,978	-1,642
-12	-1,496	-1,376	-2,644	**-2,432**	0,172	0,268	0,873	1,358	0,238	0,399	0,596	1,000	-0,370	-0,621	-1,348	**-2,263**
-11	0,638	0,587	-2,006	-1,845	-0,236	-0,367	0,638	0,992	-0,545	-0,914	0,051	0,086	-0,427	-0,717	-1,774	**-2,980**
-10	0,668	0,614	-1,338	-1,231	0,162	0,252	0,799	1,244	0,205	0,345	0,256	0,430	0,314	0,527	-1,460	**-2,452**
-9	-1,192	-1,096	-2,530	**-2,327**	-0,441	-0,686	0,359	0,558	-0,068	-0,115	0,188	0,315	0,050	0,084	-1,411	**-2,369**
-8	1,863	1,714	-0,667	-0,614	0,691	1,075	1,049	1,632	-0,063	-0,106	0,125	0,210	-0,133	-0,223	-1,544	**-2,592**
-7	-1,530	-1,407	-2,197	-2,020	0,348	0,541	1,397	**2,173**	-0,200	-0,336	-0,075	-0,126	-0,204	-0,343	-1,747	**-2,935**
-6	-1,305	-1,200	-3,501	**-3,220**	0,245	0,381	1,642	**2,555**	-0,019	-0,033	-0,094	-0,159	0,503	0,845	-1,244	**-2,089**
-5	0,343	0,315	-3,159	**-2,905**	0,779	1,212	2,421	**3,767**	-0,312	-0,524	-0,406	-0,683	0,181	0,303	-1,064	**-1,786**
-4	-0,405	-0,373	-3,564	**-3,278**	1,136	1,767	3,558	**5,534**	0,078	0,130	-0,329	-0,552	0,447	0,751	-0,616	**-1,035**
-3	-0,273	-0,251	-3,837	**-3,529**	-0,073	-0,114	3,485	**5,420**	0,567	0,952	0,238	0,400	-0,532	-0,894	-1,149	**-1,929**
-2	0,455	0,418	-3,382	**-3,110**	-0,515	-0,801	2,970	**4,619**	-0,039	-0,065	0,199	0,335	-0,651	-1,094	-1,800	**-3,022**
-1	-0,172	-0,158	-3,554	**-3,269**	-0,481	-0,749	2,488	**3,871**	-0,256	-0,430	-0,057	-0,095	-0,476	-0,799	-2,276	**-3,821**
0	0,747	0,687	-2,807	**-2,581**	-0,405	-0,630	2,084	**3,241**	0,004	0,007	-0,052	-0,088	0,258	0,432	-2,018	**-3,389**
1	-0,748	-0,688	-3,554	**-3,269**	0,094	0,146	2,177	**3,387**	0,099	0,166	0,046	0,078	-0,785	-1,319	-2,803	**-4,708**
2	-0,425	-0,391	-3,979	**-3,660**	0,475	0,739	2,652	**4,126**	0,154	0,259	0,201	0,337	-0,314	-0,528	-3,118	**-5,235**
3	-0,704	-0,647	-4,683	**-4,307**	-0,011	-0,016	2,642	**4,110**	0,228	0,383	0,429	0,720	0,261	0,438	-2,857	**-4,797**
4	1,371	1,261	-3,312	**-3,046**	0,665	1,034	3,307	**5,144**	0,095	0,160	0,524	0,880	-0,024	-0,039	-2,880	**-4,837**
5	0,433	0,398	-2,879	**-2,648**	-0,017	-0,026	3,290	**5,118**	0,173	0,290	0,697	1,170	0,444	0,745	-2,437	**-4,092**
6	-0,718	-0,660	-3,596	**-3,308**	0,027	0,042	3,317	**5,159**	-0,064	-0,107	0,633	1,063	0,706	1,186	-1,730	**-2,906**
7	0,587	0,540	-3,010	**-2,768**	0,004	0,007	3,321	**5,166**	0,250	0,420	0,883	1,483	0,161	0,271	-1,569	**-2,634**
8	-1,146	-1,054	-4,156	**-3,822**	-0,062	-0,096	3,259	**5,070**	-0,094	-0,158	0,789	1,325	0,433	0,727	-1,136	**-1,907**
9	-0,285	-0,263	-4,441	**-4,085**	0,793	1,234	4,053	**6,304**	0,227	0,380	1,015	1,705	-0,368	-0,618	-1,504	**-2,525**
10	0,222	0,204	-4,220	**-3,881**	-0,146	-0,228	3,906	**6,076**	0,256	0,430	1,272	**2,136**	0,378	0,635	-1,126	**-1,891**

Table 6. AAR, CAAR and t-test values for each event type on Portugal Stock Prices

7. Conclusion

This thesis objective, to assess the effect of CRA rating and outlook changes on Germany and Portugal Indices, was accomplished by studying the behavior of the abnormal returns using the event study methodology. With a Market Model, it was possible to show how the companies' stocks of each country would react to a positive or negative rating or outlook change. Even if the behavior of German and Portuguese stock prices to a rating change is divergent, the conclusions from this thesis are consistent with the literature. For positive rating and outlook changes there is no significant reaction from either economy. This corroborates what Branco (2012) found for S&P500 Index. Hull, Predescu, & White (2004) concluded the same for the CDS market. Regarding negative rating and outlook changes the conclusions diverge. In Germany, the effect of CRA on negative ratings and outlooks is relevant. As concluded by Abad, Díaz, & Robles (2012), related to Spanish bond market, "reviews for downgrade and negative outlooks, convey princing-relevant information to the market". In Portugal, the effect on negative ratings and outlooks is not as clear as the German case. While the stock prices show a negative tendency, this effect is actually positive on the event date. This was also concluded by Leonard (2013), regarding the S&P500 Index. Overall, German stock prices behave according to literature – there is an asymmetry between up and downgrading, being the latter twice as effective on the stocks (Hill & Faff, 2010) - while the Portuguese do not provide strong conclusions.

7.1. Limitations of the study and Suggestions for future work

It is important that traditional methodologies get constantly revised to assess if they are still effective. CRA exist for over a century and while ratings can still be useful information in the market, their relevancy on different assets is constantly tested on thesis just like this one. While only one test is not conclusive about the effectiveness of ratings, as it is always constrained by its own methodology and data, the accumulation of different tests might be. This thesis intended to study different data from previous literature. Besides, the comparison between two countries with opposite financial statuses in Europe would constitute an uncommon approach to study this objective. It was the purpose of this thesis to assess the effect of CRA actions on the German and Portuguese stock markets. Initially, it was also an objective of this thesis to assess if the effect of the Big Three among sectors is significantly different. As the financial sector was the most affected by the recent global financial crisis, the distinction between

financial and non-financial sector could provide interesting conclusions. However, the sample for the financial sector was not enough to provide any reliable conclusions. Organized by 4 companies from the German Index and 3 from the Portuguese, the number of rating changes during the time range tested would be so insignificant that no conclusions could be taken from that. Furthermore, the non-financial sector behavior across the different types of change would behave similarly to the total sample test, as only a small portion of the sample would be not used. Nonetheless, there is potential on this idea, and an assessment of the behavior of different sectors could be done for bigger samples and markets. In the same context, it would also be interesting to compare the effect of CRA across different time ranges, e.g. before and after the last global financial crisis (2008). Unfortunately, the number of rating and outlook changes on both economies before 2008 would be unrepresentative, given the lower levels of volatility in the market. These are some suggestion for future work and to improve the evidence of the effectiveness of CRA on different markets and assets.

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9. Appendixes

9.1. List of Companies used on the study[23]

DAX-30	
Company Code	**Long Name**
ALV.DE	Allianz SE
BAS.DE	BASF SE
BAYN.DE	Bayer AG
BMW.DE	Bayerische Motoren Werke AG
CBK.DE	Commerzbank AG
CON.DE	Continental AG
DAI.DE	Daimler AG
DBK.DE	Deutsche Bank AG
DB1.DE	Deutsche Boerse AG
LHA.DE	Deutsche Lufthansa AG
DPW.DE	Deutsche Post AG
DTE.DE	Deutsche Telekom AG
EOAN.DE	E.ON SE
FRE.DE	Fresenius SE & Co KGaA
HEI.DE	HeidelbergCement AG
HEN3.DE	Henkel AG & Co KGaA
LXS.DE	LANXESS AG
SDF.DE	K+S AG
LIN.DE	Linde AG
MRK.DE	Merck KGaA
RWE.DE	RWE AG
SIE.SE	Siemens AG
TKA.DE	ThyssenKrupp AG
VOW3.DE	Volkswagen AG

PSI-20	
Company Code	**Long Name**
BPI.LS	Banco BPI SA
BCP.LS	Banco Comercial Portugues SA
BES.LS	Banco Espirito Santo SA
BRI.LS	Brisa Auto-Estradas de Portugal SA
CPR.LS	CIMPOR Cimentos de Portugal SGPS SA
EDP.LS	EDP - Energias de Portugal SA
PHR.LS	Portugal Telecom SGPS SA
RENE.LS	REN - Redes Energeticas Nacionais SGPS SA

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[23] In light grey, companies from the financial sector.

9.2. Type of ratings and outlook[24] for each of the Big Three CRA

Moody's		S&P		Fitch		
Investment Grades						
Aaa		AAA		AAA		Highest Credit Quality
Aa	Aa1	AA	AA+	AA	AA+	Very high Credit Quality
	Aa2		AA		AA	
	Aa3		AA-		AA-	
A	A1	A	A+	A	A+	High Credit Quality
	A2		A		A	
	A3		A-		A-	
Baa	Baa1	BBB	BBB+	BBB	BBB+	Good Credit Quality
	Baa2		BBB		BBB	
	Baa3		BBB-		BBB-	
Speculative Grades						
Ba	Ba1	BB	BB+	BB	BB+	Speculative
	Ba2		BB		BB	
	Ba3		BB-		BB-	
B	B1	B	B+	B	B+	Highly Speculative
	B2		B		B	
	B3		B-		B-	
Caa	Caa1	CCC	CCC+	CCC		Substantial Credit Risk
	Caa2		CCC			
	Caa3		CCC-			
Ca		CC		CC		Very high levels of Credit Risk
C		C		C		Exceptionally high levels of Credit Risk
				RD		Restricted Default
		D		D		Default

[24] In the table only ratings are discriminated. For each rating, the Big Three assign an Outlook that can be positive, represented by (+), negative (-), stable or developing (used in special occasions, when i tis being revised with nuclear direction).