The effect of changes in credit rating on CDS spreads

- An empirical study of European companies rated by Standard & Poor´s, Moody´s and Fitch

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ABSTRACT:

A company's credit default swap spread is the cost per annum for protection against a default by the company. In this paper we investigate the effect of credit rating announcements on the credit default spreads in Europe.

We find all announcement types except *Downgrade* to be statistically significant. The categories *On Watch Down* and *On Watch Up* exhibit the most pronounced credit default swap reactions, with average movements of 2.71 percent and 3.01 percent respectively during the announcement day and the day following the announcement. We also find that announcements made by S&P and Moody's are statistically significant in four out of five announcement categories, whereas no announcements from Fitch are found to result in credit default swap movements that are statistically significant.

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We would like to thank professor Magnus Dahlquist for his support, enthusiasm and valuable guidance.

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1. INTRODUCTION

Rating agencies are by many considered important in mitigating problems stemming from asymmetric information between market participants. Credit rating agencies and their assessments in many cases provide the basis for credit monitoring as well as important decisions such as credit approvals and the pricing of specific credit issues. Considering this importance, credit rating agencies in theory assume a central role on the financial markets. In reality, however, the effect of credit ratings it is not fully clear. Several studies have been conducted trying to explain the link between credit rating announcements and bond/equity markets. Not until lately have there been any studies examining the direct link to credit risk through so called credit default swap (CDS) contracts. The recent development in CDS markets has allowed researchers to access CDS contract data and making investigations of any sort involving CDSs possible. To date, only a few studies have been made in this area and the majority have focused on the US markets. The underlying CDS data in these studies has been relatively illiquid, resulting in what should be unreliable finding.

Understanding the link between credit rating announcements and CDS prices is important because it relates to several interesting topics. First, as anticipation patterns might be discovered traders could engage in profitable trading strategies. Second, portfolio managers might be able to mitigate certain credit risks through hedging.

The aim of this thesis is to provide further insights to the information content of credit rating announcements, and more specifically, to the link between credit rating announcements and the spread of CDS contracts. In particular, we try to investigate the impact on the abnormal credit default swap spread around the announcement dates. The focus of this study is i) to investigate whether there is a link between credit rating announcements and CDS spreads; ii) to explain the potential links that might be found.

The contribution of this study is twofold. First, we are the first to make a comprehensive investigation of how credit rating announcements affect the European CDS market. To the best of our knowledge our study is the first to investigate the link between credit rating announcements from the three largest credit rating agencies and European CDS spreads. Second, using CDS

entities listed in the iTraxx 125 index we are guaranteed to use the most liquid and thus reliable CDS contracts available in Europe. As the European CDS market has grown significantly in size and liquidity over the recent years, the relatively new data (spanning from January 2003 to the end of March 2007) used in our study should yield more reliable results compared to prior studies investigating the topic of this paper.

We begin our thesis by describing the credit rating process and the credit rating industry in Section 2. We then describe the CDS contract and the CDS market in Section 3. The theoretical framework is outlined in Section 4 along with a presentation of related research. Based on the theoretical framework we develop our hypothesis in Section 5 together with a discussion of predicted results. In Section 6 we describe the methodology and present the descriptive statistics for our data. We then report our empirical findings in Section 7. The analysis and conclusions are then presented in Section 8.

2. THE CREDIT RATING PROCESS

2.1 Overview of the credit rating industry

Credit ratings have grown in importance during the last couple of decades as traditional bank lending has shifted towards capital market issuance. Credit rating agencies provide service to both investors and issuers by reducing some of the information asymmetries that exist in the market place. Credit rating agencies help investors understand the risks associated with investments in debt instruments while lowering the cost of raising funds for issuers.

As the financial markets are growing more complex and the number of financial instruments more numerous, credit rating agencies now more than ever assume a central role in the financial markets. Banks, bondholders, pension funds and other investors increasingly use credit ratings when making investment decision. As a result, the opinion of credit rating agencies has grown significantly in importance during recent years.

There are currently three major credit rating agencies providing credit rating information; Moody's Investors Service ("Moody's"), Standard and Poor's Division of the McGraw-Hill Companies Inc. ("S&P") and Fitch Ratings ("Fitch"). Of these three Moody's and S&P are by far the largest with global market shares (in terms of revenue) of 39% and 40% respectively, while Fitch holds a market share of approximately 16%. (Moody's Investors Service, 2008)

Moody's Investors Services is the specialised subsidiary of Moody's Corporation (traded on the New York Stock Exchange) providing credit ratings and research covering debt instruments and securities. Moody´s maintains presence in 29 countries employing approximately 3,500 people worldwide. (Moody's Investors Service, 2008) S&P is the financial services arm of the McGraw-Hill Companies (traded on the New York Stock Exchange). As a subsidiary of the McGraw-Hill Companies, S&P employs approximately 8,500 people located across 23 countries. (Standard&Poor's, 2008) Fitch Ratings is part of the Fitch Group, which is a majority owned subsidiary of the French conglomerate Fimalac S.A. Fitch Ratings is dual headquartered in New York and London and employs approximately 2,100 people world-wide. (Fitch ratings, 2008)

2.2 Business model

Rating agencies generate their revenue from two primary sources. First, the rating agencies collect fees from issuers that solicit ratings for their securities. These fees can either be per issue fees or annual fees. The size of the fee usually depends on the type and the size of the security being rated. Also the number of securities already rated for that particular client can have an impact on the fee. Second, rating agencies generate revenue from the sale of research, software, and other proprietary information.

Many smaller rating agencies earn the bulk of their revenue by offering their ratings to investors on a subscription basis.

2.3 Credit rating definitions and methodology

Credit ratings issued by the major credit rating agencies are general opinions of the relative creditworthiness of issuers or specific issues made by the issuer. The credit ratings are based on several risk factors and measure the likelihood that the issuer will honour the terms of a financial contract. The rating is not intended to constitute a recommendation to purchase, sell or hold a particular security.

The major credit rating agencies use a similar approach when evaluating the issuers or specific issues. The main part of the credit rating analysis consists of an evaluation of the financial risk profile of the company. The rating analysis however usually starts with an assessment of the business risk profile of the issuer. S&P summarizes the main factors contributing to the business risk as country risk, industry characteristics, company position, product portfolio, technology, cost efficiency and profitability.

When evaluating the financial risk profile of an issuer the rating agencies look at factors such as financial policy, capital structure and financial flexibility. A large part of the financial risk evaluation consists of an analysis of financial ratios such as EBIT (Earnings Before Interest and Taxes) interest coverage, EBITDA (Earnings Before Interest, Taxes, Depreciation and Amortization) interest coverage, funds from operations/total debt and return on capital. (Standard&Poor's, 2006)

The credit rating agencies have developed special matrices in order to evaluate the combined effects from the business and financial risk exposures faced by the issuer. (Standard&Poor's, 2006) *Table 2.1* illustrates how the combined effects from business and financial risk might be evaluated. The matrix does not address the lower rating classes as they usually originate from extraordinary circumstances which can not be generalized in this framework.

The matrix is general and there is no specific formula for combining the scores in order to arrive at a rating conclusion, in fact much of the final rating is subjective on behalf of the rating agencies. Two issuers with identical metrics can end up with completely different ratings depending on agency subjectivity and several other factors such as industry, challenges and prospects.

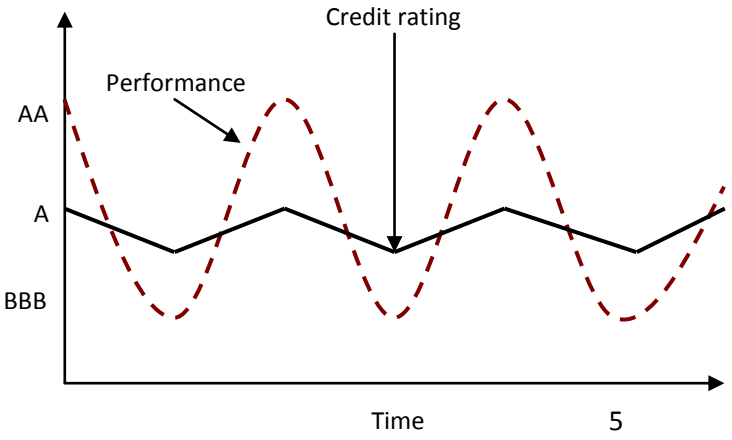
Table 2.1 **Financial risk profile versus Business risk profile**

	Financial risk profile				
Business risk profile	Minimal	Modest	Intermediate	Aggressive	Highly leveraged
Excellent	AAA	AA	A	BBB	BB
Strong	AA	A	A-	BBB-	BB-
Satisfactory	A	BBB+	BBB	BB+	B+
Weak	BBB	BBB-	BB+	BB-	B
Vulnerable	BB	B+	B+	B	B-

2.4 Cyclicality and credit ratings

Credit ratings are generally intended to be forward-looking, not merely represent a snapshot of the current state of the issuer. The time horizon considered is expected to extend as far as analytically foreseeable. Anticipated ups and downs of business cycles, whether industry specific or related to the general economy, are as far as possible factored into the credit rating.

Figure 2.1 **Business cycle and credit rating**



In order to rate issuers or specific issues through the cycle, credit rating agencies need to predict the pattern of the cyclicality. The pattern is usually hard to predict as the cycle can become longer, shorter, steeper or less severe compared to prior cycles.

There are generally two ways of incorporating cyclicality into the credit rating and to produce a through the cycle rating. The credit rating can be i) held constant throughout the cycle or ii) vary within a relatively narrow band. Moody's, S&P and Fitch all use the latter approach.

2.5 Outlook and Review

In the 1980s two new types of credit announcements were introduced in order to produce indicators that are timelier than regular credit ratings while moderately volatile. The credit announcements introduced were the outlook and the review. While rating changes signal fundamental change in an issuer's creditworthiness, rating reviews and outlooks inform about possible change in creditworthiness. Outlooks usually have a longer time frame than reviews, typically two years, and incorporate trends or risks with less certain implication for credit quality. The aim of the outlook is to map the likely direction of the issuer's credit quality over the medium term. A positive outlook indicates that an issuers rating is likely to be raised, negative likely to be lowered and stable that the rating is unlikely to be changed.

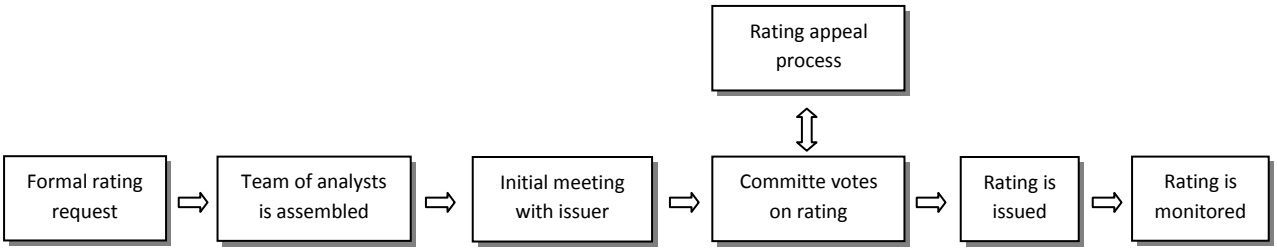
Reviews give stronger indications than outlooks of future change in the rating, the focus of a review is over the short term. When a rating is placed on a "Watchlist" by Moody's, Credit Watch" by S&P or "Ratings Alert" by Fitch, there is a very high probability that there will be a rating change. The review listing might occur when a significant event has occurred or when there is an unexpected deterioration in profitability, yet the issuer's underlying creditworthiness is not certain.

Credit ratings do not need to be placed on review or have their outlook changed to be altered. Rating agencies can upgrade or downgrade issuers or issues without prior announcement.

2.6 The credit rating process

Credit rating agencies base their assessments on information furnished by the obligors and other sources considered reliable. The meeting between the credit rating agency and the issuing company thus constitutes an important part of the credit rating process.

Figure 2.2 **The credit rating process**



The credit rating process is usually initiated by the security issuing company approaching the credit rating agency with a formal rating request. A lead analyst, responsible for the rating process, is then appointed and a team of analysts with the appropriate expertise assembled. Members of the analytical team then meet with the company management to review all the details that might influence the rating. A substantial part of the information presented at the meeting is usually confidential and provided for the sole purpose of arriving at a rating.

Following the initial meeting with the company a committee is convened to discuss the lead analyst's rating recommendation and the supporting facts. Finally, the committee votes to arrive at a final rating and the issuer is subsequently notified of the outcome. The rating can be appealed by the issuer before it is made public. In the U.S. the rating agencies always publish the rating, irrespective of the issuer's request, if the financing is a public deal. In most countries outside the U.S. ratings are only assigned on the issuer's request, the issuer can choose to make the rating public or to keep it confidential.

As soon as the rating has been assigned and made public, it is monitored in order to guarantee its legitimacy. Credit rating agencies usually meet with the management of the issuing company annually, even in the absence of new issues, in order to stay current with the companies' development. Should there be a need for a rating reassessment, a thorough investigation is made including a review of new financial and economic information. (Standard&Poor's, 2006)

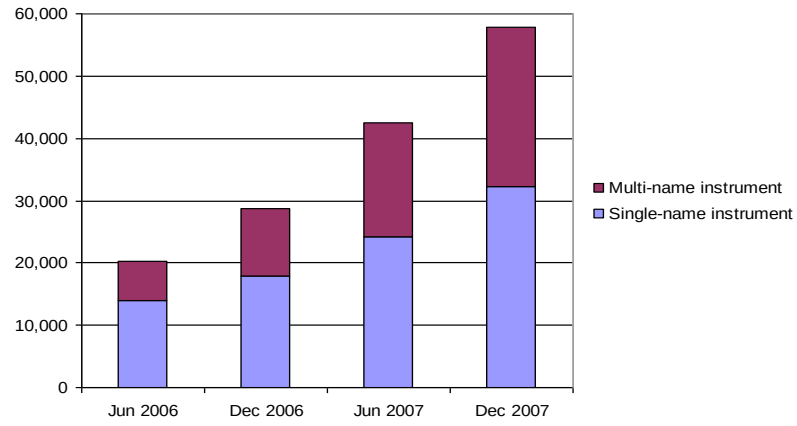
3. CREDIT DEFALUT SWAPS

3.1 The market for credit derivatives

Credit derivatives have been seen as a huge innovation in the financial markets during the recent decade. Credit derivatives allow companies and investors to manage and trade credit risk. The growth of the credit derivatives market has exceeded all expectation and is predicted to continue growing in terms of size of value and diversity of products. Despite the recent turmoil in the credit markets, the volumes for credit derivatives remain high. Increased risk premiums and appreciation in value of outstanding CDS contracts have played a pivotal role for this development. (Financial Times, 2008)

There are several different variations to the credit derivative. Perhaps the most interesting credit derivative is the credit default swap (CDS) which has traditionally also been the most traded credit derivative product. At the end of 2007 the notional amount of outstanding CDS contracts was USD 57,894bn. The most common type of CDS contract is the single name CDS, which constitutes approximately 55.7% of the total CDS market in terms of outstanding notional. The remainder (44.3%) consists of multi-name CDS instruments, contracts where the reference entity is more than one name, as in portfolio or basket CDSs or CDS indices. (Bank for International Settlements, 2008) Recent development observed indicates that the multi-name CDS segment is outpacing singe name CDS contracts in terms of growth. Estimates from the British Bankers' Association (BBA) predict that the traded value of single name CDS contracts and multi-name CDS contracts will be approximately the same by the end of 2008. (British Bankers' Association, 2007)

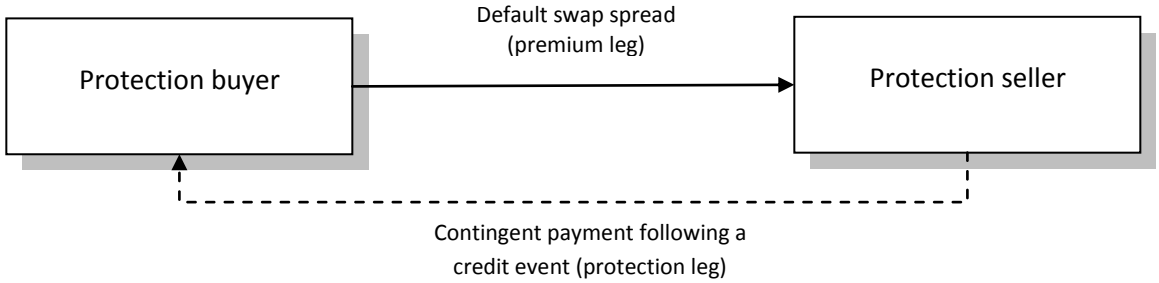
Figure 3.1 **Development of the CDS market**



3.2 Structure and features of the Credit Default Swap

A CDS is an over-the-counter (OTC) contract between two parties in which one party, the protection buyer, buys insurance against the possible default of a bond from the protection seller. The issuer of the bond involved is usually called the reference entity while the specific bond is called the reference obligation. The reference entity can be either a company or a sovereign entity. The buyer of the CDS makes periodic payments, usually quarterly, and in return receives the right to sell the reference obligation for a price of face value in the case of a credit event. This relationship is illustrated in *figure 3.2*.

Figure 3.2 **Illustration of the CDS structure**



The CDS price, or sometimes spread, is the annualized fee the protection buyer pays the protection seller. The CDS can in case of credit event be settled either by physical settlement or by cash settlement. A physical settlement implies that the buyer of credit protection delivers the reference obligation to the protection seller and in return receives the full face value of the

reference obligation. A cash settlement on the other hand means that the protection buyer is compensated for the loss incurred by the credit event, receiving the difference between face value and the current lower value of the reference obligation. The dominant form of settlement in the market is physical settlement.

The maturity of a CDS contract can vary from a couple of months up to ten years or more. Most CDS contracts have a maturity of five years and these are also considered being most liquid. Single name CDS contracts, contracts referring to a single corporate entity, are more liquid than other CDS contracts and often constitute building blocks in more complex structured credit products.

The CDS price or spread is the premium paid by the protection buyer to the protection seller. It is quoted in basis points per annum of the notional amount of the contract. The concept of a CDS spread is different from the one of a bond yield spread. In a CDS the spread is simply the premium in percent of the notional whereas for a bond it is the yield differential of a bond over a risk free rate. Arbitrage however ensures that the CDS spread approximately equals the bond yield spread. A bond yield spread, the bond yield less the risk free rate, should approximately equal the CDS spread. By selling whichever is expensive while simultaneously buying whichever is cheap there should be a possibility to generate risk-free profit. By engaging in these virtually risk-free trades the market price of these instruments will move in a way ensuring that the bond yield spread and the CDS spread stay approximately the same.

3.3 Credit events

The CDS contracts are traded within the framework of the International Swaps and Derivatives Association (ISDA) master agreement. The ISDA documentation sets out a standardized and generally accepted definition for what constitutes a credit event. The main advantage of using ISDA documentation is the reduction of legal risk faced by the contract counterparties. Also, ISDA documentation allows for an increase in speed by which the transactions can be confirmed. Despite the standardization there are several variations to the ISDA contract. The main differences can be found in the definitions of what constitutes a credit event in the context of a capital restructuring, where significant differences can be identified between Europe, Asian and the US markets.

There are several credit events that typically trigger the mechanism in a CDS contract. Traditionally occurrences such as i) bankruptcy ii) failure to make principal or interest payment iii) obligation default or acceleration iv) repudiation or moratorium (for sovereign entities) v) restructuring, would constitute credit events in a CDS contract.

4. THEORETICAL FRAMEWORK

In this section we provide a comprehensive overview of the main theories which provide the basis for our analysis.

4.1 Efficient markets

In his seminal paper *Efficient Capital Markets*, Eugene Fama describes an efficient market as a market where there is a large number of rational profit maximizers actively competing with each other and where important current information is almost freely available to all participants. The competition leads to a situation where at any point in time, acxtual prices of individual securities already reflect the effects of information based on events that have already occurred and on events which as of now are expected to take place in the future. Should for example the market price be lower than some particular piece information would suggest, the holders of that information would exploit that information by buying the security and thus driving up the price. This up movement in price would continue to the point where the market price would equal the price suggested by the information.

In his paper Eugene Fama identifies three degrees of market efficiency and presents three variations to the efficient markets hypothesis (EMH). In the least rigorous form of market efficiency, the weak-form EMH, price sensitive information is distinctly unrelated with historical prices. In a weak form efficient market the future price of a security can not be inferred by the analysis of historical price series, all past market prices and data are fully reflected in the price of the security. In other words, the weak-form EMH clearly rejects the concept of technical analysis.

In the slightly more rigorous form of market efficiency, the semi-strong form EMH, all publicly available information is fully reflected in the price of a security. Relevant public information is assumed to be digested rather quickly leaving no room for fundamental analysis. The semi-strong form EMH rejects the concept of both technical and fundamental analysis, only privately held information is assumed to have a price sensitive effect.

In the most rigorous form of market efficiency, the strong form EMH, all information (public and private) is assumed to be fully reflected in the price of a security. According to the strong form

efficient market hypothesis not even acting on privately held information (insider information) will result in an out performance of the market on a skill basis. Any yield above market average is deemed to be the result of pure luck.

What these three variations of market efficiency have in common is that they all assume that price movements are based on the arrival on new information. They also suggest that profiting from the prediction of price movement is very hard and unlikely. Perhaps most accepted by market participants and scholars are the two weaker form models.

In this study we assume that the market for CDS contracts is semi strong. This assumption is crucial for the justification of credit rating agencies and for our study to bear any results. Should the credit rating information produced by the credit rating agencies contain any information, CDS spreads should, under the semi strong market form, react to this new information accordingly. As a reaction to perceived lower risk levels, positive events (Upgrade, Review for upgrade and Positive outlook) should result in a narrowing of the CDS spread. Higher risk levels suggested by negative events (Downgrade, Review for downgrade and Negative outlook) should result in a widening of the CDS spread.

Previous research is rather conclusive in that the information conveyed by credit rating agencies influence CDS markets. Even if there are differences between specific types of credit announcements, the overall perception is that there is a link between information in credit announcements and CDS spreads. Micu et al. (2006) in their study conclude that all types of rating announcements (rating changes, reviews and outlooks), whether positive or negative, have a significant impact on CDS prices. Hull et al. (2004) confirm that certain credit rating announcements from Moody's have significant impact on CDS prices. Similar results have been found by Di Cesare (2006) in the market for CDS contracts where the underlying issuers are banks and the credit rating announcements produced by Moody's, S&P and Fitch.

4.2 Information content

Along with the development of financial products and the specialization of markets, credit rating agencies have refined the ratings they issue. To deal with issues such as timeliness and transparency of ratings, rating agencies have introduced the outlook and the review respectively.

For instance, to prevent ratings from fluctuating too much during business cycles, rating agencies use outlooks to signal the credit risk over different time horizons. At the same time, to improve transparency, reviews nowadays often precede rating changes. These reviews are intended to indicate the direction of the rating change and soften any potential rating reaction in the markets.

As the purpose and structure of announcements vary so can their information content. Depending on the timing, nature and importance of the announcement, the impact on markets might be different. The majority of studies investigating the impact of credit ratings do not differentiate between announcement types, announcements are generally lumped into positive or negative. To understand the real impact of credit ratings one must investigate each announcement type separately.

A common feature of credit rating changes is that they are often preceded by reviews. In those cases where a rating change is preceded by a review much of the information content of the rating change is already conveyed in the review, leaving little significance to the actual rating change. It is therefore crucial to differentiate between these two announcement types and to control for inter announcement contamination when making any investigations.

Not many studies investigating credit ratings and their impact have taken a serious approach to the differentiation of announcement types and controlled for announcement contamination. In those studies that have, interesting findings have been made. In their study, Norden and Weber (2004) find that controlling for different rating announcements within and across rating agencies, reviews for downgrade are associated with abnormal movements in both equity and CDS prices, while actual downgrades are not. Moreover Norden and Weber find that the price movements are more pronounced in those cases where no other rating announcements were made public during the preceding 12 months. Hull et al. (2004) in their study confirm that reviews for downgrade contain a significant amount of information while Downgrades and Negative Outlooks do not. Lehnert and Neske (2004) make somewhat different findings, not only are negative outlooks and reviews for downgrade found to contain significant information but so are actual downgrades. Even though Micu et al (2006) find that all types of credit rating announcements contain information, the impacts of credit rating announcements are found to be most pronounced for reviews. Holthausen and Leftwich (1986) find significant abnormal returns in common stocks in association with announcements of additions to S&P credit watch list.

4.3 Price pressure and asymmetric price adjustment

There might be some instances where credit rating announcements could have an effect on CDS prices even in the absence of pricing relevant information. Certain investors may have investment constraints imposed requiring them to manage credit risk in a way that might have an effect on CDS prices. Some investors could be obliged to sell securities or manage credit risk via CDS contacts under certain credit risk circumstances. Many investors are for example prohibited from holding assets below a certain credit rating. Should the asset be downgraded below that level, they would be required to manage this risk by selling the asset or alternatively by hedging the risk through CDS contracts. The movement in CDS price can thus be the result of investment restrictions rather than actual dissemination of pricing relevant information.

Often investment guidelines and investment restrictions are imposed on investors in order to prevent excessive risk taking, the rules are often set to prohibit investments in instruments with high risk. This means that most often upgraded instruments (lower perceived risk) are not affected by the investment guidelines, while downgraded instruments (higher perceived risk) require the management of risk of some sort. Negative announcements are thus, according to the theory of investment restrictions, expected to have a more significant effect on CDS spreads than positive events. When negative credit events occur, investors might be required to sell the assets or forced to hedge perceived risks by buying CDS contracts and thus driving up the market price of the CDS contracts.

Research investigating this phenomenon is rather conclusive in that negative announcements yield significant abnormal returns around the announcement days while positive announcements do not. Perhaps most influential is the work of Hull et al. (2004), which show that positive rating events produce far less significant changes in CDS spreads than negative rating events. In their study Norden and Weber (2004) confirm these findings, significant abnormal CDS spread movements are observed around negative rating events while insignificant market reaction are observed around positive events. These findings are consistent with other research studying the relationship between credit rating announcements and equity prices/bond yields and Asset Backed Securities (ABS). Steiner and Heinke (2001) conclude that downgrade announcements and negative watch listings induce significant abnormal returns for bonds on the day of the announcement and the following trading days. Ammer and Clinton (2004) find that on average

rating downgrades are accompanied by negative returns and widening of spreads in US Asset Backed Securities. Even thought most of the prior research point to the fact that only negative announcements contain information Micu et al. (2006) surprisingly enough find that all types of positive events, reviews for upgrade positive outlooks and actual upgraded all contain information. Even though Hand et al. (1992) find that positive and negative announcements both hold significant information, they find an asymmetric pattern with respect to rating change upgrades and downgrades by Moody´s and S&P. They find significantly negative average excess bond and stock returns for downgrades, but weaker positive average bond and stock returns for upgrades.

Holthausen and Leftwich (1986) find evidence that suggests that downgrades by Moody's and S&P are associated with negative abnormal stock returns in the two day window beginning the day of the press release of the rating agency. They find little evidence of the corresponding effect in upgrades. Goh and Ederington (1993) go a bit further by dividing rating changes in two classes, those related to improvement/deterioration of financial prospects and those related to changes in firms leverage. They argue that these two types can not be treated as homogenous when looking at impact on equity prices, and find only those downgrades associated with a deterioration in financial prospects have a significant negative impact on equity markets while the other have no impact.

4.4 Reliability

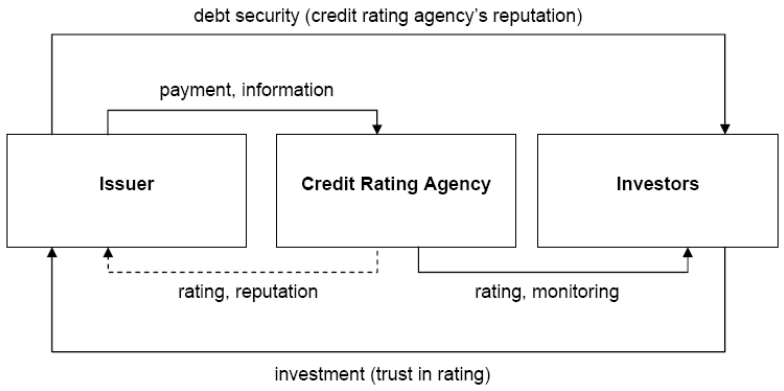
A rather frequent topic in the financial press nowadays touches upon questions such as credibility and reliability of credit ratings and credit rating agencies. Until recently there has not been much reason to doubt the assessments made by credit rating agencies. However, recent events in the market such as a number of spectacular and surprising defaults as well as differences in ratings between agencies have raised several questions among investors and other market participants. To fully understand the reason for this scepticism and the reliability of credit rating agencies one must understand the forces driving the interaction between market participants and credit rating agencies.

Central in the credit rating industry is reputation. As rating agencies easily can be monitored ex post by looking at the issuer performance or defaults, it is not hard to evaluate the accurateness in

the ratings issued. Credit rating agencies with a high accuracy can build up a reputation among investors and issuers. The benefit of enjoying a good reputation is twofold. First, investors who put faith in a particular rating agency will seek services from that rating agency, subscribing to ratings and other information. Second, issuers will seek to be rated by reputable credit rating agencies as a stable credit rating will lower the borrowing costs. Credit rating agencies enjoying a good reputation will be able to charge higher subscription fees from investors and demand a higher price for their credit rating assessments from the issuers, compared to competing rating agencies with inferior reputation.

A credit rating agency can deceive markets by producing credit assessments which in some sense are incorrect. The motivation for this might be to save costs or to generate extra fees by producing biased assessments in favour of the issuer. This deceitful behaviour would theoretically yield extra profit in the short term on the expense of a deteriorated reputation and lower long term profits. In the case where the short term gains do not offset the reduction in long term profits, there will be an incentive to produce adequate high quality material in order to maintain the reputational capital. The reputational capital theory is generally accepted in the credit rating literature and is among other described by Dittrich (2007).

Figure 4.1 **Information intermediation by credit rating agencies**



We conclude that in order to keep rating mandates, increase market shares or collect higher rating fees, credit rating agencies might engage in systematic overrating of issuers. In any case this behaviour can result in a lack of credibility among market participants and be reflected in an

absence of CDS price reactions following rating announcements from that particular rating agency.

The questions concerning credit rating reliability and the reasons for and effects from different credit ratings have caught the attention of several researchers in the past. Several studies have been made investigating the credit rating industry and its participants. Ederington (1986) does not find many differences in market reaction following the release of information from different rating agencies. According to Steiner and Heinke (2001) the international bond markets do not place any weight on whether announcements are made by S&P or Moody's. Bond spreads react identically no matter what agency releases the information. Kish et al (1999) confirm in their paper that there is not enough evidence that the market values one agency over another when comparing S&P and Moody's. The market is found to find value from both rating agencies.

5. HYPOTHESES

In this section we present our hypotheses based on the theories in section 4.

Information content in credit rating announcements: Markets do not anticipate new information and therefore react directly after rating announcements.

If credit rating announcements convey new information to the market, we should expect a significant move up/down in the CDS spread around the announcement date. Empirical evidence from prior research reveals that there is not always a significant move in the CDS spread around credit rating announcements.

Information content in reviews and outlooks: There is a more pronounced significant pattern in credit rating announcements of review and outlook type compared to actual changes in credit rating.

Reviews are usually succeeded by actual rating changes. The new information from the credit assessment is thus conveyed to the market at the first instance through the review, not much new information should be conveyed at the subsequent rating change. We expect reviews/outlooks to have a more pronounced effect on the CDS spread compared to the actual rating changes, which is in line with prior research.

Asymmetric price adjustment: There is no significant reaction in CDS spread around positive announcements while there is a significant movement around negative announcements.

Due to biased information processing among market participants, positive credit rating announcements are not expected to result in pronounced CDS spread movements. Investor constraints are expected to contribute to an asymmetric pattern between positive and negative

announcements. Research conducted investigating this asymmetric pattern shows that there is a difference in reaction following positive and negative information.

Reliability hypothesis: Information from different credit rating agencies have similar impact on CDS spreads as they enjoy the same level of confidence from the market.

As there is a possibility that rating agencies constantly overrate issuers in order to receive or retain business, markets might not trust certain credit rating agencies in their credit assessments. Due to the self-regulating reputation mechanism, we expect all rating agencies to produce high quality material and the market to take this into consideration. We expect market participants to treat information from credit rating agencies equally and we do not expect to observe any differences in impact on CDS spreads. Prior research indicates that the market values the information from rating agencies equally.

6. DATA AND METHODOLOGY

In this section we provide an overview of the characteristics of our data. Also, we calculate the average credit spread between rating classes and describe the methodology of our event study.

6.1 Data

6.1.1 Overview

In order to achieve the most reliable results for our study we analyze companies listed on the iTraxx Europe list. iTraxx Europe constitutes of the 125 most liquid investment grade entity names in the European CDS market, and a breakdown by industry gives the following table:

Table 6.1 **iTraxx Europe list by industry**

Industry	No. Of Companies	Weight In %
Financials	25	20%
Telecom, Media and Technology	20	16%
Industrials	20	16%
Energy	20	16%
Consumer	30	24%
Auto	10	8%
Total	125	100%

A complete overview of the companies listed on iTraxx Europe is given in Appendix 10.1. We collected our CDS data from Bloomberg and were able to obtain data for 119 of the companies in our study. In order to measure the liquidity in the quoted prices we gather the bid and ask for these companies. We would also have liked to consider the associated volumes, however as this was not possible we rely on other measures to ensure that our prices reflect true market values. The most liquid CDS contract is the five-year maturity and we therefore select this CDS maturity for our study. Further on, we analyze data from January 2003 to April 2007. The CDS market has grown rapidly in size over the last decade and we believe that by confining our study to the last four years, our data will be more likely to reflect true prices in the market and hence our results will be more reliable.

We decided to use credit ratings issued by the three largest rating institutes, S&P, Moody's and Fitch. Data for these were collected from Reuters and in total, ratings for 120 of the companies on

the iTraxx Europe list were available. However, for seven of these companies the rating information consisted either of events that were not included in our study or events prior to 2003, leaving us with 113 rated companies. As previously mentioned, we were unable to obtain CDS data for six companies and as all of these companies were among the 113 for which we had a rating, we were left with 106 companies for which we had both rating announcements and CDS data.

The rating announcements we will investigate all belong to one of six rating announcement types given in the table below:

Table 6.2 **Distribution of rating announcement types**

Announcement Type	Original Rating Events	Sorted Rating Events
Negative Outlook	123	77
Positive Outlook	60	50
Downgrade	106	61
Upgrade	58	48
On Watch Down	88	52
On Watch Up	18	10
Total:	453	298

We here use the notation *On Watch Up* and *On Watch Down* for what have previously been referred to as reviews for upgrade and downgrade respectively. In total we had 453 rating announcements and this number was reduced to 298 after we had controlled for contemporary events and clustering, as depicted in *section 6.2.3*. As we can see in the table, the number of events in each category differs with *Negative Outlook* having most observations and *On Watch Up* having the least. We also note that when we do a comparison between the number of negative and positive events (*Negative Outlook*/*Positive Outlook, Downgrade*/*Upgrade and On Watch Down*/*On Watch Up*), the negative events dominate.

A breakdown of the rating announcements on the three different rating institutes gives the following table:

Table 6.3 **Rating announcements by institute**

Announcement Type	S&P	Fitch	Moody's
Negative Outlook	37	14	26
Positive Outlook	20	16	14
Downgrade	38	12	11
Upgrade	17	18	13
On Watch Down	33	11	8
On Watch Up	5	2	3
Total:	150	73	75

We can see that S&P has a dominant position when it comes to the number of announcements, having in total more announcements than Fitch and Moody's combined.

When we plot the accumulated spread changes during the event window, t=0+1, for all our announcement categories, some events stand out due to the magnitude of the percentage changes. The question that arises is whether we should regard some observations as outliers or not. A more thorough analysis of these events reveals that the largest movement in our data sample is due to an announcement of possible accounting irregularities, prompting an immediately downgrade of two steps. The details are given in *Appendix 10.2*. We see this as an extraordinary event that is not representative for what typically causes a downgrade. Hence, we exclude the event from our sample. Regarding the other events that stand out, we can not find any evidence indicating that they are caused by what is seen as non-normal behaviour in the market. Therefore we choose not to exclude them.

6.1.2 Estimation of the average credit spread

In addition to determine if the spread changes are statistically significant or not, we believe it would be interesting to relate the announcement effects to the actual difference in spread levels between two rating classes. We therefore calculate the average spread difference between the rating classes in our sample. We note that it is reasonable to expect that the average spread difference between rating classes vary with different rating levels. However, as the rating levels in our sample are rather homogenous, all being within the investment grade category, we think it will be a reasonable approximation. Also, when doing the calculations we would ideally want to assign a unique credit rating to all our spread observations. However, some of the companies in our sample are rated by two or three different rating agencies, and as a consequence of that we

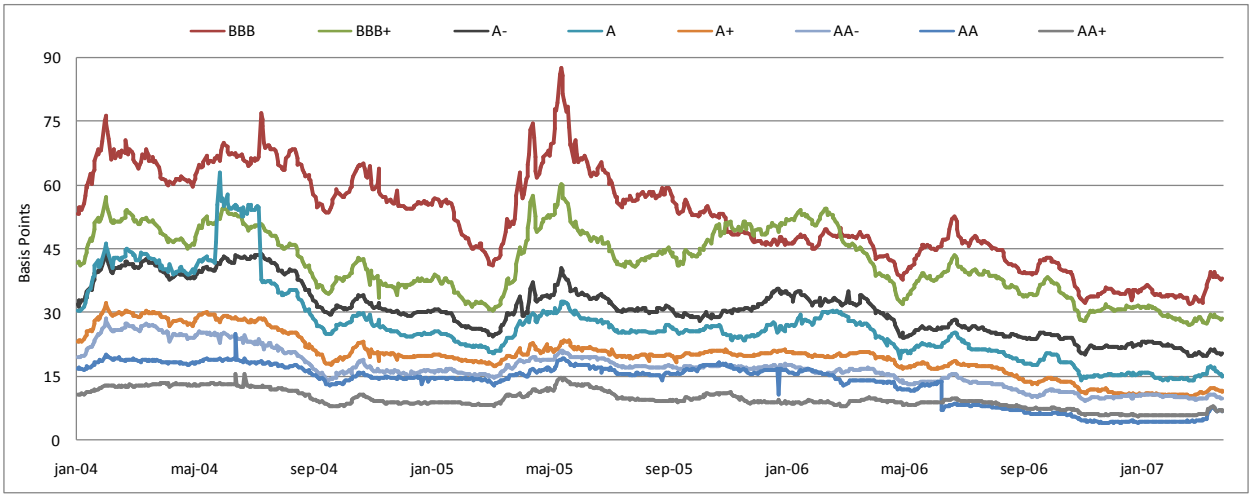
sometimes end up with ambiguous rating levels. To achieve consistency we therefore apply the following rules:

- In case of just one rating available, we use this rating regardless of which rating institute that issued the rating.
- When multiple ratings are issued, we give preference to ratings from S&P and when ratings from S&P are not available, ratings from Moody's are given preference over ratings from Fitch.

The rationale behind this sorting order is twofold. First, in our sample S&P has a dominant position when it comes to the number of ratings issued. We have more rating announcements from S&P than we have from Moody's and Fitch combined. By using ratings from S&P whenever we can, we maximize the number of observations that are rated by the same agency. Second, the choice to give Fitch the lowest priority is consistent with how the market perceives these three rating agencies. S&P and Moody's are seen as market leaders, with Fitch in a more distant third place.

When calculating the average spread difference between rating classes, we are dependent on having a fairly large number of observations for each class in order to obtain accurate estimates. As the number of companies for which we have ratings and CDS data is considerably lower in 2003 than for the rest of the period, we have excluded 2003 when calculating the average credit spread for the different rating classes. Further on, we have ratings in the interval AAA to BBB-, however, AAA and BBB- are not included as we do not have companies rated in these classes throughout the whole time period, leaving us with ratings in the interval AA+ to BBB. In *figure 6.1* below, the spreads for the different rating classes are plotted over time.

Figure 6.1 **Average credit spread over time for different rating classes**



As we can see the spread values vary with time and during this period there is a long term trend against lower spread values. However, we can observe that the differences between the rating classes are fairly constant over time and when they change, they tend to change at the same time. That is, we see parallel shifts of the spread curves. With the exception of some temporary deviations, we see a pattern where the credit spread increases with lower ratings. The average spread for each rating class is presented in the figure and table below.

Figure 6.2 **Average credit spread for different rating classes**

When we look at actual increase in the credit spread as we move down in credit rating, we first see steps of around three to four basis points. This value increases to around ten basis points as we reach the triple B ratings. If we instead analyze the changes in percent, the picture is somewhat less clear cut. The biggest change in percent is actually between the two highest ratings where we see an increase of over 40 percent in the credit spread. Thereafter the changes are in the interval 13 to 35 percent and no real pattern can be seen.

Table 6.4 **Average credit spread for different rating classes**

Rating	AA+	AA	AA-	A+	A	A-	BBB+	BBB
Credit spread in bps	9.52	13.45	16.79	19.87	27.16	30.82	41.83	52.38
Increase in %		41.40	24.79	18.32	36.73	13.45	35.75	25.20
Increase in bps		3.94	3.34	3.08	7.30	3.65	11.02	10.54

Taking the average of the values in the bottom row in the table above, we estimate the average difference in credit spread between different rating classes to be 6.1 basis points. Also, in percentage units the average difference is 28.0 percent.

6.2 Methodology

6.2.1 Event study

We will perform an event study in order to examine the potential impact rating announcements have on credit spreads. The day of the rating announcement is denoted t=0, and an estimation window with the length of 120 business days, ranging from t=-180 to t=-61, will be used to estimate normal performance in the CDS market. In order to investigate any adjustments in the market prior to the announcement, we will use two pre-event windows. The first one covers the period t=-60 to t=-11, and the second one covers the period t=-10 to t=-1.

To capture any movements in credit spreads following the rating announcement, an event window consisting of t=0 and t=1, will be used. The rationale for including t=1 in the event window is to account for the possibility of a rating announcement being made after the closure of the market. Hence, the possible impact from the new information on credit spreads may not be visible until the following day. Finally we will use a post-event window, ranging from t=2 to t=10. Through this post-event window we hope to capture any delayed reactions in the market.

6.2.2 Calculating daily- and abnormal returns

In order to examine the price movements in the CDS market we use daily holding returns for a buy-and-hold investment. The formula for the CDS return for issuer i on day t, R_t^i, is:

$$R_t^i = \frac{P_t^i}{P_{t-1}^i} - 1 = \frac{S_t^i \cdot PV_t^i(premia)}{S_{t-1}^i \cdot PV_{t-1}^i(premia)} - 1$$

where: P_t^i = the expected present value of the payments the buyer of a CDS contract makes to the seller.

S_t^i = CDS spread for issuer *i* on day *t*.

$PV_t^i(premia)$ = the present value of one basis point stream of premia on day *t*.

As we can see, the CDS return is contingent upon the value of a premia as well as the CDS spread. The buyer of a CDS contract is obliged to make scheduled payments to the seller until either the contract expires or a credit event occurs. P_t^i represents the expected present value of these payments and in order to determine $PV_t^i(premia)$, a CDS pricing model is needed. In particular, it calculates the probability that the issuer does not default prior to a certain payment date. However, if we make the assumption that $PV_{t-1}^i(premia) = PV_t^i(premia)$, we can write the expression for the CDS return as:

$$R_t^i = \frac{S_t^i}{S_{t-1}^i} - 1$$

As we use relative small steps in time, one trading day, this simplification seems reasonable. For a more elaborate discussion about this assumption, we refer to the paper of Micu et al. (2006).

In line with the literature on event studies, we calculate the abnormal daily changes to control for general market movements. The normal return is estimated with the market model and abnormal return calculated according to the formula below:

$$AR_t^i = R_t^i - a^i - b^i \cdot R_t^m$$

where: AR_t^i = abnormal return for issuer *i* on day *t*.

R_t^i = return on day *t* for issuer *i*.

R_t^m = market return on day *t*.

In order to estimate the parameters a^i and b^i we use an estimation window consisting of the 120 days that precedes the event window. A more detailed description of the event study methodology is given in *Appendix 10.3*.

6.2.3 Controlling for contemporary rating announcements and clustering

In order to isolate the potential impact from rating announcements in our sample on the credit spreads, we exclude all contemporary announcements. That is, if an agency on any given day makes two rating announcements for the same company, both are excluded from the sample. Often a firm's outlook is changed at the same time as the company is given a new rating and failure to control for these dual announcements can bias the results.

It is also important to control for other rating announcements in time that might be related to the one we are investigating. When a rating agency issues an announcement, it is not uncommon for other rating agencies to follow within a couple of days. Given this scenario, we believe it is a strong probability that the market will react on the first announcement but not on the second or third one. We do not see these secondary announcements as "new" announcements and therefore exclude them from our sample. This is done by investigating a period of ten business days preceding any announcement. If we find other rating events for the same company in this period, we exclude all announcements except the one coming first in time.

6.2.4 Test for normality and choice of test statistics

We will use a one-sample *t*-test in order to investigate if CDS returns are significantly different from zero. This test assumes that the population is normally distributed and for some of our tests the number of observations will exceed 30, which allows us to assume normality through the central limit theorem. However, as this will not always be the case, we perform a Skewness/Kurtosis test for normality as defined by D'Agostino, Balanger, and D'Agostino, Jr., and below is a table that presents the *p-values* for the test statistic. Appendix 10.5 exhibits histograms for the average daily changes during the time period *t*=0+1 for the different announcement categories.

Table 6.5 ***p*-values for Skewness/Kurtosis test of normality for abnormal CDS returns**

Event Window	Neg. Outlook	Pos. Outlook	Downgrade	Upgrade	Watch Down	Watch Up
-60 to -11	0.354	0.001	0.000	0.000	0.159	0.385
-10 to -1	0.000	0.282	0.006	0.000	0.000	0.036
0 to 1	0.000	0.006	0.000	0.109	0.000	0.640
2 to 10	0.079	0.000	0.000	0.000	0.000	0.003

As we can see in *table 6.5*, the assumption of normality can be rejected in many cases on the one percent level. However, as the *t*-test is quite robust over moderate violations of the normality assumption, we still think it is a useful test to perform, keeping in mind that the results may not be fully robust. Also, as a robustness check we will include a non-parametric test, the Wilcoxon signed-rank test, that not requires the data to be normally distributed. With the *t*-test we will use one-sided hypotheses, increasing spread levels for negative events and decreasing spread levels for positive events. The Wilcoxon signed-rank test, however, is a two-sided test.

7. RESULTS

In this section we first illustrate the development graphically and then present the results from our event study. In addition, we relate our result from the event study to the average credit spread between rating classes and we also investigate the volatility around the announcement dates.

7.1 Daily and accumulated changes for different announcement types

In order to get a visual overview of the impact from different event types on the credit spreads, we plot the daily and the accumulated changes over the time interval *t*=-10 to *t*=10. This period comprises the second pre-event window, the actual event window and also the post-event window. Graphs for the six different announcement types are given below.

Figure 7.1 **Abnormal CDS returns for the period t=-10 to t=10 for negative rating announcements**

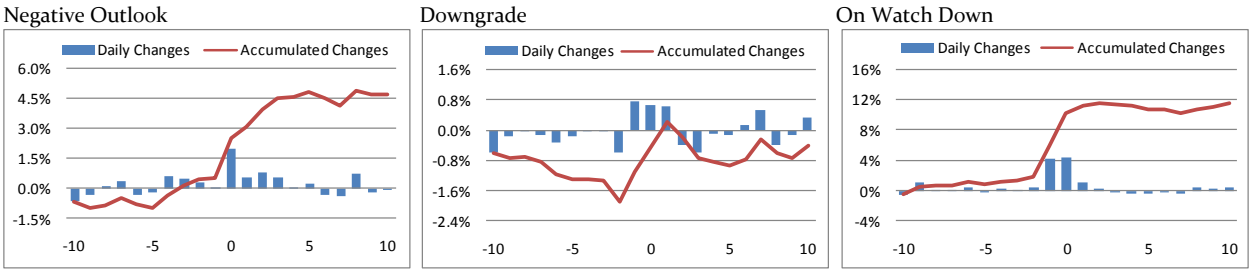
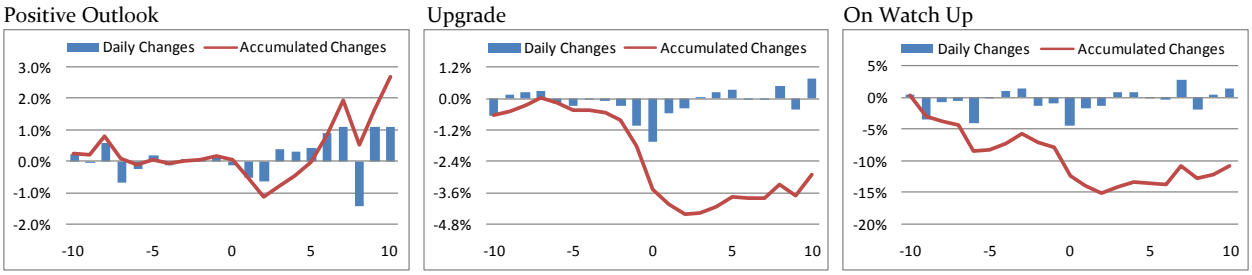


Figure 7.2 **Abnormal CDS returns for the period t=-10 to t=10 for positive rating announcements**



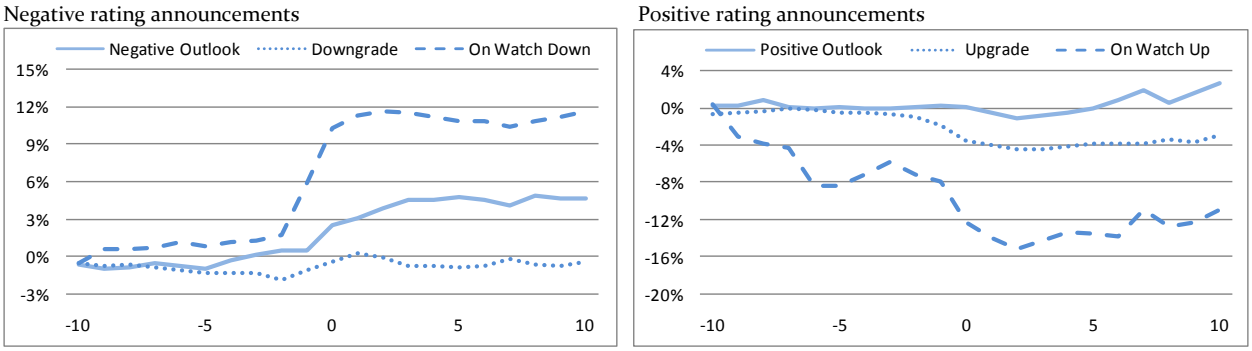
In all the graphs above with the exception for *Positive Outlook*, we can see a reaction in the expected direction around the announcement day. Looking at the accumulated changes we notice that apart from *Downgrade* and *Positive Outlook*, they move in the expected direction, that is for

negative events we see an increase in the credit spreads and for positive events we see a decrease. The picture is less clear cut for the categories *Downgrade* and *Positive Outlook*. For *Downgrade* we see a decrease in the spread level many of the days in the window, however not around the announcement day. In total the accumulated values are around zero. The category *Positive Outlook* shows no real pattern, however the accumulated changes increase during the end of the time interval.

It is interesting to note that the magnitude of the changes differs quite a lot. The largest reactions can be seen for the categories *On Watch Down* and *On Watch Up*, on the announcement day they both move more than four percent. *Negative Outlook* and *Upgrade* move approximately half that much, around two percent. Finally, *Downgrade* changes less than one percent and for Positive Outlook the reaction is negligible.

In order to facilitate a comparison between the different announcement types, all the negative and the positive events respectively, are plotted together in *figure 7.3*.

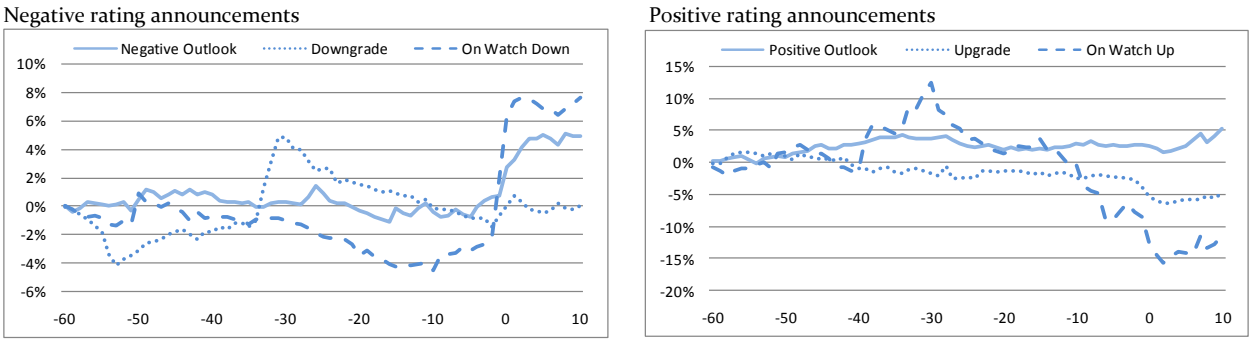
Figure 7.3 **Accumulated abnormal CDS returns for the period *t*=-10 to *t*=10**



When we compare the two graphs above, it becomes clear that *On Watch Up* and *On Watch Down* stand out also when it comes to the accumulated spread changes. For *On Watch Up* we can see considerable movements before the announcement day and the same pattern, although not as pronounced, can be seen for *On Watch Down*. The accumulated changes for these categories are in the interval 10 to 15 percent, which can be compared to *Downgrade* where the changes are close to zero and *Positive Outlook* which even moves two percent in the direction opposite to what we expect. The remaining announcement types, *Negative Outlook* and *Upgrade*, show a rather homogenous behaviour with accumulated changes reaching values around four to five percent.

Extending the time period to also include the first pre-event window, a somewhat different picture emerges. In *figure 7.4* below, we can see that there is a sharp increase in the spread level for *Downgrade* at around *t*=-30. Thereafter the spread level slowly falls back towards the original value. This pattern differs from what we see for *Negative Outlook* and *On Watch Down*; their behaviour is dominated by the sharp increase in the spread level they both exhibit around the announcement day. Looking at the positive rating announcements, we can see what seems to be a very erratic behaviour for the category *On Watch Up*. This could be caused or exaggerated by the small sample size we have for this category.

Figure 7.4 **Accumulated abnormal CDS returns for the period *t*=-60 to *t*=10**



If we do a comparison between the negative and the positive events, the negative events seem to react more upon the announcement day whereas the positive events tend to adjust prior to the announcement. This observation, however, differ from the behaviour seen for *Positive Outlook*, where no pattern or real reaction is observed at all.

7.2 Event study results

7.2.1 Results for different announcement types

In the table below we present the average daily spread changes for our different announcement categories and indicate which results that are statistically significant. The complete tables with *t*- and *p*-values are given in *Appendix 10.4*. As we can see, *Negative Outlook* and *Upgrade* show significance at the one percent level for the period *t*=0+1. *On Watch Down* and *On Watch Up* show significance at the five percent level and *Positive Outlook* is significant at the ten percent level, leaving *Downgrade* as the only non-significant category. These results are in line with the

hypothesis stating that the market does not anticipate rating announcements and therefore react when they are released. Further evidence for this hypothesis is given by the fact that no category shows significance for the first pre-event window. During the second pre-event window, only *Upgrade* and *On Watch Down* are significant, and then on the ten and five percent level respectively. Finally, looking at the post-event window we see that *Negative Outlook* is significant at the ten percent level.

Table 7.1 **Average abnormal CDS returns**

Event Window	Neg. Outlook	Pos. Outlook	Downgrade	Upgrade	Watch Down	Watch Up
-60 to -11	0.004	0.053	0.008	-0.039	-0.080	-0.012
-10 to -1	0.054	0.017	-0.110	-0.180*	0.590**	-0.792
0 to 1	1.270***	-0.341*	0.665	-1.105***	2.710**	-3.006**
2 to 10	0.178*	0.356	-0.069	0.125	0.034	0.338

*,** and *** indicates significance at the 10%, 5% and 1% level respectively for one-sided hypothesis testing of value equal to zero.

If we compare the results from the *t*-tests with the Wilcoxon signed-rank tests below, we see that the results are rather similar. The only differences are that *On Watch Up* is now significant on the one percent level instead of the five percent level and that *Positive Outlook* is not significant. Also, *Upgrade* and *On Watch Down* still show significance for the second pre-event window.

Table 7.2 ***p*-values for the Wilcoxon signed-rank test**

Event Window	Neg. Outlook	Pos. Outlook	Downgrade	Upgrade	Watch Down	Watch Up
-60 to -11	0.858	0.247	0.757	0.160	0.369	0.859
-10 to -1	0.937	0.967	0.518	0.055	0.009	0.314
0 to 1	0.000	0.134	0.202	0.000	0.001	0.051
2 to 10	0.159	0.951	0.240	0.542	0.843	0.679

Two-sided hypothesis testing of value equal to zero.

According to the hypothesis concerning asymmetric price adjustment there should only be a significant reaction in CDS spreads around negative announcements, not in the case of positive announcements. We can not find any support for this hypothesis, for example *Upgrade* shows both a statistical and economical significance that exceeds its negative counterpart *Downgrade*. On the other hand, *Negative Outlook* dominates *Positive Outlook* in the same way and for the other two categories there are no real differences.

The hypothesis stating that rating announcements of review type have a more pronounced effect on the credit spreads than actual rating changes, finds partial support in our data. *On Watch*

Down and *On Watch Up* move around three times as much as *Downgrade* and *Upgrade*, and their changes are both statistical significant at the five percent level. However, the other two categories of review type, *Negative Outlook* and *Positive Outlook*, do not exhibit a similar dominance. In order to investigate if the differences are statistically significant, we create new variables as seen in *table 7.3* below and test if the differences are significantly larger than zero.

Table 7.3 **Two sample *t*-test for the time period t=0+1**

	Neg. Outlook - Downgrade	Watch Down - Downgrade	Pos. Outlook - Upgrade	Watch Up - Upgrade
Mean Diff. (%)	0.606	2.045	0.764	-1.901
***p*-value**	0.181	0.067	0.973	0.065

One-sided hypothesis testing of value larger than zero.

We see that the differences between *On Watch Down* and *Downgrade* and *On Watch Up* and *Upgrade* respectively, are statistically significant at the ten percent level.

7.2.2 Results for different rating agencies

We now investigate whether there are any differences in significance depending on the rating agency that issues the announcement. In *table 7.4* we can see the different announcement types for the time period *t*=0+1, sorted by rating agency. Values for the category *On Watch Up* are excluded since the sample was too small for statistical tests.

When we look at the table below, a pattern can be seen. The announcements made by S&P and Moody's are in general statistically significant, whereas none of the categories for Fitch show significance. If we compare S&P with Moody's, we see that in total they seem to be rather equal, both in terms of statistical and economical significance.

Table 7.4 **Average abnormal CDS return for the time period t=0+1**

Rating Institute	Neg. Outlook	Pos. Outlook	Downgrade	Upgrade	Watch Down	Watch Up
S&P	1.470***	-0.416	1.363*	-1.087*	3.793**	N/A
Moodys	0.674*	-0.895*	0.160	-1.545***	1.445**	N/A
Fitch	1.823	0.240	-0.597	-0.710	0.903	N/A
Overall	1.270***	-0.341*	0.665	-1.105***	2.710**	-3.006**

*,** and *** indicates significance at the 10%, 5% and 1% level respectively for one-sided hypothesis testing of value equal to zero.

We once again compare our results with the *p-values* obtained from Wilcoxon signed-rank test presented in *table 7.5* below. There are no large deviations and we notice that all the categories are still insignificant for Fitch.

Table 7.5 ***p*-values for the Wilcoxon signed-rank test for the time period t=0+1**

Rating Institute	Neg. Outlook	Pos. Outlook	Downgrade	Upgrade	Watch Down	Watch Up
S&P	0.003	0.370	0.029	0.031	0.004	N/A
Moodys	0.051	0.075	0.678	0.020	0.050	N/A
Fitch	0.570	0.955	0.249	0.246	0.879	N/A
Overall	0.000	0.134	0.202	0.000	0.001	0.051

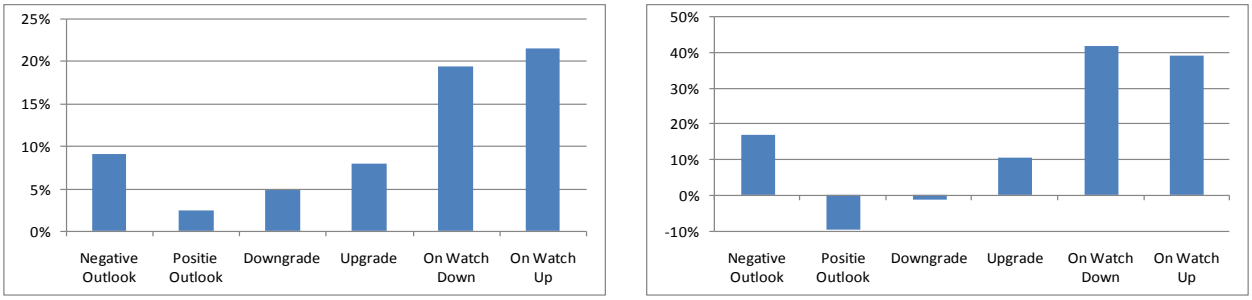
Two-sided hypothesis testing of value equal to zero.

The results we have seen above contradict the reliability hypothesis, stating that announcements from different rating agencies should have similar impact on the CDS spreads. This could be explained by the market having more confidence in some rating agencies compared to others.

7.3 Results versus average credit spread

Another way to measure the impact of credit rating announcements is to compare the resulting movements in spread levels with the average difference in credit spreads between two rating classes. In the left part of *figure 7.5* below, the accumulated changes for the period t=0 to t=1 are expressed as a percentage part of the average change between different rating classes. If the market only reacted to downgrade and upgrade announcements, ignoring potential information conveyed by other rating announcements at other dates and also made the full adjustment within the time frame of our event window (t=0+1), we should see changes equal to 100 percent for the downgrade and the upgrade category respectively. As seen in *figure 7.5*, this is not the case.

Figure 7.5 **Accumulated abnormal CDS returns as percentage part of difference between spread levels**



In the case of *Downgrade* the adjustment within the event window is around five percent, meaning that almost the entire adjustment takes place at some other time. *Upgrade* causes somewhat larger movements, however still, less than ten percent of the adjustment up to the next rating level occurs in this period. Looking at the other categories, *Watch Up* and *Watch Down* stand out with changes of around 20 percent each. *Negative Outlook* has an impact of around ten percent and for *Positive Outlook* the result is almost negligible.

If we extend the time interval to *t*=-10 to *t*=10, as seen in the right part of the figure above, the results are quite different. For some of the categories, most notably *On Watch Down* and *On Watch Up*, we see large increases in the percentage values. However, for the category *Downgrade* the previous movement of around five percent is erased and instead we see a slight movement in the direction opposite to what we expect. *Positive Outlook* on average moves almost ten percent of the distance to the rating level below.

7.4 Investigating the Volatility

To further analyze the movements around the announcement dates, we plot the volatility for the average daily changes for each rating category. The short thick lines show the value of the average daily changes and the lines above and below, indicate two standard deviations.

One of the hypotheses we are testing is that the market does not anticipate rating changes and therefore react when new information is conveyed upon the announcement day. It is reasonable to expect an increase in volatility when new information is released and if the hypothesis holds true, we should see an increase in volatility during the announcement day and possible for some of the days following the announcement.

Figure 7.6 **Volatility for abnormal CDS returns for the period *t*=-10 to *t*=10 for negative rating announcements**

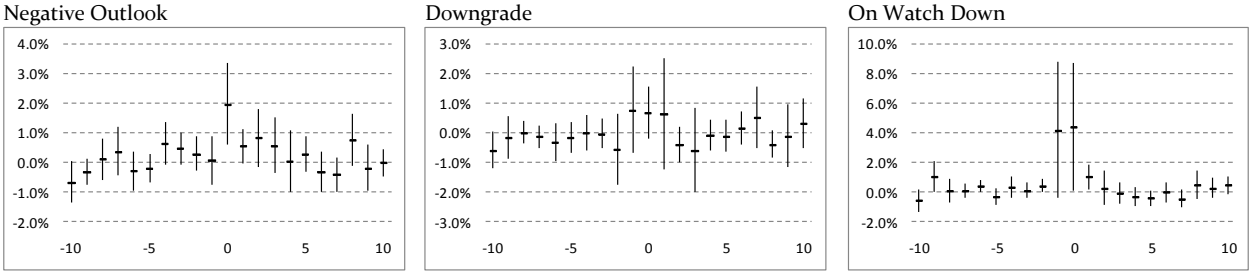
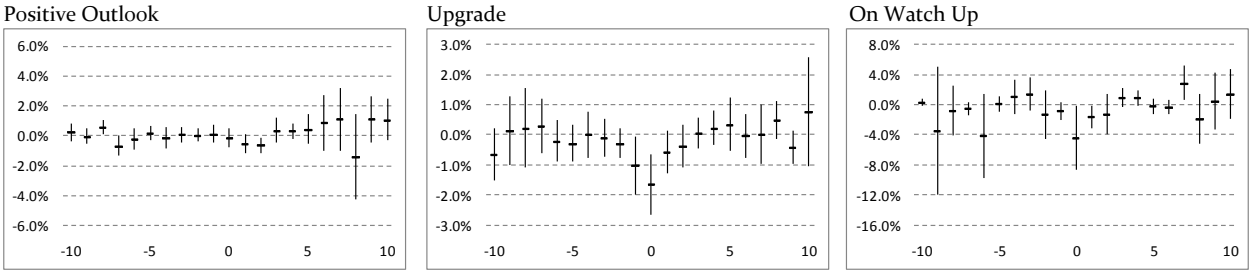


Figure 7.7 **Volatility for abnormal CDS returns for the period *t*=-10 to *t*=10 for positive rating announcements**



In all the graphs relating to negative events we can indeed see an increase in volatility during the period *t*=0 to *t*=1. This pattern is most pronounced for the announcement category *On Watch Down*. However, we can not identify the same behaviour for the positive events. For *Positive Outlook* the volatility is constant before and during the event window. The volatility then increases at the end of the time period. For *Upgrade* and *On Watch Up* no real pattern can be seen and it is possible that the erratic behaviour for the latter category can be attributed to its small sample size.

We conclude that negative announcements seem to exhibit an increase in volatility whereas the same does not hold true for positive announcements.

8. ANALYSIS AND CONCLUSIONS

In this section we analyze the results from the previous section and relate them to the hypotheses stated in *Section 5*.

When looking at the announcement period, *t*=0 to *t*=1, we find CDS movements following all rating announcements except *Downgrade* to be statistically significant. These results are in line with the hypothesis stating that the markets do not anticipate new information and therefore react upon their release. The results however contradict the hypothesis concerning asymmetric price information, according to this hypothesis we should only observe a significant reaction in the case of negative announcements.

The magnitude of the CDS movements observed for the announcement categories differ. The two review categories, *On Watch Down* and *On Watch Up*, both stand out with CDS movements of more than five percent during the time period *t*=0+1. For *Downgrade* and *Upgrade*, the corresponding numbers are slightly above one and two percent, respectively. These differences between the categories are statistically significant, supporting the hypothesis stating that there is a more pronounced pattern in announcements of review and outlook type, compared to actual rating changes. However, when we compare the two outlook categories with *Downgrade* and *Upgrade*, we find no support for this theory.

No category exhibit spread movements that are statistically significant during the period *t*=-60 to *t*=-11. For the time period preceding the rating announcements, *t*=-10 to *t*=-1, *Upgrade* and *On Watch Down* are statistically significant. The results for the post period *t*=2 to *t*=10 reveal few reactions in the markets, with *Negative Outlook* as the only statistically significant category.

When we look at the three different rating agencies that issue the ratings, we find that announcements made by S&P and Moody's are more often statistically significant than announcements from Fitch. In the case of S&P and Moody's we found four out of five categories to be statistically significant whereas for Fitch no categories were found to be statistically significant. These results contradict the reliability hypothesis, stating that announcements from

different rating agencies have similar impact on CDS spreads as rating agencies enjoy the same level of confidence from the market.

Finally, looking at the volatility around the announcement dates we see that the negative and the positive announcement categories differ. The former category type exhibits an increase in volatility around t=0, whereas for the latter category this effect is less pronounced.

We know from *Section 6.2.4* that the data we use is not always normally distributed. However, we match our tests with the Wilcoxon signed-rank test, a non-parametric test that does not require data to follow a normal distribution. When we compare these results with the ones we obtain through classical t-tests, we see that they yield similar results.

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10. APPENDIX

10.1 iTraxx Europe Series 6

ABN Amro Bank NV
Accor
Adecco SA
Aegon NV
Aktiebolaget Electrolux
Aktiebolaget Volvo
AKZO Nobel NV
Alliance Boots PLC
Allianz Aktiengesellschaft
Altadis SA
Arcelor Finance
Assicurazioni Generali SPA
Aviva PLC
AXA
BAE Systems PLC
Banca Intesa SPA
Banca Monte dei Paschi diSienaSPA
Banca Popolare Italiana - Banca Popolare di Lodi-SCSC
Banco Bilbao Vizcaya Argentaria SA
Banco Comercial Portugues SA
Banco Espirito Santo SA
Banco Santander Central Hispano SA
Barclays Bank PLC
Bayer AG
Bayerische Motoren Werke AG
Bertelsmann AG
British American Tobacco PLC
British Telecommunications PLC
Cadbury Schweppes PLC
Capitalia SPA
Carrefour
Casino Guichard-Perrachon
Centrica Plc
Ciba Specialty Chemicals Holding Inc.
Commerzbank AG
Compagnie de Saint-Gobain
Compagnie Financiere Michelin
Compass Group PLC
Continental AG
DaimlerChrysler AG
Deutsche Bank AG
Deutsche Lufthansa AG
Deutsche Telekom AG
Hellenic Telecommunications Organisation SA
Henkel KGaA
Iberdrola SA
Imperial Chemical Industries PLC
Imperial Tobacco Group PLC
ITV PLC
Kingfisher PLC
Koninklijke DSM NV
Koninklijke KPN NV
Koninklijke Philips Electronics NV
Lafarge
Linde AG
LVMH Moet Hennessy Louis Vuitton
Marks and Spencer PLC
Metro AG
Muenchener Rueck AG
National Grid PLC
Nokia Oyj
Pearson PLC
Peugeot SA
PPR
Reed Elsevier PLC
Renault
Rentokil Initial PLC
Repsol YPF SA
Reuters Group PLC
Royal & Sun Alliance Insurance PLC
RWE AG
Safeway Ltd
Sanofi-Aventis
Sanpaolo Imi SPA
Siemens AG
Sodexho Alliance
Solvay
Stora Enso Oyj
SUEZ
Svenska Cellulosa Aktiebolaget SCA
Swiss Reinsurance Company
Tate & Lyle PLC
Telecom Italia SPA
Telefonica SA
Telekom Austria Aktiengesellschaft
Telenor ASA

Diageo PLC
DSG International PLC
E.ON AG
Edison SPA
Electricite de France
Endesa SA
Enel SPA
Energias de Portugal SA
Energie Baden-Wuerttemberg AG
European Aeronautic Defence and Space Company NV
Fortum Oyj
France Telecom
Gallaher Group PLC
Gas Natural SDG SA
GAZ de France
GKN Holdings PLC
Glencore International AG
Groupe Auchan
GUS PLC
Hannover Rueckversicherung AG
TeliaSonera Aktiebolag
Tesco PLC
The Royal Bank of Scotland PLC
Thomson
ThyssenKrupp AG
Unicredito Italiano SPA
Unilever NV
Union Fenosa SA
United Utilities PLC
UPM-Kymmene Oyj
Valeo
Vattenfall Aktiebolag
Veolia Environnement
Vivendi
Vodafone Group PLC
Volkswagen AG
Wolters Kluwer NV
WPP 2005 Ltd
Zurich Insurance Company

10.2 The Case of Adecco S.A.

Adecco S.A, a global human resources company based in Switzerland, January 12th, announced that the release of its 2003 consolidated financial statements would be delayed, due to possible accounting regularities. Three weeks earlier accounting fraud had pushed Parmalat Finanziaria SpA, a major Italian firm within the diary business, to file for bankruptcy protection and the market reacted strongly on the news, resulting in a fall of 42 percent for the Adecco share on the SWX Swiss Exchange. During the same day the CDS spread increased 275 percent. After a thorough accounting investigation, Adecco in April announced that no major fraud had been found and that the problem involved minor bookkeeping mistakes. After some volatile months the CDS spread now climbed downwards until the original level was reached.

10.3 Event study formulas

In order to measure the impact of an event we calculate the abnormal return over the event window. The abnormal return for a specific issuer is defined as the excess return above what is perceived to be the normal return for the issuer. Normal return is estimated with the market model and the abnormal return is then calculated according to the following formula:

$$AR_t^i = R_t^i - \hat{a}^i - \hat{b}^i \cdot R_t^m$$

where: AR_t^i = abnormal return for issuer *i* on day *t*.

R_t^i = return on day *t* for issuer *i*.

$\hat{a}^i$ = estimate of the intercept for issuer *i* in the market model.

$\hat{b}^i$ = estimate of beta for issuer *i* in the market model, defined as the correlation between the daily returns of issuer *i* and the market.

R_t^m = market return on day *t*.

The parameters a^i and b^i are estimated through OLS regressions of the market model over the estimation window. As a substitute for the CDS market, we constructed an equal weighted index of the 119 companies in our sample for which we had CDS data. Given the definition of the iTraxx Europe list as a list of the most liquid investment grade names on the European CDS market and also the fairly large number of companies in our sample, we believe this to be a reasonable proxy. After the abnormal returns for a specific event have been calculated, we aggregate them over our different event windows. That is, we create cumulative abnormal returns (CAR):

$$CAR_i(t_1, t_2) = \sum_{t_1}^{t_2} AR_{it}$$

where t_1 and t_2 are given by the event window.

Finally, we aggregate the cumulative abnormal returns over all the observations in our sample and the result is the sample aggregated cumulative abnormal return (SACAR):

$$SACAR(t_1, t_2) = \sum_{i=1}^{N} CAR_i(t_1, t_2)$$

where *N* is the number of observations in our sample.

10.4 Tables with data from *t*-tests and Wilcoxon signed-rank tests

Table 10.1 ***p*-values for abnormal CDS returns**

Event Window	Neg. Outlook	Pos. Outlook	Downgrade	Upgrade	Watch Down	Watch Up
-60 to -11	0.470	0.839	0.478	0.320	0.909	0.469
-10 to -1	0.305	0.570	0.845	0.050	0.011	0.132
0 to 1	0.001	0.093	0.126	0.000	0.016	0.013
2 to 10	0.062	0.895	0.632	0.792	0.419	0.779

Table 10.2 ***t*-values for abnormal CDS returns**

Event Window	Neg. Outlook	Pos. Outlook	Downgrade	Upgrade	Watch Down	Watch Up
-60 to -11	0.076	1.001	0.056	-0.472	-1.357	-0.082
-10 to -1	0.512	0.176	-1.023	-1.674	2.375	-1.200
0 to 1	3.316	-1.346	1.160	-3.677	2.227	-2.734
2 to 10	1.561	1.273	-0.340	0.819	0.205	0.808
Degrees of Freedom	72	47	51	50	43	8

Table 10.3 ***p*-values for abnormal CDS returns during the period *t*=0+1**

Rating Institute	Neg. Outlook	Pos. Outlook	Downgrade	Upgrade	Watch Down	Watch Up
S&P	0.001	0.126	0.082	0.050	0.034	N/A
Moody's	0.092	0.064	0.332	0.004	0.027	N/A
Fitch	0.107	0.701	0.885	0.048	0.226	N/A

Table 10.4 ***t*-values statistics for abnormal CDS returns during the period *t*=0+1**

Rating Institute	Neg. Outlook	Pos. Outlook	Downgrade	Upgrade	Watch Down	Watch Up
S&P	3.381	-1.183	1.431	-1.739	1.902	N/A
Moody's	1.367	-1.638	0.452	-3.066	2.304	N/A
Fitch	1.304	0.539	-1.263	-1.765	0.786	N/A

Table 10.5 ***Degrees of freedom for t*-test**

Rating Institute	Neg. Outlook	Pos. Outlook	Downgrade	Upgrade	Watch Down	Watch Up
S&P	32	19	29	17	25	N/A
Moody's	24	12	8	15	7	N/A
Fitch	14	14	12	16	9	N/A

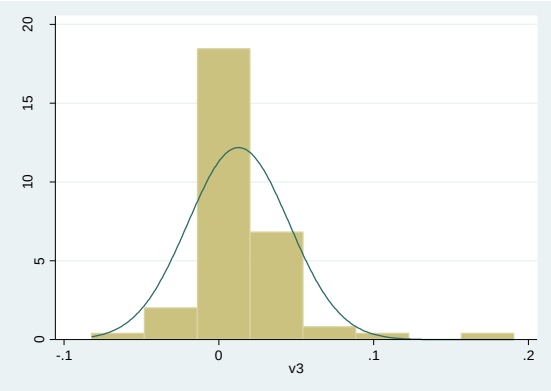
Table 10.6 ***z-values for Wilcoxon signed-rank test***

Event Window	Neg. Outlook	Pos. Outlook	Downgrade	Upgrade	Watch Down	Watch Up
-60 to -11	-0.179	1.159	0.310	-1.406	-0.899	-0.178
-10 to -1	-0.080	-0.041	-0.647	-1.922	2.614	-1.007
0 to 1	3.560	-1.497	1.275	-3.534	3.209	-1.955
2 to 10	1.410	-0.062	-1.175	0.609	0.198	0.415

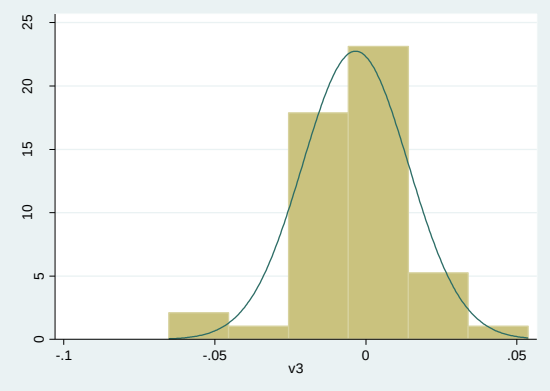
Table 10.7 ***z-values for Wilcoxon signed-rank test***

Rating Institute	Neg. Outlook	Pos. Outlook	Downgrade	Upgrade	Watch Down	Watch Up
S&P	2.939	-0.896	2.191	-2.156	2.857	N/A
Moodys	1.951	-1.782	0.415	-2.327	1.960	N/A
Fitch	0.568	-0.057	-1.153	-1.160	0.153	N/A

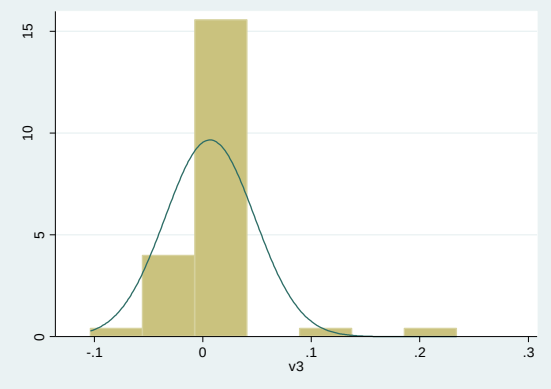
10.5 Histogram for average abnormal CDS returns for the time period *t*=0+1



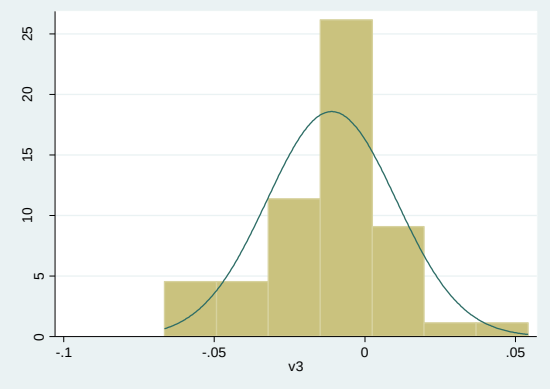
Negative Outlook



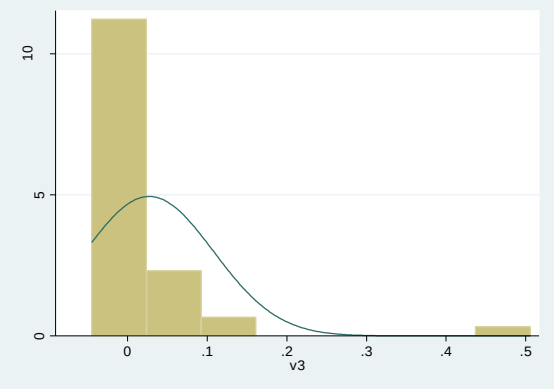
Positive Outlook



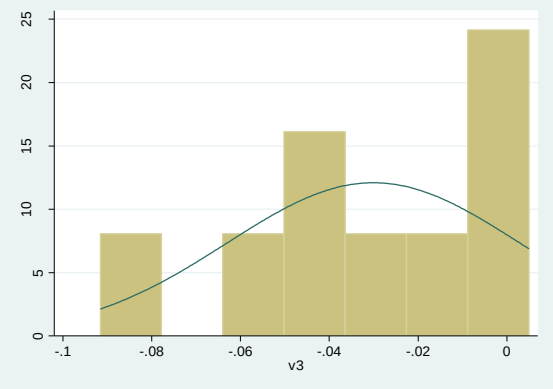
Downgrade



Upgrade



On Watch Down



On Watch Up