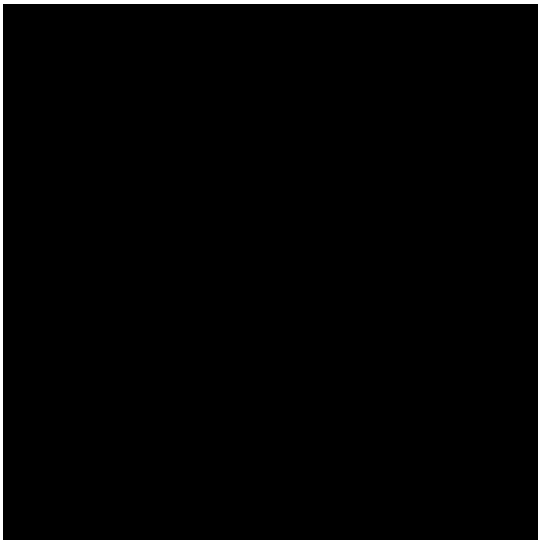

LUND UNIVERSITY

The effect of credit rating announcement in the Nordic stock market

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by

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Abstract

Credit rating agencies' influence on capital markets has been a highly debated topic in the last decades, as their power and impact have not been established with clarity. Different characteristics have been found especially between larger and smaller markets, which makes it interesting to investigate how the Nordic market as a smaller market reacts to credit changes. This study investigates how the Nordic market, consisting of the largest and most traded stocks in Sweden, Norway, Denmark and Finland, is influenced by credit rating changes. An event study approach is used to examine how the Nordic stock market behaves towards credit rating announcements of S&P Global Ratings by using a sample of 135 credit ratings taking place between January 2000 and March 2016. In order to estimate abnormal stock returns the market model is used, upon which a significance test is applied. In conclusion, the results suggest that the stock market anticipates a change one day prior to the actual happening where the effect of a rating vanishes after a few days of the actual rating change. The abnormal returns are significant towards a downgrade, yet no significance can be seen from an upgrade. Further, when observing how the stock market reacts towards a downgrade after the financial crisis, an unexpected find showed that the market reacted positively towards a downgrade after the financial crisis being previously negative.

Key words: Nordic countries, credit rating agencies, abnormal returns, event study.

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1. Introduction

Credit rating agencies are independent actors in the capital market that assign credit ratings on firms and governments based on their ability to repay debt and their probability of default. With the help of credit ratings, shareholders get an indication of credit risk[1] for a specific market participant upon which investors can react. Allegedly, credit rating agencies act as an instrument to reduce the information asymmetry[2] between a firm's management and its investors and creditors. Due to the information asymmetry in the market, investors are expected to react upon a change in credit rating as it signalises changed conditions that impact the firm in the long term (Micu, et al., 2007). Consequently, good news (upgrade) is expected to result in higher market returns, since this is a signal to the market that the firm has increased in investment quality. Meanwhile, bad news (downgrade) is expected to result in lower market returns since this signals that the firm has decreased in investment quality. Findings on the effects of credit rating announcements however differ and it is difficult to establish a clear and precise impact of credit ratings on stock returns (Ammer & Clinton, 2004).

Most studies conducted on the US market have established a well-defined impact on stock prices from downgrades (Griffin & Sanvicente, 1982; Glascock, et al., 1987; Holthausen & Leftwich, 1986; Dichev & Piotroski, 2001) while certain authors have not found any significant abnormal return for downgrades (Pinches & Singleton, 1978; Kaplan & Urwitz, 1979; Weinstein, 1977). Nevertheless, all US studies suggest that there is no significant change in returns from an upgrade, which suggests that the US market is not affected by upgrades, as it adds no informational value into the market. Meanwhile, several studies conducted on smaller markets than the US, have found contradicting results. Barron et al. (1997) examined the UK market and found that the market showed significant response towards downgrades, in addition to upgrades. Similarly, Elayan et al. (2003) researched New Zealand's market and found that stock returns were affected from both downgrades and upgrades, especially in the long-term returns. Studies conducted on the Australian stock market found however only effects from downgrades (Matolcsy & Lianto, 1995; Choy, et al., 2006). Li et al. (2004) examined the Swedish stock market and similarly only established

[1] Credit risk is the loss deriving from a failure to pay back a loan (Bank For International Settlements, 2010)
[2] Information asymmetry refers to the information gap existing between management and shareholder or creditors as the management has access to the firm's strategic plan making the other stakeholders less informed (Ogden et al., 2002).

significant reaction for downgrades. However, contradictory results were found in the Spanish stock market where significant negative results were found for merely upgrades (Abad & Robles, 2014). Furthermore, few studies have researched how stock returns behave from credit changes after the financial crisis in 2008, which suggests that this study can provide additional value to the previous researches made. Namely, Pacheco (2012) examined the Portuguese market and established that after the financial crisis in 2008 the abnormal returns have increased. In accordance, Joo & Pruitt (2006) examined the Korean market during the Asian crisis in 1997 and found that stock returns were 15 times more reactive to credit rating changes than before the crisis. Consequently, it is feasible that credit rating agencies have an increasing impact on the financial markets with their credit ratings announcements. A majority of credit rating studies have been conducted on the US market, which suggests that more insight into how other markets behave is crucial for understanding the overall impact of credit ratings.

To the extent of our knowledge, no research has been conducted on the Nordic market, whereas only one research has been conducted on the Swedish stock market in 2004 out of the Nordic countries. Bearing in mind the dearth of research in this area, it is of considerable interest to investigate if the Nordic stock market has characteristics that resemble those of smaller or larger markets. Nordic countries are amongst the most successful countries in the world, topping the international indices with AAA-credit ratings and highly ranked in competitiveness (Monaghan, 2014; World Economic Forum, n.d.). Debatably, the Nordic market[3] has a great value of total shares, while the number of shares is very small in comparison, making them less liquid. Therefore the Nordic countries convey characteristics, which both larger and smaller stock markets have (Gold, 2016; Li, et al., 2004). Considering that the Nordic market is both small and successful, it is interesting to look at how the market behaves towards credit rating changes (Elayan, et al., 2003).

For studying how the Nordic market behaves, an event study approach with different length event windows will be constructed. Through this method, it will be possible to find out how the information of a credit rating change is absorbed into the market and how quickly it adjusts to the information. This approach reveals the characteristics of the market and contributes with valuable insight to investors, debt issuers and other market participants. By this means, the market participants active in the Nordic market become aware of what to

[3] With the Nordic market we refer to the Danish, Swedish, Finnish and Norwegian market. The Icelandic market was left out as relevant data from S&P was missing which could have led to misleading results.

expect from a credit rating change in a Nordic country. The market participants can use this insight to their advantage and prepare a strategy prior to the actual credit rating change leading to better decisions and avoiding pitfalls.

In Section 2, credit ratings agencies and the credit rating process will be introduced, which lays the foundation background for this study. Section 3 presents the theoretical framework of previous researches, which is followed by hypotheses that can explain the anticipated effects in Section 4. Section 5 introduces the methodology and data as well as the limitations while the results from the event study will be presented in Section 6. In Section 7 the analysis of the researched will be presented and lastly in Section 8 a summary will be provided as well as suggestions for further research.

2. Credit ratings

In this section an overview of credit rating agencies will be presented as well as some of the criticism that has been directed towards them. Furthermore, the credit rating process of S&P Global Ratings (S&P) will be provided as credit rating announcements from this particular credit rating agency will be used in this study.

2.1 The credit rating agencies

There are three credit rating agencies that dominate the capital markets and they are often referred to as "The Big Three". These agencies are S&P Global Ratings[4], Moody's Investors Service and Fitch Ratings and they have approximately 95% share of the market. S&P and Moody's alone have approximately 80% share of the market (Frost, 2007). S&P is a US-based financial service firm that operates in 26 countries worldwide and had approximately 1.2 million credit ratings outstanding in the beginning of year 2016 (S&P Global Ratings, 2016).

The credit rating agencies play an important role in most modern capital markets. They assess the credit risk of corporate and government issuers by analysing relevant information available regarding the issuer, as well as its market and its economic circumstances. Credit rating agencies process information that is in general available to the public but this information is time consuming and costly to analyse and interpret for a single investor or a

[4] Prior to 28 April, 2016 the agency was known as Standard and Poor's Rating Services (S&P Global Ratings, 2016).

firm. Furthermore, during the process of analysing the credit rating agencies usually obtain information that are not available to the public directly from the issuer, which gives them access to inside information. Based on the analysis the agencies express their opinion through a credit rating, which is subsequently made available to the public. The credit rating agencies therefore reduce the information asymmetry in the capital markets between the firm's management and its shareholders and creditors (Technical Committee of the International Organization of Securities Commission, 2008).

Formerly, the investors had to pay to get access for a credit rating of a firm. However, this business model was reformed as the publication could easily be copied, being unsustainable for the agencies. Presently, the issuer pays for the rating and this is accessible to the public while being free of charge. This arrangement can potentially create conflict of interest, as the firm is paying the agency, which is supposed to rate the firm and its debt objectively (OECD, 2010).

The credit rating agencies are nationally recognised for having a significant role in capital markets, although their operations have been widely criticised. They have been accused of contributing to the global financial crisis through weak valuation models, methodologies and poor transparency and information gathering (Financial Stability Forum, 2008; The Financial Crisis Inquiry Commission, 2011; Council of Foreign Relations, 2015; Frost, 2007). As a result, policy makers have demanded regulations towards credit rating agencies that require them to address conflict of interest and to provide more transparency concerning the credit ratings and the ratings process (G20 Summit, 2015; European Parliament, 2012). Credit rating agencies have a big role in the capital market under the Basel framework[5] and the Solvency framework[6], which has been adopted in the European Union. Under this framework risk weightings for capital requirements are based on credit rating agencies' assessments (OECD, 2010).

2.2 The credit rating process

Credit ratings have three functions: to measure the credit risk of the issuer, to provide a means of comparison between issuers and to provide a common standard in the market (OECD,

[5] Basel is the regulatory framework set to strengthen the risk management and regulatory supervision within the banking sector in the Europe Union (Bank For International Settlements, 2010).

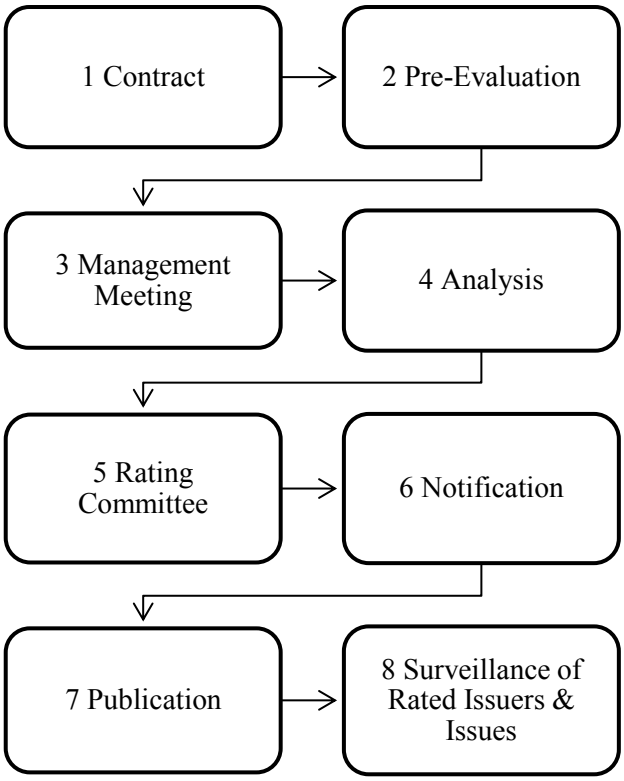
[6] Solvency is the regulatory framework set to promote comparability, transparency and competitiveness for the insurance sector in the Europe Union (European Commission, 2015).

2010). The credit rating agencies assert that their credit ratings should be regarded as opinions on the creditworthiness of entities and on financial obligations. A credit rating is an assessment of a debt issuer such as a corporation, bank-created entity, sovereign nation or local government. The credit ratings are intended to capture long-term creditworthiness and rating decisions are therefore typically not influenced by events that have a short-term effect. Hence, a credit rating is constant and only adjusted when the change is considered to be permanent (Micu, et al., 2007).

The credit rating process starts with the issuer contacting an agency requesting a rating. The rating agency assembles a team of analysts to review all the relevant information on the issue. The analysts meet with the management team of the firm in question to review and discuss the information gathered as well as obtaining additional information if necessary. The analysts then evaluate the information and based on this material they propose a rating to a committee within the agency. The committee reviews the lead analyst's rating recommendation and votes on the proposed credit rating. Subsequently, the credit rating agency provides the issuer with a pre-publication rationale for its credit rating for fact-checking and accuracy purposes. The agency publishes a press release to announce the rating and posts the rating on its website where it can be accessed at any time by the public. The final part of the process is surveillance to keep the rating current by identifying evolvements that may result in either an upgrade or a downgrade. If there are evolvements which might affect the creditworthiness of the issuer the issue is sent back to the committee for review and the following steps are repeated (Standard and Poor's Rating Services, 2014). The credit rating process is presented in Figure 1.

Figure 1: The credit rating process

The credit rating process of S&P Global Ratings are described in eight steps from the moment the rating service is requested until the rating is accessible to the public.



Each credit rating agency has its own rating system and these are usually characterised by a letter grade. The rating assignments for S&P is on a scale from AAA to D. Furthermore, they may be modified by the addition of a plus (+) or a minus (-) sign to show relative standing within a class. A rating of BBB or higher is considered to be an investment grade while a rating of BB or lower is considered to be a speculative grade (Standard and Poor's Rating Services, 2014). Usually a credit rating change occurs in a single transition, which signifies that the rating change transfers up or down by one class, for example an upgrade from A to AA or a downgrade from BB to B. Sometimes though, these credit rating changes occurs in multiple transitions, where a rating skips over one class, for example from A to AAA for an upgrade or from BBB to B for a downgrade. The rating scale for S&P is displayed in Table 1.

Table 1: S&P Global Ratings Assignments

In table 1 an overview and a definition of the possible S&P Global Ratings are given. In the figure the highest credit quality rating is at the top of the table while the lowest credit quality rating is provided at the bottom of the table. The credit rating assignments can be split into two distinct groups; Investment grade and Speculative grade. The Investment grade has a low risk of default probability, while the ratings below investment grade have low credit quality and making it speculative (Fitch Ratings, 2014; Standard and Poor's Rating Services, 2014).

	Rating	Definition
Investment grade	AAA	Exceptionally strong capacity to meet financial commitments
	AA	Very strong capacity to meet financial commitments
	A	Strong capacity to meet financial commitments, but somewhat susceptible to adverse economic conditions and changes
	BBB	Adequate capacity to meet financial commitments, but more subject to adverse economic conditions
Speculative grade	BB	Less vulnerable in the near-term but faces major ongoing uncertainties to adverse business, financial and economic conditions
	B	More vulnerable to adverse business, financial and economic conditions but currently has the capacity to meet financial commitments
	CCC	Currently vulnerable and dependent on favourable business, financial and economic conditions to meet financial commitments
	CC	Highly vulnerable; default has not yet occurred, but is expected to be a virtual certainty
	C	Currently highly vulnerable to non-payment, and ultimate recovery is expected to be lower than that of higher rated obligations
	D	Payment default on a financial commitment or breach of an imputed promise; also used when a bankruptcy petition has been filed or similar action taken

In addition to credit ratings, the credit rating agencies also announce so-called outlooks and credit watches. Outlooks reflect the opinion of a credit rating agency on the anticipated direction of any medium-term rating action, which can be expressed as positive, negative or stable. A change in outlook does not necessarily lead to a change in credit rating. Credit watch list provides a strong indication of a change in credit rating, and usually leads to a change in credit rating, both with upgrades as well as downgrades. Rating changes preceded by watch list should be less informative as the market is more likely to anticipate the change. However, an issue does not need to have a certain outlook or be placed on a watch list prior to a credit rating change (Micu, et al., 2004).

3. Theoretical framework

In this part the theoretical framework of previous researches[7] conducted on the US market and outside of the US market will be presented. Through the use of previous studies, a comprehension of how credit rating agencies are affecting market prices can be outlined to assist with the analysis of the Nordic market.

3.1 The US market

The earliest studies investigating the topic of credit ratings and their influence on the markets can be traced back to the 1970's. The first researches were conducted on the US stock and bond markets[8] mostly to investigate if credit ratings bring new information into the market or if the market already has accounted and responded to this change. Kaplan and Urwitz (1979) used Moody's credit ratings and looked at how both new and outstanding bonds were affected by ratings, by altering variables in linear models, but no evidence was found that credit-rating changes add additional information to the market. Similarly, Weinstein (1978) found no support of effect when using Moody's credit ratings and monthly returns over a revised modern portfolio. Accordingly, Pinches and Singleton (1978) who applied Moody's credit rating and used monthly stock over a market model found no evidence and determined that credit rating agencies act simply as a reputable inspector as the market already anticipates the information that causes a rating change. Meanwhile, Griffin and Sanvicente, (1982) collected monthly returns and credit ratings over sixteen years from both Moody's and S&P and got a different result and found that there was a negative abnormal reaction occurring after a downgrade. However, no significant impact was found on the stock prices as a result of a positive rating (Griffin & Sanvicente, 1982). Glascock et al. (1987) extended the work of Griffin and Sanvicente (1982) and Pinces and Singleton (1978) to examine how the daily stock price was affected by Moody's credit ratings in the market model and found related results to Griffin and Sanvicente (1982). Explicitly, a negative abnormal return could be seen from a downgrade, and therefore Pinches and Singleton (1978) conclusions were contradicted. Simultaneously, Katz (1974) used S&P credit ratings for monthly bond prices by using regression forecasting and wanted to uncover if the market anticipated any credit

[7] This study focuses only on the most relevant studies and therefore few studies on this topic will not be discussed.

[8] Bond and stock movements are considered to be asymmetric to rating changes, thus the result is not expected to differ if measuring the effect of stocks or bonds.

changes. They found that the market did not expect a credit rating prior a public announcement of reclassification.

In the 1980's collecting daily returns to investigate the effect of ratings emerged as a more appropriate method for event studies. Daily returns were found to be less impacted by noise and providing more accurate measures of how credit ratings impact stock prices by isolating the event. Arguably, previous studies had failed to capture the real impact of rating changes as a result (Pacheco, 2012). To specify, Stickel (1986) performed the first research with daily returns for stocks over a market model and found that an effect mostly occurs the day after an announcement when using Moody's and S&P. However, no clear evidence was recognised from his study as an ambiguous effect was observed. Dichev & Piotroski (2001) found similar results supporting the research of Stickel (1986) and Griffin and Sanvicente (1982) that downgrades are followed by a significant negative abnormal return. They used credit ratings from Moody's with monthly stock returns and found that the impact lasted up to a year. Thus, it was concluded that negative ratings are a robust predictor of a firm's future cash flows; hence it signalises poor future earnings (Dichev & Piotroski, 2001). Examining credit ratings in addition with credit watch became a common method in the mid 80's, when credit watch was launched. Holthausen and Leftwich (1986) conducted the first research based on daily stock returns in a market model in addition to credit watch. For their study they used both credit rating announcements from Moody's and S&P to examine how credit watch affected stock prices. With a negative rating or credit watch placements they found a significant impact during the event window, meanwhile positive ratings or credit watch placements provided inconsistent result. Hand et al. (1992) also examined how the credit watch together with credit ratings affected the stock and bond returns. They found a significant reaction to announcements of downgrades and inconclusive evidence of returns for upgrades. Mutually these researchers conclude that this reaction could be explained by the assumption that the market anticipates upgrades to a larger extent than downgrades.

3.2 Non-US markets

Matolcsy & Lianto (1995) conducted the first non-US market study and researched how the Australian stock market reacted upon credit rating changes. They used S&P credit ratings and evaluated weekly stock prices with the market model and found that the market reacted to credit ratings. They concluded that credit ratings contribute with new information to the market, where downgrade impact was significant while upgrades impact was unclear,

correspondingly to US studies. Several years later, Choy et al. (2006) examined how the daily returns in the Australian stock market reacted to credit rating announcements from Moody's and S&P. Through the use of market adjusted model they found a statistical significant effect in stock price for downgrades, especially during the two-day range prior and after event. Meanwhile, the evidence was unclear for an upgrade, which suggests a larger willingness to announce positive news in comparison to negative news. Creighton et al. (2006) studied the stock and bond market in Australia and found credit rating changes from both Moody's and S&P to be significant in both directions when using the market model, however yet minimal. Barron et al. (1997) looked at United Kingdom's daily stock market through the use of credit ratings from S&P and Moody's in addition to credit watch. They found that downgrades, in accordance with previous research, led to significant price changes in the market model. Nevertheless, a statistically significant effect was also found for positive credit ratings and credit watch placements, in comparison to previous studies conducted on the US market. Elayan et al. (2003) researched New Zealand's stock market using S&P credit ratings through a market model and found similar results to Barron et al. (2007). Elayan et al. (2003) established that upgrades in credit ratings led to significant market returns in addition to downgrades. This result was explained by the larger information asymmetry between investors and market as a result of New Zealand's smaller liquidity. Explicitly, markets that have more actors will integrate information more quickly, thus being more liquid. In addition, it was suggested that the rating announcement may reduce the information asymmetry and as a result become more appealing for investors (Elayan, et al., 2003). Li et al. (2004) examined the informational value on how daily returns in the Swedish stock market reacted to upgrades, considering that it is a small stock market. They used credit ratings from Moody's and S&P and found small evidence of such when using the market model. However, they found significant negative abnormal returns during longer event windows, which suggested that the Swedish stock market is slow at absorbing new information. Abad & Robles (2014) examined the daily returns in the Spanish stock market with Moody's and S&P credit ratings and found controversial results when using a dummy variable regression. They found that upgrades caused statistically significant negative returns whereas downgrades showed no effect. Arguably, the US and the Spanish stock market show different characteristics due to differences in liquidity, market size and the maturity of the market (Abad & Robles, 2014).

Pacheco (2012) examined the daily returns in the Portuguese stock market and found statistically significant results related to both upgrades and downgrades when using the

market model and with the help of Moody's credit ratings. The outcome of his work showed that especially after the financial crisis in 2008 the market had become very vulnerable to downgrades and that market anticipated a change prior to the actual credit change. Correspondingly, Joo & Pruitt (2005) examined Korea's daily stock prices prior and post Asian financial crisis and discovered a higher significance post financial crisis through a market model. They found that the significance effect of downgrades was 15 times stronger than before the crisis, going from a 2% change to an increase up to 30% during the crisis.

Table 2: Summary of previous researches

The table provides a summary of previous researches mentioned in this study. It gives the information of the researcher's name, when the study has been published and the time period researched. In addition, it also mentions the agency, data, method, result and country investigated.

Researcher	Study	Period	Agency	Data	Country	Method	Result
Katz	1974	1966-1972	S&P	Monthly	US	Regression	Down/Upgrade
Weinstein	1978	1962-1974	Moody's	Monthly	US	Modern portfolio	No evidence
Pinces & Singleton	1978	1950-1972	Moody's	Monthly	US	Market model	No evidence
Kaplan & Urwitz	1979	1970-1974	Moody's	Monthly	US	Linear model	No evidence
Griffin & Sanvicente	1982	1960-1975	Moody's/ S&P	Monthly	US	Cross-sectional model	Downgrade
Stickel	1986	1977-1981	Moody's/ S&P	Daily	US	Market model	Unclear
Holthausen & Letftwich	1986	1977-1981	Moody's	Daily	US	Market model	Downgrade
Glascock et al	1987	1977-1981	Moody's	Daily	US	Market model	Downgrade
Hand et al	1992	1981-1985	S&P/ Credit watch	Daily	US	Market model	Downgrade
Matolcsy & Lianto	1995	1982-1991	S&P	Weekly	Australia	Market model	Downgrade
Barron et al	1997	1984-1992	S&P/ Credit watch	Daily	UK	Market model	Down/Upgrade
Dichev & Piotroski	2001	1970-1997	Moody's	Monthly	US	Long term effect	Downgrade
Elayan et al	2003	1990-2000	S&P/ Credit watch	Daily	New Zealand	Market model	Downgrade
Li et al	2003	1993-2003	Moody's/ S&P	Daily	Sweden	Market model	Not Significant
Joo & Pruitt	2005	1996-2002	KIS/ JR	Daily	Korea	Market model	Down/Upgrade
Abad & Robles	2006	1990-2003	Moody's/ S&P	Daily	Spain	Dummy variable regression	Upgrade
Choy et al	2006	1989-2003	Moody's/ S&P	Daily	Australia	Market model	Downgrade
Creighton et al	2007	1990-2002	Moody's/ S&P	Daily	Australia	Market model	Downgrade
Pacheco	2012	2006-2012	Moody's	Daily	Portugal	Market model	Downgrade

4. Motivation for hypotheses

The goal of this study is to attain the relationship between stock markets and credit ratings, through which the characteristics and performance can be defined. In this section three different hypotheses are considered most crucial for enlightening how the Nordic stock market responds upon a credit rating change. Jointly, these hypotheses are believed to provide an oversight to explain and get an in-depth understanding of why the Nordic stock market reacts in a certain way due to a credit rating announcement.

Hypothesis 1: Credit rating announcements cause abnormal returns

Credit rating agencies are experts at information gathering and have access to inside information, unknown to the market (Ogden, et al., 2002). As a result, a change in credit rating is expected to cause abnormal returns, as there exists information asymmetry in the market (Kliger & Sarig, 2000). This suggests that credit rating agencies are professional financial intermediaries in information gathering and evaluation estimations and provide reliable and detailed measures of firms' creditworthiness (Tang, 2009).

Hypothesis 2: Credit rating announcements effect differs between upgrades and downgrades

Based on empirical studies, the market reacts differently to upgrades and downgrades. Evidence suggests that a larger significance is found for downgrades in comparison to upgrades (Dichev & Piotroski, 2001). This counteraction is suggested to occur from the lower degree of expectation of downgrades. Arguably, investors do not expect downgrades to the extent of upgrades as more positive news are released than bad news (Sewell, 2010).

Hypothesis 3: Credit rating announcements effect is larger post financial crisis

According to some empirical studies, the market is more reactive in the aftermath of the financial crisis (Joo & Pruitt, 2006). This is explained by the different sensitivity towards credit rating changes, as the information value and uncertainty has become larger during financial instability (Micu, et al., 2004). As a result, the stock reaction is expected to act differently for the data after September 2008.

5. Methodology and data

This section discusses the data collection and the selection of the data sample. Afterwards, the methodology chosen for the research will be described and lastly some possible flaws and limits to the research will be established.

5.1 Data

Credit rating announcements from S&P[9] were collected through Capital IQ over the period from January 2000 to March 2016. This time period was chosen as it was considered to be sufficient time to capture the stock prices, both before and after the financial crisis in 2008. The stock prices of the largest firms in Sweden, Denmark, Norway and Finland were collected over the same time period from DataStream, as these are the major Nordic players, where Iceland's stock data was considered to be limited. The firms representing the country stock market were taken from the country's official market index. Therefore, the OMXS30 for Sweden, OMXC20 for Denmark, OMXH25 for Finland and OSEBX20 for Norway were used. This led to data gathered on 95 firms, consisting of 30 Swedish firms, 20 Danish firms, 25 Finnish firms and 20 Norwegian firms. The official country market index is made up of the most regularly traded companies, representing the individual Nordic market. Further, in order to estimate normal returns, the S&P500 was used as the market index.

During this sample period there were 135 credit rating changes, of which 52 observations were upgrades and 83 observations were downgrades, further details are listed in Appendix A and Appendix D. From this sample 115 observations were possible to be used in this research, providing 44 observations of upgrades and 71 observations of downgrades. The main reason for eliminating observations was lack of data, where share price information or index data was missing, resulting in insufficient estimation window, which would lead to poor estimations of normal returns. Subsequently, five downgrades were eliminated at a later stage in this research as a downgrade occurred within the estimation period of another downgrade, the latter downgrade was eliminated.

[9] S&P was chosen for this study as it is arguably more user friendly (Ghosh, 2013).

5.2 Event study

An event study is a convenient method to measure the effect of an economic event on the firms' asset prices (MacKinley, 1997). As a result, an event study will be used to examine how a credit rating change affects the firm's stock prices. In a rational market the effect of an event should be reflected immediately in the firms' assets prices. Therefore, an event study should reveal possible effects of credit rating announcements, as the impact will be reflected in the stock prices. To measure the effect of an event on stock prices, the behaviour of the stock prices around the event date is studied. An important part of conducting a successful event study is to identify the event date precisely (Campbell, et al., 1997).

There are five basic steps to conduct an event study; i) event definition, ii) estimation of normal and abnormal returns, iii) testing procedure, iv) empirical results and v) interpretation and conclusions (Campbell, et al., 1997). Each step in this research will be further described in the following sections.

5.2.1 Event definition

In this study three event windows were defined. The first one consists of 5 days in total [-2, +2], the day of the event and two days prior and after the event. Two days prior to the event are considered as the time period where the market might suspect a credit rating change before it actually happens. Two days after are considered to be sufficient to capture the full magnitude of the announcement on the market prices (MacKinley, 1997). It is important to note that if the market anticipated a rating change before the date of the announcement then the event date should be reconsidered as the effects of the change are reflected in the market prior to the announcement, hence a longer event window should be utilised (Henderson, 1990).

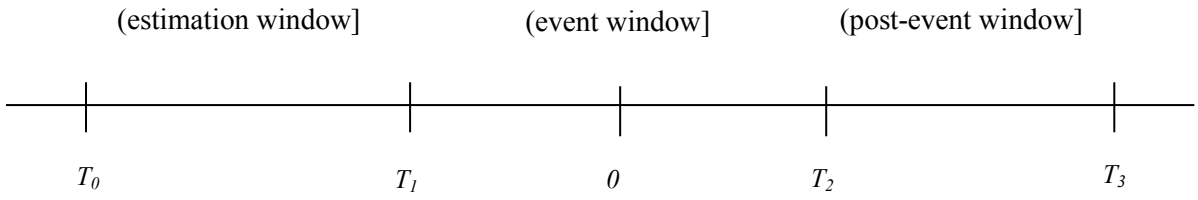
An alternative event window consisting of a total of 21 days [-10, +10], the day of the event and ten days prior to and after the event, was also constructed in order to test whether the size of a [-10, +10] or [-2, +2] event window would affect the results. Furthermore, an additional event window [-2, +10] was added at a later stage in order to clarify if a difference in results depends on days before or after the announcement.

The length of the estimation window differs substantially between researches; it is ordinarily in the range of 60-120 days. It should also be noted that the event window should be excluded

from the estimation window, otherwise the event might have an influence on the normal returns performance model and the parameter estimates of the model (MacKinley, 1997). While too many days in the estimation period might make data irrelevant, too few days will lead to poor parameter estimates. Most event studies on effects of credit rating announcements on stock prices have been conducted on the US market. The market in US has much higher capitalization compared to the Swedish, Danish, Finnish and Norwegian market (Nasdaq, 2016), hence a larger estimation window is preferred, and as a result the estimation window for this research was set to 100 days. The post-event window is usually set to the same size as the estimation window, which was done for this research. The timeline for an event study is shown in Figure 2.

Figure 2: Event study time line

In the figure a time line for an event study is established. The event happens when t = 0, the event window is between T_1 and T_2. The estimation window is denoted between T_0 and T_1 and the post-event window is denoted between T_2 and T_3.



5.2.2 Normal and abnormal returns

In order to measure abnormal returns a benchmark is required, therefore a model to specify normal returns is needed (Brown & Warner, 1980). The normal returns are estimated from the estimation window with the market model in this research. In the following equation the market model in presented:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \epsilon_{it} \quad (1)$$

Where R_{it} and R_{mt} are the returns in time *t* for observation *i* and the market index *m* and ϵ_{it} is the zero mean disturbance term (Asgharian, 2015). The market model is a statistical model that relates the return of a security to the return of the market. The model assumes a stable linear relationship between the security return and the market return (MacKinley, 1997). The parameters, α and β**,** in the market model are estimated by conducting ordinary least squares

(OLS) regression analysis (MacKinley, 1997). OLS is the most common method used to fit a line to the data at hand. A few tests can be constructed to ensure that the OLS estimators are consistent, unbiased and efficient (Brooks, 2014).

Abnormal return is the difference between the actual return observed in the market in the event window and the normal return from the estimation window, they are computed with Equation 2:

$$AR_{it} = R_{it} - E[R_{it}] \quad (2)$$

Where AR_{it}, R_{it} and $E[R_{it}]$ are the abnormal, actual and normal returns, respectively, for firm *i* at time *t* (Brown & Warner, 1980).

5.2.3 Testing procedure

To investigate abnormal returns, they must be aggregated in order to draw overall interpretations on the effect of credit rating announcements. The aggregation is considered over time and between observations. First, aggregations for individual observations over time are tested with Equation 3. Test statistics are constructed for every observation presented in Equation 4 (Brooks, 2014):

$$CAR_i(t_1, t_2) = \sum_{t=t_1}^{t_2} \widehat{AR}_{it} \quad (3)$$

$$SCAR_i(t_1, t_2) = \frac{CAR_i(t_1, t_2)}{[\hat{\sigma}^2(CAR_i)]^{\frac{1}{2}}} \quad (4)$$

Hereafter, the aggregated abnormal returns are computed. The difference between abnormal returns and aggregated abnormal returns is that with abnormal returns it is possible to investigate one event at a time. With aggregated abnormal returns it is possible to look at the overall effect of all the events on specific days in the event window. Aggregated abnormal returns are computed with Equation 5. The test statistic for the standardised aggregated abnormal return is given by Equation 6 (Brooks, 2014):

$$AAR_t = \frac{1}{N}\sum_{i=1}^{N} AR_{it} \quad (5)$$

$$SAAR_t = \frac{AAR_t}{[\hat{\sigma}^2(AAR_t)]^{1/2}} \quad (6)$$

The results from the previous testing procedures only apply to a single event, however it is also necessary to aggregate many events, between different firms, to investigate the overall effect of the event (MacKinley, 1997). The cumulative aggregated abnormal returns investigate whether the events have a persistent effect on the stock returns or not, and are computed with Equation 7. Test statistic J_1, for the cumulative aggregated abnormal returns, is then computed with Equation 8 to measure the effect (Campbell, et al., 1997).

$$CAAR(t_1, t_2) = \sum_{t=t_1}^{t_2} AAR_t \quad (7)$$

$$J_1 = \frac{CAAR(t_1, t_2)}{[\hat{\sigma}^2 CAAR(t_1, t_2)]^{1/2}} \quad (8)$$

The test statistics are usually assumed to follow a t-distribution, but given the size of the estimation window it is inconsequential whether t-distribution or normal distribution is followed, therefore a normal distribution will be applied to the results (Campbell, et al., 1997).

The null hypothesis in this research states that the credit rating announcement has no effect on the stock returns. Consequently, the alternative hypothesis states that the credit rating announcement does have an effect on the stock returns. Under the test statistic the null hypothesis is either rejected or not and the significance of these results are tested (Campbell, et al., 1997).

5.2.4 Limitations

In this research, several limitations are brought forward. This research is performed on the Nordic market, which is a relatively small stock market and only the largest firms from each of the four countries were included making it based on relatively few firms. The country indices represent the market in respect to the firm in question and it is worth noting that the Norwegian market is dominated by the oil sector (Mohsin & Holter, 2016). Having a dominating sector in the market can influence the market in a way that it no longer represents the market entirely. Therefore, there exists flaws to draw general conclusions of the Nordic

market using only 20-30 most traded stocks in each country. This study will however increase the understanding of the effects of credit ratings on stock returns in the Nordic markets.

This research is based on a time period from 2000 to 2016 where the global financial crisis in 2008 is likely to have influenced the sample. For example, the stock returns might be more volatile during this time period and it is possible that there are more negative credit rating announcements found. This could produce misleading results on individual observations that might influence the final results of the research.

Finally, a Grubbs test which detects outliers in a sample, was performed and as a result some observations were removed as otherwise they could have distorted the final result (Grubbs, 1969). Furthermore, a Jarque-Bera test was conducted which confirmed that the estimation of the parameters is consistent (Brooks, 2014). Through this procedure, a normal distribution could be ensured (Appendix B). Although the sample becomes smaller after removal of outliers, it is less subject to bias, but it automatically puts more weight on each observation. Consequently, the result becomes more dependent on each observation and poorer general conclusion can be drawn.

6. Empirical results

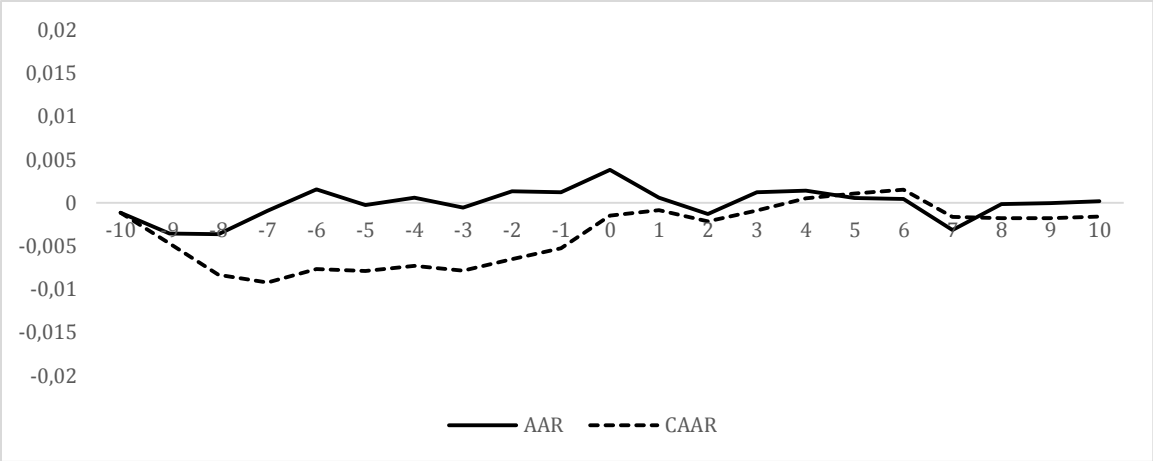
In this chapter the main results from the event study are presented, which underlines the analysis in the following chapter. The results of each hypothesis will be presented followed by a general summary of the findings.

6.1 Analysis of abnormal returns

Firstly, the aggregated abnormal returns and cumulative aggregated abnormal returns are observed in order to investigate the effect over time throughout the event window. Through this procedure it can be distinguished when the effect of a credit rating takes place and what magnitude it has. The result of abnormal and cumulative aggregated abnormal returns from upgrades is displayed over a 21-day event window in Figure 3.

Figure 3: Development of AARs and CAARs from upgrades

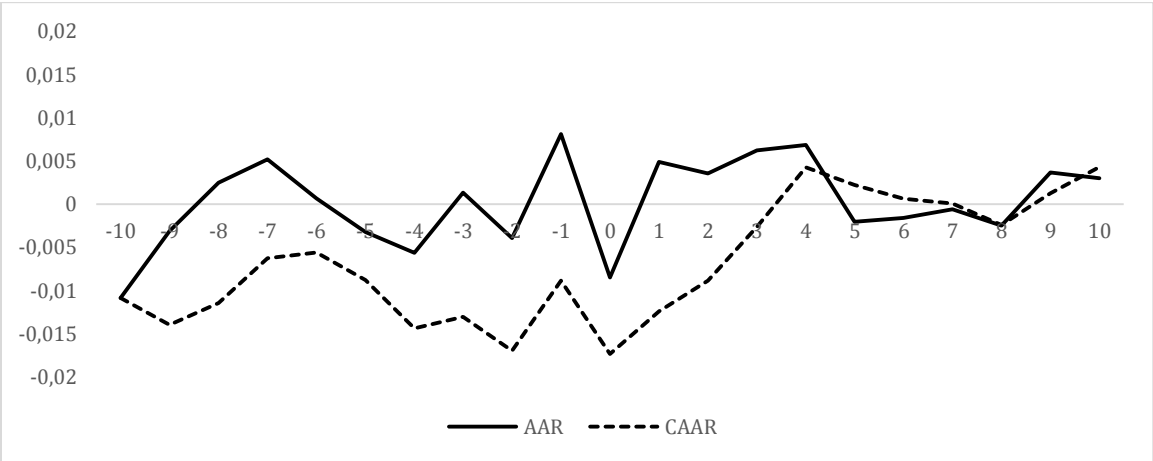
In the figure the market reactions towards upgrades are displayed over a 21-day event window. The solid line represents the aggregated abnormal returns, which is the average reaction occurring on each day in the event window. The dotted line represents the cumulative aggregated abnormal returns, which is the average reaction that captures the collective reaction of the market.



From positive credit rating announcements there is low volatility around the announcement day for an upgrade (Figure 3). From the graph no well-defined drift can be found, as the aggregated abnormal returns are fairly stable over the 10-day event window, however a positive peak around the day of the event [0] can be distinguished. Meanwhile, the cumulative aggregated abnormal returns give an image of the aggregate effect of the abnormal returns. From the cumulative aggregated abnormal returns, it can be seen that it is negative until the day of the event [0], while thereafter becoming neutral. This can be explained by the upgrade influence taking place on the day of the event.

Figure 4: Development of AARs and CAARs from downgrades

In the figure the market reactions towards downgrades are displayed over a 21-day event window. The solid line represents the aggregated abnormal returns, which is the average reaction occurring on each day in the event window. The dotted line represents the cumulative aggregated abnormal returns, which is the average reaction that captures the collective reaction of the market.



When exploring the announcements of downgrades there exists dynamic volatility (Figure 4). In Figure 4 the aggregated abnormal returns start to decrease sharply the day before the event [-1] until reaching a negative peak on the day of the event [0]. Afterwards, the aggregated abnormal returns start to increase and reaching a positive point four days after the event [+4], while thereafter decreasing. For the downgrades, the cumulative aggregated abnormal returns are fairly negative and stable while increasing on the day of the event until day four [+4].

Then the aggregated abnormal returns were also considered for obtaining the influence of the effect on a single day in the event window. The results for both event windows [-2, +2] and [-10, +10] are consistent. As expected, there was a large positive significant reaction on the event day [0] for an upgrade with a smaller negative reaction on the other days (Appendix C). For downgrades a large negative reaction was found on the day of the event [0]. Prior to the event there was a small negative reaction however after the day of the event the reaction turned positive (Appendix C).

6.2 Abnormal returns for upgrades and downgrades

This part explores how the abnormal returns react both through time and between observations. Therefore, in this part the overall reaction and significance are considered. Below in Table 7 the results from the sample of upgrades for [-2, +2], [-10, +10] and [-2, +10] event windows are displayed. It can be seen that the CAARs for upgrades cannot be rejected, as the results are significantly different from zero. To conclude, there is not enough evidence that credit rating upgrades have an effect on stock returns.

Table 7: Abnormal return measures for upgrades

In the table all the event windows [-2, +2], [-10, +10] and [-2, +10] for upgrades are displayed. The results from cumulative aggregated abnormal returns (CAAR), the variance of the CAAR and J_1 test statistic are given in the table. From the given results the P-values are displayed that inform whether the market reaction is statistically significant.

Window	CAAR	Var(CAAR)	J_1	P-value
[-2,+2]	0.0007	1.517E-06	0.5472	0.5843
[-10,+10]	-0.0016	6.729E-06	-0.6031	0.5466
[-2, +10]	-0.008	3.704E-06	0.4178	0.6762

The results from the sample of downgrades for [-2, +2], [-10, +10] and [-2, +10] event windows are displayed in Table 8 below. The null hypothesis is rejected at a 1% level for [-2, +2] event window and at a 5% level for [-2, +10] event window meanwhile, it cannot be rejected for [-10, +10] window. Hence the null hypothesis is rejected for downgrades in [-2,

+2] as well as [-2, +10] event windows and the credit rating announcements are found to have an effect on the stock returns.

Table 8: Abnormal return measures for downgrades

In the table all the event windows [-2, +2], [-10, +10] and [-2, +10] for downgrades are displayed. The results from cumulative aggregated abnormal returns (CAAR), the variance of the CAAR and J_1 test statistic are given in the table. From the given results the P-values are displayed that inform whether the market reaction is statistically significant.

Window	CAAR	Var(CAAR)	J_1	P-value
[-2,+2]	-0.0080	8.701E-06	-2.7022***	0.0070
[-10,+10]	0.0043	3.190E-05	0.7621	0.4462
[-2, +10]	0.0113	2.002E-05	2.5290**	0.0116

, * Represent statistical significance at the 5% and 1% level respectively

6.3 Abnormal returns pre and post financial crisis

To better understand the credit rating announcements effect on the stock market the sample has been split between credit ratings occurring before and after the financial crisis in 2008. This will give a better image of the credit ratings characteristics and will explain the sample to a larger extent, as it has been found that the stock market reacts differently to credit ratings from previously (Pacheco, 2012; Joo & Pruitt, 2005). There were 22 observations for upgrades for each time period, both before and after the crisis. As the samples had fewer observations than 25, the testing procedure was not conducted on upgrades as these would have led to poor estimations (Hogg, et al., 2015). However, the test was conducted on downgrades as there were 28 observations before the financial crisis and 43 observations after the crisis. The results for downgrades are displayed in Table 10.

Table 9: Abnormal return measures for downgrades pre and post the financial crisis

In the table all the event windows [-2, +2], [-10, +10] and [-2, +10] for downgrades pre and post the financial crisis are displayed. The results from cumulative aggregated abnormal returns (CAAR), the variance of the CAAR and J_1 test statistic are given in the table. From the given results the P-values are displayed that inform whether the market reaction is statistically significant.

	Pre-crisis				Post crisis			
Window	CAAR	Var(CAAR)	J_1	P-value	CAAR	Var(CAAR)	J_1	P-value
[-2,+2]	-0.0275	5.7E-05	-3.6582***	0.0003	0.00459	8.502E-07	4.9781***	7.6E-07
[-10,+10]	-0.0440	0.0002	-2.9345***	0.0034	0.0087	3.432E-06	4.7004***	2.9E-06
[-2, +10]	-0.0197	0.0001	-1.7424*	0.0817	0.0041	2.314E-06	2.7156***	0.00673

*, **, *** Represent statistical significance at the 10%, 5% and 1% level respectively

For the time period before the crisis, the results are negatively significant at 1% level for event windows [-2, +2] and [-10, +10]. Nonetheless, the results are negatively significant at a 10% level for [-2, +10] event window. Therefore, the null hypothesis is rejected for all event windows as the credit rating announcements clearly have an effect on the stock returns. For the time period after the crisis, the results are positively significant at 1% level for [-2, +2] [-10, +10] and [-2, +10] event windows. Consequently, the null hypothesis is strongly rejected for all event windows and it can be concluded that negative credit rating announcements cause abnormal stock returns.

7. Discussion

This section provides a discussion based on the empirical results. The hypotheses will be analysed through the help of theoretical framework on credit ratings and will provide a deeper insight on the obtained results.

7.1 Aggregated abnormal returns

For upgrades and downgrades several similarities and differences were found. In both cases, the largest effect of a credit rating announcement is on the day of the event, which implies that the credit ratings' influence on the market is occurring on the day of the event. This goes together with Griffin and Sanvicente (1982) who also got a market reaction the day before the event. Meanwhile, the market starts to anticipate the new credit rating the day before the event for both upgrades and downgrades. Accordingly, Pacheco (2012) argues that the market starts to anticipate a change prior to the actual credit rating change. For upgrades the new information is absorbed in the stock market on the day of the event (Figure 3), but for downgrades it takes the market four days to capture the full reaction (Figure 4). This suggests that the market adjusts very quickly to positive ratings and the response is barely detectable which supports the notion that an upgrade hardly adds any additional value in the stock market (Choy, et al., 2006). On the other hand, for downgrades it takes longer time to capture the negative information. This suggests that downgrades add new informational value in the stock market as otherwise the effect would have already been incorporated into the event before the happening (Ogden, et al., 2002). This implies that the market behaves differently between upgrades and downgrades (Dichev & Piotroski, 2001). Arguably, the Nordic market is relatively efficient where information is quickly taken into consideration. It can be noticed

that the market adjusts quickly to positive information while it takes longer time to adjust to negative information. This could perhaps be explained by a potential small information asymmetry or smaller liquidity. Thus, the research of Elayan et al. (2003) that smaller markets can have a positive effect from a downgrade cannot be contradicted. Therefore, the liquidity and size of the Nordic market can make the stock market more restricted to new information (Li, et al., 2004).

7.2 Cumulated aggregated abnormal returns

When looking at how the market reacts to a downgrade or an upgrade it is evident that the result is consistent with the general theory that the market solely reacts upon downgrades (Dichev & Piotroski, 2001; Sewell, 2010). The upgrades in this study do not show any significance (Table 7), although a minimal positive reaction could be observed on the day of the event from an upgrade (Figure 3). This supports the findings from Li et al. (2004) who researched the Swedish stock market and found no statistical significance with an upgrade. Considering that 50% of the upgrades in this study consists of the Swedish stock market, this strengthens the result in this research (Appendix A). However, based on the similar characteristics in the Nordic market it is trusted that similar results are gained from Norway, Finland and Denmark and it should not vary significantly.

The downgrades were negatively significant at a 1% level for the [-2, +2] event window and positively significant at 5% level for the [-2, +10] event window and not significant for [-10, +10] event window (Table 8). This suggests that the [-2, +2] event window does not capture the days outside of the event window, where the market adjusts to the credit rating change. Accordingly, in this time period the returns have not reached a stable condition and therefore the results are negative for this event window. This supports the notion of Choy et al. (2006) who found that the highest significance in the Australian stock market occurred during two days prior and a few days after the event study. Meanwhile, the [-10, +10] event window is too long to detect the specific effect of the credit rating. Considering that previously it was determined that the market solely starts to anticipate a credit rating change the day before the actual happening this event window is insignificant. Arguably, the [-2, +10] event window captures best the occurring event as it considers only the two previous days before the event and reflects the evolvement for the 10 following days, where the market has absorbed the full reaction and reached stability. Possibly, the market reacts positively from a downgrade as it adds more information to the market (Elayan, et al., 2003). Overall, the significance for

downgrades do indeed support the idea that in the Nordic market, downgrades are less expected and that the market is asymmetric in terms of good and bad news (Sewell, 2010).

7. 3 Cumulative aggregated abnormal returns pre and post financial crisis

For downgrades, before the crisis the results were negative at a 1% significance level for the [-2, +2] event window and [-10, +10] event window (Table 9). The [-2, +10] event window was negative at a 10% significance level. Meanwhile, the post crisis results show some very interesting evidence where the effect of a downgrade results into a positive statistical significance. The post crisis results are positively significant at a 1% significance level for both [-2, +2], [-10, +10] and [-2, +10] event window. Several explanations could be provided to understand the evidence. Potentially, the market does not trust or believe in ratings to the same extent anymore, making the reaction of a downgrade less volatile to the actual credit rating change. Alternatively, the market characteristics have possibly changed since the financial crisis, causing the market to react positively to a downgrade. This would imply that a downgrade after the financial crisis contributes with information into the market, which supports the ideas of Elayan et al. (2003) that in a market with larger information asymmetry a negavtive credit rating adds value to the market. In theory, this advocates that a downgrade provides information about the condition of the firm and therefore will have a positive effect. Another possibility is that the market has become very volatile and unstructured, making any analysis conducted during this time period unstable.

If looking simply at the significance, the results suggest, similarly to Joo & Pruitt (2006) who examined Korea before and after the financial crisis, that the market is indeed much more reactive to downgrades in the aftermath of the financial crisis. Arguably, a larger uncertainty post financial crisis can be found in the Nordic market, as all the event windows are more significant in the post crisis than previously. This supports the findings of Micu et al. (2004) that the market behaves more volatile during higher uncertainty time periods. Evidentially, it can be assumed that the financial crisis has influenced the characteristics of the Nordic stock market as it behaves differently between pre and post financial crisis.

8. Summary and conclusion

Throughout this study, the purpose has been to investigate how the Nordic stock market reacts to credit rating announcements. The Nordic market has characteristics that can be found in large markets such as the US market as well as in smaller markets. Considering it being unique it was of interest to research how reactive the Nordic market is towards credit rating announcements. From the result it was found that the Nordic market expects changes in ratings one day prior to the actual credit ratings for both downgrades and upgrades, making the Nordic market efficient. No significant results for upgrades were found, while significant results were found for downgrades. Significant results were found to be the highest during the day of the event for a downgrade, however this result was followed by a positive reaction the day after the event. This is believed to occur as the Nordic market has already reacted on the change. Possibly downgrades give more information value, which is a phenomenon that has been observed in smaller markets which are more illiquid and evidently the Nordic market is an example of such. After the financial crisis the Nordic market has become more reactive towards a credit rating change. This suggests that the Nordic market's characteristics have changed and a larger uncertainty is present in the market.

For future researches several undertakings are suggested. Firstly, increasing the sample size can improve the accuracy of this type of study, as this will provide a sample that is less subject to noise. Secondly, individual studies conducted on the Nordic countries can give a better understanding of the market characteristics experienced in each Nordic country. Thirdly, a regression model can enhance the understanding of factors affecting the abnormal returns. These suggestions can further enrich this study for why the stock returns react in a certain way for each specific rating.

9. References

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10. Appendix A: Details on credit ratings in the sample

Table 10: Summary statistic from the original sample of the Nordic countries

In this table the sample used from each specific country (Sweden, Denmark, Finland and Norway) are displayed. Downgrades and upgrades are displayed for each country as well as the total amount for each category.

Country	Upgrades	Downgrades	Total
Sweden	26	34	60
Denmark	7	5	12
Finland	10	23	33
Norway	9	21	30
Total	52	83	135

Table 11: Transitions between rating classes

In the table the transitions in the sample between rating classes from AAA to D are displayed. Most credit rating changes occur in the Investment grade (AAA to BBB) while few occur in Speculative grade (BB to D).

		Revisited change									
Before rating		**AAA**	**AA**	**A**	**BBB**	**BB**	**B**	**CCC**	**CC**	**C**	**D**	**Total**
	AAA											
	AA		2	6								8
	A		7	35	13							55
	BBB			6	35	7						48
	BB				3	10	4					17
	B					2	1	2				5
	CCC								1			1
	CC										1	1
	C											
	D											
	Total		9	47	51	19	5	2	1		1	135

Figure 5: Credit rating announcements by country

In this figure the country proportions of the credit rating announcements are displayed. Majority of the announcements are in Sweden (45%) while Norway (22%) and Finland (24%) are of similar proportion in the sample and Denmark (9%) has a small portion of the total credit rating announcements.

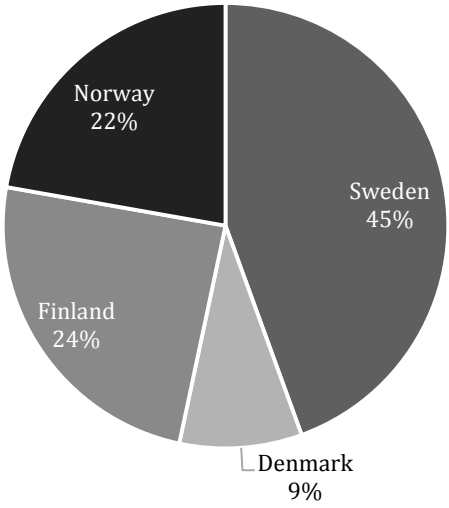
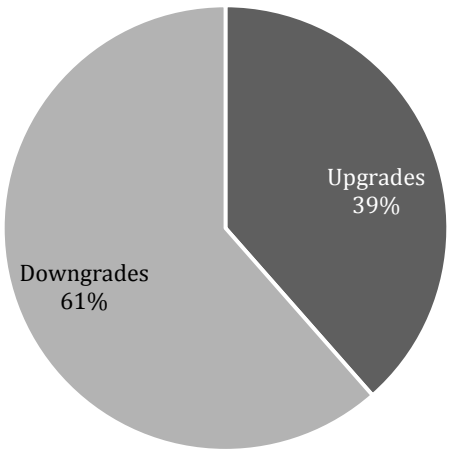


Figure 6: Credit rating announcements by upgrade or downgrade

In this figure the proportion of upgrades and downgrades in the sample are displayed. Majority of the announcements in the sample are downgrades (61%) meanwhile, upgrades (39%) are less frequent.



11. Appendix B: Results from normality test

Figure 7: Residuals from upgrades

In the figure the residuals from upgrades in the sample are plotted. It can be seen that they are slightly skewed to the right which indicated that there are more positive residuals in the sample of upgrades. Kurtosis appears to be slightly smaller than implied by normal distribution.

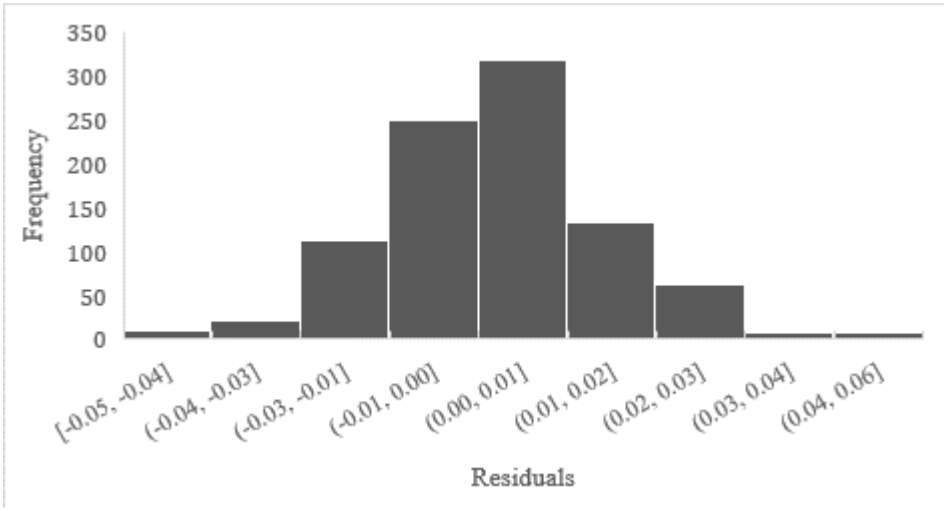
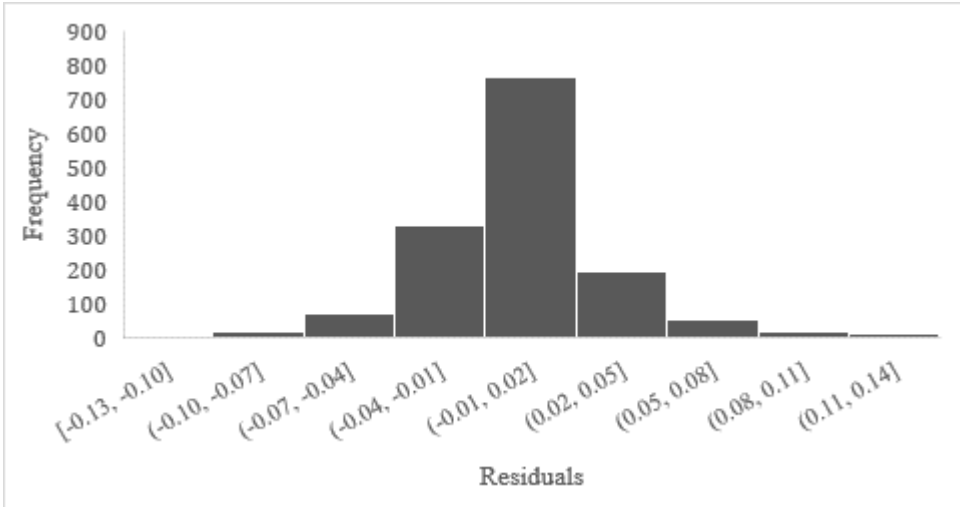


Figure 8: Residuals from downgrades

In the figure the residuals from downgrades in the sample are plotted. It can be seen that they are slightly skewed to the right which indicated that there are more positive residuals in the sample of downgrades. Kurtosis appears to be slightly larger than implied by normal distribution.



Equation 9: Jarque-Bera test.

The equation for Jarque-Bera test is displayed where N represents the size of the sample, S represents the skewness and K represents the kurtosis of the sample.

$$\text{Jarque} - \text{Bera test} = \text{N}\left[\frac{\text{S}^2}{6} + \frac{(\text{K}-3)^2}{24}\right]$$

Table 12: Jarque-Bera test

In the table the results from the Jarque-Bera test for upgrades and downgrades are displayed. The kurtosis and skewness of each sample is given as well as the $\chi 2$ statistic and the P-value. From the P-value the null hypothesis of a normal distribution cannot be rejected.

	Upgrades	**Downgrades**
Kurtosis	1.70	3.28
Skewness	0.34	0.39
$\chi 2$	3.92	2.01
P-value	0.14	0.37

12. Appendix C: Aggregated abnormal returns

Table 13: Aggregated abnormal returns during [-10, +10] event window

In this table the aggregated abnormal returns for both downgrades and upgrades are displayed from 10 days before the event until 10 days after the event.

Downgrades				Upgrades			
Day	**AAR**	**SAR**	**P-value**	**Day**	**AAR**	**SAR**	**P-value**
-10	-0.01086	-9.93544	3.01E-22	-10	-0.00113	-2.98193	0.002934
-9	-0.0031	-5.68627	1.7E-08	-9	-0.00356	-8.93428	1.93E-18
-8	0.002509	5.060982	4.96E-07	-8	-0.00364	-9.50081	1.49E-20
-7	0.005195	11.79686	3.65E-30	-7	-0.0009	-2.85228	0.00443
-6	0.000669	1.116931	0.264292	-6	0.001574	5.102447	4.01E-07
-5	-0.0032	-7.01583	4.21E-12	-5	-0.00025	-0.6318	0.527661
-4	-0.0056	-12.8017	7.41E-35	-4	0.000593	1.383676	0.166766
-3	0.001341	3.284806	0.001056	-3	-0.00055	-1.64049	0.101218
-2	-0.00393	-7.03436	3.71E-12	-2	0.001354	4.37173	1.36E-05
-1	0.008124	9.247968	1.35E-19	-1	0.001235	3.563798	0.000383
0	-0.00847	-7.28477	6.53E-13	0	0.003813	9.109521	4.4E-19
1	0.004899	7.625559	5.64E-14	1	0.000619	1.571883	0.116294
2	0.003588	7.612441	6.21E-14	2	-0.00129	-3.44729	0.00059
3	0.006222	14.53523	1.44E-43	3	0.001229	2.952083	0.00323
4	0.006877	14.47477	2.98E-43	4	0.001416	4.022485	6.19E-05
5	-0.00202	-4.11343	4.22E-05	5	0.000556	1.761778	0.078412
6	-0.00159	-4.85895	1.37E-06	6	0.000464	0.959446	0.337566
7	-0.00058	-1.37333	0.169957	7	-0.00315	-7.94298	5.29E-15
8	-0.00248	-4.23969	2.45E-05	8	-0.00015	-0.43352	0.664732
9	0.003681	4.180052	3.17E-05	9	-2.4E-05	-0.07008	0.944143
10	0.003027	7.115249	2.13E-12	10	0.000214	0.800818	0.423427

Table 14: Aggregated abnormal returns during [-2, +2] event window

In this table the aggregated abnormal returns for both downgrades and upgrades are displayed from 2 days before the event until 2 days after the event.

Downgrades				Upgrades			
Day	**AAR**	**SAR**	**P-value**	**Day**	**AAR**	**SAR**	**P-value**
-2	-0.00103	-2.03558	0.042055	-2	0.001023	3.408589	0.000679
-1	-0.00091	-1.82678	0.068031	-1	-0.00015	-0.4429	0.657937
0	-0.0088	-7.56112	9.03E-14	0	0.003129	7.553713	9.53E-14
1	0.000895	1.733473	0.08332	1	-0.00162	-4.11606	4.17E-05
2	0.001873	4.278277	2.06E-05	2	-0.00171	-4.36091	1.43E-05

Table 15: Aggregated abnormal returns during [-2, +10] event window

In this table the aggregated abnormal returns for both downgrades and upgrades are displayed from 2 days before the event until 10 days after the event.

Downgrades				Upgrades			
Day	**AAR**	**SAR**	**P-value**	**Day**	**AAR**	**SAR**	**P-value**
-2	-0.00074	-1.47486	0.140565	-2	0.001493	4.59988	4.77E-06
-1	0.00011	0.215292	0.829583	-1	0.000206	0.540857	0.588727
0	-0.00821	-7.09473	2.45E-12	0	0.003444	7.51864	1.23E-13
1	0.002565	4.673398	3.37E-06	1	-0.00133	-3.0517	0.002336
2	0.003378	7.197114	1.21E-12	2	-0.00253	-6.11409	1.39E-09
3	0.005937	13.94432	1.63E-40	3	0.000614	1.44224	0.149548
4	0.008874	16.95999	6.74E-57	4	0.002144	5.835322	7.25E-09
5	-0.00103	-2.1193	0.034311	5	-0.00191	-4.01127	6.49E-05
6	-0.0025	-7.53617	1.08E-13	6	0.003018	5.436823	6.82E-08
7	-0.00133	-3.39151	0.000722	7	-0.00429	-9.56327	8.56E-21
8	-0.00261	-4.40003	1.2E-05	8	0.000638	1.59092	0.111944
9	0.0032	3.69121	0.000235	9	-0.00094	-2.57403	0.010195
10	0.003676	8.466404	8.93E-17	10	0.000244	0.75753	0.448911

13. Appendix D: List of credit rating announcements

Table 16: List of observations in the sample

In this table 135 observations are displayed. The date of the credit rating announcement, the name of the firm, the type and transition of the credit rating change and the country.

Date	Firm	Type	From	To	Country
07 February 2002	ABB	Downgrade	AA-	A+	SWE
26 March 2002	ABB	Downgrade	A+	A	SWE
01 October 2002	ABB	Downgrade	A	A-	SWE
22 October 2002	ABB	Downgrade	A-	BBB+	SWE
05 November 2002	ABB	Downgrade	BBB+	BBB-	SWE
13 January 2003	ABB	Downgrade	BBB-	BB+	SWE
03 April 2006	ABB	Upgrade	BB+	BBB-	SWE
15 May 2006	ABB	Upgrade	BBB-	BBB+	SWE
23 April 2007	ABB	Upgrade	BBB+	A-	SWE
08 June 2010	ABB	Upgrade	A-	A	SWE
12 October 2001	Alfa Laval	Upgrade	BB-	BB	SWE
17 May 2002	Alfa Laval	Upgrade	BB	BB+	SWE
11 June 2002	Alfa Laval	Upgrade	BB+	BBB-	SWE
28 November 2003	Alfa Laval	Upgrade	BBB-	BBB	SWE
28 April 2008	Alfa Laval	Upgrade	BBB	BBB+	SWE
08 May 2013	Alfa Laval	Upgrade	BBB+	A-	SWE
26 May 2014	Alfa Laval	Downgrade	A-	BBB+	SWE
27 July 2007	Astra Zeneca	Downgrade	AA+	AA-	SWE
01 May 2015	Astra Zeneca	Downgrade	AA-	A+	SWE
10 November 2015	Astra Zeneca	Downgrade	A+	A	SWE
18 December 2015	Astra Zeneca	Downgrade	A	A-	SWE
24 February 2011	Atlas Copco	Upgrade	A-	A	SWE
09 November 2010	Electrolux	Upgrade	BBB	BBB+	SWE
06 November 2014	Electrolux	Downgrade	BBB+	BBB	SWE
17 December 2015	Electrolux	Upgrade	BBB	BBB+	SWE
11 November 2004	Handelsbanken	Upgrade	A+	AA-	SWE
12 September 2000	Nordea	Upgrade	A	A+	SWE
29 November 2005	Nordea	Upgrade	A+	AA-	SWE
20 May 2008	Sandvik	Downgrade	A+	A	SWE
02 March 2009	Sandvik	Downgrade	A	A-	SWE
09 March 2010	Sandvik	Downgrade	A-	BBB	SWE
24 May 2011	Sandvik	Upgrade	BBB	BBB+	SWE
17 March 2014	Sandvik	Downgrade	BBB+	BBB	SWE
17 October 2006	SCA	Downgrade	A-	BBB+	SWE
21 February 2014	SCA	Upgrade	BBB+	A-	SWE
16 December 2003	SEB	Upgrade	A-	A	SWE
17 October 2006	SEB	Upgrade	A	A+	SWE

05 February 2009	SEB	Downgrade	A+	A	SWE
01 December 2011	SEB	Upgrade	A	A+	SWE
12 May 2003	SKF	Upgrade	BBB+	A-	SWE
16 October 2013	SKF	Downgrade	A-	BBB+	SWE
05 May 2015	SKF	Downgrade	BBB+	BBB	SWE
19 July 2007	SSAB	Downgrade	BBB+	BBB	SWE
30 July 2009	SSAB	Downgrade	BBB	BBB-	SWE
06 December 2011	SSAB	Downgrade	BBB-	BB+	SWE
27 September 2013	SSAB	Downgrade	BB+	BB	SWE
19 May 2014	SSAB	Downgrade	BB	BB-	SWE
22 February 2016	SSAB	Downgrade	BB-	B+	SWE
17 October 2006	Swedbank	Upgrade	A	A+	SWE
03 October 2008	Swedbank	Downgrade	A+	A	SWE
01 December 2011	Swedbank	Upgrade	A	A+	SWE
02 December 2015	Swedbank	Upgrade	A+	AA-	SWE
25 October 2007	Swedish Match	Downgrade	BBB+	BBB	SWE
09 October 2006	Swedish Match	Downgrade	A-	BBB+	SWE
18 April 2002	Telia Sonera	Downgrade	AA	A+	SWE
05 February 2003	Telia Sonera	Downgrade	A+	A	SWE
28 October 2005	Telia Sonera	Downgrade	A	A-	SWE
29 April 2009	Volvo	Downgrade	A-	BBB+	SWE
15 March 2010	Volvo	Downgrade	BBB	BBB-	SWE
15 April 2011	Volvo	Upgrade	BBB-	BBB	SWE
29 June 2001	Danske Bank	Upgrade	A+	AA-	DK
05 February 2009	Danske Bank	Downgrade	AA-	A+	DK
18 December 2009	Danske Bank	Downgrade	A+	A	DK
30 May 2012	Danske Bank	Downgrade	A	A-	DK
29 April 2014	Danske Bank	Upgrade	A-	A	DK
04 June 2007	Jyske Bank	Upgrade	A	A+	DK
20 February 2009	Jyske Bank	Downgrade	A+	A	DK
01 December 2011	Jyske Bank	Downgrade	A	A-	DK
29 November 2005	Nordea	Upgrade	A+	AA-	DK
13 June 2007	Novo nordisk	Upgrade	A-	A	DK
24 June 2011	Novo nordisk	Upgrade	A	A+	DK
19 June 2013	Novo nordisk	Upgrade	A+	AA-	DK
17 April 2003	Elisa	Downgrade	A-	BBB+	FIN
22 December 2003	Elisa	Downgrade	BBB+	BBB	FIN
18 March 2015	Elisa	Upgrade	BBB	BBB+	FIN
12 August 2005	Fortum	Upgrade	BBB+	A-	FIN
21 September 2009	Fortum	Upgrade	A-	A	FIN
27 November 2012	Fortum	Downgrade	A	A-	FIN
05 June 2015	Fortum	Downgrade	A-	BBB+	FIN
26 November 2002	Metso	Downgrade	BBB+	BBB	FIN
03 March 2004	Metso	Downgrade	BBB	BB+	FIN

09 October 2006	Metso	Upgrade	BB+	BBB-	FIN
15 May 2007	Metso	Upgrade	BBB-	BBB	FIN
30 March 2011	Nokia	Downgrade	A	A-	FIN
09 June 2011	Nokia	Downgrade	A-	BBB+	FIN
02 August 2011	Nokia	Downgrade	BBB+	BBB	FIN
02 March 2012	Nokia	Downgrade	BBB	BBB-	FIN
27 April 2012	Nokia	Downgrade	BBB-	BB+	FIN
05 July 2013	Nokia	Downgrade	BB-	B+	FIN
15 May 2014	Nokia	Upgrade	B+	BB	FIN
17 April 2015	Nokia	Upgrade	BB	BB+	FIN
23 February 2006	Stora Enso	Downgrade	BBB+	BBB	FIN
22 October 2007	Stora Enso	Downgrade	BBB	BBB-	FIN
11 November 2008	Stora Enso	Downgrade	BBB-	BB+	FIN
14 May 2009	Stora Enso	Downgrade	BB+	BB	FIN
03 November 2000	Telia Sonera	Downgrade	A+	A	FIN
20 February 2001	Telia Sonera	Downgrade	A	A-	FIN
06 July 2001	Telia Sonera	Downgrade	A-	BBB	FIN
23 May 2003	Telia Sonera	Upgrade	BBB	A	FIN
28 October 2005	Telia Sonera	Downgrade	A	A-	FIN
16 May 2006	UPM	Downgrade	BBB+	BBB	FIN
21 April 2008	UPM	Downgrade	BBB	BBB-	FIN
01 April 2009	UPM	Downgrade	BBB-	BB+	FIN
17 February 2010	UPM	Downgrade	BB+	BB	FIN
20 November 2014	UPM	Upgrade	BB	BB+	FIN
02 June 2006	Norsk Hydro	Downgrade	A	A-	NOR
03 August 2007	Norsk Hydro	Downgrade	A-	BBB	NOR
20 March 2009	Norsk Hydro	Downgrade	BBB	BBB-	NOR
19 November 2010	Norsk Hydro	Upgrade	BBB-	BBB	NOR
19 January 2001	Petrol Geo	Downgrade	BBB	BBB-	NOR
31 July 2002	Petrol Geo	Downgrade	BBB-	BB-	NOR
29 October 2002	Petrol Geo	Downgrade	BB-	B	NOR
20 November 2002	Petrol Geo	Downgrade	B	CCC+	NOR
30 December 2002	Petrol Geo	Downgrade	CCC+	CC	NOR
30 July 2003	Petrol Geo	Downgrade	CC	D	NOR
10 July 2006	Petrol Geo	Upgrade	B+	BB-	NOR
02 December 2010	Petrol Geo	Upgrade	BB-	BB	NOR
04 November 2014	Petrol Geo	Downgrade	BB	BB-	NOR
22 January 2015	Petrol Geo	Downgrade	BB-	B+	NOR
16 November 2015	Petrol Geo	Downgrade	B+	B	NOR
26 February 2016	Petrol Geo	Downgrade	B	CCC+	NOR
15 March 2000	Statoil	Downgrade	AA	AA-	NOR
19 June 2001	Statoil	Downgrade	AA-	A	NOR
08 November 2006	Statoil	Upgrade	A	A+	NOR
03 August 2007	Statoil	Upgrade	A+	AA-	NOR

22 February 2016	Statoil	Downgrade	AA-	A+	NOR
21 August 2002	Storebrand	Downgrade	BBB	BBB-	NOR
08 February 2005	Storebrand	Upgrade	BBB-	BBB	NOR
27 May 2005	Storebrand	Upgrade	BBB	BBB+	NOR
15 December 2008	Storebrand	Downgrade	BBB+	BBB	NOR
10 July 2015	Storebrand	Downgrade	BBB	BBB-	NOR
01 August 2006	Telenor	Downgrade	A-	BBB+	NOR
19 November 2014	Telenor	Upgrade	A-	A	NOR
20 December 2005	Yara	Upgrade	BBB	BBB+	NOR
04 October 2007	Yara	Downgrade	BBB+	BBB	NOR