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SCHOOL OF ACCOUNTING AND FINANCE

Joonas Ujainen

THE EFFECT OF CREDIT RATING ANNOUNCEMENTS ON SOVEREIGN BOND PRICES IN EUROPE

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Author:	Joonas Ujainen
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ABSTRACT

The purpose of the study is to examine bond characteristics, bond pricing and risks related to bonds. In addition, this study focuses on how credit rating announcements affect sovereign bond returns in Europe. First, we cover bond markets and the role of credit rating agencies in general. After that, the above-mentioned topics are combined, and the effect of negative and positive credit rating information on bond returns is analyzed. The effect of rating changes is examined by measuring abnormal returns over the period from January 2000 to April 2015.

On the grounds of total market value, bonds are by far the most significant asset class. It is worth mentioning that when global bond markets reached and exceeded an estimated $100 trillion milestone in 2013, the total value of stock markets was approximately three-fifths of the total value of the bond markets. Credit rating agencies play a major role in this vast bond market and have a substantial amount of power. Due to their role in financial markets and recurrent failures, it appears that arguments against credit rating agencies are partly justified.

To summarize, the empirical findings of this paper support the view that rating changes from investment to non-investment grade cause significant market responses. Furthermore, the results suggest that negative rating changes within speculative grade are associated with more pronounced price reactions than downgrades in general. Although downgrades appear to be insignificant rating events, findings based on a small sample indicate that positive credit rating announcements do have an impact on sovereign bond returns.

KEYWORDS: Sovereign bonds, bond pricing, credit rating, credit rating agencies, watchlist, outlook

1. INTRODUCTION

Although stocks usually tend to dominate the conversation, bonds dominate the markets in value. Rates of government bonds and changes in credit ratings are now closely monitored and topics of daily news. The relationship between rating announcements and asset prices has been studied comprehensively. However, the effect of rating information on bonds has been largely neglected in Europe for some time. During the past few years, sovereign bond markets have also been quite volatile, especially in Europe. Thus, the paper will be about credit rating announcements and sovereign bonds. Because of the current economic situation, the topic in question is extremely timely. As we all know, several European countries are struggling with their debt burdens.

Although credit rating agencies provide useful information, the current economic situation has sparked a lot of conversation about and criticism of credit rating agencies. This is, of course, completely natural given the role of credit rating agencies in the economy. Credit rating announcements affect bond prices, whereas bond prices affect corporations and sovereign entities. Therefore, credit rating agencies are extremely influential institutions. Moreover, recommendations made by the Basel Committee have increased further the use of credit ratings in international markets (Hooper, Hume & Kim 2008: 142–143). The credit rating industry has been described as follows (Friedman 1996):

> "There are two superpowers in the world today in my opinion. There's the United States and there's Moody's Bond Rating Service. The United States can destroy you by dropping bombs, and Moody's can destroy you by downgrading your bonds. And believe me, it's not clear sometimes who's more powerful."

Credit rating agencies provide statements about the creditworthiness of entities. These agencies not only publish simple ratings but announce watchlists and outlooks as well. In other words, credit rating announcements help to assess credit risks. The higher the default or credit risk, the higher the probability that a borrower is unable to meet its obligations. It is rather difficult and time-consuming to determine default risks. Therefore, credit rating agencies, such as Fitch Ratings, Moody's Investors Service and Standard & Poor's Financial Services, offer valuable information. (Bodie, Kane & Marcus 2011: 489.)

The use of credit ratings is not new in itself. The first announcements were published already in 1909 (White 2010: 211). As the markets have changed, both the importance of credit rating information and the role of credit rating agencies have also changed profoundly. Nowadays, the rating market is dominated by the three largest agencies, commonly referred to as the Big Three. Credit rating information is, of course, vital to financial markets, but the importance of credit rating agencies has also a downside.

Although there were several reasons for the recent financial crisis, it is difficult to dispute the unfavorable effects of the over-optimistic credit ratings that fueled the crisis. As we all know, after housing prices plunged in the United States, it became apparent that credit ratings for mortgage-backed securities were not as accurate as though. This, in turn, contributed to the collapse of the housing market in 2006, which eventually resulted in a full-scale and global financial crisis. (White 2010: 212.)

1.1. Purpose of the Study

This study examines the effects of credit rating information on sovereign bond prices in Europe. In other words, the purpose of the study is to determine whether upgrades and downgrades affect government bond prices. Based on previous studies, it would be quite logical to expect that downgrades cause significant price reactions, while upgrades lead to less significant reactions. In addition, the aim of this paper is to examine whether differences in maturities matter. The study also explores announcement anticipation and differences between investment-grade and speculative-grade bond price reactions.

This study makes an important contribution to the existing literature by examining European bond markets during the financial crisis. The paper is also about information efficiency and frictionless markets. In efficient markets, announcements should, of course, lead to price changes in assets related to the announcements. The chosen time period combined with European bond market data provides an ideal and intriguing setting for the study. Findings related to information and market efficiency are always valuable information to investors. Although the results of the study may not be groundbreaking, each and every paper forms a valuable link in the chain of studies.

1.2. Research Hypotheses

The research hypotheses revolve around the topics of information asymmetry, investment-grade barrier and anticipation of credit rating announcements. Based on previous studies, it seems that credit rating downgrades lead to significant price reactions. However, results of the studies are not consistent on whether credit rating upgrades significantly affect bond prices. Therefore, the first research hypothesis must be as follows:

H_1: Credit rating downgrades cause significant bond prices reactions, whereas upgrades do not cause significant market responses.

Some studies suggest that drop to speculative-grade category forces investors with a mandate to hold only investment-grade bonds to liquidate the assets. In other words, drop below investment grade may lead to pronounced price reactions, commonly referred to as cliff effects. Moreover, it appears that speculative-grade bonds are in general more prone to significant price reactions than investment-grade bonds. Based on the above-mentioned findings, the following hypothesis is formed:

H_2: Downgrades from investment to non-investment grade affect bond prices, while opposite upgrades do not cause significant price effects.

Jorion and Zhang (2007) provided evidence that prior rating is a key driver of stock price reactions. Based on the study, this crucial variable has been omitted in many studies. In order to examine whether prior ratings affect bond price reactions, the following is hypothesized:

H_3: Lower prior ratings lead to larger bond price reactions, and higher prior ratings are associated with less significant price effects.

1.3. Structure of the Study

The first chapters form the theoretical part of the study. As usual, the first chapter is an introductory chapter, which is followed by the chapters exploring the bond market and bond pricing theory. After the aforementioned topics,

rating services and criticism of credit rating agencies are covered in the fourth chapter. The empirical part of the paper begins with a literature review of relevant studies, after which the data and methodology are presented in the following chapter. The empirical results are presented in the penultimate chapter, while the last chapter concludes the paper.

2. BOND CHARACTERISTICS

Historically, bonds have been and are even today an extremely important form of investment. Based on the total market value, bonds are also by far the largest asset class. For example, when the global bond market exceeded an estimated $100 trillion in 2013, the total value of the stock market was approximately three-fifths of the global bond market capitalization (Bank for International Settlements 2014; The World Bank 2017). This again is due to the fact that institutional investors, such as pension and insurance companies, value bonds for steady yields and relatively low risk. Governments, states, municipalities, banks and companies are the most common bond issuers. The United States, Japan and Germany are a few of the largest issuers worldwide, with the United States being undisputedly the largest. In addition, public lending institutions, such as the World Bank and the European Investment Bank, are large bond issuers (Anderson 1998: 98-99).

During the past few decades, the importance of securitization has grown in the bond markets. Securitization refers to, for example, a situation in which a number of loans will be collected together as collateral for sold securities, such as bonds. The principal will be paid back to investors with interests from payments made by debtors. In other words, the loans are converted into secondary market securities. These securities are referred to as asset-backed securities (ABS). In the absence of alternative funding sources, this can be a reasonable solution for a debtor. The bonds in question have usually a high rating and the effective yield is higher than the yield on government debt securities. Securitized assets are often sold to large institutional investors in over-the-counter markets. (Anderson 1998: 99, 115; Blake 2000: 379.)

The importance of junk bonds has also grown. The term junk bond refers to a bond which has an extremely low rating but a high rate of return. Markets consider bonds rated below BBB- by S&P as junk bonds, while Moody's rates junk bonds below Baa3. Despite the negative connotation, these bonds are a crucial part of the debt market. It is an important form of financing for organizations whose financial condition is weak. Such an organization can be, for example, a company which is recently founded. However, risk awareness is of the utmost importance in the case of junk bonds. Thus, junk bonds can be part of a well-diversified portfolio. (Anderson 1998: 99–114.)

2.1. Bond Markets

Bonds are financial instruments that are used for raising funds for a number of different purposes. Among other things, longer maturity distinguishes the bonds from money market instruments. Another major difference is the fact that bonds are generally not discount securities, which means that the creditor receives interest payments on a regular basis. Bonds can be divided into, for example, debenture, subordinated debt, government and corporate bonds. Debentures are riskier and therefore differ significantly from other bonds. In the event of bankruptcy, the holders of bonds and other loans take precedent over the holders of debentures. (Nikkinen, Rothovius & Sahlström 2002: 106; Martikainen & Martikainen 2009: 62.)

When investing in a bond, a buyer or creditor loans the principal to a debtor. In turn, the issuer undertakes to pay interest payments and repayments to the debtholder according to the terms of the contract. The annual interest rate that the issuer agrees to pay is also referred to as the coupon rate, or simply coupon. Repaid capital is equal to the nominal value of the bond. The principal of the loan can be repaid either in a single payment at the end of the loan period or in several payments during the lifespan of the security. (Nikkinen et al. 2002: 107; Martikainen & Martikainen 2009: 63.)

The nominal value, or face value, is not necessarily equal to the market price of a bond. The price of a bond is mainly affected by changes in credit ratings and by the prevailing level of interest rates at the time. While the face value remains unchanged, the bond might be traded below or above par in the bond market. To be precise, the final bond price consists of the market price and possible accrued interest. If the bond is traded after the coupon payment date, the seller is entitled to the interest that has accrued before the sale. Like securitized assets, most bonds are also traded over-the-counter. (Thau 2001; Bodie, Kane & Marcus 2002.)

The coupon rate is calculated on the par value of a bond, whereas the current yield refers to the annual return that the investor will gain when the bond is bought from the secondary market at the current price. The rate of a bond can be either fixed or it can be tied to, for example, market rates. In most cases, however, bonds are fixed-rate coupon bonds. The coupon rate on the fixed-rate

bond remains the same for the entire lifespan of the security, while floating coupon rate fluctuates and adjusts to changes. In addition, there are bonds that do not pay coupon payments at all. For example, zero-coupon bonds are discount securities issued without coupon payments. The profit of a zero-coupon bond consists of the difference between the purchase and selling price. (Martikainen & Martikainen 2009: 63, 102.)

Bonds also offer a variety of different features and additional benefits, such as repurchase or redeem rights. From the issuer's point of view, redeemable or callable bonds can be quite useful debt instruments. If interest rates drop, the issuer may redeem its bonds and reissue new bonds at a lower rate. In contrast, a puttable bond usually benefits the owner of the bond. Bond yields can also be bound to a variety of factors. Walt Disney, for example, has tied coupon payments to the economic success of its films, whereas the repayment of a bond issued by Electrolux has been dependent on the possibility of earthquakes in Japan. (Bodie et al. 2002: 425–426, 428.)

2.2. Mezzanine Financing and Indexed Bonds

Mezzanine financing has the financial characteristics of both debt and equity financing. Mezzanine financing is often used, for example, in the case of acquisition or restructuring. The form of financing in question is usually offered by banks, financial institutions and venture capitalists. A few of the most common forms of mezzanine financing are subordinated debt, convertible bonds and bonds with embedded options. Although mezzanine financing can take a variety of different forms, it often relates to bonds; therefore, it needs to be included in the study. In addition, the topic of indexed bonds is briefly explored in the chapter. (Martikainen & Martikainen 2009: 66.)

Subordinated debt can be structured as a combination of debt and equity financing. Compared with senior debt, subordinated bonds have lower priority in regard to claims to assets in the event of bankruptcy or liquidation. In many cases, these bonds have no collateral and are therefore referred to as unsecured bonds. However, bondholders must be paid prior to shareholders. The issuer can be, for example, a newly established business or company in financial distress. (Anderson & Tuhkanen 2004; Martikainen & Martikainen 2009.)

Funds can also be raised by issuing hybrid securities, such as convertible bonds and bonds with embedded options. Convertible bonds can be converted into a number of shares of the issuing company as specified by the conversion ratio. The conversion ratio, which is stated in the bond indenture, determines the number of shares to which the bondholder is entitled. The coupon rate on a convertible bond is typically lower than the coupon rate on a nonconvertible bond as the holder of the convertible bond profits from an increase in the price of the underlying share. (Martikainen & Martikainen 2009; Bodie et al. 2011.)

Convertible bonds and bonds with embedded options can be quite similar debt instruments. For example, the main difference between bonds with warrants and convertible bonds is that the warrants of the former are usually detachable. In other words, the bond as well as the warrant can be traded separately in the secondary market. This detachable warrant entitles an investor to subscribe to new shares of the issuer in accordance with the terms of the contract. These embedded options tend to decrease the coupon rate because investors may profit from the embedded security. The face value has to be repaid to the creditor regardless of whether new shares were subscribed or not. (Martikainen & Martikainen 2009: 66–68.)

Coupons on an indexed bond are most often tied to a price, commodity or equity index. However, these floating-rate securities can be paired with a variety of different reference rates, as mentioned above. From the investor's point of view, it is beneficial that the real rate of return is known in advance. In addition, these bonds can be useful to institutional investors who are restricted from investing directly in stocks or commodities. After fixed-rate bond sector, index-linked bonds form the largest bond sector in the United Kingdom. Many of these bonds are adjusted to inflation. In the United States, equivalent government bonds are called Treasury Inflation Protected Securities (TIPS) and have been issued since 1997. (Anderson & Tuhkanen 2004: 192; Fabozzi 2007: 6.)

2.3. Risks Associated with Bonds

Government bonds in particular are often considered to be free of credit risk or even risk-free investments. However, several risks are associated with investing in sovereign bonds and bonds in general. As the United States government can

always raise taxes or increase the money supply to meet the interest payments, risk premium is not included in the yield on bonds issued by the government. Although securities issued by the United States government are treated as free of credit risk, uncertainties regarding the debt ceiling have affected Treasury security yields numerous times since the Clinton Administration. (Mishkin & Eakins 2003: 120–123.)

A few of the most significant risks associated with bonds are interest rate risk, reinvestment risk, call risk, credit risk, inflation risk, currency risk, liquidity risk and volatility risk. Investors are also exposed to risks related to the yield curve shifts, taxation and unforeseen events. In addition to these risks, it is also a risk that the underlying risks are not completely perceived. This risk relates to the increased complexity of structured products and appears now more topical than ever. A few of the risks mentioned will be explored more closely in the next four sections of the paper. (Fabozzi 2000: 5–8, 151.)

2.3.1. Interest Rate Risk

As we all know, bond prices and the level of interest rates correlate negatively. As interest rates and bond yields rise, bond prices decrease in general. If an investor sells a bond before the maturity date, an increase in interest rates results in a market price lower than the purchase price. Market prices have to adjust to changes in interest rates as coupon payments usually remain fixed. Interest rate risk, also known as market risk, is unquestionable the most significant risk investor is exposed to in the bond market. As maturity is one of the major factors affecting price sensitivity to changes in interest rates, market risk tends to be higher for bonds with long maturities. (Fabozzi 2000: 6.)

2.3.2. Reinvestment Risk

When reinvesting cash flows, it is possible that the anticipated interest rate on the reinvestment is lower than the initial rate of return. This risk is referred to as reinvestment risk. Once again, the risk is greater for bonds with long maturities as reinvestment risk increases with maturity. While interest rate risk occurs as interest rates rise, reinvestment risk materializes when interest rates fall. The disparity between these risks enables an investment strategy referred to as immunization. (Fabozzi 2000: 6.)

2.3.3. Credit Risk

In brief, credit risk has to do with the issuer's ability to meet its financial obligations. The risk can be categorized into three different types of risk: default risk, credit spread risk and downgrade risk. Credit risk is the risk that the issuer may lack sufficient financial resources for interest payments and repayment of principal. In addition to investors, credit risk is assessed on an ongoing basis by credit rating agencies. The effects of credit risk appear in the differences between Treasury bond yields and yields of comparable debt securities issued by other entities. This difference is also referred to as the credit spread. Aside from default risk, investors are most concerned about credit spread changes. Moreover, investors are exposed to downgrade risk as bond yields are affected by credit rating announcements. (Fabozzi 2000: 7.)

2.3.4. Liquidity Risk

Liquidity risk refers to the marketability of securities as well as to the difference between the quoted bid and ask prices. This spread tends to widen as liquidity risk increases and vice versa. Although the risk is insignificant for investors who hold debt securities until maturity, it hinders institutional investors from determining the fair value of assets as portfolio managers must periodically mark positions to market. For example, marking to market leads to unfavorable and inaccurate asset values in illiquid markets. (Fabozzi 2000: 8.)

3. BOND PRICING

The fundamental valuation principles are the same for both stocks and bonds. However, bonds are usually fixed-income securities, and therefore future cash flows are known in advance. This, in turn, simplifies bond pricing substantially. The present value of a bond consists of the discounted value of coupon payments and principal, whereas the risk-free rate and the risk premium form the required rate of return. (Fabozzi, Modigliani & Ferri 1994: 3–4.)

3.1. Price Determination

The value of a bond, whose principal will be repaid at maturity, and which makes constant and periodical coupons, can be calculated in the following way (Nikkinen et al. 2002: 93, 113):

(1) $$P_0 = \sum_{i=1}^{T} \frac{C_t}{(1+r)^t} + \frac{FV}{(1+r)^T}$$

where:
- P_0 = bond price
- C_t = coupon payment
- FV = face value
- r = interest rate
- T = term to maturity
- t = time period

When determining the value of a bond, the importance of the risk premium should be kept in mind. The required rate of return should, of course, increase with the associated risks. In other words, if the required yield rises above the coupon rate, the price of the bond falls below the par value and is said to be selling at a discount. In contrast, the bond is traded at a premium when the required yield is less than the coupon rate. When the required yield equals the coupon rate, the bond is trading at par. (Fabozzi 2000: 23–24.)

In addition, changes in the current level of interest rates inversely affect bond prices as the relation between prices and yields is inverse. The required rate of return must, of course, adjust to changes in the general level of interest rates.

The equation above can also be used for calculating yield to maturity by placing the market price as the present value of future cash flows. Contrary to the nominal and current yield, the yield to maturity takes account of the market price, par value, term to maturity, coupon rate and, above all, reinvested coupon payments. In other words, it is the internal rate of return on an investment. (Bodie et al. 2002: 433–434.)

3.2. Price Volatility

The price sensitivity to interest rate changes and interest rate risk of an investment can be measured by determining the weighted average maturity of its future cash flows. This effective maturity is also referred to as Macaulay duration. The key determinants affecting duration are term to maturity, coupon rate and yield to maturity. All else equal, as coupon rate rises, duration usually tends to decrease. Furthermore, the longer the maturity, the greater the duration. Macaulay duration is calculated as follows (Nikkinen et al. 2002: 123):

(2) $$D = \sum_{i=1}^{T} t \times w_t$$

where: $$w_t = \frac{CF_t/(1+r)^t}{P}$$

T = term to maturity
CF_t = cash flow at time t
r = yield to maturity
P = bond price
t = time period

However, an adjusted version of the equation is commonly used for estimating the percentage change in price for a change in yield. The price sensitivity can be gauged using the following modified duration (Nikkinen et al. 2002: 124):

(3) $$\frac{\Delta P}{P} = -D^* \times \Delta r$$

where: $$D^* = D/(1 + r)$$

Duration is a relatively accurate estimate of the effect of interest rates on bond prices if changes in bond yield are comparatively small. If interest rate changes are large, duration should be supplemented with an additional measure. The change in the price of a bond can be accurately calculated using the following equation (Nikkinen et al. 2002: 126):

(4) $$\text{Convexity} = \frac{1}{P\times(1+r)^2}\sum_{t=1}^{T}\left[\frac{CF_t}{(1+r)^t}(t^2+t)\right]$$

$$\frac{\Delta P}{P} = -D^*\times\Delta r + \frac{1}{2}\times\text{convexity}\times(\Delta r)^2$$

As previously stated, duration is merely an estimate of the relationship between interest rate changes and bond prices. Limitations of duration can be corrected by accounting for the curvature of the price-yield curve. As Figure 1 illustrates, the curve presenting the relation between price and yield is convex instead of linear. This curvature is referred to as convexity. (Thau 2011: 70.)

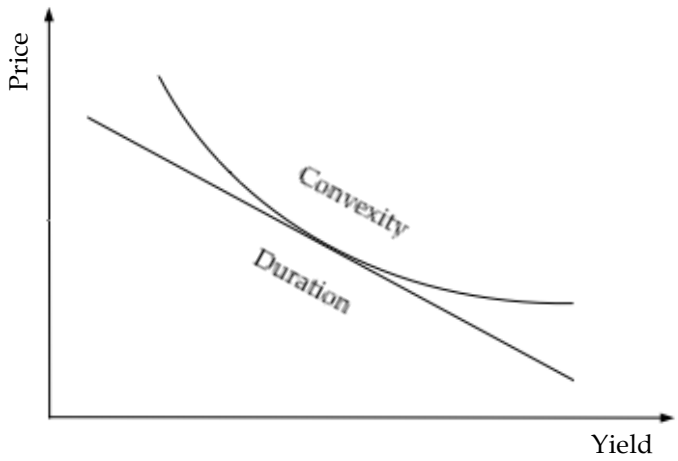

Figure 1. Convexity and duration (Bodie et al. 2011: 547).

3.3. Term Structure of Interest Rates

As mentioned above, maturity affects bond yields. However, the relationship between yield to maturity and maturity varies substantially over time. This

relationship is referred to as the term structure of interest rates and is illustrated by the yield curve. Figure 2 shows a commonly observed shape of the yield curve. In addition to a rising or normal yield curve, yield curves can, for example, also be inverted or flat. The shape of the yield curve changes with economic growth expectations. Thus, an upward-sloping yield curve may indicate that investors are expecting high inflation and vice versa. Theories pertaining to shapes of the yield curve are explored briefly at the end of this chapter. (Bodie et al. 2011: 508–509.)

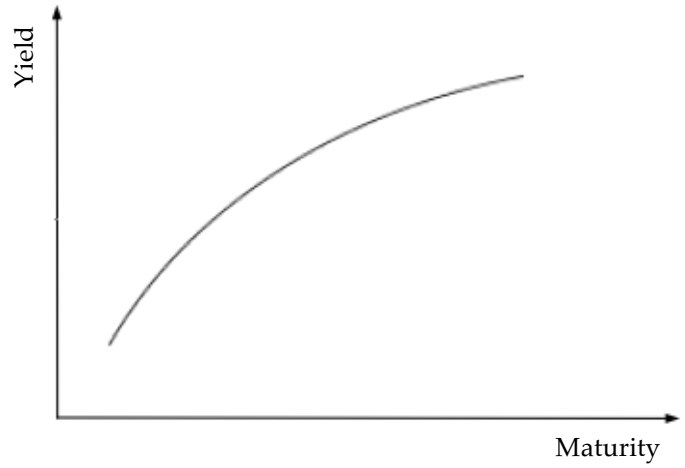

Figure 2. Normal yield curve (Pilbeam 2010: 91).

As the level of future interest rates is a major determinant of the shape of the yield curve, it is self-evident that investors require higher nominal rates when inflation is expected to rise. The impact of expected inflation on the level of real interest rates is known as the Fisher hypothesis. Based on the hypothesis, the real interest rate should equal the nominal interest rate minus the expected inflation. The relationship in question can be expressed in mathematical terms by the following Fisher equation (Nikkinen et al. 2002: 116–117):

(5) $$(1 + i) = (1 + r)(1 + \pi)$$

where: i = nominal interest rate
r = real interest rate
π = expected inflation

There are several theories explaining the shape of the yield curve. These theories can be divided into two main categories: expectations theories and market segmentation theory. Expectations theories can be subdivided into pure expectations theory, liquidity preference theory and preferred habitat theory. Based on these three theories, forward rates implied by the yield curve indicate market expectations of future short-term rates. As the name suggests, the pure expectations theory relies purely on the predictive power of the forward rates. However, the theory does not account for maturity preferences, nor for risks inherent in investments. (Fabozzi 2007: 116, 118.)

The liquidity preference theory and preferred habitat theory could be described as refined versions of the pure expectations theory. Based on these theories, the forward rates should not be considered as unbiased predictors of future interest rates. For example, the liquidity preference theory factors in a risk or liquidity premium and the term to maturity as the premium increases with maturity. The preferred habitat theory is a combination of expectations theories and market segmentation theory. Unlike the liquidity preference theory, it asserts that the premium does not necessarily rise uniformly with maturity. In other words, investors can be induced to move from a maturity range to another if compensation is considered adequate. In contrast, the market segmentation theory assumes that market participants are constrained to particular maturity sectors. (Fabozzi 2007: 119–120.)

4. CREDIT RATING AGENCIES

As we all know, the information provided by credit rating agencies play a crucial role in financial markets. As the name implies, these organizations assess the creditworthiness of companies and sovereign entities. Throughout most of the twentieth century, credit rating agencies mainly scrutinized the creditworthiness of firms and sovereign entities. Today, however, credit rating agencies also analyze a wide variety of structured products on a regular basis. Although it is possible that investors are required to pay for rating information, in most cases the costs of services provided are covered by the issuer to facilitate the efficient use of rating information. (Bertocchi, Consigli, D'Ecclesia, Giacometti, Moriggia & Ortobelli 2013.)

The credit rating market is dominated by the three largest credit rating agencies: Standard & Poor's Financial Services, Moody's Investors Service and Fitch Ratings. Both Moody's and Standard & Poor's are based in the United States, whereas Fitch Ratings is headquartered also in the United Kingdom. Fitch Ratings is owned by the French company Financière Marc de Lacharrière and by the American media company Hearst Communications, while Standard & Poor's is a subsidiary of S&P Global, formerly known as McGraw Hill Financial. The dominance of these companies is illustrated in Figure 3. It can be noted that the combined market share of the two largest rating agencies was 83% in 2012. (Bertocchi et al. 2013.)

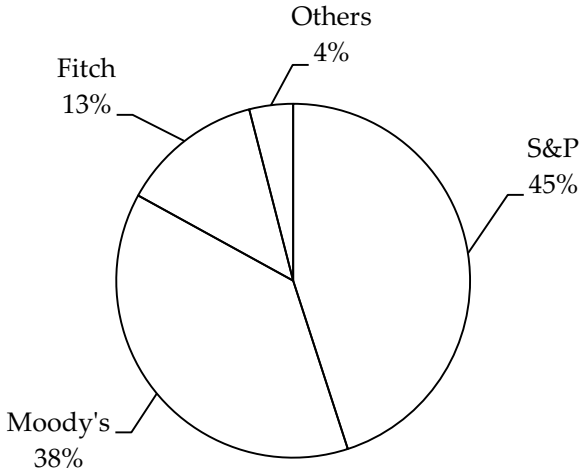

Figure 3. Market shares of credit rating agencies (Bertocchi et al. 2013).

4.1. Rating Services

It is fairly simple to rely on credit ratings rather than to comprehensively assess the creditworthiness of a particular issuer. Credit rating information discloses the probability of default and payment delays to investors in a concise form. At the beginning of the rating process, representatives of the credit rating agency usually meet with the issuer or customer. As the rating analysis proceeds, credit rating agencies examine present and forecast future cash flows. An increase in cash flow has, of course, a positive impact on the level of credit rating and vice versa. In addition, a high credit rating generally indicates that the amount of funds exceeds the amount of debt, while a large debt burden results in a speculative-grade rating. (Thau 2011.)

As can be seen from Table 1, Standard & Poor's and Fitch Ratings use somewhat different rating scales than Moody's. Furthermore, Standard & Poor's and Fitch Ratings use plus and minus signs to specify relative standing within the rating categories, whereas Moody's uses numbers from 1 to 3. For example, a rating of BB+ is equivalent to Ba1, while BB- is equivalent to Ba3. The credit rating scale is divided into investment-grade and speculative-grade ratings. All ratings below BBB- or Baa3 are considered speculative grade by market participants. Abbreviated definitions of credit ratings are also included in the table below. (Thau 2011.)

Table 1. Definitions of credit ratings (Thau 2011: 33).

S&P	Moody's	Fitch	Definition
AAA	Aaa	AAA	Highest quality
AA	Aa	AA	High quality
A	A	A	Good quality
BBB	Baa	BBB	Satisfactory
BB	Ba	BB	Speculative
B	B	B	Very speculative
CCC	Caa	CCC	Substantially speculative
CC	Ca	CC	Extremely speculative
C	C	C	In default

4.2. Conflict of Interest and Criticism

In the aftermath of the financial crisis, the United States government appointed a committee to investigate the causes which led to the crisis. The conclusion of the final report drawn up by the committee mentioned that the three largest credit rating agencies were in a key role in the crisis. According to the report, this crisis would not have arisen without credit rating agencies. The committee selected Moody's for a more detailed examination. In 2006, Moody's gave the highest credit rating for 30 mortgage-related securities every day. Later on, a staggering 83% of these rated securities were downgraded. (Financial Crisis Inquiry Commission 2011: 25.)

According to the commission, judgement was replaced by mathematical models and calculations in risk assessments conducted by financial institutions and credit rating agencies. Furthermore, the report emphasizes that the negative effects of securitization were known long before the crisis. As a result of securitization, high risk mortgages were repackaged as top-rated structured financial products. Even though this type of securitization seems questionable, it should be kept in mind that credit rating agencies were the institutions that rated these products. However, neither securitization nor rating agencies can be blamed solely for the crisis. (Financial Crisis Inquiry Commission 2011.)

Prior to the financial crisis, the multinational insurance corporation American International Group (AIG) had a credit rating of AA- by Standard & Poor's and Aa3 by Moody's. The insurance company was downgraded only after the collapse of Lehman Brothers. Because of the high credit rating, the company was able to trade a wide variety of derivatives, such as credit default swaps, on a massive scale. However, credit default swaps insured against losses on collateralized debt obligations, which were in many cases backed by mortgages. As a consequence, AIG eventually received more than $170 billion from the Federal Reserve and Treasury (Mishkin 2010: 6). According to the commission, nearly 45,000 mortgage-related securities were rated in the highest credit rating category from 2000 to 2007. It is also noteworthy that only six private sector companies in the United States had this most desired credit rating at the beginning of the decade. (Financial Crisis Inquiry Commission 2011: 25, 139–140.)

Given the importance of credit rating agencies, it is not surprising that crises give rise to criticism of these institutions. The Asian and recent global financial crises as well as the Enron and WorldCom scandals have led to widespread criticism. For example, Enron's rating was downgraded below investment grade only a few days before the company declared bankruptcy. Enron and WorldCom scandals were also accounting scandals, but rating agencies have been wrong before and after these infamous instances. As we all know, Lehman Brothers collapsed almost unnoticed by rating agencies in September 2008. (White 2010.)

Rating agencies have also been criticized for slowness in reacting to new information, but at the same time stable ratings are valued as constant changes force institutional investors to make adjustments to their portfolios. However, timely updates and stable ratings are usually conflicting objectives. It appears that the perception of inadequate timeliness is due to the through-the-cycle rating methodology that helps rating agencies to avoid rating reversals by ignoring short-term fluctuations. In other words, rating information does not fully reflect all available information. As investors favor stability at the expense of accuracy, the introduction of watchlist procedure has enabled rating agencies to provide precise information while maintaining ratings stable. (Altman & Rijken 2004; Löffler 2004.)

In addition to rating timeliness, the relationship between rating agencies and issuers has been heavily criticized. In the 1970's, the largest rating agencies switched from a subscriber-pays to an issuer-pays model. The reason for the change is somewhat unclear even today. The technological development of photocopying may have contributed to it by making unauthorized use of rating information easier. It also possible that rating agencies realized that issuers needed their approval to maximize the marketability of bonds. On the other hand, it is quite common in information industries, such as the newspaper industry, that subscribers pay for information provided. (White 2010.)

However, the current issuer-pays model is problematic as issuers are clients and under review at the same time. According to the Financial Crisis Inquiry Commission, rating agencies were compensated only for ratings that were accepted by issuers. In other words, issuers were able to pressure rating agencies by threatening to turn to another agency. In addition to the external

pressure, agencies' eagerness to compete for market share undoubtedly affected the quality of rating information. It seems that rating agencies simply traded their reputation for satisfied clients and market share increases. (Financial Crisis Inquiry Commission 2011: 210–212.)

It is estimated that there are as many as 150 credit rating agencies in the world, and the number of rating agencies appears to rise slowly (Basel Committee on Banking Supervision 2000: 14). However, as mentioned above, only a few dominate the credit rating market. Again, it is not surprising that this oligopolistic market structure has been widely criticized. White (2010: 217) mentions economies of scale, experience and reputation as potential barriers to entry. Due to the special characteristics of the credit rating industry, the market structure will remain oligopolistic also in the future.

In addition to natural barriers to entry, there is the registration as a nationally recognized statistical rating organization (NRSRO). The U.S. Securities and Exchange Commission classifies ten rating agencies as nationally recognized statistical rating organizations (SEC 2017). Alp (2013) states that one of the objectives of the Credit Rating Agency Reform Act of 2006 was to increase competition by facilitating the NRSRO registration. Nevertheless, it seems that criteria and review process for the designation still remain obscure (White 2010). The current practice not only strengthens the oligopolistic market structure but also makes rating agencies license-granting NRSROs. Ratings are incorporated into laws and regulations, and only ratings by NRSROs matter. It appears that rating agencies sell regulatory licenses rather than concentrate on the informational value of ratings (Partnoy 1999: 621–624).

After the financial crisis, the U.S. Securities and Exchange Commission, the International Organization of Securities Commissions (IOSCO) as well as the European Union have amended guidelines and regulation concerning credit rating agencies. The main purpose of these reforms was to increase transparency and oversight. Although the credit rating industry has been regulated for decades, the regulation has been largely based on voluntary guidelines issued by the International Organization of Securities Commissions. Despite regulatory approach was opposed by the Committee of European Securities Regulators (CESR), Regulation (EC) No 1060/2009 on credit rating agencies was passed in September 2009. (De Haan & Amtenbrink 2011: 17–20.)

As mentioned above, assessing risks related to structured financial products is challenging even for credit rating agencies. During the past years, rating agencies have repeatedly been overly optimistic about these securities. Due to structured products and miscalculations concerning these securities, the U.S. Securities and Exchange Commission was forced to revise the regulation concerning NRSROs in 2008 (Bertocchi et al. 2013: 122–123). According to De Haan and Amtenbrink (2011), increased requirements and regulation may actually strengthen confidence in credit rating agencies by giving the appearance that credit ratings are something more than opinions about creditworthiness.

According to the Global Financial Stability Report (2008: 54) published by the International Monetary Fund, structured products can facilitate diversification, but at the same time these complex instruments add little value to the financial system. As noted above, shortcomings of the credit rating industry enabled the financial meltdown, but the crisis would not have occurred without structured products either. It appears that the underlying causes of the global financial crisis were systemic extending far beyond the failures of credit rating agencies.

5. PREVIOUS STUDIES

Katz (1974) was among the first to examine the relation between credit ratings and bonds and found that rating reclassifications of bonds issued by electric utility companies were not anticipated in the bond market during the period 1966–1972. Later, however, Grier and Katz (1976) discovered that, unlike in the utility bond market, negative rating reclassifications were anticipated in the industrial bond market. In addition, the effects of reclassifications were more pronounced for industrial bonds than for bonds issued by utility companies. Both studies show that price adjustments to reclassifications can last up to three months, indicating that bond prices adjusted to new information rather slowly a few decades ago.

Hand, Holthausen and Leftwich (1992) likewise found that rating changes led to significant price reactions in the corporate bond market during the period 1977–1982. It appears that announcements of downgrades affect bond prices more than positive credit rating information. Furthermore, price effects caused by downgrades are stronger for speculative-grade than for investment-grade bonds. However, the results of this paper are somewhat inconsistent. After eliminating simultaneous announcements, it seems that bond prices are affected only by positive credit rating information. Nevertheless, it is evident that credit rating announcements by Moody's and Standard & Poor's significantly affect corporate bond prices.

According to Wansley, Glascock and Clauretie (1992), especially downgrades cause statistically significant market reactions. In addition, the results suggest that credit ratings crossing grades lead to stronger effects than ratings within grades. It seems to be unimportant for investors whether bond issues were placed on CreditWatch prior to rating announcements or not. Furthermore, the actual CreditWatch listings appear to be insignificant events. Consistent with conclusions of Grier and Katz (1976), the results indicate that industrial sector is more prone to price effects than utility companies.

It appears that previous returns and the magnitude of rating changes are positively correlated with price effects. In addition, the results highlight the information asymmetry relating to credit rating announcements. It is somewhat unclear why negative rating information significantly affects bond prices, while

announcements of upgrades are insignificant events. One possible explanation is that institutional investors are constrained by, for example, prospectus to sell downgraded bonds. However, the results show that the effects of credit rating changes from investment grade to speculative grade are insignificant. Although previous studies have documented lags in adjustment, these results indicate that prices adjust within a week. Thus, it seems that the bond market is just as efficient as the equity market. (Wansley et al. 1992.)

Instead of concentrating on the bond market, Goh and Ederington (1993, 1999) study the response of stock prices to rating changes. Goh and Ederington argue that credit rating announcements are not equal in regard to their information content. According to the studies, rating downgrades can be caused by either a deterioration of financial outlook or an increase in leverage. Based on the studies, credit rating announcements are in many cases anticipated by market participants as those are often preceded by, for example, changes in the capital structure. It appears that whether credit rating announcements have significant implications depends on the nature of these announcements.

Rather than categorizing credit rating announcements based on causes, Cantor and Packer (1996) study the factors affecting the determination of sovereign credit ratings. They find that of the criteria used by Standard & Poor's and Moody's especially per capita income, GDP growth, inflation, external debt, economic development and default history are significant factors. They also stress that credit rating agencies compress the information of macroeconomic indicators into valuable sovereign credit ratings. Although it seems that credit rating agencies and market participants interpret new information similarly, the results indicate that rating announcements significantly affect credit spreads.

Although the conclusions of Cantor and Packer (1996) are mostly consistent with previous studies on corporate bonds, they find that sovereign bonds rated below investment grade are more sensitive to credit rating announcements than investment-grade bonds. In addition to this, it appears that credit rating announcements that are fully anticipated cause larger price effects than unanticipated announcements. Their findings suggest that sovereign ratings contain more information than mere macroeconomic indicators as 92 percent of the sample variation is explained by credit ratings, but only 86 percent of the variation is explained by the macroeconomic variables.

Hite and Warga (1997) found that rating changes to and within speculative grade cause significant price reactions over the period beginning six months before and lasting until the end of the announcement month. In other words, the risk level and direction of the rating change appear to be the key elements affecting the magnitude of the price effect. For example, most of the effects caused by upgrades are insignificant, but rating changes from speculative grade to investment grade lead to positive abnormal returns. Unlike rating upgrades, announcements of downgrades have significant implications regardless of the level of the rating prior to the announcement. However, negative credit rating changes within investment grade lead to considerably weaker reactions than other downgrades.

When the data sample is restricted to cover only events that are not preceded by rating actions over the six-month period prior to the announcement and in which Moody's and Standard & Poor's publish announcements simultaneously, the information disclosed by those agencies leads to even more pronounced price reactions. Hite and Warga (1997) state that the results obtained with this uncontaminated data confirm the perception that price reactions in the announcement month are due to the rating change and are not explained by previous rating actions.

Based on a small subsample consisting of rating events that confirm the other agency's rating within six months, it appears that Moody's is able to provide more valuable information than Standard & Poor's. Rating changes by Moody's that confirm ratings by Standard & Poor's lead to stronger price reactions than in the opposite case. This holds true especially for negative ratings within speculative grade. As mentioned above, these observations are based on a very small subset and therefore merely provide a basis for further research. Overall, these rating agencies are equal in terms of the information they provide. (Hite and Warga 1997.)

Reisen and von Maltzan (1999) found that announcements of downgrades have significant implications for dollar bond spreads on emerging market bonds. Furthermore, the results show that possible upgrades, also referred to as positive watchlistings, have strong effects on the bond spreads over the period from ten days before to a day after the announcement day. Contrary to the conclusions of Cantor and Packer (1996), the results show that, in general, the

effects of rating announcements on dollar bond spreads are not significant. In other words, it seems that only emerging market bonds are affected by the credit rating information provided by the three leading agencies.

A study by Kliger and Sarig (2000) seeks to answer the question of why companies are willing to pay tens of thousands of dollars for credit ratings, although their bonds are rated regardless of whether they pay for the services or not. It appears that 98 percent of the issuers pay for their credit ratings. This may be due to privately disclosed forecasts, statements and internal reports. As clients, firms are able to provide rating agencies with valuable information without revealing it to, for example, competitors. Thus, credit rating agencies are able to incorporate this information into the ratings. If this theory holds, rating announcements should convey valuable information to the market.

Moody's refined its credit rating classification on April 26, 1982. The study by Kliger and Sarig (2000) is based on an examination of asset prices around that day as it enables to evaluate the information value of ratings. All bonds followed by Moody's were rerated regardless of the fact that their creditworthiness remained unchanged. According to the paper, credit rating announcements do have an impact on yield spreads and bond prices. Furthermore, the results suggest that highly leveraged firms are more prone to rerating effects than less leveraged companies.

Although several studies have focused on bonds and the bond market, few of those studies examine the relationship between credit rating announcements and bond prices in Europe. According to Steiner and Heinke (2001), the effects of credit rating information on bond prices in Europe have been neglected completely for some time. They state that it is still somewhat unclear to what extent ratings by agencies based in the United States are relied upon in the European markets. Due to country-specific differences the information value of these ratings may not be the same as in the United States.

Furthermore, they discovered that negative rating announcements, including both downgrades and negative watchlistings, are associated with strong price reactions, whereas positive rating announcements do not cause significant price reactions. These results also suggest that the nationality of the issuer has a significant effect on the magnitude of the price reaction as price reactions are

stronger for issuers based in the United States. In addition, it appears that negative rating announcements lead to overreaction. In other words, negative abnormal returns are reversed by positive abnormal returns approximately three weeks after the announcement day, and the price level eventually rises above the price prior to the announcement day. (Steiner & Heinke 2001.)

However, the results of Steiner and Heinke (2001) show that, instead of credit rating announcements, negative abnormal returns may be partly explained by investment restrictions. As mentioned above, it is possible that institutional investors are restricted to specific rating categories and thus may be forced to sell downgraded bonds. Consistent with the conclusions of Wansley et al. (1992) and Hite and Warga (1997), the results show that downgrades crossing the border between investment grade and speculative grade cause significant price reactions.

As can be seen from Figure 4, significant price movements occur in the German bond market not only on the announcement day and after it but also during the three months preceding the announcement. In other words, rating agencies lag behind the market, since changes in credit risk are incorporated into prices prior to the announcement day. Furthermore, cumulative abnormal returns (CDAR) show the overreaction on and immediately after the announcement date followed by positive returns approximately two to three weeks after the announcement. However, it is unclear whether this is simply overreaction or due to the above-mentioned investment restrictions. Negative watchlistings also cause similar and significant abnormal returns, albeit not as high as caused by downgrades. (Steiner & Heinke 2001.)

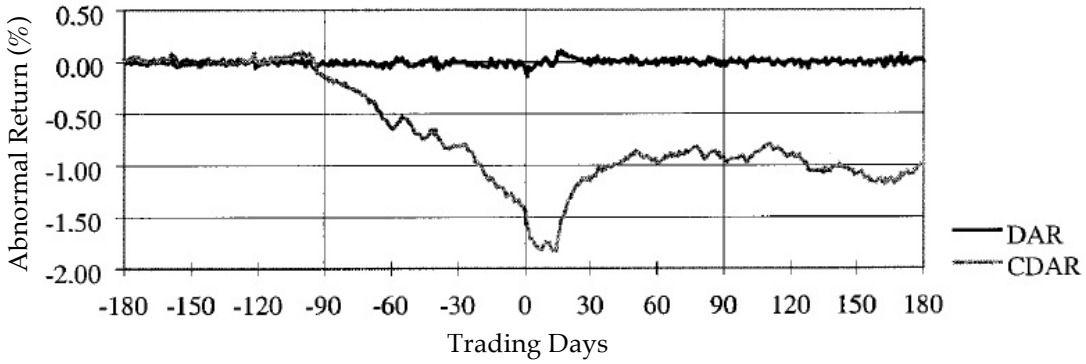

Figure 4. Negative abnormal bond returns (Steiner & Heinke 2001: 145).

Contrary to negative credit rating information, announcements of positive rating changes and positive watchlistings do not cause significant price reactions on or after the announcement day. Figure 5, however, shows that these rating actions tend to lag behind the market response to risk changes. Another possible explanation for this information asymmetry is that rating agencies estimate creditworthiness to be worse than in reality rather than the other way around. Overly optimistic views are usually more damaging than excessively pessimistic opinions. In other words, rating agencies protect their reputation by being overly cautious in their ratings. (Steiner & Heinke 2001.)

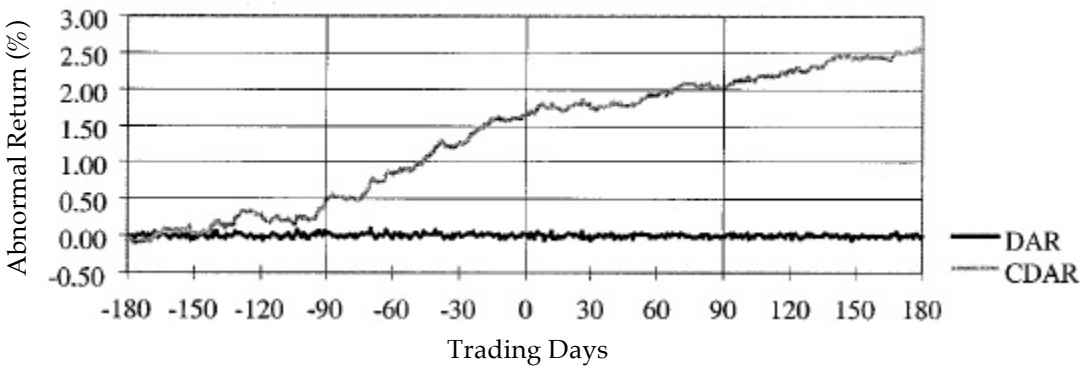

Figure 5. Positive abnormal bond returns (Steiner & Heinke 2001: 146).

Since credit default swaps are derivatives insuring against a default, also referred to as a credit event, these contracts also enable an examination of the effects caused by credit rating information. Hull, Predescu and White (2004) examined the effects of rating information on credit default swaps (CDS) and found that negative watchlistings contain significant information, whereas downgrades do not cause significant effects. It also appears that, although positive rating events cause significant reactions, those reactions are much less significant than their results for negative watchlistings. Their results also show that significant changes in credit default swap spreads occur as early as three months before the announcement date. This, however, applies only to negative credit rating events, including watchlistings and outlooks as well.

Evidence provided by Norden and Weber (2004) confirms the results on pre-announcement effects by Hite and Warga (1997) and Hull et al. (2004). They show that the credit default swap market tends to react approximately two to

three months in advance of the announcement date. Furthermore, it appears that market reactions to negative watchlistings are larger than the effects caused by downgrades. Both downgrades and negative watchlistings by Moody's as well as negative watchlistings by Standard & Poor's cause significant spread changes in the credit default swap market. However, the results suggest that neither announcements by Fitch Ratings nor positive announcements have significant information content. Based on the study, the magnitude of spread changes depends critically on the level of prior ratings and previous rating events. Although it appears that the credit default swap market adjusts to new information in advance of the announcement date, they point out that credit rating information can be valuable in the long term due to its stability.

Although Jorion and Zhang (2007) focus on the stock market response to rating events, they also emphasize the significance of prior rating similarly to Norden and Weber (2004). According to the paper, prior rating is "the single most important variable" in examining the stock market response. For example, taking prior rating into account causes the effects of rating changes that cross the border between investment grade and speculative grade to be insignificant. Probably due to this variable, their results suggest that upgrades also convey new information to the market, although the effects of positive information are approximately half the magnitude of negative effects.

A study conducted by Hooper, Hume and Kim (2008) implies that stock price reactions associated with sovereign rating changes are highly significant but also asymmetric. The effects of sovereign rating information appear to be pronounced for downgrades, during crisis periods and in emerging markets. According to the paper, due to the importance of sovereign ratings, credit rating agencies have the ability to both fuel and dampen crises. Furthermore, especially countries with high levels of debt appear to be vulnerable to the effects of rating changes.

Ismailescu and Kazemi (2010) focus on the effects of sovereign rating changes on the credit default swap market and show that positive credit rating announcements cause significant market reactions. Their findings suggest that positive credit rating announcements cause significant credit default swap changes in emerging markets, while negative credit rating announcements appear to be insignificant rating events. In other words, the results imply that

only positive rating announcements convey new information to market participants, whereas negative changes in credit risk are already incorporated into spreads prior to the announcement date. These results on downgrades are quite similar to those reported by Hull et al. (2004).

Contrary to the credit default swap market, it appears that both upgrades and downgrades lead to significant implications in the corporate bond market. According to May (2010), downgrades cause significant market responses, and furthermore, price reactions to downgrades are almost three times larger than responses to upgrades. In addition, the results of this study suggest that reactions for lower rated issuers are stronger than the effects for higher rated companies. Furthermore, it appears that credit rating changes from speculative grade to investment grade cause stronger price effects than upgrades in general.

Vu, Alsakka and ap Gwilym (2015) focus on the effects of split ratings on sovereign bond spreads. Consistent with the conclusions of Norden and Weber (2004), they find little evidence that rating events involving Fitch Ratings convey valuable information to market participants. According to the paper, divergent rating opinions by different rating agencies, also referred to as split ratings, give rise to ambiguity concerning the creditworthiness of a given sovereign entity. With respect to split ratings, higher positive events set a new ceiling, whereas lower negative events form a rating floor. Changes to these rating levels are considered important events as additional rating events are likely to follow. The results of the paper show that Standard & Poor's tends to lead the market in the case of negative credit rating events, while Moody's leads in the case of positive events.

A study by Böninghausen and Zabel (2015) seeks to answer the question of whether credit rating events concerning a given nation affect other countries. It appears that negative spillover effects are more pronounced for countries in the same region. In addition, trade and other fundamental factors are found to be insignificant in explaining cross-border spillover effects. Furthermore, the results show that information asymmetry clearly also applies to spillover effects, since bond market reactions to positive rating events are “much more muted at best” than responses to downgrades. Based on their findings, it is likely that these spillover effects are caused not only by credit rating events but also by news releases.

Evidence provided by Baum, Schäfer and Stephan (2016) shows that, although the effect of rating announcements on the value of the euro is insignificant, credit rating events have an impact on sovereign bond yields. Based on their findings, it appears that downgrades have a significant effect on volatility and bond yields. Surprisingly, negative credit outlooks seem to cause even stronger market reactions than downgrades. The finding that announcements indicating the potential direction of rating changes cause stronger market responses than actual credit rating announcements is not particularly novel. However, it is somewhat surprising that credit outlooks, rather than watchlistings, cause the strongest market responses (cf. Hull et al. 2004; Norden and Weber 2004).

After focusing on the effect of credit rating information on financial markets, it is of interest to also focus on whether economic events have affected procedures and methodologies used in assigning credit ratings. To answer this question, Reusens and Croux (2017) assessed the importance of sovereign credit rating determinants. Their findings show that rating methods do indeed have changed after the start of the European debt crisis. A comparison of rating determinants over the period 2002 through 2015 reveals that the importance of fiscal balance, economic development and external debt has increased substantially since 2009. Furthermore, it appears that rating agencies changed their outlook on eurozone membership as the membership shifted from a positive to a negative factor.

6. DATA AND METHODOLOGY

The following chapters form the empirical part of the paper and consist of a brief description of the data, research methodology and empirical findings. The description of the data used in this study is followed by a chapter presenting the methods for calculating abnormal bond returns and for examining the information content of sovereign ratings. The purpose of this empirical part is to examine whether sovereign rating announcements cause asymmetric bond price reactions and whether rating changes crossing the border between investment grade and speculative grade cause significant price effects. Furthermore, the importance of prior rating on the magnitude of market responses is evaluated.

6.1. Data Description

The data used in this study consists of daily bond index returns and credit rating announcements by Moody's, Standard & Poor's and Fitch Ratings over the period from January 2000 to April 2015. The bond price data consisting of sovereign bond indices for maturities of two and ten years is obtained from Thomson Reuters Datastream. The indices used in this study are total return benchmark indices, which are based on the most representative single bonds for the given maturity band. In the case of simultaneous rating events, rating announcements are included and excluded based on the level of prior ratings, since there are no differences in the magnitude of simultaneous rating changes. In other words, only a rating change by the credit rating agency with the lowest or lower credit rating prior to the rating announcement is included.

The following nine European countries are included in the study: Austria, Belgium, France, Greece, Ireland, Italy, Netherlands, Portugal and Spain. These countries were selected in order to ensure an economic and geographic diversity as well as a sufficient number of rating events in the sample. For example, these countries can be divided into two groups, as Portugal, Ireland, Italy, Greece and Spain (PIIGS) were considered weaker than the rest during the financial crisis. Geographically, the data sample consists of a central European country, four southern European and four western European countries. Since the European debt crisis and the above-mentioned countries

provide an intriguing setting for the study, the sample was also limited to the crisis period from January 2010 through December 2014. However, the results for the subsample proved less significant than other results; therefore, these results are included only in the appendices. In this case, the main problem with subsampling is that it decreases further the number of observations.

Table 2 reports descriptive statistics for the cumulative abnormal returns over a three-day event window. As shown in the table, the sharpest decline and positive change were approximately -23 % and 36 %, respectively. The largest negative change occurred after Greece failed to form a government on May 2012, while the sharpest increase in the abnormal returns was recorded after finance ministers of the European Union showed political will to defend the single currency and agreed on a €750 billion financial aid on May 2010.

Table 2. Descriptive statistics for the cumulative abnormal returns.

2-year	Mean (%)	Median (%)	Minimum (%)	Maximum (%)	Count
Austria	0.00	0.00	-0.83	0.84	3999
Belgium	0.00	0.00	-1.15	1.56	3999
France	0.00	0.00	-0.79	0.55	3999
Greece	-0.05	0.00	-20.48	22.44	3999
Ireland	-0.01	-0.01	-0.76	0.62	3999
Italy	0.01	0.00	-1.99	2.58	3999
Netherlands	0.00	0.00	-0.56	0.56	3999
Portugal	0.02	0.00	-8.23	7.04	3999
Spain	0.01	0.00	-2.29	2.23	3999
10-year					
Austria	-0.77	-0.76	-3.48	2.22	3999
Belgium	-0.76	-0.76	-5.51	3.88	3999
France	-0.77	-0.77	-3.49	2.64	3999
Greece	-0.78	-0.77	-23.27	36.44	3999
Ireland	-0.76	-0.75	-8.56	8.73	3999
Italy	-0.76	-0.76	-4.92	6.26	3999
Netherlands	-0.76	-0.76	-2.94	2.18	3999
Portugal	-0.76	-0.77	-13.29	13.16	3999
Spain	-0.76	-0.77	-4.46	7.72	3739

Table 3 below presents the breakdown of credit rating changes by original rating class. In addition, cardinal number scale representing the credit rating scale is included in the table. The purpose of this cardinal rating scale is discussed in more detail in the following section. As can be seen from the table, prior rating is considered investment grade in almost four-fifths of the rating events. As shown in Tables 4–7 in the penultimate chapter, rating events are mostly downgrades, since approximately one-third of the announcements are upgrades.

Table 3. Distribution of rating changes by original rating class.

Rating Class	Cardinal Rating	Number of Rating Changes	Percentage
AAA & AA	17–20	49	37.12
A	14–16	34	25.76
BBB	11–13	22	16.67
BB	8–10	5	3.79
B	5–7	9	6.82
Below B	0–4	13	9.85
Total		132	100

6.2. Research Methodology

The methods employed to evaluate the information content of sovereign credit ratings are presented in this section. The research hypotheses are tested in a manner similar to that used by Jorion and Zhang (2007). These methods employed by them are similar to those used in many of the previous studies cited above, but they also emphasized the importance of prior rating as a variable. As there is no reason to omit the variable and it is essential to examine the role of prior rating in the sovereign bond market, the variable is included to test the related hypothesis. However, before moving on to these methods, it may be of importance to explore methods for calculating index and cumulative abnormal returns. The daily returns of the total return indices are calculated by Thomson Reuters Datastream in the following way:

(6) $$RI_0 = 100$$

$$RI_t = RI_{t-1} \times \frac{\sum_i (P_{i,t} + A_{i,t} + CP_{i,t} + G_{i,t}) \times N_{i,t-1}}{\sum_i (P_{i,t-1} + A_{i,t-1} + CP_{i,t-1}) \times N_{i,t-1}}$$

where:
- P = clean price of the bond based on a middle price
- $P_{i,t}$ = clean price of the ith bond at time t
- A = accrued interest to the settlement date
- CP = adjustment for bonds with ex-dividend periods
- $G_{i,t}$ = coupon received from the ith bond at time t
- N = nominal value of amount outstanding

The summations above are over the bonds currently in the benchmark index, and during ex-dividend periods for bonds that have ex-dividend periods, CP equals the value of the next coupon payment and zero otherwise. Now that the method for calculating index returns has been presented, let us briefly focus on the method of measuring abnormal returns. First, cumulative abnormal returns, denoted by CAR, are calculated for each total return index over the three-day announcement window. This announcement window covers the days around the announcement date, and announcements are released at t = 0. The market index is a benchmark index representing the sovereign bond market in the eurozone. These total return indices for maturities of two and ten years are also calculated by Thomson Reuters Datastream. The market-adjusted excess returns are calculated as follows:

(7) $$CAR_j = \sum_{t=-1}^{+1} \left[R_{j,t} - R_{m,t} \right]$$

where:
- $R_{j,t}$ = return on bond index i at time t
- $R_{m,t}$ = return on the market index at time t

Instead of using mean-adjusted returns or relying on estimated parameters and the OLS market model in measuring abnormal returns, excess returns are calculated by using the market model procedure also studied by Brown and Warner (1980). In their studies published in 1980 and 1985, they find no evidence that more sophisticated methods convey any additional benefit in event studies, and in addition, they state that time should be spent in

constructing event studies rather than on these methods. However, they argue that the other approaches mentioned above outperform the mean-adjusted procedure as it has low power in cases involving event-day clustering.

The methods for calculating index and cumulative abnormal returns have now been presented, and it is time to move on to discuss the approach to examining the implications of rating announcements for the sovereign bond market. To test the research hypotheses, procedures similar to those employed in previous studies and by Jorion and Zhang (2007) are followed. The first regression allows the analysis of the price effects of credit rating changes, rating changes crossing the border between investment grade and speculative grade, and rating changes with prior rating below investment grade. These effects of rating announcements on sovereign bond returns are estimated with the following cross-sectional regression:

$$(8) \qquad CAR_j = \alpha_0 + \alpha_1 RCHG_j + \alpha_2 IGRADE_j + \alpha_3 SGRADE_j + \varepsilon_j$$

As mentioned above, the dependent variable, CAR, is used to measure cumulative abnormal returns during the announcement window. The first variable in the regression is RCHG and it indicates the magnitude of rating changes. Credit ratings are converted into cardinal numbers on a scale of 0 to 20, with each number representing a separate rating and 20 indicating the highest credit quality. The effects of credit rating changes crossing the cut-off between investment and non-investment grade are represented by a dummy variable, IGRADE, which takes the value of one if rating changes cross this border and zero otherwise. In addition, another dummy variable, SGRADE, is included in the regression, and it is set to one if the prior rating is below investment grade.

As SGRADE is the dummy variable only for credit rating changes from and within speculative grade, a variable for prior rating also has to be included in the study, since the effect of prior rating on the magnitude of market responses needs to be examined. To test whether the inclusion of this variable leads to increases in the explanatory power and whether there are other improvements compared to the regression model above, another regression similar to that is employed. In this regression model, the variable SGRADE is replaced by PRT,

which represents the prior rating expressed in terms of cardinal numbers. The regression, which can be described as an extension of the previous regression model, is constructed in the following manner:

(9) $$CAR_j = \alpha_0 + \alpha_1 PRT_j + \alpha_2 RCHG_j + \alpha_3 IGRADE_j + \varepsilon_j$$

7. EMPIRICAL RESULTS

After the introduction of the theoretical framework above, let us move on to the empirical results of the study. As stated above, the regression model with the variable for rating changes from and within non-investment grade is employed first, after which it is replaced by the variable for prior rating. Thus, the results and regression models can be compared. Based on previous studies, it would be logical to expect that downgrades cause significant price reactions, whereas upgrades lead to less significant effects. Furthermore, speculative-grade bonds are expected to be more vulnerable to rating changes than investment-grade bonds. In addition, it is also highly probable that rating changes crossing the border between investment grade and speculative grade cause significant reactions. The estimated coefficients from the first regression and associated t-statistics are reported in Table 4 below.

Table 4. The impact of rating changes on 2-year sovereign bond returns.

	All	Downgrades	Upgrades
Intercept	-0.02	-0.05	-0.03
	-0.19	-0.22	-0.89
RCHG	0.12 **	0.06	0.05 **
	2.20	0.41	2.26
IGRADE	-2.05 ***	-2.51 ***	0.02
	-5.19	-5.12	0.17
SGRADE	-0.30	-0.55 *	-0.06
	-1.35	-1.71	-1.11
R Square (%)	21.73	23.76	15.98
Adjusted R Square (%)	19.90	21.35	7.29
Significance F	<0.0001	<0.0001	0.1622
Observations	132	99	33

Statistical significance at the 1%, 5% and 10% levels are denoted by ***, ** and *, respectively, while t-statistics are reported below the estimated coefficients.

The second column in Table 4 shows that rating changes from investment grade to below investment grade significantly affect sovereign bond returns. These downgrades are associated with an abnormal average return of -2.51%, which is not only statistically significant but also relatively large considering that the sample represents sovereign bonds with a maturity of two years. In addition to that, the results suggest that bonds downgraded within non-investment grade are more prone to market responses than other bonds. At least at this point, the results for the small sample of upgrades are insignificant.

As shown in table 5, downgrades to below investment grade cause stronger market reactions for bonds with a maturity of ten years compared with the results above. In other words, it appears that the magnitude of the market response increases with maturity. Furthermore, the statistical significance of the SGRADE coefficient is now only two basis points above the five percent significance level. Compared with the coefficient above, it is also twice as large.

Table 5. The impact of rating changes on 10-year sovereign bond returns.

	All	Downgrades	Upgrades
Intercept	-0.64 ***	-1.21 **	-2.26 ***
	-2.68	-2.59	-4.46
RCHG	0.61 ***	0.06	1.52 ***
	5.27	0.22	4.35
IGRADE	-2.84 ***	-4.00 ***	1.31
	-3.36	-4.31	0.74
SGRADE	0.15	-1.21 *	0.43
	0.33	-1.98	0.52
R Square (%)	25.43	18.96	56.03
Adjusted R Square (%)	23.68	16.40	51.48
Significance F	<0.0001	0.0002	<0.0001
Observations	132	99	33

See Table 4 for details and definitions.

The results for upgrades are presented in the rightmost column of Table 5. Surprisingly, it now appears that positive rating announcement cause both statistically and economically significant market reactions. However, this may be due to the small sample size. Since rating agencies tend to lag behind the market during crises, it is also possible that only upgrades seem to convey valuable information to the market because the sample period includes extreme price fluctuations that occurred during the European sovereign debt crisis.

In the following tables, the variable SGRADE is replaced by PRT. First of all, the results for positive rating announcement are insignificant in the same way as in Table 4. Contrary to the existing evidence regarding the stock market response, downgrades to below investment grade appear to cause highly significant market responses, although a variable for the prior rating is included in the regression. However, this is not surprising as downgrades appear to be insignificant rating events in general.

Table 6. The effect of prior rating on 2-year sovereign bond returns.

	All	Downgrades	Upgrades
Intercept	-0.52 **	-0.83 *	-0.07
	-2.17	-1.72	-0.81
PRT	0.03 **	0.05 *	0.00
	2.00	1.95	0.61
RCHG	0.14 **	0.07	0.05 *
	2.53	0.48	1.86
IGRADE	-1.94 ***	-2.27 ***	-0.03
	-4.93	-4.70	-0.23
R Square (%)	23.01	24.44	13.50
Adjusted R Square (%)	21.21	22.05	4.56
Significance F	<0.0001	<0.0001	0.2330
Observations	132	99	33

See Table 4 for details and definitions.

At this point, it is fairly safe to say that rating changes from investment to speculative grade cause significant market responses. Furthermore, this finding holds almost uniformly across maturity bands and regardless of the method used. The results for downgrades crossing the border between investment and speculative grade are also consistent with previous research and often interpreted as evidence that institutional investors are restricted to specific rating categories as discussed above.

Table 7 presents the results for sovereign bonds with a maturity of ten years. Once again, the variable for negative rating changes is insignificant. In addition, although a positive correlation between prior ratings and cumulative abnormal returns is reported, it is not sufficient to explain the role of prior ratings. Upgrades, on the other hand, appear to be both statistically and economically significant. Furthermore, market responses to upgrades appear to be more pronounced for bonds with longer maturities.

Table 7. The effect of prior rating on 10-year sovereign bond returns.

	All	Downgrades	Upgrades
Intercept	-0.63	-2.64 ***	-2.04 *
	-1.21	-2.86	-1.70
PRT	0.00	0.09 *	-0.02
	0.04	1.89	-0.27
RCHG	0.61 ***	0.10	1.56 ***
	5.19	0.39	4.22
IGRADE	-2.85 ***	-3.51 ***	1.64
	-3.35	-3.81	1.01
R Square (%)	25.37	18.68	55.72
Adjusted R Square (%)	23.62	16.11	51.14
Significance F	<0.0001	0.0002	<0.0001
Observations	132	99	33

See Table 4 for details and definitions.

To summarize, the empirical findings presented above support the view that rating changes from investment to non-investment grade cause significant market responses, and thus play a major role in the bond market. Furthermore, the results suggest that negative rating changes within speculative grade are associated with more pronounced price reactions than downgrades in general. Although downgrades appear to be insignificant rating events, findings based on a small sample of upgrades indicate that positive rating announcements do have an impact on sovereign bond returns.

8. CONCLUSIONS

This study examines the relation between credit rating announcements and sovereign bond returns. To be more specific, the paper analyzes whether credit rating changes, rating changes crossing the border between investment and speculative grade, and rating changes with prior rating below investment grade cause significant market responses in sovereign bond markets. This paper contributes to the literature on the role of credit rating agencies in financial markets, since relatively little has been said concerning the implications of credit rating information for the sovereign bond market.

First, the results of the empirical analysis support the view that rating changes from investment to non-investment grade cause significant market reactions. Second, these results suggest that downgrades within speculative grade cause stronger price effects than downgrades in general, and third, findings based on a small sample indicate that positive rating announcements have a significant effect on sovereign bond returns. Surprisingly, the results show that negative rating announcements are insignificant events from the bondholders' point of view, and not surprisingly, the magnitude of market reactions appears to increase with maturity.

Is fairly safe to say, in the light of these findings, that rating announcement clearly have an effect on sovereign bond prices. In the first chapter, it was hypothesized that only downgrades cause significant bond price reactions. However, the findings of this paper suggest quite the opposite, and therefore the first hypothesis must be rejected. On the other hand, since the result show that downgrades to below investment grade cause significant market responses, the second hypothesis must be accepted. Although it appears that negative rating changes within non-investment grade are associated with stronger market responses than downgrades in general, the third hypothesis cannot be accepted with certainty.

The results are also in line with previous literature, since the importance of the border between investment and non-investment grade has been emphasized, and since evidence supporting the view that lower-rated bonds are associated with stronger market responses than bonds with higher ratings has been presented in previous studies. Furthermore, the findings regarding upgrades

are consistent with the evidence from the credit default swap market. Several studies have suggested investment restrictions regarding the distinction between investment and speculative grade as a possible explanation for the effects of rating changes from investment to non-investment grade. As for the information asymmetry between negative and positive rating announcements, previous studies have presented that negative watchlisting contain valuable information, while the information conveyed by negative rating changes is already incorporated into spreads prior to the announcement date.

Although the empirical findings reported in this paper suggest that credit rating agencies occasionally lag behind the financial market, credit ratings are nevertheless considerably less volatile than spreads and prices. In other words, credit rating information is valuable in the long term due to its stability. Furthermore, issuers are able to provide rating agencies with information without publicly revealing it, and the agencies, in turn, are able to incorporate this privately disclosed information into their ratings. Finally, the theory on investment restrictions raises the question of whether regulatory constraints, which likely lead to suboptimal investment decisions, are rational in their current form.

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APPENDICES

Appendix 1. The impact of rating changes on 2-year bond returns.

	All	Downgrades	Upgrades
Intercept	0.01	-0.14	-0.01
	0.06	-0.42	-0.21
RCHG	0.14 **	0.01	0.05
	1.99	0.05	1.70
IGRADE	-2.03 ***	-2.53 ***	0.02
	-4.41	-4.60	0.13
SGRADE	-0.41	-0.79 *	-0.08
	-1.43	-1.94	-1.01
R Square (%)	21.68	26.64	17.21
Adjusted R Square (%)	19.12	21.54	0.65
Significance F	<0.0001	0.0001	0.4037
Observations	96	77	19

Statistical significance at the 1%, 5% and 10% levels are denoted by ***, ** and *, respectively, while t-statistics are reported below the estimated coefficients.

Appendix 2. The impact of rating changes on 10-year bond returns.

	All	Downgrades	Upgrades
Intercept	-0.40	-1.01 *	-2.22 **
	-1.24	-1.77	-2.49
RCHG	0.70 ***	0.20	1.58 ***
	5.10	0.66	3.26
IGRADE	-2.96 ***	-3.92 ***	1.41
	-3.27	-4.07	0.59
SGRADE	0.28	-0.86	0.23
	0.50	-1.19	0.19
R Square (%)	31.19	20.62	52.62
Adjusted R Square (%)	28.95	17.35	43.15
Significance F	<0.0001	0.0007	0.0091
Observations	96	77	19

See Appendix 1 for details and definitions.

Appendix 3. The effect of prior rating on 2-year bond returns.

	All	Downgrades	Upgrades
Intercept	-0.66 **	-1.15 *	-0.14
	-2.18	-1.85	-1.09
PRT	0.05 **	0.06 **	0.01
	2.07	2.04	1.08
RCHG	0.18 **	0.04	0.06
	2.44	0.22	1.73
IGRADE	-1.91 ***	-2.21 ***	-0.04
	-4.17	-4.07	-0.28
R Square (%)	23.48	25.05	17.94
Adjusted R Square (%)	20.98	21.97	1.52
Significance F	<0.0001	<0.0001	0.3825
Observations	96	77	19

See Appendix 1 for details and definitions.

Appendix 4. The effect of prior rating on 10-year bond returns.

	All	Downgrades	Upgrades
Intercept	-0.41	-2.03 *	-2.72
	-0.69	-1.86	-1.39
PRT	0.01	0.06	0.04
	0.18	1.18	0.29
RCHG	0.72 ***	0.24	1.75 ***
	4.94	0.80	3.09
IGRADE	-2.96 ***	-3.58 ***	1.58
	-3.26	-3.75	0.71
R Square (%)	31.03	20.58	52.78
Adjusted R Square (%)	28.78	17.32	43.34
Significance F	<0.0001	0.0007	<0.0089
Observations	96	77	19

See Appendix 1 for details and definitions.