WEALTH TRANSFER BETWEEN OWNERS AND LENDERS OF EUROPEAN STOCK CORPORATIONS

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Abstract

Wealth transfer effects between company owners and lenders based on changes in a firm's credit rating have primarily been examined a) for one type of security; b) on U.S. capital markets; and c) by applying standard event study methods. In contrast to these studies, we compared the price effects of stocks and corporate bonds of the same issuer using robust event study methods. Our findings indicated that downgrades cause negative price effects for owners and lenders of European firms, whereas upgrades only induced positive price effects for lenders. However, we did not find evidence for the existence of wealth transfer effects between owners and lenders on European capital markets.

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1. INTRODUCTION

Having been blamed for incorrect risk assessments and a low degree of transparency, the reputation of credit rating companies (CRCs) has suffered repeatedly in the past – most obviously in the wake of the dotcom and the subprime crises, which linked them with corporate scandals like Enron, WorldCom, and Lehman Brothers (see, e.g., Partnoy, 2006; Darbellay, 2013). Repeated attempts to establish a European CRC as a counterpart to the "Big Three" (S&P's, Moody's, Fitch) were (and still are) also rooted in the question of the appropriate role of U.S. CRCs on European capital markets. Prior studies indicated that the "Big Three" tended to lack behind local CRCs on local markets outside the U.S. (e.g., Steiner and Heinke, 2001; Mollemans, 2004). Despite the fact that Europe is still one of the most important capital markets worldwide, the examination of the role of U.S. CRCs for this area has been insufficient so far. Consequently, we investigated the role of credit ratings announced by the "Big Three" for owners and lenders of European firms, adding further insights to the majority of studies that focus on U.S. markets. In this context, corporate owners and lenders were represented by stockholders and bondholders.

In addition, we found evidence for the absence of wealth transfer effects for European corporate owners and lenders by testing the wealth redistribution hypothesis (WRH) for European security markets. Except for a small number of previous studies (e.g. Hand, Holthausen and Leftwich, 1992; Kliger and Sarig, 2000), the WRH has been typically tested for one particular type of security. This approach seemed to be incomplete, however, since positive (negative) stock price effects at the time of announcement of downgrades (upgrades) do not automatically imply a reduction (increase) of corporate bond prices. In light of this research gap, we assembled a unique sample of stocks and corporate bonds issued by the same European issuer to obtain more valid results.

We also applied several event study methodologies in order to ensure robust results. To the best of our knowledge, our study is the first which simultaneously used three models for calculating abnormal returns, several variations in estimating expected stock and bond returns, and four tests to examine the statistical significance of the abnormal returns. We accepted abnormal returns as significant only if they were confirmed by each of the four tests on at least a 5% level in order to increase the statistical validity of the results.

2. THEORETICAL BACKGROUND

Investors consider a credit rating to be valuable for their decision-making if it provides new information. The information content of credit ratings was discussed against the backdrop of information efficiency by Fama (1970). Based on this theory, a market is described as semi-strong in terms of information efficiency if prices fully reflect all publicly available information. In a rating context, this approach implies that changes in security prices can only occur directly at the announcement date of a rating change, because thereafter, the rating itself is considered publicly available information. However, already Wakeman (1981) argued that CRCs only processed and summarized such information. Although they could lower information costs, they were unable to provide genuinely new data to the market, especially when their ratings were unsolicited.

In contrast, CRCs claimed to have access to private information in the case of solicited ratings, indicating that announced revisions of existing credit ratings could be perceived by investors to be new information. This argumentation was summarized under the information content hypothesis (ICH) according to Katz (1974), who suggested that security prices changed solely upon the announcement of rating revisions and did not depend on the direction of the corresponding rating change. If market prices already changed prior to the rating announcement, the rating's information content would decrease on the announcement date, implying that investors already anticipated the change in a rated firm's credit risk. If investors anticipated a rating change, CRCs would lag the market instead of leading it. This may be also the case if CRCs act outside their home markets (e.g., Steiner and Heinke, 2001). Covitz and Harrison (2003) summarized the existence of information and anticipation effects by identifying a fundamental tradeoff concerning downgrades categorized as solicited ratings: On the one hand, CRCs tended to act in favor of investors to maintain or increase their market reputation by publishing a rating change as soon as possible. On the other hand, they were incentivized to act in favor of a corporate issuer by retaining negative information concerning credit risk to maintain their future contractual relationship with the rated firm.

Zaima and McCarthy (1988) extended this approach by linking the direction of a rating change to the positivity or negativity of the corresponding price reaction. Thus, a downgrade was considered to induce security prices to react negatively upon the announcement, while an upgrade would cause prices to react positively. This reasoning was based on the assumption that owners and lenders alike perceived downgrades to be bad news, and upgrades to be good news. However, a downgrade (upgrade) could also possess information content if its announcement induced a positive (negative) price reaction.

The question concerning the positivity or negativity of price reactions is summarized under the wealth redistribution hypothesis, which was initially postulated by Holthausen and Leftwich (1986) and further developed by Zaima and McCarthy (1988).[1] This theory states that wealth is transferred from investors who perceive the rating change more negatively to those with a more positive perception. Prior studies (see Goh and Ederington 1993; Chung, Frost and Kim, 2012; Imbierowicz and Wahrenburg, 2013) extended this argumentation by identifying the particular reason of the rating change as the primary driver of wealth transfer effects. If the announced rating change was primarily driven by a change in the firm's operating performance, owners' and lenders' evaluation of their respective risk-return-position, and, consequently, stock prices and bond prices would move into the same direction. In contrast, a leverage-based rating change could induce inverse price effects. If the announced downgrade resulted from increasing levels of financial leverage (or an upgrade from decreasing leverage), owners could perceive the announcement positively (or negatively, for upgrades) due to higher expected returns, which would result from investments of the additional debt amount. As lenders typically did not receive any additional compensation in terms of risk premiums after the firm's debt increased, they tended to perceive a downgrade to be bad news that induces bond prices to drop.

Previous studies testing the WRH investigated a) issue ratings and b) stock prices (e.g., Zaima and McCarthy, 1988; Goh and Ederington, 1993; Taib et al., 2009; Imbierowicz and Wahrenburg, 2013). However, Hull, Predescu and White (2004) came to the result that investors other than bondholders used credit ratings more frequently as indicators for the firm's overall creditworthiness rather than for the credit risk of a specific security issuance. Hence and in particular for corporate owners, issue ratings would be less relevant, as their residual risk-return position depended on the survival and profitability of the firm as a whole.

On the other hand, issuer ratings seem to be also relevant for bondholders, since a bond's credit risk is derived from the overall creditworthiness of the firm, although issuer ratings may not contain all the issue-specific information (e.g. collateral, maturity). Based hereupon, issuer ratings seem to be more appropriate for a rating-based comparison of stocks and corporate bonds. Therefore and because wealth transfer typically occurs in an intra-company manner, investigating wealth transfer effects requires the examination of both, stocks and corporate bonds of the same issuer (Imbierowicz and Wahrenburg, 2013). In this context, the following hypotheses were tested within the framework of the present event study:

H1a: Announcements of negative rating changes do not induce significant stock returns for corporate owners.

H1b: Announcements of positive rating changes do not induce significant stock returns for corporate owners.

H2a: Announcements of negative rating changes do not induce significant bond returns for corporate lenders.

H2b: Announcements of positive rating changes do not induce significant bond returns for corporate lenders.

We examined changes in firms' issuer ratings announced by one of the three major CRCs in the period from 2000 to 2010. Our study contained a sample of European firms with actively traded stocks and corporate bonds. The majority of rating changes occurring during the research period were based on changes with respect to a firm's financial leverage. In contrast to previous studies, we analyzed both, stocks and corporate bonds, in order to investigate wealth transfer effects of announced rating changes. In addition to the univariate analysis, we also employed a multivariate approach containing several control variables.

The remainder of the paper is structured as follows: Section 3 discusses related literature. Section 4 describes the data and explains the descriptive statistics. Section 5 details the empirical method applied, while Section 6 presents and discusses the results. Finally, section 7 summarizes and concludes the study. In addition, the Appendix contains the results of our comparing price effects between stocks and corporate bonds to examine the intensity of those price effects.

[1] In this context, Kliger and Sarig (2000) define wealth transfer effects as asset substitution.

3. RELATED LITERATURE

The majority of prior research investigating the rating-based wealth redistribution between owners and lenders analyzed a) U.S. data and b) stocks (Zaima and McCarthy, 1988; Goh and Ederington, 1993; Gropp and Richards, 2001; Abad-Romero and Robles-Fernández, 2006; Taib et al., 2009; Imbierowicz and Wahrenburg, 2013). These studies commonly rejected the WRH and thus, detected neutral or negative price effects when a negative rating revision was announced. As an exception, Imbierowicz and Wahrenburg (2013) calculated positive stock returns on the announcement of downgrades which were, however, only significant on a 10%-level. Abad-Romero and Robles-Fernández (2006) found evidence for wealth transfer effects in the case of upgrades by identifying significant negative returns. However, the authors emphasized a possible bias of the price effect due to a small sample size. In solely focusing on stocks, the approach of former studies seemed to be expandable, since a positive or negative stock price reaction due to a downgrade or upgrade did not automatically imply an opposite price effect for corporate bonds.

Zaima and McCarthy (1988) and Gropp and Richards (2001) investigated stocks and corporate bonds simultaneously in order to test the WRH, making their studies the most comparable to our approach. Zaima and McCarthy (1988) detected significant negative stock returns prior to announced downgrades, but did not report any price effects at the time of announcement of upgrades. In contrast, Gropp and Richards (2001), who also examined European security markets, found significant positive stock returns for upgrades without any price effects for downgrades. Both studies concluded that rating announcements do not have any price impact on bond markets which might be due to the higher liquidity of stock markets compared to bond markets. Imbierowicz and Wahrenburg (2013) provided the only study that clearly gave evidence of the existence of wealth transfer effects. However, the authors used CDS spreads as a substitute for bond prices, thus limiting the comparability of their study with our approach.

Overall, previous studies on rating-based wealth transfer effects between owners and lenders of a firm provide mixed results. Imbierowicz and Wahrenburg (2013) suggested that a possible reason for this heterogeneity is due to the sample composition of previous studies. They argued that former studies could be biased because of the use of samples which simultaneously included positive, neutral, and negative influences on credit quality. Hence, these studies contained rating changes that could have been due to a multitude of reasons, instead of creating a homogenous sample primarily characterized by a single, specific rating rationale. Our study serves to close the research gaps which, consequently, still exist – in particular by comparing different securities of a single issuer and by focusing on European markets rather than the more thoroughly researched U.S. market.

4. DATA

We examined a sample of European firms that experienced a change in credit rating announced by one of the three major CRCs between the years 2000 and 2010. These firms are either headquartered in one of the European Union member states or in Switzerland. Prices for both types of security as well as index data were collected as daily closing prices from Thomson Datastream. Contrary to previous studies (e.g., Hand, Holthausen and Leftwich, 1992; Imbierowicz and Wahrenburg, 2013), we used different index categories to enhance the quality of the regression. We extracted national indices and a European index for both types of security. The index category with the higher coefficient of determination was included in the sample. The descriptive statistics are available upon request.

In addition to price data, we sourced rating histories for each firm from Thomson Reuters Eikon. The credit ratings were obtained as issuer ratings, since this rating category is more appropriate in analyzing the different types of securities researched.[2] The extracted rating changes were verified by the rating reports, which were available on the Standard & Poor's RatingDirect, Moody's Rating Interactive, and FitchRatings websites. In addition, we used "CreditViews" from Thomson Reuters Eikon to identify the reasons for the rating amendment if a rating report was not available. To ensure that the time series were not influenced by events other than announced rating revisions (e.g., management turnovers, company takeovers, interim and annual reports, and reports of dividend payments), we eliminated such contaminated time series from the entire sample. This approach resulted in a final sample of 115 rating events for stocks and 231 rating events for corporate bonds.

The different sizes of the stock and the corporate bond samples were due to the fact that the sample firms issued one type of stock, but multiple bond issuances. To minimize the resulting selection bias, we used the firm level approach (FLA) according to Bessembinder et al. (2009), which treats the firm as a bond portfolio. A firm's abnormal bond return was calculated as the value-weighted average of the abnormal returns for each bond issue. This approach allowed us to include all bond time series available for one sample firm and, thus, to avoid the problem of cross-correlations found in alternative approaches, such as the bond level approach and the representative approach (e.g., Hand, Holthausen and Leftwich, 1992).

[2] The issuer rating equalled the issue rating for the corporate bonds investigated. Both rating types were announced on the same date.

Table 1. Sample description for stocks and corporate bonds

	Negative rating changes				*Positive rating changes*				*Total per criteria within a panel*
	Stocks	***in %***	***Corporate bonds***	***in %***	***Stocks***	***in %***	***Corporate bonds***	***in %***	
Panel A: Issuer's geographical location									
France	24	36.4	40	31.0	16	32.7	27	26.5	**107**
Italy	10	15.2	22	17.1	19	38.8	52	51.0	**103**
Germany	10	15.2	13	10.1	7	14.3	12	11.8	**42**
United Kingdom	9	13.6	14	10.9	3	6.1	6	5.9	**32**
Switzerland	4	6.1	5	3.9	3	6.1	4	5.9	**16**
Portugal	4	6.1	13	10.1	0	0.0	0	0.0	**17**
Belgium	2	3.0	10	7.8	0	0.0	0	0.0	**12**
Luxembourg	1	1.5	10	7.8	0	0.0	0	0.0	**11**
Netherlands	2	3.0	2	1.6	1	2.0	1	1.0	**6**
Panel B: Issuer's industry									
Non-financials	19	28.8	43	33.3	28	57.1	63	61.8	**153**
Financials	47	71.2	86	66.7	21	42.9	39	38.2	**193**
Panel C: Year of rating announcement									
2000	2	3.0	2	1.6	1	2.0	1	1.0	**6**
2001	5	7.6	7	5.4	0	0.0	0	0.0	**12**
2002	8	12.1	13	10.1	1	2.0	2	2.0	**24**
2003	4	6.1	5	3.9	2	4.1	4	3.9	**15**
2004	4	6.1	11	8.5	9	18.4	19	18.6	**43**
2005	7	10.6	11	8.5	9	18.4	18	17.6	**45**
2006	4	6.1	6	4.7	13	26.5	34	33.3	**57**
2007	2	3.0	2	1.6	5	10.2	10	9.8	**19**
2008	8	12.1	23	17.8	4	8.2	5	4.9	**40**
2009	12	18.2	16	12.4	1	2.0	1	1.0	**30**
2010	10	15.2	33	25.6	4	8.2	8	7.8	**55**
Panel D: Credit rating companies (CRCs)									
Fitch	16	24.2	41	31.8	14	8.6	34	33.3	**105**
Moody's	11	16.7	19	14.7	7	14.3	22	21.6	**59**
S&P	39	59.1	69	53.5	28	57.1	46	45.1	**182**
Total per panel	**66**	**100.0**	**129**	**100.0**	**49**	**100.0**	**102**	**100.0**	**346**

Note: The number of downgrades and upgrades applied for one of the two security categories is shown by the issuer's geographical location in Panel A. Panel B shows the industry sectors of the issuer, which are compiled under the categories Financials and Non-financials. Data concerning the specific industry sectors is available from the authors. Panel C displays the annual number of downgrades and upgrades between the years 2000 and 2010. The recession period includes the sub-periods 2001-2002 and 2007-2010, whereas the years 2000 and 2003-2006 are assumed to represent periods of economic recovery. Both economic periods are based on the classification of the National Bureau of Economic Research. The number of positive and negative rating changes announced by a specific rating agency is displayed in Panel D.

Table 1 also shows that our sample was well diversified across European member states and issuer's industries. As indicated in Panel C, our sample was well distributed with respect to the annual distribution of rating changes as well as with respect to the benchmark categories labelled 'economic downturn' and 'economic stability'.[3] The majority of downgrades in our sample were announced during recessions, whereas most upgrade announcements occurred during periods of economic stability. This composition reflected the general distribution of upgrades and downgrades in Europe from 2000 to 2010.[4] Finally, most of the rating changes investigated were announced by Standard & Poor's (S&P), as displayed in Panel D. The majority of rating changes were consenting ones, while only 7.8% of the rating changes were categorized as split ratings, meaning that announced rating changes of at least two CRCs resulted in different credit ratings for the same rating object.

Table 2 further elaborates the structure of our sample using a migration matrix. Approximately 81% of the rating changes were categorized as being within the investment grade category, while only 15% of all rating changes were associated with the speculative grade category. Only 5 out of 115 (4.3%) of all issuer ratings crossed the line between investment grade and speculative grade. In contrast, approximately 90% of the rating changes resulting in the rating category "speculative grade" were announced during economic recessions.

To be able to identify changes in the issuer's financial leverage, we employed the rating reports and Thomson Reuters Eikon to determine the reasons behind the rating. To distinguish changes in financial leverage and financial prospects, we applied the keywords identified by Imbierowicz and Wahrenburg (2013), such as "capital structure" and "operating performance". "Capital structure" referred to any change in a firm's financial leverage, such as leveraged buyouts, debt-financed expansions, share repurchases, or other financing events. "Operating performance" accounted for rating changes triggered by factors influencing a firm's ability to generate future cash flows. 87.8% of all rating changes were based on changes in financial leverage, whereas 12.2% of the rating changes were the result of a change in the issuer's financial prospects.

[3]Periods of economic downturn were defined according to the classification of the National Bureau of Economic Research. Thus, downturns included rating changes announced during the years 2001 and 2002 (the new economy crisis) as well as from 2007 to 2010 (the subprime crisis).

[4]Between 2000 and 2010, 70.60% of all negative rating changes on European markets were announced during the new economy crisis or the subprime crisis. In contrast, 68.50% of all upgrades were announced between the years 2003 and 2006 (sources: corporate default studies and rating transitions of Fitch, Moody's, and Standard & Poor's).

Table 2. Migration matrix of announced rating changes

			Revised credit rating																	
		S&P/ Fitch	AAA	AA+	AA	AA-	A+	A	A-	BBB+	BBB	BBB-	BB+	BB	BB-	B+	B	B-	N (ini)	N (class)
	S&P/ Fitch	Moody's	Aaa	Aa1	Aa2	Aa3	A1	A2	A3	Baa1	Baa2	Baa3	Ba1	Ba2	Ba3	B1	B2	B3		
Initial credit rating	AAA	Aaa																	**0**	**0.0**
	AA+	Aa1																	**0**	**0.0**
	AA	Aa2		1		1	1												**3**	**66.7**
	AA-	Aa3			2		4	4											**10**	**20.0**
	A+	A1				7		3		1									**11**	**27.3**
	A	A2				1	3		8	1			1						**14**	**78.6**
	A-	A3						3		8									**11**	**27.3**
	BBB+	Baa1							9		10	3							**22**	**59.1**
	BBB	Baa2							1	5		11							**17**	**94.1**
	BBB-	Baa3									6		1						**7**	**85.7**
	BB+	Ba1									1				1				**2**	**50.0**
	BB	Ba2										2			4				**6**	**66.7**
	BB-	Ba3												6		3			**9**	**66.7**
	B+	B1															2	1	**3**	**100.0**
N(rev)			**0**	**1**	**2**	**9**	**8**	**10**	**18**	**15**	**17**	**16**	**2**	**6**	**5**	**3**	**2**	**1**	**115**	

Note: The table shows the number of rating changes excluding multiple issues of corporate bonds. N(ini) is defined as the number of initial credit ratings. N(class) indicates the percentage of rating changes within a particular rating class (e.g., AA+ to AA-). N(rev) denotes the number of revised credit ratings. The dotted line describes the border between the investment grade and the speculative grade category.

5. EMPIRICAL METHOD

We employed the event study method according to Fama et al. (1969) and extended this standard approach by a number of conceptual adjustments. In an initial step, the daily returns were calculated for each type of security by including dividends and coupon payments. As recommended by Brown and Warner (1980), Di Cesare (2006), and Hudson and Gregoriou (2015), we also calculated daily returns based on a logarithmic approach, in addition to linear returns. In particular, Hudson and Gregoriou (2015, p. 16) concluded that "it may be appropriate in research studies of returns to give greater consideration to whether mean returns are calculated simple or logarithmic returns". The method for the calculation of the daily returns is shown in the following equations:

$$R^{linear}_{stock\ j,t} = \frac{KA_{j,t} + D_{j,t} - KA_{j,t-1}}{KA_{j,t-1}} \quad \text{and} \quad R^{log}_{stock\ j,t} = \ln\left(\frac{KA_{j,t}}{KA_{j,t-1}}\right), \tag{1}$$

$$R^{linear}_{bond\ j,t} = \frac{KB_{j,t} + \frac{C_j}{365} V_j - KB_{j,t-1}}{KB_{j,t-1}} \quad \text{and} \quad R^{log}_{bond\ j,t} = \ln\left(\frac{KB_{j,t}}{KB_{j,t-1}}\right), \tag{2}$$

where $KA_{j,t}$ and $KB_{j,t}$ denoted the daily price of stocks and corporate bonds with the corresponding dividends $D_{j,t}$ and coupons C_j at date t. V_j denoted the number of days between the date t and the date of the last coupon payment. We used standardized abnormal returns $SCAR^{stock/bond}_{[T_1,T_2]}$ according to Patell (1976) and Mikkelson and Partch (1988) instead of cumulative abnormal returns (CARs) to reduce possible distortions:

$$SCAR^{stock/bond}_{[T_1,T_2]} = \frac{1}{N}\sum_{j=1}^{N} SCAR^{stock/bond}_{j,[T_1,T_2]} = \frac{1}{N}\sum_{j=1}^{N} \frac{\sum_{t=T_1}^{T_2} AR^{stock/bond}_{j,t}}{\hat{\sigma}\left(AR^{stock/bond}_{j}\right)}, \tag{3}$$

$$\text{with } \hat{\sigma}\left(AR^{stock/bond}_{j}\right) = \sqrt{\frac{1}{ED_j - 2}\sum_{t=-(11+TE)}^{-11}\left(AR^{stock/bond}_{j,t} - \frac{1}{ED_j}\sum_{t=-(11+TE)}^{-11} AR^{stock/bond}_{j,t}\right)^2}, \tag{4}$$

$$\text{and} \quad AR^{stock/bond}_{j,t} = R^{stock/bond}_{j,t} - (\alpha_j + \beta_j R^{stock/bond}_{M,t}). \tag{5}$$

N denoted the number of observations and $AR^{stock/bond}_{j,t}$ was the abnormal return of the time series j at date t depending on the type of security investigated. $\hat{\sigma}(AR^{stock/bond}_{j})$ was the standard deviation of abnormal returns $AR^{stock/bond}_{j,t}$ for stocks and corporate bonds, while ED_j denoted the number of trading days within the estimation window [- 11, - (11+TE)]. TE described the number of days in the estimation window, which ended one trading day before the beginning of the maximum event window [-10, 10]. The calculation of expected returns was based on $R^{stock/bond}_{M,t}$, defined as the market return calculated using national and European indices for stock and bond markets. The calculated SCARs were further re-standardized by their cross-sectional variation according to Kolari and Pynnonen (2011) to reduce event-induced volatility.

Abnormal stock and bond returns were analyzed within several symmetrical and asymmetrical event windows. The maximum event window [-10, 10] was split into the pre-announcement windows [-10, 0], [-5, 0], [-1, 0] to investigate anticipation effects, and the post-announcement windows [0, 1], [0, 5], [0, 10] to examine liquidity-based price distortions. Since the majority of previous studies analyzed the information content of announced rating changes within the window [-1, 1], we also used this window to ensure comparability with previous studies (e.g., Gropp and Richards, 2001; Han et al., 2009; Imbierowicz and Wahrenburg, 2013).

As already described, we applied the index that achieved the larger R^2 in the regression window. The expected returns were calculated primarily by applying the market model, since it generated the most valid results according to prior studies (e.g., Brown and Warner, 1980; Holthausen and Leftwich, 1986; Hudson and Gregoriou, 2015). However, we additionally applied alternative models for calculating expected returns – such as the mean adjusted model and the market adjusted model, as initially introduced by Brown and Warner (1980), and further developed by the same authors (1985). To make sure that the SCARs were not influenced by a certain value of TE, we used the estimation windows [-61, -11], [-111, -11], and [-161, -11] in contrast to the majority of previous studies, which usually applied only one estimation window.

Furthermore, we improved the statistical power of the regression model by performing the robust regression according to Rousseeuw (1984) and Mount et al. (2014) instead of the standard OLS regression. The robust regression was mainly based on identifying and eliminating outliers, which were defined as observations exhibiting a relatively high distance from the center of the point cloud. Outliers could bias the calculation of the parameters α_j and β_j depending on their position relative to the point cloud. Sorokina, Booth and Thornton (2013) showed that previous event studies failed to address this problem appropriately. For corporate bonds, in particular, the identification and elimination of outliers appeared essential to receive valid results, as they were typically traded less frequently than stocks. The advantage of applying this robust regression method was that the regression model achieved a higher breakdown value of up to 50%, implying that the regression results were valid even if 50% of the sample observations were outliers. In addition, it was not necessary to remove the entire time series in favor of the sample size and representativeness of the whole sample.

Moreover, the robustness of our results was increased with respect to the significance analysis, as we performed four tests. The SCARs were accepted as being statistically significant only if all of the four tests applied exhibited significance on the 5% level. The majority of the tests performed were non-parametric, because the test according to Shapiro and Wilk (1965) provided evidence that the SCARs were not normally distributed.[5] The *t*-test and the Wilcoxon signed-rank test were performed mainly to provide comparability with previous studies. In addition, the significance analysis contained the generalized rank test (GRANK test) according to Kolari and Pynnonen (2011) because of its high robustness against heteroscedasticity and autocorrelation. Finally, we applied the bootstrap method according to Efron (1979), which allowed for inference and hypothesis testing even if the distribution of the test statistic did not follow a standard distribution. We also used the *t*-statistic for testing and choose 1,000 as the population size for the bootstrap simulations. Based on the resulting empirical distribution, the *p*-value of the original value of the *t*-statistic was calculated. Including this fourth test, we also provided comparability to a small number of previous event studies using bootstrap techniques such as Di Cesare (2006).

Finally, we benchmarked the calculated returns in the treatment group against those of a control group in order to increase the validity of the entire study. Rather than using control firms, the control group consisted of randomly selected control events that represented dates other than the announcement dates investigated. By applying this approach, we tried to avoid the problem of using control firms that were different in terms of structural characteristics (e.g. market position, ownership structure, capital structure, risk profile, performance) and thus, lacking comparability (e.g. Antanasov and Black, 2016). However, if the control date represented another price-relevant event (e.g. M&As, performance reports, CEO turnovers), this date was not included in the control group. Moreover, the control dates and the corresponding control windows had to occur within a period on the verge of the estimation window used in the treatment group in order to reduce the probability of changes in the firm's environment.

6. EMPIRICAL RESULTS

This section contains the major event study results. First, we examined abnormal effects for corporate owners based on positive and negative rating changes. Next, we applied the bond-adjusted approach for lenders of the firm. In addition, we looked for abnormal return differences between stocks and corporate bonds to further investigate the existence of wealth transfer effects between owners and lenders. Finally, we employed a multivariate regression, including a variable representing the rating event and several control variables.

6.1. Owners' perspective

In the case of downgrades, the results shown in Table 3 indicated a significant negative SCAR in the announcement window [-1, 1]. This result was confirmed by the benchmark models for calculating abnormal returns and by the control group, which did not indicate any announcement effect. Thus, downgrades had information content, providing bad news to owners of European firms. This finding supported the findings of Covitz and Harrison (2003), who argue that CRCs tend to act in favor of investors to maintain or increase their market reputation by publishing a rating change as soon as possible.

[5]The results of the Shapiro-Wilk test are available from the authors.

Table 3. Abnormal returns of stocks

	Negative rating changes (N = 66)							*Positive rating changes (N = 49)*						
	[-1, 1]	**[-10, 0]**	**[-5, 0]**	**[-1, 0]**	**[0, 1]**	**[0, 5]**	**[0, 10]**	**[-1, 1]**	**[-10, 0]**	**[-5, 0]**	**[-1, 0]**	**[0, 1]**	**[0, 5]**	**[0, 10]**
Panel A: Market model (linear return)														
CARs (in %)	-0.9700	-1.3127	-1.6102	-0.5644	-0.8900	0.3211	0.6023	0.4766	0.8003	0.6543	0.3219	0.3154	0.1411	0.7135
SCARs	-0.2842	-0.3764	-0.3977	-0.2992	-0.2391	0.1358	0.0100	0.0573	0.2500	0.2353	0.1127	0.0537	0.0145	0.0768
t-test	0.0270	0.0037	0.0031	0.0132	0.0634	0.8158	0.4751	0.2914	0.0051	0.0039	0.1994	0.2303	0.4362	0.1611
WSRT	0.0198	0.0044	0.0064	0.0111	0.0990	0.5102	0.2451	0.0524	0.0047	0.0030	0.0158	0.0417	0.1906	0.1263
GRANK	0.0150	0.0032	0.0071	0.0137	0.0598	0.4094	0.2995	0.1557	0.0141	0.0316	0.0791	0.2335	0.2436	0.2390
Bootstrap	0.0150	0.0001	0.0010	0.0140	0.0270	0.8410	0.4640	0.3568	0.0040	0.0020	0.2470	0.2688	0.4675	0.1700
Panel B: Market model (log return)														
CARs (in %)	-1.1279	-1.9622	-2.0511	-0.6731	-0.9840	0.1322	0.1501	0.4400	0.6973	0.5989	0.3442	0.2901	0.0893	0.5800
SCARs	-0.3037	-0.4279	-0.4432	-0.3242	-0.2535	0.0411	0.0777	0.0430	0.2132	0.2053	0.0908	0.0424	0.0043	0.0662
t-test	0.0235	0.0017	0.0013	0.0110	0.0554	0.6065	0.3129	0.3273	0.0067	0.0062	0.2317	0.2594	0.4818	0.1959
WSRT	0.0163	0.0021	0.0019	0.0075	0.0849	0.2935	0.1738	0.0640	0.0084	0.0052	0.0179	0.0435	0.1989	0.1481
GRANK	0.0181	0.0022	0.0041	0.0181	0.0708	0.2421	0.2181	0.1878	0.0268	0.0372	0.0844	0.2579	0.2702	0.2732
Bootstrap	0.0060	0.0001	0.0001	0.0010	0.0140	0.6124	0.3219	0.3870	0.0001	0.0060	0.3070	0.2960	0.4988	0.2001
Panel C: Market adjusted model														
CARs (in %)	-1.4683	-2.3533	-2.2638	-0.9204	-1.1289	0.2403	0.1376	0.3945	0.4622	0.5558	0.2941	0.1585	-0.0404	0.3655
SCARs	-0.4052	-0.4694	-0.4667	-0.4154	-0.3165	0.0862	0.0498	0.0533	0.1063	0.1876	0.1037	0.0290	-0.0509	0.0616
t-test	0.0045	0.0011	0.0011	0.0024	0.0238	0.7276	0.6224	0.2451	0.0463	0.0063	0.1448	0.3159	0.6894	0.2766
WSRT	0.0081	0.0005	0.0018	0.0033	0.0211	0.3893	0.1959	0.0849	0.0032	0.0078	0.0391	0.1347	0.5079	0.2753
GRANK	0.0141	0.0014	0.0054	0.0055	0.0445	0.4398	0.2299	0.1577	0.0351	0.0242	0.0766	0.2258	0.4242	0.2311
Bootstrap	0.0020	0.0000	0.0000	0.0001	0.0040	0.7523	0.6512	0.2763	0.0209	0.0080	0.1665	0.3324	0.7173	0.2786
Panel D: Mean adjusted model														
CARs (in %)	-2.8235	-4.7563	-3.8422	-1.9435	-2.2938	-0.5911	-0.4322	0.5587	1.3178	1.2844	0.2300	0.0001	-0.2143	0.4654
SCARs	-0.3014	-0.4342	-0.4264	-0.3564	-0.2806	-0.0437	-0.1792	0.0364	0.1747	0.1414	0.0645	0.0951	-0.0847	0.0165
t-test	0.0143	0.0011	0.0015	0.0030	0.0270	0.3834	0.1245	0.6181	0.0447	0.0387	0.6789	0.8183	0.8083	0.5926
WSRT	0.0256	0.0044	0.0024	0.0025	0.0683	0.2312	0.1626	0.1723	0.0443	0.0417	0.2134	0.7442	0.7412	0.4446
GRANK	0.0709	0.0076	0.0121	0.0168	0.0140	0.2817	0.2835	0.3590	0.0466	0.0426	0.3867	0.5927	0.6042	0.4317
Bootstrap	0.0070	0.0001	0.0020	0.0030	0.0080	0.4065	0.0889	0.6311	0.0350	0.0386	0.7237	0.8344	0.8129	0.5932

Table 3 (continued). Abnormal returns of stocks

	Negative rating changes (N = 66)							***Positive rating changes (N = 49)***						
	[-1, 1]	**[-10, 0]**	**[-5, 0]**	**[-1, 0]**	**[0, 1]**	**[0, 5]**	**[0, 10]**	**[-1, 1]**	**[-10, 0]**	**[-5, 0]**	**[-1, 0]**	**[0, 1]**	**[0, 5]**	**[0, 10]**
Panel E: Market model [-61, -11]														
CARs (in %)	-0.9001	-1.3521	-1.7001	-0.5443	-0.8001	0.4912	0.6194	0.4701	1.0422	0.6542	0.3456	0.3103	0.2289	0.7988
SCARs	-0.1209	-0.1849	-0.3700	-0.1046	-0.1425	0.1207	0.0121	0.1055	0.3156	0.1914	0.1027	0.0601	0.1676	0.0429
t-test	0.0410	0.0055	0.0025	0.0340	0.0736	0.8297	0.4655	0.6999	0.0506	0.0439	0.6893	0.6314	0.1221	0.3567
WSRT	0.0241	0.0073	0.0028	0.0245	0.0930	0.5330	0.3159	0.0705	0.0019	0.0052	0.0175	0.0285	0.0477	0.0483
GRANK	0.0107	0.0242	0.0051	0.0143	0.1071	0.4567	0.4107	0.3332	0.0247	0.0150	0.2059	0.2623	0.1224	0.2105
Bootstrap	0.0280	0.0020	0.0001	0.0260	0.0380	0.8443	0.4419	0.7590	0.0050	0.0750	0.7424	0.6846	0.0858	0.3992
Panel F: Market model [-161, -11]														
CARs (in %)	-1.0122	-1.3002	-1.5911	-0.5707	-0.8944	0.3645	0.4045	0.3723	0.8134	0.5389	0.2694	0.1984	0.1346	0.6000
SCARs	-0.3042	-0.3547	-0.4223	-0.2917	-0.2631	0.1224	0.0005	0.0260	0.2529	0.2190	0.0586	0.0245	0.0306	0.0722
t-test	0.0173	0.0041	0.0016	0.0122	0.0457	0.7923	0.4986	0.4039	0.0153	0.0087	0.3355	0.3707	0.3758	0.1898
WSRT	0.0160	0.0033	0.0043	0.0080	0.0518	0.4974	0.2104	0.0792	0.0123	0.0064	0.0335	0.0924	0.2674	0.1748
GRANK	0.0084	0.0032	0.0049	0.0069	0.0327	0.3699	0.2043	0.1792	0.4615	0.0214	0.0852	0.3081	0.2615	0.2665
Bootstrap	0.0020	0.0001	0.0001	0.0060	0.0150	0.8477	0.4975	0.4377	0.3429	0.0120	0.3877	0.3954	0.3894	0.2222
Panel G: Control group														
CARs (in %)	0.4478	0.2564	-0.2812	-0.0025	0.2811	0.0234	0.0100	0.0153	0.9700	-0.2234	-0.0203	-0.1522	0.2500	0.9374
SCARs	0.2047	0.0260	-0.0939	-0.0450	0.1249	0.0832	0.0495	0.0123	0.0733	-0.0887	-0.0152	-0.1398	0.0930	0.0754
t-test	0.9439	0.4226	0.2423	0.6331	0.8338	0.7694	0.6702	0.4615	0.2746	0.7806	0.4442	0.8248	0.7168	0.3184
WSRT	0.8413	0.4240	0.3483	0.6005	0.7536	0.6325	0.4643	0.3429	0.2802	0.7520	0.4064	0.8438	0.5781	0.2005
GRANK	0.7845	0.3176	0.2112	0.5317	0.7089	0.5913	0.4508	0.5603	0.3823	0.8512	0.6634	0.8912	0.6720	0.3344
Bootstrap	0.9560	0.4120	0.2440	0.6560	0.8290	0.7800	0.6770	0.4700	0.2754	0.7766	0.4481	0.8126	0.7243	0.3329

Note: The table displays the mean of daily cumulative abnormal returns (CARs) and the mean standardized cumulative abnormal returns (SCARs) as four-digit decimal numbers. The number of rating events included in each security category is represented by N. The SCARs are calculated by dividing the CARs by the standard deviations of the CARs. The table also shows the p-values of the parametric test and the three non-parametric tests. The bootstrap consists of 1,000 randomly built populations. The results are assumed to be statistically significant if all tests show p-values at or below the 5% level. Panel A contains abnormal returns based on the linear return approach used in the market model. In contrast, the abnormal returns in Panel B are alternatively calculated using logarithmic returns. The expected returns calculated in Panels A and B are based on the regression window [-111, -11]. The abnormal returns in Panel C are defined as excess returns calculated as the difference between the daily linear returns of a stock and the average stock returns of a control group (see Zaima and McCarthy 1988; Bi and Levy 1993). The abnormal returns in Panel D are based on expected returns, which are calculated as the average returns during the estimation period (see Singh and Power 1992). Panel E and Panel F contain abnormal returns based on the market model approach by varying the estimation window for 50 trading days. Panel G includes dates other than the announcement dates of rating changes. The control group consists of the same companies and has the same characteristics as the test sample in terms of N and the distribution of time.

We also detected significant negative SCARs in the pre-announcement windows, indicating anticipation effects. This finding contradicted Micu, Remolona and Wooldridge (2006), who came to the result that issuers intended to restrain negative information concerning credit risk as long as possible. Since institutional as well as private investors were involved in trading on European stock markets, anticipation effects and information effects may have coexisted because these groups of investors differed with respect to their access to risk-related information and their capability to process them. Institutional investors such as hedge funds were typically superior in collecting and assessing information, so that they could anticipate an increase of a firm's credit risk during the corresponding rating process. On this basis, we confirmed the ICH in the case of downgrades, since it assumes the absence of any anticipation effects.

In addition, the univariate results implied a rejection of the WRH based on significant negative SCARs within several event windows. The positive effect of increasing financial leverage (i.e., the profitability of investments funded by additional debt capital) could be overcompensated by higher leverage risk. The latter is characterized by a decreasing return on investments due to the increasing costs of debt capital, which are driven upward by downgrades.

In the case of upgrades, we did not find a significant price effect within the announcement window [-1, 1]. This result indicated that positive rating changes did not provide any new information to stockholders of European firms. Compared to downgrades, this asymmetric reaction could be due to variations in stockholders' risk perception. Stockholders tended to be more sensitive with regard to increases in a firm's credit risk, rather than being focused on positive risk developments. Assuming that credit ratings differed from a firm's real credit risk, Abad-Romero und Robles-Fernández (2006) argued that CRCs had an asymmetric loss function, since their reputational damage was much larger in cases of inappropriate downgrades than with upgrades. Thus, these information intermediaries were incentivized to allot more technical and human resources to possible cases of downgrades.

Analogous to downgrades, we also found significant SCARs within the event windows [-10, 0] and [-5, 0] prior to announced upgrades. Combined with the absence of information effects, these results supported the argument that CRCs tended to lag the market at the time of announcement of upgrades. According to Holthausen and Leftwich (1986), issuers may have had the incentive to announce positive information concerning their credit risk as soon as possible in order to profit from the improved financing opportunities immediately. Due to this signaling, risk-related information could have been sent to market participants even before CRCs announce their rating results. Along with their asymmetric loss function, this causality might also have been a possible explanation for the observed anticipation effects in European stock markets.

Although the majority of upgrades in our sample were due to decreases in financial leverage, we did not detect any wealth transfer effects between corporate owners and lenders within either the announcement window or prior to announced upgrades. This result also supported a rejection of the WRH in the case of positive rating changes. A decrease in financial leverage means that a smaller amount of debt capital is available for investing in high risk/high return projects. In this situation, owners of stock corporations face increasing opportunity costs due to the risk of missed returns on investment. In contrast, a decrease in a firm's financial leverage and a corresponding risk reduction can lead to smaller costs of debt. Our results implied that the effect of reduced costs of debt exceeded the increase in opportunity costs. We therefore rejected hypothesis H1a, and confirmed H1b.

6.2. Lenders' perspective

In line with stocks, we also found significant negative bond SCARs following downgrades within the announcement window [-1, 1], implying that negative rating changes also contained information regarding European bond markets. Hence, bondholders perceived downgrades to be bad news if these rating changes were based on increasing levels of financial leverage, as they were not compensated by a higher risk premium.

Along with the information effects, we also identified significant negative SCARs ten trading days prior to the announcement date. This result was in line with Hettenhouse und Sartoris (1976), who also found anticipation effects on corporate bond markets. In contrast to the situation with stocks, we detected significant negative SCARs in the post-announcement window [0, 1]. This result further suggested that corporate bond markets are less liquid than stock markets. The overall results showed that downgrades were incorporated into bond prices over a certain period of time, rather than having been a date-specific event. This was mainly driven by different groups of bondholders with different levels of access to risk-related information. The result contradicted Di Cesare (2006), who did not find any significant bond price effects at the time of announcement of negative rating changes.

In the case of upgrades, Table 4 also shows positive SCARs within the announcement window [- 1, 1], indicating an information effect on European corporate bond markets. Contrary to stocks, both kinds of rating announcements provided new information to bondholders. Thus, we did not find any evidence for CRCs allocating more resources in the assessment of downgrades compared to upgrades. Our results also did not indicate anticipation effects prior to the official upgrade announcement, implying that CRCs led European bond markets when the firm's credit risk improved. This result contradicted Hettenhouse und Sartoris (1976), who only identified strong price effects of bonds prior to upgrade announcements. In addition to the significant post-announcement effects within the window [0, 1], the absence of an anticipation effect further confirmed the illiquidity of corporate bond markets compared to stock markets in Europe. This finding was also in line with the results shown in the Appendix. In summary, our results indicated that bondholders of European firms perceived downgrades and upgrades as equally important for their decision making. Based on the negative SCARs in the case of downgrades and positive SCARs in the case of upgrades, we rejected hypotheses H2a and H2b, thus confirming the absence of wealth transfer effects between owners and lenders of European companies.

Table 4. Abnormal returns of corporate bonds

	Negative rating changes (N = 129)							*Positive rating changes (N = 102)*						
	[-1, 1]	**[-10, 0]**	**[-5, 0]**	**[-1, 0]**	**[0, 1]**	**[0, 5]**	**[0, 10]**	**[-1, 1]**	**[-10, 0]**	**[-5, 0]**	**[-1, 0]**	**[0, 1]**	**[0, 5]**	**[0, 10]**
Panel A: Market model (linear return)														
CARs (in %)	-0.4872	-0.9304	-0.7422	-0.2194	-0.3838	-0.0001	-0.0735	0.1401	0.1103	0.2021	0.0254	0.0611	0.0623	0.3045
SCARs	-0.2491	-0.3054	-0.2433	-0.1181	-0.3054	-0.0605	-0.0717	0.1776	0.0145	0.0994	0.0455	0.2438	0.1728	0.1196
t-test	0.0036	0.0045	0.0282	0.0955	0.0004	0.2811	0.2584	0.0359	0.4485	0.1539	0.2974	0.0120	0.0512	0.1321
WSRT	0.0009	0.0060	0.0530	0.0344	0.0002	0.1371	0.2549	0.0658	0.7179	0.2474	0.3674	0.0173	0.0474	0.0933
GRANK	0.0022	0.0114	0.0951	0.0397	0.0002	0.1414	0.4475	0.0330	0.6178	0.1393	0.2352	0.0171	0.0475	0.0984
Bootstrap	0.0001	0.0001	0.0070	0.0649	0.0001	0.3001	0.2560	0.0070	0.4332	0.1280	0.2791	0.0001	0.0370	0.1351
Panel B: Market model (log return)														
CARs (in %)	-0.4986	-1.0235	-0.8196	-0.2224	-0.3985	-0.0275	0.0200	0.1300	0.1325	0.2847	0.0249	0.0756	0.0300	0.2632
SCARs	-0.2584	-0.3152	-0.2539	-0.1256	-0.3089	-0.0722	-0.0977	0.1765	0.0118	0.0937	0.0439	0.2394	0.1659	0.1145
t-test	0.0031	0.0035	0.0241	0.0087	0.0004	0.2438	0.1896	0.0372	0.4568	0.1624	0.3065	0.0130	0.0604	0.1426
WSRT	0.0007	0.0044	0.0423	0.0320	0.0002	0.1216	0.1739	0.0658	0.7215	0.2508	0.3798	0.0194	0.0532	0.1051
GRANK	0.0013	0.0026	0.0351	0.0312	0.0002	0.0324	0.1524	0.0321	0.6090	0.1442	0.2722	0.0230	0.0566	0.1072
Bootstrap	0.0001	0.0001	0.0070	0.0069	0.0001	0.2560	0.1798	0.0120	0.4372	0.1298	0.2839	0.0001	0.0587	0.1615
Panel C: Market adjusted model														
CARs (in %)	-0.5211	-1.1684	-0.8398	-0.2422	-0.4275	-0.0810	-0.0709	0.0234	0.0402	0.3874	0.1148	0.0532	0.0700	0.1697
SCARs	-0.2615	-0.3571	-0.2525	-0.1117	-0.3845	-0.0545	-0.0177	0.2405	0.1890	0.3001	0.1873	0.1247	0.1050	0.0732
t-test	0.0069	0.0022	0.0301	0.1411	0.0003	0.3180	0.4389	0.0174	0.0383	0.1618	0.0338	0.0021	0.2046	0.2636
WSRT	0.0034	0.0063	0.0490	0.0771	0.0001	0.2411	0.2104	0.0179	0.0780	0.1254	0.0921	0.0039	0.1950	0.2295
GRANK	0.0019	0.0088	0.0645	0.0614	0.0001	0.1806	0.1869	0.0234	0.1309	0.0946	0.0415	0.0071	0.2357	0.2498
Bootstrap	0.0040	0.0001	0.0140	0.1410	0.0001	0.3429	0.4340	0.0050	0.0350	0.1630	0.0210	0.0001	0.2198	0.2591
Panel D: Mean adjusted model														
CARs (in %)	-0.4005	-0.7862	-0.6877	-0.1313	-0.3248	-0.1129	-0.2304	0.1903	0.0549	0.2574	0.0788	0.1104	0.1689	0.5203
SCARs	-0.1296	-0.2120	-0.1876	-0.0077	-0.1948	-0.0153	-0.0279	0.0761	0.0735	0.0342	0.0189	0.1909	0.1155	0.1452
t-test	0.0319	0.0351	0.0709	0.4644	0.0273	0.4436	0.4011	0.0241	0.7261	0.6167	0.5768	0.0345	0.1521	0.0903
WSRT	0.0321	0.0497	0.1344	0.4414	0.0401	0.4280	0.4849	0.0061	0.8836	0.6714	0.5476	0.0259	0.1275	0.0812
GRANK	0.0281	0.0201	0.1191	0.1431	0.0237	0.2331	0.5808	0.0356	0.8527	0.6159	0.5066	0.0289	0.0782	0.0783
Bootstrap	0.0110	0.0210	0.0340	0.4419	0.0330	0.4620	0.3840	0.0139	0.7180	0.6064	0.5832	0.0150	0.1384	0.0948

Table 4 (continued). Abnormal returns of corporate bonds

	Negative rating changes (N = 129)							***Positive rating changes (N = 102)***						
	[-1, 1]	**[-10, 0]**	**[-5, 0]**	**[-1, 0]**	**[0, 1]**	**[0, 5]**	**[0, 10]**	**[-1, 1]**	**[-10, 0]**	**[-5, 0]**	**[-1, 0]**	**[0, 1]**	**[0, 5]**	**[0, 10]**
Panel E: Market model [-61, -11]														
CARs (in %)	-0.4763	-0.9322	-0.7492	-0.2137	-0.3799	0.0401	0.1478	0.1601	-0.0733	0.2389	0.0344	0.0811	0.1123	0.3542
SCARs	-0.2291	-0.3439	-0.3042	-0.0957	-0.3233	0.0863	0.0902	0.2514	-0.0604	0.1276	0.0878	0.2964	0.2373	0.1519
t-test	0.0068	0.0058	0.0273	0.1526	0.0005	0.2056	0.2228	0.0117	0.6621	0.0872	0.1776	0.0014	0.0257	0.0886
WSRT	0.0031	0.0067	0.0319	0.0676	0.0006	0.1777	0.2645	0.0222	0.6144	0.1194	0.2388	0.0001	0.0159	0.0420
GRANK	0.0088	0.0431	0.0149	0.0882	0.0008	0.2313	0.5623	0.0359	0.5623	0.1356	0.1836	0.0090	0.0349	0.0926
Bootstrap	0.0030	0.0001	0.0040	0.1300	0.0001	0.2199	0.2303	0.0020	0.6777	0.0723	0.1503	0.0001	0.0260	0.1260
Panel F: Market model [-161, -11]														
CARs (in %)	-1.0127	-1.326	-1.5908	-0.5700	-0.8903	0.3674	0.4005	0.1403	0.0973	0.2248	0.0201	0.0765	0.0693	0.3101
SCARs	-0.3042	-0.3547	-0.4223	-0.2912	-0.2631	0.1224	0.0005	0.1802	0.0128	0.1083	0.0465	0.2331	0.1679	0.1271
t-test	0.0173	0.0041	0.0016	0.0122	0.0457	0.7920	0.4986	0.0179	0.4522	0.1342	0.2773	0.0053	0.0589	0.0926
WSRT	0.0160	0.0033	0.0043	0.0080	0.0418	0.4974	0.2104	0.0417	0.6503	0.1745	0.3453	0.0078	0.0585	0.0651
GRANK	0.0084	0.0032	0.0049	0.0069	0.0327	0.3699	0.2043	0.0422	0.5992	0.1224	0.2475	0.0190	0.0592	0.0957
Bootstrap	0.0020	0.0001	0.0001	0.0060	0.0150	0.8425	0.4978	0.0030	0.4663	0.1034	0.2714	0.0001	0.0569	0.0978
Panel G: Control group														
CARs (in %)	-0.1301	-0.1787	-0.2233	-0.1701	-0.0833	0.0900	0.0901	0.1354	-0.0549	0.0703	0.0982	0.0501	0.1722	0.1800
SCARs	-0.2070	-0.1784	-0.2932	-0.2327	-0.2568	0.0336	0.0420	0.1443	-0.2113	0.1104	0.1155	0.0939	0.0775	0.0125
t-test	0.1100	0.1239	0.0366	0.0682	0.0675	0.3635	0.2803	0.1378	0.9626	0.8232	0.2121	0.1961	0.1103	0.5486
WSRT	0.2648	0.2859	0.0817	0.2509	0.2592	0.1489	0.3684	0.2786	0.9667	0.7404	0.2862	0.1010	0.0320	0.1744
GRANK	0.6189	0.6216	0.1387	0.3759	0.3212	0.3575	0.8244	0.2434	0.9006	0.7282	0.2811	0.1115	0.7295	0.1576
Bootstrap	0.0480	0.0899	0.0020	0.0160	0.0240	0.3500	0.2700	0.1123	0.9756	0.8159	0.2113	0.2141	0.6002	0.5969

Note: The table displays the mean of daily cumulative abnormal returns (CARs) and the mean standardized cumulative abnormal returns (SCARs) as four-digit decimal numbers. The number of rating events included in each security category is represented by N. The SCARs are calculated by dividing the CARs by the standard deviations of the CARs. The table also shows the p-values of the parametric test and the three non-parametric tests. The bootstrap consists of 1,000 randomly built populations. The results are assumed to be statistically significant if all tests show p-values at or below the 5% level. Panel A contains abnormal returns based on the linear return approach used in the market model. In contrast, the abnormal returns in Panel B are alternatively calculated using logarithmic returns. The expected returns calculated in Panels A and B are based on the regression window [-111, -11]. The abnormal returns in Panel C are defined as excess returns calculated as the difference between daily linear returns of a corporate bond and average bond returns of a control group (see Zaima and McCarthy 1988; Bi and Levy 1993). The abnormal returns in Panel D are based on expected returns, which are calculated as average returns during the estimation period (see Singh and Power 1992). Panel E and Panel F contain abnormal returns based on the market model approach by varying the estimation window for 50 trading days. Panel G includes dates other than the announcement dates of rating changes. The control group consists of the same companies and has the same characteristics as the test sample in terms of N and the distribution of time.

6.3. Cross-sectional analysis

The results of the previous univariate analysis provided an initial indication concerning the information content of rating changes, as well as the absence of wealth transfer effects between corporate owners and lenders. In addition, however, we conducted a cross-sectional analysis to examine the influence of several issuer-specific and rating-specific variables. In addition to the variable representing the rating event, the multivariate regression also contained several control variables that affect the information content of rating changes in bond markets and stock markets. To investigate the effect of these variables, we applied four models for each type of security. Model 1 included all of the explanatory variables employed, including the dummy variable EVENT, which assumed a value of 1 in the case of a rating announcement. Model 2 included the total number of control variables except for the variable EVENT, and served as a benchmark for Model 3 and Model 4. Model 3 included issuer-specific factors to control for certain characteristics of stocks and bonds, as well as for the respective issuers. In Model 4, rating-specific factors were used to control for specific rating characteristics. We estimated the regression separately for upgrades and downgrades as follows:

$$\mathrm{SCAR}_{[-1,\ 1]} = \beta_0 + \beta_1\mathrm{EVENT} + \beta_2\mathrm{SIZE} + \beta_3\mathrm{LEV} + \beta_4\mathrm{PROFIT} + \beta_5\mathrm{MAT} + \beta_6\mathrm{FIN} + \beta_7\mathrm{RECESS} + \beta_8\mathrm{WATCH} + \beta_9\mathrm{S\&P} + \beta_{10}\mathrm{FITCH} + \beta_{11}\mathrm{ININVEST} + \beta_{12}\mathrm{INBET} + \beta_{13}\mathrm{SPLIT} + \beta_{14}\mathrm{INCLASS} + \varepsilon_j\ , \tag{6}$$

where, $\mathrm{SCAR}_{[-1,\ 1]}$ denoted the standardized cumulative abnormal return of issuer j within the announcement window [-1, 1]. The application of the Durbin-Wu-Hausman Test indicated only a weak influence of endogeneity, which we therefore disregarded thereafter.[6]

SIZE referred to the issuer's firm size measured by total assets. According to Kisgen (2006), firm size was one of the most important factors in determining credit risk. Usually, large firms showed higher degrees of diversification, income, and loss-absorbing capacity. Consequently, their abnormal returns responded less negatively to downgrade (and less positively to upgrade) announcements. LEV denoted the financial leverage of issuer j, which was calculated as total debt divided by total assets. Based on the WRH, stocks were expected to react more positively to downgrade announcements (and more negatively to upgrades). In contrast, the higher the financial leverage, the more negative the price effects of corporate bonds at the date of announced negative rating revisions should have been. Similarly, lower levels of financial leverage had meant more positive bond price effects upon positive rating revisions.

PROFIT was defined as earnings before interest and taxes divided by sales revenue. According to the major CRCs, an issuer's profitability played an important role in assessing the firm's credit risk, as retained profits contributed to its loss-absorbing capacity and, thus, affected a credit rating positively. For owners of stock corporations, a high profitability implied higher expected dividend payments, resulting in higher expected returns. In contrast, a high profit reduced the negative effects of downgrades for bondholders due to the higher loss-absorbing capacity of profitable issuers. We used the variable MAT to control for the effect of time to maturity on bond SCARs. In general, a longer time to maturity implied a higher degree of uncertainty with respect to a firm's credit risk.

We also controlled for industry-specific effects using the dummy variable FIN, which assumed a value of 1 if the issuer provided financial services. Allen, Fulghieri and Mehran (2011) suggested that the incentive of financial institutions to extend their risk monitoring increased with higher levels of capital. Consequently, both owners and lenders benefitted from these self-monitoring procedures, which reduced the credit risk of financial institutions. In addition, European financial institutions were forced to disclose a large amount of information due to a relatively high degree of regulation (e.g., the European CRR/CRD IV regulations based on Basel II/III). Hence, stockholders as well as bondholders of European financial institutions had access to more risk-relevant information than those of non-financial bodies, enabling them to better anticipate changes in the issuer's credit risk. Thus, we expected rating changes of financial institutions to convey less new information for their owners and lenders than changes of non-financial firms.

We controlled for the influence of economic downturns using the dummy variable RECESS, which assumed a value of 1 if the rating change was announced during the dotcom crisis or the subprime crisis. Economic downturns could enhance the information content of announced rating changes in two ways. First, investor uncertainty could have increased due to a growing amount of risk-relevant information (e.g., Hsueh and Liu, 1992). Facing additional transaction costs for processing this information, investors were incentivized to rely on CRCs, so that the information content of credit ratings grew. Additionally, investors took a downgrade more seriously during economic downturns because of higher risk sensitivity (e.g., Hoffmann, Post and Pennings, 2013). The second reason was the asymmetric loss function of CRCs, which found it more difficult to make risk assessments in the more volatile market environment of an economic downturn. As the danger of incorrect risk assessment increased in those periods, investors became more risk averse, so that CRCs faced a higher risk of reputation loss (e.g., deHaan, 2013, on the subprime crisis). Reputational risk due to incorrect (i.e., overly optimistic) or delayed ratings incentivized CRCs to allocate more personnel and technical resources to the provision of rating changes during recessions, positively affecting the changes' information content.

In addition, we investigated the influence of the watchlist by including the dummy variable WATCH, which took a value of 1 if the rating change followed a rating review. The information content of

[6] The results of the Durbin-Wu-Hausman Test are available from the authors.

watchlists was examined in previous studies with regard to information that would signal a change of the issuer's credit risk (e.g., Holthausen and Leftwich, 1986; Bannier and Hirsch, 2010). Thus, watch-preceded rating changes are expected to possess lower information contents, since the rating change was at least partly expected through the prior announcement of watchlists.

If the leading CRCs assessed the creditworthiness of the same firm, they might have disagreed about a firm's credit risk. In addition, they typically announced their rating on different dates. Alsakka, ap Gwilym and Vu (2014) showed that S&P's, as opposed to Moody's and Fitch, commonly acted as a first mover. Thus, rating changes announced by S&P's were expected to induce stronger reactions. We used the following dummy variables to control for agency-specific price effects: The variable S&P (FITCH) took a value of 1 if the rating change was announced by S&P's (Fitch Ratings). We controlled for split ratings by using the dummy variable SPLIT, which assumed a value of 1 if at least two CRCs arrived at different results concerning the same rated entity. Such a divergence could have increased investors' uncertainty regarding an issuer's creditworthiness, and decreased the information content of a rating change announcement by a particular rating agency. Prior studies contradicted this reasoning, as they detected stronger price effects for split ratings compared to concordant rating changes (e.g., Gropp and Richards, 2001; Livingston and Zhou, 2010).

The distinction between investment grade and speculative grade is of critical importance for investment decisions and capital requirements. Rating revisions crossing this line induced price effects regardless of their information content because of rating-based regulation, so that a stronger price effect of rating changes between both rating categories was regarded more probable than for those occurring within a rating category (e.g., Steiner and Heinke, 2001). We therefore used the dummy variable INBET, which took a value of 1 for rating changes from investment grade to speculative grade and vice versa. Because most of the rating changes in our sample occurred within the investment grade category, we additionally applied the dummy variable ININVEST, which took a value of 1 if the rating change occurred only within the investment grade category. Finally, we further specified the price effects as a function of the intensity of the rating change by using the dummy variable INCLASS, which assumed a value of 1 if the rating change occurred within a particular rating class. For example, the rating class AA of S&P's contained the three ratings AA+, AA, and AA-. Hand, Holthausen and Leftwich (1992) concluded that significant price effects of rating changes did not depend on the particular rating class. Table 5 depicts our stock-related results, while Table 6 does so for our bond sample.

In the case of downgrades, we detected a significant negative coefficient of the variable EVENT for stocks. Regarding the significant negative SCARs shown in Table 3, this result also indicated that downgrades possessed information content for owners of European stock corporations. In contrast, the variable EVENT was not significant at the time of announcement of upgrades, which was also in line with the non-significant price effect of the univariate analysis. Thus, our findings provide evidence that European stockholders perceived changes in a firm's credit risk asymmetrically. Unlike stocks, corporate bonds did not show significant coefficients representing downgrades, whereas we found upgrades to be significant. Compared to stockholders, bondholders also perceived changes in credit risk asymmetrically, though in a different way: Downgrades seemed to be most important for stockholders, whereas bondholders were mainly focused on upgrades, because they received a relatively high fixed risk premium due to the improved credit risk. We detected a negative coefficient of LEV for stocks at the time of announcement of downgrades, which was highly significant across all models applied. This result implied that negative stock-price effects became even more pronounced with higher levels of financial leverage of the downgraded firm. Because we did not find a significant impact of this variable on bond prices, our study could not provide any evidence for the existence of wealth transfer effects, which was in line with Zaima and McCarthy (1988), Goh and Ederington (1993), and Gropp and Richards (2001).

For corporate bonds, we identified further variables as significant. However, only one of the three models applied exhibited significant results, indicating weak validity. In Model 1, we detected a significant positive coefficient for the variable ININVEST at the time of announcement of downgrades, and a significant negative coefficient for announced upgrades. In line with the argumentation of Hand, Holthausen and Leftwich (1992), this result indicated that announced downgrades and upgrades induced a lower abnormal price effect inside the investment grade category, since bondholders typically became less sensitive for marginal changes in a firm's credit risk with an increasing rating category. In the case of downgrades, Model 1 also showed a positive significant impact of the variable SIZE, implying that the negative SCAR became smaller for bigger companies. According to Micu, Remolona and Wooldridge (2006), bigger firms typically provided a higher amount of information, enabling investors to anticipate (at least in part) the underlying increase in a firm's credit risk. In addition, they had a higher loss-absorbing capacity and, thus, a higher financial stability despite their higher credit risk. Finally, we found a positive impact of WATCH at the time of announcement of downgrades, meaning that the negative abnormal price effect decreased if the rating change followed a previous watchlisting. This result confirmed the findings of Holthausen and Leftwich (1986).

Table 5. Multivariate analysis of standardized cumulative abnormal stock returns in response to negative and positive rating announcements

Stocks	***Negative rating changes***						***Positive rating changes***					
	Exp. sign	**N**	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Exp. sign**	**N**	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Intercept	-	66	0.6775	0.0286	0.1930	-0.6750	+	49	0.6451	0.5789	0.1574	0.3700
			(1.32)	(0.03)	(0.64)	(-1.20)			(1.11)	(0.72)	(0.51)	(1.18)
SIZE	+	66	$1.26\ 10^{-6}$	$1.46\ 10^{-6}$	$1.23\ 10^{-6}$		-	49	$6.41\ 10^{-7}$	$6{,}25\ 10^{-7}$	$4.35\ 10^{-7}$	
			(1.25)	(0.99)	(1.22)				(1.39)	(0.63)	(0.54)	
LEV	+	66	-0.0121 **	-0.0238 ***	-0.0225 ***		-	49	-0.0288	-0.0242	-0.0133	
			(-2.39)	(-3.22)	(-4.15)				(-1.37)	(-0.88)	(-0.68)	
PROFIT	+	66	0.0051	-0.0025	-0.0014		-	49	-0.0099	-0.0008	-0.0007	
			(0.78)	(-0.27)	(-0.31)				(-1.11)	(-0.04)	(-0.04)	
FIN	+	19	0.0326	0.1462	0.1361		-	28	0.1207	0.1255	-0.1270	
			(0.01)	(0.46)	(0.48)				(0.35)	(0.33)	(-0.51)	
RECESS	-	45	-0.3704	-0.4053	-0.3560		+	15	-0.2302	-0.1489	0.1059	
			(-1.66)	(-1.25)	(-1.24)				(-0.91)	(-0.44)	(0.44)	
WATCH	+	28	0.0162	0.2140		0.1523	-	12	0.0717	0.2061		0.2273
			(0.07)	(0.53)		(0.45)			(0.32)	(0.72)		(1.15)
S&P	-	39	0.1452	0.3174		0.2922	+	28	0.1365	0.0138		-0.0158
			(0.46)	(0.57)		(0.68)			(0.46)	(0.04)		(-0.08)
FITCH	+	16	0.0227	-0.0066		-0.0024	-	14	0.0863	-0.0625		-0.1048
			(0.06)	(0.00)		(0.00)			(0.25)	(-0.12)		(-0.27)
ININVEST	+	53	-0.1726	-0.0443		0.0938	-	40	-0.3958	-0.6148		-0.4802
			(-0.57)	(-0.09)		(0.33)			(-1.01)	(-1.24)		(-1.60)
INBET	-	2	0.0057	1.1591		1.0771	+	3	0.1999	0.0056		0.2261
			(0.00)	(0.46)		(0.55)			(0.38)	(0.01)		(0.49)
SPLIT	+	6	0.3924	0.1670		0.1484	-	4	-0.4057	-0.3237		-0.2145
			(0.99)	(0.32)		(0.28)			(-1.19)	(-1.26)		(-1.39)
INCLASS	+	43	-0.2791	-0.1357		0.0500	-	26	0.0265	0.1727		0.1250
			(-1.18)	(-0.39)		(0.14)			(0.01)	(0.64)		(0.64)
EVENT	-	66	-0.4890 **				+	49	0.0450			
			(-2.54)						(0.27)			
adj. R^2 (in %)			4.27	8,59	13.75	6.49			6.64	13.67	12.41	7.27
BP Test			0.6155	0.9378	0.8678	0.8531			0.8446	0.8303	0.7821	0.6956
GQ Test			0.3731	0.0064 **	0.0040 **	0.0084 **			0.8745	0.0052 **	0.0004 **	0.0015 **

*Note: The table shows the regression coefficients of independent variables for positive and negative rating changes. SIZE - size of the issuer measured by total assets; LEV - issuer's leverage ratio, defined as the quotient of total debt and total assets; PROFIT - issuer's profitability, defined as earnings before interest and taxes divided by sales revenue; FIN - dummy variable: 1 if the issuer provides financial services; RECESS - dummy variable: 1 if the rating change is announced during the dotcom crisis or the subprime crisis; WATCH - dummy variable: 1 if the rating change is a resolution of a credit watch; S&P - dummy variable: 1 if the rating change is announced by Standard & Poor's; FITCH - dummy variable: 1 if the rating change is announced by Fitch; ININVEST - dummy variable: 1 if the rating changes within the investment grade category; INBET - dummy variable: 1 if the rating changes from investment grade to speculative grade or vice versa; SPLIT- dummy variable: 1 if the rating change differs from rating changes announced by another rating agency; INCLASS - dummy variable: 1 if the rating changes within a rating class; EVENT – dummy variable: 1 in the case of a rating announcement (downgrade or upgrade). The following tests for heteroscedasticity are used: BP test - Breusch-Pagan Test, GQ test - Goldfeld-Quandt Test. (value) - heteroscedasticity-consistent t-statistic according to White (1980), Durbin-Wu-Hausman Test as an endogeneity test. The results of the Durbin-Wu-Hausman Test are available from the authors. * = 10% level, ** = 5% level, *** = 1% level. Coefficients are shown for the announcement window [-1, 1].*

Table 6. Multivariate analysis of standardized cumulative abnormal corporate bond returns in response to negative and positive rating announcements

Corporate bonds	***Negative rating changes***						***Positive rating change***					
	Exp. sign	**N**	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Exp. sign**	**N**	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Intercept	-	129	-0.7516 **	-0.7175	-0.3745 **	-0.3399	+	102	0.4028	0.6305	-0.0924	1.0397
			(-1.97)	(-1.47)	(-2.02)	(-1.04)			(0.83)	(1.03)	(-0.25)	(2.41)
SIZE	+	129	$1.41 \ 10^{-6}$ **	$1.49 \ 10^{-7}$	$-4.40 \ 10^{-7}$		-	102	$3.32 \ 10^{-7}$	$9.63 \ 10^{-7}$	$8.47 \ 10^{-7}$	
			(2.15)	(0.23)	(-1.05)				(0.92)	(1.18)	(1.25)	
LEV	-	129	-0.0020	0.0030	0.0054		+	102	-0.0316	-0.0138	-0.0101	
			(-0.74)	(0.63)	(0.94)				(-1.48)	(-0.58)	(-0.61)	
PROFIT	+	129	-0.0043	-0.0053	-0.0026		-	102	0.0103	0.0231	0.0169	
			(-0.91)	(-1.14)	(-1.39)				(1.29)	(1.39)	(1.15)	
MAT	+	129	-0.0029	0.0027	0.0023		-	102	-0.0207	0.0129	0.0117	
			(-0.37)	(0.34)	(0.30)				(-1.11)	(0.51)	(0.53)	
FIN	+	86	-0.1380	0.3301	0.3933		-	39	0.2362	-0.3135	-0.2867	
			(-0.69)	(1.43)	(1.94)				(0.69)	(-0.80)	(-1.01)	
RECESS	-	92	0.1291	-0.0037	-0.0805		+	26	-0.2575	-0.1676	-0.0292	
			(0.80)	(-0.02)	(-0.58)				(-1.06)	(-0.57)	(-0.14)	
WATCH	+	55	0.4062 **	0.3554		0.3254	-	25	-0.0841	-0.1047		0.2628
			(2.59)	(1.28)		(1.34)			(-0.46)	(-0.48)		(1.02)
S&P	-	69	-0.1839	-0.2214		-0.3141	+	46	0.1390	-0.2952		0.0446
			(-0.79)	(-0.77)		(-1.44)			(0.66)	(-1.12)		(0.20)
FITCH	+	41	-0.0385	0.1411		0.0299	-	34	-0.1396	-0.4642		-0.4565
			(-0.15)	(0.40)		(0.09)			(-0.56)	(-1.53)		(-1.97)
ININVEST	+	103	0.5997 **	0.2038		0.2925	-	82	-0.7007 **	-0.2935		-0.5837
			(2.43)	(0.51)		(0.88)			(-2.22)	(-0.92)		(-1.93)
INBET	-	4	0.8919	0.8660		0.5796	+	8	-0.2933	-0.4599		-0.7778
			(1.53)	(0.85)		(0.64)			(-0.58)	(-0.70)		(-1.34)
SPLIT	+	12	0.2424	-0.1897		-0.0002	-	9	-0.6641	-0.6640		-0.3257
			(0.99)	(-0.92)		(-0.01)			(-2.39)	(-1.72)		(-1.39)
INCLASS	+	85	-0.1273	0.1167		-0.1375	-	69	0.2036	-0.1508		-0.4885
			(-0.79)	(0.72)		(-0.75)			(0.94)	(-0.56)		(-1.90)
EVENT	-	129	-0.1185				+	102	0.3294 **			
			(-0.94)						(2.50)			
adj. R^2 (in %)			6.02	3.08	9.99	12.66			13.14	10.77	4.59	2.56
BP Test			0.3975	0.1929	0.0313 **	0.5985			0.2489	0.0237	0.0175	0.1021
GQ Test			0.6307	0.9996	0.9998	0.9999			0.2807	0.9997	0.9823	0.9928

*Note: The table shows the regression coefficients of independent variables for positive and negative rating changes. SIZE - size of the issuer measured by total assets; LEV - issuer's financial leverage ratio, defined as the quotient of total debt and total assets; PROFIT - issuer's profitability, defined as earnings before interest and taxes divided by sales revenue; MAT - number of years between issue date and maturity date; FIN - dummy variable: 1 if the issuer provides financial services; RECESS - dummy variable: 1 if the rating change is announced during the dotcom crisis or the subprime crisis; WATCH - dummy variable: 1 if the rating change is a resolution of a credit watch; S&P - dummy variable: 1 if the rating change is announced by Standard & Poor's; FITCH - dummy variable: 1 if the rating change is announced by Fitch; ININVEST - dummy variable: 1 if the rating changes within the investment grade category; INBET - dummy variable: 1 if the rating changes from investment grade to speculative grade or vice versa; SPLIT - dummy variable: 1 if the rating change differs from rating changes announced by another rating agency; INCLASS - dummy variable: 1 if the rating changes within a rating class; EVENT – dummy variable: 1 in the case of a rating announcement (downgrade or upgrade). The following tests for heteroscedasticity are used: BP test - Breusch-Pagan Test, GQ test - Goldfeld-Quandt Test. (value) - heteroscedasticity-consistent t-statistic according to White (1980), Durbin-Wu-Hausman Test as an endogeneity test. The results of the Durbin-Wu-Hausman Test are available from the authors. * = 10% level, ** = 5% level, *** = 1% level. Coefficients are shown for the announcement window [-1, 1].*

7. CONCLUSION

We investigated price effects of stocks and corporate bonds at the time of announced changes in European firms' credit ratings. For this reason, we modified the standard event study approach by applying several robust methods, and completed the univariate regression by a cross-sectional analysis. At the date of announced downgrades, our results showed significant negative abnormal returns for both owners and lenders of the firm. In contrast, we found significant positive abnormal bond returns, while we did not detect any significant price reaction for corporate owners in the case of announced upgrades. In combination with the results of the cross-sectional analysis, our findings implied that owners of European stock corporations tended to be focused on negative rating changes, while bondholders of these firms perceived both rating change directions to be of equal importance. We also did not find any indication for the existence of wealth transfer effects. In addition, our study provided some evidence of a varying magnitude of price reactions among both types of security due to differences in liquidity of European stock and bond markets.

However, our study leaves some unresolved questions. First, since the rating changes in our sample were primarily driven by changes in a firm's financial leverage, it would be interesting to conduct this study for rating changes that are caused by other factors, such as changes in expected firm profits, or merger announcements. Second, future research should extend the period of investigation to examine the effects of the Euro crisis starting 2011. Finally, our approach could be extended to other types of securities and the owner, lender or mezzanine investor positions they represent, such as preferred stocks, commercial papers, or convertibles, to identify differences and similarities of market price movements. Since the importance and liquidity of stock markets and bond markets increases as continuously as the number of data sources and the quality of the data they provide, these questions will become easier to answer, ensuring that the effect of rating announcements on market prices of securities will remain a stimulating area of research.

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APPENDICES

Appendix 1. Standardized cumulative abnormal return differences

Because of different liquidity characteristics, we use standardized abnormal returns for calculating return (SCAR) differences $DSCAR^{A,B}_{[T_1,T_2]}$ between security type A and B within the event window [T_1, T_2], i.e., $DSCAR^{A,B}_{[T_1,T_2]} = SCAR^{A}_{[T_1,T_2]} - SCAR^{B}_{[T_1,T_2]}$,

where, $SCAR^{A}_{[T_1,T_2]}$ and $SCAR^{B}_{[T_1,T_2]}$ denote the standardized cumulative abnormal return of security types A and B, respectively. In addition to the standardization of abnormal returns, we use paired samples of both security categories to provide an appropriate basis of comparison. In the case of upgrades, a significant positive $DSCAR^{A,B}_{[T_1,T_2]}$ implies that the positive price effect of stocks is stronger than for corporate bonds, with A denoting stocks and B denoting corporate bonds. In contrast, a negative $DSCAR^{A,B}_{[T_1,T_2]}$ following a downgrade announcement implies that the negative price effect of corporate bonds is stronger than for stocks (assuming corporate bonds are security type A and stocks are type B).

	Negative rating changes							*Positive rating changes*						
	[-1, 1]	[-10, 0]	[-5, 0]	[-1, 0]	[0, 1]	[0, 5]	[0, 10]	[-1, 1]	[-10, 0]	[-5, 0]	[-1, 0]	[0, 1]	[0, 5]	[0, 10]
Panel A: Stocks – corporate bonds														
DSCARs	-0.0351	-0.0709	-0.1544	-0.1810	0.0664	0.1955	0.0817	-0.1203	0.2355	0.1359	0.0672	-0.1901	-0.1583	-0.0428
t-test	0.4196	0.3087	0.1614	0.1330	0.6531	0.8752	0.6388	0.7918	0.0262	0.1175	0.3397	0.9091	0.8662	0.6168
WSRT	0.5675	0.2892	0.2738	0.2165	0.8916	0.8682	0.8228	0.3322	0.0175	0.0781	0.0710	0.6313	0.7521	0.6163
GRANK	0.4147	0.2568	0.2318	0.1300	0.7646	0.8015	0.8109	0.5668	0.0114	0.1888	0.2445	0.7511	0.7293	0.6864
Bootstrap	0.4480	0.3400	0.1460	0.1300	0.6130	0.8820	0.6250	0.8220	0.0190	0.1250	0.3790	0.9570	0.8810	0.5900
Panel B: Corporate bonds – stocks														
DSCARs	0.0351	0.0709	0.1544	0.1810	-0.0664	-0.1955	-0.0817	0.1203	-0.2355	-0.1359	-0.0672	0.1901	0.1583	0.0428
t-test	0.5804	0.6913	0.8386	0.8670	0.3469	0.1248	0.3612	0.2082	0.9738	0.8825	0.6603	0.0909	0.1338	0.3832
WSRT	0.4351	0.7130	0.7283	0.7854	0.1788	0.1332	0.1096	0.6714	0.9829	0.9234	0.9304	0.3875	0.2511	0.3725
GRANK	0.5853	0.6665	0.7432	0.7682	0.8700	0.1891	0.1985	0.4332	0.9186	0.8112	0.7555	0.2489	0.2707	0.3136
Bootstrap	0.5980	0.6810	0.8590	0.8720	0.3940	0.0940	0.3960	0.1850	0.9830	0.8630	0.6520	0.0620	0.1140	0.3780

Note: The table displays the difference of mean standardized cumulative abnormal returns (DSCARs) between stocks and corporate bonds, or vice versa. The SCARs are calculated by dividing the CARs by the standard deviations of the CARs. DSCARs are shown as four-digit decimal numbers subdivided by the direction of rating changes over a period of 21 trading days. The table also shows the p-values of the parametric test and the three non-parametric tests. The bootstrap consists of 1,000 randomly built populations. The results are assumed to be statistically significant if all tests show p-values at or below the 5% level. Panel A contains DSCARs calculated by subtracting the SCARs of corporate bonds from the SCARs of stocks, whereas Panel B contains DSCARs calculated by subtracting the SCARs of stocks from the SCARs of corporate bonds. The SCARs are calculated by using the market model approach with an estimation window of [-111, -11]. In addition to these results, we calculate abnormal returns for a control group consisting of dates other than the announcement date of the rating changes investigated. The results do not indicate any significant abnormal returns in the announcement window [-1, 1], and are available from the authors.

We do not detect a significant difference of stocks compared to corporate bonds in the case of downgrades, implying that both types of security react quite similarly to the rating event. In contrast, we detect a significant DSCAR of 0.2355 for upgrades within the pre-announcement window [-10, 0]. Therefore, stocks react more strongly than corporate bonds prior to the announcement of upgrades. This asymmetric intensity may be due to the higher liquidity of stocks compared to corporate bonds, since bondholders prefer a long-term buy-and-hold strategy. Hence, stockholders are more capable in processing risk-related information and translating it into actions that amend prices than bondholders, which is in line with Yan and Zhang (2009). We do not find any significant DSCARs between corporate bonds and stocks in the different event windows. This non-significance of DSCARs implies that corporate bonds are more illiquid than stocks.