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RELATIONSHIP BETWEEN CREDIT DEFAULT SWAP (CDS) SPREADS AND CREDIT RATING ANNOUNCEMENTS IN THE CASE OF R&D-LEADING COMPANIES

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ABSTRACT

Corporate insolvency causes significant economic losses not only for creditors, but also for owners, employees, business partners and the state, therefore reliable solvency forecasting is of paramount importance. Credit rating agencies, such as Standard & Poor's, play a central role in assessing companies' creditworthiness; however, their ratings are not without limitations, and market players often regard market-provided information authoritative. In the credit default swap (CDS) market, spreads reflect real-time assessments of credit risk and may therefore be useful for analysing market reactions to credit ratings. The aim of this research is to analyse the extent to which Standard & Poor's rating announcements can be considered predictable for companies characterised by significant R&D activity, as well as how quickly and in what direction the CDS market reacts to these changes. The analysis examines the information content of credit ratings and market reaction times through the evolution of CDS spreads. The results may contribute to a deeper understanding of the relationship between credit ratings and market expectations, as well as to the refinement of credit risk forecasting in the corporate sector. Our research highlights that the market reacts asymmetrically to credit rating events: while CDS spreads can be used as a reliable early warning indicator in the case of downgrades to refine credit risk models, upgrades retain their immediate market-moving, value-creating effect. These findings stress the importance of proactive risk monitoring for investors and transparent crisis communication for the corporate sector.

JEL codes: G32, G24, G33, N20

Keywords: CDS, credit rating, insolvency, bankruptcy

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1 INTRODUCTION

The insolvency or involuntary termination of businesses generates significant costs for those affected. Primarily the company's creditors suffer losses upon a bankruptcy event; however, the owners, company executives and employees are also affected by the negative consequences through the loss of their jobs. The company's customers and suppliers suffer losses, so does the state budget, which loses out on tax revenue. A mass bankruptcy phenomenon may jeopardise the entire national economy (Shetty, Pakkala, Mallikatjunappa et al., 2012), which makes it all the more important for stakeholders to be able to get a reliable picture of companies' current solvency. Credit rating agencies seek to meet this need.

Corporate bonds are subjected, almost without exception, to one or more external credit ratings. Although these ratings are very expensive, despite this, the vast majority of issuers opt to pay for this service (Kliger–Sarig, 2000). The literature often refers to credit rating agencies as one of the key parties responsible for the 2008 global financial crisis due to anomalies in the ratings assigned to mortgage-backed securities (Mérő, 2021). In summary, it can be said that while in the period leading up to the 2008 crisis these organisations were relatively unregulated, they have now become fully regulated and supervised institutions. In the European Union, Regulation (EC) No 1060/2009 (as amended by Regulation (EU) No 462/2013) and Directive 2013/14/EU regulate the activities of credit rating agencies, and the European Securities and Markets Authority (ESMA) is responsible for their supervision (Mérő, 2021).

When assessing the creditworthiness of corporate bond issuers and credit risk of securities, credit rating agencies assign ratings across a scale from AAA (highest credit quality) to D (default). Credit rating agencies use sophisticated methodologies and take multiple factors into account when assigning their ratings.

Although credit ratings provide valuable guidance, they have several limitations, therefore investors and lenders often rely on market sentiment when assessing a company's risk of default. Credit derivatives facilitate the trading and management of credit risk in financial markets. The most popular credit derivative is the credit default swap (CDS). This contract serves as a form of insurance against the default of a certain company or sovereign debtor. The CDS spread is the annual amount that the buyer of the protection is to pay to the seller of the protection over the term of the contract, expressed as a percentage of the notional amount. A key feature of credit default swaps is the inverse relationship between the CDS spread and the creditworthiness of the reference entity. Generally, as an organisation's creditworthiness deteriorates, its CDS spreads widen; conversely, as creditworthiness improves, spreads typically narrow.

In our research, we examined the extent to which announcements of rating deviated from market expectations, as well as how quickly they react to such news. Our goal was, therefore, to examine the extent to which participants in the credit default swap market anticipate Standard & Poor's credit rating announcements regarding R&D-leading companies, as well as how quickly the market reacts after such an announcement is made.

We chose R&D-leading companies because these firms face significantly higher costs associated with managing financial distress. This is because the value of these companies stems largely from intangible assets (patents, licenses, experimental developments, etc.), which are not liquid assets; consequently, in the event of financial difficulties, it is more difficult for the company to generate additional revenue from their sale (Lee–Choi, 2015).

In this paper, we briefly describe the significance and functioning of corporate bond ratings, as well as the key market players. Next, we will present the key points regarding the most popular credit derivative transactions (credit default swaps—CDS), followed by a review of the findings in the literature on the relationship between CDS spreads and credit ratings. After describing our sample and methodology, we present our results.

Based on our findings, market participants anticipate upgrades less effectively than downgrades; specifically, changes in spreads do not reflect an impending upgrade event, whereas for downgrades, spread values increase two months before the event. Therefore, changes in CDS spreads can be considered as an early indicator of changes in credit ratings; furthermore, incorporating changes in CDS spreads into credit risk models improves risk analysis accuracy. Since the market is less likely to anticipate credit rating upgrades, it can be concluded that it is still worthwhile for companies to invest in, often costly, credit rating services since these services reveal positive changes (not yet recognized by the market, according to our market research) in the company's operations.

2 CORPORATE BOND RATINGS

The co-movement of default risk and bond ratings is an important area of research in corporate finance. Understanding the dynamics between them is fundamental to investors, regulators, and policymakers, as it serves as the basis for investment decisions and risk management strategies

Although corporate bond ratings are quite costly, in general, roughly 98 percent of companies are willing to pay for them (Kliger–Sarig, 2000). Thus, it is the issuers rather than the investors pay for credit ratings, which is completely at odds with the original business model on which John Moody founded his agency in 1905: he

intended to sell his services to investors (Xie et al., 2022). One might explain the fact that companies being rated pay for their credit ratings by suggesting that they seek to secure better ratings. However, this is inconsistent with rating agencies' fundamental dependence on credibility for their income (Kliger–Sarig, 2000).

Instead, the answer likely lies in the fact that, by paying for credit rating services, companies are able to incorporate internal information into the rating without having to disclose this confidential information to the public. During the credit rating process, companies provide rating agencies with various types of internal information, such as internal reports, multi-year forecasts, confidential business plans, and unsigned contract drafts (Kliger–Sarig, 2000). By using a credit rating agency, the borrowing company can signal its creditworthiness to market participants, while investors can obtain this information at minimal cost. The activities of credit rating agencies therefore enable borrowers to raise funds more easily and at lower cost, while lenders can grant loans with a more accurate understanding of the credit risk (Fennel–Medvedev, 2021).

In addition to their above roles, credit rating agencies also perform ongoing monitoring activities. Before a downgrade, companies are given a warning: they are placed on a kind of 'watch list', which may encourage the borrower to take corrective action (Ligeti–Szőrfi, 2016). The activities of credit rating agencies are also coming to the fore in relation to the calculation of capital requirements under Basel III, as the regulations encourage commercial banks to invest in higher-rated bonds by assigning a lower risk weight to better-rated bonds (Xie et al., 2022).

The reliability of credit rating agencies is also relevant in relation to the reputation certification hypothesis. According to this theory, reputation is an intangible asset that is rare and difficult to imitate; consequently, companies with a good reputation gain a sustainable competitive advantage over their less reputable counterparts (Xie et al., 2022).

The credit rating industry is characterised by a high degree of concentration: the three major agencies together account for around 95% of the global market. These major players are generally referred to as the "Big Three": they include Standard & Poor's (S&P Global Ratings), Moody's Investors Service, and Fitch Ratings. Moody's and S&P hold a combined market share of approximately 80%, while Fitch holds about 15%. Bongaerts et al. (2012) studied the largest U.S. companies between 2000 and 2008 and found that virtually all these companies were rated by both Moody's and S&P. In some cases, Fitch also issued ratings for these companies.

The methodology used by credit rating agencies is based on a combination of quantitative analysis and subjective judgement. Every major credit rating agency uses its own scale to indicate creditworthiness, usually through a combination of

letters (*Table 1*). Although there are minor differences in terminology, the basic principles and the general hierarchy of risks are broadly the same across agencies. These scales generally range from the highest rating, which indicates the lowest credit risk, to the lowest rating, which signifies default or a very high probability of default. Intermediate rating categories indicate different levels of credit risk. Agencies often use plus (+) and minus (–) signs or numerical modifiers to further differentiate within each rating category.

Table 1
Rating categories of the three major credit rating agencies

Rating category	S&P	Moody's	Fitch
Highest quality grade	AAA	Aaa	AAA
Very high quality grade	AA+, AA, AA–	Aa1, Aa2, Aa3	AA+, AA, AA–
High quality grade	A+, A, A–	A1, A2, A3	A+, A, A–
Investment grade	BBB+, BBB, BBB–	Baa1, Baa2, Baa3	BBB+, BBB, BBB–
Speculative	BB+, BB, BB–	Ba1, Ba2, Ba3	BB+, BB, BB–
Highly speculative	B+, B, B–	B1, B2, B3	B+, B, B–
High-risk	CCC+, CCC, CCC–	Caa1, Caa2, Caa3	CCC+, CCC, CCC–
Extremely speculative	CC	Ca	CC
Extremely high risk	C	C	C
Default	D	–	D

Source: Bodie et al., 2014

Credit ratings generally reflect the issuer's creditworthiness rather than the quality of individual bonds (Hull et al., 2004). This is because a company's bonds generally receive the same rating, and changes to the rating are announced not for individual bonds but for the company as a whole. Although data analysis techniques and computing technology have advanced over time, the methods used by credit rating agencies have hardly changed since the industry's inception (Wilson–Donnelan, 2016). This raises question about accuracy and timeliness of the ratings.

Credit ratings are a valuable source of information, but with a number of limitations. Although credit ratings are intended to be forward-looking in their assessment of creditworthiness, they inevitably rely on historical financial data and forecasts of future economic conditions, which are by their very nature uncertain and may change as a result of unforeseeable events; and therefore credit ratings may be less accurate than the market pricing of credit risk. Bond prices and spreads often react more quickly to changes in a company's creditworthiness than

credit ratings, and they also reflect the impact of novel factors such as a company's ESG rating (Kotró–Márkus, 2020). Furthermore, credit ratings are assessments made at a specific point in time and do not necessarily fully reflect the dynamic nature of credit risk. A company's creditworthiness may change over time due to various factors, such as changes in market conditions or in the company's financial performance. Furthermore, whilst quantitative models are becoming increasingly prevalent in the rating process, a certain degree of subjectivity still remains in the interpretation of financial information and the assessment of qualitative factors during analysts' evaluations (Bodie et al., 2014). Due to the limitations of credit ratings, investors and lenders often rely on market sentiment when assessing a company's risk of default.

3 THE ROLE OF CDSS IN CREDIT RISK ASSESSMENT

Credit derivatives facilitate the trading and management of credit risk in financial markets. The most popular credit derivative is the credit default swap (CDS). This contract provides protection against default by a specific company or sovereign entity. The key measure of a credit default swap is the CDS spread, which is expressed in basis points (bps). The CDS spread is the annual fee that the buyer of the protection is to pay to the seller of the protection over the term of the contract, expressed as a percentage of the notional amount. For example, if a company's CDS spread is 300 basis points, or 3%, this means that an investor must pay $3 a year to insure $100 of the company's debt. The CDS spread is often referred to as a credit risk spread or simply a 'spread'. Essentially, the CDS spread represents the cost of insuring against the potential default of the reference entity, and thus directly reflects the perceived credit risk associated with that entity. The standardised contracts introduced in 1998 led to rapid growth in the CDS market (Hull et al., 2004).

A key correlation in the field of credit default swaps is the inverse relationship between the CDS spread and the creditworthiness of the reference entity. Generally, as an entity's creditworthiness deteriorates, its CDS spreads widen; conversely, as creditworthiness improves, spreads typically narrow. A widening in the CDS spread of a reference entity generally indicates an increase in that entity's default risk or a deterioration in the outlook for the broader economic environment. CDS pricing is therefore a widely used mechanism in the fields of pricing, risk assessment and risk management. According to Liang et al. (2023), the CDS market has become the main venue for pricing credit risk. Their research shows that the optimism or pessimism expressed in management communications can significantly influence investors' hedging behaviour and their perceptions of credit risk. This

interaction suggests that investor sentiment reflected in CDS prices may provide valuable information on anticipated credit risk, thereby facilitating market participants to make more informed decisions.

The pricing mechanisms of CDSs are clarified by Abid et al. (2020), who examine the implied probabilities of default estimated via CDS spreads. This research highlights how CDS data can be used to forecast probabilities of default by translating market expectations into quantifiable risk indicators, which may assist risk management practices in the financial sector. An assessment of the pricing mechanism in the CDS market can reveal fundamental credit risks that are not necessarily apparent from traditional financial statements, thereby enabling a more nuanced understanding of borrowers' solvency.

The correlation between CDS spreads and credit ratings

The relationship between CDS spreads and credit ratings has received considerable attention in the financial literature, particularly in the context of risk assessment and market behaviour. One of the fundamental studies on this topic was conducted by Hull et al. (2004), who examined the relationship between CDS spreads, bond yields, and credit rating announcements. They found that changes in credit ratings have a significant impact on CDS spreads: downgrades generally lead to a widening of spreads, reflecting an increased perception of risk among investors. This correlation highlights the role of credit ratings as a critical factor in determining CDS prices, as market participants adjust their expectations based on these ratings.

Further empirical analysis by Lehner and Neske (2006) supports this view, pointing out that market participants often anticipate credit rating announcements, particularly downgrades. According to their study, the CDS market reacts to these announcements even before they are officially made, suggesting that information asymmetry plays a decisive role in the formation of CDS prices. This forward-looking behaviour highlights the efficiency of the CDS market in integrating credit risk information, which is essential for investors seeking to hedge against potential defaults.

In a broader context, Tjandrasa et al. (2020) examined the macroeconomic factors influencing the yields on government bonds in Southeast Asia and found a positive correlation between CDS spreads and bond yields. This correlation suggests that as expected credit risk increases, both CDS spreads and bond yields rise, indicating a market-wide reaction to credit risk assessments. This finding is consistent with the approach taken by Longstaff et al. (2005), who state that the

majority of corporate yield premiums can be attributed to default risk, which is closely linked to credit ratings.

The relationship between credit ratings and CDS prices is further clarified in the work of Abid and Naifar (2006), who analysed the key determinants of CDS spreads. Their findings suggest that announcements of credit ratings have a significant impact on the movement of CDS prices, reinforcing the assumption that credit ratings serve as an important indicator of an entity's creditworthiness for market participants. This link is particularly pronounced during financial crises, when changes in credit ratings may lead to significant adjustments in CDS spreads.

Furthermore, the study by Gök and Arslan (2019) specifically examines the reaction of CDS spreads to credit rating announcements in emerging markets. According to their research, CDS spreads react sensitively to such announcements, which highlights the role of credit ratings in shaping risk perceptions in these economies. This is particularly important given the increasing integration of emerging markets into the global financial system, where credit ratings play a key role in attracting foreign investment.

In addition to the direct impact of credit ratings on CDS prices, the literature also highlights the role of equity return volatility as an influencing factor. For example, the work of Zhang et al. (2009) shows that the volatility of individual companies' equity returns has a significant impact on the development of CDS spreads. According to their structural model, fluctuations in share prices can lead to corresponding changes in CDS spreads, suggesting a complex interaction between equity markets and credit derivatives. This relationship is crucial to investors who use CDSs as a hedging tool against movements in the equity market.

The empirical evidence presented by Nordén and Weber (2009) further supports the theory of co-movement between CDS, bond and equity markets. Their analysis shows that changes in credit ratings affect not only CDS spreads but also bond yields and share prices, pointing to broader interconnections between financial markets. This relationship is essential for understanding how credit risk is priced across different asset classes, as well as the implications for investors and regulators.

Furthermore, in their research, Friewald et al. (2014) highlight the overlap between credit risk premiums and equity returns, demonstrating how the dynamics between CDSs and equity markets can influence overall market behaviour. Their findings suggest that, in both markets, risk-adjusted excess returns are determined by the relationship between firms' risk-neutral and real-world default probabilities, which further reinforces the link between credit ratings and market performance. This highlights the multifaceted nature of credit risk assessment

and the importance of taking various market indicators into account when assessing creditworthiness. The role of credit rating agencies in shaping market risk perceptions cannot be overstated. As Dayi and Tantoun (2023) note, these agencies provide critical information to global investors by assessing the risk levels of institutions and organisations. Their ratings have a direct impact on movements in CDS prices, as market participants rely on these ratings to assess the probability of default. Reliance on credit ratings highlights the importance of transparency and accuracy in the rating process, as any discrepancies can lead to significant market distortions.

A review of the literature reveals that research has identified a close relationship between CDS spreads and credit ratings, and empirical data also support the finding that credit ratings have a significant influence on the movement in CDS prices. The interaction between credit ratings, market expectations, and macroeconomic factors creates a complex environment for investors dealing with credit risk. As financial markets continue to evolve, understanding these dynamics will be essential for effective risk management and the establishment of investment strategies.

As seen, researchers have already examined the relationship between CDS spreads and credit ratings from a variety of perspectives, often addressing the correlations with equity returns. However, these studies do not specify how long it takes for market participants to react to changes in credit ratings. In our research, we examined the extent to which changes in ratings surprise market participants, as well as how quickly they react to individual rating changes.

4 THE SAMPLE EXAMINED

The sample included companies that are engaged in significant research and development activities. The reason for this is that businesses engaged in significant R&D face significantly higher costs associated with managing financial distress. This is because the value of these companies stems largely from intangible assets (patents, licenses, experimental developments, etc.), which are not liquid assets; consequently, in the event of financial difficulties, it is more difficult for the company to generate additional revenue from their sale (Lee–Choi, 2015). In 2022, the European Commission published the Industrial R&D Investment Scoreboard, a list of 2,500 companies from around the world that spent the most on research and development globally in 2021. From the list of 2,500 companies, a total of 61 were included in our sample, selected from the top 271 R&D Leaders: companies were included in the sample only if both their credit rating changed and CDS

spread data were available. A total of thirty-one US, twenty-two EU, and eight Japanese companies were included in the sample.

In our research, we examined Standard & Poor's (S&P) ratings that assess a company's long-term solvency. The S&P categories are shown in *Table 1*. In the course of our research, we examined 225 rating changes; our data was sourced from the LSEG Workspace database. The rating changes consisted of upgrades and downgrades.

The credit ratings examined were published between 10 March 2008 and 13 January 2025. We included a total of 103 upgrades in the sample (*Table 2*). As can be seen from the table, the majority of rating changes involved a move up by one category; there were only 10 cases in which the company achieved a rating two categories higher.

Table 2
Previous and new rating values of upgrades

Upgrades	New rating	AAA	AA	AA–	A+	A	A–	BBB+	BBB	BBB–	BB+	BB	BB–	B+	B–	CCC+	Sum
Previous rating																	
AA		1															1
AA–			3														3
A+				4													4
A					7												7
A–						12											12
BBB+						3	19										22
BBB								14									14
BBB–									11								11
BB+									2	9							11
BB										1	4						5
BB–											2	2					4
B+												1	3				4
B														2			2
B–														1			1
CCC+															1		1
CC																1	1
Sum		1	3	4	7	15	19	14	13	10	6	3	3	3	1	1	103

Source: author's compilation

The downgrades examined were announced between 7 April 2008 and 10 December 2024. We included a total of 122 downgrades in the sample (*Table 3*). In the case of downgrades, it is increasingly common for a company's rating to be downgraded by several categories: in one instance, for example, a company's credit rating was downgraded by four categories, but there are also cases where the rating has been downgraded by three categories.

Table 3
The previous and new rating values of the downgrades examined

Upgrades	New rating	AA+	AA	AA–	A+	A	A–	BBB+	BBB	BBB–	BB+	BB	BB–	B+	B–	CCC+	Sum
Previous rating																	
AAA		1		1													2
AA+			1	2													3
AA				5	1												6
AA–					11	1											12
A+						19			1								20
A							17	6									23
A–								19	4								23
BBB+									13								13
BBB										10							10
BBB–											5	1					6
BB+													1				1
BB–														1			1
B															1		1
B–																1	1
Sum		20	17	12	1	8	1	1	1	1	1	5	18	10	25	1	122

Source: author's compilation

5 DESCRIPTION OF THE METHODOLOGY

In this research, we examined whether CDS spreads change before and after the announcement of a credit rating change. We examined CDS spread quotes for 5-year maturities only and used Mid Spreads, which represent the average of the bid-ask spreads. We have daily spread data. The average level of CDS spreads can be influenced not only corporate but also macroeconomic events. This latter effect can be filtered out by adjusting for a CDS spread index. In this adjustment, the corresponding spread index value is subtracted from the spread values, on the assumption that all spreads in the sample exhibit the same sensitivity to the index. However, Hull et al. (2004) note that the results remain unchanged regardless of whether raw data or index-adjusted data are used. With this in mind, we have chosen the raw spread values as the starting point for our analysis.

In this research, we examined changes in CDS spreads before and after S&P rating events. The method we have used is similar to the traditional event analysis method. In our case, there are two possible scenarios: an upgrade or a downgrade. We excluded from our analysis any rating where another S&P rating change had occurred within the 90 days preceding the rating in question, in order to filter out these distorting effects. In this analysis, the time interval $[n_1, n_2]$ is defined as the period from n_1 days after the event to n_2 days after the event, where n_1 and n_2 may take either positive or negative values. Thus, the interval [–90, –61] ranges from the 90th day prior to the announcement of the change in rating to the 61st day prior to the event; the [1, 10] time interval ranges from the 1st day following the

announcement to the 10th day following it, and so on. We calculated the change in the spread for the time interval [n_1, n_2] by subtracting the spread value for day n_2 from the spread for day n_1. If no spread value was available for a particular day, we used the last available adjacent spread. We sought to test whether the average change in the spread relating to a rating event could be considered to be zero within the time window under examination. In the case of downgrades, we examined whether the change was greater than zero; in the case of upgrades, we checked whether the average change in the spread was less than zero. Indeed, if the announcement has no effect on the spreads, then the average change must be zero within that interval.

We do not have exact timestamps for the announcements, so it is important to include the interval [–1, 1] in the analysis in order to examine whether individual announcements caused any changes in the spreads. In addition to this, however, it is advisable to examine the days leading up to the announcement in order to determine whether the market had prior, leaked information about the change in rating, or whether market participants (in line with the credit rating agencies) had also assessed the company's operations as riskier or less risky. With this in mind, we have divided the period preceding the change in rating into three intervals: [–90, –61]; [–60, –31]; and [–30, –1]. Following the announcement, we also examined the [1, 10] interval to determine how quickly the market reacts to announcements.

We tested changes in spreads separately for credit upgrades and downgrades. Our sample comprised 103 upgrades and 122 downgrades; we tested for significance using a one-sample t-test, the test statistic for which is:

$$t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}}$$

where $\bar{x}$ is the sample mean, μ_0 is the value to which we refer (in this case 0), *and* is the adjusted standard deviation of the sample, whilst n is the number of elements in the sample. This follows a t-distribution with df = n–1 degrees of freedom (Ramanathan, 2003). Our null hypothesis is that changes in spreads can be considered zero, and we interpret our results at a 10 per cent significance level.

6 RESULTS

Our findings show that, in the case of credit rating upgrades, the change in spreads on the first day following the announcement differs significantly from zero (*Table 4*). As a result of the upgrade, CDS spreads fell by 4 basis points. However, both before and after this, the change in spreads is statistically insignificant. The market therefore either has no prior information about the company's rating upgrade, or, if it does, it is ignoring this news. However, the upgrade effect is short-lived; although spreads narrow on the day following the announcement, no further changes occur, and the change in the value of the spreads can be considered statistically insignificant.

Table 4
Test results in the case of upgrades

	N	Mean	t	Sig. (2-tailed)
[–90,–61]	103	34.715	1.004	0.318
[–60,–31]	103	–28.540	–1.069	0.288
[–30,–1]	103	–39.223	–1.175	0.243
[–1,1]	**103**	**–3.994**	**–2.004**	**0.048**
[1,10]	103	7.064	0.923	0.358

Note: the highlighting indicates a significant deviation from zero.
Source: author's compilation

In the event of a credit rating downgrade, the company's increased risk is reflected in rising CDS spreads even before the announcement: 31 days prior to the announcement, the change in spreads already deviates significantly from zero. By the day before the announcement, the value of the spreads continues to rise, and the change in spreads also differs significantly from zero during this period (*Table 5*). In the 90 days leading up to the announcement, CDS spreads widened by approximately 96.6 basis points. However, following the announcement, the spreads no longer widen. We interpret this as indicating that market participants are also taking note of the company's risky operations, which is reflected in the widening of CDS spreads; consequently, a change in the credit rating no longer comes as a surprise to market participants.

Table 5
Test results in the event of downgrades

	N	Mean	t	Sig. (2-tailed)
[–90,–61]	122	6.304	1.471	144
[–60,–31]	**122**	**22.376**	**2.000**	**0.048**
[–30,–1]	**122**	**67.966**	**1.866**	**0.065**
[–1,1]	122	13.400	1.181	0.240
[1,10]	122	–5.277	–0.652	0.515

Note: the highlighting indicates a significant deviation from zero.
Source: author's compilation (highlighted: significant deviation from zero).

Based on our findings, therefore, CDS spreads fully reflect the information contained in the rating change by day +1 at the latest. Market participants anticipate upgrades less effectively than downgrades; specifically, changes in spreads do not reflect an impending upgrade event, whereas for downgrades, spread values increase two months before the event.

Based on our findings, therefore, the market is actively monitoring companies' operations, but it tends to pick up on risky operations at an earlier stage. Given this, management cannot hide the company's risky operations from market participants; it is therefore advisable to maintain transparent and honest communication even in a crisis. Changes in CDS spreads should be regarded as an early warning system with regard to credit rating downgrades; by incorporating changes in spreads into credit risk models, more accurate models can be achieved. As regards credit rating upgrades, we found that the market does not perceive the company's operations as being less risky; consequently, it remains worthwhile for companies to make use of these often costly rating services.

6 SUMMARY

The spread on a company's credit default swap (CDS) represents the cost of protection against the company's default. The aim of this paper was to examine the extent to which participants in the credit default swap market anticipate Standard & Poor's credit rating announcements, and to analyse how quickly CDS spreads react to such announcements in the case of companies that are leaders in research and development. To investigate this, we selected 225 rating changes: 103 upgrades and 122 downgrades. We calculated the change in the spread for the time interval $[n_1, n_2]$, which is the difference between the spread on day n_2 and the spread on day n_1. If the spread value was not available for a particular day, we used the last

available adjacent spread. We examined whether the average change in the spread relating to the rating event is significantly greater than zero in the case of downgrades. In the case of upgrades, we examined whether the average change in the spread was significantly less than zero.

Our results show that the change in spreads differs significantly from zero on the first day following the announcement of a rating upgrade: CDS spreads fall by 4 basis points as a result of the improved rating. However, both before and after this period, the change in spreads can be considered zero. The market therefore either has no prior information about the improvement in the company's rating, or, if it does, it ignores this news. However, the impact of the rating upgrade is short-lived, as although spreads narrow on the day following the announcement, there is no further change thereafter, and the change in the value of the spreads can be considered zero.

In the event of a downgrade, the company's increased risk is already reflected in widening CDS spreads prior to the announcement: changes in spreads deviate significantly from zero as early as 31 days before the announcement. On the day before the announcement, spreads continue to widen, and the change in spreads during this period also deviates significantly from zero. The market therefore recognises the company's risky operations, which is reflected in the widening of CDS spreads. The news of the rating change did not come as a surprise to the market, as the average CDS spread did not widen further since the announcement.

Based on our findings, therefore, CDS spreads fully reflect the information contained in the rating change by day +1 at the latest. Market participants anticipate upgrades less effectively than downgrades; specifically, changes in spreads do not reflect an impending upgrade event, whereas for downgrades, spread values increase two months before the event.

Based on our findings, investors and lenders would be well advised to use the CDS market as a kind of early warning system to refine their credit risk forecasts. Given that, in the case of R&D-intensive companies, spreads can widen significantly as early as two months before a downgrade, it is advisable to treat CDS spreads as a leading indicator in risk management models, and waiting for the official, often delayed, reaction from credit rating agencies is not advisable. For corporate management, the key lesson from the research is that the market is quick to reflect rising risks; consequently, the effects of deteriorating financial indicators cannot be postponed until an official downgrade, making proactive and transparent market communication essential. At the same time, as the market does not typically incorporate upgrades in the price in advance, the positive ratings issued by credit rating agencies have retained their critical informational value. Although using a rating service is costly, it is worth the investment, as market participants do not pick up on positive developments relating to individual companies. For

companies, therefore, obtaining an official credit rating upgrade following a successful reorganisation or improved performance remains an essential means of reducing financing costs.

Our findings are consistent with those of Lehner and Neske (2006), who also found that market participants anticipate credit rating downgrades in advance. However, according to our research, CDS spreads no longer widen following the announcement. This can be explained by the fact that the market monitors more closely companies engaged in significant R&D activities due to the higher risks involved, and reacts more quickly and strongly to any operational inefficiencies than it does in the case of companies operating in other market segments.

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