Assessing the Impact of Credit Rating Announcements on CDS Market: An Event Study Approach

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Abstract

This research paper examines the efficiency and integration of information in Credit Default Swap (CDS) markets by analyzing their reactions to credit rating announcements, specifically upgrades and downgrades of S&P long-term issuer credit ratings. By following and testing the existing findings in the growing academic literature on this derivative market, the study evaluates whether CDS markets accurately reflect changes in credit risk through cumulative abnormal CDS spread changes (CASCs) and examines the asymmetric behavior of market participants toward positive and negative credit events. The findings indicate that credit rating upgrades generally produce smaller and often statistically insignificant CASCs, while credit rating downgrades exhibit anticipation effects, with statistically significant CASCs observed in the pre-event window. These findings challenge the premise of full efficiency in CDS markets, as abnormal market movements are observed throughout the timeline under study.

Overall, this research underscores the complexity of Credit Default Swap (CDS) markets as an alternative credit-sensitive market to more traditional ones, such as bond and stock markets. By analyzing their behavior in response to credit rating events, the results underline the importance of CDS markets in reflecting creditworthiness perceptions and pricing default risk, providing valuable insights for market participants.

Keywords: Impact, Credit Ranking, CDS Market.

Avaliação do impacto de Anúncios de Classificação de Crédito no mercado de CDS: Um Estudo de Eventos

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Sumário

Este artigo de investigação tem como objetivo analisar a eficiência e a integração de informação nos mercados de Credit Default Swap (CDS). Examina as suas reações a anúncios de alterações de classificação de crédito, mais especificamente, de melhorias e agravamentos de classificações de crédito a longo prazo da S&P. Tendo como base resultados da crescente literatura académica sobre este mercado de derivados, o estudo avalia se os mercados de CDS refletem com precisão as alterações de risco de crédito, através da observação de mudanças anormais cumulativas nos spreads do CDS (CASCs) e, examina o comportamento assimétrico dos participantes de mercado face a eventos de crédito positivos e negativos. Os resultados indicam que melhorias na classificação de crédito produzem, em geral, CASCs mais pequenos e, frequentemente, estatisticamente insignificantes, enquanto agravamentos na classificação de crédito exibem efeitos de antecipação, com CASCs estatisticamente significativos que podem ser observados na janela pré-evento. Estes resultados desafiam a premissa de eficiência nos mercados de CDS, visto observarem-se movimentos anormais no mercado ao longo do período analisado.

De uma forma geral, esta investigação destaca a complexidade dos mercados de Credit Default Swap (CDS) enquanto mercado alternativo sensível ao crédito, em contraste com os mercados mais tradicionais, como os de obrigações e ações. Ao analisar o seu comportamento em resposta a eventos de classificação de crédito, os resultados enfatizam a importância dos mercados de CDS na reflexão das perceções de solvência e na avaliação do risco de incumprimento, fornecendo informações valiosas para os participantes do mercado.

Palavras-chave: Impacto, Classificação de Crédito, Mercado CDS.

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1. Introduction

The effects of credit rating agencies have been a frequent subject of study among researchers due to their significant impact on financial markets. While much of the existing literature has focused on their influence on bonds and stocks, the emergence of derivatives markets, particularly Credit Default Swaps (CDS), has increasingly drawn the attention of academics. With the growing availability of CDS data, coupled with the prominent role CDSs played during the Great Financial Crisis and their unique characteristics, these instruments have proven to be highly effective for accurately measuring credit risk pricing. Norden and Weber (2004) were pioneers in this area, being among the first to explore how credit agency actions, such as upgrades and downgrades of credit ratings, affect this alternative credit-sensitive market, the CDS market. They developed an event study methodology that relies on a rating-class index, calculated using equally weighted daily CDS spread changes, to measure cumulative abnormal CDS spread changes (CASCs). Their groundbreaking work has served as a foundational framework for numerous subsequent studies in the field. Empirical findings have revealed that market reactions to credit events are often asymmetric depending on the nature of the event. Specifically, negative credit events (e.g., the downgrade of a credit rating) tend to present a more pronounced cumulative abnormal CDS spread change (CASC) compared to positive credit events (e.g., the upgrade of a credit rating). The nuances of these findings will be explored in greater detail later in the paper. This paper contributes to the growing body of research on the CDS market by replicating and testing established findings regarding its response to credit rating changes. Using S&P's announcements of long-term issuer credit ratings for a global market portfolio, this study applies the standardized event study methodology developed by Norden and Weber (2004) to analyze how CDS spreads react to upgrades and downgrades in these credit ratings. By doing so, this paper seeks to provide further evidence on the asymmetric market response to credit rating actions and to deepen our understanding of how the CDS market, as a credit-sensitive market, differs from the more extensively studied bond and stock markets. It is in the interest of market participants to understand how different markets react to the same event (e.g., a credit event) in order to exploit or adapt to their differing performances. These insights, focused on the behavior of CDS markets, are particularly relevant for investors, portfolio managers, policymakers, and financial institutions, as they rely on accurate assessments of credit risk to inform decision-making, manage risk exposure, and design regulatory frameworks.

The remainder of the paper is organized as follows: Section 2 provides a literature review, including foundational insights into the CDS market (2.1), the role of credit rating agencies (2.2), and the evolution of academic findings on these topics (2.3); Section 3 outlines the hypotheses that will be tested; Section 4 describes the data selection process (4.1) and empirical methodology (4.2); Section 5 presents the empirical results; Section 6 discusses limitations; and finally, Section 7 concludes the paper.

2. Literature Review

2.1. Foundational understanding of Credit Default Swaps

Before delving into the details of the research question, it is essential to establish a foundational understanding of the key variables that will be the focus of this study. In this subsection, the economic role of Credit Default Swaps (CDS) will be explored, providing the necessary context for the subsequent analysis.

A Credit Default Swap (CDS) is a type of derivative instrument designed to hedge against counterparty default risk. It involves two parties- the buyer and the seller- who agree to transfer the credit risk of a reference entity (e.g. a corporation or government) from the buyer to the seller. In this contract, the buyer agrees to pay a fixed income (premium) on a constant basis over the life of the contract, while the seller prompts to repay the notion amount of the swap (either the face value of the reference entity's debt or a cash settlement) in case a credit event occurs (e.g. default or bankruptcy). Commonly, the contracts have a maturity of 5 years, and if no credit event occurs, the contract terminates at maturity. As Kiesel, Kolaric, and Schiereck (2016) mentioned, the CDS market is still a comparatively unregulated over-the-counter (OTC) market compared to other credit risk-sensitive markets, such as the Stock and Bond markets. The OTC market is composed of financial instruments (e.g. CDS, derivatives, unlisted stocks/bonds) that are traded in customized contracts between parties. This market is characterized as a decentralized system, where trades are conducted outside of centralized exchanges (e.g. NYSE, NASDAQ) and rely on a broker-dealer network. It also presents to be a less regulated and less transparent market, allowing participants the possibility to trade securities that, under normal conditions, would not be exchanged and customize to the needs of the parties involved, with trade details typically not disclosed publicly. This flexible and opaque market is dominated by large institutional investors, such as banks, insurance firms, and hedge funds, due to the complex and specialized knowledge required for this environment.

Considering the features mentioned above, it's possible to infer that the agents that trade in this market possess informational advantages due to their market dominance, expertise and private networks, making it a preferred channel for informed trading.

When examining the practical application of Credit Default Swaps (CDS), it is possible to verify that there is a tight relationship between credit risk (default likelihood of a counterparty) and the direction and magnitude of changes in CDS spreads in accordance with that. Tendentially, the higher the risk, the greater the buyer's exposure to potential negative credit events. As a result, buyers demand higher CDS spreads to mitigate the financial impact of such events. The opposite scenario also verifies, the lower the risk, the lower buyers' requirements in terms of the CDS spreads. This concept can be explained through the relationship between credit ratings and CDS spreads. As further explored in subsection 2.2, credit ratings are closely tied to the concept of credit risk, serving as a benchmark that shapes market participants' perception of the probability of default of the reference entity. Therefore, a credit rating in the investment-grade category reflects better creditworthiness compared to a speculative-grade rating. This perception of creditworthiness can be seen in the level of the CDS spread traded. As generally observed, the higher the credit rating (e.g., AA), the lower the CDS spread, whereas the lower the credit rating (e.g., BB), the higher the CDS spread. This idea will be further explored throughout the research paper.

In articles related to this topic (Bolton & Oehmke, 2011; Kiesel, Kolaric, & Schiereck, 2016), two extreme scenarios are often highlighted, emphasizing the significant impact and magnitude of the strong correlation between these two concepts (CDS market and Credit risk) in times of financial distress. In an ultimate scenario, the concept of "Empty Creditor" can arise, where financial distress may lead to a shift in the dynamic between the debtor and creditor in relation to the performance of the reference entity for which credit insurance was secured through CDS. Typically, lenders have the flexibility to determine their level of credit protection and tendentially tend to over-insurance. This credit over-insurance induces a shift in the bargaining power from debtors to creditors. As the creditor no longer has an interest in the debtor's efficient operation, they may push the debtor into inefficient bankruptcy or liquidation to trigger the CDS payments. Hu and Black (2008) effectively capture the concept under study: "Even a creditor with zero, rather than negative, economic ownership may want to push a company into bankruptcy because the bankruptcy filing will trigger a contractual payoff on its credit default swap position.", in which reinforces the idea of how Credit Default Swaps (CDS) can misalign the incentives of creditors during financial distress. Another commonly discussed

concept, aligned with negative Credit Events, is the scenario of "Downward spiral". While this concept can cover all credit markets, the primary focus will be on derivatives markets, as this aligns with the research question. Usually, when a negative credit event occurs (e.g. a credit rating downgrade), firms find it harder to refinance their debt and encounter higher refinancing costs. To add to this, investors' perceptions of increased risk are often reflected in higher requests of CDS spread. This, in turn, can delve into a negative snowball effect, where higher CDS spreads lead to even higher refinancing costs, further increasing financial pressure and potentially resulting in the firm's insolvency or default.

Having established the relationship between these two variables, it is now important to clarify why Credit Default Swap (CDS) spreads presents the best features to accurately determine the issuer's probability of default in comparison to other asset classes. This distinction arises from several key features that set CDS spreads apart from stocks and bonds, as briefly mentioned in Andres, Betzer and Doumet (2021) paper. Unlike stocks, whose performance depends heavily on the firm's performance, market sentiment, industry trends, and external events, and bonds, whose spreads are highly sensitive to credit risk, interest rate movements, liquidity conditions, and overall market dynamics, CDS spreads provide a pure measure of credit risk as they resemble an insurance contract directly tied to the issuer's probability of default. Another advantage of CDS as a reliable tool for measuring credit risk is the high standardization of their contracts, which are commonly defined with a 5-year maturity and typically involve issuing only one CDS per firm tied to a specific credit event. This standardization simplifies the analysis making it easier to compare and isolate the credit risk. In contrast, bond spreads vary widely due to differences in maturities, coupon rates, issuer creditworthiness, among other characteristics. This heterogeneity makes it harder to aggregate or compare credit risks. Stocks face a similar challenge, as they are even less standardized than bonds, being tied primarily to ownership in a firm rather than to a specific contractual obligation. Lastly, Credit Default Swaps (CDS) also stands out as a significantly more liquid asset, in comparison to the other two financial instruments. This feature allows them to be much more accurate in time and adjustable to the real-time market perceptions of credit risk in the moment of price disclosure, something that is not as immediate or consistent with bonds or stocks. It is in the interest of market participants to understand how different markets react to the same event (e.g., a Credit event) and try to exploit conform their performances. In this context, CDS stands out as one of the most widely used derivatives, offering unique characteristics, as mentioned above, that provide valuable insights that can be beneficial for

bondholders and shareholders, as the default risk of a firm plays an important role in the valuation of a firm's equity as well as its debt.

To conclude, it is vital to emphasize the exponential growth of Credit Default Swaps (CDS), recognized as one of the most successful financial innovations, in the category of derivative instruments. Primarily launched in the early 1990s, CDS experienced rapid growth and developed an important role during the Great Financial Crisis of 2007-2009, reaching a notional amount of $61.2 trillion by the end of 2007, according to the Bank for International Settlements. However, the size of the market and the role it played in the financial crisis raised concerns among regulators and participants involved. Since then, the CDS market has undergone a series of important changes - such as contract standardization, expansion of reporting requirements, stricter margin rules, among others- that reshaped the functionality of the market. It's possible to observe the significant impact of these regulations on the CDS market, which now reports a lower notional value of $38.7 trillion (ISDA), nearly half of its peak during the financial crisis. Nevertheless, it's important to highlight that CDSs themselves were not the root cause of the crisis. As Zhang, G., & Zhang, S. (2011) mentioned, "The CDS contract per se should not be blamed for the financial crisis. The major problem for large financial institutions was that they underestimated the risk exposure of operating in the CDS market where illiquidity, counterparty risk, and systemic risks could be substantial".

2.2. Role and Functioning of Credit Rating Agencies in the CDS Market

Data on Credit Default Swaps (CDS) became widely accessible to the public on major platforms (e.g., Bloomberg, Refinitiv Datastream) only about two decades ago, unlike more established asset classes such as bonds and stocks. This relatively recent availability has drawn the attention among researchers, who aimed to fill this gap in literature and explored areas where the CDS market could be particularly sensitive.

As previously noted, Credit Default Swaps (CDSs) have unique characteristics that make them an effective asset for accurately pricing credit risk. They serve as a reliable instrument for assessing market perceptions of the reference entity's creditworthiness. These perceptions are strongly influenced by the actions of credit rating agencies, as their announcements serve as a measurable benchmark that shape the market's assessment of the entity's credit risk. Consequently, these actions (e.g. upgrade or downgrade of credit rating; placement on credit watch) have a direct impact on the value of CDSs, as they reflect the

counterparty's likelihood of default. Given the strong correlation between market participants creditworthiness perception and credit rating announcements, it's essential to explore the role of credit rating agencies in capital markets. Nowadays, the leading providers of independent credit ratings are S&P, Moody's, and Fitch. For the purposes of this research, we will focus on the announcements made by S&P regarding upgrades and downgrades of corporate firms' credit ratings in a CDS Global Market portfolio.

It's widely known the added value of credit rating agencies to capital markets. These institutions possess major sources of financial information and significantly contribute to reduce the information asymmetry among market participants. Credit rating agencies provide informed opinions on the ability and willingness of an issuer (e.g. corporation, government) to meet its financial obligations fully and on time. The impact of credit rating announcements can be observed on two fronts: first, on the entity being evaluated, and second, on the agents (e.g. investors) who receive, act on, and exploit this information. Regarding the first, it is possible to verify that credit ratings are more than just a passive reflection of an entity's creditworthiness. They actively shape the financial and strategic decisions of the entity that is being evaluated, according to the announcement made (e.g. positive or negative credit event). This can impact the access to capital (as the process of issuing and purchasing debt may be either facilitated or difficulted depending on the "sign" of the announcement), the cost of borrowing (higher-rated entities benefit from lower interest rates, while lower-rated entities face higher borrowing costs), market perception (mold the entity's reputation and financial standing), and even internal decisions, among other factors. In terms of the impact on the second party involved, the investor, it is important to highlight how rating announcements are made and how they may influence the investor's attitude. Credit rating announcements are based on available current and historical information, complemented with an assessment of potential foreseeable future events that forecasts the ups and downs of market or industry cycles for the referenced entity. This perception of the entity's ability to meet its financial obligations may be of valuable interest to investors planning to make investments (whether long or short-term). However, it is crucial to note that credit rating announcements represent a perception of credit quality, not an absolute reality (ratings rely on projections of future events, which cannot be predicted with certainty, and are therefore inherently uncertain). As a result, there is always a margin of error in assigning a rating, and different agencies may assign varying ratings to the same entity. This is because credit rating evaluation is not an exact science. Thus, while credit ratings provide valuable insights, they should not be viewed as an investment merit, nor as the only factor to

consider in an investment decision. As S&P states: “The ratings are not buy, sell, or hold recommendations, nor a measure of asset value. Nor are they intended to signal the suitability of an investment.”

In addition to the reliability of the announcements, the timing of credit rating announcements in relation to market developments is also questioned. Credit rating agencies are often asked how promptly they act based on what is already known or unknown to market participants. Agencies are known to possess private information and expertise that enable them to evaluate creditworthiness with greater accuracy. However, the critical question is whether their announcements genuinely provide new information or simply confirm what the market has already anticipated. Norden and Weber (2004) highlight this concern, putting in question the efficiency of the CDS market, stating: “If credit ratings convey new information to the market, prices should react after a rating event. On the other hand, it might be possible that credit ratings only reflect information that is already known by the market, which would imply that prices do not react to the rating event at all.” Many adopt a conservative view, assuming that rating agencies are normally alleged to follow financial markets rather than lead them. Galil and Soffer (2011) supports this idea, explaining: “The criteria used by rating agencies to make changes in ratings are quite stringent, and rating agencies often seem to react to new developments slowly, leading to allegations that ratings do not provide any new information. In response, rating agencies have argued that their criteria not only aim for appropriate timing but also for stability, so that ratings are only changed when a reversal of the change is unlikely”. The concept of market efficiency is going to be further developed in section 3, with a set of hypotheses examining the performance of CDS markets in response to the actions of credit rating agencies. Nevertheless, it is important to reaffirm that rating agencies remain major sources of financial information and that are widely useful in portfolio management, asset pricing, and risk management.

2.3. Evolution of Research: Event Studies on Credit Rating Announcements in the CDS Market

Intellectuals have developed a vast literature examining the impact of rating events on financial markets. This body of research has primarily focused on examining market reactions to rating announcements for firms listed on the stock and bond markets. Over the years, it has become a widely conducted empirical study in the field of corporate finance, yielding numerous solid conclusions regarding the impact of rating announcements on these two credit-sensitive

markets, bond and stock markets. However, the literature addressing this topic in the derivatives market, particularly CDSs, had remained underdeveloped. With the increasing availability of CDS data, the prominent role of CDSs during the Great Financial Crisis, and their close relationship with credit risk pricing, researchers' attention was drawn to the promising characteristics that seemed highly suitable for such analyses. Hull et al. (2004) and Norden and Weber (2004) were pioneers in this area, being among the first to explore this topic, focusing on the CDS market. Their groundbreaking work has served as a foundation for numerous subsequent studies in the field. The skepticism surrounding the impact of credit agency announcements in the derivatives market has driven numerous studies, and the volume of research on this topic emphasizes the challenge in reaching definitive conclusions.

Table 1 provides a brief summary of the evolution of event studies on the impact of rating events on the CDS markets, highlighting the nuances in the methods used and the new findings over the years. As shown, these studies are relatively recent compared to similar research on the other two credit-sensitive markets, which have a track record dating back to the 1970s. This aligns with the idea that CDS spreads are a much more recent asset class, that gained significant attention after the 2008 financial crisis.

Table 1: CDS Event Studies in the literature (simplified table)

Study author, year	Benchmark model	Test statistics	Time period
Hull et al. (2004)	Index based on average CDS spread in rating category	Bootstrapped T-test	Oct.1998-May.2002
Mieu, Remolona, and Wooldridge (2004)	Index based on average CDS spread in rating category	T-test, sign test	Jan.2001-Dec.2003
Norden and Weber (2004)	Index based on average CDS spreads in rating category	Wilcoxom sign (rank) test	Jul.1998-Dec.2002
Jorion and Zhang (2007)	Rating-adjusted CDS spread	T-test	Jan.2003-Dec.2004
Galil and Soffer (2011)	Index based on average CDS spread in rating category	T-test, Wilcoxom sign (rank) test	Jan.2002-Jun.2006
Dittman, Norden, Zhu (2012)	Index based on average CDS spread in rating category	T-test, sign test, Wilcoxom sign (rank) test	2001-2010

Imbierowics and Wahrenburg (2013)	Index based on CDS spread in rating category	T-test, Wilcoxom sign (rank) test	Jan.2001-Dec.2007
Bertoni and Lugo (2014)	Equally weighted index based on CDS spread in the same rating category	Bootstrapped T-test, Wilcoxom sign (rank) test	Jan.2003-Dec.2010
Wegner, Burghof and Schneider (2015)	Index based on equally-weighted CDS spread changes in rating class	Wilcoxom sign (rank) test	Apr.2004-Feb.2011
Kiesel, Kolaric and Schiereck (2016)	Index based on CDS spread changes in rating category	T-test, Wilcoxom sign (rank) test	Jan.2010-Dec.2013
Norden (2017)	Equally weighted index based on 5-year senior unsecured mid CDS spread	T-test, Wilcoxom sign (rank) test	2000-2006
Amiri-Moghadam, Javadi and Rastad (2021)	Rating-adjusted CDS spread	T-test (not clearly stated)	Jan.2001-Dec.2011

Note: This table is based on Table 1 from Andre, Betzer, and Doumet (2021). It summarizes key academic findings on this topic but does not include all relevant studies.

Highlighting the main findings in this field, it is crucial to emphasize the pioneering work of Norden and Weber (2004), as one of the most mentioned studies in this area. They conducted an event study to examine whether CDS spreads presented abnormal returns in response to credit rating announcements (e.g. changes in rating outlooks and actual rating changes), issued by the three major credit rating agencies (S&P, Moody's, and Fitch). Additionally, within the same analytical framework, they compared these results with the potential abnormal returns in the stock markets and analyzed which credit-sensitive market exhibited more anticipatory reactions. Their findings revealed statistically significant abnormal pre-announcement performance in both markets, for rating downgrades and reviews for downgrades by all three agencies. They also concluded that the CDS market reacts first, exhibiting abnormal performance earlier than the stock market. While the stock market also showed abnormal returns before downgrades, its reaction lagged behind the CDS market. In contrast, for positive events, neither market displayed statistically significant reactions—before, during, or after the announcement—suggesting that positive events carry less informational value. However, more recent findings contradict these earlier conclusions. For instance, Wengner, Burghof, and Schneider (2014) provide evidence of significant cumulative abnormal CDS spreads changes (CASCs) around announcement dates for both downgrades and upgrades. Specifically, their study demonstrates that rating upgrades are associated with a statistically significant reduction in CDS spreads, consistent with findings from more recent

research. Overall, the results highlight an asymmetric market reaction conforms the direction of the event. A positive credit event (e.g., an upgrade) leads to a reduction in CDS spreads, whereas a negative credit event (e.g., a downgrade) causes an increase in spreads. This aligns with the majority of research on CDS markets, which suggests that both positive and negative rating changes carry new information, although their market impacts differ in magnitude and significance.

Moreover, the findings reveal that the market's response to sudden credit events (CEs) differs depending on a firm's credit risk, measured by credit rating agencies. Specifically, firms with higher investment-grade ratings should present lower cumulative abnormal CDS spreads (CASC) compared to those with lower investment-grade ratings. Additionally, a more significant difference in CASC is expected between firms classified as investment-grade and those classified as speculative-grade. As highlighted by Kiesel, Kolaric, and Schiereck (2016), and other researchers, separating credit events by rating class yields more accurate results, as lower-rated firms tend to exhibit the most substantial spread changes on average. Without this separation, the lowest rating class could jeopardize or contaminate the results of the entire sample in study.

It is also important to note the non-use of standard statistical methods, such as t-tests and other common parametric tests, that are typically applied in traditional event studies on stock and bond markets. Instead, most of the studies mentioned in this research relied their statistics and conclusions on non-parametric tests, (Wilcoxon signed-rank test). Andres, Betzer and Doumet (2021) were the first to question the suitability of parametric tests for research in the derivatives market. They had the purpose to help researchers make a more informed decision regarding methodological choices in CDS event studies. While measuring the impact of events on stock prices is one of the most widely used empirical techniques in corporate finance - and it has been demonstrated that, under many conditions, the market model and standard parametric tests are appropriate for such contexts - the literature on CDS event studies was relatively scarce, and so it was the statistical knowledge associated with them. In their paper, they evaluated the performance of different methods used to detect abnormal changes in CDS spreads. Their descriptive results revealed that the distributional properties of the CDS dataset deviate from normality, exhibiting high positive skewness and excess kurtosis. As a result, using parametric test statistics in CDS event studies may lead to biased inferences and an increased likelihood of Type I errors, where the null hypothesis of no abnormal CDS spread change is falsely rejected despite being true. They conclude that only the non-parametric rank test is

properly specified for assessing the size of the tests. Considering this, we will follow their approach by using the Wilcoxon signed-rank test to infer our results, as our sample (CDS spread data), even in its preliminary stages, already exhibited a non-normal distribution. This topic will be further explored in Section 4.2.

3. Hypotheses development

Considering the findings and patterns outlined above, the purpose of this research paper is to replicate and extend the methods used in previous studies. It aims to examine whether the results are in conformance with the existing literature that has been consolidating around the market reaction to credit announcements in derivatives markets. For instance, this paper is an extension of the Efficient Market Hypothesis (Fama, 1970) to the context of CDS markets. Relying on the papers of Norden and Weber (2004), Galil and Soffer (2011), Wengner, Burghof, and Schneider (2014), Kiesel, Kolaric, and Schiereck (2016), and Andres, Betzer, and Doumet (2021) as examples, four hypotheses were formulated that are going to be further examined in detail in Section 5.

The first hypothesis aims to evaluate the overall efficiency and information integration of the Credit Default Swaps (CDS) market in response to credit rating announcements, such as upgrades or downgrades. By analyzing CDS spread behavior before, during, and after the event, we can infer how quickly and accurately the CDS market incorporates changes regarding credit risk information. Therefore, the first hypothesis under study is:

Hypothesis 1: The CDS market efficiently incorporates information from credit rating announcements, with no significant changes in CDS spreads.

Understanding the efficiency of the CDS market provides insights into its role in pricing credit risk and its reliance on external credit rating announcements. This is critical for investors, regulators, and policymakers evaluating the market's transparency and integration.

The second hypothesis challenges the prevailing findings in the literature regarding market reactions to credit rating events. As previously discussed, studies have shown that negative credit events, such as credit rating downgrades, are typically associated with significant cumulative abnormal CDS spreads changes (CASC). Conversely, positive credit events, such as upgrades, often have minimal or no significant effect on CDS spreads. This pattern suggests that downgrades are perceived as unexpected information, while upgrades tend to confirm information that is already priced into the market.

Hypothesis 2: The magnitude of abnormal CDS spread changes is greater for downgrades than for upgrades.

This hypothesis tests the theory proposed by Ederington and Goh (1998), who argued that positive news is often released by the firm itself, while negative news is typically disclosed externally. As a result, credit downgrades represent new and unanticipated information that has not yet reached the market, whereas the small effects of upgrades confirm that information was already reflected in market prices. This distinction may help explain why downgrades tend to have a more pronounced impact on CDS spreads than upgrades.

Building on the reasoning presented in Hypothesis 2, which examines how markets react to unexpected versus expected news based on the nature of the event, the third hypothesis aims to explore whether an anticipation effect is reflected in cumulative abnormal CDS spreads (CASC), depending on the sign of the event. Specifically, if hypothesis 2 holds to be true, it supports the idea that downgrades are often perceived as unexpected or not fully priced in by the market. As a result, market participants may respond with greater caution or exhibit more risk-averse behavior in anticipation of such events.

Hypothesis 3: CDS markets anticipate credit rating downgrades earlier than upgrades, resulting in significant CASCs before the announcement.

In this context, the concepts of Risk aversion and Uncertainty and Information Hypothesis (UIH) are particularly relevant, as they provide deeper insight into the results reflected by cumulative abnormal CDS spreads changes (CASC). These two concepts go beyond clear market signals about upcoming events, focusing instead on how market agents perceive and adjust their behavior in response to anticipated positive or negative events. The influence of these factors will be further analyzed once the results are available.

Lastly, as previously discussed, it is crucial to analyze whether the magnitude of cumulative abnormal CDS spreads changes (CASC) is influenced by the credit rating class of the firm in question. This aspect is particularly important, as credit rating classes (e.g., investment-grade versus speculative-grade) are a key determinant of how CDS markets perceive and react to credit events. To explore this, a hypothesis has been formulated to test the relationship between the two.

Hypothesis 4: The magnitude of CASC differs depending on the firm's credit rating level.

The findings of this hypothesis are important for understanding whether market reactions to credit events are consistent across all credit rating classes or whether the creditworthiness of a firm amplifies or reduces the impact of such events on CDS spreads. It is expected that the results will align with existing findings, suggesting that the higher the credit rating class, the smaller the changes in CASC, and conversely, the lower the credit rating class, the more pronounced the CASC changes.

4. Description of the data set and methodology

4.1. Data selection and sample description

Before presenting the empirical results, this section aims to provide a detailed description of the data set used. It outlines the variables under study, describes the sample characteristics, and identifies the data sources. The purpose is to ensure transparency and clarity regarding the scope, quality, and representativeness of the data, while also enabling future research to expand on the work developed here.

To determine the precise sample for this study, the first step was to identify the firms that were referenced as underlying entities in the CDS market, since it is not a common practice for smaller firms to attract the interest of financial institutions (e.g., banks, hedge funds) in such contexts. Typically, firms with higher market capitalizations are generally preferred in the CDS market, as they often have larger financing needs, leading to the issuance of substantial volumes of corporate bonds. Consequently, the greater the debt a firm issue, the higher its potential credit risk exposure for bondholders, which increases demand for CDS as a hedge instrument and further enhances the liquidity and tradability of CDS contracts. Additionally, CDS markets rely heavily on credit information to accurately price contracts. Smaller firms, however, may lack credit ratings or have infrequent credit updates, introducing uncertainty and limiting the feasibility of trading CDS contracts referencing them. Considering this, the daily CDS spreads analyzed in this study were obtained from Datastream, focusing on contracts with a 5-year maturity denominated in U.S. dollars, with the data collected by sector. This resulted in a time series of daily CDS spreads for 113 firms across various sectors, covering the period from January 2008 (the starting point for CDS data availability in Datastream) to October, 2024. The sample is composed by the following sectors: Banks (4), Consumer Goods (8), Electric Power (10), Energy Companies (12), Gas Distribution (2), Manufacturing (28), Other Financial Services (24), and Services Companies (25). However, it is important to note the small sample

size and the discrepancy in values across sectors, which can be attributed to the limited availability of data for this variable in Datastream. This limitation, along with the alternative approach employed to address data scarcity and produce consolidated results, will be further explored and analyzed in detail later in this paper.

Table 2: Distribution of long-term credit ratings of the sample

Rating	Frequency	Percent	Cumulative
AAA	0	0.00	0.00
AA+	0	0.00	0.00
AA	2	1.77	1.77
AA-	5	4.42	6.19
A+	5	4.42	10.62
A	11	9.73	20.35
A-	17	15.04	35.40
BBB+	24	21.24	56.64
BBB	21	18.58	75.22
BBB-	6	5.31	80.53
BB+	4	3.54	84.07
BB	9	7.96	92.04
BB-	3	2.65	94.69
B+	2	1.77	96.46
B	0	0.00	96.46
CCC+	2	1.77	98.23
CC	1	0.88	99.12
D	1	0.88	100.00
Total	113	100.00	100.00

Table 3: Distribution of Upgrades and Downgrades

Year	Downgrade	Upgrade	Total
2008	3	1	4
2009	1	1	2
2010	0	2	2
2011	2	4	6
2013	1	4	5
2014	0	3	3
2015	6	2	8
2016	1	3	4
2017	5	2	7
2018	4	4	8
2019	7	4	11
2020	4	0	4
2021	6	6	12
2022	3	12	15
2023	5	4	9
2024	9	4	13
Total	57	56	113

Established the firms under study, and following the course of the research question, the next variable to consider is the Credit Event (CE), which will be further examined in terms of its impact on CDS markets. The paper relies on S&P credit events, more specifically the actual S&P long-term issuer credit rating (excluding rating outlooks or positions on CreditWatch), and the direction of the rating change on the announcement day, whether it was an upgrade or downgrade. Although the study covers an extended timeline (2008 to 2024), the analysis is limited to each firm's most recent credit event, examining the window of (-30;30) days surrounding that event. For instance, Consolidated Edison Inc experienced a credit event on March 25, 2008, with an announcement of a downgrade of the long-term credit rating to A-, which was reconfirmed on October 6, 2022. Similarly, ATI Inc had its most recent credit event on July 31, 2024, with an upgrade to BB- . This focus on the firms' most recent credit events explains the higher concentration of events in recent years, as few firms have maintained the

same credit rating from 2008 until present, as it is possible to verify in table 3. Ultimately, the paper examines 57 negative credit events, defined as announcements of credit rating downgrades, and 56 positive credit events, defined as announcements of credit rating upgrades, resulting in a total of 113 time-series of daily CDS spreads. The majority of these events are concentrated within the A/BBB rating classes (including the "+" and "-" modifiers), classified as investment grades, as shown in Table 2. Details of the sample can be found in Table A in the Appendix.

Conform it was mentioned in Section 2.3, the literature highlights for the asymmetric reaction of CDS spreads in relation to the sign of credit rating announcements. Specifically, for positive credit events, CDS spreads tend to decrease, while for negative credit events, they tend to increase, as the negative events often signal a deterioration in the creditworthiness of the reference entity. Taking this into account, table 4 presents a broad summary of simple statistics (frequency, mean, and standard deviation) that provide an initial understanding of the trends and direction of the future analyses that are going to be developed. Based on these preliminary statistics, computed using “raw data”, daily CDS spread changes around announcement dates, the results align with existing research findings. For instance, firms across various sectors that experienced an upgrade in their credit rating generally show a decrease in their daily CDS spread, as reflected by the predominance of negative values. Notably, the “Other Financials” sector displayed the strongest reaction to positive credit events, with a mean daily CDS spread change of -3.402 basis points around the announcement date. However, certain sectors deviate from this pattern, potentially due to their unique characteristics that influence their performance. These discrepancies, shown in Table 4 (Panel A), are not going to be explored, as they fall outside the scope of this paper. For negative credit events, the results follow a similar pattern: most industries exhibit a positive mean daily CDS spread change, reflecting the adverse impact of downgrades on creditworthiness. Among these, the “Consumer Goods” sector demonstrated the strongest reaction, with a mean change of +3.53 basis points. As with positive credit events, some sectors show outliers to the general trend, as highlighted in Panel B. These deviations underline the idea that industries may react differently to the same event due to their distinct features. For instance, the Energy Companies sector shows unusual results for negative credit events, which may likely be influenced by the insolvency of one firm within the sample. Despite these variations, examining the mean daily CDS spread changes around announcement dates provides valuable insights into the market's response to credit rating events. Overall, the results align with expectations and set a promising foundation for more sophisticated methodologies

to be applied in subsequent analyses. However, while statistics are presented by industry, the analysis is limited by the small sample sizes and discrepancies in values across sectors, largely due to the scarcity of CDS data in Datastream. This limitation makes the current approach insufficient for robust conclusions. To address this, for the following analysis, the data was aggregated into a single, comprehensive portfolio representing a global market that encompasses a variety of industries. This aggregation ensures a more diverse and representative sample, enabling a broader and more reliable perspective on market trends and performance.

Table 4:Descriptive statistics of the daily mean CDS spreads changes

Industry	N	Change in Bps	Standard dev.
Panel A: Descriptive statistics at the announcement date of upgrades			
Consumer Goods	1	-1.380	0.000
Eletric Power	4	-0.007	0.050
Energy Companies	5	1.777	3.051
Gas Distribution	1	0.800	0.000
Manufactoring	15	-1.883	5.249
Other Financials	14	-3.402	6.344
Service Companies	15	-1.044	4.664
Banks	1	0.019	0.000
Total	**56**	**-1.357**	**4.734**
Panel B: Descriptive statistics at the announcement date of downgrades			
Consumer Goods	7	3.530	11.097
Eletric Power	6	-0.190	0.721
Energy Companies	7	-8.543	22.616
Gas Distribution	1	0.000	0.000
Manufactoring	13	1.300	7.142
Other Financials	10	0.161	0.313
Service Companies	10	0.590	3.642
Banks	3	-1.750	2.817
Total	**57**	**-0.677**	**10.292**

Note: This table provides descriptive statistics, including frequency, mean daily CDS spread changes (in basis points, Bps), and standard deviation, for CDS spread changes across industries surrounding the announcement date of upgrades (Panel A) and downgrades (Panel B).

4.2. Event study methodology

To measure the impact of a credit event in CDS markets, an event study methodology was applied to assess the efficiency of this derivative market. In fact, in an efficient CDS market, CDS spreads should not exhibit significant reactions to rating announcements, as this information would already be expected and integrated into market prices. However, as mentioned in Section 2.2, credit rating agencies possess privileged information that is largely unknown to the public. Therefore, a significant market reaction around the days of the credit

rating announcements (e.g. upgrade or downgrade of a credit rating) would be expected to be observed.

Unlike traditional event studies, which mostly focus on stock markets and have already been extensively explored in empirical research, this approach is tailored to CDS markets. Norden and Weber (2004), pioneers in this area, introduced a foundational model to specifically measure the abnormal CDS spread changes (ARCDS) around rating announcements that has since become a standard methodology widely adopted by researchers in the field. Following their approach, the abnormal CDS spread changes ($ARCDS_{i,t}$) for firm i at time point t was computed, by comparing the firm's CDS spread changes with its benchmark index. First, the CDS spread change from one day to the next ($CDS_{i,t} - CDS_{i,t-1}$) was computed for each firm. For the benchmark, a rating-class-based index was created conditional on the firm's rating class before and after the credit event. Therefore, two indexes were computed for each firm: one based on the old rating prior to the credit rating change ($RICDS_{i,o,t}$ for $t<0$), and another based on the new rating implemented on the day of the change ($t\geq 0$) and moving forward ($RICDS_{i,n,t}$). These indexes were determined using equally weighted CDS spread changes for all firms with the same S&P long-term credit rating as the firm in question, excluding the firm under study to avoid contaminating the results. The model can be seen below:

$$ARCDS_{i,t} = \begin{cases} (CDS_{i,t} - CDS_{i,t-1}) - (RICDS_{i,o,t} - RICDS_{i,o,t-1}) \text{ for } t < \text{date of the rating change} \\ (CDS_{i,t} - CDS_{i,t-1}) - (RICDS_{i,n,t} - RICDS_{i,n,t-1}) \text{ for } t \geq \text{date of the rating change} \end{cases}$$

To examine the market reaction to a credit event for a specific period, rather than just a single day (which $ARCDS_{i,t}$ captures), Cumulative abnormal CDS spread changes (CASC) were calculated, by adding the daily $ARCDS_{i,t}$ over a certain time period. The CASC from time point t_1 to t_2 is calculated as:

$$CASC_{i,t1,t2} = \sum ARCDS_{i,t}$$

For the purpose of the analysis, different time windows for the CASC (cumulative abnormal CDS spread changes) were defined to assess the market reaction to the credit event in question (such as a downgrade or upgrade of the credit rating), before, during and after the event, being the day of the event established as day zero (t=0). Therefore, the pre-event

windows (-30; -16) and (-15; -1) were designed to measure the long and short-term market reactions before the announcement day. These windows capture the market behavior leading up to the event and account for any anticipatory effects or information leakage. The event window (0) was used to measure the immediate reaction of the CDS spread change during the event day, focusing on how the market responds to the event as it unfolds. Lastly, the post-event windows (1; 5), (5; 15), and (16; 30) were used to examine both the short-term and long-term market reactions following the credit event, capturing the immediate response as well as the longer-term market adjustment.

As previously mentioned in Section 2.3, the sample of abnormal CDS spread changes (ASCS) and consequently, cumulative abnormal CDS spread changes (CASC) does not follow a normal distribution. Therefore, following the recommendation of Andres, Betzer, and Doumet (2021), as well as the approach taken by most researchers in this field, the Wilcoxon signed-rank test was employed to determine whether the CASC data are significantly different from zero. This non-parametric test evaluates whether the difference between the medians of two related samples are statistically significant different from zero. In the context of this research, the Wilcoxon signed-rank test assesses whether the median daily CDS spread change of the firm in question is statistically different from the median daily CDS spread change of its benchmark during the event window. If a significant difference is observed, it would indicate that the credit event had an abnormal impact on the firm's CDS spreads compared to the benchmark. The results will be presented in the next section.

5. Empirical results

The event study methodology implemented in this research paper replicates the method that has been widely used in this field since it was introduced by Norden and Weber (2004). In fact, as mentioned in section 2.3., the skepticism surrounding the impact of credit agency announcements in the derivatives market has driven numerous studies. The extensive volume of research on this topic emphasizes that there are still gaps in this field requiring deeper investigation. The purpose of this study is to assess whether the research findings are in conformance with what the literature has been confirming until present or, if due to the limitations of the sample (a topic that is discussed in more detail in Section 6), the results deviate from the typical outcomes and if so, it is important to understand why.

Ultimately, the research paper aims to infer the efficiency and integration of information in CDS markets by analyzing their behavior in response to credit agency announcements, specifically focusing on upgrades and downgrades of S&P long-term issuer credit ratings. This analysis relies on the Efficient Market Hypothesis (EMH) concept, which states that asset prices should quickly and accurately reflect all available information at any given time. Consequently, market participants should not be able to "beat the market," and no abnormal returns should occur. Extending this concept to CDS markets, and in line with the earlier discussion, CDS markets should fully reflect all available information at any given moment. Consequently, CDS spreads should accurately reflect the creditworthiness of the reference entity based solely on the information known to the market, without influence from any other factors. As a result, there should be no opportunity for abnormal returns based on public information, and market performance should not exhibit deviations that indicate inefficiency, whether before, during, or after significant market events. This paper puts this principle to the test, as articulated in Hypothesis 1, by examining whether the unique characteristics of CDS markets and the role of credit agencies contribute to the presence of cumulative abnormal CDS spread changes (CASCs). For instance, as highlighted in Section 2.1, CDS markets operate in over-the-counter (OTC) environments, which are typically less regulated and less transparent. This lack of transparency may allow certain market participants to possess informational advantages that are not accessible to all. Furthermore, as discussed in Section 2.2, researchers question the role of credit agencies, specifically whether they lead financial markets, as they possess information that is not accessible to market participants, or merely follow market trends. These ideas are broadly addressed in Hypothesis 1 and explored in greater detail through Hypotheses 2, 3, and 4, which examine the nuances of the topic under investigation.

Table 5: Changes in CDS spreads prior to and following positive and negative credit events

	[-30;-16]	[-15;-1]	[0]	[1;5]	[5;15]	[16;30]
Panel A: Total Sample (Positive Credit Events)						
N	55	55	31	39	39	39
CASC median	-0.366	0.219	0.001	-0.153	-0.233	1.278
Negative %	52.727	47.272	64.516	53.846	51.282	38.462
p-value rank test	0.552	0.315	0.115	0.845	0.676	0.072*
p-value sign test	0.394	0.705	0.040*	0.375	0.500	0.946
Panel B: Total Sample (Negative Credit Events)						
N	56	56	40	47	47	46
CASC median	0.541	0.185	0.000	0.110	0.055	0.221
Negative %	60.714	57.143	50.000	59.574	51.064	58.696
p-value rank test	0.091*	0.504	0.697	0.299	0.657	0.435
p-value sign test	0.070*	0.175	0.563	0.122	0.500	0.151

Note: The p-value for the rank test is more powerful for detecting deviations from zero, as it incorporates both magnitude and rank information, compared to the p-value for the sign test.

For this, the paper relies on the results presented in Table 5, which displays the median Cumulative Abnormal CDS Spread Change (CASC median) for the six windows under study, with the event window defined as day 0. To assess the statistical significance of this variable in relation to the Credit Event (Upgrade/Downgrade of Credit Rating), the Wilcoxon signed-rank test was employed. The null hypothesis for this test is defined as CASC median = 0, with a significance level set at 10%. Additionally, due to the small sample sizes within sectors and the significant discrepancies in values between them, largely due to the limited availability of CDS data in Datastream, the analysis was conducted using a global market portfolio. This portfolio aggregates CDS spreads across sectors, providing a more diverse and representative sample. While this approach enhances the reliability of the analysis, the results should still be interpreted with caution, as the sample still does not meet the ideal parameters. This limitation will be addressed in greater detail in Section 6.

Panel A presents the statistical results of credit rating upgrades for the global market portfolio under study. As discussed in Section 2.1, CDS spreads exhibit an asymmetric reaction depending on the sign of the credit event. In the case of a positive credit event, such as a rating upgrade, CDS spreads are expected to decrease, as buyers perceive the upgrade as an improvement in the creditworthiness of the reference entity. As a result, buyers require a lower spread. This expectation is evident by the negative CASC median values observed in half of the time windows analyzed. The negative sign indicates that the median daily CDS spread change for the firm is lower than the median daily CDS spread change of the benchmark, reflecting the impact of a credit rating upgrade. Although most of the results are statistically insignificant, which strongly aligns with the majority of the existing literature, there are observable trends throughout the timeline. Specifically, CDS market exhibit this behavior during the long-term pre-event period and the short-term post-event period. For instance, in the five days following the event, the CASC median for the global market portfolio decreased by 0.153 basis points, indicating that market participants perceived this positive credit event as a reduction in credit risk for the entities involved. However, some statistically insignificant positive CASC median values are also observed in the short-term pre-event window (−15; −1) and on the event day (0). Moreover, a statistically significant positive CASC median (p-value rank test = 0.072 ≤ 0.1) is recorded in the long-term post-event window. These heterogeneous results likely reflect market participants' ongoing adjustments and reassessments of the credit event over time. During a credit rating upgrade, participants may react initially based on the information and expectations available at the time of the event. However, as additional information emerges or

as the event's implications are gradually absorbed into market pricing, CDS spreads may either stabilize or continue to adjust. This process helps explain the variation in CASC values observed across different time windows. Overall, the findings align with the academic literature, which suggests that positive credit events generally result in smaller, often statistically insignificant CASCs.

For Panel B, the results focus on the reaction of the CDS global market portfolio to credit rating downgrades. In this context, it is expected to observe an increase in the CDS spread, as this event reflects an increase in the likelihood of default of the reference entity. As a result, the buyer demands a higher CDS spread to mitigate the financial impact of such events (e.g., default, bankruptcy). This pattern is reflected in the positive CASC median values observed across the entire timeline under study. The positive sign indicates that, in response to a negative credit event, the firm's median daily CDS spread change exceeds the median daily CDS spread change of the benchmark. Although most of the results are statistically insignificant, differing from the vast literature on this topic, the direction of the results aligns with theoretical expectations. Among all the event windows studied, the long-term pre-event window (-30; -16) shows a statistically significant result with a p-value rank test of 0.091 (significant at 10% level) and a CASC median of 0.541 basis points. This suggests that market participants anticipate an increase in credit risk, and as a result, the sample increases the CDS spreads in response to such an event.

Overall, based on the results presented, Hypothesis 1 can be rejected, as both panels exhibit statistically significant CASCs. These findings contradict the criteria outlined in Hypothesis 1, which state that market performance should not exhibit deviations that indicate inefficiency, whether before, during, or after significant market events. However, it is important to emphasize that, although this research aligns with the broader literature in rejecting the notion of efficiency in CDS markets, the significant CASCs observed in this study do not follow the typical patterns reported in most previous studies. Generally, significant CASCs are expected to occur mainly on the event day (t=0), and they tend to be more pronounced for credit downgrades than for upgrades, as the latter typically produce smaller effects that are often statistically insignificant. This idea, concerning the magnitude of changes in CDS spreads based on the nature of the credit event, is tested in Hypothesis 2. Several studies propose explanatory theories to justify the asymmetric market reaction depending on the type of credit event. For example, Ederington and Goh (1998) attribute this behavior to the fact that firms typically release positive news themselves, whereas negative news, such as downgrades, is often

disclosed by external agencies. Consequently, negative events (such as downgrades) introduce new information to the market that has not yet been incorporated, while positive events (such as upgrades) usually confirm information already reflected in market prices. Additionally, Dichev and Piotroski (2001) suggest that market participants may process negative news more strongly or with greater attention than positive news. Negative information can provoke more immediate and emotional reactions, potentially resulting in larger abnormal returns following negative events. However, the results do not provide sufficient evidence to support these statements. Based on the sample, there are not enough discrepancies between the impact of positive and negative events to conclude that CDS spread changes are consistently stronger for negative news than for positive news. In fact, it is possible to observe similar patterns between the two credit events. Although they present opposite signs in the CASC median, as expected, both credit events generally exhibit a small impact, often resulting in statistically insignificant CASCs. Therefore, the results from the research paper do not provide sufficient evidence to confirm Hypothesis 2. These findings challenge one of the most established conclusions in this field. These outliers will be further clarified in Section 6.

Building on the reasoning presented in Hypothesis 2, Hypothesis 3 takes this analysis a step further by not only identifying the clear signals and the different adjustments that the market presents as a reaction to the type of credit event but also by questioning the chronological appearance of significant CASCs. This analysis explores how CASCs may reflect the human behavior and market participants' perceptions to upcoming events. According to the results, the CDS global market portfolio exhibits a statistically significant CASC during the time window (-30 to -16) prior to a credit rating downgrade. This finding aligns with the research of Norden and Weber (2004), among other studies, which also report evidence of anticipated CASCs in response to upcoming negative events. This pattern invites further reflection and raises questions about the observed trend. Even though Hypothesis 2 was not confirmed, Ederington and Goh's (1998) theory can still serve as a foundation to help understand and clarify the interpretation of the results. Their theory adds robustness to the Uncertain Information Hypothesis (UIH), a modified version of the Efficient Market Hypothesis (EMH). The UIH suggests that market participants tend to exhibit more cautious or irrational behavior when faced with uncertain, ambiguous, or incomplete information. This view, along with Ederington and Goh's (1998) observation that negative credit events (such as credit rating downgrades) are often not fully disclosed and integrated into market expectations, helps explain the statistically significant CASC observed prior to the event. The rise in CDS

spreads in anticipation of a potential negative event likely reflects investors' more risk-averse and cautious posture, serving as a defensive response to the uncertainty and lack of clarity surrounding a possible negative outcome in CDS markets. This conclusion, however, does not extend to positive credit events, as these are generally more widely known to market participants and tend to attract less attention as a result. Furthermore, risk aversion is typically associated with negative outcomes rather than positive ones, which explains the absence of an anticipation effect in CASCs prior to positive events. Overall, the findings support the statement outlined in Hypothesis 3, which confirms that CDS spreads tend to anticipate credit rating downgrades earlier than upgrades.

Lastly, Hypothesis 4 aims to confirm the earlier expectation, briefly mentioned in Section 3, that credit events differ significantly across rating categories in terms of basis point (bps) changes. Previous studies have shown that lower-rated categories, such as speculative grades, tend to exhibit higher cumulative abnormal CDS spread changes (CASCs) compared to investment-grade firms for the same type of event. To test this hypothesis, the same methodology was applied. However, instead of analyzing a global market portfolio, the sample was divided into six rating categories (AA, A, BBB, BB, B, and a combined category for CCC, CC, and D). This approach was designed to identify potential contamination in the results, as certain rating classes might exhibit stronger CASCs than others, potentially influencing the results observed for the global CDS market portfolio. Based on Table B (provided in the appendix), the results do not appear to support Hypothesis 4 since there are almost no statistically significant CASCs observed for any rating class across any time window. This suggests that the global market portfolio results are unlikely to be biased by any particular rating class, providing therefore greater reliability to the earlier findings regarding the global market portfolio results. However, these results should be interpreted with caution, as they do not align with the established findings in this area. The poor results can be attributed to the small sample size, which limits the ability to conduct a proper analysis across rating classes. As shown in Table 2 in Section 4.1, there are very few observations for each rating class, and the values vary significantly. For instance, category B includes only have three firms, making it unfeasible to perform a reliable analysis. The same issue applies to the other rating classes. Therefore, these findings may not accurately reflect the reality under study. As such, it cannot be conclusively determined whether market reactions to credit events are consistent across all credit rating classes or whether a firm's creditworthiness amplifies or mitigates the impact of such events on CDS spreads.

Overall, the results align with certain aspects of the literature, confirming Hypotheses 1 and 3, while also providing insights that challenge some established conclusions. The study underscores the complexity of CDS market reactions to credit rating events, revealing nuances that suggest CDS markets may not always conform to traditional efficiency models. These findings highlight the need for further research to better understand these dynamics. Therefore, a more in-depth investigation, using larger and more representative datasets, could enhance our understanding of how credit events impact CDS markets, as discussed in more detail in Section 6.

6. Limitations

This research paper contributes to the existing literature on the CDS market's reaction to credit announcements. It tests established findings that have become standardized in this field, as formulated by the four hypotheses. However, it is important to note that the following approach has some limitations that may raise questions about the reliability and trustworthiness of the results, as some appeared to contradict established academic findings. Therefore, it is crucial to clarify the possible limitations that may explain these outcomes. The main limitation affecting the implemented methodology, which may explain the outlier results, is the small sample size on which the research is based. This constraint arises from the limited availability of CDS data in Datastream, which provided complete information for only 113 firms that met the necessary requirements to conduct the event study. This number of observations contrasts sharply with the significantly larger sample sizes typically used in academic studies in this field. As a result, it was not feasible to implement certain standard data-cleaning procedures (as this would have further reduced the already limited sample size), such as excluding rating announcements that were preceded or followed by another rating announcement within a specific time window. Implementing this procedure would have allowed the paper to more accurately capture the impact of each individual credit agency action under evaluation on CDS markets, as reflected in CASCs. This is particularly important since these actions are often preceded or followed by events such as S&P credit watches, outlooks, or rating changes from other credit agencies, or by the release of related information in the public media, among other factors. The absence of this procedure may explain why Hypothesis 2 was not confirmed and why negative credit events failed to produce statistically significant cumulative abnormal CDS spread changes (CASCs) on the event day, as this finding contrasts with one of the most

established results in this field. It is likely that the CASC measurements in this study were contaminated by simultaneous events, making it challenging to attribute the observed market reactions solely to the single, unanticipated credit agency action under investigation. As prior research has noted, it is also important to highlight that isolating a completely uncontaminated rating action is inherently difficult because such actions are often accompanied by other related developments, as noted earlier. Moreover, attempting to isolate a completely uncontaminated effect may lead to an underestimation of the market's response to rating announcements, as these are typically associated with a clustering effect. For instance, when a credit rating agency downgrades a company, the announcement rarely occurs in isolation. Instead, it is often intertwined with other related events that influence the market's perception of the company and the broader economic environment. Attempting to isolate only the effect of the credit rating announcement, without considering the impact of the clustered events, may lead to an underestimation of the true market response, as the downgrade often coincides with and contributes to broader market dynamics.

Additionally, the small sample size also affects the ability to draw robust conclusions regarding Hypothesis 4, which examines whether there are differences in CASC reactions across rating classes. As previously mentioned, this hypothesis requires a segmented analysis, and the small sample size limits the ability to implement it. Therefore, no reliable conclusions were inferred, as the proper conditions to test the hypothesis were not met.

In conclusion, while this study offers valuable insights into the CDS market's reaction to credit announcements, its findings must be interpreted cautiously due to the outlined limitations. Future research using more comprehensive datasets and refined methodologies could help overcome these limitations and provide a deeper understanding of the relationship between credit rating announcements and CDS market reactions, ultimately strengthening the overall knowledge in this field.

7. Conclusion

This research paper aimed to evaluate the efficiency and integration of information in Credit Default Swap (CDS) markets by examining their behavior in response to credit agency announcements, specifically focusing on upgrades and downgrades of S&P long-term issuer credit ratings. Despite limitations in the dataset, such as small sample sizes and sectoral discrepancies, the results offer valuable insights into the functioning of CDS markets. The

findings align with those of Norden and Weber (2004), among other studies, by reinforcing the idea of asymmetric reactions in the CDS market to credit rating actions. For instance, the CASC median values align overall with theoretical expectations, as upgrades predominantly show negative values, while downgrades display positive ones. This pattern reflects market participants' perception of the credit events under study, with negative values indicating an improvement in the reference entity's creditworthiness and positive values signaling a deterioration in its creditworthiness. Additionally, the results indicate that credit rating upgrades generally produce smaller and often statistically insignificant CASCs, while credit rating downgrades exhibit anticipation effects, with statistically significant CASCs observed in the pre-event window. This finding aligns with previous research, such as that of Ederington and Goh (1998), which suggests that negative events often introduce new and unexpected information to the market, leading to more pronounced reactions. Regarding the magnitude of CASCs in relation to the nature of the credit event and the rating class of the firm (as examined in Hypotheses 2 and 4), the outcomes must be interpreted with caution. The results do not provide sufficient evidence to confirm the patterns established in previous academic studies or support the hypotheses. However, overall, the findings support the rejection of the premise of efficiency in CDS markets, as statistically significant CASCs are observed throughout the timeline under study.

This research underscores the complexity of Credit Default Swap (CDS) markets as an alternative credit-sensitive market to more traditional ones, such as bond and stock markets. By analyzing their behavior in response to credit rating events, the results underline the importance of CDS markets in reflecting perceptions of creditworthiness and their role in pricing default risk. These insights are particularly valuable for investors, portfolio managers, policymakers, and financial institutions, as they depend on accurate credit risk assessments to guide decision-making, manage risk exposure, and develop effective regulatory frameworks. Future research that addresses the limitations outlined in Section 6, such as expanding the dataset and incorporating sector-specific analyses, could offer a more comprehensive understanding of CDS market dynamics and their responses to credit rating events. This would help refine current insights and further enhance the accuracy of credit risk assessment.

8.Appendix

Table A: Sample under study

Name of the firm	Credit rating	Rating Date	Credit Event
Avon Products Inc	D	13-Aug-2024	Downgrade
British American Tobacco plc	BBB+	23-Jan-2017	Downgrade
Conagra Brands Inc	BBB-	07-Jan-2019	Downgrade
Coca-Cola Co	A+	26-Apr-2018	Downgrade
Colgate-Palmolive Co	A+	19-Apr-2024	Downgrade
Campbell Soup Co	BBB-	07-Aug-2023	Downgrade
Altria Group Inc	BBB	20-Dec-2018	Downgrade
Constellation Brands Inc	BBB	27-Apr-2018	Upgrade
Ameren Corp	BBB+	04-Dec-2013	Upgrade
American Electric Power Company Inc	BBB+	04-Mar-2024	Downgrade
CMS Energy Corp	BBB+	03-Dec-2014	Upgrade
CenterPoint Energy Inc	BBB+	01-Feb-2019	Downgrade
Dominion Energy Inc	BBB+	01-Feb-2016	Downgrade
DPL Inc	BB	21-Dec-2022	Downgrade
DTE Energy Co	BBB+	09-Dec-2010	Upgrade
Duke Energy Carolinas LLC	BBB+	26-Jan-2021	Downgrade
Endesa SA	BBB	05-Dec-2023	Downgrade
Entergy Corp	BBB+	04-Aug-2016	Upgrade
Apache Corp	BB+	26-Mar-2020	Downgrade
Anadarko Petroleum Corp	BB+	25-Jan-2022	Upgrade
Baker Hughes Holdings LLC	A-	05-Dec-2017	Downgrade
Chesapeake Energy Corp	BB	24-Oct-2022	Upgrade
Canadian Natural Resources Ltd	BBB-	11-Feb-2021	Downgrade
Conocophillips	A-	11-Feb-2021	Downgrade
Centerpoint Energy Resources Corp	BBB+	01-Feb-2019	Downgrade
Chevron Corp	AA-	11-Feb-2021	Downgrade
Devon Energy Corp	BBB	20-Apr-2022	Upgrade
Enbridge Energy Partners LP	BBB+	08-Nov-2018	Upgrade
Enbridge Inc	BBB+	19-Jun-2015	Downgrade
EOG Resources Inc	A-	20-Jul-2018	Upgrade
ONEOK Inc	BBB	30-Jun-2017	Upgrade
Osaka Gas Co Ltd	AA-	28-Jan-2011	Downgrade
American Axle & Manufacturing Holdings Inc	BB-	24-Feb-2021	Upgrade
Cleveland-Cliffs Inc	BB-	14-Mar-2023	Upgrade
3M Co	BBB+	30-Aug-2023	Downgrade
Agilent Technologies Inc	BBB+	22-Dec-2011	Upgrade
Applied Materials Inc	A	09-Aug-2021	Upgrade
Assured Guaranty Ltd	A	18-Mar-2014	Upgrade
ATI Inc	BB-	31-Jul-2024	Upgrade
Autozone Inc	BBB	26-Jun-2008	Downgrade
Avery Dennison Corp	BBB	05-Dec-2008	Downgrade
Barrick Gold Corp	BBB+	29-Mar-2022	Upgrade
Beazer Homes USA Inc	B+	03-Aug-2023	Upgrade

BHP Group Ltd	A-	01-Jun-2022	Downgrade
Bombardier Inc	B+	04-Jun-2024	Upgrade
Borgwarner Inc	BBB	16-Jun-2020	Downgrade
Canon Inc	A	03-Aug-2020	Downgrade
Cabot Corp	BBB	09-Sep-2021	Upgrade
Cameco Corp	BBB-	01-Mar-2019	Downgrade
Celestica Inc	BB	21-Feb-2024	Upgrade
Commercial Metals Co	BB+	23-Nov-2011	Downgrade
Carpenter Technology Corp	BB	15-Feb-2023	Downgrade
Cisco Systems Inc	AA-	16-Dec-2013	Upgrade
Cintas Corp	A-	13-Feb-2019	Upgrade
EIDP Inc	A-	07-Oct-2015	Downgrade
Cummins Inc	A	01-Feb-2024	Downgrade
Danaher Corp	A-	14-Jun-2022	Upgrade
Dover Corp	BBB+	18-Dec-2017	Downgrade
Eastman Chemical Co	BBB	02-Apr-2021	Upgrade
Corning Inc	BBB+	27-Oct-2015	Downgrade
Aetna Inc	BBB	27-Nov-2018	Downgrade
Allianz SE	AA	23-Mar-2009	Upgrade
Amdocs Ltd	BBB	31-Mar-2008	Upgrade
American Honda Finance Corp	A-	20-May-2020	Downgrade
American International Group Inc	BBB+	31-Jan-2017	Downgrade
Anthem Holding Corp	A	01-May-2015	Upgrade
Aon Corp	A-	14-Jun-2016	Upgrade
Assured Guaranty Municipal Holdings Inc	A	18-Mar-2014	Upgrade
AvalonBay Communities Inc	A-	30-Apr-2015	Upgrade
AXA SA	A+	11-May-2022	Upgrade
Chubb Ltd	A	26-Oct-2015	Downgrade
Onemain Finance Corp	BB	17-Feb-2022	Upgrade
Prologis LP	A	02-Aug-2022	Upgrade
Brandywine Realty Trust	BB	16-Jan-2024	Downgrade
Boston Properties LP	BBB	11-Jan-2024	Downgrade
Cigna Holding Co	A-	19-Dec-2018	Upgrade
Colonial Realty LP	A-	24-Aug-2022	Upgrade
CNA Financial Corp	A-	15-Nov-2019	Upgrade
Camden Property Trust	A-	04-Feb-2019	Upgrade
DISH DBS Corp	CC	01-Oct-2024	Downgrade
Avangrid Inc	BBB+	22-Apr-2016	Upgrade
Consolidated Edison Inc	A-	25-Mar-2008	Downgrade
Equifax Inc	BBB	14-Mar-2019	Downgrade
Berkshire Hathaway Inc	AA	16-May-2013	Downgrade
Abbott Laboratories	AA-	09-Mar-2022	Upgrade
Amgen Inc	BBB+	12-Dec-2022	Downgrade
AutoNation Inc	BBB-	18-Jul-2011	Upgrade
Avis Budget Car Rental LLC	BB	26-Jan-2022	Upgrade
Baxter International Inc	BBB	16-Dec-2021	Downgrade

Becton Dickinson and Co	BBB	29-Dec-2017	Downgrade
Best Buy Co Inc	BBB+	20-May-2021	Upgrade
Boston Scientific Corp	BBB+	07-Dec-2022	Upgrade
Bristol-Myers Squibb Co	A	27-Dec-2023	Downgrade
Cardinal Health Inc	BBB	16-Dec-2019	Downgrade
Carlton Communications Ltd	BBB-	29-Mar-2013	Upgrade
Comcast Cable Communications LLC	A-	14-Feb-2013	Upgrade
Aramark Services Inc	BB	06-Jun-2023	Upgrade
Automatic Data Processing Inc	AA-	11-May-2021	Downgrade
Carnival Corp	BB	25-Jun-2024	Upgrade
Cox Enterprises Inc	BBB	04-Aug-2011	Upgrade
Costco Wholesale Corp	A+	16-Feb-2010	Upgrade
Cox Communications Inc	BBB	04-Aug-2011	Upgrade
CVS Health Corp	BBB	06-Mar-2018	Downgrade
Dillard's Inc	BB+	13-Apr-2023	Upgrade
Deluxe Corp	B-	29-Feb-2024	Downgrade
Darden Restaurants Inc	BBB	12-Oct-2021	Upgrade
Eastman Kodak Co	CCC+	21-Jun-2019	Upgrade
Eli Lilly and Co	A+	19-Feb-2019	Downgrade
iHeartCommunications Inc	CCC+	01-Mar-2024	Downgrade
American Express Co	BBB+	30-Apr-2009	Downgrade
Bank of America Corp	A-	22-Nov-2017	Upgrade
Bank of New York Mellon Corp	A	02-Dec-2015	Downgrade
Citigroup Inc	BBB+	02-Dec-2015	Downgrade

Table B: Changes in CDS spreads prior to and following positive and negative credit events, according to the credit rating class.

	[-30;-16]	[-15;-1]	[0]	[1;5]	[5;15]	[16;30]
Panel A: Positive Credit Events						
AA	0.595	-1.387	0.000	-0.300	0.022	-0.396
A	-0.119	-0.432	0.003	-0.159	0.214	0.180
BBB	-2.417*	0.116	0.005*	-0.065	-0.847	2.060
BB	0.309	21.985*	0.000	2.247	-25.625	93.960
B	-29.552	101.765	0.000	-1.947	42.427	10.120
CCC/CC/D	2795.480	6325.542	0.000	0.000	0.000	0.000
Panel B: Negative Credit Events						
AA	1.802	0.004	0.000	0.009	-0.625	0.174
A	1.075	1.009*	0.001	0.311	-0.487	-0.055
BBB	0.469	0.043	0.002	0.089	1.019	0.478
BB	0.015	1.720	0.000	32.147	-49.378	0.280
B	-28.540	36.567	0.007	0.000	0.000	0.000
CCC/CC/D	5.700	-5.709	0.000	-942.200	12.839	0.000

Note: these results should be interpreted with caution, as they do not align with the established findings in this area. The poor results can be attributed to the small sample size, which limits the ability to conduct a proper analysis across rating classes.

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