SOVEREIGN CREDIT DEFAULT SWAP MARKET RESPONSE TO CREDIT RATING ANNOUNCEMENTS: AN EVENT STUDY ON EMERGING MARKETS

ERDEM DOĞUKAN YILMAZ

BOĞAZİÇİ UNIVERSITY

2014

SOVEREIGN CREDIT DEFAULT SWAP MARKET RESPONSE TO CREDIT RATING ANNOUNCEMENTS: AN EVENT STUDY ON EMERGING MARKETS

Thesis submitted to the
Institute for Graduate Studies in the Social Sciences
in partial fulfillment of the requirements for the degree of

Master of Arts
in
International Trade Management

By
Erdem Doğukan Yılmaz

BOĞAZİÇİ UNIVERSITY
2014

Thesis Abstract

Erdem Doğukan Yılmaz, "Sovereign Credit Default Swap Market Response to Credit Rating Announcements: An Event Study on Emerging Markets"

Credit risk assessments by credit rating agencies and credit default swap (CDS) spreads are the leading indicators of credit risk. Extant literature examined CDS market response to credit rating announcements by credit rating agencies for corporate entities and mostly for developed markets. Few studies, however, investigated the relationship between CDS market and credit rating announcements for sovereign entities.

The current study investigates the effect of credit rating announcements on emerging market sovereign CDS spreads and analyzes whether credit rating announcements are anticipated by the CDS market within a period of thirteen years starting from 2001. Event study methodology is used to assess the impact of the credit rating events on sovereign CDS spreads of twenty emerging markets. The results reveal that emerging market CDS spreads respond significantly to positive rating announcements. On the other hand, no significant responses were found for negative rating announcements, implying that the reactions of CDS spreads to credit rating announcements are not symmetrical for positive and negative rating announcements. Additionally, results suggest that both positive and negative rating announcements are anticipated by the CDS market for the entities studied.

Tez Özeti

Erdem Doğukan Yılmaz, "Kredi Derecelendirme Anonslarının Ülkelerin Kredi Temerrüt Takas Primlerine Yansıması: Gelişmekte Olan Ülkeler Üzerine Olay Analizi"

Kredi derecelendirme kuruluşlarının değerlendirmeleri ve kredi temerrüt takasları piyasalar tarafından kredi riskinin iki önemli göstergesi olarak kabul edilmektedirler. Geçtiğimiz on yıllık zaman dilimi içerisinde, kredi derecelendirme kuruluşları tarafından yayımlanan değerlendirmelerin firmaların kredi temerrüt takas oranları üzerindeki etkileri araştırmacılar tarafından yoğun bir şekilde incelenmiştir. Ancak, sadece birkaç çalışma ülkelerin kredi temerrüt takaslarına yoğunlaşmıştır.

Bu çalışmada kredi derecelendirme kuruluşlarının anonslarının gelişmekte olan ülkelerin kredi temerrüt takas primleri üzerindeki etkileri ve olası bir anonsun kredi temerrüt takas piyasaları tarafından öngörülüp öngörülemediği incelenmektedir. Bu ilişkilerin analizi için, yirmi gelişmekte olan ülkenin beş senelik kredi temerrüt takas primleri seçilmiştir. Araştırma için olay analizi (event study) yöntemi kullanılmıştır. Çalışmanın bulguları olumlu derecelendirme anonslarının kredi temerrüt takasları üzerinde anlamlı bir etki yaratıldığını saptarken, aynı etki olumsuz anonslar için bulunamamıştır. Bu bulgular, kredi derecelendirme anonslarının kredi temerrüt takasları üzerindeki etkisinin simetrik olmadığını göstermektedir. Olası bir olumlu ya da olumsuz bir kredi değerlendirme anonsunun çalışmaya dahil edilen gelişmekte olan ülkelerin kredi temerrüt takas piyasaları tarafından öngörüldüğü belirlenmiştir.

ACKNOWLEDGEMENTS

I owe my deepest gratitude to my advisor, Prof. Sema Sakarya for her patience, tolerant assistance, encouragement, and supervision from the very early stage of this research.

I gratefully thank Assoc. Prof. Gözde Ünal, my thesis co-advisor for her special participation and constructive comments.

I am also thankful to Assist. Prof. Mehtap Işık and Assist. Prof. Aysa İpek Erdoğan for their participation and contributions in this study.

I want to express my special thanks to my family for their valuable support not only for the thesis period, but also everything they done for me. My grandfather, Sabri Yılmaz, also deserve special mention for his encouraging support. Sezin Öter, I am so grateful to you for your support and so lucky to have you in my life.

I would like to thank my beloved friends, Tolga Tezcan, Robert Bruce Jackson and Mehmet Yığılı for their assistance.

CONTENTS

TABLES

FIGURES

CHAPTER 1

INTRODUCTION

> "There are two superpowers in the world today in my opinion. There's the United States and there's Moody's Bond Rating Service. The United States can destroy you by dropping bombs, and Moody's can destroy you by downgrading your bonds. And believe me, it's not clear sometimes who's more powerful" (Thomas Friedman; February 13, 1996)

Financial markets bind borrowers and lenders in order to cater financing needs. Information asymmetry that exists between the borrowers and the debtors however forms a major barrier for arranging financing. The information asymmetry between borrowers and debtors makes leads to inefficiency in and allows borrowers to demand higher interest rates (Goyenko, Subrahmanyam, & Ukhov, 2011). Credit Rating Agencies' (CRAs) ratings and credit default swaps (CDS) spreads are the leading indicators for credit risk and help to overcome problems caused by the information asymmetry.

Starting from the first rating announcement in history by Moody's Investors Service in 1909, the role of credit rating agencies in financial markets has grown dramatically. Today, credit rating agencies are the major institution providing information on securities' relative creditworthiness and ability to obey contractual and financial obligations when they become due (Poon & Chan, 2010). In order to measure issuer's relative credit worthiness, CRAs offer a variety of ratings, outlooks and reviews for different debt instruments. The most influential credit rating agencies today are Standard and Poor's, Moody's and Fitch. (Micu, Remolona, & Wooldridge, 2004).

Over the years, many credit derivative instruments are introduced to financial markets such as credit default swaps, asset swaps and total return swaps. One of the

most popular credit derivatives is the Credit Default Swap. Initially, Credit Default Swaps were introduced as a hedging instrument to protect security purchasers against the risk of default. Today, however, CDS contracts evolved into intensively traded securities and are perceived as one of the most important credit risk indicators (Singh & Spackman, 2009).

Given that credit rating agencies and CDS contracts are important gauges for credit risk, question of how these gauges affects each other naturally arose. Credit rating agencies make intensive research and collect exclusive information about corporate and sovereign entities and some content of this information is not publicly available. Therefore, when this information is released to public through announcements, one can expect CDS markets to adjust in accordance with new information coming from these announcements.

Extensive body of research that has investigated the relationship of credit rating information and CDS markets on a corporate basis. Recently however, researchers started to focus the relationships on the sovereign level as well especially after the financial crisis in the United States and the debt crises in Europe. This shift in research interest is not incidental. Whether a follower of global economic conditions or not, the general public is accustomed to news such as "Moody's Investor Service again downgraded Greece" (Smith, 2011), "Standard and Poor's warns Spain against possible downward rating change" (Catan & House, 2009). Thus, market participants' fear of default by sovereign entities have increased and induced investors to hedge against default risk and led to an increased number of sovereign CDS contracts. Additionally, with the contribution of derivative traders, sovereign CDS market has flourished (Vogel, Bannier, & Heidorn, 2013).

The question of whether or not the content of credit rating announcements contains new information for the CDS market has been discussed by some authors in previous studies. If credit rating announcements carry new information, credit default swap (CDS) spreads are expected to respond to the corresponding new risk level following the credit rating announcements (Hull, Predescu, & White, 2004; Norden & Weber, 2004; Micu, Remolona, & Wooldridge, 2004; Ismailescu & Kazemi, 2010; Afonso, Furceri, & Gomes, 2011; Finnerty, Miller, & Chen, 2013). Most of these studies have explored the extent of relationships between CRAs instruments and CDS markets. Most of the studies are conducted at the corporate level (Hull, Predescu, & White, 2004; Norden & Weber, 2004; Micu, Remolona, & Wooldridge, 2004; Finnerty, Miller, & Chen, 2013). A new stream of research investigates this realtionship at the sovereign level mostly for developed markets. There is only one study on emerging economies CDS market reactions to credit rating announcements by Ismailescu and Kazemi (2010). Given the fact that the most recent one among these studies condcuted prior to 2008-2009 financial crisis, it is the belief of the author that it is germane to revisit this question in the light of more recent data and take advantage of a more liquid credit default swap market to make contributions to the existing literature.

The thesis is structured around three main research questions: First, how do emerging market sovereign CDS spreads respond to credit rating announcements? Second, is the CDS market response to credit rating announcements symmetrical? Third, are credit ratings announcements anticipated by the CDS market? The first question aims to uncover whether the credit rating announcements provide new information to the CDS market or not. If they do, credit default swap (CDS) spreads are expected to adjust to the corresponding new risk level following the credit rating

announcement. The second research question is set to find out whether emerging sovereign CDS spread respond to positive and negative credit rating announcements similarly in the expected direction and in the same magnitude. The third question examines whether or not significant changes in emerging sovereign CDS spreads are observed prior to the credit rating announcements, i.e. credit rating announcements anticipated by CDS market participants. Sovereign CDS data for twenty emerging economies for the years 2001-2013 are used for the event study conducted for answering the research question posed. It is believed that exploring the relationship of sovereign CDS market responses to credit rating announcements within the emerging market context, with recent data is expected to contribute to the empirical data base in related literature.

The study continues with the background information which covers review of financial markets, financial risk, credit derivatives, credit rating agencies, efficient market hypothesis and information content of ratings.

Financial Markets

The main function of all financial markets is ensuring transfer of funds from participants who receive more money than they spend to (borrowers), those who spend more money than they receive (debtors). Financial markets are typically characterized by having transparent pricing, basic regulations on trading assets, costs and fees, and market forces (demand and supply) determine the prices of securities that are traded (Hull J. C., 2007).

Financial Markets for securities can be classified based on market levels such as primary and secondary (Elton, Gruber, Brown, & Goetzmann, 2010). Primary

markets facilitate the issuance of new securities. Companies, governments or public sector institutions can obtain funding through the sale of a new stock or bond issue. On the other hand, secondary markets facilitate the trading of existing securities in the market and allow for a change in the ownership of the securities. In other words, primary market transactions provide funds to the initial issuer of securities, whereas secondary market transactions do not. Within the secondary market, there is another market called Over the Counter (OTC) market. In the OTC market, it is possible to trade financial securities such as stocks, bonds, commodities or derivatives directly between borrowers and debtors. It is a decentralized market that does not have a central physical location. Investors and debtors trade with one another through various communication modes such as the telephone, email and proprietary electronic trading systems. This enables parties to negotiate pricing of derivatives (Valdez & Molyneux, 2010).

Equity, debt and derivative securities (instruments) are traded in financial markets (Valdez & Molyneux, 2010). Equity securities represent ownership of the assets such as stocks. They are generally issued to company shareholders and are used to fund the business. Debt securities are any debt instrument that can be bought or sold between two parties and have basic terms defined, such as notional (nominal) amount (amount borrowed), interest rate and maturity/renewal date. Debt securities include government bonds, corporate bonds, municipal bonds, preferred stock, collateralized securities and zero-coupon securities (Elton, Gruber, Brown, & Goetzmann, 2010). In addition to the money market and capital market securities, derivative securities are also traded in financial markets. Derivative securities are financial contracts whose values are derived from the values of underlying assets (debt or equity instruments). Many derivative securities enable investors to engage in

speculation and risk management. Derivative securities allow an investor to speculate on movements in the value of the underlying assets without having to purchase those assets. Some derivative securities allow investors to benefit from an increase in the value of the underlying assets, whereas others allow investors to benefit from a decrease in the assets' value. On the other hand, financial institutions and other firms can use derivative securities to adjust the risk of their existing investments in securities. If a firm maintains investments in bonds, it can take specific positions in derivative securities that will generate gains if bond values decline. In this way, derivative securities can be used to reduce a firm's risk. The loss on the bonds is offset by the gains on these derivative securities (Hull J. C., 2007).

Financial Risk

Financial risk is a general term for multiple types of risk associated with financing. Especially in the last 20 years, financial risk management gained more importance because the market has experienced the default of several large financial institutions due to failure in risk management. Examples include Barings in 1995, Long Term Capital Management in 1998, Enron in 2001, and Lehman Brothers in 2008 (Gregory, 2010).

Financial risk is a broad concept and can be categorized under four main categories, namely market risk, liquidity risk operational risk and credit risk (Hull J. C, 2006).

Market Risk

Market risk is defined as the risk of loss (or gain) arising from unexpected changes in market prices such as security prices or market interest or exchange rates (Dowd, 2005). Market risk is also strongly influenced by fluctuations in the market (Gregory, 2010).

Market risk can further be divided into interest rate risk and currency risk categories. Interest rate risk is the risk of change in investment's value due to a change in the absolute level of interest rates, in the spread between the two rates or in any other interest rate relationship (Jorion, 2006). It is a major risk to all bondholders. As interest rates rise, bond prices fall. The rationale is that when interest rates increase, the opportunity cost of holding a bond decreases, investors are able to realize greater profits by switching to other investments that reflect the higher absolute interest rate spreads. For instance, a bond with 10% coupon rate is worth more if interest rates decrease. (Hull J. C, 2006)

Currency risk is defined as a risk that occurs when a financial transaction is denominated in a foreign currency other than that of the base currency of the investor. If exchange rate moves upwards against the base currency, investor will realize loss (Wand, 2005).

Liquidity Risk

Liquidity risk is the risk that a given security or asset cannot be traded quickly enough in the market to prevent a loss. Liquidity risk is typically reflected in unusual bid-ask spreads or large price movements (Jorion, 2006). Liquidity risk affects ability

of the asset holders to trade. If there is high liquidity risk associated with a security, bond holders will face difficulty in finding a counterparty to sell to.

Operational Risk

According to the definition of the Basel Committee on Banking Supervision, operational risk can be expressed as the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events (Basel Committee on Banking Supervision, 2001: 2). These risks include human error and fraud (failure of people), inadequate controls and systems (failure of internal processes). Additionally, these risks may include business and system disruptions caused by external catastrophic events (e.g., earthquake) or terroristic attack like the one on World Trade Center on September 11, 2001 (Fontnouvelle, DeJesus-Rue, Jordan, & Rosengren, 2003).

Credit Risk

Credit is the provision of the financial resources by one party to another party, where the second party is obliged to repay resources or fulfill contractual obligations when they become due. Credit is granted by the creditor (lender) to the debtor (borrower) and the conditions of a specific credit transaction depend on the contractual agreement between the two parties (Schönbucher, 2003).

Credit risk is defined as a risk that a debtor may be unable or unwilling to make a payment or fulfill contractual obligations (Jorion, 2006). Credit risk may be characterized in terms of an actual default (when a debtor is unable to pay or fulfill

contractual obligations) or, less severely, by deterioration in a counterparty's credit quality (credit worthiness). The first case may result in an actual and immediate loss whereas in the second case future losses become more likely (Gregory, 2010)

Default risk is the uncertainty surrounding an entity's ability to meet its obligations with respect to the timely payment of interest and repayment of the amount borrowed (Bruyere, Fery, Jaeck, & Spitz, 2006). If a default occurs, the creditor will receive only a proportion of the claimed amount which is called the recovery rate and the potential loss of a creditor is called the recovery risk. Recovery rates are measured by their price in the secondary market after a month following the occurrence of the default (Moody's Investor Services, 2002).

Credit rating agencies such as Standard and Poor's (S&P) and Moody's, classify securities according to their probability of default by providing credit ratings. High ratings are associated with low probability of default whereas low ratings are associated with high probability of default. Credit deterioration occurs when the rating of security is downgraded. In case of a downgrade, the value of debtor's asset will decrease which in return results in loss for the creditor. The risk of downgrade is called credit deterioration risk (Schönbucher, 2003).

Throughout the 1970's, researches intensively focused on modelling credit risk. The literature distinguishes between methods that use accounting information (structural models) and methods that use market prices of assets (reduced form models) to model credit risk for assessing or forecasting the credit risk of an entity (Brown & Wang, 2002).

Structural models forecast default probabilities by analyzing structural factors associated with historical default ratios of corporate or sovereign entities (Jorion, 2006). The first study considered as a structural credit risk model in the literature was

conducted by Altman (1968). In his work, he analyzed the historical trend and changes in financial ratios of firm's that ended up in bankruptcy. The second structural model was developed by Merton (1974). Merton compared the value of a firm's assets with its outstanding debt values. Merton claims that if a firm's assets are worth less than its outstanding debt, default will occur in the near future. A third model within the structural framework was introduced by Black and Cox (1976). They claimed that default occurs as soon as a firm's asset value falls below a certain threshold. Today, credit rating agencies such as Moody's, S&P, or Fitch use similar structural models to classify corporations and countries by credit ratings.

In reduced-form models, credit risk is assessed with the help of traded asset prices whose value is associated with probability of a default. Assets such as bonds and CDSs reflect the expectations of market participants and hence incorporate the market's perception of the default probability of the firm or country (reference entity). In reduced-form models, the probability of default is denoted as hazard rate or default intensity. Reduced-form models are dependent on exogenous information for delivering default estimates. On the other hand, structural models estimate default by endogenously given information (Duffie & Singleton, 2003).

When estimating default risk with reduced form models, researches first determine a benchmark risk free rate then calculate the credit spread. A benchmark risk free rate is the theoretical rate of an investment with no risk of financial loss (Hull J. C., 2007). Credit spread is the difference between return rate of a security and the benchmark risk free rate. For instance, American Treasury Bond is usually treated as a benchmark for all other traded bonds. The difference between the coupon rate on the American Treasury Bond and the other bonds are called the credit spread, specifically for bonds the credit spread is called the yield spread. The credit spread

varies according to factors such as the credit rating of security and the maturity of a security (Caouette, Altman, Narayanan, & Robert, 2008).

Credit Default Swaps (CDSs) are quoted as percentages and referred to as CDS premiums or CDS spreads. The advantage of CDS spread over other credit spreads is that CDS spreads allow factoring out the other risks associated with the bond such as interest rate risks and currency risk (Vogel et al., 2013). In this context, the next section analyzes credit derivative products and particularly CDS.

Credit Derivatives

A credit derivative is an instrument for which pay-off is related to the credit worthiness of a borrower. It provides protection against credit risk in return for a fee paid to the party who assumes the risk. Historically, the asset swap is seen as a predecessor of credit derivatives such as total return swap, credit spread products, credit default swaps, credit linked notes and collateralized debt obligations. Credit derivatives are also supposed to improve accuracy of hazard rate of credit risk in financial markets. Credit derivatives are traded at OTC markets (Mengle, 2007).

Basically, credit derivatives are contractual agreements that transfer credit risk from one party to other. The party which is called “buyer of protection” pays periodic fees to the other parties called “seller of protection”. The protection seller is obligated to compensate protection buyer for the loss in case of a reference entity’s default or decrease in credit rating. These contractual agreements between protection buyers and protection sellers are standardized by International Swaps and Derivatives Association (ISDA). The most important contract elements in a credit derivative transaction are:

Underlying asset: Since a derivative is a financial instrument whose price is based (derived) from a different asset, there must be a reference instrument. The underlying asset is the reference financial instrument (e.g., stock, futures, commodity, currency, index) on which a derivative's price is based (ISDA, 2003).
Credit Events: The credit event is defined in the contract and obligates the protection seller to pay a compensation payment to the protection buyer in case the credit event occurs before maturity of the contract (ISDA, 2003).

Credit Event Payment: It is a payment that would be settled if the credit event occurs. Terms of payment can be a physical settlement, cash settlement or an auction settlement. If parties have agreed on a physical settlement, the buyer of protection buys bonds, if the bonds are not already owned. Then the protection buyer delivers the defaulted security to seller of protection and in return the seller of protection pays face value of the security. If the credit event is settled by cash payment, the amount of payment is the difference between the nominal amount of the underlying asset and the market value of the asset after the occurrence of the credit event. In the auction settlement the recovery rate is determined by a series of processes. An auction settlement will be examined in detail under *Settlement* title (ISDA, 2003).

Credit Fee: It is a periodical payment made to the protection seller by the protection buyer in order to transfer credit risk. The credit fee is expressed in basis points (bps) and made in arrears every quarter year, every half year and every year (ISDA, 2003).

According to International Swaps and Derivatives Association (ISDA), the credit default swaps account for the vast majority of credit derivatives activity (2014a).

Credit Default Swap

Overview of the Market

The corporate and sovereign credit default swap (CDS) market has grown remarkably since its inception in the early 1990's (Markit, 2010). According to the market survey of the ISDA (2014a), the gross notional amount outstanding of credit default swaps (CDS) was $26.3 trillion at mid-year 2010 and CDSs form 5.6 percent of the total of all derivatives (2014). Until the financial crisis in the United States in 2007/08 and the rising government debt levels in Europe, CDS market was almost entirely focused on corporate default risks. However, following the financial crisis, financial markets reassessed their risk perceptions vis-à-vis sovereign issuers (Vogel et al., 2013). The gross notional amount outstanding of sovereign CDS contracts in 2008, was 10% percent of the gross notional amount outstanding of all CDS contracts, while it reached 20% in 2012 (ISDA, 2014a).

The CDS market is a fairly young market when compared with other derivatives markets. The first CDSs were created by JP Morgan in 1994. JP Morgan transferred the credit risk of Exxon Mobile to European Bank of Reconstruction and Development (EBRD) and in return agreed to pay periodical fees (Girish, 2010).

Like all of credit derivatives, credit default swaps (CDS) are contracts that transfer the credit risk of a reference entity from one party to another. If two parties engage in a contract, the buyer of protection pays a premium to the seller of protection until the termination of the contract or the occurrence of a credit event (Hull J. C., 2006). CDS contracts might seem similar to classical insurance contracts however CDSs do not require any funding and banks are not required to hold any

reserves (Noeth & Sengupta, 2012). It is not necessary for investors to own the security. This allows traders to speculate on the credit worthiness of reference entities. The purchase of CDS without purchasing the underlying asset is called "naked CDS" (Vogel et al., 2013).

The most common types of CDSs are single-name CDSs and multi-name CDSs. Single-name CDSs provides protection for a single sovereign or corporate entity. Multi-name CDSs, on the other hand, reference multiple entities. In terms of market share, single-name CDSs have surpassed multi-name CDSs for both sovereign and corporate markets as of March 2013 (Figure 1).

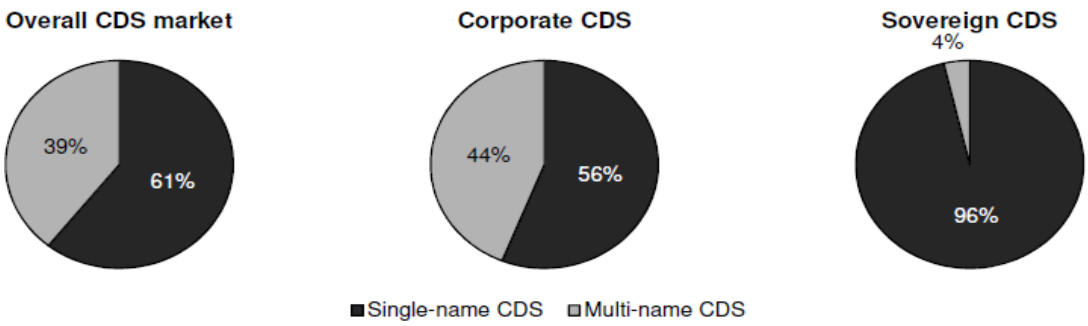

Fig. 1 Total CDS transaction mix by instrument types (Vogel et al., 2013: 6)

CDS Spread

Credit default swaps are quoted in terms of basis points (bps) and annual periodical CDS payments (credit fee payments) are referred to as CDS spreads or CDS premiums. Most of the payments are made quarterly (Vogel et al., 2014). A basis point is a unit that is equal to 1/100th of 1%, and is used to denote the change in a financial instrument's value. For example, 1% change in CDS is equal to 100 basis points, and 0.01% change is equal to 1 basis point.

Quarterly payments of buyers of protection are calculated using the face value of the contract and CDS premium (Noeth et al., 2012). Suppose a buyer of protection purchases a 5-year CDS of a company with a spread of 200 bps. The face value of protection is equal to $10 million. The buyer of protection makes quarterly payments of $10 million*0.02*0.25 = $50.000.

If the credit event occurs before the CDS contract expires, the buyer of protection receives a credit event payment equal to one minus the recovery rate (Berndt, Douglas, Duffie, Ferguson, & Schranz, 2004). Assuming the credit rating event occurred for the above mentioned company and the recovery rate is determined as 55%. The buyer of protection therefore receives $10 million*(1-0.55) = $4.5 million from the seller of protection. Figure 2 provides the structure of payment flows of a Credit Default Swap (Vogel et al., 2013: 7).

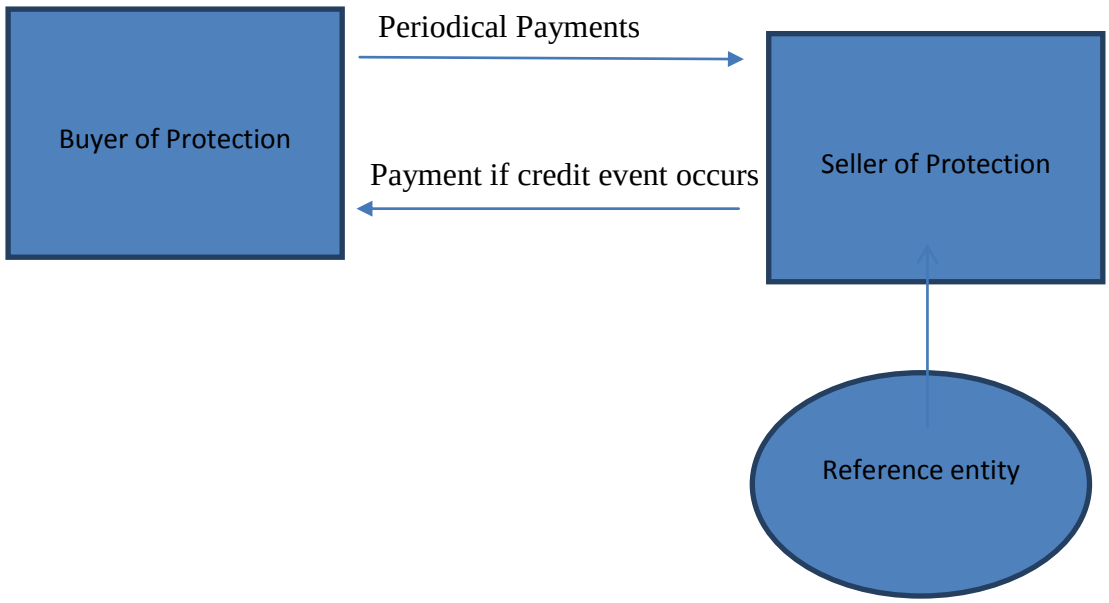

Fig. 2 Structure of Credit Default Swap (Vogel et al., 2013: 7)

Figure 2 indicates that if a credit event does not occur, the buyer of protection continues to make periodical payments. If the credit event occurs, however, the buyer of protection receives a credit event payment from seller of protection.

Reference Entity

In CDS contracts, the reference entity refers to the entity whose credit risk is protected and is traded. The reference entity can be either corporate or sovereign. According the definition of International Swaps and Derivatives Association (ISDA), a sovereign entity can be "any state, political subdivision or government, or any agency, instrumentality, ministry, department or other authority … thereof" (ISDA, 2003:19). The most actively traded CDSs of sovereign and corporate reference entities as of May 16, 2014 are shown in Table 1 below.

Table 1. Most Actively Traded CDSs of Sovereign and Corporate Reference Entities

Sovereign	Net Notional ($ mil)	Net % Change vs 1 Week Ago	Net % Change vs 4 Weeks Ago	Net % Change vs 52 Weeks Ago	Gross Notional ($ mil)	Contracts
ITALY	19,599	1.06%	1.72%	0.56%	389,216	13,511
BRAZIL	17,420	-0.67%	0.91%	-0.56%	140,137	9,569
CHINA	13,434	3.47%	11.07%	89.08%	81,972	8,707
MEXICO	12,211	-0.59%	3.11%	44.65%	104,119	7,388
GERMANY	11,149	-0.58%	-2.04%	-20.29%	131,414	3,727
SPAIN	10,673	1.38%	3.64%	-5.77%	173,447	7,704
RUSSIA	9,599	1.69%	9.82%	75.16%	128,997	11,477
TURKEY	9,514	-6.37%	4.37%	21.27%	136,442	9,621
JAPAN	9,403	-0.41%	0.49%	-1.03%	65,170	4,641
FRANCE	9,228	-6.46%	-6.16%	-38.41%	144,581	5,663
KOREA	7,092	0.52%	0.83%	20.37%	69,780	5,449
UNITED KINGDOM	5,325	-0.02%	0.11%	-21.84%	62,212	3,172
SOUTH AFRICA	4,558	0.58%	-3.94%	33.31%	53,166	5,592

Table 1. Continued

AUSTRALIA	3,975	-2.36%	-2.21%	13.90%	24,210	1,456
UNITED STATES OF AMERICA	3,946	-0.46%	-2.70%	22.81%	23,589	927
Corporate						
GENERAL ELECTRIC CAPITAL	8,902	-1.21%	2.15%	9.99%	60,283	4,596
BERKSHIRE HATHAWAY INC.	6,705	0.11%	1.56%	-3.15%	34,533	3,121
METLIFE, INC.	4,640	-1.15%	2.68%	17.43%	26,784	3,355
DEUTSCHE BANK	4,300	-1.52%	-4.01%	-2.15%	46,910	5,105
BARCLAYS BANK PLC	4,284	-1.02%	2.00%	6.73%	40,725	4,780
JPMORGAN CHASE & CO.	4,275	-0.28%	2.18%	9.22%	47,790	5,411
BANK OF AMERICA	4,161	0.17%	-0.58%	0.94%	62,759	7,842
TELEFONICA, S.A.	3,582	1.23%	0.86%	25.08%	36,193	4,256
AXA	3,429	-1.26%	-1.39%	2.67%	34,109	3,984
PETROLEO BRASILEIRO	3,385	0.75%	3.18%	-3.65%	12,230	1,913
THE GOLDMAN SACHS GROUP	3,022	0.71%	7.83%	-28.69%	46,193	5,093
UNICREDIT	2,936	0.14%	2.92%	-12.57%	40,610	5,220
DAIMLER AG	2,879	-0.48%	-1.87%	0.22%	32,342	3,301
VOLKSWAGEN	2,791	0.72%	-0.01%	-10.31%	30,263	2,993
MORGAN STANLEY	2,608	1.26%	-1.08%	-31.06%	47,804	5,356

Source: Compiled using data provided by DTCC (2014), as of May 16, 2014

Table 1 is based on data provided by the Depository Trust& Clearing Corporation (DTCC), (2014). The most actively traded sovereign CDSs are Italy and Brazil and corporate CDSs are General Electric Capital and Berkshire Hathaway Inc. When the top 15 corporate and sovereign CDS reference entities are compared in terms of gross notional amounts and net notional amounts, sovereign CDSs notional amounts significantly exceed corporate CDSs. In Table 1, net notional amount represents net protection sold or bought for a single entity, whereas gross notional amount represents the CDS contracts finalized between market participants and for all reference entities (ISDA, 2014b). Percentage net changes show net notional movement for that week compared to one week ago, one month ago and one year

ago. The net notional amount of CDS contracts of France decreased 6.46% when compared with the previous week. On a monthly and yearly basis, the most significant changes observed for China, are 11.07% and 89.08%, respectively. In comparison with the net notional amount of CDS contracts of sovereign entities, amount of corporate CDS contracts changed less in amount for all weekly, monthly and yearly terms. The most substantial weekly (-1.52%) and monthly (-4.01%) changes are observed for Deutsche Bank. Besides, Morgan Stanley's net notional amount of CDS contracts decreased 31.06% relatively to last year. Above examples from Table 1 reveal that sovereign CDS market is more volatile than the corporate CDS market.

Pricing of CDS

Theoretically, the CDS price is the value of credit risk given to the reference entity's bond or loan. The rationale behind the CDS pricing is to isolate the security's credit risk from other types of risks such as interest rate risks. Once a credit risk is isolated, it is calculated based on default probability and the potential loss if credit rating event occurs. The magnitude of the credit risk determines the amount of the credit fees (Hull J. C., 2006).

There are several methods used for pricing CDS spreads, however the main idea behind the methods is calculating the present value of all payments weighted by the instantaneous probability of default (Arvanitis & Gregory, 2004). Pricing of CDS spreads is explained in detail in studies by Kealhofer (2003), Arvanitis and Gregory (2004) and Kasapis (2008).

Actual market CDS spreads often are observed to be higher than the spreads obtained from CDS pricing models. This is because of macroeconomic fundamentals (e.g growth rate, inflation) and investor's risk aversion on the levels of default risk effects the CDS spreads. Remolona, Scatigna and Wu (2007) claim that the growth rate of a country and thre global risk aversion for that country are the dominant determinants of the true sovereign CDS spreads. Recently, many dynamic pricing methods emerged in literature to price CDS spreads accurately. These new dynamic methods take into account macroeconomic variables and the risk aversion of investors (White R. , 2013).

Contract Sizes and Maturity

Since CDSs are the OTC products, their size and maturity are determined by demand and the requirements of counterparties (sellers of protection and buyers of protection). Maturities vary from one to ten years with five years being the most frequently traded CDS maturity. Whereas gross notional amount of contract sizes ranges in-between $5 million and $20 million. For corporate CDSs, liquidity is fairly high regardless of maturities. On the other hand, for sovereign CDSs, only contracts with maturities of up to five years are liquid (Vogel et al., 2013).

Currencies

Underlying currencies are important determinants for CDS contracts, and are particularly more important for sovereign CDS traders. If a default of a sovereign entity occurs, a currency devaluation or redenomination might follow the default of

the sovereign entity. Currency devaluation means weakening of the denominated currency of CDS. Therefore most of the CDS contracts are traded in terms of CDS spreads (Haworth, Porter, Gibney, & Sparks, 2010). As of March 2012, more than 61% or 1.5 million CDS contracts were denominated in US Dollars (Vogel et al., 2013).

Credit Events

As we claimed above, ISDA (2003) defines the main credit event triggers as bankruptcy, failure to pay, repudiation (moratorium), and restructuring. Table 2 compares credit rating events for sovereign and corporate CDSs particularly for the Eurozone.

Table 2. Credit Rating Events for Sovereign and Corporate CDSs

	Bankruptcy	Failure to Pay	Repudiation/ Moratorium	Restructuring
Eurozone Sovereign	No	Yes	Yes	Yes
Eurozone Corporate	Yes	Yes	No	Yes

Source: Vogel et al., 2013:11

As can be seen from the Table 2, Eurozone corporate CDSs' credit events are triggered by bankruptcy, failure-to-pay and restructuring events whereas sovereign CDSs are not triggered in cases of a bankruptcy event since it is not common for sovereign entities to declare bankruptcy. Instead, CDS contracts of sovereign entities include a repudiation or moratorium (Naraparaju, Chatellier, Sheets, & Lin, 2011).

CDS Market Participants

According to the classification of DTCC, market participants can be categorized as reporting dealers, other financial institutions, and non-financial institutions (2011). The biggest participants of the market are reporting dealers with a total market share of 55% for corporate CDS, and 83% for sovereign CDS markets. The largest dealers of CDS market are investment banks such as the Bank of America, Merrill Lynch, Barclays, BNP Paribas, Calyon, Citibank, Credit Suisse, Deutsche Bank, Goldman Sachs, HSBC, JPMorgan, Morgan Stanley, Natixis, Nomura, RBS, Societé Générale, UBS and UniCredit (DTCC, 2011).

Other financial institutions, such as commercial banks and security firms form the second biggest market participants of the CDS market. Bank and security firms account for 14% and 10% of corporate and sovereign CDS markets respectively. These institutions are relatively smaller than investment banks and engage in CDS contracts to transfer and thus reduce the credit risk in their portfolios (Weistroffer, 2010).

Non-financial institutions include corporations, governments and special-purpose-vehicles (SPVs). They account for a small market share, 20% for corporate and 6% for sovereign CDS markets. Hence, one can infer that CDS markets are primarily used by financial institutions rather than non-financial ones (Vogel et al., 2013). Additionally, Central Counterparty (CCP) organizations take part in CDS markets. CCPs are acting as intermediaries between dealers and have a regulatory effect on CDS transactions. CCPs clear terms of contracts and ensure that payments to others occur when counterparties default. CCPs represented with a market share of 11% in corporate CDS market, whereas 1% in sovereign CDS (Markit, 2010).

Settlement Methods

In case of a credit event, the mechanics of the settlement to be used depends on the method agreed upon at the origination of the contract. Market participants can either settle via a physical settlement or a cash settlement. During the early expansion period of the CDS market, common settlement method used was physical settlement. However with the tremendous growth of the market, CDS contracts referencing a company's debt obligations exceeded the notional amount of that company's outstanding debt. Therefore shortages of available bonds occurred. For instance, after the bankruptcy of Delphi Corporation in 2005, the problem of physical settlement emerged. The notional amount of Delphi's CDS's debt obligation was $20 million whereas there were only 2$ million notional of Delphi bonds available in market. (Lieu, 2011).

With the introduction of the auction settlement in 2009 by ISDA however, the market standard for settlements changed and contracts started to include the option of settlement via auction (Haworth, Porter, Gibney, & Sparks, 2010). A credit event auction is a process in which the value of a CDS contract after a credit event is determined. Prior to auction, ISDA publishes a document called CDS protocol which specifies auction terms such as maximum bid-offer spread (e.g 2%) and quotation size (e.g $5 billion) (Markit, 2010). Auctions are administrated by two companies, Creditex and Markit. Creditex is a credit market broker that provides execution and processing of credit default swaps (CDS) in the U.S., Europe and Asia which has headquarters in New York, London and Hong Kong while Markit Group was founded in 2003 in London as a source of credit derivative pricing and provides information, processing and financial services (Lieu, 2011). The auction day process

has two phases. In the first phase of the process, the first step is to determine the *initial market midpoint (IMM).* Process of determining IMM is as follows: Participating dealers (reporting dealers who participate in the auction) submit bid and offer prices for underlying bonds for which they would buy and sell the reference entity's debt obligations. Table 3 provides an example of bid-offer submissions from Spanish Bank, Bankia's auction as an example for corporate auction settlement.

Table 3. Initial Market Submission for Bankia's Auction

Dealer	Bid	Offer
Bank of America N.A.	97.5	99.5
Barclays Bank PLC	96.0	98.0
BNP Paribas	95.75	97.75
Citigroup Global Markets Limited	94.5	96.5
Credit Suisse International	96.5	98.5
Deutsche Bank AG	95.0	97.0
Goldman Sachs International	97.25	99.25
HSBC Bank PLC	96.0	98.0
JPMorgan Chase Bank N.A.	95.0	97.0
Morgan Stanley & Co. International PLC	97.0	99.0
Nomura International PLC	96.0	98.0
Société Générale	96.0	98.0
UBS AG	97.5	99.5

Source: Creditex, 2013

After initial market submission, bids are sorted in descending order while offers are sorted in ascending order.

The highest bid is matched with the lowest offer. Then each bid is accorded with a corresponding offer. The matched bids and offers that form a tradable market are removed from the calculation. Tradable market refers the situation where a bid exceeds offer. The "Best half" of the pairs are taken for calculation. The average of best halves gives the IMM. Then, the arithmetic average is rounded to $1/8^{th}$. Table 4

shows non tradable markets and best half. According to Table 4, no tradable market is observed and since the best half is an odd number for matched pairs, the number of matched pairs is rounded up. The Calculated IMM for Bankia auction is 97,125.

Table 4. Non-tradable Markets and Best Half for Bankia's Auction

Dealer	Bid		Offer	Dealer
Bank of America N.A.	97.5	Non Tradable, Best Half	96.5	Citigroup Global Markets Limited
UBS AG	97.5	Non Tradable, Best Half	97.0	Deutsche Bank AG
Goldman Sachs International	97.25	Non Tradable, Best Half	97.0	JPMorgan Chase Bank N.A.
Morgan Stanley & Co. International PLC	97.0	Non Tradable, Best Half	97.75	BNP Paribas
Credit Suisse International	96.5	Non Tradable, Best Half	98.0	Barclays Bank PLC
Barclays Bank PLC	96.0	Non Tradable, Best Half	98.0	HSBC Bank PLC
HSBC Bank PLC	96.0	Non Tradable, Best Half	98.0	Nomura International PLC
Nomura International PLC	96.0		98.0	Société Générale
Société Générale	96.0		98.5	Credit Suisse International
BNP Paribas	95.75		99.0	Morgan Stanley & Co. International PLC
Deutsche Bank AG	95.0		99.25	Goldman Sachs International
JPMorgan Chase Bank N.A.	95.0		99.5	Bank of America N.A.
Citigroup Global Markets Limited	94.5		99.5	UBS AG

Source: Creditex, 2013

The second step in the first phase is to determine the *open interest.* The open interest is calculated based on the buy and sell physical settlement requests (PSR) submitted. Before the auction, participating dealers receive PSRs from their customers (CDS investors) and set buy and sell orders in accordance with them. Table 5 shows PSRs for participating dealers. The difference between buy and sell physical settlement requests submitted gives the net open interest. The net open interest for the auction of Bankia was EUR 12.7 million to buy.

Table 5. Physical Settlement Requests for Participating Dealers

Dealer	Bid/Offer	Size
Barclays Bank PLC	Offer	0,00
BNP Paribas	Offer	0,00
Citigroup Global Markets Limited	Offer	0,00
Credit Suisse International	Offer	0,00
Deutsche Bank AG	Offer	0,00
Goldman Sachs International	Offer	1,80
HSBC Bank PLC	Offer	0,00
JPMorgan Chase Bank N.A.	Offer	0,00
Morgan Stanley & Co. International PLC	Offer	0,00
Nomura International PLC	Offer	0,00
Société Générale	Offer	0,00
Bank of America N.A.	Bid	7,00
UBS AG	Bid	7,50
Net Open Interest: EUR 12.7 million to buy		

Source: Creditex, 2013

ISDA asks participating dealers to submit fair estimates for market value of the defaulted bonds. To prevent off-market initial bids and offers, ISDA uses a penalty system. If an initial market offer does not cross any other initial market offer, participating dealers pay the amount called "the adjustment amount" as a penalty. If the open market interest is to sell, the adjusted amount is a value of the initial market bid minus IMM, multiplied by the notional amount set by the ISDA. If the open market interest is buying, the adjustment amount is IMM minus the initial market offer multiplied by notional amount set by ISDA. For the auction of Bankia, Citigroup, JPMorgan and Deutsche bank gave offers under IMM. The notional amount is set by ISDA as EUR 1 million for that auction, therefore Citigroup, JPMorgan and Deutsche bank paid 6.250, 1.250 and 1.250 euros respectively. Adjustment amounts paid go to ISDA to be used for covering auction costs. If

adjustment amount exceeds the cost of an auction, it is distributed to dealers in future auctions.

If there is no open interest, the final price would set as IMM, and auction administrators publish all initial bids and offers, buy and sell physical requests, IMM and adjustment offers. In the case of a mismatch, approximately 75 minutes later, the second phase of the auction begins in order to establish the final price. The supply of bonds will be equal to open interest which is equal to EUR 12.7 million and participant dealers are asked to submit limit orders. With limit orders, participating dealers specify from which offer or bid rate and how much they are willing to pay. Dealer requests are filled by starting with the lowest offers if the interest is to buy or by the highest bids if the interest is to sell. The amount of each filled order is subtracted from the open interest until the value reaches zero. The final price will be the price for which the last physical settlement request can be filled Table 6 shows the limit orders for auction of Bankia. For the case of Bankia, JPMorgan requested to buy from the offer rate of 96.25 and aspired to buy all open interest. Since JP Morgan gave the lowest offer, it filled the open interest. JP Morgan's interest is shown as partially filled in Table 6, since JPMorgan gave limit order of 1 million from the 97,125 offer rate and the sum of it's order equals EUR 13.7 million (Lieu, 2011; Markit, 2010; Creditex, 2013).

Table 6. Limit Orders for Auction of Bankia

Dealer	Offer	Size
JPMorgan Chase Bank N.A.	96.25*	13
Citigroup Global Markets Limited**	97.125	1.0
JPMorgan Chase Bank N.A.**	97.125	1.0
Deutsche Bank AG**	97.125	1.0
UBS AG	97.75	7,5
BNP Paribas**	97.75	1.0

Table 6. Continued

Bank of America N.A.	98.0	7.0
Nomura International PLC**	98.0	1.0
HSBC Bank PLC**	98.0	1.0
Société Générale**	98.0	1.0
Barclays Bank PLC**	98.0	1.0
Morgan Stanley & Co. International PLC	98.5	7.0
Credit Suisse International**	98.5	1.0
Morgan Stanley & Co. International PLC**	99.0	1.0
Goldman Sachs International**	99.25	1.0
Bank of America N.A.**	99.5	1.0
UBS AG**	99.5	1.0
BNP Paribas	99.875	8.0
Goldman Sachs International	101.0	5.0
Goldman Sachs International	102.0	5.0
Goldman Sachs International	103.0	1,7

** Limit Orders that were derived from initial markets.
* Limit Orders that were filled.

Source: Creditex, 2013

Greece CDS Auction in 2012 is an example for sovereign auction settlements. After the auction of Creditex, IMM of credit default contracts underwritten on Greek sovereign debt was determined as 21.75 bps. For an Initial Market Midpoint of 21.75, holders of credit default swaps on Greek sovereign debt would have a 78.25 bps of recovery rate. Further, the net open interest in the auction was € 291.6 million to sell which means that there are more sellers than buyers of Greek government bonds in the auction. As a result of this mismatch, the final price is expected to be lower than the Initial Market Midpoint. The final price for Greek bonds was set at 21.5, meaning that the buyer of $10 million CDS protection on a default of Greek can expect $7.85 million payout (Pollac, 2012).

Functions of CDS

The primary function of CDS contracts was determined as a hedging tool against credit risk by ISDA (2012). However with increasing liquidity of credit risk, CDS contracts have become a trading tool for investors. Additionally, they serve as a credit risk indicators (Vogel et al., 2013).

CDSs are used as hedging tools against credit risk. For instance, an investor creates a portfolio consisting of a long position the in a bond and the CDS. This portfolio is theoretically risk-free. This is because for the case of the bond issuer defaults, the CDS should cover to a certain extent of incurring losses to the investor. Further, CDS creates opportunity to mitigate credit risk separately and increases the possibility of controlling overall risk and return (Vogel et al., 2013).

Sizes of the corporate CDS market sand recently the sovereign CDS market have become large enough for the trade of CDS contracts (Weistroffer, 2010). CDS spreads (credit fee payments) will change as market conditions change. When one party engages in a CDS contract, he can take either a short or a long position. The buyer of protection takes a short position while seller of protection takes a long position. In the following days, if the CDS spread increases (credit quality decreases) the buyer of protection will pay less than the premium traded in the market. Hence, the buyer of protection can sell the contract for a higher price and realize profit or vice versa: If credit quality of the reference entity increases, the seller of protection can sell the CDS contract for a higher price (Meissner, 2005).

Additionally, financial markets today perceive CDS as an instrument that provides information on a reference entity's credit quality and thus CDS spreads serve a valuable signaling function for defaults (ISDA, 2012). Basically a higher

CDS spread implies a higher default risk. Whereas a lower CDS spread indicates lower default risk for the reference entity (Meissner, 2005).

Credit Rating Agencies and Credit Rating Announcements

Credit rating agencies (CRAs) such as Standard & Poor's (S&P), Moody's and Fitch are the leading providers of credit ratings and credit risk analysis and claim forward looking opinions about credit risk. Although there are over 150 rating agencies, the three before mentioned agencies represent 95% of the total market for rated credits (White, 2010). CRAs mainly issue credit ratings on corporations, sovereigns, structured financings, mutual funds, insurance companies and managed funds (Krahnen & Weber, 2001). These credit ratings categorize the entities according to their likelihood of failure to pay obligations and the loss in the event of default (Crouhy, Galai, & Mark, 2001).

Credit ratings can be defined as predictions of potential credit losses due to failure of making payments, delay in payments or partial payments. Credit loss is defined as the difference between what the issuer has promised to pay and what is actually received. All CRAs' credit ratings measure total credit loss, including the probability that an issuer will default, as well as the expected severity of the loss if default occurs. Each rating agency uses different rating scales to categorize investment grades. The rating scales of Fitch and Standard & Poor's use AAA as highest rating, followed by AA, A, BBB, BB, B, CCC, CC, C, and D, where D indicates default of an instrument. The rating scale of Moody's is almost identical with AAA as the highest rating, followed by Aa, A, Baa, Ba, B, Caa, Ca, C, and D. Rating agencies often assign intermediate ratings such as "+" and "-" (i.e. BBB+,

BBB, BBB- or Caa1, Caa2 and Caa3). Table 7 shows the rating scales used by the three major credit rating agencies. When opinions of CRAs about reference entity change, they change the entity's credit rating. Rating change (RC) can be done by an upgrade or a downgrade. An upgrade to the movement refers movement of a security to a higher rating category whereas a downgrade refers to a movement to a lower one (White, 2010).

Table 7. Rating Scales of Credit Rating Agencies

S&P	Fitch	Moody's	Interpretation
Investment Grade			
AAA	AAA	AAA	Highest quality, with minimal credit risk.
AA	AA	Aa	High quality and are subject to very low credit risk.
A	A	A	Upper-medium grade and are subject to low credit risk.
BBB	BBB	Baa	Moderate credit risk.
Speculative Grade/ non-investment grade			
BB	BB	Ba	Speculative grade elements and are subject to substantial credit risk.
B	B	B	Speculative grade and are subject to high credit risk.
CCC	CCC	Caa	Poor standing and are subject to very high credit risk.
CC	CC	Caa	Highly speculative grade and are likely in, or very near, default.
C	C	C	Lowest rated class of bonds and are typically in default.
D	D	-	Default

Source: White, 2010

In the 1980's, CRAs introduced outlooks (OL) and reviews as new credit rating instruments. Outlooks usually have a longer time frame than reviews, typically 12-18

months. They aim to map the likely direction of the issuer's credit quality over the medium term. A positive outlook indicates that an issuer's rating is likely to be raised whereas a negative outlook indicates that the rating is likely to be lowered or kept as it is. On the other hand, the focus of a review is on the short term. Reviews are called "Watchlist" (WL) by Moody's, "Credit Watch" (CW) by S&P and "Ratings Alert" (RA) by Fitch. Release of a review indicates that rating change is highly probable. In this study, credit rating announcements refer to all instruments rating change, outlooks and reviews (Bannier & Hirsch, 2010).

All CRAs have formulated specific objectives and limitations for their credit ratings. For instance, Standard and Poor's defines a credit rating as an "opinion of the general creditworthiness of an obligor, or the creditworthiness of an obligor in respect to a particular debt security or other financial obligation". Similarly, Moody's identifies the credit rating as an "opinion of future relative creditworthiness derived by fundamental credit analysis" (Frost, 2007). Furthermore, the CRAs emphasize that a credit rating is not a recommendation to the investor on whether to sell, hold or buy the issuer's debt securities. A credit rating is merely an opinion about the issuer's credit quality.

The CRAs essentially provide two services with rating instruments. First, they provide information services by offering an assessment for the ability of issuers to meet debt obligations. Thereby CRAs reduce information costs for borrowers which in return may affect the number of borrowers in markets and promote more liquid markets. Second, CRAs offer monitoring services. The rating scale can be used by the issuer for reflection, a downgrade or negative outlook may be used by the issuer of debt to prevent further loss of credit worthiness (Jakob & Fabian, 2011).

Sovereign Credit Ratings

Sovereign credit ratings are "a condensed assessment of a government's ability and willingness to repay its debt, in principal and in debt" (António, Pedro, & Philipp, 2007). The key difference between a sovereign credit rating and other ratings is the "willingness" of the sovereigns to pay their debt. Since a country can announce default even if she has resources to pay an outstanding debt. As a result, credit rating agencies include qualitative inputs such as political risk, rule of law, governance and transparency as well in their assessments for ratings (Alsakka & Gwiliym, 2012). The rating methodology used by credit rating agencies is not publicly accessible but it is known that rating agencies use both publicly available information and private information that is voluntarily supplied by obligors or obtained from other reliable sources to categorize a country's credit worthiness (Ismailescu & Kazemi, 2010). Table 8 shows ratings of G20 countries by Moody's, S&P and Fitch in May, 2014.

Table 8. Ratings of G20 Countries by Moody's, S&P and Fitch

	Rating by		
Country	Moody's	S&P	Fitch
Argentina	Caa1	CCC+	CC
Australia	Aaa	AA+	AAA
Brazil	Baa2	BBB-	BBB
Canada	Aaa	AAA	AAA
China	Aa3	AA-	A+
France	Aa1	AA	AA+
Germany	Aaa	AAA	AAA
India	Baa3	BBB-	BBB-
Indonesia	Baa3	BB+	BBB-
Italy	Baa2	BBB	BBB+
Japan	Aa3	AA-	A+
Republic of Korea	Aa3	A+	AA-
Mexico	A3	BBB+	BBB+
Russian Federation	Baa1	BBB-	BBB

Table 8. continued

Saudi Arabia	Aa3	AA-	AA
South Africa	Baa1	BBB	BBB
Turkey	Baa3	BB+	BBB-
United Kingdom	Aa1	AAA	AA+
United States	Aaa	AA+	AAA

Source: Compiled from Country Economy, 2014

According to Table 8, only Argentina is in non-investment grade category for the three CRAs. Further, Turkey and Indonesia are categorized in non-investment grade category by S&P whereas categorized in investment category by Moody's and Fitch. Except for these countries, all other G20 countries are in the investment grade category.

Efficient Market Hypothesis and Information Content of Ratings

The efficient market hypothesis (EMH) was developed by Eugene Fama in 1970. According to his definition, an efficient market is a market where large numbers of profit maximizers are competing with each other by using important current information which is available to all participants in the market. In addition to that, Fama claims that if the price of a particular security is lower than the price suggested by the current information, holders of information would buy that security thus drive its price up until it reaches the suggested price (1970). EMH has been widely accepted and many researchers have tried to test it by using different empirical examples (Blume & Durlauf, 2007).

In his empirical work, Fama (1970) hypothesized three versions of an efficient market hypothesis depending on the structure of market. In the first version of his efficient market hypothesis (EMH) which is the least rigorous one, current

stock prices reflect all historical information on prices or return sequences. The first version, called the "weak efficient market hypothesis", rejects the concept of technical analysis. It suggests that in a weak efficient market, it is impossible to infer future prices of a security. According to the semi-strong EMH (version two), only privately held information has an effect on prices and all publicly available information is fully reflected on the price of a security. In the third version of his hypothesis called the strong EMH all available public and private information is fully reflected in prices such that every individual investor expects the same trading profit level from transactions.

The rationale behind the question of whether or not CDS spreads react to credit rating announcements relies on the efficient market hypothesis. Many indicators exist in history that reveals the inefficiency of markets and immediate reactions to credit rating announcements. As an example, Moody's downgraded Greece from B1 and Caa1 and proclaimed a negative outlook on June 1, 2011. Greek 10-year government bond yields (bond spread) increased by 12 basis points. The effect of downgrade spread to the Europe and the Stoxx Europe Index fell by 0.7%. Twelve days later S&P downgraded Greece from B to CCC (with negative outlook) on June 13, 2011 and in the outlook S&P claimed that any attempt to restructure the country's debt would be considered a default. In reaction to this, the five-year CDS spreads on Greek government debt rose 58 bps to 1600 bps (Alsakka & Gwiliym, 2012).

Effect of rating announcement on the other hand may depend on the information content of the rating announcement. It is reasonable to assume that rating events which are based on a larger degree of non-public information should experience larger adjustments of credit spreads than any piece of publicly accessible

news (Ederington, Yawitz, & Roberts, 1984). Sometimes however, announcements carry little new information to the market and credit spread changes are observed to be insignificant. The study continues with Chapter Two which covers the literature review, particularly on stock, bond and CDS market responses to credit rating announcements. Research objective, event study methodology and data and the descriptive analysis presented in Chapter Three. Findings regarding the CDS market response to the credit rating announcements and CDS market anticipation of credit rating announcements are discussed in Chapter Five. Chapter Six concludes with a discussion of findings, the contribution and limitations of the study along with implications for future research.

CHAPTER 2

LITERATURE REVIEW

Markets Response to Credit Rating Announcements

Credit risk exists in almost all financial activities and affects the prices in markets such as credit default swap (CDS), bond and stock markets. These three markets are structurally different and respond to changes in credit risk conditions with different speeds (Forte & Lovreta, 2009). Starting from the 1970s, research initially focused on stock markets and shifted to bond markets. After considerable development and growth in the CDS market, research interest has shifted to CDS spreads in the mid 2000s.

In line with the chronological stream of research, the following discussion of relevant literature on market response to credit rating announcements is presented under three sections as stock market response, bond market response and CDS market response. In the related literature, event study methodology is frequently used to examine market response to credit rating announcements. Event study methodology will be analyzed in the following chapter. Table 9 gives a summary of extant literature on market response to credit rating announcements. Event study methodology is commonly used in empirical studies listed.

Table 9. Literature Summary on Market Response to Credit Rating Announcements

Market	Author	Data	Main Findings
Stock	Pinches and Singleton (1978)	1959-1972, Moody's	Price changes significantly from 30 months before, no evidence during the change or 12 months afterwards
Stock	Griffin and Sanvicente (1986)	1960-1975, Moody's and S&P's	Significant cumulative abnormal returns for downgrades, no significant results for credit rating upgrades
Stock	Holthausen and Leftwich	1977-1982, S&P	Significant response for negative announcements, no response for positive ones
Stock	Hand et al. (1992)	1977-1982, Moody's and S&P	Significant abnormal returns for downgrades, no response for upgrades, significant abnormal returns for Credit Watch list
Stock	Goh and Ederington (1993)	1984–1986, Moody's	Positive returns for some of the stock shares after downgrades due to financial leverage
Stock	Followil and Martell (1997)	1984-1986, Moody's	Negative reviews and downgrades affect significantly while positives do not
Stock	Barron, Clare and Thomas (1997)	1984-1992, S&P	Significant abnormal stock returns related with bond rating downgrades and positive Credit Watch announcements
Stock	Goh and Ederington (1999)	1984-1990, Moody's	Significant abnormal returns only for negative announcements
Stock	Dichev and Piotroski (2001)	1970-1997, Moody's	No consistent abnormal returns after upgrades, significantly negative reaction in the first month after downgrades
Stock	Elayan, Hsu and Meyer (2003)	1990-2000, S&P	Announcements with positive connotations for New Zealand companies generate significant abnormal returns
Stock	Bannier and Hirsch (2010)	1982-2004, Moody's	Stock market reacts more to direct credit rating downgrades than to Credit Watches preceding downgrades, no significant reaction for direct upgrades and Credit Watch preceding upgrades
Stock	Chung, Frost and Kim (2012)	1992-2010, Moody's	Watch List announcements are found to be associated with abnormal stock returns
Bond Market	Katz (1974)	1966-1972, Moody's, (Corporate bond)	No significant change on monthly returns before rating actions however abnormal performance observed during 6-10 weeks after the downgrade

Table 9. Continued

Bond Market	Hettenhouse and Sartoris (1976)	1963-1973, Moody's and S&P, (Corporate bond)	Downgrades were found to have weak effect on monthly bond returns where upgrades have no significant effect
Bond Market	Wansley, Glascock and Clauretie (1992)	1982-1984, S&P, (Corporate bond)	Significantly negative returns in the week of downgrades, no significant response to upgrades
Bond Market	Hite and Warga (1997)	1985-1995, Moody's and S&P, (Corporate bond)	Downgrading effect increases as sample moves from investment grade to non-investment grade, upgrade effects are weaker in significance
Bond Market	Kamin and Kleist (1999)	1991-1996, Moody's and S&P, (Sovereign bond)	Borrowers in Latin America and Eastern Europe are systematically charged higher spreads than borrowers in Asia and the Middle East
Bond Market	Steiner and Heinke (2001)	1985-1996, Moody's and S&P, (Sovereign Bond)	Significant bond price reactions are observed, upgrades and positive watch lists do not cause announcement effect
Bond Market	Gande and Parsly (2005)	1991-2000, S&P, (Sovereign Bond)	Spillover of negative rating announcements, no spillover effect due to positive rating announcements
CDS Market	Hull, Predescu and White (2004)	1998-2002, Moody's, (Corporate CDS)	Significant reaction to negative announcements, insignificant reaction to positive rating events, spread changes contain useful information for estimating the probability of negative rating announcement
CDS Market	Micu, Remolona, and Wooldridge (2004)	2001-2003, Moody's and S&P, (Corporate CDS)	Downgrades affect CDS market significantly, CDS spreads anticipate the upcoming reviews for all rating classes except for AA-rated entities
CDS Market	Norden and Weber (2004)	2000-2002, Moody's, S&P, Fitch, (Corporate CDS)	CDS market reacts and anticipates negative rating announcements, only S&P's and Moody's announcements are found to be significant

Table 9. Continued

CDS Market	Ismailescu and Hossein (2010)	2001–2009, S&P, (Sovereign CDS)	Significant reaction of CDS spreads to positive rating announcements, no significant reaction to negative announcements, negative announcements are anticipated by CDS market
CDS-Bond Market	Afonso, Furceri and Gomes(2011)	1995-2010, S&P, (Sovereign CDS), (Sovereign bond)	For bond market, effects of negative announcements from S&P and effects of positive announcement Moody's are found significant. For CDS market, evidence of significant spread reaction to positive rating announcements by S&P and negative rating announcements by Moody's are found. Fitch's announcements are not found significant for neither for markets nor for types of announcements
CDS Market	Finnerty, Miller and Chen (2013)	2001-2009, S&P (Corporate CDS)	Significant reaction to both negative and positive events, negative rating announcements are anticipated by market, CDS spreads for investment-grade credits contain information that is useful for estimating the probability of negative credit rating announcements

Stock Market Response to Credit Rating Announcements

Wide-ranging research has been conducted concerning the effect of changes in credit ratings to stock prices. Results regarding stock price responses to downgrades and upgrades are inconsistent. The first study was conducted by Pinches & Singleton in 1978. They investigated the behavior of the stock market in US prior to announcements and after the announcements. Their data set consists of 207 firms and credit rating announcement list of Moody's between the years 1959-1972. They found that prices changed significantly from 30 months before to the announcement. On the other hand, no evidence of price changes was found during the rating change or 12 months afterwards.

Griffin and Sanvicente (1982) also investigated the monthly abnormal stock shares reaction to credit rating changes in US. They used Moody's and S&P's announcement lists for the period 1960-1975 which consisted of 180 events. They choose an event window of one year and explored the price changes eleven months preceding the credit rating change and one month after the event, [-11,1]. Their analysis reveals significant cumulative abnormal returns for downgrades but no significant returns for credit rating upgrades.

Holthausen and Leftwich (1986) conducted a study similar to Pinches et al. (1978) and Griffin et al. (1982) studies with a larger sample. Their data set consisted of 1014 rating changes, 256 credit watches from S&P announcement list for the period 1977-1982. They also concluded that downgrades and negative credit watches by Moody's and Standard & Poor's are associated with negative abnormal stock returns, while no response is found for upgrades and positive credit watches. They used an event window of 12 months, [-10, 2].

Hand, Holthausen and Leftwich (1992) also reached the same conclusion with previous studies. For the US stock market, rating downgrades present new information to investors, while upgrades do not. They used credit announcements lists of Moody's and S&P for the period 1977-1982. Hand et al. (1992) also find that daily abnormal returns are significant when they tested Credit Watch list of S&P's between the years 1981 and 1983. The event window used for analysis covers 11 days before to 60 days after the announcement, [-11, 60].

Goh and Ederington (1993) investigated US market reaction of stock market to credit rating downgrades by using a daily event window of [-30, 30] and Moody's announcement list. They observed positive returns for some of the stock shares after downgrades. After their analysis, they concluded that some of these downgrades resulted from changes in financial leverage and were not bad news for shareholders as downgrades resulting from changes in financial leverage indicate shifts of wealth form bondholders to shareholders.

Followill and Martell (1997) investigated stock returns with a Moody's sample which consisted of reviews and rating changes and 64 counts in total. For the years 1984-1986, they found significantly negative daily returns for reviews for downgrades and negligible abnormal performance around actual downgrades. They also found that the effect of positive reviews and positive rating changes on returns were insignificant. The time interval for analysis was 10 months, [-5, 5].

The study of Barron, Clare and Thomas (1997) concentrates on the effect of credit rating changes and Credit Watches of S&P on the UK market. In order to test the effect of long and short-term rating changes, they investigated the period of 30 days, [0, 30], and used daily data covering the years from 1984 to 1992 for 87 companies. The results replicated the general results from the US studies: results are

significant for abnormal stock returns related with bond rating downgrades were observed. Additionally, they found positive abnormal stock returns for Credit Watch announcements.

In a latter study, Goh and Ederington (1999) investigated information content of credit rating announcements. For their analysis they collected data for all corporate bond rating changes by Moody's between January 1, 1984 and December 31, 1990--a total of 1526 rating events of which 1043 were downgrades and 483 were upgrades. Their analysis shows that for the 2-day event window, downgrades result in a negative cumulative abnormal return of -1.21%. For the same event window, the effect of upgrades is a negative cumulative abnormal return of 0.095%. Interpreting these results, they concluded that downgrades contain private negative public information and upgrades appear to reflect public information.

Dichev and Piotroski (2001) use corporate rating changes between the years 1970 and 1997 from Moody's. The Moody's credit announcement list consisted of 4727 rating changes. They found no consistent abnormal returns after upgrades but a significantly negative reaction in the first month after downgrades.

Elayan, Hsu and Meyer (2003) investigated credit rating change announcements for New Zealand firms' stock shares. Unlike most of the U.S. studies where only negative announcements cause statistically significant market responses, announcements with positive implications for New Zealand companies also generate significant abnormal returns.

Bannier and Hirsch (2010) conducted a study with Moody's credit rating announcement lists between the years 1982 and 2004. They categorized downgrades as direct rating changes and as Credit Watch-preceded rating changes. Using a 3 day event window -one day prior to event and one day after the event- they find that

stock market reacts more to direct credit rating downgrades than to Credit Watches preceded downgrades. On the other hand, they found significant reaction for direct upgrades and Credit Watch preceded upgrades.

Chung, Frost and Kim (2012) analyze effects of credit watch and rating credit rating changes on the stock market separately. In their analyses, they use Moody's credit rating change and Credit Watch data for all issuers whose financial statement data are available in Compustat (a market database published by Standard and Poor's) for 1992–2010. They found that Credit Watch announcements generate abnormal stock returns, indicating that credit watch actions carry significant information for market.

Literature on stock market shows evidences for significant negative stock price reactions to downgrades, but no strong evidence of stock price reactions for upgrades. Thus, research on stock market indicates asymmetrical stock market reaction to credit rating announcements.

Bond Market Response to Credit Rating Announcements

One of the first studies of bond market response to credit rating announcements is conducted by Katz (1974). He used announcement list of Moody's which covers the period 1966-1972. He collected data on 115 bonds from 66 corporate entities. The investigated event window is 12 months before and 5 months after the announcement. Katz found no significant change in monthly returns before rating events; however he observed abnormal performance of bond returns during 6-10 weeks after the downgrades.

Hettenhouse and Sartoris (1976) studied the effect of Moody's and S&P's credit rating announcements on returns for bonds for 46 corporate entities. The rating announcement data in this study covered the period from 1963 to 1973. Using a 12 month event window (6 months prior to announcement and 6 months after the announcement) downgrades were found to have a weak effect on monthly bond returns whereas upgrades had no significant effect.

Wansley, Glascock and Clauretie (1992) investigated the effect of credit rating announcements of S&P on weekly abnormal corporate bond returns of 351 entities from the US market. Chosen event window was event window of two months, [-1, 1]. Their results showed significantly negative returns in the week of downgrades and no significant response to upgrades.

In the study of Hite and Warga (1997), price reaction of corporate bonds to Moody's and Standard & Poor's bond-rating changes is investigated using database of Lehman Brothers for March 1985 through March 1995. Dataset consisted of 2,800 bonds issued by 1,200 firms. All Standard & Poor's and Moody's rating changes are studied in a period from up to 12 months before the rating change to 12 months after. Downgraded firms' bond returns reveal a significant announcement effect in both the announcement month and during the preannouncement period. Downgrading effect increases as the sampled entities move from investment grade to non-investment grade. On the other hand, they find that upgrades have an insignificant effect on bond returns.

Kamin and Kleist (1999) relate emerging markets' sovereign spreads in bond and loan markets to credit ratings issued by S&P and Moody's between the years 1991-1996. Their study shows that emerging market bond spreads have a strong relationship with credit ratings. Study also reveals that borrowers in Latin America

and Eastern Europe are charged with higher spreads than borrowers in Asia and the Middle East. They used panel regression for the analyses.

Steinee and Heinke (2001) examine daily abnormal euro bond returns associated with announcements of credit watches and rating changes by Standard & Poor's and Moody's. Dataset covers the years between 1985 and 1996 and consists of 546 rating changes and 182 watch lists. Significant bond price reactions are observed for the period starting from 90 days before the announcements of downgrades and negative watch lists while upgrades and positive watch list did not cause announcement effect.

Gande and Parsly (2005) study the effect of a sovereign credit rating change of one country on the other country's sovereign bond spreads. Investigating the period from 1991 to 2000, they find that positive rating announcements have no spillover effect on other sovereign spreads, whereas negative ratings announcements are associated with an increase in spreads.

The literature on the bond market response to credit rating announcements confirms the results for the literature on the stock market reaction to credit rating announcements. No significant abnormal return or yield spread change is found for positive credit rating announcements whereas negative credit announcements found to be significantly affecting bond returns and yield spreads.

CDS Market Response to Credit Rating Announcements

A comprehensive body of literature investigated the relationship between changes in the rating agencies' release of information or credit rating announcements and the response of bond and stock markets. Due to the rapid growth of derivative markets,

research interest has shifted to the CDS market. Especially since the recent Lehman crisis in 2007, studies on Credit Rating Agencies and their relationship with sovereign CDS market have attracted considerable attention.

Hull, Predescu and White (2004) were the first scholars to investigate the relationship between CDS spreads and CRA announcements. Their credit rating announcement list is gathered from Moody's and covers a time period between January 1998 and May 2002 for 1,599 named entities. They collected 29,032 spread observations for CDS contracts with a 5-year maturity. In order to control for macroeconomic effects on the CDS spreads, indices of CDS spreads were separately calculated for each investment-grade category. Later on, they converted each spread in to an "adjusted spread observation". Hull et al. (2004) conducted two sets of statistical tests. First they investigated effects of rating announcement and analyzed the movements in spreads before and after a credit rating event. Second, they tested whether the probability of rating events can be inferred from movement of credit spread.

They used a time interval of 100 days [-90, 10]. Then they investigated subintervals ([-90,-61], [-60, -31], [-30, -1], [-1, 1], and [1, 10]) to examine the spread movements at different points in time. After analyzing all observations, they conclude that CDS spreads anticipate negative credit rating announcements. There is a significant increase in CDS spreads before negative credit rating announcements (actual downgrade, review for downgrade, or negative outlook) at the 1% confidence level. For the event window of 90 days preceding negative announcements, the CDS spreads increased approximately by 38 bps for downgrades, 24 bps for reviews for downgrade and 29 bps for negative outlooks. Also, for reviews for downgrade and negative outlooks, CDS spreads increased significantly at 1% level 30 days before

the announcement. However, no significant spread change was observed in the following 10 days after a negative credit rating announcement. For the event window [-1, 1], CDS spread change was found significant only for A, and for Baa rated entities and only for reviews for downgrades and actual downgrades. This result suggests that announcements of reviews for downgrades and downgrades carry new information for the market. However, after the rating announcements, spreads fully adjust to information in one day since no significant adjustment is found for the post window of 10 days. On the other hand, no significant spread change was found for positive rating announcements. The authors state that this finding may be affected from the limited number of positive rating announcements in their sample.

In their second set of analysis, Hull et al. (2004) calculated the coefficient for the "adjusted spread change" in order to estimate the probability of rating events that might be inferred from CDS spread changes. In order to calculate the coefficient for adjusted rate, they constructed non-overlapping 30 day time intervals for each reference entity and observed whether a particular rating event occurs until the end of the time interval. They found that the coefficient is significant at a 1% confidence level for the probability of a downgrade or a negative outlook and is insignificant for reviews for downgrades. After these analyses, they conclude that adjusted spread changes contain useful information for estimating the probability of negative rating announcement.

Micu, Remolona, and Wooldridge (2004) studied the relationship between credit rating agency announcements and CDS spreads with 694 reference entities from the financial and non-financial sectors situated in European Union, Japan, Sweden, Switzerland, UK, and US. They excluded entities with ratings above AA and below BBB. The study examined daily CDS spreads for reference entities' with

5-year maturity. When compared to the study of Hull et al. (2004), their study covers a shorter time period, between January 2001 and December 2003. Micu et al. (2004) followed the same methodology with Hull et al., created an index for spreads in a given rating category in order to control market-wide systematic factors and calculated adjusted spread changes. The announcement data used was from Moody's and Standard & Poor's and they are investigation covered an 80 day event window [-60, 20]. The interval is divided into four sub intervals ([-60, -21], [-20, -2], [-1, 1], and [2, 20]).

The announcement data includes 2,010 negative and 325 positive rating announcements. Authors find that number of positive announcements is too small when compared to the number of negative announcements. Therefore, Micu et al. (2004) excluded positive rating announcements from dataset. The authors apply one parametric and one non-parametric test. The parametric test is a mean test with the null hypothesis that the mean spread changes for negative rating events are positive and vice versa for positive rating events. Non-parametric test used is median test which takes into account median change in spreads and constructs null-hypothesis in accordance to median change. The null-hypothesis was that, 50% of changes in spreads have a positive sign (above median change), and 50% have a negative sign (below median change).

The study concludes that the impact of downgrades on CDS spreads is statistically significant even for downgrades that were preceded by other rating announcements in the previous 60 days, CDS spread responds significantly. The impact of downgrades was found to be greatest for A- and BBB-rated entities. Further, for A-rated entities, spreads change significantly only if preceded by another announcement within 60 days. Also, announcements of negative reviews have a

significant effect on the CDS spreads regardless of whether there has been a preceding credit rating announcement or not. Similar to downgrades, the effect is biggest on A- and BBB-rated entities for reviews. Moreover, CDS spreads anticipate the upcoming reviews for all rating classes except for AA-rated entities. In the case of A- and BBB-rated entities, the spreads continue to increase up to twenty days after the announcement

Norden and Weber (2004) also apply event study methodology in their study. They investigated whether and how strongly the adjusted CDS spread changes respond to credit rating announcements by Standard & Poor's, Moody's, and Fitch. The data set of the study contains 90 corporate entities (58 from Europe, 24 from the US, 8 from Asia) over a time period of three years (2000-2002). After removing corporations with less than 100 daily CDS spread observations from the dataset, they obtained 60,827 daily CDS spread observation in total. In their dataset, 86 corporations are rated by both S&P and Moody's and 59 by all three agencies and there are 149 negative reviews and 198 downgrades.

They use an event window of 180 days, [-90, 90], which is further divided into smaller windows ([-90, -61], [-60, -31], [-30, -2], [-1, 1], [2, 30], [31, 60], [61, 90]). They calculated mean adjusted CDS spread change for each agency and each announcement type.

In the first phase of analysis, the authors examine the CDS market response to actual downgrades and reviews for downgrades for each agency separately. They find that CDS market anticipates downgrades and reviews for downgrades in the [-90, -61] period and shows an abnormal performance. However, the most significant adjusted CDS change is found for the event window [-1, 1] which means that even though the market anticipates downgrades and reviews for downgrades prior to

announcements, the rating agencies still provide new information to the market. Similar to Hull et al. (2004), Norden & Weber (2004) find that markets absorb the new information provided by rating events within one day as the [2, 20] window was found to be insignificant in terms of adjusted spread change.

Comparing the three rating agencies in terms of adjusted spread changes in all pre-event time intervals, the effect of S&P and Moody's announcements were found to be significantly bigger than zero, at 1% and 5% levels, respectively. However, the effect of Fitch announcements on adjusted spread change was found to be insignificant.

Ismailescu and Kazemi (2010) examine the response of sovereign CDS markets to a deterioration or improvement in creditworthiness of emerging economies during the years 2001–2009. They collected data from 22 reference entities and 43,436 daily observations from 22 emerging markets (Argentina, Brazil, Chile, China, Colombia, Ecuador, Egypt, El Salvador, Indonesia, Israel, Lebanon, Malaysia, Mexico, Panama, Peru, Philippines, South Africa, South Korea, Thailand, Turkey, Venezuela, and Vietnam) and used S&P's event list. They preferred a two-day measurement window, [-1, 1] to the standard 30-day period in order to avoid the event window contamination problem by other announcements or news. After their analysis they reached the conclusion that positive rating announcements have an immediate impact, while negative rating announcements have no impact on sovereign CDS markets for both CDS spread changes and adjusted CDS spread changes. They also investigated whether or not rating announcement are anticipated by the CDS market by using time periods of [-30, -1], [-60, -31], and [-90, -61]. Adjusted CDS spread changes were found to be significant for negative announcements during the one month preceding the event at a confidence level of

1%. For positive rating announcements, adjusted spread changes were found to be significant at 5% level. For CDS spread changes, significance is found to be at 1% confidence level for both the negative and positive credit rating announcements. According to their interpretation of these results, credit upgrades for emerging economies convey more information than a credit downgrades and positive rating announcements still carry new information even though they are anticipated. Additionally, CDS spreads are useful in predicting the probability of negative events but are not useful in estimating the probability of an upgrade.

Afonso, Furceri and Gomes (2011) examine the impact of rating announcements by Standard & Poor's, Moody's and Fitch on Eurozone sovereign CDS spreads and bond yields. The investigated period starts as early as January 2, 1995 for some countries and ends on October 2010. In order to test the response of markets to rating announcements, they used an [-1, 1] event window. For the bond market, effects of negative announcements from S&P and effects of positive announcement Moody's were found to be significant. For the CDS market, they found evidence for significant spread reaction to positive rating announcements by S&P and negative rating announcements by Moody's. Fitch's announcements were found to be significant neither for markets nor for announcements.

Finnerty, Miller and Chen (2013) investigate the effect of Credit Watches, outlooks and credit rating changes on CDS spreads and examine the ability of CDS spreads and adjusted spread changes to predict positive as well as negative credit rating events. They used 1,500,735 daily five year CDS spreads of 14,248 corporate entities and S&P's announcement list between January 2, 2001 and May 31, 2009. In order to test the effect of rating announcements, they used [-1, 1] event window. Contrary to prior findings, they document significant announcement effects in

response to all types of positive credit rating announcements (rating upgrade, outlook, and credit watch). They found that upgrade announcements had a consistent significant impact on CDS spreads, starting from 2003. Further, they found that negative rating announcements are anticipated in the time windows of [-30, 2], [-60, -31] and [-90, -61] while positive rating announcements are anticipated in the time windows of [-30, 2] and [-60, -31]. Moreover, they claim that CDS spreads for non-investment grade credits, like changes in CDS spreads for investment-grade credits, contain information that is useful for estimating the probability of negative credit rating announcements.

The findings related to corporate CDS market indicate that the negative credit rating announcements significantly impact the CDS spreads (Hull et al., 2004; Micu et. al., 2004; Norden & Weber, 2004). Finnerty et al., however, found significant response to both negative and positive credit rating announcements (2013). At the sovereign level for the developed economies, the results of the empirical research show that in the case of Moody's, the effect of negative credit announcements are significant whereas in the case of S&P's, the same effect is observed for the positive credit rating announcements (Afonso et al., 2011). For the emerging economies, the response of sovereign CDS market is found to be significant for positive credit rating announcements while there is no response for the negatives ones (Ismailescu & Kazemi, 2010).

Previous research focused on the impact of credit rating announcements on stock, bond and CDS markets in order to determine the information value of the credit ratings through abnormal market responses. To put it differently, the studies hypothesized that if the credit rating announcements deliver new information to the markets, they should be accompanied by abnormal market responses. However, if the

credit rating announcements simply aggregate the existing information, then the rating announcements do not contain new information and will not affect the stock, the bond or the CDS markets. The findings from empirical research on stock market response to credit rating announcements indicate that for corporate entities, the stock prices respond significantly to negative credit rating announcements but no strong evidence suggests that the stock prices respond to positive ones. The findings are similar for corporate and sovereign bond market response to credit rating announcements. For the CDS market for corporate entities from developed economies, the findings indicate that, the CDS spreads significantly respond to negative credit rating announcements but no significant response is reported on the positive credit rating announcements except for the study conducted by Finnerty et al. (2013). They found that both the negative and the positive credit rating announcements have significant impact on CDS spreads. At the sovereign level for the developed economies, Afonso et al. (2011) found evidence for significant spread reaction to positive rating announcements by S&P and negative rating announcements by Moody's. For the emerging economies at the sovereign level, the positive rating announcements are found to have significant impact on CDS spreads while the negative rating announcements are found to have no impact (Ismailescu & Kazemi, 2010). The findings further reveal that the market response to credit rating announcements is asymmetrical and the negative announcements were found to have greater information content except for the study conducted by Ismailescu and Kazemi (2010). The CDS market anticipation is another issue that is elaborated. The literature suggests that both the positive and negative rating announcements are anticipated by the CDS market, but the negative credit rating announcements continue to carry new information to the market after the announcement. For the

study of Ismailescu and Kazemi (2010), however, only positive credit rating announcements continue to convey new information to the CDS market.

Hitherto, few studies have examined sovereign CDS market while there are numerous studies conducted on CDS market response to credit rating announcements on the corporate level within the developed economies context. There is one study in the literature that examines CDS market response to credit rating announcements for the emerging economies at the sovereign level. Additionally, the studies conducted for the sovereign CDS market cover the period before the Eurozone debt crisis of 2009 and no there are no studies which covering the post-crisis period. The following chapter presents the research questions of the study and the event study methodology.

CHAPTER 3

RESEARCH METHOD

Research Objective

As discussed in the previous chapter, CDS spreads are considered as reasonable measures of credit risk compared to stock and bond market instruments and indices where information regarding credit risk is reflected only implicitly through prices (Blanco, Brennan, & Marsh, 2005; Longstaff, Mithal, & Neis, 2005; Ericsson, Jacobs, & Oviedo, 2009). Furthermore, new information is reflected relatively quicker in the CDS markets than in bond and stock markets (Longstaff et al., 2003; Blanco et al., 2005; Norden and Weber, 2009; Forte and Peña, 2009). Whereas CDS market response to credit rating announcements for developed markets is an extensively researched area, only few studies examined the response of sovereign CDS market response to credit rating announcements. To the best of author's knowledge, there is only one empirical study within the context of emerging market economies (Ismailescu & Kazemi, 2010).

This study aims to investigate the response of emerging market sovereign CDS spreads to credit rating announcements, the symmetry in CDS market responses to positive and negative credit rating announcements, and how significant the changes in emerging market sovereign CDS spreads are prior to credit rating announcements (i.e whether or not the CDS market anticipates credit rating announcements) by using Standard & Poor's credit rating announcements for a period of twelve years (2001-2013). Credit rating announcements of S&P are chosen

since previous studies find that S&P rating changes occur more frequently, are less forecasted by markets, and precede Fitch's and Moody's announcements (Reisen & Maltzan, 1999; Gande and Parsley, 2005; Ismalescu and Kazemi, 2010). Additionally, the choice presents an opportunity to compare results with previous studies most of which also use S&P event lists.

Emerging market sovereign CDS spreads are explored by addressing the following research questions for the selected period (2001-2013):

Research Question 1:

How do emerging market sovereign CDS spreads respond to credit rating announcements? If credit rating announcements carry new information for the CDS market, then one can expect CDS spreads to decrease if rating announcements are positive and increase if credit rating announcements are negative. So simply, the first question is whether credit rating announcements can indeed carry new information to the market or not.

Research Question 2:

Are the CDS market responses to improvements and deteriorations in credit ratings symmetrical? In other words, do emerging sovereign CDS spreads respond to positive and negative credit rating announcements similarly in the expected direction and in the same scale? Empirical evidence from prior researches disclosed conflicting results in how CDS spreads reacted before and after credit rating announcements. For example, Hull et al (2004), Micu et al. (2004), Norden & Weber

(2004) found that only the effect negative rating announcements is significant; whereas Ismailescu and Kazemi (2010) found only positive rating announcements to have a significant effect on CDS spreads. On the other hand, Finnerty et al. (2013) concluded that both negative and positive rating announcements significantly affected CDS spreads.

Research Question 3:

Can credit ratings announcements be anticipated by the CDS market? If significant changes in emerging sovereign CDS spreads are observed prior to the announcement, one can infer that credit rating announcements can indeed be anticipated by the CDS market.

The research questions stated above are explored by using event study methodology. Event study is a statistical method for assessing the impact of an event on an entity within a time horizon around the particular event (Mackinlay, 1997). The time horizon surrounding the event is called the event window (Mackinlay, 1997). For this study, chosen entities are twenty emerging market economies and in order to assess the effects of events on entities, CDS spreads for 5 year emerging market bonds are used. Furthermore, events used for this study are the credit rating announcements released by Standard & Poor's between the years 2001 and 2013. For the first research question, a [-1, 1] day event window, covering the day before the event, the day of the event and the day after the event, is used. The second research question uses the same event window for comparing positive and negative rating announcements' effects on CDS spreads. Finally, for the third research question we go back 3 months and use a [-90, 20] day event window to explore if the market

could anticipate the rating announcements. The conceptual framework developed is presented in Figure 3.

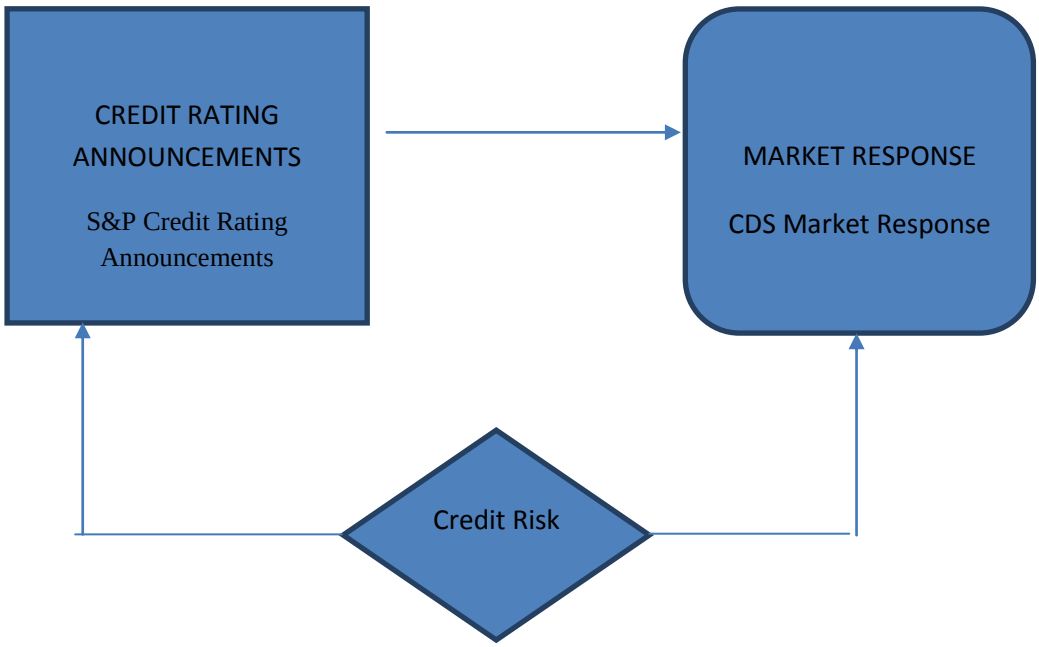

Fig. 3 Conceptual framework

Event Study Methodology

Event studies are used in assessing the economic impact of a given event. So as to measure the impact, the unexpected or abnormal return on the underlying security is studied by comparing the actual return that was observed during the event with the expected or normal return, *i.e.* the return that would have been expected in the absence of the event. This approach has an inherent assumption that capital markets can respond efficiently to publicly available news (semi-strong capital market efficiency) (Mackinlay, 1997).

An event study measures the impact of a specific event on the value of an entity by using financial market data. The effectiveness of the event study methodology comes from the fact that, given rationality in the marketplace, the

effects of an event will be reflected instantaneously in security prices. Consequently, a measure of the event's economic impact can be constructed using security prices observed over a relatively short period of time. In contrast, other analysis methods may entail longer time of observation (Mackinlay, 1997). Therefore, in order to test the CDS spread reaction associated with credit rating events an event study was performed.

In literature, event studies use a number of alternative techniques to estimate expected returns. Mainly, there are four commonly used models: the Capital Asset Pricing Model (CAPM), the Market Model (MM), the Mean Adjusted Returns Model (MAR) and the Market Adjusted Returns or Index Model (IM). Consistent with our research objective, where the impact of rating announcements on twenty emerging countries CDS markets is studied, we employ the Market Adjusted Returns Model (IM) by creating an index representing all twenty emerging country sovereign bonds' CDS spreads (Mackinlay, 1997).

Bowman (1983), Henderson (1990) and Mackinlay (1997) state that the event study methodology contains five steps. Using their approach, this study adopted the following steps:

Step 1: Event Identification*:*

The first step of event study is to identify events and their announcement dates. The events employed in this study are credit rating announcements (Rating change, outlook, credit watch) of S&P between the years 2001 and 2013 for twenty emerging market economies.

Step 2: Characterizing the CDS spread changes and market index:

Step two involves in calculation of the CDS spread changes for the entities and the market index. The entities studied are five-year dollar denominated sovereign CDS spreads for the twenty emerging market economies. An equally weighted portfolio of all reference entities (twenty emerging countries) in our sample is created and this is considered as market index. As explained above, the market adjusted return model is chosen which uses the return on this market index as its benchmark. The market index can be calculated as:

$$Index_t = \frac{1}{n}\sum_{i=1}^{n} CDS\ spread_{\ i,t}$$

where:

$CDS\ spread_{i,t}$ ~ CDS spread of country *i* on day *t*
n ~ number of reference entities

The market adjusted return model prevents occurrence of biased results in cases of whole market movement (Brown & Warner, 1985). This methodology is similar to methodologies used in prior studies (Hull et al., 2004; Norden and Weber, 2004; Ismailescu and Kazemi, 2010, Finerty et al. 2013).

First, daily CDS spread change and daily index changes are calculated as follows:

$$\Delta Spread_{i,t} = \ln(CDS\ spread_{i,t}) - \ln(CDS\ spread_{i,t-1})$$

$$\Delta Index_{t} = \ln(Index_{t}) - \ln(Index_{t-1})$$

where;

$CDS\ spread_{i,t}$ ~ CDS spread of country i on day t
$CDS\ spread_{i,t-1}$ ~ CDS spread of country i on day t-1

$\Delta Spread_{i,t}$ ~ CDS spread change between the days *t* and *t-1*.
$Index_t$ ~ market index on the day *t*
$Index_{t-1}$ ~ market index on the day *t-1*
$\Delta Index_t$ ~ market index change between the days *t* and *t-1*.

Step 3: Modeling adjusted spread change

The third step is to calculate daily CDS spread change of entities relative to chosen benchmark. Adjusted spread changes (ASC) are defined as the spread change of a particular entity minus market index change:

$$ASC_{i,t} = \Delta Spread_{i,t} - \Delta Index_t$$

$\Delta Spread$ ~ change in the credit spread for country *i* at time *t*
$\Delta Index_t$ ~ market index change between the days *t* and *t-1*
$ASC_{i,t}$ ~ adjusted spread change of country *i* at time *t*.

Step 4: Aggregating the abnormal returns

Even though spread changes around the events could be analyzed distinctly, it might not represent the change caused by the specific event since countless spread movements are also be stemming from the information flow that is unrelated to the particular event in question. Taking average of all adjusted spread changes for all rating announcements for the entities in the sample improves the informational value of analyses and isolates the effect of a particular event. The average adjusted spread change (AASC) calculated as follows:

$$AASC_t = \frac{1}{N} \sum_{i=1}^{N} ASC_{i,t}$$

N ~ number of credit rating events

In order to analyze the performance over a longer time period, cumulative adjusted spread changes (CASC) are used. CASC is aggregation of abnormal returns from the start of the event t_1, up to time t_x. The cumulative adjusted spread changes (CASC) for a country *i* is expressed as follows:

$$CASC_i = ASC_{i,t1} + \ldots + ASC_{i,tx} = \sum_{t=t_1}^{t_x} ASC_{i,t}$$

After calculating AASC and CASC, cumulative average adjusted spread change (CAASC) for the credit rating announcements for the entities can be calculated by two methods:

$$\textit{Method 1: } CAASC = \sum_{t=t_1}^{t_x} AASC_t$$

$$\textit{Method 2: } CAASC = \frac{1}{N}\sum_{i=1}^{N} CASC_{i,t}$$

CAASC ~ average of cumulative adjusted spreads

The formula measures the average effect of the event on the value of CDS spreads for sovereign bonds of n countries.

Step 5: Testing the significance of the aggregated adjusted spreads

After finding CAASC, final step is to check whether these calculated abnormal returns are significant for a priori specified significance levels. Under the null hypothesis that the CAASC is equal to zero, cross sectional *t-test* is calculated as:

$$t_{CAASC} = \sqrt{N}\frac{CAASC}{s}$$

where:

N	~ number of events
s:	~ standard deviation

Where the standard deviation (s) is calculated as:

$$s = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(CASC_i - CAASC)^2}$$

In the study it is assumed that adjusted spread changes (ASC) are normally distributed since the sample is large enough for both negative and positive announcements to fit central limit theorem. The sample includes 127 positive events and 54 negative events which are both larger than 30. To test the significance of CAASC at a 10 percent confidence level, the critical value should be higher than 1.64 or lower than -1.64 and to test it at the 5 percent confidence level, the critical value should be higher than 1.96 or lower than -1.96. Finally, critical value for 1 percent confidence level should be higher than 2.58 or lower than -2.58

This study assumes that the CDS markets of selected entities, the twenty emerging countries, are semi-strong efficient markets where is the CDS spreads react to publicly available new information provided by credit rating agencies. In this study, all event study results are computed using Event Study Metrics Software 1.03. Table 10 summarizes the event study used in this thesis.

Table 10. Summary of the event study

Reference Entities	49, 925 daily observations for 5 year sovereign bond spreads for twenty emerging economies covering the period starting from the October 12, 2001 to December 31, 2013. The emerging economies studied are: Argentina, Brazil, Chile, China, Colombia, Ecuador, Egypt, Indonesia, Israel, Malaysia, Mexico, Panama, Peru, Philippines, South Africa, South Korea, Thailand, Turkey, Venezuela, and Vietnam
Events	181 S&P's credit rating announcements (127 positive, 54 negative) for the chosen emerging market economies between the years 2001 and 2013
Event Windows	3 days [-1, 1] event window (for the first and the second research questions) 110 days [- 90, 20] event window (for third research question)
Analysis Steps	1. Events are identified as credit rating announcements by S&P 2. Market index as an equally weighted portfolio of all reference entities' CDS spreads, daily logarithmic CDS spread changes of each entity and daily logarithmic market index changes are calculated. 3. ASCs are calculated by taking the difference between daily logarithmic CDS spread changes and logarithmic market index changes. 4. For each negative and positive credit rating announcement for the entities, averages of all adjusted spread changes (AASCs) are taken within the chosen event windows. Then cumulative average adjusted spread changes (CAASCs) are calculated by aggregating the AASCs 5. Cross sectional *t-test* is conducted under the null hypothesis that the CAASC is equal to zero

Data and Descriptive Analysis

The primary data set consists of daily observations of dollar denominated sovereign CDS spreads with five-year maturities. Data is obtained from Bloomberg database which gathers the relevant data from Markit Group. Markit Group compiles data of more than million CDS quotes from more than 30 major market participants on a daily basis. After elimination of outliers Markit computes a daily composite spread only if CDS contract has two or more market participants (Mayordomo, Pena, & Scwartz, 2010).

Data used in the study has different number of daily CDS spread observations from the October 12, 2001 to December 31, 2013 period for each emerging country. For the twenty emerging countries studied, an overall number of 49,525 CDS spread observations are used. The twenty emerging markets studied are: Argentina, Brazil, Chile, China, Colombia, Ecuador, Egypt, Indonesia, Israel, Malaysia, Mexico, Panama, Peru, Philippines, South Africa, South Korea, Thailand, Turkey, Venezuela, and Vietnam. Summary statistics on the raw CDS data for each country are provided in Table 11.

Table 11. Summary Statistics for CDS Data for Each Country

Country	Starting Period	No. of Daily Observations	CDS Spread (bps)		Daily CDS Spread changes	
			Mean	Standard Deviation	Mean	Standard Deviation
Argentina	22.06.2005	2287	1167,94	1006,48	0,140	3,834
Brazil	12.10.2001	3158	383,65	561,36	0,011	3,880
Chile	24.01.2003	2869	72,73	50,28	0,044	3,742
China	24.01.2003	2655	65,73	46,58	0,111	4,751
Colombia	24.01.2003	2892	218,71	153,68	-0,004	3,705
Ecuador	24.10.2006	395	285,87	171,19	0,290	7,412
Egypt	19.07.2006	431	2004,03	1426,19	0,439	16,299
Indonesia	08.10.2004	2025	224,37	128,44	0,056	4,149
Israel	23.08.2004	1977	98,60	59,12	0,189	6,164
Malaysia	22.10.2001	2928	88,22	58,03	0,067	4,155
Mexico	12.10.2001	3159	134,23	79,92	0,032	3,903
Panama	03.11.2003	2708	159,00	79,99	0,017	3,466
Peru	20.10.2003	2717	173,72	95,32	0,034	3,930
Philliphines	04.04.2002	2735	255,70	144,23	0,011	3,074
Russia	12.10.2001	3159	208,82	159,21	0,040	3,936
South Africa	12.10.2001	3152	145,34	83,53	0,058	3,476
Thailand	04.04.2002	2664	97,42	59,72	0,095	4,328
Turkey	12.10.2001	3159	321,28	241,09	0,009	3,415
Venezuela	24.01.2003	2899	825,23	538,73	0,019	2,940
Vietnam	09.05.2006	1556	256,07	117,10	0,118	3,722

CDS spread averages for the sample vary across countries ranging from 65.73 bps for China to 1167.94 bps for Argentina. The general trend is an increase in the CDS spreads across all countries, except for Colombia; indicating that average CDS spread daily percentage change for each country is positive.

Credit rating announcement events for the selected period are collected from S&P's Sovereign Rating and Country Transfer and Convertibility Assessment Histories. From October 12, 2001 to December 31, 2013, S&P reported 229 long-term foreign currency rating announcements (dollar denominated) for 20 emerging market countries (Standard & Poor's Rating Services, 2013). However, some countries do not have CDS spread observations for some of the announcement days. To overcome this problem, the methodology used by Hull et al. (2004) Norden and Weber (2004) and Finnerty et al (2013) was followed and linearly interpolated adjacent CDS spreads were used. In order to minimize generation of false data points, this method was only used for gaps of 10 trading days or less. After

eliminating unmatched announcements the final announcement event list sample has 181 observations, among which 127 are positive and 54 are negative announcements (see Table 12).

Table 12. Distribution of Rating Announcements

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
The distribution of rating announcements per year														
Number of Positive Announcements	2	10	13	10	11	18	12	7	5	11	12	7	8	127
Number of Negative Announcements	0	4	1	0	4	2	2	16	2	1	5	9	9	54
Total	2	14	14	10	15	20	14	23	7	12	17	16	17	181
					Number of Announcements per day									Total days
						1			2					
Distribution of rating announcements per day														
Number of Positive Announcements						94			15					111
Number of Negative Announcements						50			1					53
All Announcements						144			32					176*

* There is one day with one negative and one positive announcement, one day with three announcements, two positives and one negative

Table 12 shows that improvements in emerging countries ratings were more frequent between 2002 and 2007 and on 2010 and 2011. On the other hand, deteriorations of credit ratings have been more frequent especially in 2008, 2012 and 2013. There is only one day in the observed period when three rating announcements were simultaneously made (May 2, 2013). There are 15 days when two positive announcements and a single day when two negative ratings were announced on the same day. Remaining 144 ratings were all announced on different days.

In this study, a credit rating announcement is defined as either a change in a country's credit rating or a change in its credit review for a rating change. Positive announcements are upgrades of S&P's letter credit ratings or upward revisions in the sovereign's credit outlook, whereas negative announcements are downgrades of letter credit ratings or downward revisions in the sovereign's credit outlook. Sometimes S&P places a country on credit watch-positive (watch-negative) several months prior to an upgrade (downgrade) to signal the likelihood of a credit rating

change. Our rating announcement data consist of 72 rating upgrades, 55 positive outlooks, 25 downgrades, 26 negative outlooks and 3 negative credit watches for the period October 12, 2001 and December 31, 2013. The most frequently downgraded country is Egypt with 6 downgrades whereas most repeatedly upgraded country is Russia with 7 upgrades. For the period 2001-2013, S&P announced 13 outlooks for Turkey (7 positive, 6 negative). Table 13 shows the number rating changes, outlooks and credit watches by country in the sample.

Table 13. Number of Rating Changes, Outlooks and Credit Watches by Country

Country	Rating Change		Outlook		Credit Watch	
	Positive	Negative	Positive	Negative	Positive	Negative
Argentina	3	4	0	2	0	0
Brazil	6	1	4	1	0	0
Chile	5	0	5	1	0	0
China	4	0	3	0	0	0
Colombia	3	0	4	0	0	0
Ecuador	4	3	2	0	0	0
Egypt	1	6	0	1	0	2
Indonesia	4	0	2	2	0	0
Israel	2	0	2	1	0	0
Malaysia	2	0	2	1	0	0
Mexico	4	1	2	1	0	0
Panama	4	0	3	0	0	0
Peru	5	0	4	0	0	0
Philippines	3	3	3	1	0	0
Russia	7	1	3	2	0	0
South Africa	2	1	2	2	0	0
Thailand	2	0	3	1	0	1
Turkey	5	0	7	6	0	0
Venezuela	5	4	3	3	0	0
Vietnam	1	1	1	1	0	0
Total	72	25	55	26	0	3

Numerical values are assigned for each credit rating announcement in order to quantify credit rating events (Gande and Parsley, 2005; Ismailescu and Kazemi,

2010; Finnerty et al., 2013). For letter credit ratings, we create a ratings scale from -1 to 17 in which AAA rating takes the highest value whereas SD (‘‘Selective Default”) the lowest. Table 14 provides the numerical scaling used in quantifying the rating announcements for the countries. Credit outlooks take on values between -0.5 for outlook ‘‘Negative” and 0.5 for outlook ‘‘Positive”. “Not Meaningful” (NM) implies that sovereign is in default (D) and Credit Watches may add on to the rating scale of the country by -0.25 or 0.25. Since “Not Meaningful” does not convey any information, it is assigned a zero value. Finally, following Gande and Parsley (2005), Ismailescu and Kazemi (2010) and Finerty et al (2013), a comprehensive credit rating (CCR) for each reference entity is created, by adding the numerical values assigned to the letter credit rating and credit outlook of that entity. For example, on March 11, 2008, Russia’s long term foreign currency was rated BBB+/Positive. Thus, from March 11, 2008 until Russia’s next credit rating announcement on September 19, 2008, the comprehensive credit rating of Russia was 10.5.

Table 14. Numerical Rating Scale

A. Credit Rating	Numerical Value
AAA	17
AA+	16
AA	15
AA-	14
A+	13
A	12
A-	11
BBB+	10
BBB	9
BBB-	8
BB+	7
BB	6
BB-	5
B+	4
B	3
B-	2

Table 14. Continued

CCC+ to CCC-	1
Below CCC-	0
SD (Selective Default)	-1
B. Credit outlook & Credit Watches	
Credit outlook	
Positive	0,5
Watch positive	0,25
Stable	0
Watch negative	-0,25
Negative	-0,5
NM (not meaningful)	0

Source: Gande and Parsley, 2005; Ismailescu and Kazemi, 2010; Finerty et. al, 2013

For a comprehensive credit rating (CCR), absolute change greater than or equal to 1 indicates either upgrade or downgrade of the country's letter credit rating, while an absolute change less than 1 indicates, an upward or downward revision in the sovereign's credit outlook or credit watch. The succession of credit rating announcements of sovereigns in our sample is plotted in Figure 4.

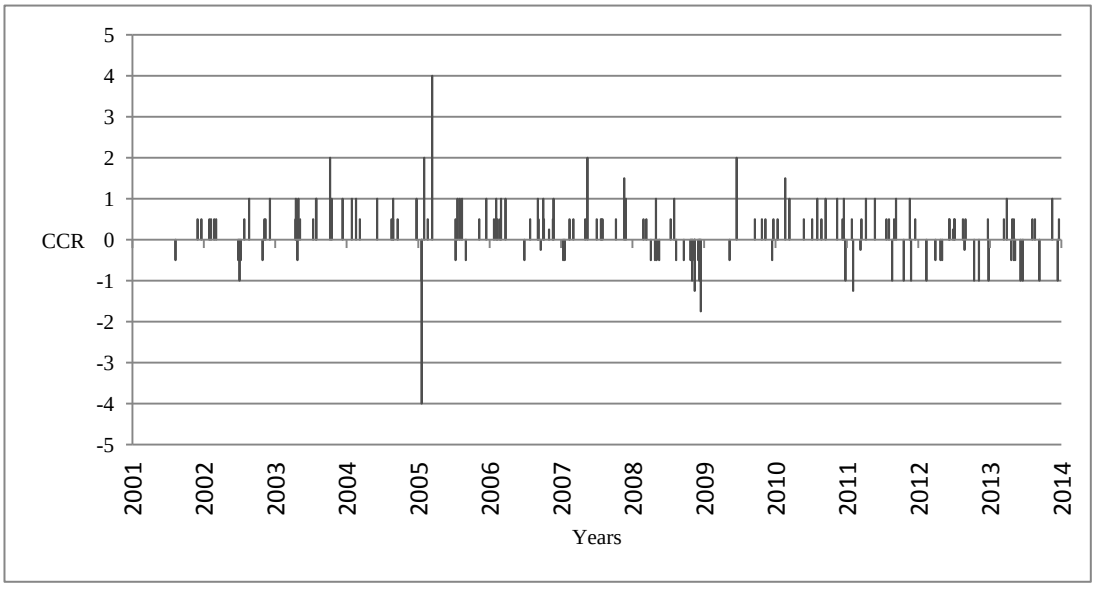

Fig. 4 Comprehensive Credit Ratings (CCR) for rating events

Venezuela accounts for both the highest upward and downward changes in Figure 4. The highest downward change is observed when Venezuela is downgraded from B/stable to default on January 18, 2005. On the other hand, Venezuela's rating is upgraded from SD to B/Stable again on March 12, 2005 which accounts for the highest upward change. Numerical provision of B/stable is 3, whereas SD is equal to -1. The absolute difference is equivalent to 4.

CHAPTER 4

ANALYSIS AND RESULTS

The following event study steps below conducted for the answering research questions mentioned in Chapter 3. In the first step, events are identified as credit rating announcements for twenty emerging market economies. These announcements are disclosed by several Credit Rating Agencies such as Fitch, Moody's and S&P. In this study, S&P's Sovereign Rating and Country Transfer and Convertibility Assessment Histories are used. Second, daily CDS spread changes for five year duration bonds of the selected emerging countries and daily bond market index changes are calculated. Next, by using Event Study Metrics Software 1.03, adjusted spread changes –CDS spread changes exceeding or underperforming the bond market index returns- are determined for the chosen event windows. The event windows used are covering the days before, of, and after the announcement, i.e. [-1, 1] for the first and second research questions. For the third research question, event study covers a time span of 90 days before and 20 days after the announcements, i.e. the window is [-90, 20]. This event window is further divided into sub event-windows of [-90, -61], [-60, -31], [-30, -16], [-15, -2] and [2, 20] in order to observe adjusted spread changes in the shorter periods of time. In the fourth step, adjusted spread changes are aggregated, i.e. cumulative adjusted spread changes (CASC) are computed and the cumulative average adjusted spread change (CAASC) is calculated by taking average of aggregated adjusted spread changes. Finally, statistical significance of CAASC is tested. The following section covers the analysis

for two research questions. And then the third research question will be discussed in the next section.

CDS Market Response to Credit Rating Announcements

This section first analyses the research question of whether emerging markets sovereign CDS spreads respond significantly to credit rating announcements or not. Three-day event window [-1, 1] is used to avoid event window contamination caused by other news as suggested by Ismailescu and Kazemi (2010) and Finnerty et al (2013). Tables 15, Table 16 and Figure 5 show adjusted spread change averages (AASCs) of 127 positive and 54 negative rating announcements, respectively. As expected, positive rating announcements, that imply lower risk assessments, lead to a decrease in CDS spreads. For positive rating announcements, AASC change is -0.22% prior to event day, while it is -0.91% on event day. On the day after the event, observed AASC is a further -1.09%. So, over these three days, -the day before the announcement-, -day of the announcement- and –the day after the announcement- the Cumulative Average Adjusted Spread Change (CAASC) is -2.22%.

Negative rating announcements, that imply an increase in risk assessments of the sovereigns, are expected to increase the CDS spreads. Compared to positive rating announcements, smaller magnitude of changes are noted for negative credit rating announcements. The day before the announcement, AASC is 0.91% implying that market players intuited the announcements. On the announcement day, the AASC is slightly negative (-0.0095%) but is not statistically significant. On the post event day, AASC increases by 0.49% which is also insignificant. For negative

announcements CAASC over the three days is equal to 1.3892%. Figure 5 presents CASSCs for both negative and positive announcements.

Table 15. Daily AASCs for Positive Credit Rating Announcements

Day	AASC(%)	CAASC(%)	t-test	p-value
-1	-0.2152	-0.2152	-2.8037***	0.0051
0	-0.9125	-1.1277	-2.7266***	0.0064
1	-1.0912	-2.2189	-3.3944***	0.0007

*** significance at 1%
** significance at 5%
* significance at 10%

Table 16. Daily AASCs for Negative Credit Rating Announcements

Day	AASC(%)	CAASC(%)	t-test	p-value
-1	0.9149	0.9149	1.5157	0.1296
0	0.0095	0.9053	-0.0224	0.9821
1	0.4839	1.3892	0.7719	0.4402

*** significance at 1%
** significance at 5%
* significance at 10%

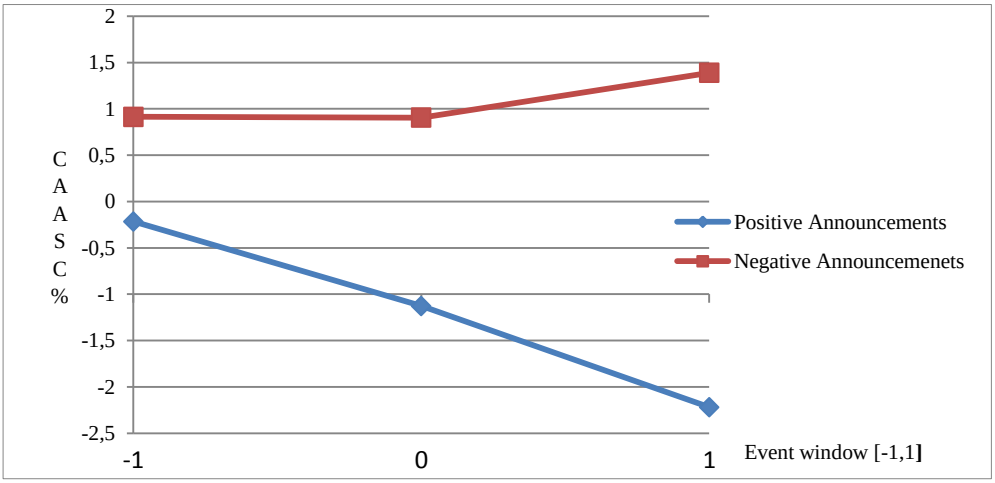

Fig. 5 CAASC for positive and negative credit rating announcements

The tables above show that the positive credit rating announcements effect CDS spreads negatively and significantly on the day before the announcement, on the announcement day and the day after the announcement. The most significant effect is observed after the day of announcement. For negative events, CDS spreads are not affected before the announcement day, on the announcement day and day after the announcement.

Table 17 presents *t-test* statistics results of positive and negative announcements for the event window [-1, 1].

Table 17. T-test Statistics Results of Positive and Negative Credit Rating Announcements for [-1, 1]

	N	CAASC (%)	t-test	p value
Positive	127	-2.2189	-3.6158***	0.0003
Negative	54	1.3892	1.7418*	0.0815

*** Significance at 1%
*Significance at 10%

Table 17 indicates that positive announcements result in negative significant CAASC. The cumulative average adjusted spread change for positive announcements surrounding the event date [-1, 1] is -2.22%. The result is different from zero and statistically significant at 1% level according to the cross sectional *t-test*. For the negative credit rating announcements, however, CAASC is found to be 1.39% and significant at 10% confidence level. These findings suggest that the emerging economies' sovereign CDS spreads respond significantly to positive and negative credit rating announcements but magnitudes of abnormal market responses are different. The response for the positive credit rating announcements is found be

more significant compared to the negative ones indicating that the positive credit rating announcements carry more information to the CDS market. Therefore, one can infer from these results that CDS spread adjustments are not symmetrical for positive and negative announcements for the emerging market economies.

These findings support the previous findings by Finnerty et al. (2013) but they are inconsistent with the studies conducted by Hull et al. (2004), Norden and Weber (2004), Micu et al. (2005) and Ismailescu and Kazemi (2010).

Given the above results, the next step is to examine whether CDS markets have anticipated the information content of credit rating announcements by the time the rating announcements were made and the number of days it takes for the market to absorb this information. The analysis for the research question three on CDS market anticipation of credit rating announcements is presented below.

CDS Market Anticipation of Credit Rating Announcements

In order to test CDS market anticipation of credit rating announcements, significance of negative and positive adjusted CDS spread changes within a few months prior to the rating events are checked. The results are reported for periods of [-90, -61], [-60, -31], and [-30, -2] for investigating market anticipation as Finnerty et al. (2013) did. However it was necessary to divide event window of the most recent month [-30, -2] further into sub windows of [-30, -16] and [-15, -2], because it is observed that CAASC has been increasing more sharply over the most recent fifteen days prior to the credit rating announcement events. Moreover, in order to investigate whether CDS market absorbs all information on the day of the announcement or over a period after the announcement, an event window of [2, 20] was also examined.

Table 18 provides cross sectional t-test results for time windows [2, 20], [-15, -2], [-30, -16], [60, -31], and [-90, -61]. There are 6 positive announcements in the first 90 days of the dataset. Therefore, in this part of the analysis 121 (127-6) positive rating announcements and 54 negative rating announcements with more than 90 days history are employed.

Table 18. T-test Statistics Results for Multiple Event Windows

	Event window	N	CAASC (%)	t-test	p-value
Positive	[2, 20]	121	-0.76	-0.8090	0.4184
	[-15, -2]	121	-1.19	-1.1834	0.2367
	[-30, -16]	121	-1.60	-1.7108*	0.0871
	[-60, -31]	121	-2.82	-2.1790**	0.0293
	[-90, -61]	121	-1.86	-1.2624	0.2068
Negative	[2, 20]	54	3.57	1.2042	0.2285
	[-15, -2]	54	8.54	4.3313***	0.0001
	[-30, -16]	54	-1.32	-0.5300	0.5961
	[-60, -31]	54	-0.12	-0.0470	0.9625
	[-90, -61]	54	-0.2	-0.0913	0.9273

* Significance at 10%

** Significance at 5%

*** Significance at 1%

For positive rating announcements in the [-30, -16] and [-60, -31] windows CAASCs are found to be significant at 10% and 5% confidence levels, respectively. This finding suggests that even though positive rating announcements may be anticipated by the CDS market, they may still contain new information and result in significant market responses.

For negative rating announcements, only the [-15, -2] event window gives significant results at 1% confidence level. Since a significant increase in the adjusted CDS spreads is observed over the fifteen day period prior to announcements, this result suggest that negative rating announcements are intuited by the market players.

Figure 6 and Figure 7 show daily CAASC observations of positive and negative announcements for the event window of [-90, 20], respectively.

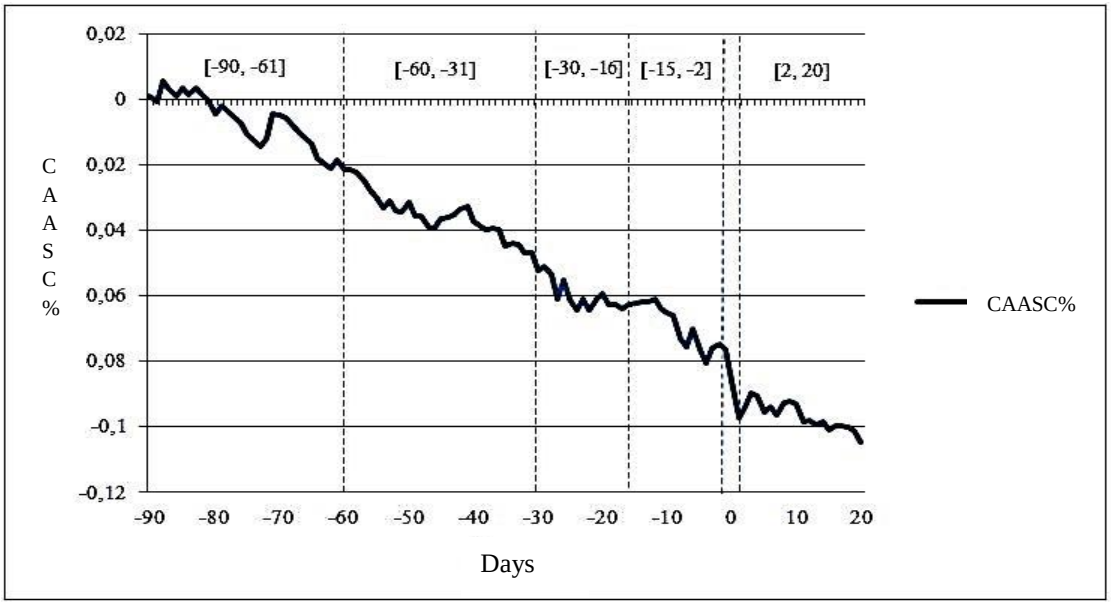

Fig. 6 CAASC observation for positive credit rating announcements [-90, 20]

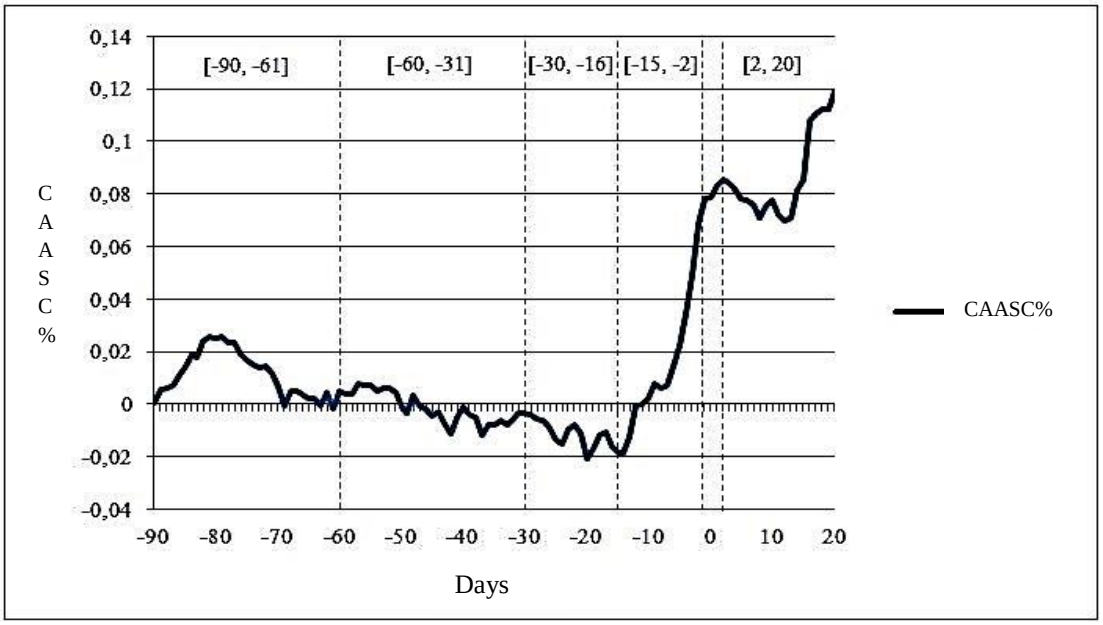

Fig. 7 CAASC observation for negative credit rating announcements [-90, 20]

For positive announcements Figure 6 shows that over the time interval that starts 2 months before the announcement and ends 15 days before the announcement, CAASC is in a negative trend and both [-60, -31] and [-30, -16] event windows are found significant at 5% and 10% levels, respectively. CAASC follows same negative trend going further from 15 days to day before the announcement but this decline is statistically insignificant. On the day just before the announcement, the decline becomes even steeper. Test statistics results presented in Table 15 (page 69) indicates that AASCs are statistically significant on the day and after the day the positive ratings are announced. However, regarding the announcements in the event window [2, 20], no significant change is ascertained. Hence, one can deduce that the information conveyed to CDS market by positive rating announcements is totally absorbed on the day of the event and the day following the event.

Going back three months before the negative announcements, on Figure 7, CAASC is insignificant until the 15th day before the announcement. In the last 15 days before the announcement, however, there is a steep increase in the average adjusted CDS spreads. Therefore, it can be inferred that declines in ratings are anticipated prior to their announcements. The post event window of [2, 20] is found to be insignificant which indicates that CDS spreads fully adjust to information provided by the announcements in three days, [-1, 1].

These results suggest that both the positive and the negative credit rating announcements are anticipated by the CDS market. However, the CDS market anticipates more of the information content the negative credit rating announcements carry relative to information content positive credit rating announcements (table 18). The findings regarding the CDS market anticipation are consistent with findings of Finnerty et al. (2013) and Ismailescu and Kazemi (2010) who also claim that the

CDS market anticipates both positive and the negative credit rating announcements. Other findings, however, indicate significant market responses for the pre-event windows studied for negative credit rating announcements only (Hull et al., 2004; Micu et al., 2004; Norden & Weber, 2004). Furthermore, the finding regarding the insignificant market response in the post-event window studied are consistent with previous findings by Hull et al. (2004), Norden and Weber (2004) and Finnerty et al. (2013) but inconsistent with the finding by Micu et al. (2004) who found the [2, 20] event window to be significant for entities rated between A- and BBB-.

CHAPTER 5

CONCLUSION

In this study, the response of twenty emerging economy sovereign CDS spreads to credit rating announcements, the symmetry in the CDS response and the anticipation of credit rating announcements by the CDS market were explored by using Standard & Poor's credit rating announcements for a period of twelve years (2001-2013). The findings indicate that 5 year sovereign emerging CDS spreads indeed respond significantly to positive and negative credit rating announcements. This result implies that both positive and negative credit rating announcements for emerging markets transmit new information to the CDS market. Positive rating announcements, however, carry greater new information than negative credit rating announcements, suggesting that the CDS spread adjustments are not symmetrical for positive and the negative rating announcements. Additionally, both negative and positive credit rating announcements were anticipated by the emerging sovereign CDS market implying that both rating announcements carry new information for the CDS market. Negative credit rating announcements were anticipated within the 15 days preceding the announcements whereas positive rating announcements were anticipated starting from two months before the announcement. However positive credit rating announcements resulted in stronger response and were found to carry more new information relative to negative announcements for the emerging economies sovereign CDS market.

The findings of the current study are consistent with the findings of Finnerty et al. (2013), which state that both the positive and the negative credit rating

announcements affect CDS markets. They do not, however, support previous studies by Norden and Weber (2004), Hull et al. (2004) and Ismailescu and Kazemi (2010) on the CDS market response to credit rating announcements. The studies of Norden and Weber (2004) and Hull et al. (2004) found that only negative credit rating announcements convey useful information to the CDS market whereas Ismailescu and Kazemi (2010) concluded that emerging economy CDS markets respond only to positive credit rating announcements.

Previous studies on the topic covered the period before the World economic and Euro-zone crises, mostly for corporate entities within developed economy contexts. Similar to the study of Ismailescu and Kazemi (2010) which is the only study on emerging market sovereign CDS spreads covering the years between 2001 and 2008, this study covers the period of twelve years, between 2001 and 2013. The findings regarding the response CDS market to positive and negative rating announcements, however, are not consistent with Ismailescu and Kazemi (2010) who found that only positive rating announcements have significant effect on emerging sovereign CDS spreads. Thus, it can be claimed that magnitude and direction of emerging market CDS spread response to negative credit rating announcements change after the year 2009 and the Eurozone debt crisis. One reason that may account for this change can be the change in global risk aversion of the investors. Emerging economies rebounded relatively quickly from the 2008 global financial crisis. Also, with the following debt crisis in the Eurozone in 2009 and the increased liquidity in financial markets, investors started to focus on emerging markets and the higher returns they provided. In line with the successful performances of the emerging economies during the crisis, credit rating agencies upgraded their investment categories from non-investment to investment grade especially in the

years 2010 and 2011. In the years 2012 and 2013, however, most emerging markets were downgraded once more to the non-investment category. The change in response of the emerging CDS market to negative credit rating announcements can be ascribed to the demote of emerging economies to non-investment category as restricted financial institutions are obliged to subtract non-investment grade and deteriorating investments from their portfolios. Since the majority of the countries in the sample belonged to the non-investment category before the year 2009, lack of CDS market response to negative events can be attributed to the buying/selling pressure by restricted investors. The second reason may be lack of new information conveyed by negative credit rating announcements made before the crisis. For the time period between the years 2001 and 2008, negative events were followed shortly by other negative events, while positive events occurred in isolation. Therefore, information transmitted by negative rating announcements for one emerging country might have had spillover effects on the others.

Contribution and Limitations

The present study focused mainly on the question of whether the Credit Default Swap market anticipates or responds to the information supplied by Credit Rating Agencies. While these issues have been addressed for corporate CDS markets within the context of developed economies, there has been a scarcity of research on the sovereign CDS market. Additionally, when tremendous growth and improved liquidity of sovereign CDS market after the Eurozone debt crisis is considered, it was right time to investigate relationship of credit rating announcements and sovereign CDS market response. This study addresses these gaps in literature and contributes to

the extant literature on CDS market response to credit rating announcements by documenting the relationship between sovereign CDS spreads and credit rating announcements particularly for emerging market economies. Additionally, the study is the first study that examines the relationship between sovereign CDS spreads and credit rating announcements after the Eurozone debt crisis.

The study has limitations regarding the number of reference entities and credit rating announcements used. The sample used fits to the requirements of central limit theorem since it has more than 30 observations for both negative and positive announcements but conducting similar analysis with larger samples could be beneficial for strengthening findings regarding the effects of announcements on the CDS market. Unavailability of CDS spread data for the other emerging economies prevents inclusion of more than twenty emerging markets in the sample. Additionally, the total number of rating announcements within the period studied precludes investigation of CDS market response to rating changes, outlooks and credit watches separately.

Based on the results of this study, further research can be conducted concentrating on how rating announcements can be predicted by observing changes in CDS spreads. Furthermore, effects of credit rating announcements on CDS spread volatility might be investigated.

Considering the credit rating announcement data availability for sovereign entities, emerging and advanced economies can be examined together by classifying rating announcements under investment and non-investment categories and adjusting their CDS data with created benchmark indices for both investment and non-investment categories. Future research on emerging corporate CDS spreads may also contribute the empirical data base on CDS market responses an under investigated

issue. Future studies related to emerging market corporate CDS spreads can benefit from the research design of this study.

REFERENCES

Afonso, A., Furceri, D., & Gomes, P. (2011). *Sovereign credit ratings and financial market linkages: Application to European data.* Frankfurt: European Central Bank.

Alsakka, R., & Gwiliym, O. (2012). Rating agencies' credit signals: An analysis of sovereign watch and outlook. *International Review of Financial Analysis 21*, 45-55.

Altman, E. I. (1968). Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. *Journal of Finance, 23 (4)*, 589-609.

António, A., Pedro, G., & Philipp, R. (2007). *What "Hides" Sovereign Debt Ratings?* Frankfurt: European Central Bank.

Arvanitis, A., & Gregory, J. (2004). *Credit: The Complete Guide to Pricing, Hedging and Risk Management.* Navarra: Risk Waters Group.

Bannier, C. E., & Hirsch, C. W. (2010). The economic function of credit rating agencies –what does the watchlist tell us? *Journal of Banking & Finance, 34(12)*, 3037-3049.

Barron, M. J., Clare, A. D., & Thomas, S. H. (1997). The effect of bond rating changes and new ratings on UK stock returns. *Journal of Business Finance & Accounting, 24(3)*, 0306-686X.

Basel Committee on Banking Supervision. (2001, June). *International Convergence of Capital Measurement and Capital Standards.* Basel. Retrieved from Positions in global over-the-counter (OTC) derivatives markets at end-June 2010: www.bis.org/publ/otc_hy1011.pdf

Berndt, A., Douglas, R., Duffie, J. D., Ferguson, M., & Schranz, D. (2004). *Measuring default risk premia from default swap rates and EDFs.* EFA 2004 Maastricht Meetings Paper No. 5121.

Black, F., & Cox, J. C. (1976). Valuing corporate securities: Some effects of bond indenture provisions . *Journal of Finance, 31(2)*, 351-367.

Blanco, R., Brennan, S., & Marsh, I. W. (2005). An Empirical Analysis of the Dynamic Relationship between Investment-Grade Bonds and Credit Default Swaps. *Journal of Finance, 60*, 2255-2281.

Blume, L., & Durlauf, S. (2007). *The New Palgrave: A Dictionary of Economics.* New York: Palgrave McMillan.

Bowman, R. (1983). Understanding and conducting event studies. *Journal of Business Finance and Accounting, 10*, 561-584.

Brown, C. A., & Wang, S. (2002). Credit risk: The case of First Interstate Bankcorp. *International Review of Financial Analysis*, 229 – 248.

Brown, S., & Warner, J. (1985). Using daily stock returns: The case of event studies. *Journal of Financial Economics, 14*, 3-31.

Bruyere, R., Fery, L., Jaeck, C., & Spitz, T. (2006). *Credit derivatives and structured credit: a guide for investors.* . Wiley.

Caouette, J. B., Altman, E. I., Narayanan, P., & Robert, N. (2008). *Managing Credit Risk: The Great Challenge for the Global Financial Markets.* New York: Wiley.

Catan, T., & House, J. (2009, January 13). *Spain's Credit Rating Is at Risk, S&P Warns.* Retrieved from The Wall Street Journal: http://online.wsj.com/news/articles/SB123179943473474981

Chung, K. H., Frost, C. A., & Kim, M. (2012). Characteristics and information of credit watches. *Financial Management 41*, 119–158.

Country Economy. (2014). *Sovereigns Rating List*. Retrieved May 24, 2014, from Country Economy: http://countryeconomy.com/ratings

Creditex. (2013, June 5). *Bankia Auction Results*. Retrieved May 22, 2014, from http://www.creditfixings.com/CreditEventAuctions/results.jsp?ticker=BANKSA

Crouhy, M., Galai, D., & Mark, R. (2001). Prototype risk rating system. *Journal of Banking & Finance, 25(1)*, 47-95.

Depository Trust & Clearing Corporation (DTCC). (2011). *Market activiy analysis-Single name.* Retrieved May 22, 2014, from http://www.dtcc.com/downloads/products/derivserv/Market_Activity_Single_Name_

Depository Trust & Clearing Corporation (DTCC). (2014, May 16). *OTC Credit Default Swaps Data*. Retrieved May 16, 2014, from http://www.dtcc.com/news/2014/may/13/otc-credit-default-swaps-data.aspx

Dichev, I. D., & Piotroski, J. D. (2001). The long run stock returns following bond ratings changes. *Journal of Finance (56)*, 173-203.

Dowd, K. (2005). *Measuring Market Risk.* Chichester and New York: Wiley.

Duffie, D., & Singleton, K. J. (2003). *Credit risk : pricing, measurement, and management.* Princeton University Press.

Ederington, L. H., Yawitz, J. B., & Roberts, B. E. (1984). The informational content of bond rating. *NBER Working Papers*, no:1323.

Elayan, F. A., Hsu, W. H., & Meyer, T. O. (2003). The Information Effect of Credit Rating Announcements on Share Prices in a Small Market. *Journal of Economics and Finance, 27(3)*, 337-356.

Elton, E. J., Gruber, M. J., Brown, S. J., & Goetzmann, W. N. (2010). *Modern Portfolio Theory and Investment Analysis.* New York: Wiley.

Ericsson, J., Jacobs, K., & Oviedo, R. (2009). The Determinants of Credit Default Swap Premia. *Journal of Financial and Quantitative Analysis, 44*, 109-132.

Fama, E. (1970). Efficient capital markets: A review of theory and empirical work. *Journal of Finance, XV*, 383–417.

Finnerty, J. D., Miller, C. D., & Chen, R. R. (2013). The impact of credit rating announcements on credit default swap spread. *Journal of Banking & Finance 37 (6*, 2011-2030.

Followill, R. A., & Martell, T. M. (1997). Bond review and rating change announcements: an examination of informational value and market efficiency. *Journal of Economics and Finance 21*, 75-82.

Fontnouvelle, P. d., DeJesus-Rue, V., Jordan, J., & Rosengren, E. (2003). *Capital and Risk: New Evidence on Implications of Large Operational Losses.* Boston: Federal Reserve Bank of Boston.

Forte, S., & Lovreta, L. (2009, December 17). *Credit Risk Discovery in the Stock and CDS Markets: Who leads, When and Why?* Retrieved 05 24, 2014, from Social Science Research Netowk: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1183202

Forte, S., & Peña, J. I. (2009). Credit Spreads: An Empirical Analysis on the Informational Content of Stocks, Bonds, and CDS. *Journal of Banking and Finance, 33*, 2013-20025.

Friedman, T. (1996, February 13). Revolt of the Wannabes. (D. Gergen, Interviewer)

Frost, C. A. (2007). Credit Rating Agencies in Capital Markets: A Review of Research Evidence on Selected Criticisms of the Agencies. *Journal of Accounting, Auditing, and Finance 22*, 469–492.

Gande, A., & Parsley, D. (2005). News spillovers in the sovereign debt market. *Journal of Financial Economics 75*, 691–734.

Girish, V. S. (2010). A Brief History of Derivatives. *The banking & financial world*, 19-21.

Goh, J. C., & Ederington, L. H. (1993). Is a bond rating downgrade bad news, good news, or no news for stockholders? *The Journal of Finance 48 (5)*, 2001–2008.

Goyenko, R., Subrahmanyam, A., & Ukhov, A. (2011). The Term Structure of Bond Market Liquidity and Its Implications for Expected Bond Returns. *Journal of Financial and Quantitative Analysis 46 (1)*, 111-139.

Gregory, J. (2010). *Counterparty credit risk: the new challange for global financial markets.* Wiley.

Griffin, P. A., & Sanvicente, A. Z. (1982). Common stock returns and rating changes: a methodological comparison. *Journal of Finance 37*, 103–120.

Hand, J. R., Holthausen, R. W., & Leftwich, R. W. (1992). The effect of bond rating agency announcements on bond and stock prices. *The Journal of Finance 47 (2)*, 733–752.

Haworth, H., Porter, W., Gibney, T., & Sparks, S. (2010). *Sovereign CDS Primer,*. London: Credit Suisse Fixed Income Research.

Henderson, G. V. (1990). Problems and solutions in conducting event studies. *Journal of Risk and Insurance, 57*, 282–306.

Hettenhouse, G. W., & Sartoris, W. (1976). An analysis of the information value of bond-rating changes. *Quarterly Review of Economics and Business, (16)*, 65-78 .

Hite, G., & Warga, A. (1997). The effect of bond-rating changes on bond price performance. *Financial Analyst Journal 53*, 35-51.

Holthausen, R. W., & Leftwich, R. (1986). The effect of bond rating changes on common stock prices. *Journal of Financial Economics, 17(1)*, 57 - 90.

Hull, J. C. (2006). *Options, Futures, and Other Derivatives.* New Jersey: Pearson Education.

Hull, J. C. (2007). *Risk Management and Financial Institutions.* New Jersey: Wiley.

Hull, J. C., Predescu, M., & White, A. (2004). The relationship between credit default swap spreads, bond yields, and credit rating announcements. *Journal of Banking and Finance 28*, 2789–2811.

International Swaps and Derivatives Association (ISDA). (2003). *SDA Credit Derivatives Definitions.* ISDA: New York .

International Swaps and Derivatives Association (ISDA). (2014a, May 21). *ISDA Margin Survey 2014.* ISDA. Retrieved from Market Overview - Central

Clearing: http://www.isdacdsmarketplace.com/market_overview/central_clearing

International Swaps and Derivatives Association (ISDA). (2014b). *Understanding Notional Amount*. Retrieved May 20, 2014, from http://www.isdacdsmarketplace.com/market_statistics/understanding_notional_amount

Ismailescu, I., & Kazemi, H. (2010). The reaction of emerging market credit default swap spreads to sovereign credit rating changes. *Journal of Banking & Finance 34*, 2861–2873.

Jakob, D. H., & Fabian, A. (2011). *Credit Rating Agencies.* Amsterdam: De Nederlandsche Bank.

Jorion, P. (2006). *Value at Risk.* McGraw-Hill.

Kamin S., von Kleist, K. (1999). The Evolution and Determinants of Emerging Market Credit Spreads in the 1990s. *Bank for International Settlements Working Paper 68*.

Kasapis, A. (2008). *MAstering Credit Derivatives: A step by step guide to credit derivatives and structured credits.* London: Prentice Hall.

Katz, S. (1974). The price adjustment process of bonds to rating reclassifications: a test of bond market efficiency. *Journal of Finance 29*, 551-559.

Kealhofer, S. (2003). Quantifying credit risk I: Default prediction. *Financial Analysts Journal, 59(1)*, 30-44.

Krahnen, J. P., & Weber, M. (2001). Generally accepted rating principles: A primer. *Journal of of Banking & Finance, 25(1)*, 3-23.

Lieu, A. (2011, April 1). *An Analysis of Credit Default Swap Auctions.* Retrieved May 23, 2014, from The Leonard N. Stern School of Business: http://www.stern.nyu.edu/cons/groups/content/documents/webasset/uat_024294.pdf

Longstaff, F. A., Mithal, S., & Neis, E. (2005). Corporate yield spreads: Default risk or liquidity? New evidence from the credit default swap market. *The Journal of Finance, 60(5)*, 2213–2253.

Mackinlay, A. C. (1997). Event Studies in Economics and Finance. *Journal of Economic Literature*, 13–39.

Markit. (2010, February). *Credit Event Auction Primer.* Retrieved May 22, 2014, from The Ice: https://www.theice.com/publicdocs/Credit_Event_Auction_Primer.pdf

Mayordomo, S., Pena, J. I., & Scwartz, E. S. (2010). *Are all Credit Default Swap Databases Equal?* Madrid: Spanish Securities Market Comission (CNMV).

Meissner, G. (2005). *Credit derivatives - application, pricing, and risk management.* Oxford: Blackwell Publishing.

Mengle, D. (2007). *Credit Derivatives: An Overview.* Atalanta: Federal Reserve Bank of Atalanta.

Merton, R. C. (1974). On the pricing of corporate debt: The risk structure of interest rates. *Journal of Finance, 29(2)*, 449-470.

Micu, M., Remolona, E. M., & Wooldridge, P. (2004, June). *The price impact of rating announcements: evidence from the credit default swap market.* Retrieved December 30, 2013, from http://www.bis.org/publ/qtrpdf/r_qt0406e.pdf

Moody's Investor Services. (2002). *Default& Recovery Rates of European Bond Issuers, 1985-2001.* New York.

Naraparaju, P., Chatellier, R., Sheets, A., & Lin, E. (2011). *Sovereign CDS: Credit Event and Auction Primer.* London: Morgan Stanley Research.

Noeth, B. J., & Sengupta, R. (2012, April). *A Look at Credit Default Swaps and Their Impact on the European Debt Crisis*. Retrieved May 21, 2014, from Federal Reserve Bank of St. Louis: http://www.stlouisfed.org/publications/re/articles/?id=2231

Norden, L., & Weber, M. (2004). Informational efficiency of credit default swap and stock markets: the impact of credit rating announcements. *Journal of Banking and Finance 28,*, 2813–2843.

Norden, L., Weber, M. (2009). The Co-Movement of credit default swap, bond and stock markets: an empirical analysis. *European Financial Management 15*, 529-562.

Pinches, E. G., & Singleton, J. C. (1978). The adjustment of stock prices to bond rating changes. *Journal of Finance, 33*, 29–44.

Pollac, L. (2012, March 19). *Final auction results.* Retrieved May 22, 2014, from Financial Times Alphaville: http://ftalphaville.ft.com//2012/03/19/929071/final-auction-results/

Poon, P. H., & Chan, K. (2010, August 24). *ADBI Working Paper No. 244.* Retrieved May 19, 2014, from Social Science Research Network: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1671452

Reisen, H., & Maltzan, J. v. (1999). Boom and Bust and Sovereign Ratings. *International Finance, 2(2)*, 273–293.

Remolona, E., Scatigna, M., & Wu, E. (2007, October 30). *The dynamic pricing of sovereign risk in emerging markets: fundemental and risk aversion.* Retrieved April 19, 2014, from Bank for International Settlements: http://www.bis.org/repofficepubl/arpresearch_fs_200612.02.pdf

Schönbucher, P. J. (2003). *Credit derivatives pricing models : Models, pricing and* . Chichster: Wiley.

Singh, M., & Spackman, C. (2009). *The use (and Abuse) of CDS spreads during distress.* International Monetary Fund.

Smith, A. (2011, July 25). *Moody's downgrades Greece again.* Retrieved May 19, 2014, from CNN Money: http://money.cnn.com/2011/07/25/news/international/greece_debt_moodys/

Standard & Poor's Rating Services. (2013). *Ratings Direct: Sovereign Rating And Country T&C Assessment Histories.* New York: Standard & Poor's Rating Services.

Steiner, M., & Heinke, V. G. (2001). Event study concerning international bond price effects of credit rating actions. *International Journal of Finance and Economics 6,* 139–157.

Valdez, S., & Molyneux, P. (2010). *An Introduction to Global Financial Markets.* Hampshire: Palgrave Macmillan.

Vogel, H. D., Bannier, C. E., & Heidorn, T. (2013). *Functions and characteristics of corporate and sovereign CDS.* Frankfurt: Frankfurt School of Finance & Management.

Wand, P. (2005). *The Economics of Foreign Exchange and Global Finance.* Berlin: Springer.

Wansley, J., Glascock, J. L., & Clauretie, T. M. (1992). Institutional bond pricing and information arrival: The case of bond rating changes. *Journal of Business Finance and Accounting, 19,* 733-750 .

Weistroffer, C. (2010). *Credit Default Swaps.* Frankfurt: Deutsche Bank Research.

White, L. (2010). Markets: The credit rating agencies. *Journal of Economic Perspectives 24 (2),* 221-226.

White, R. (2013, October 15). *The Pricing and Risk Management of Credit Default Swaps, with a Focus on the ISDA Model.* Retrieved May 20, 2014, from OpenGamma Research: http://developers.opengamma.com/quantitative-research/Pricing-and-Risk-Management-of-Credit-Default-Swaps-OpenGamma.pdf