

***THE IMPACT OF RECENT REGULATORY REFORMS OF THE
RATING INDUSTRY***

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Abstract

This Thesis investigates the recent regulatory reforms applied to the credit ratings industry in Europe and the US. It analyses the impact on credit rating agencies (CRAs) and financial markets. The prior literature on CRA regulation is focused on the US markets and is limited to investigations of competition between CRAs. The impact of recently implemented regulations for CRAs in Europe has received very little academic attention and presents a highly topical research avenue. This Thesis makes several novel contributions to the literature, including (i) critical perspectives on the new regulation, especially in the EU; (ii) the impact of the solicitation status of sovereign ratings upon bank ratings; and (iii) whether European Securities Markets Authority (ESMA) rating identifiers affect the quality of ratings. Several methodologies are applied to enhance the robustness of the findings, including ordered probit analyses, fixed effects models, covariate matching (CVM) and propensity score matching (PSM). An extensive sample of rating actions by the largest CRAs (Fitch, Moody's and S&P) during 2006 to 2014 is utilised.

The critical review of the EU's CRA regulation sheds light on several shortcomings and raises a need for reassessment. Some assumptions presented by the European Commission (EC) lack underlying evidence and are subjective in nature. Disclosures by CRAs have been inconsistent, which may reflect ambiguity in the regulations. Compliance with new regulation has affected the CRAs' operating costs, which confirms earlier fears expressed by CRAs. Additional evidence is presented relating to CRAs' business models. The second empirical chapter identifies that changes to the solicitation status of sovereigns induced by new disclosure rules have an adverse effect on banks domiciled in these countries. This has policy implications for regulators and banks since the ceiling effect identified in the study can lead to higher costs and harm the intermediaries. In the final empirical chapter, ESMA's requirement for rating identifiers is questioned since it does not have any discernible impact on the quality of ratings reported by CRAs. This finding is of interest to policymakers, market participants and academics since the quality of ratings is linked to banking regulation and affects financial stability.

I would like to dedicate this Thesis to my parents who have always supported me and believed in my capabilities...

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Abbreviations

BCBS	Basel Committee on Banking Supervision
Big Three	Fitch Ratings, Ltd; Moody's Investors Service; Standard and Poor's Ratings Services
BIS	Bank for International Settlements
BOE	Bank of England
CDS	Credit default swap
CEREP	ESMA Central Repository for publishing the rating activity statistics and rating performance statistics of credit rating agencies
CRA(s)	Credit Rating Agency(ies)
CVM	Covariate Matching
DD	Difference-in-difference
EBA	European Banking Authority
EC	European Commission
ECB	European Central Bank
EEA	European Economic Area
EIOPA	European Insurance and Occupational Pensions Authority
ESAs	European Supervisory Authorities
ESMA	European Securities Markets Authority
EU	European Union
Fitch	Fitch Ratings, Ltd
FSA	Financial Services Authority
FSB	Financial Stability Board; previously known as Financial Stability Forum (FSF)
HHI	Herfindahl-Hirschmann Index
IMF	International Monetary Fund
IOSCO	International Organization of Securities Commissions
MEs	Marginal Effects

MLE	Maximum Likelihood Estimation
Moody's	Moody's Investors Service
NCA's	National Competent Authorities
NRSRO(s)	Nationally Recognized Statistical Rating Organization(s)
OJEU	Official Journal of the European Union
OLS	Ordinary Least Square
PSM	Propensity Score Matching
SEC	US Securities and Exchange Commission
S&P	Standard and Poor's Ratings Services

Chapter 1: Introduction

Credit Rating Agencies (CRAs) have played an important role in global financial markets in recent decades. They enabled international investments by providing clear and coherent assessments of creditworthiness for investors who would not be able to perform such exercises on their own (i.e. due to costs and time). CRAs provide investors with an independent opinion regarding the creditworthiness of debt issuers or issues and thereby facilitate a reduction in information asymmetry between investors and issuers (S&P, 2014). This ultimately results in lower costs of capital (Löffler 2004; Duff and Einig, 2009a). Moreover, the importance of ratings to users stems from the fact that entities seeking funding from debt markets are required to obtain credit assessment (Langohr and Langohr, 2010).

According to Boot et al. (2006), three key and beneficial functions performed by CRAs are: information production, monitoring and certification. To a large extent, ratings facilitate the standardisation of securities via their straightforward linear rating scale (Alcubilla and Del Pozo, 2012).

Ratings are useful in highlighting vulnerabilities in the financial system and identifying which institutions are affected by it (BIS, 2011). Therefore, ratings are important to various users such as corporations (including banks) and sovereigns. Creditors and trading counterparties use them to define the risk element of a party with whom they enter agreements. Sovereign ratings are central to other countries when setting conditions for international arrangements and determine the cost of borrowing. They are also essential to institutions operating in these countries as the creditworthiness of the country translates into support available to them in case of deteriorating economic conditions. Moreover, banks use ratings to assess the risk-weighted assets for regulatory requirements (BIS, 2011).

CRAs' techniques for corporate and sovereign ratings have performed reasonably well over a long period of time (Bank of England (BOE), 2011). Conversely, structured finance products require more than reducing information asymmetry between the debt issuers and the investors. They need quality credit assessment for investors who were not qualified. However, during the period leading up to the US sub-prime crisis, the CRAs were not able to adequately assess the probability of default of structured products in comparison to their strengths in traditional debt instruments.

Recent financial crises repeatedly drew the attention of regulators, academics and market participants to the activity of CRAs. They were blamed for an inability to foresee the Asian crisis in 1997 and were criticised at the beginning of the 21st century for failures to foresee the collapse of large corporates both in Europe and the US (e.g. Enron, Parmalat, Worldcom) (e.g. see Bolton et al., 2012).

The US subprime crisis in 2007 raised serious questions about the role played by CRAs in modern financial markets and about their influence on global economic stability (Alcubilla and Del Pozo, 2012). In this respect, numerous commentators aimed to highlight the deficiencies of the CRA industry during the crisis. The most substantial flaws were found with the ratings of structured finance products (e.g. Financial Stability Forum (FSF), 2008; Stiglitz, 2008; Mathis et al., 2009). These investigations identified weaknesses relating to the business model and internal procedures of CRAs as a whole; and triggered demand for new CRA regulation.

The determination of regulators to reform the credit rating industry stemmed not only from the sub-prime crisis originated in the US but also from the events which severely affected Europe during the debt crisis. Contrary to the previous accusations, of being too slow and lenient when releasing ratings, the CRAs were criticised for being too strict when suddenly issuing a series of sovereign downgrades in Europe (Alsakka and ap Gwilym, 2013).

After the sovereign crisis struck Greece and Ireland, the European Commission (EC) instigated measures to implement EU CRA regulation. The CRAs' European downgrades contributed to disruption of the stability of developed markets and placed the CRAs in the spotlight. The EC decided to transform the shape of the CRA business (Dalton, 2011).

Until 2010, CRA regulation in Europe was minimal and relied on self-regulation (BOE, 2011). Before the crisis the EC relied on existing directives (e.g. the Capital Requirements Directive) and self-regulation applied by CRAs under the IOSCO Code and accountable to the Committee of European Securities Regulators (CESR) (EC, 2006).

According to the EC (2013), the main flaws of the CRA system could be grouped into three categories: issues relating to integrity, reliability and lack of transparency. Firstly, the CRAs' business model leads to some conflicts of interest. The *issuer-pays* model implies that the debt issuer is the same party that remunerates the CRA for its rating services. The CRA faces a dilemma where it seeks to rate the issuer with the highest accuracy while ensuring the service is satisfactory for the client who brings revenue to the CRA (Becker and Milbourn, 2011). This

need to attract and retain customers triggers the phenomenon known as ratings shopping during the crisis (Skreta and Veldkamp, 2009). The potential issuers make enquires at several CRAs for a preliminary rating assessment and employ the CRA which assigned them with the highest rating. In essence it leads to pressures on CRAs to release inflated and more favourable ratings.

Secondly, the crisis revealed an inability of CRAs to reflect precisely, and in a timely manner, the creditworthiness of structured finance products in the face of deteriorating economic conditions. This issue is closely linked to the deficiencies in methodologies and assumptions which did not hold in reality and underestimated the risk of a global crisis (Coval et al., 2009). The effect was amplified further by the overreliance by market participants who instead of using ratings as partial credit appraisal relied on them entirely (EC, 2010). This dependence resulted in the cliff-effect situation with its cascading and disastrous effect upon debtors known as the ‘death spiral’ (Manso, 2013).

Thirdly, lack of transparency in CRAs’ rating processes is one of the major points condemned by politicians and market participants who urged new regulation (ESMA, 2011a). Before the crisis, rating criteria and model assumptions were not disclosed to the market (ESMA, 2011a). Moreover, the limitations of ratings were not explained and there was no comparable information on each CRA’s performance. The rating methodologies of CRAs were considered to be a ‘black box’ (Sy, 2009). This opacity created difficulty for investors to judge the quality of ratings and to comprehend the rating process (Duan and Laere, 2012).

There are also views that a lack of competition and the oligopolistic CRA industry accentuate the problems mentioned above. ESME (2008)¹ claim that the dominance of three players reduces the quality and integrity of ratings. Additionally, Fennel and Medvedev (2011) suggest that the current system is beneficial for the CRAs rather than for other stakeholders.

Moreover, the fact that ratings are strongly hard-wired into securities regulations does not make it easy for market participants to ignore them (BOE, 2011). According to Partnoy (2002), the numerous references to ratings in securities and banking regulation make CRAs more important than they would otherwise be.

After recognising numerous flaws of the system, steps have been taken by international authorities to improve the legislation and promote competition in the CRA business. Recent regulatory developments are based on a micro-prudential perspective and aim to reinstate the

1. European Securities Markets Expert Group.

confidence of investors and improve financial stability (ECB, 2012). The ECB stresses that the main actions deal with reducing problems such as conflict of interest, spillover effects, developing a stronger rating market with improved quality of ratings and ensuring investors are protected. Further, the new EU regulation aims to strengthen the independence of CRAs while increasing soundness of rating procedures and methodologies with the overall aim of improving ratings quality (EC, 2011a; ESMA, 2011b; ESMA, 2011c). For example, some of the undertakings include modifications to the Code of Conduct Fundamentals for CRAs from 2008 imposed by IOSCO to tackle issues of independence, conflict of interest, transparency and competition (Alsakka and ap Gwilym, 2012a).

In December 2009, the European Parliament and the Council released formal regulation of CRAs known as CRA I regulation valid from December 2010 (EC, 2011b). One aspect relates to the registration procedures which demand that financial firms in Europe only use ratings released by CRAs which are registered or certified. This regulation was reshaped in May 2011 (CRA II) in relation to the formation of the European CRA regulator, namely the European Securities Markets Authority (ESMA) (EC, 2011c). ESMA was assigned with formal responsibilities of certifying CRAs and having oversight of their actions from July 2011.

In November 2011, the EC announced a further proposal known as CRA III regulation (EC, 2011d). The document focuses on several areas including release timings for sovereign ratings, addressing issues of conflict of interest,² accountability of CRAs, issues of transparency³ and finally overreliance on ratings.⁴ The new proposal forbids European Supervisory Authorities (ESAs)⁵ from making references to external ratings.

In June 2013, amendments to the CRA III regulations took effect (OJEU, 2013a). The regulation operates on the same principles as outlined in the original documentation Regulation (EC) No 1060/2009 and applies these rules to outlooks and watches.^{6,7}

Since the regulation was enacted, ESMA has been involved in scrutinising the rating process, carrying numerous inspections and investigations. This resulted in the first penalty issued to a

2. I.e. capping ownership of CRAs.

3. For example, via disclosure requirements.

4. EC released the application for a directive aimed at external use of ratings by investors (EC, 2011e).

5. ESMA, EBA and EIOPA.

6. Also known as long-term and short-term rating reviews respectively.

7. The main aims of regulation include promoting accuracy, transparency and reduction of conflict of interest.

CRA operating in Europe (DBRS was fined by ESMA in June 2015 for insufficient internal controls) (ESMA, 2015a).

In the coming years, ESMA aspires to minimise the hard-wiring of ratings in securities regulation while supplying technical reports to the EC with regards to structured finance products (ESMA, 2014a). The regulator seeks to strengthen its relationship with the IOSCO Committee and complete the alterations to the Code of Conduct. Steps are also being taken to reduce the current reliance on ratings by market participants (FSB, 2014).

These recent regulatory changes are a topical issue and this Thesis aims to present original evidence on this theme. The changes are still evolving, and therefore evidence on their effectiveness is much needed. The Thesis assesses the impact of new regulations on the quality of ratings but also investigates the implications for the financial system as a whole. Concerns exist that the new regulation could further undermine the economic competitiveness of new entrant CRAs. Additionally, there are fears that the methodological requirements might jeopardise the independence of the CRAs (EC, 2012). The regulator finds itself in a difficult position as it needs to make choices between competition and stability.

The objective of this Thesis is to evaluate whether European CRA regulations accomplish their purpose or whether they result in unintended consequences. As a result, this work can have major implications for policymakers, regulators and market participants. Examining recent regulatory changes and their impact on the economy can inform future regulations in Europe.

The Thesis empirically analyses the impact of regulatory changes imposed on CRAs in Europe upon banks and financial markets. It comprises three main topics. The first empirical study (Chapter 4) critically evaluates the recent steps taken to reduce the mechanistic reliance on ratings via increased transparency requirements. The main research question states: “*Are the profitability and competitiveness of CRAs intact following the raised expectations for transparency and disclosure?*” The chapter suggests that there are shortcomings in the basic assumptions made by the regulators. For example, the EC inflate the problems of CRAs to the global level without using any empirical evidence and relying on many subjective assessments. The chapter also finds possible drawbacks of the *investor-pays* paradigm and suggests serious reconsideration of proposals surrounding this proposed alternative model. Recent scandals relating to the only CRA applying this form of remuneration provide evidence that the alternative model is not free from conflicts of interest. Moreover, inconsistencies in regulatory reporting amongst CRAs are detected. This leads to questioning whether it is an issue of

compliance on the side of CRAs or shortcomings on the side of regulators for not explicitly setting the requirements for CRAs and allowing scope for interpretations of regulation. Further, the chapter evaluates whether the costs of running a CRA business increased significantly since the regulation was introduced. Profitability measures including a novel proxy, calculated as the number of outstanding ratings to the number of analysts, are aimed to determine whether CRAs' fears of impaired ability to compete are valid.

The chapter offers a synergy of the literature on organizational capital and the financial performance of CRAs which has not been explored before. The prior papers consider the incentives of analysts and the quality and accuracy of ratings (Che, 1995; Bar-Isaac and Shapiro, 2011) and the reputational concerns of CRAs (Strausz, 2005; Mathis et al., 2009). The chapter utilises the existing literature on the effect, role and performance of credit analysts and their coverage to justify possible undesirable effects of regulation. The transparency requirements might put a strain on the CRAs to employ more staff, and consequently raising their costs and reducing profitability.⁸

Furthermore, the chapter supplements existing studies on the impact of US regulation on CRAs (e.g. Jorion et al., 2005; Dimitrov et al., 2015). The novelty of this study also derives from its consideration of the wider CRA market and not only the largest CRAs. Numerous comparisons (i.e. profitability measures) are made for various Nationally Recognized Statistical Rating Organizations (NSROs) rather than the three biggest CRAs only.

The second empirical study (Chapter 5) investigates the conversion of the solicitation status of sovereigns induced by ESMA disclosure rules (Article 10 (5) of the EU Regulation 1060/2009). The CRA regulation requires that all ratings issued on an unsolicited basis need to be identified as such. Following enactment of EU regulation, S&P announced conversion to unsolicited status for 14 of its rated sovereigns in February 2011 (S&P, 2011a). The research question is: *“Did the conversion to sovereign unsolicited rating status (induced by regulation) result in lower bank ratings in the sovereign states whose status was converted?”* Solicited ratings result from the contract between the CRA and the issuer who requests and pays for the rating. Unsolicited ratings do not involve this agreement and are released by a CRA without the prior request or remuneration from the issuer.

8. Although the effect on the profitability of the CRAs might be neutral it might negatively affect the shareholders.

The solicitation status of ratings remains one of the most controversial characteristics of the CRA industry which raised debates and disputes amongst policymakers in Europe and Asia (The Japanese Center for International Finance (JCIF), 1999; Fitch, 2006; Behr and Güttler, 2008). The previous literature uncovers that intermediaries and firms which are rated on an unsolicited basis have relatively lower ratings than those issuers who pay for the service. Three main theories might explain this phenomenon: self-selection, conservatism and the blackmail theory (Bannier et al., 2010; Van Roy 2013). Despite this existing literature, there is no prior study investigating the impact of sovereign solicitation and its consequences.

The purpose of this chapter is to examine whether the CRA regulatory requirements achieve their purpose of more transparent and reliable rating services or whether they lead to unintended outcomes. The issue of solicitation conversion is important because it links with the recent disclosure rules imposed by ESMA. This literature on unsolicited (non-sovereign) ratings forms a theoretical framework for the chapter. Moreover, it is known from previous studies that sovereign risks can be transferred onto financial institutions via different channels (BIS, 2011; De Bruyckere et al., 2013; Alsakka et al., 2014). Furthermore, Borensztein et al. (2013) finds that sovereign ratings act as a ceiling on non-sovereign ratings. As a result of this, the ratings of the latter issuers usually do not exceed those of the sovereign state where they are domiciled. By bridging these three themes of research (regulation, unsolicited ratings and the sovereign-bank rating ceiling), Chapter 5 achieves a unique contribution to the CRA literature.

The third empirical study (Chapter 6) assesses the effects of the requirement for identifiers introduced by ESMA in April 2012 and its influence on rating quality. More specifically, the chapter investigates the influence that identifiers had on the market. The study questions whether the market performs better in the sense that it is more aligned with ratings through bond yields. The research question is: *“Did the quality of ratings change after the ESMA identifiers were introduced?”* The quality is identified as the information content of ratings which emerges through the ability of ratings to explain bond yields. When the rating precisely mirrors the risk of an issuer and correlates highly with bond yields it is considered a high quality rating and vice versa (Becker and Milbourn, 2011).

In line with Act 4.3 of the EU CRA Regulation, ESMA requires that CRAs disclose which ratings are issued in the EU, which originated outside the EU and have been endorsed, and which have not been endorsed. Only ratings which obtained either EU-issued or endorsed status

can be used for the regulatory purposes e.g. capital adequacy requirements of a bank (EC, 2011c). Effectively, for ratings to be used by financial firms, the rating analysts must be situated in a jurisdiction with a CRA regulatory regime at least as stringent as that in the EU (EC, 2011c). The rationale behind the introduction of identifiers is to improve rating quality, increase supervisory integration of the CRAs, protect investors in the EU and to seek an overall improvement in the functioning of financial markets (ESMA, 2011b).

The novelty of this chapter stems from the fact it considers the effect of regulation which does not evolve around the competition aspect as in earlier studies (see Kisgen and Strahan, 2010; Becker and Milbourn, 2011; Bongaerts et al., 2012; Doherty et al., 2012). Additionally, this is a unique study because it is the first to consider the influence of ESMA identifiers on the CRA market.. In essence, it captures the direct feedback of regulation (induced by the presence of identifiers) on the quality of ratings. It is important to study this issue more closely because it is believed that endorsement requirements could add credibility to CRAs' opinions and thereby cause ratings to be more rather than less important to market participants.

The data used in this Thesis covers numerous CRAs operating globally and regionally. In Chapter 4, statistics on the number of analysts, outstanding ratings and competition levels are acquired from the US Securities and Exchange Commission (SEC) and ESMA Transparency Reports. Interactive Data Credit Ratings International (IDCRI) is also used as an alternative source of issuer ratings data across seven CRAs.

The datasets used also offer a wide cross section of countries with differing industrialisation levels. For example, the sample in Chapter 5 covers 42 sovereigns and 147 listed banks originating from these countries rated by S&P. Chapter 6 uses sovereign ratings from Fitch, Moody's and S&P covering 69 countries. The sovereign rating data is acquired from my supervisors' database and from CRAs' publications. The bank rating data derives from the IDCRI database. Financial and accounting statistics on publicly listed banks is sourced from Bankscope whereas the macroeconomic variables are sourced from DataStream. Further, the bond characteristics and pricing data along with global risk factors are from Bloomberg.

To ensure rigour in the findings, the methodologies used in Chapters 5 and 6 apply the quasi-experimental design such as difference-in-difference (DD) estimation. Further, the chapters apply fixed effect models and additionally include ordered probit analyses. They also offer numerous robustness tests including falsification tests, covariate matching (CVM) and propensity score matching (PSM).

The contribution of this Thesis is mainly based on the originality of the research questions. For instance, this is the first analysis of the steps aimed at reducing mechanistic reliance on ratings in an empirical setting. The link between the sovereign-bank rating channel, solicitation status and regulation has not been explored before. Additionally, originality stems from the investigation of the ESMA identifiers which did not receive any attention whatsoever in the prior literature. Lastly, extensive data coverage enables the robust contributions of this Thesis.

The significance and relevance of the studied issues is substantial because the EU CRA regulatory changes are new and remain on-going. The Thesis identifies implications of regulation on the financial system and on the CRAs themselves. For example, changes in the solicitation status of sovereigns are found to have a negative effect on banks operating in the countries which switched their status. Moreover, the profitability and competition of the CRAs is marginally (negatively) affected as a result of transparency requirements. On the other hand, the efforts aimed at increased quality of ratings via the use of identifiers do not imply any effects (neither negative nor positive) and require further examination. The question which arises here is whether these results are the impact of the new regulation itself or an effect arising from revealing aspects of CRAs' behaviour that were previously opaque.

The structure of the Thesis is as follows. Chapter 2 provides the context and introduces fundamental characteristics of the CRA industry. Chapter 3 reviews prior literature in the field and points to the gaps in the literature. Chapter 4 begins the empirical investigation and provides an overview of regulatory actions aimed at reducing mechanistic reliance on ratings via increased transparency requirements. The chapter offers a critical appraisal of the actions taken by the European regulators. Chapter 5 investigates the impact of the changes in sovereign solicitation status upon bank ratings in those countries. Chapter 6 considers the effects of ESMA identifiers on the quality of ratings. Finally, Chapter 7 concludes the Thesis, presents limitations and opens potential avenues for future research.

Chapter 2: Background of the credit rating industry and recent regulatory reforms

2.1 Introduction

CRA's are an important contributor to financial markets by measuring creditworthiness. Without the presence of CRA's, repeated credit assessments would prove costly and time consuming for investors. By entrusting the task of issuing ratings, market participants rely on the robustness and accuracy standards of the issuing CRA's. Investors implicitly trust that rating assessments are performed to the highest possible standards and represent full commitment of the analysts (Duan and Laere, 2012). The CRA's face a dilemma of whether to rate accurately (in a short-term sense) or in a stable manner that does not unnecessarily disrupt markets by reversing their ratings in a short time window (Löffler, 2005). Another issue relates to the fact that the prevalent model of remuneration is not perfect and leaves scope for criticism. Namely, the *issuer-pays* paradigm is prone to conflict of interest issues since the issuer pays for the ratings (see Fennell and Medvedev, 2011).

In the recent years CRA's have been put in the spotlight and criticised for their lax ratings and inability to predict the sub-prime crisis (Stolper, 2009). CRA's also stand accused of worsening the European debt crisis by downgrading ratings of Eurozone sovereigns too far and too fast (Alsakka and ap Gwilym, 2013). Politicians across the EU called for further regulation and competition in sovereign ratings. Several policy actions have been agreed and new legislation has been voted by the European Parliament (EC, 2011b, c, d). The overall objective of regulatory changes is to reduce the impact of rating actions in financial markets, especially the mechanistic reactions induced by hardwiring and cliff-effects as well as imposing civil liability for ratings.

The problem of CRA's is not one sided however. Some of the issues arise from the business model of ratings itself while others from the regulatory negligence on the side of regulators and the market players. For example, users of credit ratings were often found to over-rely on the given information and blindly made their decisions without performing in-house assessments (House of Commons, 2012). In addition, regulators kept a blind eye for a very long time (BOE, 2011). The ratings became strongly imbedded into regulations and this assured investors about their reliability and encouraged reckless behaviour. The purpose of this chapter is to present

the current issues and features relating CRA industry. In addition to providing the background of the ratings used in this Thesis and their importance, the chapter links the recent regulatory efforts regarding rating industry in Europe. Namely, the chapter shows steps undertaken by responsible authorities, by providing detailed information about policy proceedings, legal actions and regulatory proposals and directives.

The chapter structure is as follows: section 2.2 introduces philosophy and methodologies used by CRAs. Section 2.3 demonstrates the types of existing ratings and number of players in the CRA market. Moreover, section 2.4 stresses the importance of ratings for the financial markets and the economy as a whole. In section 2.5, the business model of CRAs is presented along with the recent criticisms of the paradigm. The need for regulation resulting from these issues and the steps taken and challenges faced by the regulators is subject of section 2.6. Section 2.7 concludes the chapter.

2.2 Philosophy and methodology of credit ratings

The ratings construct is based on two leading philosophies. The first school of thought, *Through the Cycle Rating*, is predominant in external CRAs whereas approach based on *Point in Time Ratings* is mainly employed internally by intermediaries.

The former approach allows CRAs to focus on long term perspective which covers from one to many business cycles. This gives smoothening effect as ratings are not influenced by one particular point during the business cycle. This relates to the fact that if a change of creditworthiness is made, it is very difficult to be reversed to the initial rating as there is a permanent change in credit worthiness rating of the issuer. Market participants who appreciate this methodology are regulators, bond issuers and investment managers as it smoothenes out the turbulences in the business cycle of the rated security.

A *Point in Time Rating* methodology imitates the future borrower's position in the exact short time frame. Accordingly, as the business cycle changes issuer's rating position alters. This paradigm is sought by investors of hedge funds or traders who prefer ratings to be accurate at the time they purchase securities.

Rating approaches can be divided into qualitative, quantitative and mixed. The approaches vary across CRAs. For this reason, users should be careful when comparing ratings and treating

them as benchmarks for their investment decisions. According to S&P (2011), some CRAs use analysts, others build mathematical models, whereas some of them combine two approaches.

S&P applies analyst driven credit ratings where specialists appraise issuer based on financial data as well as weight in qualitative information (e.g. future strategies). Scope of S&P's approach embraces financial performance, policies and risk management strategies of the debtor together with the external business environment affecting the business. Likelihood of default is the central factor in rating process. It mirrors ability and willingness to meet debt obligations. Importantly, ratings deriving from this approach do not measure absolute default probability (S&P, 2012a).

Fitch Rating's rating methodology reviews institutional framework, intermediate risk assessment, competitive dynamics and system-wide funding. Their approach splits credit risk into two components: default probability and loss given default. Each sovereign and corporate is issued with Issuer Default Rating (IDR) and Recovery Rating (RR) which are then combined together giving final Issue Rating. The former rating measures ability of debtor to repay agreed amounts on time whereas the following rating suggests the likelihood of recovery of an issuer in case of defaulting (Fitch, 2012).

Moody's utilises the "*expected loss*" (EL) methodology which takes into account probability of default (PD) and loss given default (LGD) of the issuer. Those measures are subsequently multiplied to derive at EL value. Similar to the earlier CRA PD quantifies the probability of issuer not meeting debt obligations and defaulting whereas LGD is computed by dividing losses of the issuer against his/her exposures during default (Moody's, 2012a).

2.2.1 The rating process

The rating process within which a sovereign or bank rating is produced differs quite substantially. The principles on which the analysis is conducted are presented using examples based on the two largest CRAs.

The sovereign rating criteria of S&P (2014) refer to factors which influence a government's willingness and ability to pay its debt obligation promptly and in its entirety. The analysis conducted by the CRA focuses partially on the past behaviour in terms of the economic and political cycles but also the factors which might shed light on the higher or lower fiscal and monetary flexibility in the upcoming economic cycles. S&P investigates five factors which

form the foundation of the credit analysis. These are: institutional and governance efficacy and security risks, economic structure and growth outlooks, external liquidity and international investment position, fiscal performance and flexibility followed by debt burden and finally monetary flexibility. The analysis of these factors consists of quantitative and qualitative elements. For example, the robustness of the political institutions comprise mainly qualitative information whereas economic factors such as debt and external liquidity are mainly based on quantitative indicators.

Each of the categories receives a score on the six-point numerical scale from the strongest (1) to the weakest (6). These values are then combined together to achieve the sovereign's institutional and governance effectiveness and economic profile (an average of the first two scores) and its flexibility and performance profile (an average of the remaining three scores). These two elements are used to determine the indicative rating level. S&P notes that the expected sovereign foreign-currency rating will most likely fall within one notch of this level depending on a comparison against other sovereigns.

The entire rating process is normally initiated by the issuer willing to be rated (the same applies to bank ratings and to other CRAs) i.e. solicited ratings. Once the request from the sovereign is received the CRA typically enters into an agreement to rate the issue/issuer. Although most governments have agreements with CRAs, some sovereigns' ratings are released on unsolicited basis where no agreement with the issuer was reached. The CRA continues to rate those issuers when it believes that there is significant interest in the market and sufficient public information available to support the analysis.

To rate a sovereign, S&P allocates a lead analyst who acquires information from published statements and reports, along with interviews and dialogue with government representatives. The formulation of the rating opinion is conducted according to specific criteria and is informed by the expertise and judgement of credit analysts and other professionals involved in the process (S&P, 2014). The information prepared by the analysts during the rating process is reported to the rating committee. The quantitative and qualitative assessments performed by the teams are presented by the lead analyst together with views and recommendations which are finally considered by the voting members of the rating committee to arrive at the assigned rating. The issuer is notified about the outcome and publication and dissemination of public rating opinions follows.

Bank ratings are determined not only by bank-specific factors but also macroeconomic factors and the extent of external support that they receive. S&P (2011d) stresses that their framework for rating financial institutions comprises of two steps: verifying Stand-Alone Credit Profile (SACP) and evaluating extraordinary support by either government or a group. Combining both steps establishes the bank's Issuer Credit Rating (ICR).⁹ The estimation of SACP depends on six factors grouped into macro and bank-specific factors. The first two indicators such as economic risk and industry risk rely on the Banking Industry Country Risk Assessment methodology (BICRA) which measures the conditions of the surrounding economic environment. The following four indicators signify strengths and weaknesses of the particular intermediary such as business position, capital and earnings, risk position, funding and liquidity. Finally, the support framework takes into account the rapport between the bank and the parent group or the government and considers how it affects banks creditworthiness.

Moody's (2015a) assigns sovereign ratings based on four principal factors: economic strength, institutional strength, fiscal strength and susceptibility to event risk. Each of these factors encompasses the sub-factors which have quantitative weights attached and are represented by indicator variables (i.e. macroeconomic variables).¹⁰ After each indicator has been calculated, it is mapped into one of the 15 ranking categories. These in turn determine the score for the particular sub-factor. Finally, the scorecard informs the determination of the overall rating.

Moody's recently revised its bank rating methodology in the light of the financial crisis and the ongoing fundamental shifts in the banking sector and its regulation. The methodology includes a similar approach to S&P to an institution's creditworthiness. Additionally, the analysis addresses the expected losses while considering whether external support is available to the bank or not. Moody's approach to assigning bank ratings takes the form of sequential analysis, which comprises an assessment of the standalone financial strength of the bank – Baseline Credit Assessment (BCA) followed by an assessment of possible affiliates. Thirdly, Loss Given Failure (LGF) captures the influence of the bank's failure on the expected loss of

9. Once the probability of extraordinary support is ascertained, S&P first establishes the bank's indicative issuer credit rating (ICR). This indicative measure is the component of the final ICR which is the combination of the SACP and the support factor. In most cases, the indicative ICR is the same as the final ICR, however there are instances when it differs by plus/minus one notch. This may occur when the bank is subject to political, social or economic trends which either impede or facilitate its creditworthiness or some positive or negative transition which adds/lessens the risk not captured earlier by the ICR (S&P, 2011d).

10. For example, the sub-factor of the economic strength 'growth dynamic' is quantified by using the average real GDP growth, volatility in real GDP growth and the WEF Global Competitiveness Index.

various creditor classes. Finally, Moody's considers the potential support by governments to conclude the credit rating for a particular instrument. The assessments include qualitative (i.e. business diversification, opacity and complexity) as well as quantitative components (financial ratios relating to solvency and liquidity). Moody's stresses that it seeks information on bank statistics such as funding bases through examination of public information together with dialogue with the issuers.

As highlighted by Moody's (2015a), the factors identified in published methodologies as being used to rate issuers may not always capture all considerations taken by the CRA. Moody's might use additional adjustment factors specific to that issuer (e.g. sovereign) which may not be universally available or relevant. If such confidential information is used, it is not disclosed to the public. Moody's suggests that it may consider some supplementary factors, which are difficult to measure. In some cases, the elements used are complex and expressing them in the published methodologies is problematic. In addition, the weighting of factors used for calculations might sometimes differ from those published. The new regulatory environment has failed to extract all methodological details from the CRAs, who have a clear incentive to protect their business and commercial advantages.

S&P (2014) suggests that in addition to publicly available information, discussions with issuers contribute to the assessment involved in the rating process. For example, when rating sovereigns, S&P collects information during meetings with officials from the treasury or finance ministry. Information also derives from reports and discussions with other official observers, politicians in and outside government, and private-sector commentators on economic and political trends (economists, bankers, media sources). S&P highlights that some information used in the rating process might not be considered public.

To summarize, ratings are opinions on the issuer's creditworthiness and reflect both quantitative and qualitative assessments of risk and the expert judgements of a rating committee (often using soft information). For this reason, ratings cannot be explained entirely by a particular set of data and formal rules (BIS, 2011). Moreover, it is often stressed that the assessment produces a relative not absolute measure. The assigned rating level must be regarded relative to other issuers. Therefore, the value added from using ratings stems from CRAs' private information and the cost savings to issuers and investors that arise from that. The added-information role of CRAs aids transparency and market efficiency and reduces information asymmetries between buyers and sellers in debt markets (Fitch, 2013).

2.3 Types of ratings

As of July 2015, the EU CRA industry comprised 25 registered and 4 certified¹¹ CRAs. Within the group of registered CRAs, the three main players (Fitch Ratings, Moody's and S&P) constitute a group of 17 legal entities (ESMA, 2015b). S&P has representation in three European states whereas Fitch and Moody's reside in six European markets each. The three CRAs comprise approximately 90 percent of the outstanding ratings (ESMA, 2014c). The growth of market share remains at similar levels since 2013 although the regulator observes increasing numbers of applications for registration from CRAs (ESMA, 2015c).

As of December 2014, there were 10 NRSROs¹² registered with the SEC. The larger CRAs (Fitch, Moody's, and S&P) comprised approximately 97¹³ percent of the market share (SEC, 2014). In terms of concentration of CRAs, larger NRSROs rate over 99 percent of the government, municipal and sovereign issuers, 84 percent of financial institutions and 74 percent of insurance companies in the US.

The range of services provided by ratings lie within five classes: (1) financial institutions (i.e. brokers, dealers); (2) insurance companies; (3) corporate issuers; (4) asset-backed securities' issuers and (5) government securities' issuers (i.e. government securities, municipal securities, or securities issued by a foreign government) (SEC, 2014).

According to Alsakka and ap Gwilym (2010a), *issue* and *issuer* ratings can be distinguished for short-term and long-term debt. An *issue* credit rating is the judgment of the CRA about the creditworthiness of a party concerning a particular financial project or asset class. On the other hand, an *issuer* rating is the opinion about the overall ability and motivation of the party to repay its debts on time. Short-rating comprises appraisal of short term debt (i.e. bonds) which matures in less than 365 days. The long term ratings are for instruments and investments with a maturity in excess of 12 months.

11. According to the EU CRA Regulation CRAs willing to provide rating services need to be registered or certified by the regulatory body European Securities Markets Authority (ESMA) (ESMA, 2013c). The CRAs established in the EU or their subsidiaries operating in Europe are entitled to apply for registration. The ratings issued in third countries are allowed for regulatory purposes if they are issued by certified CRAs. Certification obliges that "*the Commission has adopted an equivalence decision regarding the third country's regulatory regime for CRAs*" (EC, 2011d; p.22).

12. Nationally Recognized Statistical Rating Organizations.

13. As of 2014 the total reported ratings amounted to 2,437,046. Other NRSROs include A.M. Best, DBRS, EJR, HR Ratings, JCR, KBRA and Morningstar (SEC, 2014). For comparison of concentration of the CRA market across the years see Table 4.3b.

Further, credit ratings can relate to debt issuers whose obligations lie in home or foreign currency (i.e. *local* versus *foreign* currency ratings). According to S&P (2012a), the local currency ratings can be higher than foreign rating up to two notches to account for possible advantage in governments' position. This might include issuing currency and control over country's financial system.¹⁴

Different classifications of ratings exist. For instance, issuers willing to measure their ability to repay debt and are incurring cost of the appraisal are issued with *solicited ratings*. An unanticipated assessment by the CRA using publicly given information about the issuer is known as *unsolicited rating*. In the latter, the CRA is not awarded a fee, unlike the former (Gan, 2004; Behr and Güttler, 2008).

In addition to traditional rating changes which express the creditworthiness of an issuer, CRAs publish reviews: watchlists and outlooks on issuers.¹⁵ The former also known as rating review is an evaluation of particular rating for the next 90 days. If there is a sign that the rating might need alteration such issuer is placed on a watchlist with the negative changes resulting in a downgrade or a positive changes followed by an upgrade. Watchlist category may also give direction of uncertain category (E) however this classification is generally omitted in the literature (see Hamilton and Cantor 2004; 2005). Outlook on the other hand, involves estimations of the course of ratings in the coming 12-18 months which can take form of positive, negative, developing or stable (Hamilton and Cantor, 2005, 2004; Klaar and Riley, 2005).

This work will focus on two types of rating services, namely sovereign and bank ratings. Sovereign and financial institutions ratings are based on appraisal of bonds released by governments or financial firms and reflect their ability to repay outstanding debt obligations.

Sovereign long-term foreign-currency ratings assess the ability and willingness of a country to repay its foreign currency obligations on time. The ranking reflects social, economic, financial as well as political situation of considered country together with its overall advancement.

14. Situation changes when a government belongs to the monetary union where it answers to the central bank. In such instance the ratings might equal to the foreign currency ratings (S&P, 2012b).

15. S&P started producing outlook and watch status, together with its sovereigns, in 1989 (Vazza et al., 2005; Chambers and Ontko, 2007). Moody's introduced watch in 1991, as the second CRA. Outlooks followed in 1995 (Hamilton and Cantor, 2004). Fitch implemented watch status in August 1994, when it first joined sovereign ratings market (Klaar and Riley, 2005). Moreover, Fitch started reporting outlook status on long-term foreign-currency sovereign ratings from September 21, 2000.

Quite the contrary holds for bank ratings as valuations are created using economic and financial information.

2.4 Importance of credit ratings

Globalization as well as complexity of available investment products and its originators has triggered need for universal and nationally recognised risk assessment (Alsakka and ap Gwilym, 2010a, 2013; Hill and Faff, 2010). Need for rating derives from the fact that market participants who wish to join capital markets are required to obtain credit assessment. Some even call them “tickets to entry” to capital markets (Langohr, 2006; Langohr and Langohr, 2010). According to Von Schweinitz (2007), approximately 80 percent of the capital flow is influenced by credit ratings.

Moreover, due to hardwiring ratings into regulations, certain financial institutions are not allowed to invest in debt securities which have not obtained an investment rating from restricted group of CRAs (i.e. NRSRO) (Löffler, 2004; Stolper, 2009; Kisgen and Strahan, 2010). For example: according to rule 2a-7 of the US Investment Company Act of 1940 money market funds are obliged to acquire eligible securities which include the highest two short-term ratings classes (SEC, 2010). These need to be classified by one of the NRSROs or comparable to securities which fall in the same category.¹⁶ According to adjustments of the regulation from May 2010, funds are restricted from purchasing second tier rated securities. Additionally, pension funds municipalities¹⁷ are obliged to invest merely within grade classes assigned by the certified group of CRAs (Alsakka and ap Gwilym, 2010b; Kisgen and Strahan, 2010).

Moreover, ratings act as an intermediary between financiers and debtors thus reducing information asymmetry. This in effect leads to lower cost of capital (Löffler 2004; Duff and Einig, 2009a). Beneficiaries of ratings comprise of issuers themselves, potential investors, intermediaries as well as regulatory bodies as they provide credit assessment and deliver it to other parties.

16. Amended rule 2a-7(a)(12) (eligible security).

17. A political unit, such as a city, town, or village, incorporated for local self-government.

2.4.1 Sovereign ratings

The importance of sovereign ratings in particular lies in the fact that investors willing to diversify abroad should understand the credit risks of sovereign issuers (Cantor and Packer, 1996). Moreover, sovereign ratings help countries to gain access to new sources of capital by entering international markets and enabling a flow of foreign investment (Bissoondoyal-Bheenick, 2004; Andritzky et al., 2007; Kim and Wu, 2008). The announcement of sovereign ratings has major implications on financial markets such as rising cost of credit and hindered market access (BIS, 2011). In addition, the release of rating has become a very sensitive area in the world of politics. Politicians and regulators are concerned about the impact credit ratings may have on Governmental policy. For instance, in an interview to the Financial Times (FT), president Sarkozy admitted that his concern was only about maintaining the triple “A rating” for France.¹⁸ Designing and delivering special packages aimed at sustaining current sovereign rating (triple A) of the United Kingdom provides evidence on the impact of ratings on governmental legislation.

Furthermore, sovereign ratings used to act as ceilings on ratings allocated to intermediaries, corporates, and local governments. This means that if the country received a particular rating the corporate bonds amongst others could not be rated above this grade. Although rating ceilings no longer exist, after Moody’s, S&P and Fitch removed it from their directives, it still positively influences other classes of ratings (Williams et al., 2013). Borensztein et al. (2013) name this phenomenon as the *sovereign ceiling lite*.

2.4.2 Bank ratings

The reliance on bank ratings has grown in the recent years when the number of financial transactions increased in quantity and their complexity amplified. Additionally, the finance moved from banks to capital markets (Boot and Thakor, 2010). This simultaneously with the deregulation and inventions in the financial services (e.g. securitisation, derivatives) resulted in the intermediaries’ market being bigger in size, more concentrated, complex and closely linked with the capital markets (Hau et al., 2013). Additionally, bank ratings play an important role in shaping the cost of issuing senior unsecured debt. This type of debt is the most important

18. However, France was downgraded from AAA to AA+ by S&P in January 2012. In November 2012 Moody’s also downgraded France from Aaa to Aa1 and has kept its negative outlook. During the entire 2012 Fitch rated France at AAA with a negative outlook (FT, 2012).

type of funding for intermediaries in the long run (Wyman, 2011). Rating banks pose some difficulties on the side of CRAs however. For example, intermediaries are opaque and subject to range of different risks. They are also exposed to issues of asymmetric information and under constant pressure of regulatory interference.

Following, the importance of bank ratings stems from the fact that banks play dominant role in the economy by providing intermediation such as distribution of capital and risk and liquidity creation. The policies in the US made CRAs responsible for determining the quality of banks portfolios (White, 2010). For example, to obtain liquidity central banks need to satisfy the minimal quality of collateral identified through the CRA ratings. This connects closely to the capital requirements stated in the Basel II accord which rely heavily on the use of the external bank ratings. Hau et al. (2013) suggests that, although large intermediaries might apply internal credit assessments, their models often depend on external ratings (e.g. methodological grounds). While Basel III acknowledges the need to lessen the dependence on ratings for securitised loans, it creates another responsibility for ratings in over the counter derivatives markets (BCBS, 2010).

2.5 *Business model of CRAs*

Rating industry is characterised by '*for profit business model*' which at its onset relied on the *investor-pays* principle where investor incurred cost of credit assessment of the institution he/she wanted to invest in. The paradigm changed in the late 70's when it was replaced by the *issuer-pays* model (Pagano and Volpin, 2010; White, 2010). Credit ratings arising from the technological innovation around that time, which induced free-riding problem, as well as resulting from increased complexity of financial instruments became known as *sell-side* credit ratings (Randhawa, 2011).

The *issuer-pays* model offers advantages including free information about investments available to market participants and researchers. In addition, CRAs are not encumbered with the free-riding problem since the income is not dependent on investors but issuers. Some believe this leads to greater economies of scale for CRAs and in effect more adequate ratings (McDaniel, 2009). According to SEC (2012), from the nine CRAs registered as NRSROs at the end of 2012 six were operating under the *investor-pays* model¹⁹ which accounted of nearly

19. A.M. Best Company, Inc. (A.M. Best); DBRS, Inc. (DBRS); Fitch, Inc. (Fitch); Japan Credit Rating Agency, Ltd. (JCR); Moody's Investors Service, Inc. (Moody's); and Standard & Poor's Ratings Services (S&P).

99 percent of issued ratings at the end of 2011. Two CRAs²⁰ have previously been using the *subscriber-pays* model and recently started providing services under the first paradigm. The only CRA fully relying on the *subscriber-pays* model is EJR.²¹

When a new rating is issued (under the *issuer-pays* model), a CRA is typically compensated as part of the contract with the issuer (unless the rating is unsolicited and is issued free of charge). Such compensation depends on different factors such as rating type and the debt issuance amount. According to S&P (2016), there might be a supplementary fee for rating more complex and unique structures which require additional analytical attention. Extra fees might also be charged for requests which require action in more restricted time frames. S&P's website states its fees for rating services in the US as of January 2016 (see Table 2.1). Moody's information is much more ambiguous by stating that their fees range from \$1,500 to approximately \$2,500,000. Moody's includes this information in the form of a disclaimer in all of its publications. Fitch reports prices for its services in a similar manner as part of the disclaimer message. It receives fees between US\$1,000 to US\$750,000 for rating services from issuers, insurers, guarantors, other obligors and underwriters. Fitch might also charge annual fees to those issuers wanting to rate multiple issues amongst others. These fees range between US\$10,000 to US\$1,500,000.

The *issuer-pays* model became subject to criticism in recent years. Justifications for disapprovals of the model are presented in the subsequent section. In addition to issues directly concerned with the business model, the general criticisms of the industry such as overreliance on rating and competitiveness of the markets are introduced.

20. Kroll Bond Rating Agency, Inc. (KBRA) and Morningstar Credit Ratings, LLC (Morningstar).

21. Egan-Jones Ratings Company. On January 22 2013 the CRA became barred from some ratings by SEC (Reuters, 2013) (see section 4.2.2.5).

Table 2.1- Fees charged by S&P

Type of the rating	Fee
Corporate*	<ul style="list-style-type: none"> • Up to 6.25 basis points for most transactions • Minimum fee \$100,000
Public Finance	<ul style="list-style-type: none"> • Depends on the sector, par amount, structure and complexity of the transaction • Fees range from \$7,500 to \$500,000 • Fees on large transactions (>\$500million) are determined on a case-by-case basis
Sovereigns	<ul style="list-style-type: none"> • Up to 6.25 basis points for most transactions • Minimum fee \$100,000
Structured Finance	<ul style="list-style-type: none"> • Fees range up to 12 basis points
Complex Transactions	<ul style="list-style-type: none"> • Higher fees apply to more complex transactions
Frequent Issuer and Multi-Year Fee Arrangements:	<ul style="list-style-type: none"> • Alternative fee arrangements can be made for volume issuers and multi-year rating service agreements.

Notes: This Table presents fees charged by S&P for their rating services. Information accessed from S&P (2016).

* Corporate includes industrial and financial service companies.

2.5.1 Critiques of the paradigm

Firstly, despite the fact that assessment of credit worthiness revealed by CRAs has an influence on financial decisions across internal investors as well in a cross country spectrum; until recently, CRAs did not reveal information outlining methodologies applied while producing such ratings. The transparency issue was one of the prevalent arguments pointed out by politicians,²² as well as among market participants pressing for amendments in regulation (ESMA, 2011a).

Secondly, the actual methodology calls for attention from rating providers. The economic significance of ratings produced is being disputed and criticisms are directed at their ability to forecast creditworthiness. Some authors argue that ratings are backward looking (Duan and Laere, 2012). For instance, in the early 2007-2008, CRAs were incapable of recognising risks associated with securities backed by sub-prime mortgages (Duff and Einig, 2009b; Stolper, 2009). During the recent crisis CRAs have also been blamed for lagging the sovereigns and

22. European Commissioner for Internal Market and Services Michel Barnier called for enhanced transparency on how ratings evaluate sovereign debt, January 2012.

downgrading them too far and too fast (EC, 2010). Further, uniformity of ratings across CRAs remains an issue requiring immediate attention. Although CRAs' methodologies might share some similarities, they are very different (House of Lords, 2011). It is often the case that CRAs release contradicting issues. Split ratings arise due to, inter alia, different time frames applied by raters and varying methodologies capturing different aspects of an investment environment.

Thirdly, problems arise due to the fact that issuer of the credit rating is the same party remunerating the CRA for their thorough analysis. Until outburst of the crisis, CRAs' business relied mainly on source of funding arising from corporate and structured products ratings. For instance, Moody's main revenue derived from ratings whereas the rest of their operations and services were dedicated to sensitivity analysis, risk management and consulting (Partnoy, 2002). Sell-side ratings became a multi-billion industry where majority of income stems from bond ratings. Deb and Murphy (2009) refer to these services as 'cash cows' of the CRAs.

The conflict of interest, in turn, might trigger the *shopping for ratings* phenomenon which is usually seen in structured products and leads to pressures on CRAs.²³ Issuers are given preliminary information about the rating and might decide to request ratings from multiple sources and pressurise CRAs to receive the most desired rating (Fennell and Medvedev, 2011). Given the fact that in majority of cases it is the issuer who encounters cost of rating procedure (i.e. example of solicited ratings), many big financial firms (i.e. large banks) may gain favourable treatment of its regular rating supplier (see White, 2002; Hau et al., 2013). In line with this belief, studies find that unsolicited ratings tend to be knowingly lower (Economist, 2005) and for this reason have raised concerns amongst issuers and policy makers (see Matsuo, 2005; Fitch, 2006).²⁴

Further, commentators often label rating industry as uncompetitive and harmful for issuers and very beneficial for CRAs. The fact that 97 percent of the market share remains in the hands of the three main players in the industry (S&P, Moody's, Fitch) is an indicator of the lack of competitiveness and implies oligopolistic market form.

In addition, one can observe various barriers to entry to the rating industry, as follows:

- 1) Regulation proves to be a costly barrier to entry born by incumbent rating firms.

23. CRAs are remunerated based on issuance of rating.

24. The public debate across countries on the procedures relating unsolicited ratings is subject of section 3.4.

- 2) Brand awareness constitutes a major problem for smaller firms offering ratings to issuers. When the issuers think CRAs, they most often assimilate particular brand names such as S&P and Moody's, therefore it is difficult for rivals to break this credence and loyalty (Fennell and Medvedev, 2011).

In summary, it is known that rating services were considered part of the aggregated analysis in measuring credit worthiness of an issuer. However, this role deepened over time and such appraisal became a requirement for variety of market indentures. Problematic nature of hardwiring is that market participants cannot simply ignore ratings since they became strongly embedded into regulation and financial contracts (Bank of England (BOE), 2011). This hardwiring effect coupled with the overreliance of investors who instead of viewing such appraisals as input towards decision making relied on them carelessly.

On the other hand, regulators blamed for turning a blind eye on CRAs. In one of parliamentary meetings in the UK, Paul Taylor CEO of Fitch ratings lashed out at members of the Treasury Select Committee for their incompetence and inability to appropriately scrutinise the CRAs. Members of the Treasury were blamed for lack of briefing and not utilizing the available research produced by Fitch and other CRAs. In his interview for the Times, Taylor added: *“Unless you understand the depth of the information we're producing, and the work that goes into it, you're not criticising us from a well enough informed position”* (The Times, 2012).

2.5.2 European sovereign debt crisis

Generally, financial crises have been considered an emerging country phenomenon (Reinhart, 2010). Developed world have not seen financial crisis since 1995. In contrast, numerous crises have stroke emerging markets in the same time span. These include crisis in Mexico 1994-1995, financial turmoil in Asia 1997-1998 and downturn in Turkey 2001-2002, amongst others.

The debt crisis of 2007-2010 has shown that not only the emerging economies are unstable and face downgrades of their sovereign ratings. The example of such occurrence could be seen when Iceland experienced a series of downgrades starting in November 2008. Greece, Spain and Portugal have shown their deterioration in credit worthiness in January 2009 when S&P has announced its downgrades. This was followed by subsequent downgrades of these countries up until 2012 and remains an on-going issue. Sovereign debt crisis restarted the debate about impact of sovereign ratings during crises as well as the linkages between financial markets (Arezki et al., 2011).

During sovereign crisis, one could observe numerous sovereign downgrades (see Arezki et al., 2011 for details); problems in trading stocks as well as amplified spread of sovereign bond and credit default swap (CDS) markets. BIS (2011) stresses participants of mature economies concerned about the state of the economy and tensions in the Euro have recently boosted the demand for safe haven assets. This resulted in significant reduction of yields on most highly rated and liquid government bonds such as German, Swiss or the US.

CRAAs have been accused of worsening the European debt crisis by downgrading the ratings of Eurozone sovereigns too far and too fast. At the same time many participants followed their ratings blindly without taking up necessary and independent research. Overreliance on ratings is explained by many in strong hardwiring of CRAAs into the regulation in Europe (Kisgen and Strahan, 2010). In the sovereign debt crisis, this dependence resulted in cliff-edge effect where downgrades of particular security from investment to junk grade²⁵ had disproportionate cascading effect²⁶ (Manso, 2013).

Situation in Europe has further emphasised hazardous effect of spilling over the negative signals and actions born by investors to other neighbouring states and countries but also onto interconnected international financial markets (e.g. banks) (Arezki et al., 2011). Rationale behind worsening credit worthiness of these countries, amongst others, could be attributed to close interconnectedness of these markets with emerging economies as well as with each other.²⁷ The channels through which spillovers are transmitted to countries and markets are various, and include inter alia, holding sovereign debt by outside economies (Blundell- Wignall and Slovik, 2010) and cross-border holding (BIS, 2010) (for more details on spillover channels see section 5.2.1.1).

25. Investment grade debt-issuers and issues with relatively high levels of creditworthiness and credit quality. Junk grade-non-investment grade debt-issuer has the ability to repay its debts but faces significant uncertainties (S&P, 2011b). Issuers rated Baa3/BBB- and above are classified as investment grade whereas issuers rated Ba1/ BB+ or below are considered speculative grade.

26. In many cases these downgrades caused cost of credit to rise pushing the debtor into financial problems and in extreme cases, default.

27. For example, via the currency within the Eurozone.

2.6 EU Regulation of CRAs

Repeatedly CRAs have been blamed for failing to recognise financial crises around the globe. CRAs were criticised for not anticipating the Asian financial crisis which broke out in 1997 and the Latin-American debt crisis of the late 1980's (Ferri and Stiglitz, 1999). The global crisis events, resulting from the collapse of individual institutions such as Lehman Brothers,²⁸ have brought a major stroke to the economy. The efficacy of CRAs also became seriously damaged. CRAs were criticised for furthering the US sub-prime crisis by being too permissive while rating structured finance products (Alsakka and ap Gwilym, 2013). The inability of CRAs to recognise risks associated with securities backed by sub-prime mortgages (Crouhy et al., 2008; Duff and Einig, 2009b; Stolper, 2009) constitutes one of the main reasons of their infamous publicity and ongoing scrutiny by authorities.

In the history of ratings, there were examples of CRAs being accused of the misguidance of market participants or even deteriorating economic conditions. Nevertheless, resolutions have been ineffective, responsive at the time of the actual downturn and slow in process (Duan and Laere, 2012). In many cases role of CRAs was overestimated as instances of fraud and data manipulation were found on the side of the issuers.²⁹ The recent regulatory efforts concerning CRAs had their source not only in sub-prime crisis initiated in the US but were also due to events which stroke Europe during a debt crisis. In contrast to the previous allegations of issuing ratings which were too high, CRAs were blamed for downgrading sovereign ratings (e.g. Greece, Italy, Spain) too quickly and too severely (Alsakka and ap Gwilym, 2013).

Restructuring the financial industry stands as the priority task of policymakers wishing to strengthen and improve the shape of the international financial markets. It has been widely pronounced that gaps in regulations on CRAs stimulated negligence and abusive performance which in turn triggered a breakdown of the global financial system (Duan and Laere, 2012). Numerous proposals have been drawn to improve the resistance of the financial system. Some authorities implemented legislative measures, communicated the necessity of reinforcing regulation administering CRAs or have already started taking necessary actions (Duan and Laere, 2012).

28. The three major CRAs granted an investment grade to debt of the very investment bank only one day prior its bankruptcy.

29. In 2001 main CRAs were blamed for not predicting bankruptcy of energy company Enron in the US which was later found to misreport their statistical data. Similar situation took place during the recent European sovereign crisis where CRAs were accused of causing a crisis in Greece. However, Greece has manipulated its statistical data (including government debt levels) (Eurostat, 2009).

The formation of the EU CRA regulation can be divided into three main phases: reactive, implementation and enhancement; and is subject of the subsequent sections.

2.6.1 'Reactive' phase of EU CRA Regulation

In spite of the systemic nature of CRAs (BOE, 2011) industry in Europe has been mostly self-regulatory. Up until 2010 there was no direct legislation under which CRAs would fall. Shortly before the crisis, in March 2005, ESMA in its communication to the EC recommended that no regulation in Europe was needed and proposed to rely on the self-regulation of CRAs and observe the extent to which CRAs work in accordance with IOSCO Code³⁰ (CESR, 2005). Consequently, the EC did not propose legislation regarding CRAs to the European Parliament as it was convinced that existing directives (e.g. Capital Requirements Directive, Market Abuse Directive) as well as self-regulation applied by CRAs accountable to the Committee of European Securities Regulators (CESR) suited this role sufficiently (EC, 2006). ESMA was responsible for monitoring the compliance of DBRS, Fitch, Moody's and S&P which voluntarily decided to endorse rules of the Code and reported to the authority (Alcubilla and Del Pozo, 2012). Since that time the authority has been reporting to the EC on a continuous basis (CESR, 2005).

The need for tighter regulatory framework aimed at CRAs has been observed during the crisis during which stability of the system has been at risk (Alcubilla and Del Pozo, 2012). The G-7 and Governors from central banks invited the Financial Stability Forum (FSF) to carry out the investigation of the sources of the crisis and to propose possible action plan (FSF, 2008).

During the G-20 summit in Washington 2008 member states "*aimed to ensure that no institution, product or market was left unregulated at EU and international levels*" (EC, 2013; p.2). The EC categorised the weaknesses of the CRA business into: issues of integrity, reliability and transparency.

In December 2009, EC introduced a new set of laws involving CRAs within European jurisdiction. The Financial Services Authority (FSA) summarises them in two paragraphs (Fennell and Medvedev, 2011). The first division relates to registration procedures which

30. See (IOSCOPD151).

demand that credit institutions, investment firms, insurance companies, and pension funds operating in the EU use ratings solely from certified CRAs.³¹

Second aspect of the new rules targets reducing issues of conflict of interest. Sanctions comprise governance requirements and inside the CRA inspections. Regulations target increased transparency and ways to enhance methodologies and attributes of ratings. For instance, CRAs are prohibited from providing advisory services and are not permitted to rate instruments in instance when an insufficient amount of information is available. CRAs are required to publish their methodologies, models and key assumptions underlying their analysis. Moreover, transparency reports need to be delivered on a yearly basis. Additionally, CRAs are required to establish a function within their entity to evaluate the quality of ratings. In addition, at least two directors at the board of one CRA (unconnected with each other) will be rewarded irrespectively of the accomplishment of the CRA. Furthermore, single term appointment of a director must not exceed five years and the reason of discharge is to be based on their professional delinquency. Finally, if the CRA delivers structured product ratings one of the directors is required to be an expert in the field of securitisation and structured finance.

During the Toronto summit in June 2010, G-20 and FSB debated about the mechanistic reliance on ratings. As a result in October 2010, a list of principles targeting a decrease of dependence on credit ratings was announced by the FSB. The main aim of the report was to reduce the mechanistic reliance on ratings and enhance processes of independent credit worthiness assessment by market participants at the international level (FSB, 2010). The first goal was to encourage regulators and evaluate references to CRAs and if possible replace or remove them. Secondly, the report stressed that market participants should be making their own risk evaluation and not depend fully or routinely on CRAs' opinions. According to the FSB (2010)³² principles should be specific depending on the nature of financial operators and include rules targeting central bank operators, the prudential supervision of banks, investment policies of investment managers and institutional investors, private sector margin agreements and disclosures by issuers of securities. The body requested international regulators, central bankers and other financiers to apply these rules into practice in a coherent and unbiased manner. As a helping tool to reinforce the rules and regulations equally across states, FSB recommended endorsing code of conduct set by the IOSCO.

31. This came as a result of inquiries of, inter alia, the G-20 group who put forward a formal request for registration which came into action since November 2008.

32. See Principles for reducing reliance on CRA ratings, Financial Stability Board, 27 October 2010.

2.6.2 'Implementation' phase of EU CRA Regulation

As a response to the political agreement between G-20 nations, European Parliament and the Council formed EU regulation on CRAs, known as CRA I Regulation,³³ which took effect from December 2010. In January 2011, the Committee of European Securities Regulators was replaced by European Securities Markets Authority (ESMA). In addition to ESMA, three other European financial supervisors were introduced: EBA,³⁴ EIOPA³⁵ and ESRB.³⁶ The adjustments to the first regulation were introduced in May 2011,³⁷ as a result of handing over the direct supervision of CRAs in Europe to ESMA.

On the November 15 2011, plan to alter the current regulation of CRAs has been published by the EC. Proposal for CRA III regulation (EC, 2011d),³⁸ was followed by a proposal of the directive on the application of external ratings by fund managers (EC, 2011e).³⁹

The proposed changes of CRAs regulation focused on four main areas. Firstly, sovereign debt ratings are to be assessed every six months and require release of a report when new rating or amendment is issued. The unsolicited ratings are required to be published after the close of business (Friday) and minimum one hour before markets open again (Monday).

Secondly, issues of conflict of interest are tackled by introducing rotation rules,⁴⁰ capping on the ownership of CRAs⁴¹ and preventing CRAs from rating issuers in which they have financial gains or financial incentives.

33. Regulation (EC) No 1060/2009 of the European Parliament and of the Council of 16 September 2009 on credit rating agencies (EC, 2011b).

34. European Banking Authority.

35. European Insurance and Occupational Pensions Authority.

36. European Systemic Risk Board.

37. Regulation (EU) No 513/2011 of the European Parliament and of the Council of 11 May 2011 amending Regulation (EC) No 1060/2009. Also known as CRA II regulation (EC, 2011c).

38. Proposal for a Regulation of the European Parliament and of the Council amending Regulation (EC) No 1060/2009 on credit rating agencies (EC, 2011d).

39. Proposal for a Directive of the European Parliament and of the Council amending Directive 2009/65/EC on the coordination of laws, regulations and administrative provisions relating to undertakings of collective investment in transferable securities (UCITS) and Directive 2011/61/EU on Alternative Investment Funds Managers (AIFM) in respect of the excessive reliance on credit ratings (EC, 2011e).

40. Based on the principle that the issuer would be required to change the CRA assessing its creditworthiness every four years (using services of CRA no more than 3 years) in case of solicited ratings.

41. If a shareholder holds 5 per cent in one CRA it is not allowed to hold 5 per cent and over in another CRA or to provide services and advise to issuers rated by the CRA. Likewise, the CRA will not be able to rate an issuer which holds more than 10 percent of its capital.

The third aspect of the CRA III proposal deals with accountability of the CRAs. This relates to violations performed either intentionally or by negligence and which have impact on credit ratings.

The fourth and final sphere tackles issues of transparency and overreliance on ratings. On the side of CRAs, the EC requires the CRAs to disclose information about their securitised products on continuous basis. In addition, CRAs need to present details of methodologies and underpinning assumptions of all types of rated assets. Moreover, CRAs are obliged to inform the issuer about its rating 12 (working) hours before it is made public and one working day before publishing the rating.

Regarding supervisory authorities, EBA and ESMA and EIOPA are banned from making references to CRAs in their workings. ESMA is required to introduce the platform for ratings for public use⁴² along with the dedicated webpage which tracks the performance of the underlying assets provided information from issuers, sponsors and the originators. Namely, CRAs are required to provide information on their past activities to the central depository CEREP, which serves a public purpose. Reported data should include statistics from the minimal period of 10 years prior to the regulation was enacted. If the CRA did not produce ratings before 1999 it needs to provide data from times of its earliest ratings. CRAs do not need to release data on ratings issued before registration and certification of the CRA. The data should be uniform and transferrable to be easily compared CRAs (in terms of complexity, scale). Data collected centrally by the system will accept ratings issued by third country CRAs. Regulation states types of ratings which might be reported are classified as: (a) corporate ratings; (b) structured finance ratings; (c) sovereign and public finance ratings. In case of the sovereign and public finance ratings short and long term issuer rating as well as local and foreign currency (sovereign ratings) rating is to be submitted. If the issuer rating is not available the long-term debt needs to be provided. In terms of reporting up to six rating scales are allowed and only one rating scale relating to the specific time frame and type of issuer.

Moreover, fees which are charged by CRAs are to be overseen by the organisation. Additionally, ESMA released four draft Regulatory Technical Standards reports which ensure the equal opportunities for all CRAs and safety for investors and consumers in the EU (ESMA,

42. Regulation required two IT platforms: the former CEREP is the publicly accessible whereas SOCRAT stores reporting on rating events statistics and is used for supervisory purposes available to ESMA only (see 15 Point (e) of article 21(4) of Regulation (EC) No 1060/2009 19).

2013a). Moreover, authority acts as informer to the Commission on technical issues such as competition, rotation plans and their expansion amongst others. Body also informs the EC about the viability of rating scales of each CRA (mapping), amounts needed for resources and recruitment. In addition, ESMA is to recommence the evaluation process of outside EU CRAs which require endorsement status.⁴³ Finally, every year organisation is required to release market share for individual CRAs (ESMA, 2013a).

As part of consolidation of the last aspect of proposal and reducing dependence on ratings by market participants, EC also proposed to make alterations to the UCITS IV Directive (2009/65/EC) and Alternative Investment Fund Managers Directive (2011/61/EU) (AIFM Directive).

The November proposal withdrew the earlier proposition to found European rating agency. The research has shown, that such institution would incur costs approaching to 300-500 million Euros every five years. Regulators feared this could cause potential danger to conflict of interest, of the member states, which would be ultimately funding the enterprise (EC, 2013).

In January 2012, Executive Director of ESMA informed the European Parliament on its progress in executing revised regulation relating CRAs, also known as CRA II (ESMA, 2012a). Verena Ross, in her public speech in Brussels, said that in the first six months of operating the organisation has performed first on-site inspections of three major CRAs. The authority planned to “*finalise the establishment of the reporting data tools provided by the Regulation and of the CEREP⁴⁴ central database – an essential disclosure facility for investors*” (ESMA, 2012b; p.1). In addition, organisation confirmed that procedures aimed at evaluating ratings from third countries were in progress. In terms of the CRA III proposals, ESMA supported and recommended procedures relating to disclosure of information, conflict of interest and harmonised rating scale⁴⁵ together with civil liability.⁴⁶

To this point, regulations ordering CRAs were introduced from a micro-prudential perspective and aimed at boosting the confidence of investors and market participants at the same time

43. The assessment renewal is required by the 1 June 2018.

44. It is not unclear whether the central repository designed by ESMA for publishing the rating activity and performance statistics of CRAs is comprehensive or successful.

45. ESMA suggested applying the standardised rating scale to all CRAs operating within the EU. Considering difficulty in distinguishing varying rating scales and methodologies the authority implied that uniform rating metric would help in achieving greater transparency, comparability and as a result could lead in boosting competition.

46. According to the proposal, higher accountability could help in avoiding the scenario of structured products observed few years ago and urge CRAs to apply more stringent rating practices.

improving financial stability (ECB, 2012). In April 2012 the ECB in an answer to the invitation by the Council of the European Union released its opinions about the proposal of the European Parliament regarding the regulation of the CRAs as well as those of the Council. The main proceedings regarding CRAs were classified in to five areas: (i) lessening excessive reliance on credit ratings, (ii) alleviating risks relating to the spillover effect when new information is being released, (iii) developing a CRAs market in a way to improve the overall quality of rating practices, (iv) safeguarding compensation system for investors, (v) improving the independence of CRAs together with soundness of rating processes and methodologies with an aim to enrich quality of ratings (ECB, 2012). In the proposed directive the ECB stressed the need to work on issues relating to overreliance on ratings and supported the view that limitations of the existing CRAs industry pose a threat to investors' confidence and financial stability as a whole.

According to Commission Delegated Regulation, from February 2012, CRAs are liable to remunerate ESMA for its supervisory services for the first time. The authority charges annual registration and certification fee from the CRAs, which reach certain threshold of turnover (OJEU, 2012a). This form of revenue supplements EU budget sources and the member state authorities' funds dedicated to the functioning of European supervisor of CRAs.

In March, 2012 the EC together with the European Parliament released set of regulations, regarding technical standards on the content and format of submitting ratings data,⁴⁷ technical standards for credit rating methodologies,⁴⁸ presentation of data available via central repository,⁴⁹ and finally technical standards for registration and certification of CRAs.⁵⁰ All four regulations have been published in the OJEU.

The first regulation outlines technical standards on the content and format of data periodic reporting which ESMA receives from CRAs (OJEU, 2012b). For instance, CRAs should report data in a standardised form provided by ESMA. It is also necessary that CRAs store the past files, at least for five years in the electronic form, in case viewing requests are made. In case errors in the data are discovered, CRAs are obliged to correct the information and send the updated version of reports to ESMA. To ensure ESMA's close and effective supervision of

47. Commission Delegated Regulation (EU) No 446/2012 (OJEU, 2012b).

48. Commission Delegated Regulation (EU) No 447/2012 (OJEU, 2012c)

49. Commission Delegated Regulation (EU) No 448/2012 (OJEU, 2012d).

50. Commission Delegated Regulation (EU) No 449/2012 (OJEU, 2012e).

CRA, the regulator requires CRAs to report their data on monthly basis.⁵¹ More specifically, time elapses after 15 days to the end of the allowed period. In case of extraordinary circumstances, when data cannot be reported on time, CRAs are to inform ESMA immediately. Further, legislation itself does not enter into force earlier than six months after it has been published by the OJEU. This is to ensure that CRAs provide complete and accurate data, accounting for changes in the technical standards set up by ESMA, as well overall changes in the financial markets. Data are reported by individual CRAs; in instance when CRAs form a group the selected CRA can submit the information on behalf of other group members.

In accordance with the initial regulation CRAs are required to apply methodologies which are rigorous and systematic, continuous and easy to test and to validate using, inter alia, back testing methods. The regulation will present rules of assessing such methodologies. CRAs are required to regularly review their existing methodologies including mathematical models, assumptions as well as their overall relevance (OJEU, 2012c). CRAs need to demonstrate their compliance with the above at any times to the regulator. The process of continuously assessing the compliance is also performed by ESMA. Following, rating data should comprise sections outlined in the Table 1, Annex II (OJEU, 2012d). Moreover, a reason for withdrawal of a rating needs to be recorded with the underlying cause. Any changes relating to cancellations or changes in the data need to be updated in the form of a report. The reporting period lasts six months between January and June or July to December.

Lastly, European Parliament and Council set rules and procedures for CRAs willing to register or receive certification by ESMA (OJEU, 2012e). For instance, the CRA is required to provide details of pursuits of its owners. Details include, inter alia, curriculum vitae and criminal record of senior managers. CRA should also supply ESMA with composition of its board together with details of its actions. To enhance effectiveness of actions relating avoidance of conflict of interest, CRAs is to submit record of existing and threats of possible conflict of interest. As part of the certification process the CRA needs to present information about systemic status of its ratings and the working of the CRA on the financial stability as well as integrity of financial markets.

In July, 2012 Commission Delegated Regulation released regulatory supplement relating process of enforcing fines and penalties on CRAs as well rights available to them (i.e. right of hearing by ESMA's Board of Supervisors, by the investigating officer) (OJEU, 2012f).

51. With an exception of firms which employ less than 50 employees where data can be reported every two months.

On November 28 2012, European Parliament together with European Council agreed on new directive relating CRAs in Europe proposed a year earlier (15 November 2011). Michel Barnier⁵² released a statement which summarizes agreement between EU policymakers. Among others the commissioners stressed that sovereign ratings need to be more transparent to the public whereas their timing more defined (EC, 2012).

The daily magazine *Les Echos* (2012) stressed, however, that introduced changes are more lenient than the original proposals. According to Mr Gauzes⁵³ in terms of the sovereign debt the CRAs will be permitted to issue unsolicited ratings for sovereigns up to three times per year with their timing specified in advance (Bloomberg, 2012). Additionally, CRAs might release additional measures of state's creditworthiness on prior permission of the regulator. In the original proposal Michel Barnier mentioned prohibiting ratings for countries which are in receipt of international aid. Additionally, rotation in ratings which was supposedly to boost competition has not been approved with the exception of complex structured products. According to Reuters (2012), although the rotation of corporate or/and sovereign ratings has been ruled out the EC suggested that tougher regulation is required to boost competition between the largest three CRAs. According to the source on 27 November 2012, such draft has been agreed by negotiators and requires authorisation by the European Parliament and individual governments.

On 16 January 2013, European Parliament has voted in favour the proposals received in previous years. In addition to yearly calendars for releasing unsolicited debt ratings, dates of publishing outlooks, where relevant, are also required (European Parliament, 2013). The new rules increase accountability of CRAs mentioned in CRA III proposals. Issuing a rating as a result of a conflict of interest or issuing a rating outside of the reported day will be considered a violation. Moreover, mandatory rotation solely for structured products is confirmed.

Further, consistent with the G-20 initiatives new principles lessen the over-reliance on external ratings and enhance internal risk assessments by financial institutions by inter alia banning European Supervisory Authorities (ESAs) from making references to external ratings. The plan of EC is firstly to reduce reference to ratings creating mechanistic reliance and secondly present alternatives and substitutes to using external ratings with the intention of eliminating them completely by 2020 (EU Parliament press release, 2013).

52. Internal Market and Services Commissioner.

53. Lawmaker participating in forming the EU regulation on CRAs.

The EC is required to report to the Parliament by 1 July 2016 and reassess the state of affairs of the CRAs market and if needed propose modifications and regulatory proposals in years to follow. The obligation of the EC includes re-evaluation of the consequences of the *issuer-pays* model recommended by ESMA.

On May 21 2013, amendments to CRAs III regulation, initially proposed in November 2011, were released (OJEU, 2013a).⁵⁴ The Regulation entered into force in June 2013 whereas the accompanying Directive⁵⁵ was to be employed by December 2014. The regulation applies all the requirements summarised in the initial Regulation (EC) No 1060/2009, to rating outlooks and watches.⁵⁶ The modifications also include stipulations for sovereigns. For instance, CRAs are forbidden from making policy recommendations, prescriptions or guidelines when releasing sovereign ratings and/or outlooks.

In December 2013, as part of its supervisory functions and plan released in January 2013,⁵⁷ ESMA published a press release on its examination of the three biggest CRAs (ESMA, 2013b). The assessment involved desk research, records and site inspections of the sovereign ratings from period between February and October 2013. The publication revolves around three themes: independence and mitigation of conflict of interest, confidentiality of rating information rules and finally timing of publications of rating events. The authority points to the good practices in area of adequacy of resources, training possibilities, and practices during committee discussions, consistency and continuity of rating sovereigns and many others. Investigation also discloses deficiencies which could result in lower quality and reliability of sovereign ratings and the process as a whole. The researched areas include governance and organisation, expertise and resources used for rating purposes, procedures involved with releasing ratings. ESMA provides possible remedial actions for numerous cases.

On February 23 2014, ESMA released its 2013 Annual Report. The authority declares six action plans (which resulted in approximately 110 actions), owing to ESMA's thematic investigations, which were carried over the course of 2012 and 2013 (ESMA, 2014a). The authority comments on the improvements and compliance of one or more CRAs to the regulation. This includes the record keeping practices and strengthening of the compliance

54. Regulation (EU) No 462/2013 of the European Parliament and of the Council of 21 May 2013 amending Regulation (EC) No 1060/2009 on credit rating agencies (OJEU, 2013a)

55. Directive 2013/14/EU of the European Parliament and of the Council of 31 May 2013 (OJEU, 2013b).

56. This stems from the fact that influence of rating outlooks is similar to that of the actual ratings.

57. ESMA/2013/87, (23 January 2013) CRA supervision and policy work plan ESMA (2013b).

function amongst others. Some of the deficiencies include authorisation of the rating methodologies and the safety measures implemented in the IT systems applied by CRAs. Further, the regulator fears that the revenue generating publishing activities of rating analysts might pose potential conflicts of interest. Moreover, contracting the external public relations by some of the CRAs threatens the confidentiality of the data.

ESMA's activity in 2013 comprised improvements outlined in the 2012 Annual Report which were tackled with use of thematic work and individual investigations. The areas included: (i) methodology of bank ratings, (ii) examination of the sovereign rating process (published in December report; ESMA, 2013c), (iii) scrutinising structured finance ratings of four larger CRAs and (iv) weaknesses in the publication mechanisms.⁵⁸ Regulator also pledged to validate all registered CRAs by July 2014. The latter was exercised via detailed investigations of small and medium CRAs.⁵⁹ In the course of 2013 ESMA granted registration of three new CRAs and certified one CRA⁶⁰ at the same time rejecting two applications.

2.6.3 'Enhancement' phase of EU CRA Regulation

ESMA's plan for the forthcoming years involves investigating the remaining CRAs, publications and numerous technical reports aimed at EC with relation to situation in the structured finance industry and the overall state of affairs on the credit rating market (ESMA, 2014a). Moreover, the authority endeavours to minimise references to credit ratings from laws and regulations. Additionally, there are propositions to perform examination of sovereign debt ratings in Europe which might involve ESMA's technical support.

With regards to CRA III implementation following the discussion paper released on 10 July 2013⁶¹ and a consultation paper on February 11 2014,⁶² subject to commentaries, the authority was to submit the draft RTSs to the EC by July 2014. The organisation also began the developments of its IT systems required for the proper enactment of the three RTSs (ESMA, 2014a). Further, ESMA along with EBA and EIOPA⁶³ was requested by Capital Requirements

58. Including delays in published information and secureness of systems. Such issues were highlighted in ESMA's March 2012 report; see ESMA/2012/207 (22 March 2012) – ESMA's report on the supervision of credit rating agencies.

59. At the time of the report the authority investigated 14 (out of 22) small and medium sized CRAs which were registered as of 31 Dec 2013.

60. Newly registered CRAs: The Economist Intelligence (UK) Unit Ltd, Dagong Europe Credit Rating Srl (Italy), Spread Research (France). Certified agency: Kroll (US).

61. ESMA/2013/891 (10 July 2013) - Discussion paper on CRA3 implementation.

62. ESMA/2014/150 (11 February 2014) – Consultation paper on CRA3 implementation.

63. Also known as Competent Authorities.

Regulation (CCR)⁶⁴ to produce a draft on Implementing Technical Standards (ITS) to the EC by July 1 2014. This required identifying whether credit quality steps (CQS) and the rating classification used by registered and certified CRAs are equivalent (mapping).

By the end of 2014 an ESA intended to implement guidelines and recommendations on how the Sectoral Competent Authorities (SCAs) should handle reliance on credit ratings across the financial sector. The authority along with two other competent authorities will continue working jointly on these recommendations.⁶⁵

The efforts of ESMA parallel the initiatives taken by the FSB since October 2010, when a collection of Principles and Guidelines aimed at reducing overreliance on ratings was published. Subsequently after the G-20 Summit, in Russia in September 2013, the FSB requested from regulators to speed up the process of reducing reliance on ratings with accordance to the roadmap drafted in October 2012⁶⁶ (FSB, 2012). As a way of accelerating this process the peer reviews were conducted aimed at helping national authorities in reaching objectives set in the Roadmap. This took form of two stages: (i) the first step documents all references to ratings included in laws and regulations across authorities, which resulted in a report on August 2013 (FSB, 2013);⁶⁷ (ii) the second ongoing stage focuses on the schemes applied by authorities to implement the FSB Principles which are expected by end of 2015. The progress was published in May 2014 (FSB, 2014). The authority stresses that approaches vary across FSB member jurisdictions and financial sectors. Advancements in the enactment of regulation also vary significantly worldwide. For instance, private agreements, collateral contracts and risk-prudential frameworks for intermediaries rely on external ratings. The report discourages national authorities and market participants from applying measures substituting CRA ratings as they might lead to procyclicality and herding among investors. The awareness was raised in relation to internal ratings-based (IRB) approaches for which reliability, comparability and transparency among others is debatable (BCBS, 2013a, b). FSB suggests that in addition to initiatives regarding laws and regulations the mechanistic reliance should be reduced by market participants. The authority does not discourage from using CRA ratings but advises using them together with investors own judgement. Lastly, the report draws on the

64. Article 136 of Regulation (EU) No 575/2013 (CRR).

65. On 6 February 2014 competent authorities released set of guidelines; see JC/2014/04 (6 February 2014) – EBA, EIOPA and ESMA final report on mechanistic references to credit ratings in the ESAs' guidelines and recommendations.

66. FSB, Report to G-20 Finance Ministers and Central Bank governors on the roadmap and workshop for reducing reliance on CRA ratings, November 2012.

67. See FSB, Interim thematic review on FSB principles for reducing reliance on credit rating agency ratings, August 2013.

existing practices and proposes recommendations on the problems encountered by the regulators.

2.6.4 Challenges faced by the policymakers

In one of the public hearings at the European Parliament ESMA drew attention to the proposal on CRA III. Several points raised in the proposed framework have implications and for this reason, require particular attention (ESMA, 2012a).

Firstly, the new draft methodology requirement imposed on new CRAs could collide with the existing rules of non-interference and independence condition on CRAs. According to the EC (2012) neither Commission nor any public authority can interfere with the methodologies being applied by CRAs. EACRA⁶⁸ confirms that “*CRAs enjoy full independence on their methodologies as long as they are applied consistently and continuously*” (House of Lords, 2011; p.25). Nevertheless, regulation might outline rules on which methodologies can be evaluated. For instance, ESMA assesses the compliance of CRAs with regulation by identifying whether their rating methodology is rigorous, systematic and continuous as well as if it is possible to test the validity of results. For the latter the authority suggests applying back testing using historical data (OJEU, 2012c).

Further, ever since the mandatory rotation has been proposed for analysts and CRAs it encountered significant opposition. During the Treasury Committee meeting at the British Parliament in March 2012 Chairman of National Association of Pension Funds expressed his disapproval of the rotation. Mr Harrison stressed it might complicate workings of companies in understanding new entrant CRAs, add unnecessary cost to companies and cause overall imbalances in the rating industry (House of Commons, 2012). Supporting this view was Mr Grodzki, the Head of Credit Research, who stressed such invention, apart from rising costs, would lead to noise in rating fluctuations which could cause difficulties for corporate bond investors and impair the timelessness of ratings. During the same session Mr Cooper, Global Tax and Treasury Director,⁶⁹ supported the abovementioned points and highlighted the unworkability of idea of changing CRAs. He claims that his company is a frequent issuer and therefore it would need to replace a CRA every year. In line with the rules the issuer would not be allowed reappoint the same CRA within four years which could leave his company with no

68. European Association of Credit Rating Agencies.

69. National Grid plc.

rating providers. Also the regulator feared that rotation might bring unintended consequences. Namely, according to ESMA (2012a) new entrants could be offering higher ratings or lower fees in need to attract customers. Quality of ratings and reliance on them could pose a serious threat to the system.

In relation to the fact that authority is now required to assess concentration levels and accompanying risk in the CRAs market in its annual reports ESMA's spokesperson claimed this possess major issues for the organisation and needs closer attention. In addition to technical inconvenience, specifically acquiring new levels of expertise and grasping new methodologies needed for such task ESMA claims that organisation finds itself in position where it needs to choose between competition and stability in ratings (ESMA, 2012a).

Furthermore, concerns about the timing and close deadlines were stressed in public hearing in Brussels in January 2012. For example, the closing date to update the assessment methods of the third countries compliance to the regulation in accordance with the CRA III regulation posed difficulty for ESMA. Such requirement had practical difficulties as for January 2012 CRA III proposals were not enforced by all G-20 or IOSCO frameworks. Additionally it could have undermined good intentions of the authority in monitoring the efforts of third-country rating regulation in which ESMA was involved as part of the prevailing regulation. Another issue relates to the extension of time allowed to employ Regulatory Technical Standards stated in the CRA III proposal. The proposal suggested January 2013 as the final deadline, however ESMA stressed that it required one year for preparation, discussion and reaching a consensus on the new paradigms to make sure they meet criteria set by the Parliament. These examples show that the increased responsibilities caused a considerable strain on ESMA because they did not always correspond with the timing of the ongoing reforms.

Finally the regulators in Europe (ESMA, EBA and EIOPA) are facing financial difficulties as their budgets are being cut in real terms (Reuters, 2015a). The regulators fear that lack of resources will prevent them from taking necessary actions aimed at preventing future financial crisis.

2.7 Conclusion

This chapter introduces the main features and characteristics of the CRA market. The types and classifications of ratings are presented along with the main players occupying the market. The three big CRAs form an oligopolistic market form concentrating the market above 87 percent (ESMA, 2014c). The philosophy and differing methodologies used by CRAs are also presented (Fitch, 2012; Moody's, 2012a; S&P, 2012a).

The flaws of the business model were pointed out by many commentators when the subprime crisis hit the US and the sovereign debt crisis struck Europe (Duff and Einig, 2009b; EC, 2010; Duan and Laere, 2012). Lack of transparency, flaws in methodologies and conflicts of interest are examples of perceived deficiencies of CRAs (ESMA, 2011a). On the other hand, it became apparent that gaps in the regulation allowed negligence amongst CRAs (i.e. in the instance of the structured products) but also enhanced careless behaviour of market participants who over-relied on produced ratings. European system became highly *hard-wired* with references to credit ratings and steps to improve the situation are being taken (BOE, 2011). Regulators and politicians call for reforms aimed to increase civil accountability to ratings, enhanced transparency and reduction of issues of conflict of interest between issuers and CRAs.

The chapter outlines steps taken by multinational authorities and the supervisory body awarded with the responsibility of overseeing CRAs in Europe – ESMA. This process is divided into three main phases: reactive, implementation and the enhancement. The regulation responding to problems of the European debt crisis mainly aims to reduce mechanistic inclusion of ratings within regulation as well as cliff-effects (Cantor et al., 2007; Alsakka and ap Gwilym, 2013). Some of the reforms recently proposed in the EU include innovative rules to improve practicalities of using rating services and mitigating the conflict of interest (i.e. rotation in ratings, prevention from using consultancy services from CRAs, number of ratings required for particular product, specifying top analysts in the area of ratings). Further, the regulation aims to induce transparency and quality of released ratings.

Many problems are acknowledged in the course of the regulatory reforms. It becomes more evident that regulating the CRA market might be more challenging than previously thought (ESMA, 2014a). Certain proposals, such as methodology requirements, pose threats to the independence of the CRAs and need to be carefully evaluated (e.g. EC, 2012). Other solutions such as rotation and increased competition also require attention as, according to the literature,

they might simply aggravate the situation and lead to unintended consequences (Kodres, 2010; Camanho et al., 2012; ESMA, 2012b).

Authorities themselves face difficulties such as technological improvements and making a choice between competition and stability in ratings (ESMA, 2012b). Also, CRAs face a trade-off between stability versus accuracy without compromising the quality of their ratings. These and many more issues facing regulators will be considered in the subsequent chapters of this Thesis.

Chapter 3: Literature Review

3.1 Introduction

The aim of this chapter is to introduce empirical literature investigating the main issues relating to the CRA business. Firstly, studies focusing on the philosophy and methodologies of the CRAs are discussed (e.g. Löffler, 2005; Alsakka and ap Gwilym, 2010c). The dilemma of CRAs in relation to the stability versus accuracy of ratings is managed by using additional credit warnings (outlooks and watch status) (see Hamilton and Cantor, 2004; Boot et al., 2006; Bannier and Hirsch, 2010).

Moreover, the chapter offers evaluation of studies examining the importance of ratings reinforced when the financial markets became more complex while number of financial contracts rose significantly (Hau et al., 2013). CRAs are found to perform three primary roles in the economy which include information provision, monitoring and certification (Boot et al., 2006). Subject of information content of ratings deserves substantial attention since it is a topic of the empirical investigation in Chapter 6 (e.g. Hand et al., 1992; Ederington and Goh, 1998; Becker and Milbourn, 2011).

Although the CRAs perform an important role for the financial markets, until recently there was a lack of transparency about the factors which contribute to the determination of a rating (Bennell et al., 2006). This gave raise to attempts aiming to find rating determinants for various issuers (Cantor and Packer, 1996; Afonso et al., 2007; Alsakka and ap Gwilym, 2010b).

Stemming from the financial crisis in the US and the sovereign crisis in Europe, the business model of CRAs received a considerable amount of criticisms. The literature points to issues such as *rating shopping*, deflated unsolicited ratings, lack of competition between the CRAs and disagreements among CRAs (split ratings) (Bannier et al., 2010; Alsakka and ap Gwilym, 2012b; Bolton et al., 2012; Hau et al., 2013; Vu et al., 2015; see section 2.5). It also investigates whether the ratings affect/drive markets or mirror the information which is already realised by the market participants.

In general, the perceived problems in the CRA industry relate to conflicts of interest, the overall independence of rating opinions and the lack of transparency in the rating processes (see section 2.5.1). The latter relates to the fact that outsiders are unaware of the rating process, rating determinants, and details of rating methodology. CRAs have more information about the

issue/issuer than the investors. Before CRA regulations were revised, the methodologies used by CRAs to rate their clients were not publicly available (Sy, 2009). Therefore the quality of such ratings was difficult to judge while comprehending the rating process was challenging (Duan and Laere, 2012). After the introduction of new regulation, the CRAs report the variables that are used in the rating process yet they do not reveal the weights applied nor the soft information which enters the rating process. The subjective component in the credit rating is heavily determined by the quality of the CRA's human capital such as the experience of the credit analysts. CRAs were condemned for the incompetence of their analysts in the aftermath of the US sub-prime crisis (Gaillard, 2011).

This chapter outlines the empirical literature measuring impact of previous regulatory actions applied in the CRA industry. The novelty of this Thesis is derived from the fact no other paper, except Alsakka et al. (2015), examines empirically the effects of these regulatory undertakings on the CRA market in Europe. The gap in the literature is identified and explored in detail to give grounds for the empirical work executed in later Chapters (4-6).

The chapter is structured in the following manner: the philosophy and methodologies of ratings is subject of section 3.2. The importance of credit ratings together with information they transmit to the market and their determinants is subject of section 3.3. Section 3.4 discusses the business model of CRAs. Section 3.5 presents literature on influence of regulatory actions aimed at CRAs in the recent years. Section 3.6 reviews methodologies used in the CRA literature including the limited dependent variable models (3.6.1) and difference in difference estimation (3.6.9). Each of these methods comprises an outline of the theoretical underpinnings together with the applications in the empirical literature. Finally, section 3.7 closes the discussion on the recent workings of the CRA market and explains the gaps which this Thesis fulfils in contrast to the existing literature.

3.2 Philosophy and methodologies in ratings

CRAs find themselves in a dilemma of either reaching stability or accuracy in their ratings (Löffler, 2005). Generally, CRAs intend to give ratings which are stable over time and not influenced by temporary fluctuations due to the nature of the business cycle (*"through the cycle"* methodology; see section 2.2). Modifications to ratings are made when CRA are confident that change in creditworthiness of an issuer is steady and permanent (Alsakka and ap Gwilym, 2010c). Market participants such as bond issuers and investment management firms

appreciate this methodology as it would add costs to their investments if ratings were constantly changing and reversing.

In addition, capital adequacy requirements often depend on riskiness of the assets held in the portfolio. Therefore if ratings are unstable it might change efficacy of ratings as the governance instruments. Moreover, since ratings allow investors to access capital their constant fluctuations might influence ticket to entry conditions which will be difficult to reverse (Langohr, 2006). Although stability of ratings is appreciated by regulators and issuers market participants such as investors of hedge funds or traders prefer ratings which are accurate and characterised by timeliness (Cantor and Mann, 2007; Cantor et al., 2007).

To manage dilemma between stability and accuracy CRAs use additional credit warnings such as outlook and watch to show possible direction and timing of their ratings (Hamilton and Cantor, 2004). As reported by Boot et al. (2006) and Bannier and Hirsch (2010), these instruments play an important economic role. The latter study finds CRAs enhance information transmission by using watch signals. Löffler (2004, 2005) and Altman and Rijken (2006) conclude that credit warnings might be means by which CRAs disclose new information to the market because of their through the cycle methodology and stability concerns.

Empirical literature proves that outlook and watch signals transmit strong information to the markets (see Kaminsky and Schmukler, 2002; Ismailescu and Kazemi, 2010; Hill and Faff, 2010; Afonso et al., 2012; Alsakka and ap Gwilym, 2013). Additionally, Kodres (2010) emphasises that CRAs demonstrate their information and certification role using credit warnings rather than actual rating changes. Sy (2004) concludes that credit signals (e.g. negative watch and outlook) about sovereigns send by Moody's assist in forecasting probability of distress in the following year. Furthermore, literature concludes that the effect of credit signals is in fact stronger than the actual changes in ratings (e.g. Hull et al., 2004; Pukthuanthong-Le et al., 2007; Hooper et al., 2008; Hill and Faff, 2010; Kim and Wu, 2011).

Hull et al. (2004) using CDS market find that negative watch signals published by Moody's transmit information about that market whereas rating reduction does not. In equity and debt market Pukthuanthong-Le et al. (2007) show that outlooks and watch status by S&P also have stronger effects on those markets. In fact Hooper et al. (2008) in their comprehensive study of 42 countries over 1995- 2003 show the impact of sovereign credit warnings to be two times stronger than for rating changes. Alsakka and ap Gwilym (2013) supplement the literature in confirming the stronger effect of credit warnings, in comparison to general ratings, by studying

the trade-off between accuracy versus stability faced by CRAs. These authors find that policies employed by the S&P are aimed at short-term ratings accuracy whereas Moody's actions are more consistent with ratings stability. Additionally, the study confirms a stronger effect emanating from negative outlook signals in comparison with watch status.

3.3 Importance of credit ratings

According to Boot et al. (2006), CRAs perform three fundamental roles: information production, monitoring and certification. Freely available information about, inter alia, the relative risk of default of an issuer is produced via publicly released ratings. Additionally, this role relates to the fact that CRAs have influence over decisions of the firm by issuing the rating which determines their investment and pricing decisions. This might suggest to market participants that a credit rating has a “potentially valuable contractual feature and could now have informational content” (p.32).⁷⁰ Moreover, by signalling prospective changes in ratings (via outlooks or watchlists) CRAs might foster and motivate debt holder to adjust their situation. Lastly, according to Kodres (2010) CRAs perform a certification role. Ratings are used by investors to classify investment opportunities according to their risk attributes as well as to decide on terms and conditions of financial contracts.

Kiff et al. (2012) empirically investigate and test the information value represented by ratings. The event study, covering period 2005-2010 on 72 sovereigns, confirms information and certification role of ratings and finds no evidence for monitoring services. The latter is in line with Chan et al. (2011).

It is believed that CRAs allow borrowers to raise capital more cheaply through reductions in asymmetric information where they reduce risk premium of debt issue between investors and debtors (Duff and Einig, 2009a) (see section 2.4).

The information content of ratings is one of the measures used to proxy the quality of ratings in the empirical literature (West, 1973; Ederington et al., 1986; Hand et al., 1992; Ederington and Goh, 1998; Becker and Milbourn, 2011). Becker and Milbourn (2011) study the impact of the increased competition in the rating market on the quality of ratings. The quality is defined as the ability of ratings to transmit information to market participants, as well as their ability to

70. This feature is closely related to the fact that in the US CRAs are excused from the Regulation FD which specifies that all information is disclosed to the market (see Jorion et al., 2005). This supports a view that there is potential information content in rating actions.

categorise the risk of a rated product. These authors claim that the correlation between bond yields (dependent variable) and rating levels of high quality ratings should be high to contain in depth information about bond's value. The conditional correlation between ratings and bond yields helps to evaluate how content of ratings alters according to changes in competition. Study finds the information content of ratings decreases with competition.⁷¹

Contrary to this, Doherty et al. (2012) concentrates on other dimensions of competition. In terms of the quality of ratings, a more refined scale is used to indicate which ratings carry more information. The study analyses the impact of increased competition on informativeness of ratings using the entry of S&P into the monopolistic insurance rating market of A.M. Best. The study differs from Becker and Milbourn (2011) as it captures transition from monopoly to duopoly rather than changes in competition from two to three CRAs. The results indicate that issuers who were higher quality in terms of their rating from the first CRA (A.M. Best) would be more likely to request the second rating to differentiate them. The results of the paper, unlike those by Bongaerts et al. (2012), represent a voluntary act of the insurer to request a second rating to communicate its strength to the market; as the regulation in the insurance industry does not require multiple ratings.

Bongaerts et al. (2012) study entry of the third player (Fitch) into the corporate bond market. The findings suggest that Fitch's ratings act as a "tiebreaker" for regulation once ratings by Moody's and S&P are split. The results show that, when the effect is favourable, the cost of capital is lower by 45 basis points compared to unfavourable rating. In fact, when two CRAs issue contradicting ratings on bonds (speculative rating vs. investment grade), Fitch's rating is decisive about whether the bond becomes investment grade or not. However, according to Kisgen and Strahan (2010), the study is not able to isolate the scale of this regulatory-specific component. These authors investigate the impact of constrained bond investment on the firm's cost of debt and confirm that ratings affect the cost of borrowing. In line with Jorion et al. (2005), the study suggests that if a firm receives a downgrade its cost of credit increases, and vice versa.

Although the importance of ratings for the economy has been explicitly pronounced in the abovementioned studies, many believe its value has diminished significantly since the 1970s (Duan and Laere, 2012). Partnoy (2002) goes further and claims CRAs were made more

71. The forecasted probability of default on most common non-investment grade ratings is 2.4 times more than on (most common) investment grade ratings when competition is low whereas only 1.5 times when the competition is high.

important than they otherwise would be simply by including their references in the regulation. For instance, under the Basel II Accord standardised approach intermediaries whose internal model of ratings was not approved calculated their capital requirements as a portion of risk-weighted assets. These risk weights were allowed to be calculated using ratings of approved CRAs.⁷² In addition, although large banks could employ internal ratings even those models often included input (actual or methodological) influenced by external ratings (Hau et al., 2013). According to Mariathasan and Merrouche (2012), in times of no crisis and under the Basel II framework, risk-weighted leverage ratio performs better in forecasting collapses of banks than the unweighted leverage ratio. The opposite is true when probability of a crisis is high; the unweighted leverage ratio predicts a failure of an issuer more accurately.

3.3.1 Credit ratings determinants

Until recently, the rating methodologies were a black box and did not specify the relevant details such as the assumptions of the appraisal (Bennell et al., 2006).⁷³ For this reason many empirical studies attempted the question of what drives the sovereign ratings. The determinants of sovereign creditworthiness are more complex than ratings of non-sovereigns as they not only encompass the information about the ability of an issuer to repay its obligations but also their willingness to do so (Butler and Fauver, 2006). For instance, sovereigns can announce the defaulting state even if it has the funds to repay its liabilities in time. The indicators explaining sovereign ratings can be divided into two groups: economic fundamentals and socio-political factors (e.g. Cantor and Packer, 1996; Afonso et al., 2007; Alsakka and ap Gwilym, 2010b). In addition to economic and financial fundamentals, CRAs implement factors resembling legal and political risks as well as institutional setting (Moody's, 2008; Fitch, 2011; S&P, 2011c). Hill et al. (2010) test for political factors and show that country risk rating and market risk premium help in explaining sovereign ratings.

There are different ways to capture the political risk in the empirical literature. Some studies account for it in the error term (Eliasson, 2002; Alsakka and ap Gwilym, 2010b), others apply proxy variables (Alexe et al., 2003; McKenzie, 2004; Butler and Fauver, 2006; Mellios and Paget-Blanc, 2006; Erdem and Varli, 2014; Ozturk, 2014).

72. For instance, risk weights for claims based on sovereign ratings as follows: AAA-AA: 0%; A: 20%; BBB: 50%; BB-B: 100%; CCC-C: 150%; and D: deducted from capital (Von Schweinitz, 2007).

73. Transparency requirements of regulation correct this issue by introducing disclosure rules amongst others.

Cantor and Packer (1996) in their cross section study of 49 sovereigns in 1995 find that sovereign ratings by S&P and Moody's are determined by publicly accessible economic, social and political indicators. The most frequent variables quoted in the CRAs reports include: per capita income, GDP growth, inflation, fiscal balance, external balance, external debt and economic development as well as default history. Although a paper is considered a ground-breaking research on the determinants of ratings, it applies the OLS estimation and was criticised for its inability to capture the discrete nature of ratings (Bennell et al., 2006; Mellios and Paget-Blanc, 2006; Afonso et al., 2007).

Mulder and Perrelli (2001), studying 25 sovereigns during 1992-1999, find that the determinants of sovereign ratings are ratios including investment to GDP, debt to exports and the short-term debt to reserves. Similarly, Bissoondoyal-Bheenick (2005) investigates S&P and Moody's to estimate the connection of sovereign ratings with economic indicators. Author applies ordered probit model to 95 sovereigns during 1995-1999. The results suggest that GNP per capita, inflation, current account balance and foreign reserves perform important function in explaining sovereign ratings in countries with lower ratings.

Using a rating sample of 70 sovereigns for the period 1989-1999, Bennell et al. (2006) suggest that significant explanatory variables include foreign debt to exports, fiscal deficit or surplus to GDP, mean of current deficit or surplus to GDP mean of inflation rate, mean in GDP growth, GDP per capita and development level. The shortcoming of the method is pooling ratings from 11 CRAs to form one dependent variable because it is believed the methodological aspects across CRAs differ significantly.

To address this issue, Afonso et al. (2007) estimate separate regressions for different CRAs. These authors use a random effects ordered probit model on a panel of 78 sovereigns over the 1995 to 2005 period. The fundamental indicators explaining sovereign ratings are GDP per capita, growth in GDP, government efficacy, government debt, external debt and external reserves and default predictions.

Bank ratings, on the other hand, measure the creditworthiness of intermediaries and by doing so they create the information through the cycle which is not otherwise available to the market (Hau et al., 2013). Due to the complexity (i.e. opacity) and systematic importance of the banking industry bank ratings are driven not only by their specific factors but also by macroeconomic environment and potential external support from the government (S&P, 2011d). Situation of banks is different to other corporations as the sovereigns may elect to assist

banks even if it erodes their own creditworthiness (e.g. case of downgrade of Ireland by S&P in 2010 due to high sector fiscal costs) (S&P, 2011b). The governments evaluate the potential impact of the contingent liabilities of the financial sector on their ratings. When the systematic banking crisis strikes the government might be required to recapitalize the system. On the other hand, sovereigns might limit financial flexibility of intermediaries through regulatory means. Banks are prone to similar sources of stress as the sovereigns and for this reason the sovereign risk is considered as a key factor determining a bank rating (S&P, 1997; S&P, 1998; Fitch, 2002, Poon and Firth, 2005).

Poon and Firth (2005) study the determinants applied by Fitch to rate banks (see Fitch, 1998) on 82 countries and discover that size, profitability, asset quality and liquidity of the bank together with the sovereign credit risk contribute towards the bank ratings.

Van Roy (2013) extends the sample size by investigating ratings from S&P. The author follows Fitch (2004) for testing bank rating determinants and find that banking and finance score (estimated by the Heritage Foundation capturing aspects related to the market environment of banks), loan loss provisions to net interest revenues, net loans to total assets, liquid assets to deposits, equity to total assets, net interest margin, return on assets and total assets are the most influential.

Laere et al. (2012) conclude that following sovereign rating, bank size is the second most important indicator which has a positive impact on the ratings of intermediaries. Additionally, liquidity, profitability, asset quality and Z-index play an important role.

Hau et al. (2013) employ bank ratings by the big three CRAs over the period 1990 to 2011 and suggest that the potential determinants of bank ratings' quality are CRA's incentives, the regulatory system, reputational capital and competition pressures.

3.3.2 How do sovereign rating signals affect markets?

Credit ratings are known to transmit information to the markets about the creditworthiness of the issuer based on the expertise and experience of the CRA. The majority of empirical literature indicates that market participants react more strongly to negative rather than to positive rating signals (e.g. Hand et al., 1992; Dichev and Piotroski, 2001⁷⁴; Hull et al., 2004; Afonso et al., 2012; Alsakka and ap Gwilym, 2013; Kiff et al., 2012).

According to Jorion et al. (2005), this can be explained in two ways. Firstly, firms react to negative news because it affects their real costs (e.g. when firms become downgraded its cost of credit changes). Alternatively, this news is stronger because CRAs transmit new (negative) information to the market. Ederington and Goh (1998) argue that sources of negative information might be considered more ‘valuable’ because firms are more likely to announce any positive news about their business and withhold more undesirable information. In addition, issuers devote more resources to reveal the underlying causes of negative rating actions. For instance, companies will dedicate more means to trace the origins of their declining credit worthiness (Jorion et al., 2005).

Two cross country studies look at the own-market reaction to sovereign ratings. They find an effect on equity markets and suggest that the impact attributable to each of three CRAs is different.⁷⁵ Brooks et al. (2004) show that only S&P and Fitch’s ratings yield significant results when they downgrade a country. Hill and Faff (2010) find a reputation effect of S&P and Fitch during negative events. Moreover, S&P and Moody’s ratings have a stronger effect on developing economies. Overall, S&P’s ratings are found more informative than other CRAs’.

In the contrasting body of literature (see Cantor and Packer, 1996; Reisen and von Maltzan, 1999; Ismailescu and Kazemi, 2010), the authors find that rating upgrades lead to fall in yield spreads. The effect is also stronger than the downgrades. Ismailescu and Kazemi (2010) obtain a marginally significant impact of positive ratings on CDS spreads in emerging countries during 2001-2008. These authors suggest that positive events transmit more information in emerging market countries than the negative actions. This could be due to some anticipation effect of investors in the CDS markets where the possibility of deteriorating creditworthiness is already embedded in the market data whereas the positive information is not. In addition,

74. The authors find that both upgrades and downgrades yield significant results although the latter effect is stronger.

75. Brooks et al. (2004) use data on Standard & Poor’s (S&P), Moody’s, Thomson Bank Watch and Fitch IBCA. In 2000 Fitch IBCA acquired Thomson Bank Watch (Anderson, 2007).

Jorion et al. (2005) find that stock prices in the equity market were positively affected by upgrades in ratings after the Reg FD⁷⁶ came into force.

Recent research has shown that changes in European sovereign ratings have a spillover effect on other sovereigns as well as financial markets, including institutions or other asset classes (Arezki et al., 2011). Despite serious implications of the contagion effect of ratings on financial stability this stream of literature remains scarce. Kaminsky and Schmukler (2002) confirm a spillover effect of sovereign bond ratings and credit warnings (i.e. outlooks) on other sovereigns as well as on different asset classes such as stocks. In their study of 16 developing markets including the period 1990-2000 the effect of contagion is magnified during crises in countries neighbouring with each other and where the information flow is not transparent. Further, upgrades in ratings are recorded when the market is booming (i.e. stock prices are rising). On the other hand, downgrades occur mostly during the economic downturns. These authors conclude that the pro-cyclical nature of ratings might lead to instability in emerging markets. In line with this, Alsakka and ap Gwilym (2013) complement the body of literature confirming a contagion effect of negative news of CRAs during crises. The study reveals that the impact of the outlook and watch signals on foreign markets is stronger than that of actual ratings. Using a dataset covering Europe and Central Asia prior to (2000-2006) and during the crisis (2006-2010), these authors find that the effect of negative rating news is more pronounced in the second sub-sample (first sub-sample) period for countries which are considered highly (low) rated.

Arezki et al. (2011) using Eurozone data on CDS spread, banking stock index, insurance stock index and country stock market indices covering 2007-2010 uncover that sovereign downgrades have strong economic and statistical influence on other countries as well as financial markets. Study reveals that sign and scale of the spillover effect depends on the information released, on the first affected issuer (e.g. the first downgraded country), and on the CRA itself. Further, rating downgrades which result in near speculative grade ratings,⁷⁷ for large countries, show a highly systematic effect. This in turn presents serious threats to

76. Regulation Fair Disclosure came into force on 23 October, 2000. The statute prohibits US companies to disclose information to finance professionals with the exception of the CRAs.

77. For instance, downgrade of Portugal sovereign rating from BBB- to BB+ (negative outlook) in November 2011 by Fitch (Financial Market News, 2011). Downgrade of Hungary in December 2011 by S&P and Moody's from BBB-/Baa3 to BB+/Ba1 respectively (Bloomberg, 2011).

financial stability. The fact that ratings are hardwired into banking regulation, CDS contracts, and investment mandates may help explaining this phenomenon.

Lastly, Gande and Parsley (2005) in their analysis of emerging bond markets in time spanning the period 1991-2000 detect a negative impact of sovereign downgrades on other sovereign bond spreads.

3.4 Business model of CRAs

The current CRA remuneration framework allows issuers to choose and change their rating providers from the available competing CRAs. This in turn might lead to pressures from issuers and result in positive rating bias known as *ratings shopping* (see section 2.5). According to Hau et al. (2013) the more incentive the CRA has to stay in business with particular issuer the higher likelihood that its ratings will be inflated. On the similar note, Griffin and Tang (2011) find that CRAs which are more closely related with issuers produce more upward biased ratings in comparison with those of supervisory division.

The empirical literature finds that for the comparable companies' solicited ratings tend to be higher than the unsolicited ratings. Gan (2004) relying on a sample of S&P and Moody's ratings on the US industrial companies' finds that unsolicited ratings are lower after controlling for publicly available data. This issue is known in literature as downward bias and the author justifies this finding by the self-selection on the side of the issuer. This is in line with Bannier and Tyrell (2006) who highlight that the unsolicited ratings are lower because firms who wish to be rated present better inside information in comparison to companies which do not inquire about solicited ratings. Further, Bannier et al. (2010) show that such ratings are lower due to strategic conservatism of CRAs. Namely, when the CRA does not hold the inside information it might prefer to rate the issuer too low rather than too high. These authors find that self-selection among issuers is a potential reason of deflated unsolicited ratings. Bannier et al. (2010) also conclude that the more opaque the bank the higher threat of downwards bias (for more details on these theories see section 5.2.1.2).

Another rationale behind lower unsolicited ratings is geographical discrimination. For instance, Poon (2003), Poon and Firth (2005) and Behr and Güttler (2008) find that unsolicited ratings

of Japanese companies are lower than those from other countries.⁷⁸ The last study looks at reaction of the stock market to unsolicited ratings and discovers a strong negative reaction to the release of the initial unsolicited rating for small Japanese firms. This study is an extension of Byoun and Shin (2003) where no market reaction is recorded for the initial rating and strong negative/positive stock market responses to downgrades/upgrades are observed respectively.

Furthermore, differences in the way different CRAs award unsolicited ratings are known to exist. Fairchild et al. (2009) show that Moody's ratings become lower in a situation when the firm to be granted unsolicited rating presents the CRA with their private information. These authors compare unsolicited ratings of Moody's and S&P and reveal no differences despite the first CRA having the inside information. Fulghieri et al. (2014) using a dynamic rational expectations model of the credit rating process provide a formal theoretical basis demonstrating coercive behaviour on behalf of CRA but did not test the relationship empirically. The authors argue that unsolicited ratings are deliberately lower because CRAs try to induce issuers to sign a contract with the CRA by understating their creditworthiness.

During a Treasury Committee meeting in 2012, Mr Grout⁷⁹ told the panel that when the issuer signs the agreement with the CRA it agrees that in situation when it stops paying to the CRA the CRA will keep on providing unsolicited ratings to that issuer. In such scenario, the ratings are to be issued based on the publicly gathered information (House of Commons, 2012).⁸⁰

Unsolicited ratings were subject of debates and disputes especially in Europe and Asia (JCIF, 1999; Fitch 2006). Discussion on appropriateness of using unsolicited ratings became concern of market participants since the establishment Basel II framework and its capital adequacy standards. One of the approaches allowed verifying credit risk which helps in calculating the required amount of capital includes standardised approach (BCBS, 2004). National banks needed to settle on whether unsolicited ratings are permitted as an addition of the solicited credit assessment when standardised approach is used.

Basel II capital adequacy requirements allow solicited and unsolicited ratings to be used to calculate the adequate amount of capital. The second accord maintains that care should be taken when solicited ratings are being ordered so that they are issued by the authorised CRA.

78. Nickell et al. (2000) find that even solicited ratings of Japanese companies tend to be lower than their counterparts from other countries.

79. Policy and Technical Director, Association of Corporate Treasurers.

80. E.g. contract of Turkey with S&P ended in January 2013.

Depending on national authorities banks might equivalently utilize unsolicited ratings (Banner et al., 2010).

Furthermore, the important aspect of business model of CRAs is competition between the CRAs. According to Hau et al. (2013) competition plays an integral role for the quality of ratings. Nevertheless, the literature on the possible effect of competition is divided.

Camanho et al. (2012) claim competition lessens the good reputation incentive for ratings resulting in their reduced quality. Likewise rating quality might be impaired when issuers shop for more positive ratings (Bolton et al., 2012). Moreover, Kodres (2010) declares that additional CRA in the market results in lower quality of ratings. The higher ratings are explained by rise in *rating shopping* behaviour contrary to previously believed increases in information. Furthermore, Becker and Milbourn (2011) find that quality of ratings of S&P and Moody's has weakened since Fitch "material entry" in 1997. In addition, these authors find that the ability of CRAs to forecast default of a firm is poorer when Fitch captures larger market share.

A second school of thought believes that competition plays a positive role in terms of the product quality. Industrial organisation literature points that this should apply also to the rating industry (Hörner, 2002). Hau et al. (2013) find that "*multiple bank ratings by different rating agencies correlate with less favourable ratings relative to future expected default frequencies (EDFs)*" (p.5). This notion questions proposition that competition amongst CRAs leads to inflated ratings via *rating shopping*. Doherty et al. (2012) find that entry of a new player leads to improved accuracy of default rate estimates.⁸¹

Another characteristic of the rating market is the fact that CRAs do not always agree on the creditworthiness of the issuer and release split ratings. It was believed until recently that split sovereign ratings are emerging countries' phenomena due to their political, regulatory and economic incoherence (Alsakka and ap Gwilym, 2010a). Recent global situation has shown that split ratings affect also developed countries.⁸² According to Alsakka and ap Gwilym (2009) disagreements between CRAs concern sovereigns more often than corporate issuers. Hill et al. (2010) estimate that the differences in opinion are typically one or two notches. IMF (2010)

81. See section 6.3.2 for more detailed comparison.

82. For example, at the beginning of August 2011 Chinese leading CRA (Dagong Global Credit Rating) downgraded the USA from their triple "A" position due to soaring debt. S&P also downgraded the country by one notch to AA+ and negative outlook blaming the poor political efforts to decrease spending and lessen national debt (Bloomberg, 2011).

explains this fact by the similar public information used by CRAs. Prior studies (see Liu and Moore, 1987; Cantor et al., 1997; Jewell and Livingston, 1998) show the importance of split ratings in revealing valuable information to markets such as influence on yields for bonds and prices.

In terms of the determinants of split sovereign ratings, limited literature exists. Cantor and Packer (1995a) claim that split ratings between S&P and Moody's are caused by their inexperience in rating sovereigns and the complexity of the process. In addition to assessing creditworthiness of a government, CRAs need to assess the willingness of a country to repay its debt (i.e. stability of institutions, social and economic interrelation). Alsakka and ap Gwilym (2009) highlight that disagreements among CRAs are caused by different rating procedures and weights employed in their analysis. In addition, the authors claim that CRAs might have different opinions about more speculative grade issuers and give extra credit to issuers occupying the same geographical area (home bias). However, according to Güttler and Wahrenburg (2007), the latter does not apply to Moody's and S&P.

Numerous studies examine the underlying causes of split corporate ratings. Differences might arise due to random errors incurred by different CRAs (Ederington, 1986), varying methodological approaches and weights applied in models (Cantor and Packer, 1995b; Pottier and Sommer, 1999; Dandapani and Lawrence, 2007) or because of home bias when issuers are rated more favourably in the home country (Beattie and Searle, 1992; Shin and Moore, 2003).

More recent studies look at the effect of split ratings on future ratings migrations.⁸³ Using bond market data, spanning between 1983-2001, Livingston et al. (2008) find corporate bonds which received split ratings by S&P and Moody's are more susceptible to future rating movements. Vu et al. (2015) investigating sovereign bonds over period 2000-2012 suggest that market responses stronger to negative actions on the inferior ratings and to positive actions of the superior ratings. Strong market implications on credit spreads are found for split rating issued by the two out of three big CRAs (S&P and Moody's).

83. Rating migrations portray changes in the quality of credit risk over a time period.

3.5 Literature on the influence of regulation

Most of existing literature focuses on the relationship between rating information affecting yields on company's bonds. The literature measuring direct impact of regulation on cost of debt on firms or countries remains scarce.

Kisgen and Strahan's (2010) innovatory approach looks at direct impact of regulation of ratings on firm's yields in comparison to earlier studies which focus on the impact of having a rating on leverage⁸⁴ (see Faulkender and Petersen, 2006; Sufi, 2009). In their natural experiment using US data, these authors find that exogenous change in regulation of a CRA affects firm's cost of debt capital. Paper extends Kliger and Sarig (2000) on how ratings influence the bond yields. In line with the earlier paper change in ratings reduces yield on investment class of bonds. The effect on the bonds at the lower end of the rating scale remains insignificant.

Kisgen and Strahan (2010) support the results of Bongaerts et al. (2012) who claim that ratings assigned by Fitch are important due to regulatory reasons. The earlier study explains that investors are most likely to employ the Fitch rating if the remaining two large CRAs issue contradictory credit ratings within the investment grade margin. Fitch is effectively known to "break the tie" for regulatory use of ratings. Positive rating resulting in investment grade by Fitch lead to 45 percent lower spreads than when it rates the bonds as speculative grade. This is in line with Kisgen and Strahan (2010) where results tend to be stronger in area of investment-grade cut-off, where impact of regulatory restraint is the most binding. The above studies suggest that ratings influence cost of capital of a company for both information and regulatory reasons (Kisgen and Strahan, 2010).

Lemmon and Roberts (2010) use bond market data spanning the period 1986-1993 to measure impact of intensifying regulation imposed by NAIC⁸⁵ in 1990 and coinciding restrictions on saving and loan investment⁸⁶ on the distribution of financing and investment. These authors find that changes in the supply of credit have a strong influence on financing and investment decisions of firms within the speculative-grade rating categories.

Using data on the corporate bond market between 2001 and 2005, Ellul et al. (2011) find that insurance firms which are restricted by regulation to a large extent are more likely to sell bonds

84. Also known as general supply of capital effects Kisgen and Strahan (2010).

85. National Association of Insurance Companies (NAIC).

86. In speculative-grade.

with speculative grade at a very low price. The decreasing prices of bonds which reach below their fundamental value is an example of the negative effect of regulation.

Alsakka et al. (2015) is the only study which studies the recent reforms of the CRA industry in Europe since the formal regulation was introduced in December 2009. In particular, it focuses on whether there is change in the market perceptions to the ratings issued by Fitch, Moody's and S&P since the supervisory role of overseeing CRAs was handed to ESMA in July 2011. Using 44 publicly listed banks in Europe, the authors investigate the responses of stock returns and price volatilities to bank rating events issued by the big three CRAs during 2008-2013. The sample considers only downgrades since they comprise the majority of events in that time frame. The applied methodology includes event study. The findings suggest that the reaction to regulation is mixed and cannot be interpreted easily. For example, downgrades by Moody's and S&P are found to cause strong negative abnormal returns after the supervision was entrusted with ESMA whereas they did not exist before. For the former CRA these effects are short-lived. Moreover, the regulation reduces the market reaction for Fitch. Further, after July 2011 the price volatility of S&P downgrades decreased in contrast to the earlier period. For Moody's the effect is the opposite and the price volatility after regulation increases marginally. The regulation is not found to change the insignificant effect of the Fitch downgrades on bank's share price volatility.

These results represent mixed movements in the market's perceptions in terms of improving rating quality and endorsing market stability and for this reason the authors stress that the evidence cannot solely be attributed to regulation. They conclude that the regulatory changes had not taken full effect on the market at the time of this investigation.

3.6 Methodologies applied in credit rating research

3.6.1 Limited dependent variable

The limited dependent variable model relies on the fact that the financial outcome or behaviour captured in the dependent variable is not a random continuous variable. Instead, it points to the direction whether a particular outcome occurred or not (binary response) (Greene, 2012). The discrete nature of the dependent variable means that it can lead to binary response or alternatively take a value from a multiple limited number of values exceeding the choice of two.⁸⁷

Limited dependent (categorical) variable can include binary, multinomial, or ordered responses.

- Binary choice is an effect of one response arising over another (i.e. 0 or 1).
- Nominal choice is one that occurs from a variety of more than two available options (i.e. A, B, C...).
- Ordered choice reveals the strength or a ranking of a response and takes a numerical value (i.e. 1st, 2nd, 3rd...) (Gujarati, 2004).

When categorical variables are involved, the linear regression models (e.g. OLS) are no longer suitable for efficient and non-biased estimation, as they do not result in the best linear unbiased estimator (BLUE). Different econometric models are available to researchers depending on their particular needs. Logit and probit regressions account for binary choices (see Eq. (3.1)). Multinomial logit is used to analyse nominal responses, while ordered logit/probit regressions deal with ordinal responses (see Eq. (3.4)) (Gujarati, 2004).

Most of the above models are estimated by means of the maximum likelihood (ML) method. Its objective is to find values of unspecified parameters, so that the probability of detecting dependent variable (e.g. 0 or 1) is as high as possible (maximum).

⁸⁷. It takes a finite number of values into account: e.g. throwing a dice has 6 possibilities; in credit ratings the numerical score often includes 20 or 58 categories.

3.6.1.1 Binary response: Probit and logit

Probability density function (PDF) is the probability for a random variable to take on a particular value. In the case of binary models, a limited number of responses is considered (e.g. 0 or 1). The probit model follows standard normal distribution, where error term is assumed to have zero mean and variance of one. The probability density (PDF) is characterised by high peak and thin tails.

The logit model, on the other hand, follows standard logistic distribution, where the error term is assumed to have zero mean and variance of $\pi^2/3$. The logit probability density function has lower peak and flatter (heavier) tails compared to the earlier model (Greene, 2012). In addition to the difference in the assumption of standard errors, the estimation of two models is different. Usually, needs and convenience of a researcher determine which model is to be used (Gujarati, 1995; Afonso et al., 2009).

According to Wooldridge (2007) the interest of the binary response model is to explain the effect of independent variables (X) on the response probability of P(y). Since the responses take discrete values, an unobserved latent variable formulation will help in explaining the dependent variable y.⁸⁸

$$y_{it}^* = \alpha_i + \beta_1 X_{1it} + \beta_2 X_{2it} + \dots \varepsilon_{it} \quad (3.1)$$

y^* = an unobserved latent variable

$i = 1, \dots, N$ entities and $t = 1, \dots, T$ time periods.

α = intercept term, (i.e. threshold)

X_1, X_2 = explanatory variables

β = regression parameters

ε = latent error term

assuming that:

$$y_{it}=1 \quad \text{if} \quad y_i^* > 0$$

$$y_{it}=0 \quad \text{if} \quad y_i^* \leq 0$$

88. An unobserved latent variable is used to make inferences about the observable variables in the regression model (Gujarati, 2004).

In the standard binary model, one single cut-off point is projected at 0 as this model has only two outcomes {e.g. 0 and 1} (Wooldridge, 2007).

Depending on the distribution assumption of the error term ε_{it} , the discrete response is viewed as a reflection of the underlying regression: probit or logit (Greene, 2012).

The probit model is derived from the latent variable model when the error term ε_{it} is normally distributed. The model can be written as:

$$\phi(z) = (2\pi)^{-\frac{1}{2}} e^{-z^2/2} \quad (3.2)$$

$\phi(z)$ = normal standard density

e = exponential value approximately equal to 2.71828

π = mathematical constant approximately equal to 3.14159

Z = standard normal variable ($z = \alpha + \beta_1 + \beta_2 X_i + \dots$)

The logit model on the other hand is estimated when ε_{it} follows standard logistic distribution and can be seen in Eq. (3.3) below.

$$\lambda_z = e^z / (1 + e^z) \quad (3.3)$$

λ_z = logistic cumulative distribution function

e = exponential value approximately equal to 2.71828

z = standard normal variable ($z = \alpha + \beta_1 X_i + \beta_2 X_i + \dots$)

It could also be written that:

$$\lambda_z = 1 / (1 + e^{-z}) = e^z / (1 + e^z) \quad (3.4)$$

This further leads to the odds ratio of a response written by $\lambda_z / (1 - \lambda_z)$ where λ_z is the probability of the event occurring whereas $(1 - \lambda_z)$ is the probability of the opposite. One can write:

$$\lambda_z / (1 - \lambda_z) = (1 + e^z) / (1 + e^{-z}) = e^z \quad (3.5)$$

After taking a logarithm the log of odds ratio is linear in X and in parameters (Gujarati, 2004).

$$\ln(\lambda_z / (1 - \lambda_z)) = z \quad (3.6)$$

where $z = \alpha + \beta_1 X_i + \beta_2 X_i + \dots$

The studies which apply the logistic function in the CRA literature include Rijken (2004), Fuertes and Kalotychou (2007), Behr and Güttler (2008); Bannier et al. (2010). On the other hand, it is believed by some that probit techniques are more adequate to forecast ratings (Gujarati, 1995; Afonso et al., 2009) and because they are based on fewer assumptions relating the error term (Cluff and Farnham, 1985; Wooldridge, 2005).

3.6.1.2 Ordered response: Ordered probit and logit

Ordered logit/probit specification is an extension of the binary model shown in Eq. (3.1). The regressand, however, has more than two responses in a ranked order (exceeding choice of yes or no; “0” and “1”). Error terms show the same distribution as previous models, and they also produce similar results. Namely, ordered logit (with logistic distribution) can be used as an equivalent of ordered probit (characterised by normal distribution).

The ordered model follows the latent variable model explained earlier in the binary option (see Eq. (3.1)). Different values of α act as threshold parameters which divide the data sample into z intervals.

$$y_{it}^* = \beta_1 X_{1it} + \beta_2 X_{2it} + \dots + \varepsilon_{it} \quad (3.7)$$

y^* = an unobserved latent variable

$i = 1, \dots, N$ entities and $t = 1, \dots, T$ time periods.

X_1, X_2 = explanatory variables

β = regression parameters

ε = latent error term

The probability of regressand (y_{it}) taking a particular value equates to the probability that latent variable (y_{it}^*) will fall in a particular interval. The latent error term (random effect) is assumed to follow standard normal distribution and to be independent of X_{it} . The model does not contain a constant, since in the ordered probit specification one observes threshold parameters rather than one intercept. These cut-off points divide the data into z intervals greater than one. Let J be the number of available responses $\{0, 1, 2, \dots, J\}$ and α_j act as cut-off point.

The unobserved latent variable relates to the observed responses y_{it} so that:

$$y_{it}=0 \quad \text{if} \quad y_i^* \leq \alpha_1$$

$$y_{it}=1 \quad \text{if} \quad \alpha_1 < y_i^* \leq \alpha_2$$

$$y_{it}=J \quad \text{if} \quad y_i^* > \alpha_J$$

For instance, if y_{it} has three responses $\{0,1,2\}$ there will be two cut-off points: α_1 and α_2 .⁸⁹ Since ordered models incur multiple responses and consequently have more than one cut-off points, there is no intercept term in the ordered probit/logit model. If one finds α term in the model, this simply represents the first threshold.

The (β) parameters of the regression as well as thresholds (α) are estimated using maximum likelihood estimation (ML) and are subject to constraint $\alpha_1 < \alpha_2 < \dots < \alpha_J$ (Wooldridge, 2007).

Application of ordered logit/probit models in the credit rating literature is widespread. The ordered probit model was applied by Blume et al. (1998); Nickell et al. (2000); Trevino and Thomas (2000, 2001); Hu et al. (2002); Bennell et al. (2006); Wendin and McNeil (2006); Purda (2007); Alsakka and ap Gwilym (2009, 2010a). The methodology allows the researcher to take into account the discrete and ordinal nature of the rating scale and of changes in ratings (Alsakka and ap Gwilym, 2010a). As highlighted by Park (2005) and Bennell et al. (2006), the distances between adjacent points on the rating scale are not equal. Thus, using approaches which recognise the dependent variable as being continuous or having equal distance between points on the scale (e.g. Ordinary Least Squares) might result in biased and inefficient estimates.⁹⁰ In a further sample, Bissoondoyal-Bheenick (2005) shows that the ordered probit model has advantages over OLS in measuring quantitative determinants of sovereign ratings for 95 countries over the period 1995-1999.

On the other hand, Mellios and Paget-Blanc (2006) exploit the logistic model to find determinants of sovereign ratings from the three main CRAs using a sample of 86 countries. The authors claim that the ordered logistic model, with the 21-point rating scale, allowed them to predict sovereign ratings in 95 percent of the cases with two notches range and in 74 percent of the cases with an accuracy of plus/minus one notch. Finally, Ederington (1985) applies both

89. Following the rule $\alpha_J = y_{it} - 1$.

90. Estimates are not BLUE.

ordered probit and logit to predict bond credit ratings and finds the former model outperforms the latter.

3.6.1.3 Nominal response: Multinomial logit/probit

Multistage probability distributions, similarly, to the ordered probit and logit model, involve the regressands which have multiple responses. In such models, choice is not ordered and nominal in nature {e.g. A, B, C}.⁹¹ Similarly to basic probit/logit model, multinomial specification relies on similar assumptions and, hence, follows a similar distribution. For instance, the multinomial logit model relies on the assumption that the log-odds of choices pursue a linear model.

The example of application of multinomial logit model can be found in Livingston et al. (2008) where the authors investigate the relationship between split bond ratings and rating migrations by S&P and Moody's during 1983-2000.

3.6.2 Marginal effect

When using a linear regression model, the slope coefficient quantifies the variation in the average value of the dependent variable for a unit change in the independent variable, while other control variables are held constant. The marginal effect measures the economic significance of identified relationships. In the nonlinear model, this situation is different and the parameters of the coefficients cannot be interpreted as marginal effects (Greene, 2012).

In the logit model, the slope coefficient of a variable X results in the change of log of the odds, which corresponds to unit change in that control variable holding all remaining regressors constant. However, due to the nature of logit model, the change in probability of a particular response is influenced by probabilities of all dependent variables rather than an isolated coefficient as in the earlier example of linear model.

The effect is given by $\beta_i \lambda_z (1 - \lambda_z)$, where the parameter of a particular regressor is known as β_i whereas λ_z is a probability of a particular response. From Eq. (3.6) it can be seen that, in order to estimate the probability of a response, all variables are included.

91. For example, if one talks about different means of transport A-car, B-train, C-plane – there is no ordinal ranking of responses.

According to Gujarati (2004), in the probit model the rate of change of probability of a particular component is more complex and can be written as $\beta_i \phi(z)$. As seen in Eq. (3.2), $\phi(z)$ is the density function of standard normal variable $z = \alpha + \beta_1 + \beta_2 X_i + \dots$. Also in this scenario, the partial effect of a variable X cannot be disentangled from the remaining regressors, as all variables of the regression model are used in the estimation.

For the above reasons, the parameter coefficient which is obtained in basic logit/probit models or their extensions (ordered logit/probit) cannot be interpreted as marginal effect.

According to Greene (2012), there are two approaches to estimate the marginal effect in binary models. One can estimate the marginal effect at every observation and take the sample average of the individual effect, known as average partial effect (AME). Alternatively, the marginal effect can be obtained from the sample means of the data (MEM).

A difference is made as to how marginal effects for independent variables are estimated for binary variables (dummies) or continuous variables. In the former example, one calculates the difference between probability of one response occurring (e.g. 1) minus the probability of the second response occurring (e.g. 0), while all other variables from the model are kept at their mean.

This could be illustrated by:

$$\text{Marginal effect} = \text{Prob}[y=1 | \bar{x}_{(a)}, a=1] - \text{Prob}[y=1 | \bar{x}_{(a)}, a=0] \quad (3.8)$$

y = dependent discrete variable

$\bar{x}_{(a)}$ = means of all other variables in the sample

a = binary independent variable

The partial effect of the continuous variable on the response probability is obtained by calculating change in the predicted probability which is due to one unit change in the independent variable (a), while holding other explanatories fixed at their mean values.

$$\text{Marginal effect of } = \lim_{\Delta \rightarrow 0} [\text{Prob}(y=1 | \bar{x}_{(a)}, a+\Delta) - \text{Prob}(y=1 | \bar{x}_{(a)}, a)] / \Delta \quad (3.9)$$

as Δ gets closer and closer to 0.

y = dependent discrete variable

$\bar{x}_{(a)}$ = means of all other variables in the sample

a = explanatory continuous variable

Δ = change in the independent variable

3.6.3 Panel data

Panel data has both a cross-sectional and a time dimension, which results in numerous observations. For unit observations represented by “N”, there are potentially time periods depicted by “T” resulting in number of observations N*T. The panel is known to be balanced if every cross-section unit has the same number of time dimension observations. If the number of observations is different for different units, the panel is unbalanced.

The benefit of using panel data is that it allows for unobserved heterogeneity. On the other hand, relationship between error term and independent variables can be problematic, as heterogeneity might be undetected. This gives rise to an assumption concerning the dependence of error terms and coefficient, which is described in more detail in the next subsection.

3.6.4 Fixed effect

Fixed and random effects are frequently used in estimating regression models in panel data. In a panel data, each cross-sectional unit might represent an individual characteristic;⁹² hence, the intercepts for each of them will be different. Subscript i on the intercept (α_i) shows this individual effect. The fixed effect (regression) model (FEM) for binary choice model is shown in Eq. (3.10). Although the model assumes that the intercept for each unit is different, it is *time invariant* – meaning that it remains constant across time for the same cross-section unit.

For example, if the intercept is described by α_{lit} , this would mean that each unit’s intercept varies across entities, as well as across time (*is time variant*). Furthermore, the slope coefficients ($\beta_1, \beta_2,$) are assumed to be constant amongst all units/time in FEM models, whereas the error term follows normal distribution (Gujarati, 2004).

$$y_{it}^* = \alpha_i d_{it} + \beta_{1it} X_{1it} + \beta_{2it} X_{2it} + \dots + \varepsilon_{it} \quad (3.10)$$

y_{it}^* = latent dependent variable

α_i = intercept term

d_{it} = dummy variable taking value of one for individual i at time t , zero otherwise;

$i = 1, \dots, N$ entities and $t = 1, \dots, T$ time periods.

92. If talking about firms there might be different traits of companies in the sample in terms of their management style etc.

X_1, X_2 = explanatory variables

β = regression parameters

ε_{it} = latent error term

assuming that:

$$y_{it}=1 \quad \text{if} \quad y_i^* > 0$$

$$y_{it}=0 \quad \text{if} \quad y_i^* \leq 0$$

To practically estimate the model which captures cross-section variations (effects), the dummy variable technique is often used.⁹³ Furthermore, one can account for differences in the time dimension (e.g. regulation, technological improvements) via including time binary variables. Both effects can be included together in a regression model. However, this results in losing significant number of degrees of freedom.

3.6.5 Random effect

In the random effects model, rather than assuming that the intercept term is fixed α_{1i} one presumes the intercept is a random variable with mean value α_1 . In this scenario, the intercept is defined as:

$$\alpha_{1i} = \alpha_1 + v_i \tag{3.11}$$

α_{1i} = intercept value of individual $i = 1, \dots, N$ entities

α_1 = mean value of the intercept

v_i = random error term

where v_i is a random error term which follows zero mean and variance of σ_v^2 . This model assumes that units included in the sample have common mean value of the intercept term (α_1), and any existing differences are contained in the error term (v_i).

The random effect model can be written as:

$$y_{it}^* = \alpha_1 + \beta_{1it}X_{1it} + \beta_{2it}X_{2it} + \dots + \varepsilon_{it} \tag{3.12}$$

$$\varepsilon_{it} = v_i + u_{it}$$

93. Also known as least-squares dummy variable (LSDV) model which is an alternative name to the fixed effect model (FEM).

y_{it}^* = latent dependent variable

α_i = intercept term

$i = 1, \dots, N$ entities and $t = 1, \dots, T$ time periods.

X_1, X_2 = explanatory variables

β = regression parameters

ε_{it} = composite error term

v_i = unobserved latent error term time invariant.

u_{it} = random error

The error term (ε_i) comprises of two elements, v_i and u_{it} . The first component, also known as latent variable, is not observable. It captures cross-section variations,⁹⁴ while it does not vary across time. Following normal distribution with the mean of zero and a constant variance of $\sigma_{v_i}^2$, it assumes to be unrelated to the independent variables (x_{it}). The latent variable represents the (random) deviation of a particular entity (its intercept) from the intercept mean value α_1 .

The second component, the white noise, u_{it} is assumed to be normally distributed with the mean of zero and unit variance $\sigma_{u_i}^2$. The random error term u_{it} merges together the time-series element and the cross-section variation (see Eq. (3.12)).

The random effect model, in contrast to the fixed effect model, assumes v_i to be uncorrelated with independent variables (Greene, 2012). Furthermore, error components are assumed to be uncorrelated to each other, across time, or cross-sectionally (Gujarati, 2004).

These above assumptions can be written as:

$$v_i \sim N(0, \sigma_v^2)$$

$$u_{it} \sim N(0, \sigma_u^2) \rightarrow N(0, 1)$$

$$E(v_i x_{it}) = 0$$

$$E(v_i u_{it}) = 0 \quad E(v_i v_j) = 0 \quad (i \neq j)$$

$$E(u_{it} u_{is}) = E(u_{it} u_{jt}) = E(u_{it} u_{js}) = 0 \quad (i \neq j; t \neq s).$$

From the above properties it can be written that:

$$\text{var}(\varepsilon_{it}) = \sigma_u^2 + \sigma_v^2 = 1 + \sigma_v^2 \tag{3.13}$$

94. I.e. specific heterogeneity.

The final expression derives from probability distributions where $u_{it} \sim N(0,1)$.

According to Gujarati (2004), if the σ_v^2 was equal to 0, there would be no difference between the FEM in Eq. (3.10) and REM in Eq. (3.12).

However, since v_i is one of the two components of the error term,⁹⁵ the composed error term ε_{it} from Eq. (3.12) is serially correlated across time (ε_{it} and ε_{is} where $t \neq s$).

It can be written that correlation coefficient, $\text{corr}(\varepsilon_{it} \text{ and } \varepsilon_{is})$ is:

$$\rho = \text{corr}(\varepsilon_{it} \text{ and } \varepsilon_{is}) = \frac{\sigma_v^2}{\sigma_v^2 + \sigma_u^2} = \frac{\sigma_v^2}{\sigma_v^2 + 1} \quad (3.14)$$

where $t \neq s$

The estimated ρ measures the proportion of the panel-level variance component to the total residual variance.

Random and fixed effect can be integrated together with probit or logit models. The combination of the random effect probit model is considered more attractive than the logit due to higher availability of estimators. When choosing between the fixed or random effect for the limited dependent variable, decision is based on the error term characteristics. Namely, if the v_i is significant, we find random effect in our data, whereas insignificant v_i shows that the panel does not account for random effect in the data and fixed effect should be used instead.

The ρ statistic is useful to test for presence of the unobserved effect in the panel (i.e. whether the error term has composite nature) and whether random effect ordered probit model should be chosen instead of the basic ordered probit model.

Using likelihood ratio (LR) with one degree of freedom, the two models can be compared. When the null hypothesis ($\rho=0$) is rejected, this implies that the panel-level variance component is important and the upgraded specification should be used. On the other hand, if the null hypothesis is accepted it is assumed that the error term is not of composite nature. Hence, it is normally distributed with zero mean and unit variance ($u_{it} \sim N(0, \sigma_u^2) \rightarrow N(0,1)$).

Random effect ordered probit specification is widely used in sovereign ratings' literature and is considered the most superior specification (Afonso et al., 2007, 2009; Alsakka and ap Gwilym, 2010b). This is due to its ability to capture the cross-sectional variances in its error

95. Which is present in every time period.

term.⁹⁶ Such factors include geographical insecurity, political risks, social imbalances which influence the sovereign credit ratings. It is believed that no time series component can replicate the social and political conditions across sovereigns. According to Afonso et al. (2009) and Eliasson (2002), REM error term corrects for not including these dynamics in the regression model.

3.6.6 Fixed versus random effects

In the FEM model, each cross-section entity has its separate (fixed) intercept. In the REM, the intercept consists of the mean value of all cross-sectional intercepts plus the error term which explains the deviation value of a particular intercept from the mean.

Moreover, FEM does not require the assumption of no relationship between time variants (individual effects) and the regressors. Random effect, in contrast, requires independence between them (i.e. error term and the regressors must not be correlated). When choosing between two models, the *Hausman* statistic test is used.

3.6.7 Robust standard errors

One of the assumptions of the regression model (linear as well as non-linear) is homoscedasticity. It implies that variance of the disturbance term in the regression model is constant and corresponds to σ^2 .

$$E(\varepsilon_{it}^2) = \sigma^2 \tag{3.15}$$

ε = error term of the regression model

$i = 1, \dots, N$ entities and $t = 1, \dots, T$ time periods.

According to Brooks (2008), since the basic limited dependent variable takes one out of two possible outcomes, the disturbance term also takes only one out of two values. Therefore, normal distribution of the error term is not possible. Furthermore, since the disturbance term adjusts systemically with independent variables, the error term does not have a constant variance, thus it is not heterodastic. To treat this problem, it is advised to use robust standard errors (Brooks, 2008). The standard error calculations are based on the assumption that the sample size is large (asymptotic assumption). The estimation method is maximum likelihood,

96. The cross-section error term follows normal distribution.

while the critical values follow normal distribution. To ensure the standard errors (SE) are robust, statistical Huber or White tests can be applied.

In addition to the homoscedasticity assumption, both the non-linear and linear model require no autocorrelation. According to Kendall and Buckland (1971; p.8), autocorrelation is a “*correlation between members of series of observations ordered in time [as in time series data] or space [as in cross-sectional data]*” Consequently, autocorrelation should not be present within the error term. This means that the error term of one unit observation is not subjective to the error term of another observation, either in time or in cross-sectional spectrum.

$$E(\varepsilon_i \varepsilon_j) = 0 \quad (i \neq j) \quad (3.16)$$

3.6.8 Clustered standard errors

Often data might include independent observations which have a cluster structure, which results in correlations between groups due to their similarities. These clustered observations invalidate the main assumption of regression analysis which requires errors to be independently and identically distributed (i.i.d.) (Primo et al., 2007). This issue is closely related to heteroskedasticity or non-constant error variance.

According to Primo et al. (2007) clustered data results in higher dependency of data, which subsequently could result in misleading results. If there is a number of independent observations and the data are clustered, it might mean that what the sample holds is not the number of cases, but the number of clusters which decreases the information content.

According to Moulton (1990), who conducts state and local policy research, if one does not take into account the clustered nature of the data, the model will understate the standard errors of the parameters. When adjusting for clustered nature of the data, one makes allowance for the observations within the cluster to be linked with each other, although observations amongst clusters are assumed to be independent (Primo et al., 2007).

The clustered standard errors approach is a modification of Huber-White heteroscedasticity standard errors and involves a more relaxed approach. Namely, the general form of heteroscedasticity is permitted, as long as errors are not correlated across or within units (Huber, 1967; White, 1980). The clustered standard errors tackle the problem of typical

heteroscedascity and intra-cluster correlation.⁹⁷ For limited dependent variable models, the clustered standard errors technique requires a high amount of clusters.

3.6.9 Quasi-experimental research design: Difference-in-difference (DD)

The difference-in-difference (DD) approach is an example of the quasi-experimental research design. It relies on the notion of ‘natural experiments’ where a particular group of individuals or entities experience a treatment (treatment group), while others do not (control group). Exogenous shocks used in this methodology might include changes in government policy, implementation of a new drug, natural disasters or wars (Angrist and Pischke, 2009).

The panel data method shows the result of a treatment action (intervention) by comparing how the outcome changes over time and between both groups (treatment and control). According to Angrist and Pischke (2009), the controls in the model do not necessarily need to include the *time* and *state* dimensions which are the ones most used in examples. Data can be grouped by using other characteristics or groups. The aim of the study is to perform treatment versus control comparison. According to Angrist and Pischke (2009), the method is a type of fixed effect estimation where aggregated data are employed.

This estimator is obtained via the regression model framework:

$$y_{it} = \alpha_1 + \beta_1 Treatment_{it} + \beta_2 Post_t + \beta_3 (Treatment * Post)_{it} + \varepsilon_{it} \quad (3.17)$$

y_{it} = binary indicator of an outcome; the estimate follows $(TG^{POST} - TG^{PRE}) - (CG^{POST} - CG^{PRE})$
 where: TG is a treatment group, CG control group, POST(PRE) relates to the post (pre) event period.

$i = 1, \dots, N$ entities and $\tau = 1, \dots, T$ time periods

Treatment = dummy variable takes value of 1 if the entity is in the treatment group; 0 otherwise.

Post = dummy variable takes value of 1 if the observation is in a post-treatment period; 0 otherwise.

β_1 = average of the outcome variable for the treatment group relative to the control group pre-treatment period.

β_2 = change measurement in the outcome variable between periods within the control group.

97. The intra-cluster correlation leads to bias in standard errors. However, it does not affect estimated coefficients.

β_3 = treatment effect measures of how much outcome variable changed in the treatment group due to treatment in respect to how much outcome variable changed in the control group in the same time period.

Jiang et al. (2012) apply the DD approach to test if ratings of the same corporate bond issued by S&P (treatment group) and Moody's (control group) alter under different payments models.⁹⁸ The findings suggest that the only ratings affected by the change of the remuneration model are bonds which bear some characteristics of conflict of interest. Natural experiment of Becker and Milbourn (2011) uses the entry of Fitch⁹⁹ as a shock to the market which triggered competitiveness between CRAs.

Kisgen and Strahan's (2010) quasi-natural experiment uses certification of Dominion Bond Rating Service (DBRS) by SEC, in February 2003, as an exogenous shock on the bond investment market to investigate its impact on the firm's cost of debt. These authors find a negative effect of DBRS on the cost of capital for firms which used their services preceding its certification. The paper complements Kliger and Sarig (2000) and Tang (2009) who study bond yield before and after Moody's 1982 enhancement of its rating scale.

Lemmon and Roberts (2010) using DD approach study the impact of three exogenous shocks to the supply of credit influencing corporate funding opportunities and investment behaviour of speculative- rank firms. Gertler and Gilchrist (1994), Leary (2007), Faulkender and Petersen (2006) and Sufi (2009) also study the supply forces on firms' workings by means of treatment and control group comparisons. The former two papers make a distinction between large and small firms, whereas Faulkender and Petersen (2006) differentiate whether the credit rating is present or absent. Finally, Sufi (2009) compares speculative- against investment-grade firms.

98. In July 1974 S&P replaced the *investor-pays* model with the *issuer-pays* model already implemented by Moody's since October 1970.

99. More specifically its gained prominence in providing rating services which significantly increased during end of 1990.

3.7 Chapter conclusions

The current literature emphasises the relevance of studying workings of the CRAs. For instance, Kaminsky and Schmukler (2002) and Arezki et al. (2011) offer evidence that CRAs play an integral role in financial markets and spillover between markets and countries may have serious repercussions on stability of financial systems. Additionally, the ratings alter the cost of capital of companies due to regulatory and information reasons (Kisgen and Strahan, 2010; Bongaerts et al., 2012). The information transmission function of the CRAs received a considerable attention. Although the literature presents mixed results regarding which signals are more influential the majority of evidence points out to the negative rating events (Hull et al., 2004; Afonso et al., 2012; Alsakka and ap Gwilym, 2013).

Further, the chapter evaluates studies relating to business model of CRAs. There is significant body of literature examining the issues of conflict of interest originating from the predominant paradigm (Becker and Milbourn, 2011; Hau et al., 2013). Despite this there is no empirical evidence which could point out to the right model (Jiang et al., 2012). Furthermore, the studies find that the ratings which are issued on the solicited basis are higher and more favourable to the issuers (Gan, 2004; Behr and Güttler, 2008). Although competing theories of the phenomenon are put forward the studies omit the sovereign ratings altogether (Behr and Güttler, 2008; Bannier et al., 2010). Additionally, the issue of competition in the CRA market is being criticised by many competitors however the views on this topic are divided (Kodres, 2010; Camanho et al., 2012; Doherty et al., 2012; Hau et al., 2013). Lastly, the literature shows that the reaction of the market to changes in ratings and credit signals vary across CRAs which implies on the possible superiority of CRAs in forecasting credit worthiness (Güttler and Wahrenburg, 2007).

In relation to the recent regulatory undertakings relating CRAs in Europe there is no literature except Alsakka et al. (2015). The existing papers either focus on the US market or on indirect effect of regulation (Kisgen and Strahan's, 2010; Becker and Milbourn, 2011; Bongaerts et al., 2012).¹⁰⁰ Lack of publications on the EU markets in this sphere calls for more evidence and emphasises the gap in the literature. This thesis is the first attempt to empirically investigate

100. Majority of the papers on CRAs apply limited dependent variable models whereas the newer generation of studies uses quasi-experimental research design.

the direct effects of recent reforms to CRAs in the European markets with regards to disclosure rules, transparency and mechanical reliance.

The empirical Chapters 4-6 of this Thesis investigate whether the regulatory changes had impact on the workings of CRAs. This analysis acts as means of measuring effectiveness of regulatory efforts implemented by EU authorities. One of the questions is whether the regulation achieves its objectives. The effect of recent changes to CRAs regulation is of economic importance and comprises an important point on the agenda of regulators and policymakers. These, together with many interlinked issues, are studied in greater depth in the course of this Thesis.

Chapter 4: The effects of disclosure rules on CRAs' profitability and competition: A critical assessment

4.1 Introduction

“The growing use of ratings in regulation had given rise to three potentially adverse industry dynamics: 1) the substitution of regulatory demand for investor-driven demand for ratings, 2) growing perception that ratings were something more than an opinion as a result of their official recognition by regulators, and 3) a vicious cycle of intrusive regulation to induce ratings and rating agencies to behave in line with regulatory use needs, potentially changing the nature of ratings”.

(Cantor, 2013; p.1).

Several commentators (see Cantor and Packer, 1995b; Moody's, 2003), urge regulators to take necessary steps to limit the underlying cause of the abovementioned problems – an ongoing overreliance on credit ratings in financial market and securities regulation.

The issue was outlined among other problem drivers in EC (2011a) where deficiency on the side of the CRAs has been grouped into six areas and visualised in the form of a tree shown in Figure 4.1. The EU's CRA III regulation is the third attempt which focused on tackling these problems in Europe.

Reducing mechanistic dependence on ratings is considered as one of the main goals of the CRA regulation (Cantor, 2013) and is at the heart of this investigation (see red box in Figure 4.1). The over-dependency on external measures was attributed to hardwiring external ratings in legislation, excessive use of ratings for internal risk assessments, investment strategies directly connected with ratings and lack of sufficient information when rating securitized products. Side effects of such events including procyclicality and cliff-effects, gave rise to global problems such as stability issues and weakened investor confidence (EC, 2011a).

Closely related to reducing mechanistic reliance is the transparency of the systems and practices which are in place ensure that ratings are reliable and of the highest quality. During the financial crisis, CRAs were heavily criticised for the competence of their analysts. Among other issues, the insufficient number and inadequate education and experience of analysts were highlighted. To address the problem, regulators increased the transparency requirements. As an example, for CRAs aiming to be registered or certified by ESMA, Annex I.A.8. of the

Regulation requires the disclosure of information about the quantity and quality of human resources (Gaillard, 2011). The detailed information about company structure, experience of the senior staff members and their assigned responsibilities along with compensation are to be reported directly to ESMA. Such requirements might increase the operating costs of CRAs.

This chapter consists of an innovative study of mechanistic reliance on ratings and recent developments in regulation which tackle this issue. Cantor (2013) emphasizes that actions in the US aimed at decreasing reference to ratings on a wide scale were of great success. However, the author believes that the Basel Committee¹⁰¹ does not have a strategy to realize the same in Europe (see also Moody's, 2012b, 2003).

Moody's (2012b) supports the need to reduce reliance on ratings although it raises concerns with the way that regulators are tackling the problem. The CRA highlights that the process is time consuming. Laws and regulations are either adopted but not implemented or have been advised but require further attention. The company fears that the current and future regulation might augment costs to the CRAs. They also fear that legal responsibilities will increase thus lessening their profitability. Moody's stresses that its capability to compete with other CRAs could suffer due to increasing regulatory costs, price competition and the entry to the market of newly registered CRAs.

Although the above mentioned concerns were directly raised by Moody's (2012b) it is not clear why they affect any particular CRA disproportionately.¹⁰² For instance, similar fears were expressed in the recent annual report by McGraw-Hill Financial which owns S&P Ratings Services (McGraw-Hill, 2014). The rating group stresses that the rising regulation both in the US and abroad escalates the costs of running the business and might have adverse repercussions on their business, its financial health and the resulting operations. Namely, it might influence communications with issuers and CRAs and the way in which ratings are issued, hence changing how their users operate. CRAs need to understand and interpret laws and regulations accurately as the inability to do so will lead to risks of incurring fines, penalties or sanctions. One recent example is the substantial penalty imposed on S&P in January 2015 by the SEC.

101. Basel Committee on Banking Supervision (2014) proposal to revise the standardised approach for credit risk aims to erase the references from external credit ratings. The Committee is looking to substitute ratings with risk drivers which should be "*simple, intuitive, readily available and capable of explaining risk consistently across jurisdictions*" (BIS, 2014; p.1). The examples for bank exposures would include capital adequacy ratio and an asset quality ratio. However, as stated in the document, the process is at the preliminary phase where feedback and data to improve the proposal are desired from market participants.

102. The effect could be disproportional if CRAs have heterogeneous client bases (e.g. different proportion of sovereign versus non-sovereign ratings being issued) and the regulations affect these segments of the clientele differently.

The first fine exercised on by ESMA was in June 2015, when DBRS was penalised for insufficient internal controls. Since these costs are passed onto customers they might affect the demand for credit ratings and workings of the CRA business. *“Each of these developments increases the costs and legal risk associated with the issuance of credit ratings and may have a material adverse effect on our operations, profitability and competitiveness, the demand for credit ratings and the manner in which such ratings are utilized”* (McGraw-Hill, 2014; p.11). However, one could argue that similar costs would face other CRAs hence the competitive impact might be neutral.

The aim of this chapter is to investigate whether the expressed fears of CRAs are justifiable and if externalities (higher costs to CRAs due to transparency requirements) impair the way that CRAs operate. The chapter examines whether (staffing) and operational costs of the CRAs increased because of regulatory interventions leading to decreased profitability. Additionally, the consequences of greater transparency and disclosure rules on the level of competition between CRAs are considered. This leads to the main research question: *Are CRA profitability and competition between CRAs intact following increased transparency and disclosure requirements?*

This chapter fills a gap in the literature by presenting a thorough analysis of the most recent undertakings in reducing references to ratings. It contributes towards the existing studies on the impact of regulations aimed at the CRAs in the US (e.g. enforced by SEC) (see Jorion et al., 2005; Kisgen and Strahan, 2010; Bruno et al., 2015). Additionally, it delivers a unique perspective empirical work (except Alsakka et al., 2015), on the impact of the recent CRA regulation in Europe. Overall, the chapter offers comparisons between the two governing systems which have not been studied before. Evaluation of the regulatory efforts in the US is very important since they were initiated much earlier than those in Europe. This can give a clear indication about their effectiveness and act as potential guidance for future European policy making.

The CRAs used in the analysis exceed 95 percent of the market share. This wide coverage of CRAs adds credibility and reliability to the inferences. Most studies up to date concentrate on the bigger CRAs when making judgements about the regulatory efforts or the overall working of the industry (e.g. Kisgen and Strahan, 2010; Bongaerts et al., 2012; Alsakka et al., 2015).

Although the big three CRAs dominate the market share, it is important to observe the impact of regulation on staffing costs not only at the largest CRAs but also the smaller players. The

latter might be relatively more affected by the possible increases in staffing costs. In addition, the only users of the *investor-pays* model, which was suggested as an alternative to the conventional remuneration model, are smaller CRAs such as KBRA, Morningstar and EJR (the only CRAs depending on this model exclusively). Therefore, it would be a risky move to shift the remuneration model of the entire CRA market based on the experiences of only one CRA.

Additionally, the chapter uncovers some surprising facts about the very low number of staff dedicated to rating an extremely large number of issues. This leaves a question mark surrounding the information quality of some CRAs' ratings.

Another novelty of this comparative study stems from the proxies used to assess the impact of regulatory efforts aimed at reducing overreliance on ratings. Measures including earnings, staffing of CRAs (e.g. number of analysts), number of outstanding ratings and the ratio between the two have not been applied in the earlier empirical literature on CRAs. This is the first study which investigates impact of recent regulatory undertakings in this sphere.

The wide portfolio of statistics available for CRAs within two main regulatory jurisdictions in the world (US and Europe) gives a clear picture of the recent workings of the CRA market. This offers a strong foundation for the critical assessment of the recent regulatory undertakings. For example, issues such as reporting style and compliance of CRAs with regulation as well as controversies over the “appropriate” business model are considered. Additionally, the rationale behind the recent fines and penalties incurred by CRAs is evaluated.

To summarize, this chapter contains many original and significant aspects. These are policy implications, empirical evidence and critique. This is relevant to policymakers, market participants and academics alike since the regulatory initiatives aimed at CRAs are still ongoing. The chapter offers many contributions to the debate.

The remainder of the chapter is structured as follows. Section 4.2 summarises the literature and the critiques of the regulatory regime. Sections 4.3 and 4.4 present the data sources along with results. Finally, section 4.5 concludes the study.

4.2 Literature

To investigate the effects of the regulation aimed at reducing the mechanistic reliance on ratings, this chapter builds on three streams of literature. Firstly, the action plans and responses of regulators are discussed. This section provides a critical appraisal of the implemented actions. Secondly, human capital literature is incorporated into the chapter as a means to explain the dynamics which drive capacity and productivity of firms. Lastly, literature on the role of analysts and the analyst coverage versus firm performance is introduced.

4.2.1 Response of the regulators

As a response to the mechanistic reliance on ratings and issue of hardwiring ratings in the regulation, key policy actions were initiated.

In July 2009 and December 2010, the Basel Committee on Banking Supervision (BCBS) made amendments relating ratings in regulation and reducing cliff-effect. Changes related increasing motivation of banks to perform in-house risk evaluations. These efforts were aimed mainly at securitised products however.

The Dodd-Frank Act obliges US regulators of financial intermediaries to “*specify the use of an assessment of the creditworthiness of a security or money market instrument and any references to, or requirements regarding, ratings*” (OCC, 2012; p.1).

Federal Banking Agencies and the SEC in the US released proposal outlining which alternatives to rating assessments could be introduced to lessen references in the existing regulation (see Advance Notice of Proposed Rulemaking (ANPR) by FDIC, 2010; Securities Act and the Investment Company Act by SEC, 2011b). The proposal was finalised in December 2013 and took effect from February 2014 (SEC, 2013b).

Moreover, Financial Stability Board (FSB) released Principles for Reducing Reliance on CRA Ratings in October 2010. The proposal requires responsible authorities in the international arena (such as BCBS, ESMA or national regulators) to take steps necessary to implement these rules. Report stresses need to increase transparency and disclosure of information in financial markets to lessen dependence on ratings and motivate investors to perform internal credit assessments (FSB, 2010). The updates on the progress were released in May 2014 (FSB, 2014) (for more details see section 2.6.3).

For instance, CRA III requires disclosure of information about securitised products and reporting of assumptions and features of methodologies for all rated asset classes. ESMA built publicly available platform for ratings accompanied by webpage which informs about performance of underlying assets (CEREP). Requirements of CRA regulation in relation to transparency issues relating disclosure rules, technical standards and public releases of information can be found in section 2.6.1 and 2.6.2.

Bank of England (BOE) recognised the need to improve transparency and introduced suitability standards for collateral in securitized products by requiring ABS originators to release more detailed information about loan levels and terms of contract amongst others (BOE, 2011). Organisation aims to make participants as well its practices less reliant on ratings. In 2009 European Central Bank (ECB) also announced to introduce similar principles.

BOE (2011) gives a summary of the possible steps to remove regulatory hardwiring of ratings. Some of them include emphasizing need for internal risk assessment methods in the existing Basel Accord framework. Introduction of substitutes such as market and non-market based indicators and marrying them with the current ratings and internal assessment is also under consideration. Moreover, handing the credit assessment to independent party is considered as an additional option. BOE admits however, such proposals require further analytical investigation.

4.2.2 Critical appraisal of regulation

This section outlines some of the issues relating to the existing regulations aimed at CRAs. Shortcomings of the resulting actions taken by both the policymakers but also the CRAs themselves are discussed. For example, the identification of the global problems lacks objectivity and empirical grounds. Further, the reporting styles to the mandatory publications and compliance with regulation is not consistent amongst the CRAs. The similar issue relates to fines and penalties for misconduct. Lastly, the inquiry into the business model is performed by exploring evidence from both remuneration models. Undermining evidence of the *investor-pays*, not discussed in earlier studies is revealed.

4.2.2.1 The “Problem Tree”

Figure 4.1 segregates the main problem drivers of CRAs into four groups, as identified by the European Commission (EC) (EC, 2011a). Those lead up to the six main consequences which finally list four resulting global issues. However, there is a problem with how the executive body specified and identified some of the issues when forming of CRA regulation.

Two of the problem drivers are more subjective and judgemental whereas others are reasonably objective. For instance, the first box in the second pillar states: “*Insufficient objectivity and completeness of the sovereign rating process*”. This is questionable since it is difficult to judge the objectivity of the CRA by the regulator. Claiming that the sovereign process is incomplete is also serious accusation without any underpinning evidence. The comparison of the press releases justifying rating actions before and after the regulation was introduced might lend hand to investigate whether these accusations had validity at the time of the EC report. For example, Moody’s in its press releases before 2011, such as a downgrade of Hungary on the 22 December 2006, includes a short section on the details of the rating action such as the issuer and its location. There is a brief description of what determined the rating to change. This together with the details of the managing director and the senior staff close the section which does not exceed 1 A4 page (for downgrade of Hungary see Moody’s, 2006; for downgrade of city of Athens see Moody’s, 2009). The press releases of rating actions after 2011 provide much more detail about the rating process. For instance, the downgrade of Greece on the 1st July 2015 and a change of outlook on Hungary on 7th November 2014 provide relatively extensive analysis of the performed creditworthiness assessment (Moody’s, 2014; Moody’s, 2015b). Firstly, documents consider the rationale for the rating change and the key drivers of the outlook changes respectively. The anticipation of what could drive the rating up or down from the current state is also explained. Further, press releases provide macroeconomic indicators such as GDP per capita, GDP growth, inflation, fiscal and external balance among others. Finally, the publications include the details how rating/outlook changes fit the regulatory disclosure rules. As in the earlier reports the CRA gives details about its analyst and managing director followed by the releasing office. The length of the document exceeds the 3 A4 pages and is an indication of the improved transparency standards.

Further, the box “*Inappropriate timing of ratings publication*”, which was an immediate criticism after downgrading the EU countries too fast, in the same pillar (as well as the last box in the last pillar) raises another question. At the time when no regulation was in place there was

no appropriate time for releasing rating news. In addition it might be harmful to restrict the natural workings of the market?¹⁰³ (see section 2.6.4 for more details). On the positive note, the problem driver identified in box 3 of pillar 1 “*Investment strategies directly linked to ratings*” has been empirically investigated and demonstrated by Cantor et al. (2007), and references therein.

Additionally, the EC’s subjective view is expressed in the list of consequences in the next column - “*Insufficiently sound credit rating methodologies and processes*”. It is controversial to claim that the processes are inadequate without providing evidence. CRAs were blamed for failing to predict defaults of Enron and during WorldCom as well for the rise of Asian crisis in the 1998.¹⁰⁴ In addition, the failure in the structured finance market added to their growing criticisms. Lack of transparency regarding methodology CRA regulation did not reveal the methodologies applied by CRAs and the CRAs were regarded as black “boxes”. Therefore, it is understandable that the EU regulation tried to deal with these issues after the outbreak of the financial crisis. The issue remains however, as to how much CRAs can interfere into the working of CRA industry.

The Problem Tree also lists the main four global problems claimed to exist as a result of the listed shortcomings of the CRA industry. However, the two out of four problems do not have any sources of evidence. Namely, “*Low confidence in financial market*” and “*Undermined investor confidence*” have not been supported by any academic literature and mean exactly the same thing. On the contrary, the rate of issuance has increased in the recent years which could indicate that investor confidence has not decreased. As it stands ratings classes are bundled together by policymakers when such judgements are being made. They should be separated into structured finance and the rest rather than being generalized. For instance, the criticisms are valid for structured finance where the number of issuances has significantly dropped since the breakthrough of the financial crisis (see Table 4.3b). One could speculate about the sovereign ratings while the corporate ratings market is booming and the investor confidence has not shown any sign of depreciation (see Table 4.3b). Such generic statements are misleading and show a lack of substance. This oversimplification is either a consequence of negligence or an attempt to make the regulation easier to push forward and implement. As can be seen in the Figure 4.1 the illustrated problems have also been lifted to the global scale. By

103. According to CRAs III regulation the sovereign ratings are supposed to be released after the close of business (Friday) and at least one hour before opening markets (Monday).

104. Although in case of Enron fraudulent behaviour (i.e. misreporting data) on the side of the issuer was found later.

inflating the problem the regulators can better justify and validate their regulatory actions, especially allowing assignment of a greater weight onto the possible resolutions.

4.2.2.2 Reporting styles

Additionally the reporting style of the documents required by regulation leaves a big scope for improvement. This related directly to Transparency Reports published by CRAs in Europe as well as globally in the Annual Reports on Nationally Recognized Statistical Rating Organizations by SEC.

The Transparency Reports are part of the disclosure rules introduced in CRA I regulation (Article 12 and Part III of Annex I, Section E). They require that CRAs release information outlined in Part III of Section E of Annex I of CRA I regulation on annual basis. These include legal structure and ownership status, information about internal control mechanisms, allocation of staff between rating tasks, report of record-keeping policy, and conclusions from the annual internal reviews, accounts on rotation policy and accounting information including revenues, followed by governance statement on the annual accounts.

When the staffing information across rating tasks is considered the only CRA which complies fully with the regulatory requirements is Moody's. The CRA publishes statistics on staff dedicated to new credit ratings, credit rating reviews, methodology or model appraisal and senior management as precisely quoted in Part III of Section E of Annex I. S&P and Fitch either report statistics relating to staffing which have not been mentioned in the regulation or present aggregate numbers which are not split across categories as required. For instance, Fitch reports total analytical staff which comprises of individuals employed in new credit ratings, reviews and methodology and appraisal (see more in section 4.4.1).

Further issue relates to availability of European CRAs data to conduct the analysis. Namely, the start reporting date for Transparency Reports amongst the big three is different. According to the Article 12 and Part III of Annex I, Section E of CRA I regulation each CRA is obliged to publish an annual Transparency Report. It should be released at the lasts three months after the end of the financial year. In case of the first report ESMA recommendation is that it should be published three months after registration in case when the date of registration exceeds more than four months from the end of the financial year (Alcubilla and Del Pozo, 2012). All the three big CRAs were registered on the same date, namely 31 October 2011. S&P and Moody's

released their first Transparency Reports in March 2011 while still undergoing the registration process.

As written by Moody's (2011) *“Moody’s Investor Service has prepared this first Transparency Report in the European Union (“EU”) pursuant to the Regulation... At present none of the MIS EU Subsidiaries have been registered. This Transparency Report reflects the structure and operation of MIS’s business in the EU for the year ended 31 December 2010, with specific information provided for each MIS EU Subsidiary as required by the Regulation. MIS anticipates that, if registered, the nature and content of this Transparency”* (Moody’s 2011; p.2).

This might raise the question as to why Fitch did not produce their first report in the same time? Was it the voluntary action of the other two CRAs or an effect of ambiguous regulation which allowed flexibility in choosing the date of the first report? Further, was there any incentive for Moody’s and S&P to release their reports one year earlier?

Furthermore, the format and content of Transparency Reports does not provide consistency of the submitted statistics across the CRAs (also see discussion in section 4.4.1). This lack of format standardisation prevents from cross sectional comparisons which seem to be the aim of having publicly available information in the first instance.

Similar issue in reporting styles is present in the SEC reports required by Section 6 of the Credit Rating Agency Reform Act of 2006. The reliability of annual reports is questionable given the volatility in the measures (see section 4.4.2.2). There is lack of standardisation of what is required. For example, CRAs report different types of outstanding ratings (issue vs issuer level) which are then tabulated and presented as alike in the SEC reports. Namely, the smaller CRAs¹⁰⁵ report number of issuer ratings (i.e. number of companies) whereas others^{106,107} including the big three (S&P, Moody’s and Fitch) disclose issue ratings (debt securities) (for more details see section 4.3). This practice lacks consistency and precludes not only the market participants but also regulators themselves from making assessments which will inform the debate about the CRAs.

105. E.g. A.M. Best, EJRB, JCR, Morningstar, R&I.

106. E.g. DBRS, KBRA.

107. Furthermore, inconsistencies among the reported outstanding ratings per asset class are present. For example in 2012 KBRA reports issue outstanding ratings on sovereigns while in previous and following years it discloses issuer ratings.

To this end one of the lessons that can be learned is that the regulation is not robust enough, since it allows individual interpretations by CRAs and fosters disclosing the information which is convenient for CRAs. In some cases it could be seen that the information provided is voluntarily presented by the CRAs rather than required by the regulation. There should be a precise requirement as to which statistics are to be produced and in which format to prevent this inconsistency in the reporting styles and enable apple vs apple comparisons.

4.2.2.3 Compliance with the regulation

Further critique relates to how the CRAs comply with the regulation itself. For instance, EU Regulation 1060/2009 Article 10 (5) on disclosure rules requires that when a CRA issues an unsolicited rating¹⁰⁸ it needs to be classified as such (see section 5.1). However, the reason the Chapter 5 is based only on S&P data is that this CRA is the only one which clearly specified which sovereigns were assigned with the unsolicited and solicited ratings across times when the regulation was being introduced. This is also the only CRA which is transparent about the solicitation status of their issuers prior to the regulatory changes. Moody's presents securities rated on the unsolicited basis after October 2010, however it was not possible to retrieve the solicitation status before that. They also report the information about which securities were rated with or without the participation of the rated issuer. Fitch on the other hand, is the vaguest amongst the three and working with their website is extremely difficult. The Rating Solicitation and Disclosure Policy released in October 2011 clearly states that the CRA obliges to disclose the solicitation status in every Rating Action Commentary. However, it is very challenging to find the list of unsolicited issuers on the website. The search engine does not recognise the word "unsolicited" and one is better off looking for this information using the generic search engine outside their web page. To find out which issuers are of which status one is required to search manually for that particular issuer at the time. Although this is not a misconduct since the CRA includes that information on their website finding it is extremely challenging and does not leave impression of an open transparency.¹⁰⁹ Majority of reports are also not available to the standard account user and are reinforced by an additional payment. Therefore standardisation in the accessibility of information across CRAS in this respect is highly important.

108. A solicited rating is a credit rating requested by the issuer who incurs the cost of the appraisal. An unanticipated (by the issuer) assessment by the CRA using public information about the issuer is known as an unsolicited rating.

109. It is very clear from the DBRS website on the other hand.

Another example implying about lack of compliance by CRAs to the regulation is visible in Chapter 6. Since April 2012 ESMA requires CRAs to disclose which ratings originate in the EU and which are issued outside but are EU endorsed. However, the reason why the empirical analysis is based solely on the three biggest CRA is because other CRAs are not transparent about this information. The exception is the DBRS which clearly states the location of the analyst.¹¹⁰

Directly related to this issue is the fact that ESMA itself does not provide direct targets and aims which are supposed to be achieved via introduction of identifiers. ESMA publications relating endorsement give an ambiguous explanation as to what purpose they serve (see section 6.2.2). For example, one of the statements mentions improving functioning, efficiency, competition and stability of financial markets with the use of equivalence rules. It is not explained however, how these identifiers are aimed to achieve this goal? Another issue which arises is how ESMA intends to examine whether such targets have been met? Are there any particular variables of interest which could indicate about progress triggered by the identifiers? Lastly, and most importantly little is known about rationale for introducing the identifiers in the first instance.

4.2.2.4 Fines and penalties

Closely related to the compliance of CRAs to the regulation is the subject of what actions are taken to correct their misconduct.

In January 2015 SEC announced charges held against S&P which was the first endorsement action ever conducted on the big three CRAs. The press release mentions three orders against S&P which are already being settled (violation of rating methodology, false and misleading publication and RMBS surveillance issues).¹¹¹ The CRA is settling the order by paying out \$77 mln fine of civil charges. There is also an ongoing order in which SEC investigates whether the head (Barbara Duka) of S&P CMBS Group concealed the less stringent methodology of

110. The CRA also informs about the solicitation status of the issuer.

111. The first case relates to misrepresentation of the methodology used when rating CMBS transactions. As a result of not disclosing the methodology which was being used, as opposed to the one S&P claimed to be in place, S&P agreed to withdraw from rating conduit fusion CMBS. After the enforcement, and as a way of getting back to the CMBS market and convincing market participants about its conservatism (stemming from the new rating criteria), S&P issued the “false and misleading article” (SEC, 2015). The research was found to be using the erroneous data and to be built on incorrect assumptions. The final order relates to deficiency in the surveillance of RMBS ratings. S&P altered one of its basic assumptions when rating these debt obligations which effectively made the ratings less conservative. According to the SEC, the outlined orders are violations of sections such as fraud, internal control, books and records violations and lastly no documentation explaining discrepancy between output of the numerical model and ratings.

the CMBS ratings. Public hearings are scheduled by the SEC Enforcement Division to determine if the allegations hold and if countermeasures are required (SEC, 2015).

Interestingly, the other two of the big tree CRAs did not undergo examinations by SEC or DOJ in the recent times. Neither did they receive penalties for their ‘contribution’ in deteriorating economic conditions leading towards financial crisis as widely expressed by market participants and academics (Hill and Faff, 2010; Financial Times, 2013; Alsakka et al., 2014).

In September 2010 SEC dropped fraud charges, aimed at Moody’s, which originated in 2007 due to a computer defect when rating CDO products (FT, 2010). As of February 2015 DOJ was at the preliminary stage of inspecting the CRA and its allegedly inflated MBS ratings from the pre-crisis period (Reuters, 2015b). It is not certain whether there will be a lawsuit. To this point Fitch was not subject of legal scrutiny by the US Justice Department.

The timing of the empirical investigation of this chapter gives a mixed picture of S&P in comparison to other CRAs. At the same time, focus of the regulatory attention and significant fines imposed on solely S&P raises the question whether the CRAs are subject to the same treatment by the regulator.

The first enforcement action on the CRAs in Europe was handed down by ESMA on the 29th June 2015 to DBRS for insufficient internal controls in place (ESMA, 2015a). However, the fine of €30,000 seems inconceivably small and not worth the effort of the legalities to conduct assessments and carry out inspections. In this respect the monetary value of the penalties and the interventions taken by the regulators should be commensurate with the amount of time spent and other costs involved when inquiring and inspecting the CRAs. Otherwise it might leave the market participants and CRAs in belief that the regulator is lenient and the consequences of not complying with regulation are not severe enough to avoid them.

4.2.2.5 Business model of CRAs

The predominant business model of the CRAs has raised number of criticisms over the recent years. The *issuer-pays*¹¹² remuneration approach offers rating information to the wider market (academics and market participants) and not only investors who purchase ratings as it is the case in the *investor-pays*¹¹³ model. It also eliminates the free-rider problem which might result in better quality of ratings (see section 2.5 and 2.5.1). Although both remuneration models are prone to the conflict of interest the *issuer-pays* model is questioned more frequently.

Some of the problems mentioned by policymakers include independence of CRAs as well as high market concentration where often shareholdings between CRAs and rated institutions overlap (SEC, 2009) (also see section 2.6.4). For instance, such conflict of interest might lead to *shopping* in ratings and put pressure on the level (thus quality) of ratings assigned by CRAs (e.g. Becker and Milbourn, 2011; Hau et al., 2013; for more information see section 3.4). Some commentators claim that the *issuer-pays* model leads to the failure of CRAs. The chief economist for the Financial Times Wolf (2009) believes “*It is a scandal that the model of payment for the credit rating agencies has not been changed. They should be paid by agents for the buyers not by the sellers.*” The theoretical literature also calls for implementing the *investor-pays* model (Mathis et al., 2009; Skreta and Veldkamp, 2009; Sy, 2009; Pagano and Volpin, 2010; Bolton et al., 2012).

On that note the World Bank (2009) published a revision document where the introduction of the *subscriber-pays* model is encouraged. Nevertheless, the report sheds light on the possible side effects of implementing such system. For example, the investors are unlikely to replace the income stream to the CRAs with their individual subscriptions. Additionally, the smaller issuers or less frequently traded issues could receive less interest in being rated. Others including CRAs believe that the conflict of interest rather being minimised could shift from the issuers to investors. The supranational organisation suggests hybrid solution, where the issuer pays for the rating the conventional way and searches for the second rating released by subscriber-pays based CRA,¹¹⁴ as a viable resolution to the problem.

112. The issuer employs the CRA to issue the rating.

113. In the *investor-pays* model the CRA attracts investors who purchase the right to view (single or) pool of credit ratings issued by them. These buy-side credit ratings are self-motivated and an effect of private needs of investors (Duan and Laere, 2012).

114. Or the hybrid CRA formed by group of intuitional investors.

In the same vein, Calomiris (2009a) criticised changing the model and stressed that the *investor-pays* model would result in inflated ratings. Namely, the investors would compensate CRAs for underestimating risk since the high ratings relax the regulatory constraints as to in which products they can finance. Additionally, Richardson and White (2009) allude to the free rider problem which might not be resolved even with increased competition.

SEC (2003) claims that although the conventional model gives rise to conflicts of interest and often inflated ratings, market participants consider CRAs to be successful at mitigating these problems. Additionally, it is argued that CRAs do not allow themselves to engage in short-sighted monetary aims by releasing low quality ratings due to reputational concerns (Schwarcz, 2002; Covitz and Harrison, 2003; SEC, 2003; for more see section 6.3.2 and 6.3.3). However, the subsequent experience of the US sub-prime crisis has starkly identified that practices in different rating segments (e.g. structured finance versus corporate ratings) can be vastly different. Publicly available ratings increase discipline in the field and prove to be a low-cost coordination mechanism (Boot et al., 2006).

To date, there is limited empirical evidence on which CRA business model is more appropriate (Jiang et al., 2012). A body of literature suggests that *subscriber-paid* ratings tend to be more timely and informative than the *issuer-paid* ratings (Beaver et al., 2006; Cornaggia and Cornaggia, 2013; Xia, 2014; Bruno et al., 2015).¹¹⁵ Bruno et al. (2015) suggest they the former are more timely because it is the paying investor who demands the rating therefore incentivising a CRA to update them more often.¹¹⁶

Further, Xia (2014) adds to the literature which finds a negative connection between the new entrant CRA and the incumbent CRA's information quality.¹¹⁷ Unlike other papers it considers the *investor-paid* CRA (EJR) which enters the market and compares the performance of the *issuer-paid* CRA (S&P) as an effect of that. The presence of the former appears to improve the discipline and the quality of ratings by the latter CRA in line with the reputation cost

115. Although the paper finds that ratings based on the *investor-pays* model are more timely and symmetric they do not advise against the converse model as a solution to the rating inflation. Firstly, because if all ratings are buy-side type some CRAs might provide ratings to those investors who prefer when they are inflated to be able to be compensated for their risk. Secondly, the conventional model "facilitates public dissemination of ratings which serve as a disciplinary tool and a low-cost coordination mechanism" (Bruno et al., 2015; p.27).

116. In their study, the CRA operating under this model (EJR) updates its ratings three times more often than the one of the largest CRAs operating under the *issuer-pays* model (Moody's). Moreover, the former ratings are more symmetric with respect to positive and negative rating events.

117. This paper adds to the dialogue on whether more competitive market is desirable (see sections 3.4 and 6.3.2).

hypothesis/channel (Mathis et al., 2009; Skreta and Veldkamp, 2009; Bolton et al., 2012; Bar-Isaac and Shapiro, 2013; Fulghieri et al., 2014; Opp et al., 2013).

What has to be considered is that the little literature which focuses on the *subscriber-pays* based model¹¹⁸ does not inquire about (the proportion of the) number of analysts involved in the rating process (to the amount of outstanding ratings). This chapter is unique in this sense as it presents long reaching comparison of the CRA market with regards of staffing against the rating output (see section 4.4.2 and 4.4.2.2).

Furthermore, the credibility of the *investor-pays* model has been undermined when EJR and its president Sean Egan (the only CRA fully operating under this model) were banned by SEC in January 2013 from issuing ratings to sovereigns and asset-backed securities (SEC, 2013). Paradoxically the allegations concern the violations of the conflict of interest and misreporting information. Prior to that, the CRA was openly expressing its critique over the *issuer-paid* CRAs and the flaws of the industry operating under this theme. Active participation in the CRAs' and SEC hearings resulted in numerous regulatory proposals and triggered uncertainty of market participants involving the credibility of the current paradigm and the big three CRAs in particular (Lindorff, 2001; Greenberg, 2002; Morgenson, 2002; Egan, 2003, 2009).

4.2.3 Human/Organization capital

The objective of this section is to introduce the importance of human capital for the working of a firm. The reviewed literature portrays the role of analysts, their coverage, incentives and performance and reveals links with the profitability and productivity of the firm. This issue relates closely to the subject of the recent regulatory changes aimed at improving transparency and disclosure rules of CRAs. By studying the value of analysts for the firm one is able to realise that the regulations increasing the disclosure rules (and as an effect need for more staff) might result in significant increase in costs for the CRAs which negatively affects their profitability. Employing this stream of literature in such context is not only an innovative approach which helps in uncovering the CRA business but also gives grounds to understanding the feedback effect of the recent regulatory efforts.

Organization capital, otherwise considered as human capital, is the expertise and knowledge that counts towards firms' capacity and productivity (Prescott and Visscher, 1980; and Lev and

118. Egan-Jones Ratings Company (EJR) is the only one fully working under this theme; see section 2.5.

Radhakrishnan, 2005). Due to the fact it is difficult to measure, organization capital has not received much attention and only recently shown to have influence on asset pricing, corporate practices, labour forces and economic growth (Lev and Radhakrishnan, 2005; Lev, Radhakrishnan and Zhang, 2009; Lustig et al., 2011; Eisfeldt and Papanikolaou, 2013; and Li et al., 2014). The key issue with human capital in contrast to physical capital is that the firm's key talent can never be fully owned by shareholders and there is always an outside option (Prescott and Visscher, 1980; Becker, 1993; Eisfeldt and Papanikolaou, 2013). Eisfeldt and Papanikolaou, (2013) show that when options to work outside the company improve for the key talent members the shareholders earn lower capital rents. Therefore they demand higher expected returns to cover for this risk.

4.2.3.1 Case for CRAs

Bar-Isaac and Shapiro (2011) investigate the CRA analyst market and the incentives of its employees, affecting CRA quality, driven by market fundamentals. These authors conceptualize a theoretical model where the analyst initially works for the CRA and later has an option to move and work for the investment bank subject to financial incentives in place. The authors find that the accuracy of ratings increases when the CRA has in place a system to scrutinize its analysts (this example directly feeds with the recent crisis situation where the complicated structured finance products ratings were of questionable accuracy since it was difficult to monitor their issuance). It is also demonstrated that ratings are more accurate when investment banking sector profits are higher since an analyst might take additional training to prepare himself for the potential post at the investment bank. Similarly, Bar-Isaac and Shapiro (2013) find that rating accuracy is countercyclical. Mathis et al. (2009) and Strausz (2005) reach similar conclusions while focusing on the incentives of analysts and the reputational effect on the rating quality. However, their studies do not incorporate changes in the economy or labour market over the business cycle. Che (1995) suggests that the thought of working for the investment bank one day incentivises novel analysts at CRAs to improve their skills and as a result captures the positive externality of revolving door between CRAs and banks. According to Bar-Isaac and Shapiro (2011) the effect is positive. Namely, possibility of gaining entry to the investment bank increases rating accuracy when the opportunities are scarce (positive revolving-door effect) whereas it might lessen rating accuracy when these opportunities are vast. These authors explain that the phenomenon of decreased accuracy has two underlying causes. Firstly, there is a possibility that a majority of CRA's analysts are less

talented novices. Secondly, after losing more experienced analysts to investment banks CRAs might reduce their motivation to train them. The latter could be observed during the peak in the mortgage boom in 2010 when many seasoned analysts from CRAs fled to investment banks for significantly higher pay packages (New York Times, 2010).

4.2.3.2 Role of analysts

In more general spirit analysts perform two roles: information provision and intermediation (Bhushan, 1989). Depending on which role they represent in the capital markets will influence firm disclosure on the demand for analyst assistance. For example, if the analyst performs intermediation role the improved firm disclosure dictates that analyst report has more value and the demand for his assistance grows. On the other hand, if the analyst is the primary information contributor, who competes with disclosures provided by firm immediately to investors, and his services do not outperform those of the firm, the demand for his assistance decreases. This conjecture is in line with Diamond (1985) who concludes that companies with more informative disclosures diminish the gains from information privately attained by analysts.

According to Rees et al. (2014) the main role financial analysts perform in capital markets is information intermediation.¹¹⁹ Beyer et al. (2010) document that analysts' predictions are part of the accounting information utilized by capital markets. It is found that these forecasts can justify 6% of the return variances of (medium) US firms. Rees et al. (2014) examine the determinants of analyst coverage in the press and its impact on their careers. They conclude that those who represent traits of higher quality analysts are more likely to be quoted in business publications. The quality characteristics are proxied by analyst's prestige, abilities, experience and effort.¹²⁰ Earlier studies find that markets respond stronger to negative news and forecasts disseminated by analysts who are known by the public (Harrington 1989; Hamilton and Zeckhauser 2004; Soroka 2006; Gaa 2009).

119. For more information see Ramnath et al. (2008) who summarize literature on the role of analysts in the capital markets.

120. Some of the variables include number of analysts, firm experience, broker size and total of firms or industries dedicated to an analyst.

4.2.3.3 Analyst coverage and performance

Results in the literature on information production and analyst attitudes are divided. One group of studies in finance finds that analyst coverage increases when firm traits are linked with the information asymmetry which follows the information provider function of analysts (Bhushan, 1989; Moyer et al., 1989; Chung et al., 1995; Ahn et al., 2005).¹²¹ They find that firm characteristics related to information asymmetry have positive impact on the quantity of analysts following a company. This is in line with the concept that private information has greater value when the firm's future is more uncertain (or when there is information asymmetry).

The reverse is concluded in Brennan and Subrahmanyam (1995) who suggest that the more analysts follow a company the lower adverse selection and information asymmetry via their increased information creation. Their paper together with Van Ness et al. (2001; p.79) concludes that analyst coverage diminishes "*in various estimates the adverse selection component of bid-ask spread*" which is in line with intermediary function of analysts.

Accounting literature finds mixed results of the relationship between firm disclosure quality and following analysts. According to Lang and Lundholm (1993, 1996) and Healy et al. (1999) higher disclosure quality leads to more analysts following firms. Barth et al. (2001), on the other hand, report that demand for analysts is greater when accounting reports are less able to provide signals about the company's worth. Barron et al. (2002) show that forecasts for firms with numerous intangible assets consist of more private information. Lobo et al. (2012) builds on the literature which finds links between analyst coverage, intangible assets and elaboration of company's reporting. They propose that since lower quality accruals are linked with more information asymmetry firms which show lower accruals quality are more inclined to give more incentives to analysts. This is because they might benefit more from private information. Overall the study examines how such accruals quality influence supply of and demand for analysts.

By studying the effect of changes in analyst coverage on corporate policies, Derrien and Kecskes (2013) find evidence that analysts directly affect firms decisions. Graham et al. (2005) document that 80% of managers value analysts so deeply that they would be willing to decrease

121. Ahn et al. (2005) suggest analyst coverage rises when costs of asymmetric information costs escalate.

investment just to meet their earnings expectations. 36% of surveyed managers regard analysts as the most important factor determining stock price of their company.

These authors test this premise using two natural experiments which address the likely endogeneity problem of analyst coverage (broker closures and broker mergers). Their paper is one of the few studies which investigate analyst coverage and corporate policies. The existing literature provides evidence that drops in analyst coverage trigger increased information asymmetry and consequently higher cost of capital. Doukas et al. (2008) illustrate firms with higher analyst coverage incur more capital expenditure and rely more on external sources of funding (debt and equity). Chang et al. (2006) focus on coverage and the capital structure whereas Yu (2008) investigates its link with the earnings management. The latter paper fills the gap by exposing that exogenous contraction in analyst coverage negatively affects investment and financing decisions. This effect is more prevalent (costly) for smaller firms and those with lower analyst coverage and those with the information asymmetry on the raise.¹²²

Additionally, Derrien and Kecskes (2013) investigate the quality of brokers and analysts. It is anticipated that analysts bring value to the company by conducting their research given that when they leave firms' corporate policy changes. As a measure of research quality, these authors use earnings estimate accuracy of analysts (and brokers), which is also supported by Mikhail et al. (1999), Hong and Kubik (2003), and Wu and Zang (2009). Hong and Kubik (2003) document that analysts who are not promoted but also have not been demoted are less accurate overall. Moreover, Derrien and Kecskes (2013) use relative expectations of analysts against their peers as a measure of their quality.

To summarise, the existing literature on the information production, analyst incentives and firm disclosure quality gives indication as to how the demand and supply of analysts is created in the financial markets. The importance of analyst coverage for the corporate policies suggests that any adjustments in staffing might have repercussions for the firm value, investment decisions and gearing. The research provided by analysts is significant for the workings of the firm and therefore is an important aspect to be considered when designing new policies. With respect to this chapter the increasing transparency and disclosure requirements might translate

122. One analyst is more valuable to the CRA with only 5 analysts in comparison to the CRA covered by 30 analysts. Loss of one individual causes a bigger upsurge in information asymmetry if there are only few others to cover for him than when there are number of analysts available. On the similar note, since the smaller CRA has more information asymmetry than the big CRAs, when an analyst is discharged it results in growth of information asymmetry (for the small firm) for which the coverage is very important.

into changes to the workings of the CRA by pushing pressure on the value of human capital. For example, the need to report the number of staff might increase costs of the CRAs which will aim to present themselves as the best equipped among other CRAs. This issue requires investigation as it might affect profitability of CRAs. This feedback effect of regulation might be shifted onto customers by the CRAs willing to keep their proceeds intact.

4.2.3.4 Effect of financial analysts

This strand of literature measures effects of financial analysts on firm value. Numerous findings suggest analysts have positive effect on firms because they lessen information asymmetry, have forecasting abilities and act as external scrutinizers of management (e.g. Brennan and Subrahmanyam, 1995; Hong et al., 2000; Yu, 2008; Ellul and Panayides, 2009). For this reason, they are found to positively influence firm's investment choices, share prices, liquidity and valuations (Bradley et al., 2003; Irvine, 2003; Chang et al., 2006; Derrien and Kecskes, 2013; Kelly and Ljungqvist, 2011).

On the other hand, Dechow et al. (2010), Dugar and Nathan (1995) and Hong and Kubik (2003) argue that analysts grant overoptimistic earnings growth forecasts. This leads to miscalculation of firm's equity (Bradshaw et al., 2006). Graham et al. (2005) identify that analysts place strain on managers at the same time triggering myopic attitudes. Managerial myopia suggests that managers in public firms focus on short term achievements and profits rather than on the long-term gains. This is because they are under more pressure to show good short-term performance in relation to their private-firm counterparts (Hea and Tian, 2013; Asker et al., 2015). Bushee (1998) documents the cost of research and development is likely to be reduced as a result of earnings drop when short-term investors constitute majority of ownership.

Hea and Tian (2013) show that analyst coverage induced by an exogenous shock negatively affects firm's innovation. The underlying rationale is that analysts exercise significant pressure on managers, which manifests itself in focusing on short-term plans instead of long-term investments (i.e. in innovation). These authors conclude that firms with higher coverage of analysts invent less patents or lower quality ones. This combined with the notion that patents positively correlate with firm's market value (Hall et al., 2005) shows that analysts have negative effect on firm value by dampening innovative operations. Although analysts are known to reduce information asymmetry this positive function is outweighed by their negative

effect on innovation. Their paper adds to the existing body of literature in finances and innovation.

Manso (2011) finds that accepting failure in the short horizon and encouraging success in the long horizon by managers works best for inspiring innovation. Ferreira et al. (2013) claim that private ownership with literally no analyst coverage is the best setting for firms' innovation. Factors which were found to influence managers to take on innovations include size of the company (Aghion et al., 2013), corporate venture capital (Chemmanur et al., 2014), equity ownership (Lerner et al., 2011; Bernstein, 2015) and financiers' resilience to failure (Tian and Wang, 2014).

This section suggests that the increased analyst coverage (via an exogenous shock) might have a negative effect on the firm's innovation and consequently market value (since these measures are closely correlated with each other). This might raise questions whether CRA regulation could act as an exogenous shock which can trigger negative effects on firms via changes to analyst coverage (e.g. via profitability or the competition channel). As a result, this chapter presents some threats that regulators should uncover while forming future policies. Its main contribution lies in the synergy of three streams of literature: human capital, CRAs' analysts and regulation.

4.2.4 Contribution to the literature

Section 4.2 adds to the discussion of the recent regulatory changes aimed at reducing mechanistic reliance on ratings. The reporting styles and standards when submitting information to the supervisory body are compared amongst CRAs. Consequently advantages and disadvantages of using various reports as data sources for analysis are discussed.

Additionally, the section offers a critical assessment of actions taken up to date and possible scope for improvement. For instance, the rationale behind the recent fines and penalties incurred by CRAs up to this date is evaluated. The effect of such actions on the profitability via increasing costs to the CRAs and its effect on the workings of the CRAs' business is a major contribution. To my knowledge there is no other study which investigates the link between increased transparency requirements and profitability of CRAs. Further, this chapter evaluates whether the ability of CRAs to compete in the global markets is affected as previously shared by the CRAs.

Furthermore, this is the only study which employs the human capital literature in the context of the lowered profitability induced by the channel of regulation. Understanding the importance of the organization capital for the working of the CRAs and raising costs due to transparency and disclosure requirements helps in portraying the feedback effect of the regulatory actions and therefore is of policy relevance.

To summarize, this chapter bridges the three streams of research. It links the effect of regulatory actions and its effect on the performance of the firm with the close focus on the role of analysts.

4.3 Data sources

Statistics on qualifications required by analysts and senior analysts at S&P and Moody's are available from CRA's Transparency Reports. This constitutes an integral part of the disclosure rules introduced by CRA I regulation (see section 4.2.2.2). Although these reports provide details on the number of analysts and costs incurred by the main three CRAs across EU entities, their time series coverage is limited due to the recent regulatory change. For S&P and Moody's it starts in 2010 whereas for Fitch in 2011. These statistics are presented in Appendix 4.A Tables 4.A.1-4.A.3 for further information.

To expand the sample size but also enable across CRAs comparisons, two alternative sources of data are used. SEC Annual Reports on Nationally Recognized Statistical Rating Organizations (NRSROs) report the global number of specialists (analysts and supervisors), the number of outstanding ratings and the concentration levels (HHI index; inverse HHI) of the 10 NRSROs. The available data covers the period between 2008-2014. However, SEC reports data on outstanding ratings is not uniform amongst the CRAs (see Tables 4.3-4.4). This is especially transparent when sovereign ratings across CRAs are considered (see column 7 Table 4.3a) (for critical overview of regulation see section 4.2.2).

To make the quantity of ratings amongst CRAs more comparable, the issuer level ratings assigned between 2008-2015 to different CRAs is accessed from the Interactive Data Credit Ratings International (IDCRI) (see Table 4.5).^{123,124} Each issuer is counted only once however there are a few exceptions when double counting on specific asset types could occur in this

123. Data is available from November 1999 to April 2015 in monthly frequency. To obtain the yearly frequency the outstanding number of ratings is recorded as of January of each year.

124. Herein I refer to this dataset as rating "IDCRI" dataset whereas sources used previously are classified as "SEC" dataset. The data is provided to me by my supervisor Owain ap Gwilym.

database.¹²⁵ IDCRI provides (issuer) ratings for Capital Intelligence and R&I which are not available from the SEC dataset. These CRAs are dropped from sample because there is no information about their number of analysts. In comparison with the first (SEC) dataset EJR, KBRA and Morningstar ratings are not available from IDCRI. The CRAs compared amongst the two datasets comprise outstanding ratings by A.M. Best, DBRS, Fitch, JCR, Moody's and S&P. See Table 4.6 for comparison of the two data sources.

Profits and revenue data for big three is available from SEC annual filings 10-K Forms of the parent companies (see Table 4.8). For example, S&P statistics are provided in reports by McGraw-Hill Financial Services' with those for Fitch from the Fimalac Group. The availability of segmented data for rating activities by S&P is available for the period 2008-2014. There are earlier consolidated figures on profit and revenues for McGraw-Hill Financial Services, however they do not differentiate the rating activities. Fitch data are continuously reported up until 2013 and date back as far as 1999. Since the CRA is based in Europe the reporting in Euro (€) was converted into Dollars (\$) using the historical exchange rates provided in the (same) annual reports. The revenue statistics for Moody's are available between 1998-2014. In terms of profits, the reports do not differentiate the operating income (operating profit) which has been gained from the rating services standalone for the first three years (1998-2000). As explained in Moody's (2000), these activities comprise 86% of the company's revenues.

4.4 Empirical evidence

4.4.1 Evidence on analysts-European perspective

Table 4.1 presents statistics for qualifications required by analysts and senior analysts available from Transparency Reports in the EU. As can be seen S&P separates the functions on more levels than Moody's. Fitch does not report this information. This situation illustrates the differences in approach of the CRAs when releasing information (of voluntary versus compulsory).

In addition, the reporting style between the CRAs in the Transparency Reports differs significantly. Each of the CRAs produces different categories and segments of the analyst coverage (see Appendix 4.A Tables 4.A.1-4.A.3). For example, S&P informs about the number

125. E.g. for Moody's banks are included with debt both and deposit ratings; for S&P and a few instances for Fitch, insurance companies are included with both debt and financial strength ratings; for Capital Intelligence banks have long term debt ratings and financial strength ratings assigned.

of analysts working on the different rating classes such as corporate and government, structured finance and following this depicts number of quality and criteria as well as analytical and general managers. Moody's on the other hand, focuses on the angle of rating activities performed by analysts when quoting their numbers (i.e. new credit ratings and/or reviews, methodology appraisal). They additionally outline the number of support staff and senior management. Lastly, Fitch presents the total number of analytical staff with the differentiation between supervisors, global heads and support staff.

The time span of these data sources is very short and inconsistent, therefore the main analyses within this chapter are based on other data sources. S&P and Moody's report data continuously between 2010-2014 whereas Fitch only started releasing their information from 2011 (for critical evaluation see section 4.2.2.2). The sample applies to the data on revenues published by the CRAs. Therefore it is not tabulated.¹²⁶

There is an evident slump in the number of analysts between 2011-2012 for Moody's and Fitch which picks up again in 2013. Moody's is on the increase even after 2013 whereas S&P and Fitch reduce their staffing levels. Due to short time-series and the reporting style of these two CRAs it is not possible to distinguish whether this drop is attributed to the particular rating segment (in contrast to S&P information, where this differentiation is made). For example, one could strongly anticipate that fewer analysts were needed for structured finance than previously.

Short time-series and lack of comparability is the major drawback of these reports. More standardised reporting format is needed in the future to allow more in depth comparisons across the CRAs in Europe. For example, once this is achieved, detailed analysis of each geographical segment per CRA entity can be performed.

126. Data on revenues across European entities per CRAs is available from Transparency Reports for the period 2010-2014 for S&P and Moody's and 2011-2014 for Fitch.

4.4.2 Evidence on analysts- Global view

The corresponding (global) number of specialists for each CRA reported to SEC between 2008-2013 is depicted in Table 4.2. As suggested in SEC annual report for NSROS's (2014) the rising staffing levels (i.e. rating analysts) could indicate actual or (possible) increases in rating activity. This could also imply that a CRA is expanding its operations by entering new markets. Additionally, increasing analysts' coverage could be aimed at improving rating quality or reassuring regulators about CRAs compliance with regulation. Overall, this measure is useful to compare the state of the CRA's business and its business outlook.

As presented in Figure 4.2 (based on Table 4.2) the changes in number of staff involved in rating process for the smaller CRAs have been rising between 2009 and 2011 when they reached the peak especially for KBRA, DBRS and Morningstar.¹²⁷ For these CRAs changes in staffing show a dramatic drop around 2012 and start picking up again. The remaining three CRAs (A.M. Best, EJR, JCR) show much slower gradual increases in their staffing after the significant drop in 2010. Overall, smaller CRAs such as EJR, KBRA and Morningstar, which rely (entirely or partially) on the *investor-pays* model, report the number of analysts falling below sixty. The case of EJR is especially alarming. It is debatable if the CRA can operate reliably under the *investor-pays* model with help of only few analysts. In the period 2008-2013 the CRA reports having 7 analysts on average while releasing over a thousand issue ratings (for a discussion see section 4.2.2.5).

Among the big three, Moody's and Fitch show a decline in the analyst number around 2010. For the latter it is very steep reaching a 24% drop (331 less analysts were recorded). Moody's experiences a sink of nearly half of this magnitude -10.3% (129 analysts were discharged) in the 2012. This was followed by a strong raise in 2013 where the previous levels were obtained (i.e. 10.8% of them are reported back and the number of analysts increased by 121). S&P on the other hand, shows the opposite effect. Namely, it recruits more analysts reaching its peak at 8.3% (increase by 103 analysts) in 2010 after which it undergoes a steady decline.

127. SEC (2014) suggests that the rising levels of analysts for KBRA and Morningstar could be due to increasing number of ratings based on the *issuer-pays* model in the previous couple of years (not only subscriber-pays model as before) (for an overview of the business model of CRAs see 2.5 and 2.5.1. For comparison of the two models see section 4.2.2.5).

4.4.2.1 Outstanding ratings

Number of outstanding ratings per CRA available from SEC is depicted in Table 4.3a. It captures the dynamics of the industry in the years prior and after the legislative and regulatory changes emerged. However, since the beginning of the available data coincides with extreme staffing activities, by DBRS¹²⁸, Moody's in 2008 and in 2011 for Morningstar, the outstanding ratings are scaled (by dividing them) by the total number of analysts to illustrate them graphically (see Table 4.4).

As an additional exercise ratings by S&P classified between the main asset groups and solicitation status are explored (for latter classification see section 2.3). Data on long-term foreign currency ratings together with the solicitation status is acquired from S&P Global Credit Portal publications. The data spans between 2006-2012 and comprises issuers from variety of industries including ABS, corporates, financials, sovereigns, insurance and utilities (see Appendix 4.B Table 4.B.1). The former group relies solely on the contracts with the issuers, the same as the utilities. Corporate, financial institutions' and insurance ratings are issued on the unsolicited basis only in less than 0.5% cases. The group which receives the most ratings without the request of the issuer is sovereigns which account for 1.6% of released ratings. For an in depth discussion and empirical investigation of solicitation status of sovereigns and its economic implications see Chapter 5.

4.4.2.2 Ratings to analysts (R/A) ratio

The magnitude of ratings to the analyst ratio is used to see if the staffing costs to the CRAs increase relatively to the supply for ratings (e.g. number). Alternatively it picks up if staffing expenses are irrespectively higher with respect to the number of ratings produced (no change in supply) which could be due to other reasons (i.e. regulatory). Using this measure the impact of regulatory pressures is investigated from the perspective of the CRA in contrast with the majority of papers which focus on the reaction of the market (issuer). Decreasing ratio indicates about raising costs to the CRA due to staffing despite the same or lower amount of outstanding ratings. This could potentially result in the enhanced quality of released ratings as more analysts are allocated to perform rating activities. On the other hand, increasing ratio would signal that

128. Additionally there is a change in the reporting style to the SEC by DBRS after 2007. Namely, the issuer ratings disclosed in 2007 are replaced by issue ratings in the years to follow (and hence the large magnitude of the percentage change in the total amount- column 10 of Table 4.3). This does not affect data sample since the majority of statistics are available since 2008.

the number of ratings is increasing or remains the same whereas the number of analysts is dropping. Although in such scenario costs to the CRAs are not increasing having less analytical staff could have serious consequences on the quality of given ratings.

After scaling ratings (by dividing them by number of analyst), some extreme values still remain. For EJR the number of analysts is surprisingly low in contrast to the number of outstanding ratings and therefore the Ratings/Analyst ratio is very high. The percentage changes of the R/A ratio across the years 2008-2009 and 2009-2010 are the highest amongst all CRAs in the examined data sample¹²⁹ (see Table 4.4). For instance, in 2009 the CRA claimed to be reporting above 1000 ratings by only 8 analysts of which 3 are supervisors. The ratio increased even further in the following year (Table 4.4, Figure 4.3- EJR). One could argue that releasing this amount of ratings per year by only a few analysts is not credible and raises doubts about the business model and ethics of EJR. Additionally, it is to be kept in mind that the CRA uses the *subscriber-pays* model, which involves issuing far higher number of ratings by an analyst than would be the case for CRA under the *issuer-pays* model. This finding is of policy relevance and is further discussed in section 4.2.2.5.

Similarly high change in the ratio is reported for KBRA in 2011 when it decreased by 54%. In 2010 the CRA issued more than 17600 ratings with help of a team smaller than 15 analysts. In the following year the CRA employed 100% more staff who despite that constitute less than 30 analysts.

Figure 4.3 presents differences in the dynamics of the ratio between smaller versus big three CRAs. As can be seen DBRS shows similar patterns to S&P and Moody's representing steady and smooth movement across the years. As can be seen the trend for smaller CRAs is downward sloping. Additionally, as depicted in Table 4.4, the changes in the R/A are in majority on the negative side implying increasing costs to the CRAs. These are not extreme costs burdens without few exceptions when the change in the ratio exceeds 20%. On the opposite side, there is only handful of instances when the CRA is understaffed while producing vast amounts of ratings.

Certainly, it can be stated that Fitch is the most volatile CRA with regards to R/A Ratio amongst the studied CRAs. In 2009 and 2011 there is a significant decrease in the ratio indicating about amplification of the costs to the CRAs to produce the same or similar amount of ratings. The

129. Change of 102% (66%) is recorded for the 2008-2009 (2009-2010) period respectively.

slump in 2011 is one of the most dramatic amongst all other CRAs (33.9%).¹³⁰ Namely, the numbers of analysts increased by 4.5% while the number of ratings dropped by 31% (see Table 4.2 and 4.3a).

Since SEC data on outstanding ratings is not consistent amongst the CRAs (representing issuer ratings for some CRAs and issue ratings for others; see section 4.2.2.2 and 4.3) the alternative source of data is used. Table 4.5 presents number of outstanding issuer ratings obtained from the IDCRI dataset and repeats the number of analysts per CRA from the original dataset, it then presents ratio between the two. As can be seen there are minor discontinuities in the data especially when the ratio is calculated. Although the ratings information from IDCRI is available between 1999-2015 the analyst data series from SEC dataset only covers period 2008-2013. Having an additional dataset enables comparisons of the available statistics between the six CRAs (see Table 4.6).¹³¹ There is strong positive correlation (0.94 significant at 1%) between the outstanding ratings from both data sources which suggests using either measure will produce similar results although the CRA coverage differs (see Figure 4.8).¹³² The Ratings to Analyst (R/A) Ratio is strongly negatively correlated between the two datasets (-0.59 at 1%) (see Figure 4.9). Analyst data is fixed therefore it is only influenced by ratings count.

4.4.2.3 Competition amongst CRAs

The final statistic provided in (column 8) Table 4.4 captures the competitive environment of the industry measured by the outstanding number of credit ratings as a proportion of the largest 10 CRAs. The percentage change and levels are also reported and plotted in the Figure 4.5 differentiating between smaller and bigger CRAs. The change in the market share over the years is relatively steady for A.M. Best, S&P and Moody's. The strongest inclination in opposite directions can be seen for Morningstar, DBRS and Fitch. Namely, in 2011 Morningstar gained approximately 108% of its own market share, DBRS 31% whereas Fitch lost almost 26% of its relative market share. Outstanding ratings per asset class suggest the shift across ratings in 2011 where Fitch recorded a drop in financials by 11% (from 61550 to 54586) and sovereign ratings by 40% (from 363897 to 217198). Overall, the drop that year for

130. Except for the EJRI where the ratio dropped by 36.8% in 2013, KBRA by 54.5% in 2011 and Morningstar 39.1% in 2013. The latter two series have not been plotted due to short time series (i.e. 2010-2013).

131. Obvious differences in reporting types of ratings (i.e. issue versus issuer) are distinguishable between the two data sources. The IDCRI dataset is consistent as it only shows issuer ratings for all CRAs. In SEC dataset out of six CRAs only two CRAs (A.M. Best and JCR) report issuer ratings while the remainder disclose the issue ratings. The differentials between reporting of two data sets are highlighted in bold. See section 4.2.2.2 for directly related policy issues.

132. Deviation is influenced by sovereign and ABS categories in particular.

number of all rated classes yielded 31% (see Table 4.3a). DBRS recorded raise in the financial ratings of 45% (from 14941 to 21695) and an increase in corporate ratings by 5% (from 3863 to 4037), furthermore sovereign ratings output increased by 17% (from 13533 to 15798). Overall DBRS issued 21% more ratings across all categories (Table 4.3a).

In absolute terms the concentration of the CRAs market did not change as much as individual CRAs workings. In Table 4.7 the Herfindahl-Hirschman index (HHI) was calculated using the formula below (Equation 4.1) where the N is number of firms, s_i is the share of firm i in the market. The HHI index can range up to 100^2 , or 10,000. The inverse HHI was calculated by dividing the 10,000 by the HHI. The values below 1,500 suggest unconcentrated market, 1,500 to 2,500 indicates moderate concentration whereas anything above is high concentration.

$$H = \sum_{i=1}^N s_i^2 \quad (4.1)$$

HHI (or inverse HHI) suggests that CRAs experienced increased concentration levels between 2008-2011, which remained at a similar level after that. This suggests that the competitiveness among CRAs is slowly decreasing and the main players dominate the market despite the regulatory efforts. Amongst all categories the market in 2008 was dominated by 2.99 CRAs whereas post-regulation in 2013 by only 2.72 CRAs.

The HHI of 3649.63 shows that in 2011 the total credit rating market was highly concentrated and this is an equivalent of $(10,000/3649.63)$ 2.74 equally weighted CRAs (see Table 4.7). This result shows a drop from the previous year when it amounted to 2.88. What can also be seen is that there is the least competition amongst sovereign ratings. This pattern has been increasing over the years where the concentration reached its highest level in 2013 (4065.04). If sovereigns are excluded from the analysis the market was least (most) concentrated in 2011 (2010) respectively. The former date coincides with the introduction of CRA II regulation in Europe and nominating ESMA as a supervisory body for CRAs (Alsakka et al., 2015). The financial ratings are the only business segment where the concentration reached lower levels than 2500 (moderate concentration) and at the same time allowing more than 3 players to compete in the market.¹³³

133. The alternative measures of competition/concentration used in the banking literature include Panzar and Rosse (1987) H-Statistic, and measure of bank density, the ratio of banks to population (log). The non-structural measures such as Lerner index (1934) and Boone indicator (Boone, 2008) are considered more precise and robust than the structural measures since they do not correlate with the concentration measures (i.e. H-Statistic) as strongly (Love and Peria, 2014).

These findings give strength to the argument shared by CRAs when regulatory changes started taking effect. Namely, it can be seen that the level of competition in the CRAs industry has been deteriorating in recent years, especially in case of sovereign ratings. Unquestionably, the span of time series (i.e. number of years) and the measure itself, which does not change significantly from year to year, is not the best predictor of the state of affairs for CRAs. Therefore, these results will be assessed in parallel with the profitability measures reported by CRAs.

4.4.2.4 Profitability measures

Revenue and profit figures for the big three CRAs are depicted in Table 4.8. The measures are assessed over time to see if there are any noticeable fluctuations surrounding the regulation. Applying these variables differentiates this study from the rest of the literature.¹³⁴ Due to data availability other market players are not evaluated here.

Since the S&P time series of revenues and profits is much shorter and starts relatively late, these statistics are plotted against each other (individually) separately from other two CRAs (see Figure 4.6). The two series form almost straight lines diverging from each other with similar magnitude until the 2013 where profits plummet unexpectedly (reaching 166% decrease from the previous year). Although the revenues recorded in 2014 increased by 8% from the previous year mainly due to growing corporate and financial ratings services, increased fees and fines among others significantly reduced profits in those years (see section 4.2.2.4). In fact in 2014 profits reached its lowest levels ever recorded (-583 mln loss). According to McGraw Hill Financial K-10 filing from 2014 this drop can be justified by \$1.6 billion of legal and regulatory settlements which took place in 2014. To give a perspective in 2013 these settlements amounted to \$77 million.

In 2013 and 2014 the company underwent major restructuring aimed at changing the management structure to increase cost effectiveness and taken steps to exit the non-strategic businesses. The initial restructuring charge for S&P Ratings in 2014 however was significantly higher than for the previous year.¹³⁵ This together with elevated legal costs can potentially explain the severe losses in 2014.

134. According to SEC (2014) although this information is required by the Commission under section 17g-3(a)(3) it is not required to be publicly available.

135. In 2013 it amounted to \$13 whereas in 2014 it reached \$45 million.

The revenues of Moody's and Fitch show a similar upward trend up until 2013 however, data for 2014 has not been released yet. The highest revenues for Moody's were reported up until 2007 during the outburst of the crisis whereas the biggest slump followed in the year subsequently after that. The revenues stagnated in between 2008-2009 and picked up again after 2009 and are on a constant raise. A similar pattern was observed for Fitch with the peak reaching up in the 2008 and its subsequent decline after that (see Figure 4.7b). In terms of percentage changes, the biggest drop for Fitch (Moody's) was recorded in 2009 (2008) with -36.8% (-30.9%). The biggest positive change in revenues for Fitch (Moody's) was recorded in 2008 (2001) with 50.3% (47.4%) (Figure 4.7a).

In terms of profits (levels), Fitch reports relatively steady accounts with a small increase in 2008. Moody's on the other hand is more varied across the years (see Figure 4.7b). Up to 2007 profits were on a constant growth reaching its peak and then dropped significantly in 2008-2009 reaching lowest estimates in almost two decades.

Changes in profits by Moody's present relatively steady accounts with the significant slump around 2008 represented by 40.6 percentage points drop in profits (see Figure 4.7a). Fitch series are more volatile reaching highest peak in 2001 yielding 112.5 percentage change.

To summarise, this section presents mixed results on the impact of regulation on CRA's profitability. As can be seen from Table 4.8 the direct measures of profitability do not detect any increases in costs for Fitch and Moody's which could be attributed to the regulatory changes. Namely, problems with profitability end in 2009 for Moody's and in 2010 for Fitch and the productivity is on the increase after that. Somewhat mixed picture is presented by S&P which after the crisis suffers losses in 2011 and 2014. The latter can be explained by the significant fines imposed by the regulator along the restructuring costs which supports the fears of CRAs towards regulation expressed in their publications.

4.4.2.5 Revenues to profits ratio (R/P)

Additionally, to enable comparison amongst the three CRAs the revenues have been scaled by dividing them by profits (see R/P in Table 4.8). The smaller the ratio is (in absolute terms) the higher proportion of profits is in relation to revenues; therefore indicating about higher productivity and vice versa. It can be seen that overall Moody's has the highest proportion of profits in relation to its revenues. In 2004 and 2006 the profits reached \$782.2m and \$1010.7m respectively, which corresponds to the highest peaks in profitability between 2001-2014 (the ratio is 1.68 in both instances). The biggest drop in profitability was observed around 2008 when the ratio amounted to 2.11 (which is a 16.3% increase from the year earlier). In the following year CRA experienced the lowest profitability to date.

For S&P, 2008 is associated with the highest profitability among the available data. The CRA reported \$749.3m profits out of \$1583m revenues. The profitability (as proportion of revenues) has been on the decrease ever since 2008 until the end of the sample period 2014. The biggest slump in productivity is encountered in 2014 when the profits reach negative value. Additionally, in 2011 the ratio increased considerably to 2.45 from the earlier position of 2.22 constituting 10.3% drop in profitability.

For Fitch, 2013 was the year of the best financial performance when \$332.3m profits were recorded in contrast with \$753.3m revenues (ratio stands at 2.27). The CRA shows gradual improvement in profitability across years 1999-2013. Ever since 2005 Fitch recorded profits of above \$130m with the R/P ratio below 4. The biggest intensification in profits was observed in 2001, 2005 and 2013. The biggest slump, on the other, hand took place around the crisis period in 2008 when the ratio amounted to 3.33 representing 22.6% increase from the year earlier. This resembles other CRAs' performance from that period (although for S&P data is not available prior to 2008 the R/P ratio level is the same as that of Moody's- 2.11).

These findings add to the discussion presented in the earlier section (4.4.2.4) where the direct profitability measures were analysed and the link with the regulation was made. The ratio allows somewhat more detailed examination of the trends presented by each of the CRAs. For example, it is evident that the S&P is on the negative spiral in terms of its profitability from the beginning of the available data which evolves around the financial crisis. In comparison to this Fitch shows high volatility in respect of its productivity. On the other hand, Moody's profitability was in jeopardy until 2008 and has been improving ever since. Looking at these

mixed estimates it is difficult to ascribe a definite weight to the CRA regulation. With certainty there is a discrepancy in the financial health of the major players and their behaviour should be investigated in the coming years whether it is due to regulatory reasons or other underlying problems.

4.5 Conclusion

This chapter offers a twofold contribution. Firstly, it investigates the responses to the regulatory changes aimed at reducing mechanistic reliance to ratings via increased transparency requirements. The chapter fills a void in the literature which measures the impact of the regulatory changes on CRAs in Europe and complements studies which investigate the US regulations (ultimately giving a cross-country perspective). The portfolio of studied CRAs covers the vast majority of the market share which thereby offers a reliable overview of the industry. Investigation of the number of analysts compared to the outstanding ratings finds suggestive evidence of amplification in costs to the CRAs in the recent years. Nevertheless, these results are mixed. In this exercise, Fitch is found to be one of the most volatile amongst all other CRAs. Moreover, the chapter considers the direct measure of profitability of the big three CRAs and does not find any rise in costs. The only exception is S&P which faced heavy fines and legal fees in 2014.

Moreover, it is also found that the level of competition across CRAs reduced under the new regulatory regime. The concentration levels have been on the increase subsequently after the 2011 slump which corresponds with the CRA regulatory interventions in Europe. These findings might confirm the fears expressed by CRAs when the disclosure rules were being implemented.

Secondly, the chapter offers a discussion and critique of the recent regulatory actions with respect to their objectivity, practicality and reliability. For instance, some of the problems of the CRA system identified by the EC suggest subjectivity on their part. The issues have been raised to the global problem and half of them do not have underpinning evidence (two out of four main areas).

Additionally, the chapter finds many inconsistencies in data reporting by the CRAs which sheds light on the lack of standardisation and explicit requirements by the regulators. Problems with compliance with regulations were also recognised when dealing with data across different CRAs.

Further, it is unclear why S&P is the only CRA (as at May 2016) which has been fined significant amounts for their misconduct and deficiency in surveillance while all CRAs have been accused for contributing to the deteriorating economic conditions during the financial crisis. This raises the question as to whether other CRAs are receiving the same attention from the regulators.

Finally, the chapter draws attention to the need to reconsider whether the investor-pays model (which is considered superior by many commentators) should be proposed as an alternative to the conventional remuneration model (Pagano and Volpin, 2010; Bolton et al., 2012; Cornaggia and Cornaggia, 2013; Xia, 2014; Bruno et al., 2015). The recent restrictions on the only CRA working explicitly under this business model place doubts on the credibility of the paradigm. This is further questioned by the surprisingly low number of staff employed to rate a very large number of issues.

To conclude, this chapter demonstrates empirical evidence which can have future policy implications. The above-mentioned findings contribute towards several aspects of the debate on CRA regulation. The outcomes should be of interest to policymakers, academics and market participants alike. The portrayed issues offer potential for future research, as the regulatory actions progressively increase their influence in the CRA industry.

Table 4.1 Qualifications for credit analysts

CRA	Type of role	Education level	Minimum years of experience
Moody's			
	Junior level credit analyst	Bachelor's degree in Finance, Economics, Accounting or Computer Science; additionally Master's degree or higher degree in Finance, Economics or related field or Chartered Financial Analyst or Certified Public Accountant	2
	Senior level credit analyst	Master's degree or advance degree in Finance, Economics or related field and a professional qualification such as Chartered Financial Analyst or Certified Public Accountant	4
	Credit analyst supervisor	Master's degree or advance degree in Finance, Economics or related field and a professional qualification such as Chartered Financial Analyst or Certified Public Accountant	15
S&P			
	Junior level credit analyst	Bachelor's degree, MBA, CFA, JD or other relevant degree or designation preferred	2
	Mid-level credit analyst	Bachelor's degree, MBA, CFA, JD or other relevant degree or designation preferred	5
	Senior level credit analyst	Bachelor's degree, MBA, CFA, JD or other relevant degree or designation preferred	7
	Credit analyst supervisor (mid-level)	Bachelor's degree, MBA, CFA, JD or other relevant degree or designation preferred	7+5
	Credit analyst supervisor (senior)	Bachelor's degree, MBA, CFA, JD or other relevant degree or designation preferred	7+7

Source: Information collected from Forms NRSRO "Application for registration as a Nationally Recognized Statistical Rating Organization (NRSRO)" released on websites of individual CRAs. S&P's form available at: <http://www.standardandpoors.com/ratings/form-nrsro/en/us>, Moody's form available at: <http://www.moody.com/sites/products/ProductAttachments/NRSRO%202013.pdf>

Table 4.2 Number of credit analysts and credit analyst supervisors

Year	CRA	Credit Analysts	Credit Analyst Supervisors*	Total	Δ Amount	Δ Perc
2008	A.M. Best	144	50	194	-	-
2009	A.M. Best	134	42	176	-18	-9.3
2010	A.M. Best	77	43	120	-56	-31.8
2011	A.M. Best	82	41	123	3	2.5
2012	A.M. Best	-	-	126	3	2.4
2013	A.M. Best	-	-	123	-3	-2.4
2008	DBRS	62	24	86	-	-
2009	DBRS	67	20	87	1	1.2
2010	DBRS	75	20	95	8	9.2
2011	DBRS	84	34	118	23	24.2
2012	DBRS	-	-	93	-25	-21.2
2013	DBRS	-	-	98	5	5.4
2008	EJR	12	3	15	-	-
2009	EJR	5	3	8	-7	-46.7
2010	EJR	2	3	5	-3	-37.5
2011	EJR	2	3	5	0	0.0
2012	EJR	-	-	5	0	0.0
2013	EJR	-	-	7	2	40.0
2008	Fitch	1057	305	1362	-	-
2009	Fitch	1035	345	1380	18	1.3
2010	Fitch	712	337	1049	-331	-24.0
2011	Fitch	758	338	1096	47	4.5
2012	Fitch	-	-	1092	-4	-0.4
2013	Fitch	-	-	1102	10	0.9
2008	JCR	59	23	82	-	-
2009	JCR	61	27	88	6	7.3
2010	JCR	27	30	57	-31	-35.2
2011	JCR	24	33	57	0	0.0
2012	JCR	-	-	59	2	3.5
2013	JCR	-	-	57	-2	-3.4
2008	KBRA	8	4	12	-	-
2009	KBRA	7	4	11	-1	-8.3
2010	KBRA	9	4	13	2	18.2
2011	KBRA	22	6	28	15	115.4
2012	KBRA	-	-	37	9	32.1
2013	KBRA	-	-	58	21	56.8
2008	Moody's	1124	126	1250	-	-
2009	Moody's	1096	143	1239	-11	-0.9
2010	Moody's	1088	116	1204	-35	-2.8
2011	Moody's	1124	128	1252	48	4.0
2012	Moody's	-	-	1123	-129	-10.3
2013	Moody's	-	-	1244	121	10.8

Year	CRA	Credit Analysts	Credit Analyst Supervisors*	Total	Δ Amount	Δ Perc
2009	Morningstar	15	7	22	0	0.0
2010	Morningstar	17	7	24	2	9.1
2011	Morningstar	26	10	36	12	50.0
2012	Morningstar	-	-	22	-14	-38.9
2013	Morningstar	-	-	30	8	36.4
2008	R&I	80	80	160	-	-
2009	R&I	81	6	87	-73	-45.6
2010	R&I	74	4	78	-9	-10.3
2011	R&I	-	-	-	-	-
2012	R&I	-	-	-	-	-
2013	R&I	-	-	-	-	-
2008	S&P	1081	228	1309	-	-
2009	S&P	1019	223	1242	-67	-5.1
2010	S&P	1109	236	1345	103	8.3
2011	S&P	1172	244	1416	71	5.3
2012	S&P	-	-	1436	20	1.4
2013	S&P	-	-	1465	29	2.0

*Some credit analyst supervisors may also have analytical responsibilities. Source: Data acquired from annual reports on NRSROs by SEC published between June 26, 2009 and December 25, 2014. Reports are available from: <http://www.sec.gov/divisions/marketreg/ratingagency.htm#nrsroannreps>. Notes: There is no breakdown between analysts and analysts supervisors for 2012 and 2013. ΔAmount stands for the amount change in the Total whereas ΔPerc for the percentage point change in the Total.

Table 4.3a Outstanding ratings reported by CRAs

Year	CRA	Financial	Insurance	Corporate	ABS	Sovereign	Total	ΔAmount	Δ Perc
2007	A.M. Best	3	6129	2696	54	0	8882	-	-
2008	A.M. Best	3	6009	2710	54	0	8776	-106	-1.2
2009	A.M. Best	3	5364	2246	54	0	7667	-1109	-12.6
2010	A.M. Best	-	5062	2043	54	-	7159	-508	-6.6
2011	A.M. Best	-	4826	1910	56	-	6792	-367	-5.1
2012	A.M. Best	-	4610	1787	55	-	6452	-340	-5.0
2013	A.M. Best	-	4492	1653	56	-	6201	-251	-3.9
2007	DBRS	855	35	590	840	45	2365	-	-
2008	DBRS	18040	110	7080	7470	10560	43260	40895	1729.2
2009	DBRS	16630	120	5350	8430	12400	42930	-330	-0.8
2010	DBRS	14941	156	3863	10091	13533	42584	-346	-0.8
2011	DBRS	21695	151	4037	9889	15798	51570	8986	21.1
2012	DBRS	16222	148	3736	10054	15952	46112	-5458	-10.6
2013	DBRS	13624	150	3790	10706	16038	44308	-1804	-3.9
2007	EJR	62	46	803	0	0	911	-	-
2008	EJR	62	46	803	14	9	934	23	2.5
2009	EJR	82	45	853	14	13	1007	73	7.8
2010	EJR	89	47	877	13	19	1045	38	3.8
2011	EJR	101	51	962	13	9	1136	91	8.7
2012	EJR	109	48	1004	-	-	1161	25	2.2
2013	EJR	104	46	877	-	-	1027	-134	-11.5
2007	Fitch	79125	4871	15865	72278	787781	962920	-	-
2008	Fitch	83649	4797	14757	77480	491264	671947	-290973	-30.2
2009	Fitch	72311	4599	12613	69515	352697	511735	-160212	-23.8
2010	Fitch	61550	1657	13385	64535	363897	505024	-6711	-1.3
2011	Fitch	54586	4010	14427	58315	217198	348536	-156488	-31.0
2012	Fitch	51718	3786	15367	56311	223188	350370	1834	0.5
2013	Fitch	49821	3222	15299	53612	204303	326257	-24113	-6.9
2007	JCR	155	32	559	68	85	899	-	-
2008	JCR	155	31	544	71	71	872	-27	-3.0
2009	JCR	156	31	518	64	53	822	-50	-5.7
2010	JCR	159	30	495	-	52	736	-86	-10.5
2011	JCR	163	27	478	-	54	722	-14	-1.9
2012	JCR	159	27	472	-	56	714	-8	-1.1
2013	JCR	150	27	463	-	56	696	-18	-2.5
2010	KBRA	16515	48	1002	0	59	17624	-	-
2011	KBRA	16127	52	1001	40	58	17278	-346	-2.0
2012	KBRA	15646	50	1000	352	1945	18993	1715	9.9
2013	KBRA	15982	44	2749	1401	25	20201	1208	6.4
2007	Moody's	70000	6500	25000	110000	175000	386500	-	-
2008	Moody's	84773	6277	31126	109261	880880	1112317	725817	187.8
2009	Moody's	76801	5455	31008	106337	862240	1081841	-30476	-2.7
2010	Moody's	61581	4540	30285	101546	841235	1039187	-42654	-3.9
2011	Moody's	56486	3953	30439	93913	814087	998878	-40309	-3.9

Year	CRA	Financial	Insurance	Corporate	ABS	Sovereign	Total	ΔAmount	Δ Perc
2012	Moody's	50795	3639	32510	82357	754062	923363	-75515	-7.6
2013	Moody's	53383	3418	40008	76464	728627	901900	-21463	-2.3
2010	Morningstar	-	-	-	8322	-	8322	-	-
2011	Morningstar	-	-	-	16070	-	16070	7748	93.1 ¹
2012	Morningstar	-	-	-	13935	-	13935	-2135	-13.3
2013	Morningstar	-	-	-	11567	-	11567	-2368	-17.0
2007	R&I	100	36	629	214	89	1068	-	-
2008	R&I	100	32	600	210	100	1042	-26	-2.4
2009	R&I	100	30	543	186	123	982	-60	-5.8
2010	R&I	503	48	2836	-	1031	4418	3436	349.9 ²
2007	S&P	44800	6900	28900	197700	967600	1245900	-	-
2008	S&P	47300	6600	26900	198200	976000	1255000	9100	0.7
2009	S&P	52500	8600	41400	124600	1004500	1231600	-23400	-1.9
2010	S&P	54000	8200	44500	117900	965900	1190500	-41100	-3.3
2011	S&P	60700	7800	45400	108400	948300	1170600	-19900	-1.7
2012	S&P	60300	7600	47400	97500	930500	1143300	-27300	-2.3
2013	S&P	59000	7200	49700	90000	918800	1124700	-18600	-1.6

Source: Data acquired from annual reports on NRSROs by SEC published between June 26, 2009 and December 25, 2014. Reports available from: <http://www.sec.gov/divisions/marketreg/ratingagency.htm#nrsroannreps>. ΔAmount stands for the amount change in the Total whereas ΔPerc for the percentage point change in the Total. Notes:¹ The value of Δ Perc is large because in 2010 Morningstar reported number of outstanding issuer ratings whereas in 2011 issue ratings.² The same applies for R&I where in 2009 CRA reported number of issuer and in 2010 issue ratings.

Table 4.3b Outstanding ratings reported by CRAs-Total of 10 CRAs between 2007-2013

	Year	Insurance	Corporate	ABS	Sovereign	Financial	Total
Total of 10 CRAs	2007	213,000	24,649	75,052	394,635	1,930,658	2,638,094
	2008	252,082	24,002	86,520	401,960	2,359,184	3,123,748
	2009	235,846	24,304	95,531	318,056	2,232,087	2,905,824
	2010	209,338	19,788	99,286	302,461	2,185,726	2,816,599
	2011	209,858	20,870	98,654	286,696	1,995,504	2,611,582
	2012	194,949	19,908	103,276	260,564	1,925,887	2,504,584
	2013	192,064	18,599	114,539	243,806	1,868,038	2,437,046

Source: Data acquired from annual reports on NRSROs by SEC published between June 26, 2009 and December 25, 2014. Reports available from: <http://www.sec.gov/divisions/marketreg/ratingagency.htm#nrsroannreps>. The statistics represent the total of outstanding ratings per rating class as seen in the Table 4.3a (above). The total comprises the following CRAs: A.M. Best, DBRS, EJR, Fitch, HR Ratings JCR, KBRA, Moody's, Morningstar and S&P.

Table 4.4. Ratings to Analyst ratio per CRA (Data source I)

Year	CRA	Analysts	Ratings	R/A	Δ Amount	Δ Perc	Mkt share	Δ Perc
2008	A.M. Best	194	8776	45.2	-	-	0.28	-
2009	A.M. Best	176	7667	43.6	-1.7	-3.7	0.26	-6.1
2010	A.M. Best	120	7159	59.7	16.1	36.9	0.25	-3.7
2011	A.M. Best	123	6792	55.2	-4.4	-7.4	0.26	2.3
2012	A.M. Best	126	6452	51.2	-4.0	-7.3	0.26	-1.0
2013	A.M. Best	123	6201	50.4	-0.8	-1.5	0.25	-1.2
2008	DBRS	86	43260	503.0	-	-	1.39	-
2009	DBRS	87	42930	493.5	-9.6	-1.9	1.48	6.7
2010	DBRS	95	42584	448.3	-45.2	-9.2	1.51	2.3
2011	DBRS	118	51570	437.0	-11.2	-2.5	1.98	30.6
2012	DBRS	93	46112	495.8	58.8	13.5	1.84	-6.8
2013	DBRS	98	44308	452.1	-43.7	-8.8	1.82	-1.3
2008	EJR	15	934	62.3	-	-	0.03	-
2009	EJR	8	1007	125.9	63.6	102.2	0.04	15.9
2010	EJR	5	1045	209.0	83.1	66.0	0.04	7.1
2011	EJR	5	1136	227.2	18.2	8.7	0.04	17.2
2012	EJR	5	1161	232.2	5.0	2.2	0.05	6.6
2013	EJR	7	1027	146.7	-85.5	-36.8	0.04	-9.1
2008	Fitch	1362	671947	493.4	-	-	21.51	-
2009	Fitch	1380	511735	370.8	-122.5	-24.8	17.61	-18.1
2010	Fitch	1049	505024	481.4	110.6	29.8	17.93	1.8
2011	Fitch	1096	348536	318.0	-163.4	-33.9	13.35	-25.6
2012	Fitch	1092	350370	320.9	2.8	0.9	13.99	4.8
2013	Fitch	1102	326257	296.1	-24.8	-7.7	13.39	-4.3
2008	JCR	82	872	10.6	-	-	0.03	-
2009	JCR	88	822	9.3	-1.3	-12.2	0.03	1.3
2010	JCR	57	736	12.9	3.6	38.2	0.03	-7.6
2011	JCR	57	722	12.7	-0.2	-1.9	0.03	5.8
2012	JCR	59	714	12.1	-0.6	-4.5	0.03	3.1
2013	JCR	57	696	12.2	0.1	0.9	0.03	0.2
2010	KBRA	13	17624	1355.7	-	-	0.63	-
2011	KBRA	28	17278	617.1	-738.6	-54.5	0.66	5.7
2012	KBRA	37	18993	513.3	-103.7	-16.8	0.76	14.6
2013	KBRA	58	20201	348.3	-165.0	-32.1	0.83	9.3
2008	Moody's	1250	1112317	889.9	-	-	35.61	-
2009	Moody's	1239	1081841	873.2	-16.7	-1.9	37.23	4.6
2010	Moody's	1204	1039187	863.1	-10.0	-1.2	36.90	-0.9
2011	Moody's	1252	998878	797.8	-65.3	-7.6	38.25	3.7
2012	Moody's	1123	923363	822.2	24.4	3.1	36.87	-3.6
2013	Moody's	1244	901900	725.0	-97.2	-11.8	37.01	0.4
2010	Morningstar	24	8322	346.8	-	-	0.30	-
2011	Morningstar	36	16070	446.4	99.6	28.7	0.62	108.3
2012	Morningstar	22	13935	633.4	187.0	41.9	0.56	-9.6
2013	Morningstar	30	11567	385.6	-247.8	-39.1	0.48	-14.7
2008	S&P	1309	1255000	958.8	-	-	40.18	-
2009	S&P	1242	1231600	991.6	32.9	3.4	42.38	5.5
2010	S&P	1345	1190500	885.1	-106.5	-10.7	42.27	-0.3
2011	S&P	1416	1170600	826.7	-58.4	-6.6	44.82	6.1
2012	S&P	1436	1143300	796.2	-30.5	-3.7	45.65	1.8
2013	S&P	1465	1124700	767.7	-28.5	-3.6	46.15	1.1

Notes: Ratio: Ratings/Analysts. Source: Data acquired from annual reports on NRSROs by SEC published between June 26, 2009 and December 25, 2014. Market share was calculated based on the total number of outstanding ratings by the 10 largest CRAs reported by SEC in given annual reports. ΔAmount stands for the amount change in the R/A whereas ΔPerc for the percentage point change in the R/A.

Table 4.5 Ratings to Analyst ratio per CRA (Data source II)

Year	CRA	Analysts	Ratings	Δ Amount	Δ Perc	R/A	Δ Amount	Δ Perc
2008	A.M. Best	194	-	-	-	-	-	-
2009	A.M. Best	176	-	-	-	-	-	-
2010	A.M. Best	120	-	-	-	-	-	-
2011	A.M. Best	123	3844	-	-	31.3	-	-
2012	A.M. Best	126	3775	-69	-1.8	30.0	-1.3	-4.1
2013	A.M. Best	123	3487	-289	-7.6	28.3	-1.6	-5.4
2014	A.M. Best	-	3522	36	1.0	-	-	-
2015	A.M. Best	-	3530	8	0.2	-	-	-
2008	DBRS	86	1209	-	-	14.1	-	-
2009	DBRS	87	1203	-6	-0.5	13.8	-0.2	-1.6
2010	DBRS	95	1046	-157	-13.1	11.0	-2.8	-20.4
2011	DBRS	118	1043	-3	-0.3	8.8	-2.2	-19.7
2012	DBRS	93	1038	-5	-0.5	11.2	2.3	26.3
2013	DBRS	98	1026	-12	-1.2	10.5	-0.7	-6.2
2014	DBRS	-	1010	-16	-1.6	-	-	-
2015	DBRS	-	981	-29	-2.9	-	-	-
2008	Fitch	1362	4752	-	-	3.5	-	-
2009	Fitch	1380	4862	110	2.3	3.5	0.0	1.0
2010	Fitch	1049	4921	59	1.2	4.7	1.2	33.2
2011	Fitch	1096	5495	574	11.7	5.0	0.3	6.9
2012	Fitch	1092	5757	262	4.8	5.3	0.3	5.2
2013	Fitch	1102	5365	-392	-6.8	4.9	-0.4	-7.7
2014	Fitch	-	5643	278	5.2	-	-	-
2015	Fitch	-	4997	-646	-11.4	-	-	-
2008	JCR	82	926	-	-	11.3	-	-
2009	JCR	88	909	-17	-1.8	10.3	-1.0	-8.5
2010	JCR	57	880	-29	-3.2	15.4	5.1	49.5
2011	JCR	57	869	-11	-1.3	15.2	-0.2	-1.3
2012	JCR	59	818	-51	-5.9	13.9	-1.4	-9.1
2013	JCR	57	808	-10	-1.2	14.2	0.3	2.2
2014	JCR	-	798	-10	-1.2	-	-	-
2015	JCR	-	803	5	0.6	-	-	-
2008	Moody's	1250	10744	-	-	8.6	-	-
2009	Moody's	1239	9324	-1420	-13.2	7.5	-1.1	-12.4
2010	Moody's	1204	8180	-1144	-12.3	6.8	-0.7	-9.7
2011	Moody's	1252	8109	-71	-0.9	6.5	-0.3	-4.7
2012	Moody's	1123	7953	-156	-1.9	7.1	0.6	9.3
2013	Moody's	1244	7495	-458	-5.8	6.0	-1.1	-14.9
2014	Moody's	-	7754	259	3.5	-	-	-
2015	Moody's	-	8010	256	3.3	-	-	-
2008	S&P	1309	9262	-	-	7.1	-	-
2009	S&P	1242	8892	-370	-4.0	7.2	0.1	1.2
2010	S&P	1345	8188	-704	-7.9	6.1	-1.1	-15.0

Year	CRA	Analysts	Ratings	Δ Amount	Δ Perc	R/A	Δ Amount	Δ Perc
2011	S&P	1416	8253	65	0.8	5.8	-0.3	-4.3
2012	S&P	1436	8573	320	3.9	6.0	0.1	2.4
2013	S&P	1465	8747	174	2.0	6.0	0.0	0.0
2014	S&P	-	9474	727	8.3	-	-	-
2015	S&P	-	9944	470	5.0	-	-	-

Notes: Ratio: Ratings/Analysts. Source: Analyst data acquired from annual reports on NRSROs by SEC published between June 26, 2009 and December 25, 2014. Outstanding issuer ratings sourced from Interactive Data Credit Ratings International (IDCRI) available in monthly frequency between November 1999 to April 2015. For the purpose of this chapter, data are reported in yearly frequency (Jan of each year) between 2008-2015 to correspond to the analyst statistics and form a more balanced panel. ΔAmount stands for the amount change in the Total (R/A) whereas ΔPerc for the percentage point change in the Total (R/A) respectively.

Table 4.6 Ratings to Analyst ratio per CRA: Comparison of data sources

Analysts			Ratings (Source I)				Ratings (Source II)			
Year	CRA	Total	Total	R/A	Δ Amount	Δ Perc	Total	R/A	Δ Amount	Δ Perc
2008	A.M. Best	194	8776	45.2	-	-	-	-	-	-
2009	A.M. Best	176	7667	43.6	-1.7	-3.7	-	-	-	-
2010	A.M. Best	120	7159	59.7	16.1	37.0	-	-	-	-
2011	A.M. Best	123	6792	55.2	-4.4	-7.4	3844	31.3	-	-
2012	A.M. Best	126	6452	51.2	-4.0	-7.3	3775	30.0	-1.3	-4.1
2013	A.M. Best	123	6201	50.4	-0.8	-1.6	3487	28.3	-1.6	-5.4
2008	DBRS	86	43260	503.0	-	-	1209	14.1	-	-
2009	DBRS	87	42930	493.5	-9.6	-1.9	1203	13.8	-0.2	-1.6
2010	DBRS	95	42584	448.3	-45.2	-9.2	1046	11.0	-2.8	-20.4
2011	DBRS	118	51570	437.0	-11.2	-2.5	1043	8.8	-2.2	-19.7
2012	DBRS	93	46112	495.8	58.8	13.5	1038	11.2	2.3	26.3
2013	DBRS	98	44308	452.1	-43.7	-8.8	1026	10.5	-0.7	-6.2
2008	Fitch	1362	671947	493.4			4752	3.5	-	-
2009	Fitch	1380	511735	370.8	-122.5	-24.8	4862	3.5	0.0	1.0
2010	Fitch	1049	505024	481.4	110.6	29.8	4921	4.7	1.2	33.2
2011	Fitch	1096	348536	318.0	-163.4	-34.0	5495	5.0	0.3	6.9
2012	Fitch	1092	350370	320.9	2.8	0.9	5757	5.3	0.3	5.2
2013	Fitch	1102	326257	296.1	-24.8	-7.7	5365	4.9	-0.4	-7.7
2008	JCR	82	872	10.6	-	-	926	11.3	-	-
2009	JCR	88	822	9.3	-1.3	-12.2	909	10.3	-1.0	-8.5
2010	JCR	57	736	12.9	3.6	38.2	880	15.4	5.1	49.5
2011	JCR	57	722	12.7	-0.3	-1.9	869	15.2	-0.2	-1.3
2012	JCR	59	714	12.1	-0.6	-4.5	818	13.9	-1.4	-9.1
2013	JCR	57	696	12.2	0.1	0.9	808	14.2	0.3	2.2
2008	Moody's	1250	1112317	889.9	-	-	10744	8.6	-	-
2009	Moody's	1239	1081841	873.2	-16.7	-1.9	9324	7.5	-1.1	-12.4
2010	Moody's	1204	1039187	863.1	-10.0	-1.2	8180	6.8	-0.7	-9.7
2011	Moody's	1252	998878	797.8	-65.3	-7.6	8109	6.5	-0.3	-4.7
2012	Moody's	1123	923363	822.2	24.4	3.1	7953	7.1	0.6	9.3
2013	Moody's	1244	901900	725.0	-97.2	-11.8	7495	6.0	-1.1	-14.9
2008	S&P	1309	1255000	958.8	-	-	9262	7.1	-	-
2009	S&P	1242	1231600	991.6	32.9	3.4	8892	7.2	0.1	1.2
2010	S&P	1345	1190500	885.1	-106.5	-10.7	8188	6.1	-1.1	-15.0
2011	S&P	1416	1170600	826.7	-58.4	-6.6	8253	5.8	-0.3	-4.3
2012	S&P	1436	1143300	796.2	-30.5	-3.7	8573	6.0	0.1	2.4
2013	S&P	1465	1124700	767.7	-28.5	-3.6	8747	6.0	0.0	0.0

Notes: Ratio: Ratings/Analysts. Source: Analyst data and Ratings (Source I) acquired from annual reports on NRSROs by SEC published between June 26, 2009 and December 25, 2014. Ratings (Source II) acquired from Interactive Data Credit Ratings International (IDCRI) available in monthly frequency between November 1999 to April 2015. For the purpose of this chapter, data are reported in yearly frequency (Jan of each year) between 2008-2015 to correspond to the analyst statistics and form a more balanced panel. Note that data from SEC is observed as 31 Dec, and this may explain some minor differences in figures. ΔAmount stands for the amount change in the R/A whereas ΔPerc for the percentage point change in the R/A.

Table 4.7 Concentration of the CRA business

Year	Financial	Insurance	Corporate	ABS	Sovereign	Total (all categories)	Total excluding sovereign securities
Inverse HHI							
2008	3.7	4.1	3.8	2.8	2.8	3.0	3.6
2009	3.9	3.8	3.2	3.2	2.7	2.9	3.6
2010	4.0	3.4	3.2	3.2	2.7	2.9	3.6
2011	4.2	3.8	3.0	3.4	2.5	2.7	3.7
2012	4.0	3.7	3.0	3.4	2.5	2.8	3.7
2013	4.0	3.7	3.0	3.5	2.5	2.7	3.7
HHI							
2008	2688.2	2469.1	2638.5	3546.1	3533.6	3344.5	2809.0
2009	2597.4	2604.2	3144.7	3144.7	3773.6	3496.5	2793.3
2010	2506.3	2967.4	3154.6	3125.0	3717.5	3472.2	2816.9
2011	2403.9	2659.6	3311.3	2958.6	4048.6	3649.6	2702.7
2012	2475.3	2688.2	3333.3	2907.0	4000.0	3636.4	2717.4
2013	2506.3	2717.4	3300.3	2873.6	4065.0	3676.5	2739.7

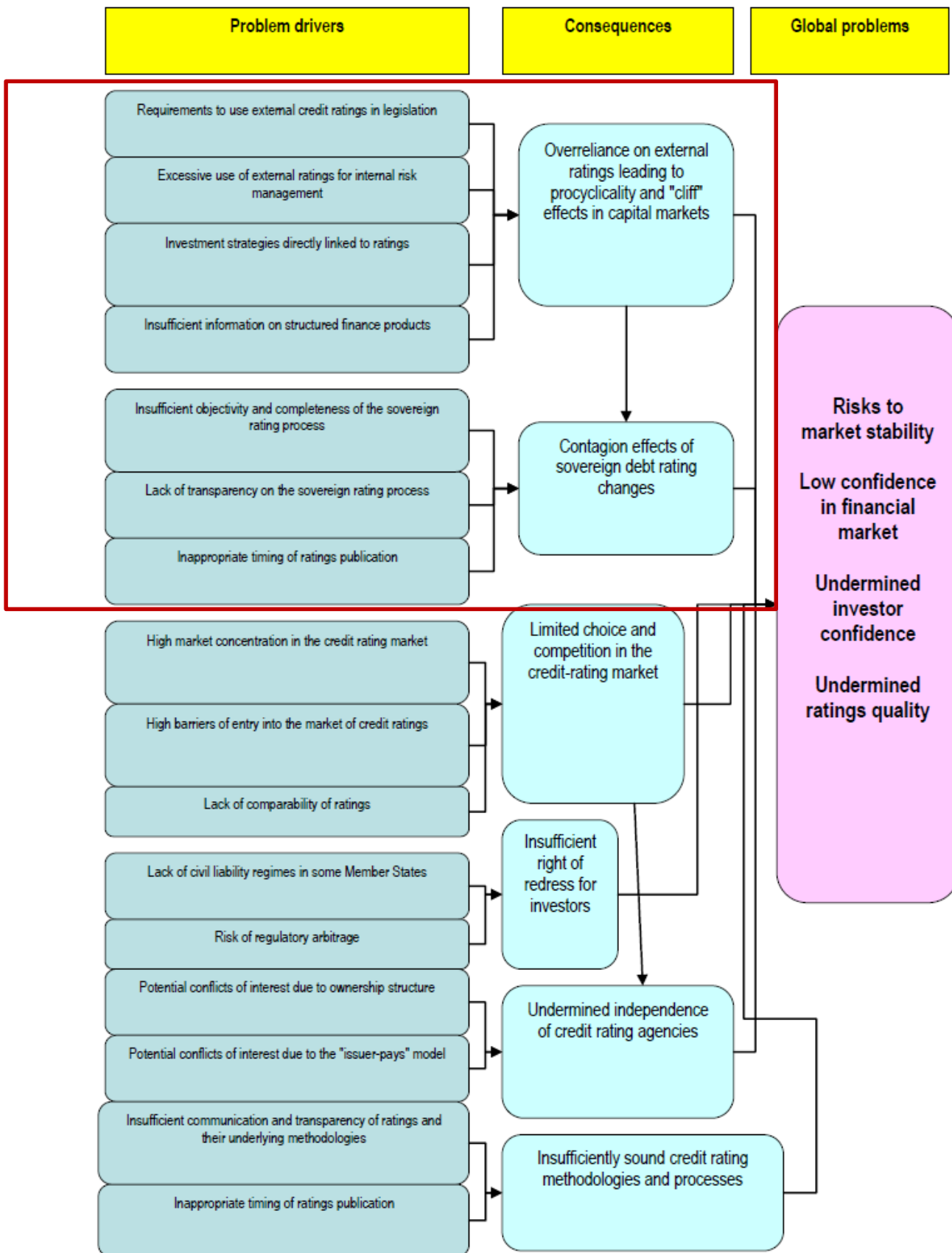
Source: Data acquired from annual reports on NRSROs by SEC published between June 26, 2009 and December 25, 2014. Market share was calculated based on the total number of outstanding ratings by the 10 largest CRAs reported by SEC in given annual reports. The formula is $H = \sum_{i=1}^N s_i^2$ where the N is number of firms, s_i is the share of firm i in the market. The HHI index can range up to 100^2 , or 10,000. The inverse HHI was calculated by dividing the 10,000 by the HHI.

Table 4.8 Revenues and profits of the big three CRAs

Year	S&P Ratings					Fitch Ratings					Moody's Investors Service					
	Revenue	Δ	Revenue	Profit	Δ	R/P	Revenue	Δ	Profit	Δ	R/P	Revenue	Δ	Profit	Δ	R/
	%		Profit %				Revenue		Profit %			Revenue %		Profit %		P
							%									
1999	-	-	-	-	-	-	157.7	-	29.8	-	5.3	502.2	-	-	-	-
2000	-	-	-	-	-	-	259.4	64.5	42.6	43.1	6.1	519.6	3.5	-	-	-
2001	-	-	-	-	-	-	385.9	48.7	90.6	112.5	4.3	765.9	47.4	401.5	-	1.9
2002	-	-	-	-	-	-	441.7	14.5	103.0	13.6	4.3	941.8	23.0	543.4	35.3	1.7
2003	-	-	-	-	-	-	454.9	3.0	112.9	9.6	4.0	1140.2	21.1	658.1	21.1	1.7
2004	-	-	-	-	-	-	501.6	10.3	123.1	9.1	4.1	1317.5	15.5	782.2	18.9	1.7
2005	-	-	-	-	-	-	605.4	20.7	189.1	53.6	3.2	1600.3	21.5	936.3	19.7	1.7
2006	-	-	-	-	-	-	655.9	8.3	201.6	6.6	3.3	1685.6	5.3	1002.2	7.0	1.7
2007	-	-	-	-	-	-	642.4	-2.1	236.5	17.3	2.7	1835.4	8.9	1010.7	0.8	1.8
2008	1583.0	-	749.3	-	2.1	965.4	50.3	289.9	22.6	3.3	1268.3	-30.9	600.6	-40.6	2.1	
2009	1537.3	-2.89	712.2	-4.95	2.2	609.8	-36.8	221.5	-23.6	2.8	1277.7	0.7	557.2	-7.2	2.3	
2010	1695.0	10.26	762.0	6.99	2.2	550.5	-9.7	149.4	-32.6	3.7	1466.3	14.8	647.2	16.2	2.3	
2011	1767.0	4.25	720.0	-5.51	2.5	606.1	10.1	164.8	10.3	3.7	1634.7	11.5	761.2	17.6	2.1	
2012	2034.0	15.11	809.0	12.36	2.5	799.5	31.9	255.4	55.0	3.1	1958.3	19.8	946.5	24.3	2.1	
2013	2274.0	11.80	882.0	9.02	2.6	753.3	-5.8	332.3	30.1	2.3	2150.2	9.8	1069.5	13.0	2.0	
2014	2455.0	7.96	-583.0	-166.10	-4.2	-	-	-	-	-	-	2353.4	9.5	1227.8	14.8	1.9

Notes: This Table presents revenues and (operating) profits for three CRAs expressed in \$ mln. The changes (Δ) are expressed in percentage terms. R/P is the Revenue to Profit ratio used for scaling purpose to enable comparison amongst the CRAs. Source: Data for S&P and Moody's obtained from SEC annual filings of the parent company and annual reports for Fitch. Where data not available, or no breakdown of rating activities is available it is reported as "-".

Figure 4.1 “Problem Tree” by the European Commission



Source: European Commission Staff Working Paper, November 15, 2011.

Figure 4.2 Number of analysts (I-IV)

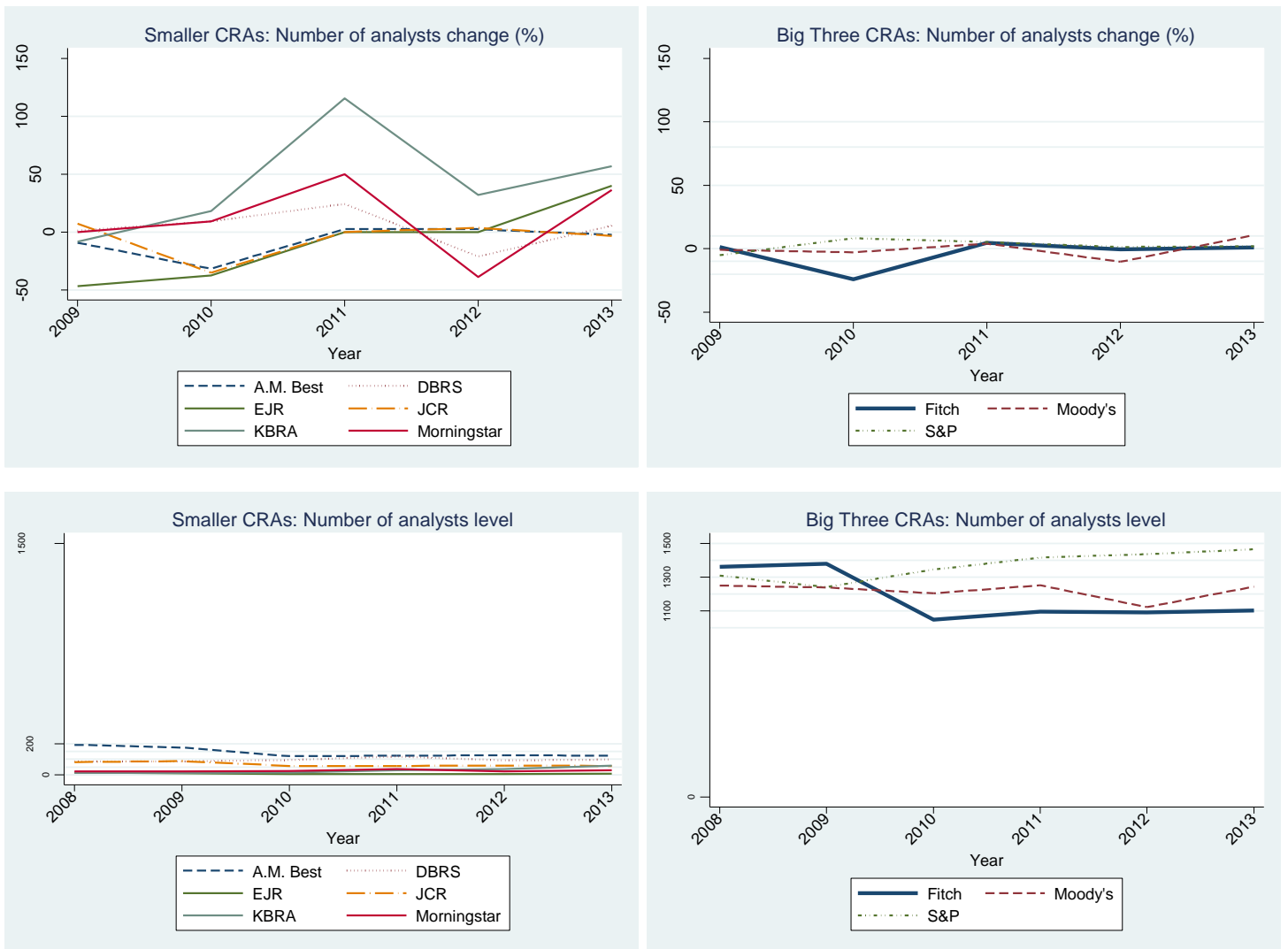
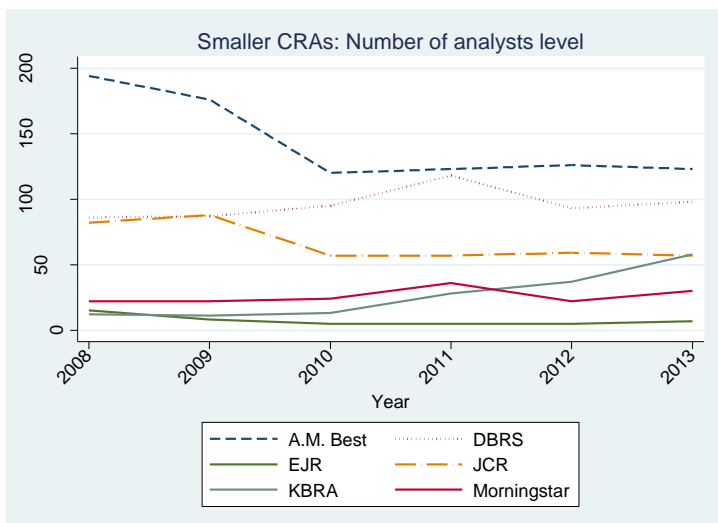


Figure 4.2(a) Number of analysts: Expanded scale



Expanding on the previous Figure 4.2 (III); by reducing the y-axis one can see more clearly dynamics of the levels of analysts among Smaller CRAs.

Figure 4.3 Ratings/Analyst Ratio across CRAs (source I)

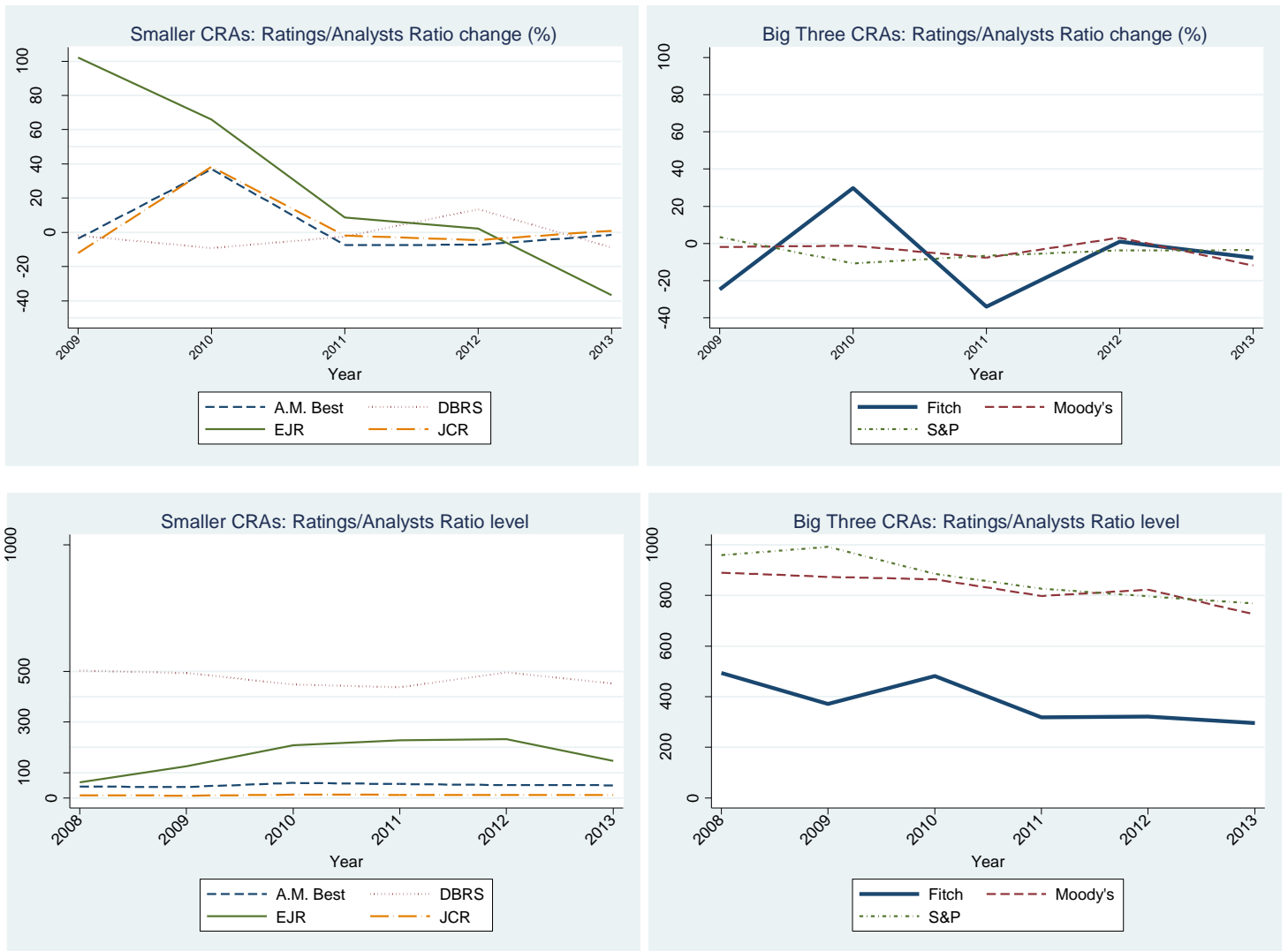


Figure 4.4 Number of outstanding ratings (I-II) (source I)

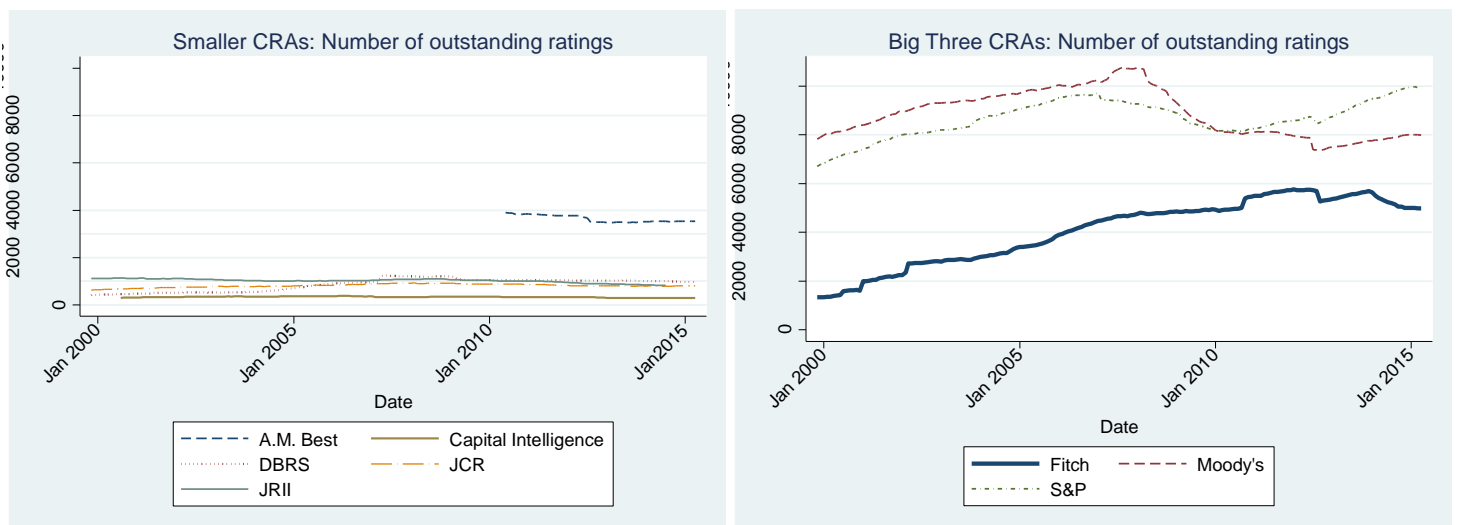
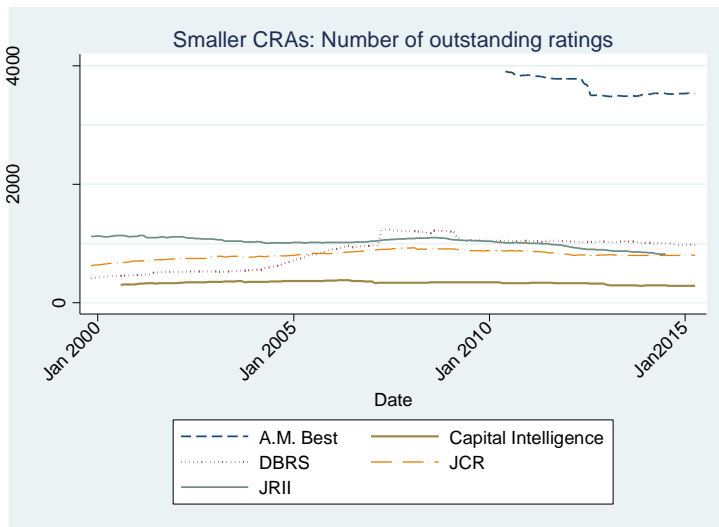


Figure 4.4(a) Number of outstanding ratings: Expanded scale



Expanding on the previous Figure 4.4 (I); by reducing the y-axis one can see more clearly number of outstanding ratings among Smaller CRAs.

Figure 4.5 Concentration across CRAs (I-IV)

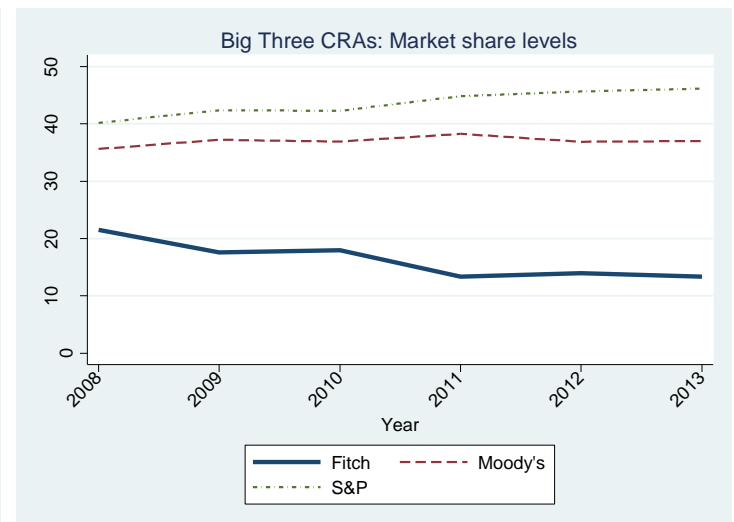
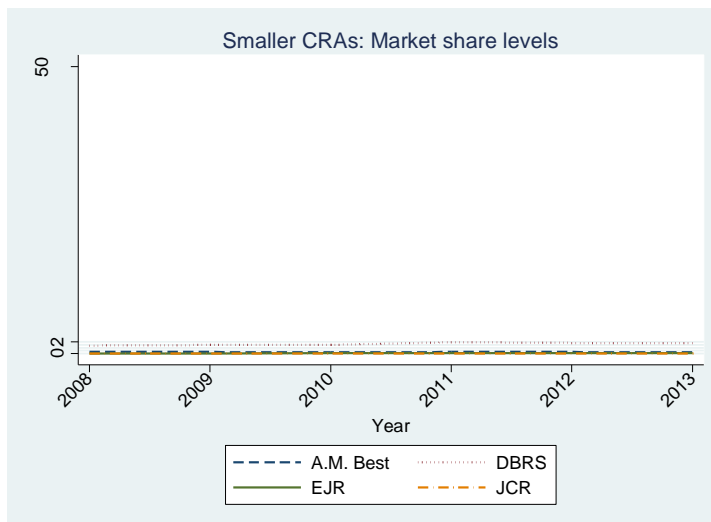
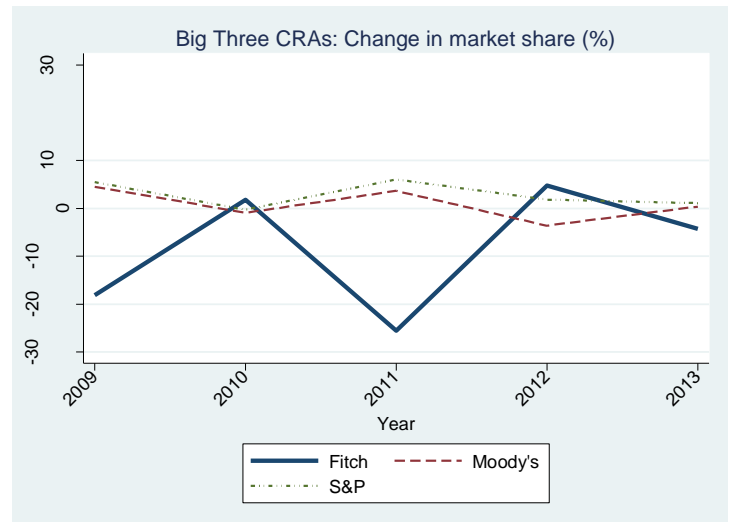
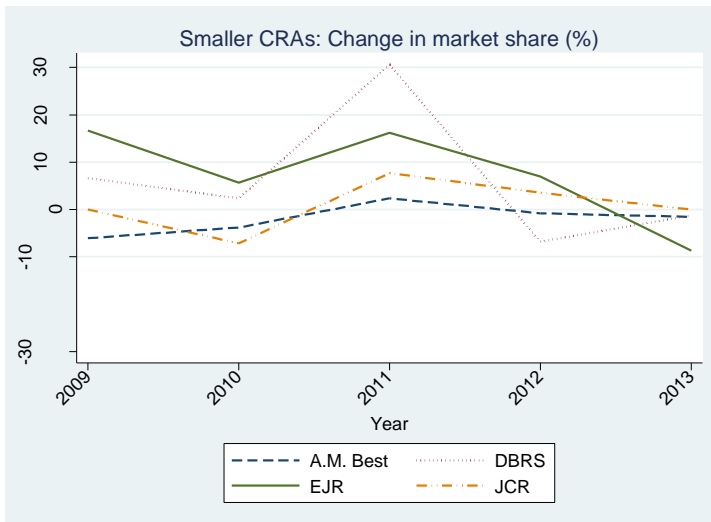


Figure 4.5(a) Concentration across CRAs: Expanded scale



Expanding on the previous Figure 4.5 (III); by reducing the y-axis one can see more clearly the market share levels among Smaller CRAs.

Figure 4.6 Revenues and Profits: S&P

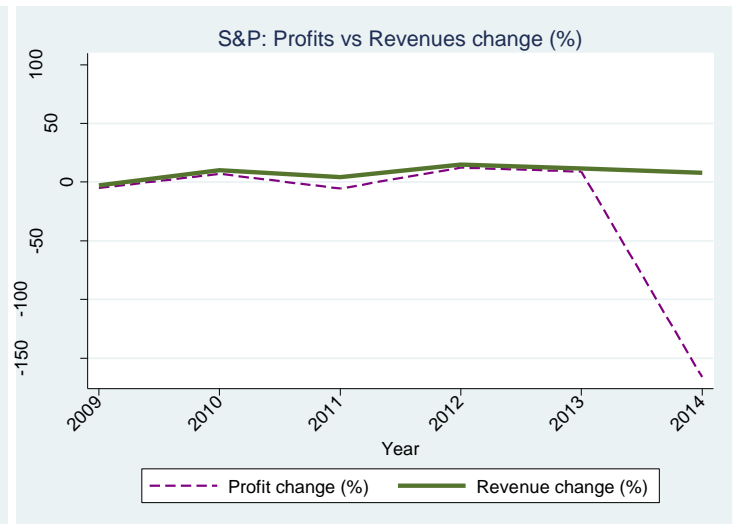
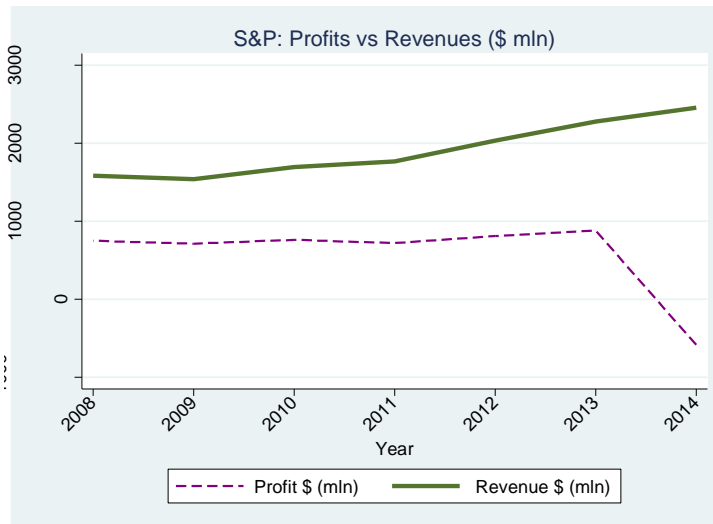


Figure 4.7a Revenues and Profits: Moody's vs Fitch

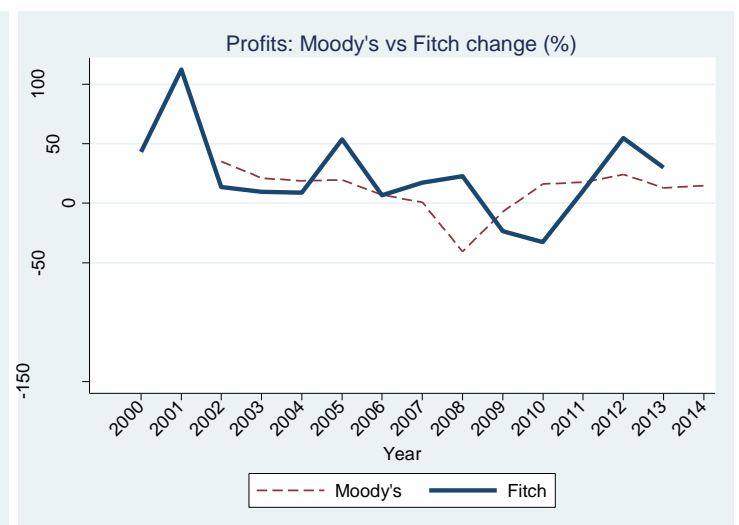
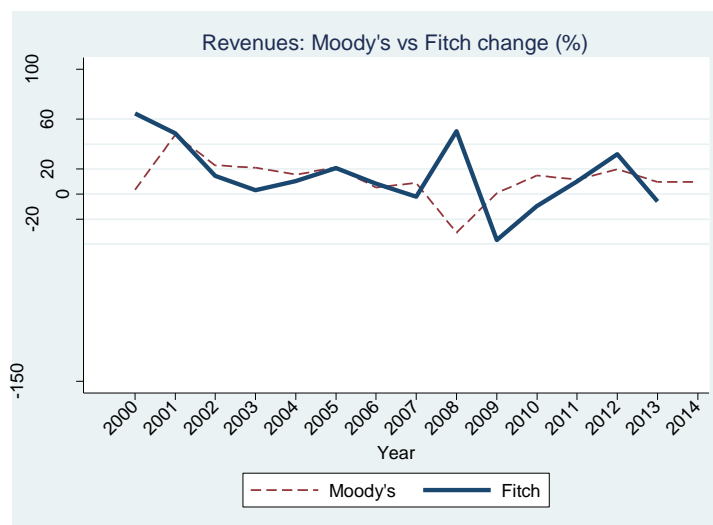


Figure 4.7b Revenues and Profits: Moody's vs Fitch



Figure 4.8 Correlation between Outstanding Ratings across two data sources

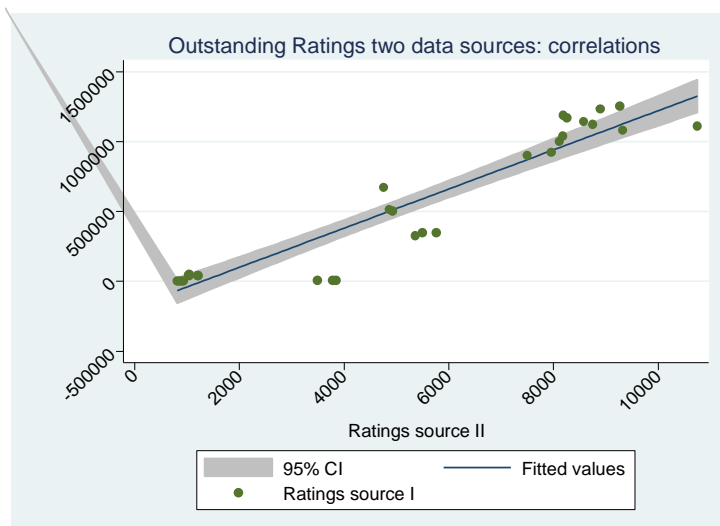
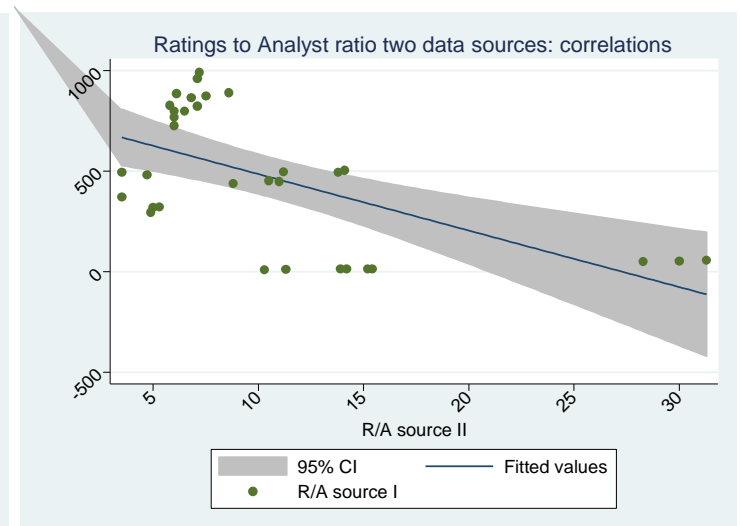


Figure 4.9 Correlation between R/A across two data sources



Appendix 4.A Data acquired from Transparency reports

Table 4.A.1 S&P Staffing across EU Entities

Year	EU Entity	Corporate	Financial	Sovereign	Structured finance	Total	Analytical managers	General managers	Total	Criteria staff	Quality staff	Total
2010	CMS Europe	169	-	-	88	257	-	-	-	6	5	11
	CMS France	45	-	-	4	49	-	-	-	4	2	6
	CMS Italy	11	-	-	8	19	-	-	-	0	0	0
	Total	225	-	-	100	325	-	-	-	10	7	17
2011	CMS Europe	202	-	-	92	294	32	5	37	4	5	9
	CMS France	57	-	-	5	62	8	2	10	4	2	6
	CMS Italy	16	-	-	8	24	2	1	3	0	0	0
	Total	275	-	-	105	380	42	8	50	8	7	15
2012	CMS Europe	250	-	-	100	350	30	3	33	3	5	8
	CMS France	56	-	-	5	61	9	4	13	3	2	5
	CMS Italy	14	-	-	7	21	3	1	4	0	0	0
	Total	320	-	-	112	432	42	8	50	6	7	13
2013	CMS Europe	111	96	47	93	347	34	8	42	3	6	9
	CMS France	29	22	7	5	63	8	3	11	3	4	7
	CMS Italy	6	6	3	8	23	3	1	4	0	0	0
	Total	146	124	57	106	433	45	12	57	6	10	16
2014	CMS Europe	107	89	48	80	324	28	10	38	3	6	9
	CMS France	29	22	9	4	64	7	2	9	5	4	9
	CMS Italy	6	6	2	6	20	0	1	1	0	0	0
	Total	142	117	59	90	408	35	13	48	8	10	18

Source: Data available from Transparency Reports by S&P Ratings published in relation to Article 12 and Annex I, Section E, Part III of Regulation (EC) No 1060/2009 of the European Parliament and of the Council of 16 September 2009 on CRAs, subsequently amended by Regulation (EU) No 513/2011 of the European Parliament and of the Council of 11 May 2011. Between years 2010-2012 the corporate rating also include sovereign ratings. CMS abbreviates for Credit Market Services; one of the three legal entities of Standard & Poor's. Europe entity represents UK (it has three external branches: Germany, Spain and Sweden).

Table 4.A.2 Moody's Staffing across EU Entities

Year	EU Entity	New credit ratings and reviews	New ratings only	Reviews only	Methodology appraisal	Support staff	Senior management	Total
2010	MIS LTD	109	47	31	8	76	6	277
	Deutschland	34	12	9	0	23	10	88
	France	15	10	9	2	4	7	47
	Italia	14	7	1	0	2	3	27
	Espana	13	7	3	0	0	3	26
	Cyprus	10	0	0	0	1	3	14
	EMEA	0	1	0	0	0	6	7
	Total	86	37	22	2	30	32	486
2011	MIS LTD	142	49	30	12	108	6	347
	Deutschland	37	13	9	0	22	10	91
	France	14	9	9	2	5	7	46
	Italia	15	7	1	0	2	3	28
	Espana	13	7	3	0	0	3	26
	Cyprus	10	0	0	0	1	3	14
	Total	231	85	52	14	138	32	552
	2012	MIS LTD	162	48	28	14	96	6
Deutschland		38	14	5	0	18	9	84
France		14	8	7	2	1	7	39
Italia		14	8	0	0	3	3	28
Espana		14	6	3	0	0	3	26
Cyprus		11	0	0	0	1	3	15
Total		253	84	43	16	119	31	546
2013		MIS LTD	235	52	28	12	66	6
	Deutschland	48	12	6	0	6	9	81
	France	22	3	4	0	0	7	36
	Italia	8	7	0	0	0	3	18
	Espana	16	6	3	0	0	3	28
	Cyprus	10	0	0	0	0	3	13
	Total	339	80	41	12	72	31	575
	2014	MIS LTD	263	46	29	11	66	7
Deutschland		49	12	6	0	8	8	83
France		22	3	3	1	0	9	38
Italia		8	7	0	0	0	2	17
Espana		14	6	3	0	0	2	25
Cyprus		12	0	0	1	0	3	16
Total		368	74	41	13	74	31	601

Source: Data available from Transparency Reports by Moody's Investors Service published in relation to Article 12 and Annex I, Section E, Part III of Regulation (EC) No 1060/2009 on CRAs. MIS LTD represents branches located in Czech Republic, Russia and Dubai (Poland belongs to this group since 1st January 2014). Since 1st January 2013 the Dubai branch became an affiliate- Moody's Investors Service Middle East Limited. EMEA abbreviates for Europe, Middle East and Africa.

Table 4.A.3 Fitch Staffing across EU Entities

Year	EU Entity	Total analytical staff	Out of which: analytical supervisors	Out of which: global heads	Support staff	Total no of staff
2011	France	25	12	0	18	43
	Germany	25	4	0	17	42
	Italia	20	5	0	10	30
	Poland	12	1	0	6	18
	Spain	18	7	0	13	31
	Limited	242	72	2	246	488
	CIS	21	3	0	19	40
	Total	363	104	2	329	692
2012	France	29	13	0	16	45
	Germany	27	6	0	17	44
	Italia	23	5	0	10	33
	Poland	12	1	0	6	18
	Spain	18	7	0	12	30
	Limited	248	70	2	221	469
	CIS	27	3	0	19	46
	Total	384	105	2	301	685
2013	France	30	13	0	18	48
	Germany	29	8	0	17	46
	Italia	23	8	0	9	32
	Poland	10	2	0	6	16
	Spain	18	7	0	12	30
	Limited	257	66	3	206	496
	CIS	33	3	0	21	54
	Total	400	107	3	289	722
2014	France	30	11	0	17	47
	Germany	30	7	0	9	39
	Italia	25	7	0	10	35
	Poland	12	2	0	6	18
	Spain	21	7	0	8	29
	Limited	279	77	3	209	488
	CIS	35	6	0	20	55
	Total	432	117	3	279	711

Source: Data available from Transparency Reports by Fitch Ratings published in relation to Article 12 and Annex I, Section E, Part III of Regulation (EC) No 1060/2009 of the European Parliament and of the Council of 16 September 2009 on CRAs, subsequently amended by Regulation (EU) No 513/2011 of the European Parliament and of the Council of 11 May 2011. Fitch Ratings Limited established in the UK operates mainly in the UK however it has branches in Sweden, Dubai, South Korea and Taiwan. Fitch Ratings CIS functions exclusively via its office in Russia. The remainder of companies operate from the country of establishment (e.g. Fitch Polska S.A. (Poland) operates from Poland).

Appendix 4.B Solicitation of rating events

Table 4.B.1 S&P rating events 2006-2012

Rating	Solicited %	Unsolicited %
ABS	100.0	0.0
Corporate	99.9	0.1
Financial	99.8	0.2
Sovereigns	98.4	1.6
Insurance	99.6	0.4
Utility	100.0	0.0

Source: Data available from S&P Global Credit Portal publications. This Table presents the proportion of the rating events issued by S&P between 2006-2012 based on the solicited vs unsolicited basis.

Chapter 5: Unsolicited sovereign ratings and the sovereign- bank ceiling: An unintended consequence of regulatory disclosure

5.1 Introduction

CRAAs play a prominent role in modern financial markets. Globalization and the increasing complexity of investment products have triggered a growing demand for widely recognised risk assessment. Sovereign ratings serve as a basis for evaluating the creditworthiness of a country, and thereby influence long-term investment and lending decisions across borders. Rating downgrades have major implications for financial markets and institutions, including rising costs of credit and hindered market access (e.g. BIS, 2011; Alsakka et al., 2014; Correa et al., 2014).

The global financial crisis brought CRAAs renewed publicity and ongoing scrutiny by regulators. CRAAs were blamed for worsening economic conditions by downgrading some sovereigns too quickly and too severely. The overreliance on ratings by market participants led to cliff effects whereby downgrades had a disproportionate effect. The situation in Europe has further emphasised the hazardous effects of negative spillovers while highlighting interconnectedness between international financial institutions (e.g. Arezki et al., 2011). The influence of ratings on global financial stability has become a major concern.

In 2009, the EC implemented a new set of regulations aimed at CRAAs including registration procedures, governance requirements, internal controls, disclosure rules and improvements in rating methodologies. This chapter draws attention to the disclosure rules with particular focus on Article 10 (5) of the EU Regulation 1060/2009, which requires that when a CRA issues an unsolicited rating, it needs to be identified as such. Moreover, CRAAs are required to declare whether the issuer (or third party) participated in the rating process or not, and whether the inside information about the rated entity (such as financial accounts) was available to them (EC, 2011c).

As a result of implementing the Article in February 2011, S&P disclosed the conversion to unsolicited status of 14 rated sovereign governments (S&P, 2011a, e, f). Unsolicited ratings are one of the most controversial features of the CRA business. Prior literature (e.g. Poon et al., 2009; Bannier et al., 2010; Van Roy, 2013) finds that banks and corporations rated on an unsolicited basis have significantly lower ratings. Concerns exist that unsolicited ratings are

biased downward because CRAs are not compensated for their service. Additionally, policymakers have focused on this feature, because both solicited and unsolicited ratings are permitted for some regulatory uses.

The implementation of the EU Regulation by S&P acts as the treatment in the regression model. The sample comprises group of sovereigns which do not change their solicitation status meaning that they pay for ratings at all times. The control group acts as a benchmark to evaluate how the switch in status affects banks which belong to the treatment group. For each bank the rating change is calculated which is then tested for differences before and after the solicitation status of sovereigns has switched. This helps to empirically examine the direct impact of ongoing regulatory changes on banks and financial markets.

The broad aim of this chapter is to examine whether the disclosure rule on solicitation status achieves its objective of more credible rating services or has unintended consequences. Specifically, it is investigated whether conversion to sovereign unsolicited rating status (induced by disclosure rules) results in lower bank ratings (in the re-designated unsolicited sovereign states). Previous literature on the controversies related to unsolicited (non-sovereign) ratings provides a theoretical framework (see section 5.2.1.2). Additionally, it is well known that sovereign risk spills over to financial institutions through many channels (BIS, 2011; De Bruyckere et al., 2013; Alsakka, et al., 2014). Studying whether the mandatory disclosed unsolicited status of sovereign ratings transmits risk to banks is a key motivation for this research.

The novelty of this study derives from building on three streams of research, which meaningfully overlap and result in a synergy which has not been previously explored. The first theme relates to the unique opportunity to investigate the dynamics of rating solicitation for sovereigns. To the best of my knowledge, no prior study has investigated the rationale and impact of rating solicitation status for sovereigns. The existing literature concentrates on the solicitation of corporate and bank ratings (Poon, 2003; Poon et al., 2009; Bannier et al., 2010; Van Roy, 2013) yet it does not include any study of solicitation conversions. The second theme relates to the impact of sovereign ratings on bank ratings through the rating channel. This aspect of the chapter builds on recent work (Alsakka et al., 2014; Huang and Shen, 2015) while adding a new dimension to the type of constraints imposed by sovereigns on banks via rating ceilings.

Thirdly, this chapter considers the influence of the recent EU CRA regulation. To the best of my knowledge, there is no published empirical work on the effects of enhanced disclosure by

CRA regulations introduced since 2009. Jorion et al. (2005) study the effect of US Regulation Fair Disclosure (Reg FD), introduced in 2000, and find that both positive and negative rating changes have a stronger informational effect on stock prices after the Reg FD took effect. Poon and Evans (2013) find that the impact of rating downgrades on bond yield premia (after Reg FD) depends on the size of the firm. Studies on other forms of rating-related regulation focus on periods prior to the EU CRA regulation (e.g. Becker and Milbourn (2011) utilize a US sample from 1995 to 2006).

The chapter uses a large sample of 147 banks rated by S&P incorporated in 42 countries in Europe, Asia-Pacific and Latin America for the period between 2006 and 2013. An ordered probit model estimation is applied, along with many robustness checks including placebo tests and matching exercises. I strongly endeavour to rule out the possibility of sample selection bias or that the observed phenomenon arises from events other than the adoption of EU disclosure rules for CRAs.

The results strongly suggest that disclosure of unsolicited sovereign status adversely influences bank ratings through the rating channel. Banks in countries converted to unsolicited status are more likely to be downgraded and less likely to be upgraded compared with banks in sovereigns which retained solicited ratings at all times. The marginal effects (MEs) analysis suggests that the former banks are 1.73%, 0.74% and 0.47% more likely to be downgraded by 1, 2 and ≥ 3 Comprehensive Credit Rating (CCR) points respectively. The significance of the MEs should be considered in relation to the total number of bank (sovereign) rating downgrades which represent 3.28% (2.73%) of all observations. Additionally, the analysis confirms a strong ceiling effect between sovereigns and banks. These findings have clear policy implications for regulators and banks, since there are potential costs to the institutions and the wider economies through this rating ceiling effect. The phenomenon represents an unintended consequence of regulation, and suggests a need for greater awareness of CRA rating policies in designing future regulation. Policymakers should take a closer look at unsolicited sovereign ratings and their implications. The findings of this study reveal an undesirable impact of recent regulatory developments on the European economy and will be informative in shaping future proposals.

The chapter design is ordered in the following manner. Section 5.2 brings about the research question together with the underpinning theoretical premises and testable hypothesis. Sample and data sources including descriptive statistics are presented in section 5.3. Further the

estimation method and the model along with proposed variables and necessary robustness tests are explained in parts 5.4-5.6. The last section 5.7 revises the chapter and concludes.

5.2 Research question and hypothesis

Current EU regulation on credit ratings, among other things relating to disclosure and presentation, requires CRAs to present solicitation status when assigning ratings (EC, 2011c; S&P, 2011a, e, f).

By studying the close relationship between sovereign and bank ratings, this chapter aims to investigate whether solicitation status of the country has an effect on banks. In other words, does sovereign solicitation status impact creditworthiness of bank ratings?

The literature suggests a possible contagion which feeds from the sovereign sector to other asset classes (Arezki et al., 2011; BIS, 2011; Moody's, 2012c; ESMA, 2013a; Alsakka et al., 2014; Correa et al., 2014). The papers investigating spillover effect between the sovereigns and the banking sector are limited but the literature has grown during the European debt crisis (Ejsing and Lemke, 2011; Alter and Beyer, 2014; Angeloni and Wolff, 2012; De Bruyckere et al., 2013; Demirguc-Kunt and Huizinga, 2013). Although the sovereign rating ceiling technically no longer exists, there is evidence that sovereign ratings still strongly affect ratings of non-sovereigns (Borensztein et al., 2013; Williams et al., 2013). The empirical papers on unsolicited corporate and bank ratings imply that entities rated on a solicited basis have significantly higher ratings (Poon, et al., 2009; Bannier et al., 2010; Van Roy, 2013). The issues related to unsolicited ratings caused controversies and regulatory responses especially in Europe and Asia (JCIF, 1999; Fitch, 2006) (see section 3.4 for more details).

This research combines above two streams of literature and examines whether sovereign solicitation matters. This chapter investigates whether the downward bias concerns sovereign issuers as much as it affects banks sector participants. Further, it investigates if solicitation status of the country spills onto financial institutions and determines their ratings. The study seeks to identify whether banks bear a penalty for their sovereign's rating status being unsolicited.

5.2.1 Derivation of the hypothesis

5.2.1.1 Spillover channels

In studying the close relationship between sovereign and bank ratings, I am interested in whether the rating solicitation status of the government has an effect on bank ratings.¹³⁶ The spillover between sovereigns and banks, affecting the latter's costs and funding opportunities, is known to transmit through four main channels: (i) asset holdings, (ii) collateral, (iii) government guarantees and (iv) ratings. Firstly, when banks hold sovereign debt they are faced with a loss in balance sheet value and overall profitability while funding becomes more expensive if the sovereign risk increases (BIS, 2011; Arezki et al., 2011; Angeloni and Wolff, 2012; De Bruyckere et al., 2013).

Secondly, higher sovereign risk results in lower value of collateral available to banks when negotiating costs of funds e.g. with the central bank (Kaminsky et al., 2003; Kiyotaki and Moore, 2005; Sy, 2009; BIS, 2011; De Bruyckere et al., 2013; Correa et al., 2014).

Thirdly, any reduced creditworthiness of the sovereign lessens the funding opportunities for banks arising from implicit and explicit government guarantees. A weakened government position undermines the credibility of any support for banks (BIS, 2011; De Bruyckere et al., 2013). For example, Demirguc-Kunt and Huizinga (2013) and Brown and Dinc (2011) show how the country's ability to support banks influences their market valuations.

The last channel relates to the fact that lower ratings of sovereigns are found to translate directly into lower bank ratings in that country (Alsakka et al., 2014; Huang and Shen, 2015). The spillover is known to occur for two reasons. Firstly, the lower sovereign ratings affect the cost of debt and equity funding. Arezki et al. (2011) show that sovereign rating changes affect bank stock index levels in Europe over the 2007–2010 period. Similarly, Caselli et al. (2014) find evidence of significant bank losses following sovereign rating downgrades in the European market. Correa et al. (2014) find that banks which are expected to receive government support demonstrate lower stock returns after a sovereign rating downgrade, while Williams, et al. (2015) show that S&P actions induce a significant impact on bank valuations in emerging markets. Further, BIS (2011) emphasises that sovereign debt concerns push up banks' funding costs. BIS (2011) show that in 2010 a large proportion (30%, or 120 basis points) of the spread,

136. For channels between sovereigns and corporates, see Borensztein et al. (2013).

between the bond yield and the swap rate of similar maturity, on bank bonds reflected the conditions of the sovereign (in terms of sovereign ratings and CDS premium).

Secondly, the ceiling effect arises because sovereigns have greater resources and policies at their disposal which mean that a higher non-sovereign rating is rarely justifiable. Borensztein et al. (2013) suggest that sovereign risk transmits onto non-sovereign issuers via the capital and other administrative controls and restrictive measures available to the government. Prohibitions against inflow and outflow of investment into the country (transfer and convertibility risk) restrain companies from repaying their external debt when the government reaches default or near default. In such a relationship, the non-sovereign debt always defaults when the state defaults, as it cannot access currency or transfer its funds outside the borders. Fitch (2012) suggest that sovereign actions such as altered regulated tariffs, deposit freezes, penalty taxation or expropriation are other reasons which justify the sovereign ceiling. Additionally, many banks participate in cross-holding claims of other intermediaries across countries, and thereby become exposed to one another (Arezki et al., 2011). Other channels include banking regulation, CDS contracts, and investment mandates (Sy, 2009).

5.2.1.2 Theories of inflated ratings

Theoretical insights on deflated unsolicited ratings arise under four concepts:¹³⁷

- Self-selection bias
- Strategic conservatism
- Blackmail theory
- Geographical discrimination

137. In contrast, Byoun et al. (2014) find no evidence of deflated unsolicited ratings. Using long-run stock market performance of Japanese firms paper finds that release of new unsolicited ratings leads to a negative long-run stock performance whereas announcement of new solicited ratings has insignificant effect. These authors suggest that this contradicts the strategic conservatism theory which implies unsolicited rating to be deflated. Further, the positive (negative) events for solicited firms lead to abnormal positive (negative) stock performance while they do not detect any abnormal reaction for those of unsolicited ratings. The argument suggests there is no bias between two types of ratings but simply the information conveyed by them is different. Solicited ratings are based on mixture of both public and private information whereas the unsolicited ratings are based on the former only.

i) Self-selection bias

Bannier et al. (2010) explain the difference between solicited and unsolicited ratings by the strategic behaviour on the part of the issuers (self-selection bias) or strategic behaviour on the part of CRAs.

Self-selection bias indicates that entities with unsolicited ratings who wish to convey a message that their creditworthiness is in fact better than stated will request solicited ratings. Once the rating improves, such entities benefit from a lower cost of capital. The overall reduction in cost explains the willingness of firms to incur fees for solicitation. Conversely, issuers which are aware of their weak creditworthiness, do not request and pay for a solicited rating (Bannier and Tyrell, 2006; Bannier et al., 2010; Fulghieri et al., 2014). Consequently, low quality issuers remain with their (relatively low) unsolicited ratings. Self-selection is thereby predicted to assist in reaching the most adequate credit appraisal for issuers regardless of the solicitation status. In this context, one could argue that a sovereign expecting a future rating downgrade would be more relaxed about an impending conversion to unsolicited status (e.g. not wishing to pay fees to a CRA if they consider a lower rating to be inevitable). The exact opposite of this premise arises under the strategic conservatism theory.

ii) Strategic conservatism

Bannier et al. (2010) suggest that unsolicited ratings might be driven by CRAs' "*strategic considerations in the rating process*" (p.264).¹³⁸ When CRAs face a reduced information flow from an issuer, they might prefer to rate "too low" rather than "too favourably". These authors argue that issuers who share the same creditworthiness can be assigned different ratings, based on different solicitation status. Those who do not mandate for ratings receive a (lower) unsolicited rating whereas those who purchase a rating obtain a (higher) solicited rating (after controlling for the economic and financial conditions of the sovereign). Likewise, the same rating level assigned to both solicited and unsolicited borrowers conveys a message that the unsolicited issuer is in fact less risky than implied by its rating.¹³⁹ However, this does not assist a non-sovereign with solicited ratings in this context. In a scenario where an issuer converts to

138. Self-selection and strategic conservatism act as an exact opposite predictions of lower unsolicited ratings in Bannier et al. (2010).

139. In such instance, the unsolicited rating is assumed to share negative correlation with the probability of default of the firm. For example, Bannier et al. (2010) as an indicator of default apply: default rates; bank individual z-score; market base estimate of default risk in line with Merton (1974).

unsolicited status, the CRA does not have access to private information and might therefore decide to rate lower after the conversion in order to ensure conservatism. Also, prior literature has not considered how this effect may proceed under the sovereign-bank ceiling e.g. a bank paying for its solicited rating might face a downgrade attributable to the sovereign's decision-making in opting for an unsolicited rating.

Lack of soft information is particularly problematic when publishing unsolicited ratings for financial institutions (Bannier et al., 2010). These ratings rely purely on publicly available information. Conversely, unsolicited sovereign ratings might encompass inside government information in addition to widely available statistics. Bannier et al. (2010) stress that the effect of underrating is the strongest for high opaque borrowers: banks and insurance companies. Their asset structures and legal responsibilities are the most complex (Morgan, 2002; Hirtle, 2006; Iannotta, 2006).

Furthermore, Löffler (2005) explains that issue of strategic conservatism is related to rating errors: type I and II. The overrating, (type I error), takes place when the entity defaults, despite its high rating (i.e. low risk of default). Underrating (type II error), on the other hand, occurs when non-defaulting issuer is assigned with a very low rating. According to Morgan (2002), conservative CRAs are more concerned about the type I error. The pessimistic ratings, which are a result of lacking soft information and thus conservatism of the CRAs, might explain differences between levels of solicited and unsolicited ratings.

iii) Blackmail theory

According to Bannier et al. (2010) and Van Roy (2013), the blackmail theory shares similar results as the strategic conservatism theory. In line with the previous theory one would expect the unsolicited ratings issuers to be less risky relatively to solicited issuers (see Bannier et al., 2010). The blackmail theory assumes that CRAs might persuade issuers to purchase ratings, otherwise threatening them (indirectly) by releasing disproportionately low unsolicited ratings. The rationale suggests that when the issuer is not transparent and does not disclose information, the risk assessment is difficult to perform and therefore downward biased ratings are not prone to being questioned by market participants (Van Roy, 2013).

Bannier et al. (2010) conclude it is relatively simple to increase the rating of the opaque issuer subsequently after solicitation was mandated, and to justify it by the enhanced soft information. Although this theoretical explanation seems possible one could speculate whether it is likely to

be the case in a modern world. Would a company providing services allow itself to threaten its own or potential clients without fear of harming its reputation?

Ramakrishnan and Thakor (1984) stipulate that blackmail is not a tenable position for the CRAs, since their reputational capital plays a more important role than any short-term financial gains. Covitz and Harrison, (2003) reach the same conclusion empirically. However, Bar-Isaac and Shapiro (2013) and Opp et al. (2013) argue that the reputational concerns of CRAs change over the business cycle. CRAs increase their ratings quality in low points of the economic cycle and relax them during booms.

iv) Geographical discrimination

JCIF (1999) suggests that non-Asian CRAs discriminate against Japanese and other Asian issuers due to cultural bias. After observing six major CRAs the institution concludes that Japanese CRAs,¹⁴⁰ unlike others, consider distinct governance structure of Japanese enterprises and take into consideration Japanese culture. The remaining non-Japanese CRAs rely on the standardised and globally applied rating standards.

Survey of managers of Japanese financial and industrial firms, conducted by JCIF, affirms that the US originated ratings do not recognise corporate nature of Japanese industry such as the keiretsu links. “*Keiretsu is a large financial or business network based on cross shareholdings, mutual appointment of officers and other key personnel, intra-group financing to group firms by group financial institutions, and formation of presidential councils*” (Byoun and Shin, 2003; p.21). In a situation of financial difficulty of one of the keiretsu affiliates, the entity would be bailed out by an associate from the related industry, either financial or an industrial alliance. Li et al. (2006) conclude that raters outside Japan (Moody’s and S&P) do not reflect the keiretsu affiliation status.

Behr and Güttler (2008) are not able to explain why ratings of Japanese issuers by one of the global agencies (S&P) indicate higher risk of default than the Asian originated CRAs. They propose simple explanations as to why this could be the case. Firstly, they allude to the varying approaches of CRAs when issuing unsolicited ratings. Poon (2003) proves empirically that S&P assigns different weights to economic variables when rating Japanese and non-Japanese companies.

140. Such as Japan Rating and Investment Information (R&I) and Japan Credit Rating Agency (JCR).

Secondly, the reason might lie behind the *home bias* where the CRAs in the rated country or region favour the issuer. The fact that Japan suffered crisis at the turn of the XX and XXI century might have given an incentive of Asian CRAs to spare firms and the economy as a whole, by rating them more optimistically. In case of significant rating downgrades the entire economy could have been impaired. Related literature by Shin and Moore (2003) and Trevino and Thomas (2000) also confirms that the CRAs assign higher sovereign ratings to issuers in their own region.

The final more provoking explanation suggests the strategic behaviour of non-Asian CRAs is to supposedly sabotage Japanese firms, by intentionally lowering ratings, to harm their reputation and ability to compete. This explanation is widely expressed among Japanese government and market participants (Behr and Güttler, 2008).

5.2.1.3 Hypothesis

Two streams of literature discussed above provide a potential explanation for differentials between ratings of banks incorporated in solicited versus unsolicited sovereigns. Firstly, the theories of downward biased ratings for unsolicited non-sovereigns provide reasons to believe that the solicitation status of sovereigns will impact their credit ratings. Secondly, the evidence that bank ratings are influenced by sovereigns through the rating channel (e.g. BIS, 2011; Alsakka et al., 2014) might lead the sovereign's solicitation status to become a concern for banks. Under the interaction of these effects, I propose:

Hypothesis: *Bank ratings are more likely to be downgraded in countries whose sovereign rating status is converted to 'unsolicited'.*

Such an effect has a negative impact on the funding costs of banks in that country. Investigation of the interplay between sovereigns and banks in this setting poses challenges in interpretation of the competing theories of unsolicited ratings. There is no literature (theoretical or empirical) which examines the issue of solicitation of sovereigns, not to mention the dynamics of any conversion in status. Individual governments do not reveal their rating subscription details and it is difficult to deduce whether self-selection plays a role in the status of sovereign ratings. CRAs themselves are also not very clear as to how the solicitation procedure of sovereigns is initiated. For instance in publication released in February 2011, S&P states it is converting the US issuer and issue ratings following previously announced conversions on the seven European issuers as an answer to new EU regulations on credit ratings (S&P, 2011e). The publication

adds that the CRA does not have the agreement with the issuer. It is not clear from the report itself whether the government of US was previously purchasing the ratings or not. On the other hand, news about Turkey terminating its contract with S&P in May 2012 is an example of the action taken on the side of the sovereign. Additionally, what is uncertain is also the fact whether particular solicited country purchases agreements with all three (or more) CRAs in order to be rated fairly?

On the other hand, sovereigns are relatively transparent in terms of their liability structures (unlike banks) however, when a sovereign converts its solicitation status, the CRA might perceive a deficiency of soft information and start rating the sovereign more conservatively. The blackmail theory could offer a plausible explanation in a case where the issuer is less transparent (Van Roy, 2013). However, it is unlikely that a CRA providing services not only to a sovereign but also to a number of non-sovereigns in that constituency would threaten its current or potential clientele without genuine concern about harming its reputation (Ramakrishnan and Thakor, 1984).

The geographical bias could be potentially part of the explanation. According to Poon (2003), S&P assigns different weights to economic variables when rating Japanese and non-Japanese companies and the same could be true for other Asian sovereigns. The reason might lie behind *home bias* where the agencies in the rated country or region favour the issuer.

5.3 Sample and data sources

In order to address the research questions, investigating the impact of solicitation status on the bank rating changes the following data is selected. Firstly, to examine the rating channel from sovereigns onto banks the credit ratings data is utilised. This dataset comprises of long-term foreign sovereign and bank ratings. The details of the ratings selected along with their matching process and requirements are subject of section 5.3.1. The reasoning behind using bank ratings as opposed to other non-sovereign issuers is explained in section 5.3.1.2. Further, bank financial data used to capture the banking environment across the sample is subject to section 5.3.2. Lastly the macroeconomic variables controlling for differentials between the countries in the dataset are presented in section 5.3.2.1.

5.3.1 Credit ratings dataset

The sample comprises monthly sovereign and bank long term foreign currency issuer ratings by S&P between January 2006 and January 2013. 1 March 2011¹⁴¹ is treated as the single date of the regulatory intervention (see section 5.3.1.1) and for this reason it is believed that 5 year pre-treatment period should sufficiently explain existing trends across markets. The end date is restricted by the availability of macroeconomic variables.

The reason for using ratings from one CRA (S&P) stems from the fact that its solicitation status on sovereigns including historical status is the most transparent and verifiable among all big CRAs. This is with regard to the sources available on the website as well as approachability of the analysts.¹⁴² Using ratings by S&P forms clear and uncontaminated dataset. The choice of the CRA is supported by Williams et al. (2013) where the authors find that bank ratings issued by S&P, in contrast with Fitch and Moody's, are most likely (80% of studied cases) to be at the sovereign level.

5.3.1.1. Sovereign ratings data

Monthly frequency sovereign ratings data together with watch and outlook status is available from my supervisor's database for the entire sample period. Solicitation status of sovereigns is obtained from S&P Global Credit Portal publications. In February 2011, S&P (2011a, e, f) released reports on conversions of solicitation status for: 1) seven European countries (Belgium, France, Germany, Italy, Netherlands, Switzerland, United Kingdom); 2) six Asia-Pacific countries (Australia, Cambodia, India, Japan, Singapore, Taiwan); and 3) the US. Table 5.1 illustrates the dates of S&P's conversion of solicitation status of sovereigns. The press releases from S&P state: 'Standard & Poor's is converting its issuer and issue ratings on Belgium, France, Germany, Italy, Netherlands, Switzerland, the UK, and the European Central Bank (ECB) to "unsolicited", in light of the new European Union regulations' (S&P, 2011a), and 'Standard & Poor's is converting its issuer and issue ratings on Australia, Cambodia, India,

141. It is believed to be the precise approximation when considering a monthly data frequency.

142. Moody's does not have a constant record of labelling sovereign ratings as solicited vs. unsolicited. In the correspondence with head of the sovereign risk group it was mentioned that he had limited and coincidental knowledge about contractual arrangements past and present. Nonetheless, the manager would prefer to preserve the confidentiality of the contractual arrangements. Fitch, on the other hand, does not continuously identify unsolicited ratings (shadow ratings) as a result of numerous mergers and acquisitions which changed its operating structure (Banner et al., 2010). The CRA does not publicise the history of the solicitation status. This information is not available for purchase due to confidentiality agreements with its rated issuers, neither current nor historical.

Japan, Singapore, and Taiwan to "unsolicited" (S&P, 2011f). In addition, all the issue ratings are then withdrawn shortly after the conversion of the issuer rating to 'unsolicited', which lends support to there being a fundamental change in S&P's relation with these sovereigns. For example, S&P (2011f) states: 'On May 24, 2011, we will withdraw all our issue ratings on the debt of Japan, Singapore, and Taiwan'. Further, Argentina's solicitation status was converted on the 4th April 2011 and was the final case arising from the regulatory requirements on disclosure during our sample period.¹⁴³ The US is excluded from the reported results due to it having a high proportion (approx. 20%) of all S&P-rated financial institutions, which would distort the sample and dominate any evidence on the research question.

In the analysis the treatment group consists only of those countries which status changed in February 2011 (with the exception of Argentina) to rule out influences other than those driven by the EU regulation. As a result, Turkey and the Republic of Madagascar are omitted from the sample.¹⁴⁴ The US is excluded due to high number of financial institutions (approximately 20%).¹⁴⁵ Consequently the treatment group consists of 13 sovereigns: Argentina, Commonwealth of Australia, Kingdom of Cambodia, Republic of France, Federal Republic of Germany, Republic of India, Republic of Italy, Japan, The State of Netherlands, Republic of Singapore, Swiss Confederation, Taiwan (Republic of China) and the United Kingdom.

The new regulation (Article 10 (5) of the EU Regulation 1060/2009) is compulsory for CRAs, and is therefore applicable to all sovereigns rated by S&P. For banks operating in the EU to use sovereign ratings for regulatory purposes, the rating's solicitation status (of all countries) must be disclosed.¹⁴⁶ Hence, any government may request to withdraw their ratings, but the CRA may elect to convert the rating to 'unsolicited' status rather than withdraw the rating (S&P Policy on Withdrawals, Suspensions, Discontinuances and Conversions, December 2014). Further, S&P may assign unsolicited credit ratings when it believes sufficient market interest

143. Correspondence with the S&P analyst (2013a) confirmed the solicitation status of all sovereigns before the regulatory changes took place.

144. Turkey ceased its contract with S&P on January 14, 2013 whereas Madagascar withdrew its contract with the CRA on May 11, 2009.

145. These institutions would dominate the sample and could bias results which are aimed at cross-country analysis and the interplay between sovereigns and banks.

146. For example, S&P (2011f) states: "These actions, in turn, follow new European Union regulations on credit ratings (Article 10(5) of EU Regulation 1060/2009), which address matters relating to the disclosure and presentation of credit ratings, requiring, among other things, that unsolicited credit ratings be identified as such. [...] We are converting our issuer credit ratings on the six governments to "unsolicited," as we do not have rating agreements with these governments. Nevertheless, Standard & Poor's will continue to rate these governments and classify the ratings as unsolicited, as we believe that we have access to sufficient public information of reliable quality to support our analysis and ongoing surveillance, and because we believe there is significant market interest in these government ratings."

exists for the rated entity (S&P Policy on Assignment of Credit Ratings, May 2014). Hence, whenever there is no agreement with a government to be rated, the CRA can convert the rating to ‘unsolicited’.

The treatment group predetermines the rest of the sample geographically. Namely, the control group sovereigns need to be both rated by S&P and be restricted to regions such as Europe, Asia and Pacific and Latin America. The sample excludes remainder of America, Africa and Middle East regions. This results in a manageable number of entities for which accounting and financial data can be found.

5.3.1.2 Bank rating data

Monthly bank rating data including watch and outlook status is obtained from the Interactive Data Credit Ratings International (CRI) database. This data is cross checked with help of Global Rating Handbooks by S&P which discloses solicitation status of bank issuers (Poon and Chan, 2010).¹⁴⁷ The sample only comprises financial institutions because there is a far stronger link between sovereigns and banks than between sovereigns and corporations (see Borensztein et al., 2013; Huang and Shen, 2015). For example, corporates do not use sovereign bonds as collateral and for this reason are not equally affected by sovereign rating fluctuations. Also, for most countries (but not the US), banks are typically much more likely than corporations to be rated at the sovereign ceiling.

Initially 2284 financial institutions meeting the geographical criteria are found. However, when an institution’s status is withdrawn (NR) at any point of time the item is removed from the sample and reported as a separate event (see Table 5.A.1 in Appendix 5.A). Further, the original sample included four instances of Watch developing announcements¹⁴⁸ (which indicate entity being placed on a Watch with developing implications). A rating with this particular type of a watch signal is not taken into account when calculating rating events.

Once the bank rating sample is obtained the credit rating data¹⁴⁹ is matched with the financial and accounting data sourced from Bankscope (section 5.3.2).

147. The final dataset comprises of 147 institutions which have ratings assigned by S&P.

148. BTA Bank JSC (2009/02/03 and 2009/02/16), Piraeus Bank SA (2007/01/12) and West Siberian Commercial Bank-Zapsibcombank (2008/10/15).

149. Including sovereign rating data from section 5.3.1.1 and bank ratings from this section.

5.3.2 Bank financial data

Yearly statistics on bank financials and accounting data are available through Bankscope. Poon and Firth (2005) and Hau et al. (2013) motivate choice of the bank variables. The example of available accounting and financial data includes:

- Total assets
- Total equity
- Net loans to total assets
- ROAE
- Loan loss reserves to gross loans
- Equity to total assets

The sample is narrowed to publicly listed companies which provide good source of financial statistics. Further, banks are selected based on their specialisation and include: commercial banks, savings banks, cooperative banks, real estate and mortgage banks, investment banks, other non-banking credit institutions, bank holdings and holding institutions, finance companies and group finance companies. After filtering in accordance with the regional classification 906 entities meeting these criteria are obtained.

5.3.2.1 Macroeconomic data

Data containing macroeconomic environment in yearly frequency is accessed via DataStream database. The obtained statistics originate from:

- The World Bank (WB): World Development Indicators (WDI), Aggregated Governance Indicators (AGI), Global Development Finance (GDF), World Bank's Analytical Classification of income.
- The IMF: World Economic Outlook (WEO), International Financial Statistics (IFS)
- Oxford Economics

5.3.3 Monthly dataset

As a result of matching the credit rating and bank sample, 147 intermediaries originating from 42 countries are obtained. This includes 13 unsolicited and 31 solicited sovereigns. This is the final dataset used in the empirical analysis after some banks and countries exit the initial dataset due to winsorising the accounting data. Removal of the outlying observations which are above

the 99.5 percentile and below the 0.5 percentile of the distribution is achieved using the trimmed estimator in STATA. Amongst the variables which required winsorisation were: ROAE (minimum values; 97 observations deleted); LEVERAGE (maximum values; 36 observations deleted); INCREV (maximum values; 37 observations deleted). For the list and description of variables, see Table 5.8.

The full lists of sovereigns participating in the study and their corresponding intermediaries are available from Tables 5.A.2 and 5.A.3 in Appendix 5.A. The rating daily data is collapsed onto the monthly observations to decrease the number of zeros in the sample. This results in 8900 observations.

Monthly data suits the experimental design of this study. According to Bertrand et al. (2004) in their review of 92 papers, which applied DD methodology, more than 75 percent included more than five years of data. The longest time series including 51 and 83 periods (months) were observed in approximately 95 and 99 percent of the examined publications.¹⁵⁰

5.3.3.1 Rating events: Sovereigns

To calculate the sovereign rating events, ratings which were present as of January 1 2006 and continued until 2013 are used. This involved collecting the entire history of events for 42 sovereigns in case backtracking was necessary. This is due to the fact that the frequency of actions for sovereigns is very low. For instance, on couple of occasions country retained the rating which was awarded long before start of the sample period and which did not change until this date (e.g. Denmark-with its triple A rating since 27th February 2001). Others experienced an action only in the recent years (e.g. Finland changed from AAA/Stable outlook which carried since 1st February 2002 to AAA/Watch Negative on the 5th December 2011).¹⁵¹

To identify rating events, the 20-notches scale is applied first. The scale assigns numerical scores such as: SD, CC, D=1, CCC-=2, CCC=3, CCC+=4,..., AA+=19, AAA=20. To add weight to the rating changes and to increase number of observations, the ratings scale is supplemented with watch and outlook status. This results in the comprehensive credit rating scale (CCR-58 points scale). Literature on watch and outlook status is found to produce

150. This is explained by papers using monthly data.

151. The release of rating events is not fixed to particular day of the month and for this reason it is difficult to find rating events matching exactly the beginning of the sample period (i.e., the first recorded rating event in 2006 might exceed January 1st). In such instance the most recent rating event before that date is extracted and set it as the base year (1st January 2006).

stronger effect than actual ratings (Kim and Wu, 2011; Alsakka and ap Gwilym, 2013) (see section 3.4). In the CCR scale, each rating class is assigned a value between 1 to 58 (i.e. C, SD, CC, D=1, CCC=-4, CCC=7,..., AA+=55, AAA=58) (as seen in Sy, 2004 and Alsakka and ap Gwilym, 2012a, 2013). For positive watch +2 is added, for positive outlook +1 whereas for negative outlook and negative watch 1 and 2 is subtracted respectively. Stable outlook and no watch, or no outlook does not add points to the existing rating scale.

Credit events include the following:

Positive events include:

- rating upgrades (solo)
- positive outlook actions (solo) (change from stable outlook to positive outlook status or change from negative outlook to stable/positive outlook status)
- positive watch actions (solo)(action where the rating is confirmed (no rating change) after being placed on negative watch or positive watch status is introduced)
- change from negative watch to negative outlook (in relative terms this event is considered as a positive signal since weight of the negative watch is -2, in the CCR scale, and is replaced by negative outlook which weighs -1 points)
- positive combined action: rating upgrade accompanied by outlook or watch status

Negative events include:

- rating downgrades (solo)
- negative outlook actions (solo) (change from stable outlook to negative outlook status or change from positive outlook to stable/negative outlook status)
- negative watch actions (introducing negative watch status or positive watch status is replaced with stable outlook status with no rating change)
- change from positive watch to positive outlook (positive watch weights 2 points and is replaced by positive outlook which carries 1 point in the CCR scale)
- negative combined actions: rating downgrades accompanied by outlook or watch status

Descriptive statistics for the sovereign ratings actions can be found in Tables 5.2-5.4. The first Table presents the rating events expressed in the 20-notch scale. In total the sovereigns incurred 154 rating events during the investigated period; 71 positive and 83 negative. The positive and

negative actions are distributed in similar proportions representing 46% and 54% of the rating events (2.33% and 2.73% of the total number of observations respectively).

Single rating actions amount to 27% (1.38% of the total observations) of the rating events where 18% constitute upgrades and 9% downgrades. Single outlook events comprise 37% of all events (1.9% of observations), out of which 19.5% followed positive and 17.5% negative route. Single negative watch events significantly outweigh the positive and comprised 9% of all events (translates to 0.46% of sample observations). Finally, the combined actions represent 22.1% of events (1.12% of the studied sample). The recorded events total 3.9% and 18.2% for positive and negative combined actions respectively.

Table 5.3 expresses rating events in the CCR scale. The total number of rating events (positive vs. negative) is the same regardless whether 20-notch or 58-point scale is used. Table 5.4 on the other hand, splits the sovereigns into treatment and control group and reports their ratings in the CCR scale respectively. The control group encounters the same number of positive and negative actions in the data sample (62). Treatment group experiences 30 negative actions against 9 positive actions.

Panel II of Table 5.7 presents the aggregated statistics concerning sovereigns. The sample period is divided into pre- and post-intervention phase. The pre-regulatory period yields positive as well as negative rating events in similar proportions (52 positive and 46 negative). They are distributed evenly among the two groups (treatment 7 vs 8 and control 45 vs 38). The post-regulatory phase conversely shows a steep decline in upgrades and increase in downgrades for the treatment group (2 upgrades against 13 downgrades). The control group also shows deteriorating economic conditions through higher number of downgrades. Nonetheless, negative events remain proportional to the upgrades (17 upgrades vs 24 downgrades). Additionally, the overall sample of rating actions is attributed to 40% (60%) speculative (investment) grade sovereigns respectively.¹⁵²

Figures 5.1-5.4 in Appendix 5.A present distributions of two groups of sovereigns by rating score depicted in 20-notch scale. The credit ratings of sovereigns are transformed into 20-notch scale. Frequency relates to the percentage of monthly rating observations which correspond to a particular rating in the scale. Figures 5.1 and 5.2 show the distribution of ratings, in the

152. Ratings of issuers equal to and below BB+ (i.e. BB+, BB, BB-, ..., C, SD, CC, D) are considered speculative grade ratings. Ratings equal to and higher than BBB- are known as investment grade (i.e. BBB-, BBB, BBB+, ..., AA+, AAA).

treatment group, in both pre and post-treatment data period. As can be seen the dispersal of sovereigns in this group skews towards the A+ and ratings above in both periods. Approximately 90 percent of the distribution in the pre-treatment sample is driven by the investment grade ratings (BBB- = 11; and above). The remainder comprises speculative ratings which include BB+ and below (10).

Similar distribution is present in the post-treatment period with the exception that majority of speculative ratings are assigned to “B” rating. Allocation of investment grade ratings changes by introducing BBB+ (13) and A (15) ratings in that period. Additionally, fraction of AA- ratings rises by almost a half.

Figures 5.3 and 5.4 depict ratings distribution of the control group sovereigns. These distributions are more balanced representing ratings in the group between CCC+ to AAA+ (4-20) in the pre-treatment period. In the post-treatment period the entire rating scale is represented with the exception of “CCC-” (2) and “CCC+” (4) and “B-“ (5) rating. Fraction of triple “A” (15) ratings drops to less than 20 percent. Significant increase in “B+” (7), “B-“ (8), “BBB” (12), “BBB+” (13) and “AA-” (17) ratings can be observed. In the second period, sovereigns with a default status unlike in the earlier period are observed.

5.3.3.2 Rating events: Non-sovereigns

Table 5.5 and 5.6 depict the number of bank’s monthly rating events according to 20-notch scale and 58-point scale respectively. The differentiation between events as well as their calculation follows that of sovereigns mentioned earlier.

In summary, 516 events out of which 224 (292) are positive (negative) are found. The total number of single rating events amounts to 136 (1.5% of the sample). This includes 79 upgrades and 57 downgrades. In terms of distribution of individual upgrades, 94% of all solo upgrades are increases by one notch (74 in total) whereas the remaining 6% by more than one notch (5 in total). On the other hand, 93% (53 in total) of all individual (solo) downgrades in the bank sample fall by one notch. The remainder (7%) are the downgrades of two, three and four notches (4 in total). Solo outlook events comprise 32% of all events (1.85% of the data sample). Single negative outlook actions outweigh the positive by approximately 4% on the whole.

Watch events constitute integral part of the studied bank dataset amounting to 19.3% of the total actions (1.12% the sample observations). Watch negative actions prevail in 64% of cases

relative to positive watch signals. In relation to the entire events data, watch negative events occur more frequently by 5% than those of positive nature.¹⁵³ Also, negative combined actions are dominant in the data sample. Out of 101 combined actions, 22 are positive whereas 79 yield negative signals. In relative terms combined actions equate 19.6% of the rating events (1.13% of the data sample).

In addition to rating events, Panel I in Table 5.7 splits the sample into pre and post-treatment periods. The positive (negative) events in the former period amount to 1.75% (1.79%) of all observations. After the treatment, banks incur 0.76% (1.49%) positive (negative) events respectively. Data from both periods suggests that 366 (71%) of overall events relate to investment grade ratings whereas 150 (29%) to speculative grade ratings. Pre-treatment sample includes 81 (234) events linked to speculative (investment) grade. The post-treatment sample includes 69 (132) speculative (investment) grade events.

Descriptive statistics identify a strong ceiling effect which is observed for 78% of sample observations ($B < S$). The instance when banks and sovereign ratings coincide persists in the 19% of data sample ($B = S$). Bank ratings are able to pierce the ceiling in 3% of cases ($B > S$). One can identify the ceiling by comparing averages of bank numerical ratings in comparison to sovereign ratings. According to 20-point (58-point) scale, sovereigns obtain a numerical rating of 14.5 (43.86) whereas banks of 13 (36.8) respectively. The magnitude of the ceiling effect is also observed when the sample is split into pre and post-regulatory period.

Figures 5.5 and 5.6 in Appendix 5.A show the distribution of the monthly bank ratings in the sample in the pre and post-treatment data period. As previously ratings are converted into 20-notch rating scale. The bank ratings form the normal distribution skewing towards the speculative grade ratings. Very low fraction of the sample consists of default institutions (less than 2 percent). Conversely, the other end of the distribution does not stretch above “AA+” (“AA”) in the first and (second) period respectively. The junk grade ratings amount to less than 20 percent of the sample in the pre-treatment period. This fraction rises after March 2011. In the latter period number of “A” ratings rises to 20 percent whereas the neighbouring category “A-” drops from by approximately 5 percent.

153. Negative watch amounts to 64 events which constitutes 12% of all bank rating events (0.72% of the data sample), whereas positive watch adds up to 36 events which amounts to 7% rating events (0.4% of the sample).

Figure 5.7 in Appendix 5.A presents the country distribution of bank ratings in the sample. The Japanese financial institutions dominate the sample comprising approximately 20% of its size. This could be due to high number of rated Japanese FI which are publicly listed companies. Further, approximately 5% intermediaries derive from Australia and Italy followed by India, United Kingdom and Russian Federation. Since merely listed companies are used the number of German or Dutch banks might seem underrepresented in the sample.¹⁵⁴

5.3.4 Trends between sovereign and bank ratings

To graphically illustrate the trends between sovereign and bank ratings the dataset is collapsed onto yearly observations. The ratings are observed as of 1st January every year.¹⁵⁵ This results in 886 observations. Figures 5.8-5.17 illustrate trends in 10 unsolicited countries (treatment group). Sovereign line (blue) represents a rating of a country. The bank rating line (maroon) corresponds to an average rating of the financial institutions incorporated in that country at the same point in time. The dashed line (cranberry) represents the change of solicitation status by the sovereign.

The treatment group illustrates the ceiling effect is present in the sample¹⁵⁶ meaning the bank ratings rarely exceed those of the sovereign issuer. There is a wide gap in between bank and sovereign ratings with the exception of Argentina and India where they overlap with each other.

The cranberry line indicating treatment effect illustrates slump in ratings approximately around the period when regulation was introduced. In case of France, Germany and Italy both sovereign and bank ratings show a substantial decline cumulated around the first quarter of 2011. On the other hand, Australia, Taiwan and the UK exhibit slump in bank ratings while the sovereign credit worthiness remains constant. This graphical interpretation illustrates the ceiling effect observed in section 5.3.3.2 which is captured in Panel I of Table 5.7.

154. FI excluded from the sample included non-listed institutions such as: Germany: Bayerische Landesbank Girozentrale, DZ Bank Deutsche Zentral-Genossenschaftsbank AG, HSH Nordbank, Landesbank Baden-Wuerttemberg, Landesbank Berli; France: Societe Generale, Netherlands: Rabobank Nederland, ABN Amro Bank NV among others.

155. For 2006, 2011 and 2012 there is no trading day on the 1st January and 6th January is selected instead.

156. The graphical interpretation of Cambodia, Singapore and Taiwan is not presented but yields similar results.

5.4 Methodology

5.4.1 Univariate tests

5.4.1.1 Summary statistics

Preliminarily, the choice of the control variables for the univariate and subsequently multivariate analysis is influenced by the literature highlighting determinants of bank and sovereign ratings (Cantor and Packer, 1996; Poon and Firth, 2005; Afonso, 2007; Hau et al., 2013) (see section 3.3.1). Additionally, variables with the least number of missing observations were kept for further analysis. Appendix 5.B lists all of the tested variables.

The summary statistics such as mean, standard deviation, number of observations and percentiles along with abbreviations and definitions of variables used in the multivariate analysis are depicted in Table 5.8. These statistics are a useful tool of detecting possible errors and the outliers in the dataset. Table 5.8 provides summary statistics for monthly observations of independent and dependent variables employed in the regressions over the studied period Jan 2006- Jan 2013. The sample represents a balanced panel data.

The rating change of sovereigns represents the mean -0.05 percent which illustrates the high number of “zeros” in the data sample. The negative sign suggests that the number of downgrades outweighs the upgrades on average. The lower average rating change is found for banks (-0.02) which confirm the ceiling effect is present. The maximum rating a bank received in a sample period equals 55 CCR points. This translates into AA+ rating with a Stable Outlook.¹⁵⁷ The minimum bank rating, on the other hand, amounts to 1 CCR point. This presents CC rating with Negative Outlook or Negative Watch.¹⁵⁸ On average banks in the data sample are rated at 37 CCR points which translates into BBB+ rating with a Stable Outlook. In relation to control variables the highest standard deviation (18.5) in the distribution is recorded for non-interest income over gross revenue-INCREV. That is where the minimal and the maximum values diverge most from the mean and median values.

157. The rating was recorded to the BNP Paribas (France) up until August 2007.

158. Such instance was recorded for three intermediaries: Banco Hipotecario SA (Argentina), BTA Bank JSC (Kazakhstan) and Nadra Bank (Ukraine).

5.4.1.2 Univariate analysis

This section tests for differences in financial profiles of the two groups of banks (treatment and control group). It helps to identify whether groups comply with the parallel trend assumption required for the multivariate analysis. In other words, in the absence of regulatory intervention the difference between treatment and control group should be constant over the time. To verify this t-test statistic of the means between two groups is estimated (solicited vs. unsolicited sovereigns) for a number of covariates where the t-value statistic is expected to yield insignificant results. The lower frequency (yearly) data is used in this exercise to reduce the number of “0” in the sample.¹⁵⁹ The ratings are observed on the first trading day of January across years 2006 to 2013.

Firstly, differences in distributions between changes in bank ratings incorporated in countries which did (did not) undergo the change of solicitation status treatment (control group) respectively are tested for. Since the change in bank ratings (Δ BANK) is not continuous but ordinal variable the Mann-Whitney U test¹⁶⁰ (also known as Wilcoxon rank-sum test) is applied to test for differences in two groups of unmatched data (Poon, 2003). The null hypothesis (H0) indicates that there are no differences in distributions between ratings events in treatment and control group. The alternative hypothesis (H1) states that two groups differ in terms of bank ratings changes.

The null hypothesis, that the change in bank ratings in both groups is identically distributed, is rejected for the post-treatment as well as for entire sample period (see Panel I Table 5.9). Namely, the two groups represent different characteristics and the rating changes for banks in each group are statistically different from each other. When the test is performed for mean ratings the p-value indicates that two groups are statistically different from each other in all tested periods (pre, post-treatment and the whole sample) (Panel II Table 5.9). Mean rating of banks in unsolicited countries is equal to 40.03 as opposed to 32.97 under solicited jurisdiction. A statistically significant mean difference of 7.06 with 99 percent confidence intervals is obtained for the entire data sample. Somewhat lower difference is accounted in the post-treatment period however it remains significant at the one percent level. The most significant

159. T-tests for change in bank ratings in daily, monthly and yearly frequency yield the same results.

160. The Mann-Whitney U test is a nonparametric test used as an alternative to the independent sample t-test when the data are ordinal in nature. $U = n_1 n_2 + \frac{n_2(n_2+1)}{2} - \sum_{i=n_1+1}^{n_1+n_2} R_i$ where: U=Mann-Whitney U test; n_1 = sample size one; n_2 = sample size two; R_i = rank of the sample size.

difference between two means can be observed in the pre-treatment period where it amounts to 7.59. On average, bank ratings in solicited countries take the value of 33 CCR points whereas in the opponent group they approximate to 40 points.

Additionally, differences in financial profiles of banks incorporated in both solicited and unsolicited countries are examined. Differences in financial variables and ratios are tested using the t-test.

These include:

- Profitability measures: Return on average equity % , Non-interest income over gross revenue %
- Size: LN(ASSETS)
- Asset quality measure: Loan Loss Reserve / Gross Loans %
- Capital adequacy: Total Assets / Equity Multiple

The same hypothesis follows. The null hypothesis suggests that there is no difference between the financial profiles of banks in the treatment and control group. Alternative hypothesis indicates that there are significant differences between the financial profiles of banks incorporated in sovereigns with solicited and unsolicited ratings.

Tests in Table 5.9A show that on the whole banks incorporated from the two groups of sovereigns have distinctive characteristics and are not balanced groups (for 4 out of 5 variables the null hypothesis is rejected). Banks in the treatment group are characterised by lower returns on equity and keep lower loans reserves. Portfolios in these banks are composed of a larger amount of assets and are more leveraged. According to the mean population comparison, banks in each group are not different in terms of non-interest income.

To correct for the differences in profiles across of banks a more detailed paired subsample test in later phase of multivariate analysis is conducted (see section 5.6.2). The subsample is selected by pairing (matching) banks based on their financial profiles and ratings. The issuers with similar profiles are then tested for differences between mean ranks and t-statistics (seen in Poon, 2003; Poon and Firth, 2005; Lemmon and Roberts, 2010).

5.4.2 Multivariate analysis

The studied phenomenon of a regulatory change provides grounds for applying the quasi-experimental research design such as the difference-in-difference (DD) estimation¹⁶¹ (Angrist and Krueger, 1999) (for more details see 3.6.9). The methodology allows capturing the endogenous shock in the sample (effect of regulation) and its effect on variable of interest (bank ratings). However, the DD is a method which relies on the linearity assumption and since the dependent variable is of a discrete nature one could fall into censoring issues (Wooldridge, 2007).¹⁶²

Although the ordered probit model is applied, this study is constructed with the intention to contain all the important elements needed for testing the impact of the treatment effect in the linear as well as non-linear setting. For the same reason the sample is grouped similarly to the DD empirical papers and consists of treatment and a control group. To correct for possible variation amongst treatment and control group variety of fixed effects are tested for with use of dummy variables.

As already mentioned the solicitation status of a sovereign issuer after the regulation took place acts as a treatment. The assumption that the shock induced by the European regulation is exogenous is fundamental for proper estimation of its effect on the dependent variable (Roberts and Whited, 2013). It is unlikely that the bank ratings among other covariates could in any way enforce the regulation regarding the solicitation status. However, to validate this premise, the sample is checked for such instances. It is very rare to find bank rating actions which would precede their home sovereign actions within a short time window. Similarly to Alsakka et al. (2014), I find no evidence whatsoever of a bank-to-sovereign rating channel.

161. $y_{it} = \alpha_1 + \beta_1 Treatment_{it} + \beta_2 Post_t + \beta_3 (Treatment * Post)_{it} + \varepsilon_{it}$

where: y_{it} = binary indicator of an outcome; the estimate follows $(TG^{POST} - TG^{PRE}) - (CG^{POST} - CG^{PRE})$ where: TG is a treatment group, CG control group, POST(PRE) relates to the post (pre) event period.

$i = 1, \dots, N$ entities and $\tau = 1, \dots, T$ time periods

Treatment = dummy variable takes value of 1 if the entity is in the treatment group; 0 otherwise.

Post = dummy variable takes value of 1 if the observation is in a post-treatment period; 0 otherwise.

β_1 = average of the outcome variable for the treatment group relative to the control group pre-treatment period.

β_2 = change measurement in the outcome variable between periods within the control group.

β_3 = treatment effect measures of how much outcome variable changed in the treatment group due to treatment in respect to how much outcome variable changed in the control group in the same time period.

162. The author explains that when the dependent variable is discrete in nature, a data problem could arise because the “responses might be censored above or below some value; that is, it is not observable for part of the population” (Wooldridge, 2005; p. 517).

To maintain the experimental design, the study also needs to satisfy the assumption requiring both groups to share similar characteristics with the exception of receiving the treatment. The parallel trend assumption dictates that in the absence of the treatment in the form of regulation, the pre-treatment difference between treatment and control group is constant over time. This means that ratings issued by solicited or unsolicited sovereigns should follow the same time trend without regulatory reforms (intervention). Likewise, the treatment effect should introduce deviation from this trend (Angrist and Pischke, 2009). Since the univariate tests in section 5.4.2 show discrepancies between the groups in the initial test the matching exercises in section 5.6.2 investigate this issue in more detail.

Series of additional robustness tests in section 5.6.1 test the data to rule out the possibility that events other than regulation itself could be driving the results. The falsification tests are motivated by Roberts and Whited (2013).

In view that the non-linear probability model is used for estimation, it does not allow to draw the same inferences about effects on regulation as the linear model would. Once the effect of regulation is confirmed more narrowed robustness tests are performed to see the magnitudes of this effect using Ordinary Least Squares method (section 5.6.4). Based on this postulation, one can approximate the causal effect between groups prior and post the treatment using the DD estimation.

5.4.2.1 Ordered probit model: Model estimation and variables

To test the hypothesis from section 5.2.1.3, the ordered probit framework is employed. The ordered probit approach is widely used in the credit ratings literature since it accounts for the ordinal nature of the dependent variable (Alsakka and ap Gwilym, 2010c; Caporale et al., 2012).¹⁶³ Using approaches which do not account for the discrete nature of the dependent variable (i.e. which treat the responses at equal distance such as in OLS) can lead to errors in inferences and produce biased estimators (Park, 2005; see section 3.6.1.2). In other words, the difference between two levels of a rating scale (e.g., 1 compared to 2, 2 compared to 3) is not

163. For applications of the ordered probit model in CRA literature see section 3.6.1.2.

the same, therefore one observes strictly non-linear transformation captured by the thresholds, which are estimable parameters in an ordered choice model.

The model estimates upgrades and downgrades as well as no change probabilities for bank ratings identified by points in the CCR scale. Equation (5.1) captures the effect of an external and exogenous event (disclosure rules) which feeds through sovereign ratings and continues onto the financial markets participants (banks rating changes) in the considered countries, as follows:

$$\Delta y_{i,j,t}^* = \beta_1 (Post * Treatment)_{j,t} + \beta_2 \Delta SovR_{j,t} + \beta_3 BankR_{j,t} + \beta_4 X_{j,t} + \lambda CF * YF + \varepsilon_{i,j,t}$$

$$\varepsilon_{i,j,t} \approx N(0, I) \quad (5.1)$$

$\Delta y_{i,j,t}^*$ is an unobserved latent variable connected to the ordinal responses of $y_{i,j,t}$; change in rating of bank i in country j at month t based on the 58-point CCR scale and taking values of -3, -2, -1, 0, 1, 2, 3, by the measurement model:

$$\Delta y_{i,j,t} = \begin{bmatrix} -3 \text{ (i.e. bank rating downgrade by 3 or more CCR points) if } \Delta y_{i,j,t}^* \leq \alpha_1 \\ -2 \text{ (i.e. bank rating downgrade by 2 CCR points) if } \alpha_1 < \Delta y_{i,j,t}^* \leq \alpha_2 \\ -1 \text{ (i.e. bank rating downgrade by 1 CCR point) if } \alpha_2 < \Delta y_{i,j,t}^* \leq \alpha_3 \\ 0 \text{ (i.e. no bank rating change) if } \alpha_3 < \Delta y_{i,j,t}^* \leq \alpha_4 \\ 1 \text{ (i.e. bank rating upgrade by 1 CCR point) if } \alpha_4 < \Delta y_{i,j,t}^* \leq \alpha_5 \\ 2 \text{ (i.e. bank rating upgrade by 2 CCR points) if } \alpha_5 < \Delta y_{i,j,t}^* \leq \alpha_6 \\ 3 \text{ (i.e. bank rating upgrade by 3 or more CCR points) if } \alpha_6 < \Delta y_{i,j,t}^* \end{bmatrix}$$

The (β, λ) parameters of the regression as well as thresholds (α) are estimated using maximum likelihood estimation (ML) and are subject to constraint $\alpha_1 < \alpha_2 < \dots < \alpha_6$ (Wooldridge, 2007).¹⁶⁴

As can be seen the model does not contain a constant, since in the ordered probit specification threshold parameters rather than one intercept are observed. The bank rating changes by $\{-3, -2, -1, 0, 1, 2, 3\}$ points are the cut-off points which divide the data into 6 intervals.

¹⁶⁴ More details on the latent variable model can be found in section 3.6.1.

5.4.2.2 Explanatory variables

Selection of the appropriate determinants and their specification is based on *stepwise* methodology together with the backward elimination. The latter allows finding relationships which could be omitted when employing variables in the first step (Menard, 2002). To avoid multi-collinearity the key explanatory variables are tested using *_rmcoll* command in STATA. Additionally, the pairwise collinearity test is carried out and no collinearity is detected among any two variables.

The economic significance of the observed controls and their impact on the discrete dependent variable is measured by the marginal effect (Greene, 2012). The marginal effect of sovereign rating action reveals the influence of sovereign changes in country *j* on the probability of bank rating changes in the same country *j*. For continuous variables, the marginal effect is the difference in the predicted value of the dependent variable (change in bank rating) as one independent variable changes value by one standard deviation (1 s.d.) while all other variables are held constant at their mean.

According to Alsakka and ap Gwilym (2012c; p.15) the marginal effect for dummy variable is the “*partial derivative of the predicted probability of the dependent variable that results when the independent dummy variables take the value of 1 while the other variables are held at their mean.*”

The list of variables is as follows:

- 1) Treatment is a dummy variable taking the value of 1 if the country belongs to the treatment group; 0 otherwise. Post is a dummy variable taking the value of 1 if the observation is from the post-treatment period (March 2011 onwards for all countries, but May 2011 for Argentina); 0 otherwise. This main interaction dummy (POST*TREATMENT) captures the impact of disclosure rules in the regression model. In line with the theoretical explanations of unsolicited ratings (see section 5.2.1.2) and economic intuition, the expected sign of this variable is negative. This is consistent with the notion that bank ratings in countries with unsolicited ratings might face more downgrades (and fewer upgrades) than the banks in the other group due to the rating ceiling effect.
- 2) The key explanatory variable, $\Delta\text{SovR}_{j,s}$ represents the change in sovereign CCR by S&P based on the 3-month window prior to month *t* (i.e. *s* = the *t*-3 to *t* window). It takes the value

of -3, -2, -1, 0, 1, 2 or 3. The predicted sign of the coefficient is positive since bank ratings have the tendency to move in the same direction as ratings of their home sovereigns (e.g. Huang and Shen, 2015). The CRAs and academic literature confirms that sovereign risk is the key factor influencing bank ratings (S&P, 1997; 1998; Fitch, 2002; Poon and Firth, 2005). Poon et al. (2009) conclude that: “*sovereign rating of a country is important in determining individual bank ratings because it captures some important macroeconomic and institutional characteristics of the countries in which the banks are located*” (p.307). In addition to evidence on spillover effect seen in section 5.2.1.1 the expected sign of the coefficient is positive.

The sovereign changes are selected instead of rating levels to avoid issues of collinearity with the bank rating level used as an independent variable. There are two specifications of this variable. The first one captures the change in the sovereign ratings at the same point in time as the bank ratings are being measured. In the second specification 3 month rolling window is applied which allows capturing the potential variation in the banking industry resulting from the most recent sovereign action(s). In that way one avoids omitting a relevant sovereign action which may take some time to elapse and affects the intermediaries in the given country.

3) $BankR_{j,t}$ represents banks' CCR taking values 1-58. This controls for the banking environment. The variable is expected to have a positive sign given that higher bank ratings result in higher probability of bank upgrades and lower probability of bank downgrades and vice versa.

4) Vector $X_{j,t}$ includes other control variables which originate from literature on bank ratings determinants and portray the banking environment. Variables describing bank size, profitability, quality of held assets, capital adequacy and liquidity are found significant in explaining bank ratings in inter alia Poon and Firth (2005) and Hau et al. (2013) (for more see section 3.3.1). Appendix 5.B lists example of variables tested as bank controls. The correlation matrix has been considered, and I find no evidence of multi-collinearity for the control variables in Eq. (5.1) (see Appendix 5.C).

5) CF is a full set of country dummy variables. YF is a full set of year dummy variables.

5.5 Empirical results

The estimation results of Eq. (5.1) are provided in Table 5.10. The examination begins with measuring the direct effect of regulation on the probability that bank rating changes. In model I of Table 5.10 it is found that the bank ratings in the treatment group face more downgrades than banks in the other group. The effect is not statistically significant despite correcting for observable time-varying bank characteristics (e.g. bank size, profitability or credit ratings) as well as country specific and time effects.¹⁶⁵ The specification does not yet account for unobserved differences in the economic development and industrialisation level or geographical bias concerning the sovereigns. On the similar note, the model does not control for unobservable time-variant banks heterogeneity such as bank's risks, quality and investment opportunities amongst others (Petersen and Rajan, 1994). Subsequently it is difficult to identify the strength and effect of regulation on these banks. To help with this problem several model specifications are tested with help of various fixed effects and cluster options used interchangeably similarly as seen in Jiménez et al. (2012). Before focusing on these issues in more detail (section 5.5.2) the coefficients on the main explanatory variables are discussed first.

5.5.1 Explanatory variables

The estimated coefficients on sovereign rating changes and banks ratings are significant, economically relevant and stable in all model specifications I-VIII. The sign on both coefficients is in line with the predictions. This confirms that applying these regressors is necessary.

The positive sign on the sovereign rating changes supports the theory on ceiling effect. Namely, the bank ratings in a given country are predetermined by the economic and political situation, fiscal and monetary status of the home sovereign. In other words, banks incorporated in countries which received a credit rating downgrade, in given three months window, are more likely to be downgraded and less likely to be upgraded. This effect could not be captured using sovereign and bank ratings simultaneously (on the same day). For this reason window of three months is used to enhance and strengthen this effect. This is due to the time needed between S&P reflects the sovereign news when rating banks.

165. The fixed effect dummy variables are obtained using n-1 number of entries; hence 41 countries and 6 years' dummies are obtained.

The marginal effects (MEs) suggest one CCR point in sovereign rating upgrade increases the probability by 0.8%, 0.5% and 0.3% of a bank rating upgrade by one, two and three and above CCR points and leads to reduced probability of downgrade by one, two and three and more CCR points in 0.9%, 0.5% and 0.4% (see Table 5.11). The MEs across model specifications also imply about the asymmetry of a given effect. The downgrades yield moderately stronger marginal effects than upgrades consistent with Borensztein et al. (2013). These results are robust to introduction of year-country, bank and month fixed effects.

The positive sign on the bank ratings coefficient resembles the fact that intermediaries with higher credit ratings are more likely to become upgraded and less likely to become downgraded. The marginal effects imply that one CCR point increase in the bank rating increases the probability of an upgrade by 1, 2 and 3 points and above in 0.07%, 0.04% and 0.02% and decrease probability of a downgrade by 1, 2 and 3 and more points in 0.09%, 0.04% and 0.04%. These estimates are robust to inclusion of bank and/or monthly fixed effects tested in latter models.

The bigger sized banks are more likely to become downgraded and less prone to become upgraded. This could relate to the fact that such banks take on more risky investments and participate in less traditional form of banking which focused on originating loans and taking deposits. The negative coefficient remains statistically significant throughout all model specifications I-VIII.

The coefficients of the remaining controls are marginally or not significant although their signs present anticipated economic rationale. For instance, banks with higher leverage (return on equity) are more likely to become downgraded (upgraded) and vice versa. Hence, more banks with stronger- balance sheet characteristics are more likely to receive rating upgrades. These controls are retained in regressions to control for the banking environment previously tested in the empirical literature.

5.5.2 Various fixed effects models

This section presents rationale and estimates of various fixed effect models and clustering options applied to the baseline model (model I) in the rest of the Table 5.10.

In model II the year and country fixed effects in the initial model is replaced with the interacting year-country fixed effects.¹⁶⁶ Interacting fixed effects became a more common practise in the recent empirical literature (for more details see Dell’Ariccia et al., 2008; Mathis et al., 2009; Jiménez et al., 2012).

This practice enables control for possible omitted variable bias which could result in endogeneity issues (Lemmon and Roberts, 2010). The interaction term accounts for any variation across the time and country spectrum which might not be controlled for in the preliminary model. It will also correct for the differences in the economic development and industrialisation level of sovereigns (e.g. industrialised vs. developing countries). This is of importance since countries in the treatment group include only one low income economy: Cambodia. In addition, Argentina and India are the only non-investment grade sovereigns in that group. Using the interacting fixed effect regional differences in Europe, Asia and Latin America are controlled for.

The interaction dummies capture the changes in the macroeconomic environment such as GDP growth, inflation and shocks influencing the economies. These fundamentals are also inherently controlled by the sovereign credit rating changes and for this reason no additional macroeconomic variables are included. The identification of macroeconomic conditions derives entirely from the interactions. This reasoning is in line with Thompson (2011)¹⁶⁷ and Jiménez et al. (2012).

Once the interacting fixed effects was incorporated the magnitude of the main coefficient on treatment dummy (POST*TREATMENT) increased nearly five times and is now statistically different from zero with the predicted sign (see Table 5.10 model II onwards, pp.190). The treatment has a negative adverse effect on bank ratings changes. The switch of the sovereign status from solicited (0) to unsolicited (1) leads to higher probability of bank downgrades and

166. Since data is in monthly frequency it would be more appropriate to include the month-country fixed effects. Results obtained in this combination suffer from convergence issues due to high number of interactions. To control for the time effects the month fixed effects are tested for in models VI-VIII.

167. The author suggests that when the fixed effects are used one needs to drop the macroeconomic covariates from the regression as they become collinear with the dummy variables.

lower probability of upgrades in the concerned states. Hence, *ceteris paribus* banks which belong to the treatment group are more likely to be downgraded and less likely to be upgraded compared with banks not in the treatment group. The marginal effect suggests that such banks are 1.85%, 0.93% and 0.79% more likely to be downgraded by one, two and more than two CCR points respectively (see Table 5.12).

The effect of the treatment dummy standalone represents a strong marginal effect in comparison with the 3.28% (2.73%) of the negative bank rating (sovereign) events recorded in the entire data sample (see Table 5.7). The distribution of bank negative events against total number of observations is as follows: downgrades by one, two and more than two CCR points represent 1.56%, 0.8% and 0.92% of the entire observations (see Table 5.6). The sovereign rating downgrades of one, two and more than two points represent 1.08%, 0.53 % and 1.12% of the sample observations (see Table 5.3).

In Model III, the second specification (Model II) is supplemented with one way clustering on bank level (Table 5.10). The rationale stems from the fact that in panel data one deals with several observations for the same unit (e.g. multiple of firm, country, industry or month, year observations) which could be correlated across observations (Primo et al., 2007; Petersen, 2009; Thompson, 2011). For instance, the residuals of the particular firm or country can be found correlated across different time periods. On the other hand, the residuals at the same point in time can be correlated among different firms or countries (Petersen, 2009).

The bias arising from not correcting these cluster correlations are significant in nature whereas the White standard errors, commonly used in the literature, correct merely for heteroscedasticity. The standard errors which are not clustered are understated, and consequently inflate the t-statistic. This produces statistical significance for coefficients which are in fact not significant (Thompson, 2011). This might result in rejecting the hypothesis which would not be rejected otherwise. On the whole it is suggested that the clustering option produces more precise results (Petersen, 2009).

Petersen (2009) provides that that most clusters in finance literature appear for given firms (firm effect arising from time-series dependence) and/or time dimension (time effect arising from cross sectional dependence). Based on this premise separate regressions with alternative

single dimension clustering options are estimated (no cluster, firm cluster and time cluster).¹⁶⁸ The Appendix 5.B Table 5.B.1 presents the results of competing models. The standard error on the treatment dummy in variation I shows lower estimates than when clustering is applied which demonstrates underestimation of the correlation between time (i.e. month), cross-section (i.e. bank), or potentially two dimensional effect. Although higher standard error estimates in variation II and III are not as strong as advised in the classification by Petersen (2009)¹⁶⁹ they are considered as an indication of the possible firm and time (or both) effect which are tested further in the upcoming models. Namely, further simulations are carried out with use of combinations of fixed effects and clusters to observe the sensitivity of the standard errors.

Results after inclusion of the bank clustering depicted in Model III¹⁷⁰ remain robust (Table 5.10). The coefficients for all variables are consistent with the earlier specification. The standard error estimate for the main explanatory variable increases leading to smaller z-statistic. The economic inference of treatment dummy and its adverse effect on bank ratings remains strong and significant.

To this moment the model corrected for country-wide and bank observable characteristics which helped in testing the differences between the treatment and control group which arose due to regulatory action. However, to ensure the proper estimation of this effect the randomisation of the treatment effect has to be confirmed.¹⁷¹ Without randomisation one is essentially testing the differences between the treatment and control group due to not only regulation but also other differences between the groups which are related to the bank ratings changes. Solving it by inclusion of bank controls in the model helps in correcting for the observable differences in banks profiles affecting rating changes but does not handle the unobserved effects which could be driving these differences and the dependent variables itself. Incorporating the bank dummy variables in the regression helps to correct for these omitted and possibly unobserved effects (Roberts and Whited, 2013).

168. Since the model already corrects for the macroeconomic environment with year-country fixed effects no clustering on these dimensions is applied. The clusters by firms and month amount to 147 and 85 respectively.

169. When the standard errors for time (firm) are two to four times higher to the White standard errors they indicate the presence of time (cross-sectional effect). On the other hand, when the standard errors combined for country and time effect are significantly higher than those clustered for a single factor, both time and cross-sectional effect is observed in the data. The double clustering, bank-month, is not performed as the number of clusters outnumbers the total observations of the sample (8478). However, the same exercise is performed in the later models (VI, VII and VIII) with the use of month dummies followed by clustering on bank level similarly to paper by Faulkender and Petersen (2006) amongst others.

170. The model estimations are equivalent to variation II presented in Appendix 5.B Table 5.B.1.

171. Section 5.4.2 explains in more detail the exogeneity assumption of the model.

Model IV presents the results of incorporating bank dummy variables to an earlier specification seen as Model II (Table 5.10). All estimated coefficients except the treatment dummy (also insignificant) are bigger with the same predicted sign. The effect is stronger especially for the bank ratings (BANK58ALL) and LN(ASSETS) where the coefficient increased almost three and five times respectively.

Further, model V is estimated with the use of both the bank fixed effect as well as the clustering option on the bank level (Table 5.10). The reason for including both effects together was inspired by the paper by Jiménez et al. (2012). Petersen (2009) achieves unbiased estimates when using firm dummies and errors clustered on firm level in his simulations on various panel datasets.¹⁷² Also earlier studies by Bertrand et al. (2004) and Kezdi (2004), which looked at the single way clustering, suggest that the panel data with numerous cross-sections might require the cluster option after the time/firm/state effects have been included to ensure legitimate results. Cameron et al. (2011) experiment with the use of fixed effects along with clustering options and report unbiased standard errors regardless whether clusters have been included or not (see Cameron et al., 2011; Table 2 p. 245).

Petersen (2009) suggests the standard errors which change once the firm clustering option is used, in addition to the firm dummies, indicate that the effect for firms across a time period is not fixed. Although most corporate finance papers assume the effect to be constant over the time it is not always the case and can result in potential bias of the standard errors.¹⁷³

After including the bank dummies along with the bank clustering the standard errors on the treatment dummy increased significantly which could suggest that the firm effect in the data sample is non-constant (dies over time). This could be explained by observing an effect for one bank in 2006 which is more highly correlated with its residual in 2007 than with the residual in the latter time period (e.g. 2010).

When comparing models IV and V there is no difference between the results in the economic sense (all coefficients remain the same) (Table 5.10). The inference from the main dummy coefficient remains the same as hypothesised the results are insignificant. Namely, banks bear a penalty for belonging in the treatment group and face more significant downgrades than their counterparts from non-treatment group. There are some minor differences in the statistical

172. A simulation of using OLS with firm dummies with accompaniment of clustered option is reported in Table 5 Panel A in Petersen (2009).

173. Cameron et al. (2011) and Thompson (2011) present examples clustering on more than one dimension when no-constant time effects are present.

sense. The values for log likelihood and pseudo R-squared seemingly do not change however there are slight improvements in the criterion for model selection in model V. Namely, the BIC and AIC decrease, from 7646 and 5376 (in version IV) to 5491 and 4902 (in version V). This informs that the latter model is preferred. Smaller AIC and BIC values are preferred since the higher log likelihood shows improvement in the model. When models are nested, as the case in this example, these criteria impose penalty for model size. The AIC penalty is smaller than the BIC (Cameron and Trivedi, 2010) and for this reason the second measure is used.

Model VI tests whether time effect is present in the data with use of month fixed effects applied to the specification from Model II (Table 5.10). When the clustering test was performed on two dimensions it was found that standard error for the treatment dummy increased when clustering by month was in place. Therefore there is basis to believe that time effects arising from cross sectional dependence (i.e. banks) could exist in the model (see Appendix 5.B, Table 5.B.1).

The post clustering estimate shows that coefficient on the treatment dummy remains significant at one percent with the similar magnitude presented in models I-III. The marginal effects remain at similar levels as previously recorded (see Table 5.14).¹⁷⁴ The remainder of variables retain their sign and significance levels. The log likelihood ratio changes to -2318 whereas the pseudo r-squared increases to 0.19.

The time effect tested in this specification (VI) is found to be constant (see Table 5.10), meaning that the given effect influences each bank by the same amount at the same point in time, and can be ultimately absorbed with use of time dummy variables (Petersen, 2009).^{175,176}

The estimations so far controlled for correlation of one aspect, time or cross-section, at the time. This is in line with empirical literature including Andrews (1991); Rogers (1993); Williams (2000) among others. The specification obtained in model VII combines clustered errors on more than one dimension at the same time similar to Petersen (2009) and Thompson (2011). When clustering on one dimension it is assumed that the residuals are not correlated amongst different clusters. Specifically, when using the firm fixed effect it is presumed that there is no time effect such that different firm's residuals are correlated in particular point of

174. The MEs for all corresponding models explained in this section are depicted in Tables 5.11-5.15.

175. This assumption does not hold when the effect is not constant.

176. The tentative test (not reported in this work) is performed to discover whether the time effect is constant. Petersen (2009) suggests if the clustering option is added to regression already using time fixed effects on the same level and estimated standard errors change in magnitude it is a sign of the non-constant time effect (Petersen, 2009) and vice versa. In addition to month fixed effect in specification VI month clusters are added and no difference among standard errors is observed. For this reason it is assumed that the time effect is constant.

time (month, year). In some instances, however, this assumption does not hold and two simultaneous dimensions of correlation might need to be taken into consideration (Thompson, 2011).

One way of tackling the dual correlation problem by researchers in finance is to estimate one dimension using dummy variables and the latter with clustering option. The panels usually have more cross-sections (firms) than time periods and hence the method is to insert time dummies and cluster on the firm level (see Anderson and Reeb, 2004; Gross and Souleles, 2004; Sapienza, 2004, Faulkender and Petersen, 2006).¹⁷⁷ In the data there are 84 months and 147 financial intermediaries hence in specification VII separate monthly dummy variables are inserted into the model (equivalent to model VI) and clustering on the bank level is implemented.

The theory suggests that in such setting month dummies eliminate the correlations between observations occurring in the same time intervals (time effect). This results in a pure firm effect with unbiased standard errors (Petersen, 2009). Simultaneous clustering allows relaxing the assumption that the time effect is constant in order to produce unbiased estimates as long as the number of periods is proportionate with the number of firms (Cameron, et al., 2011). Thompson, (2011) in his Monte Carlo simulation finds that double clustering on more than 25 time and firm clusters poses sufficient basis for unbiased estimates.¹⁷⁸

In sum, estimates of Model VI and VII suggest that magnitude of the solicitation switch becomes more prevalent when monthly fixed effects are in place (Table 5.10). The coefficient on the main explanatory variable amounts to 0.45. The sign of the coefficient remains negative and is statistically robust which confirms the message conveyed in majority of previous models. The marginal effects resulting from two most recent models can be inspected from Table 5.14. The remainder of coefficients on controls is equivalent in both models. In terms of the goodness of fit specifications reach the highest value to date amounting to 0.19.

Model VIII presented in Table 5.10 includes various effects seen in Model VII supplemented by the bank dummies. The rationale of using bank fixed effects with the clustering option is previously discussed along with model V. The multilevel clustering acts as a remedy which

177. Petersen (2009) stresses, however that this is still not a common practice to insert firm dummy variables as a way of correcting for correlation on the firm level. Only a minority of finance papers considered, in his Review of Financial Studies paper, apply this method.

178. The theory suggests that the number of clusters determines the consistency of the estimates (Donald and Lang, 2007; Wooldridge, 2007).

relaxes the assumption about the fixed firm effects to produce unbiased estimates and correct confidence intervals (Petersen, 2009).

The coefficient on treatment dummy represents the greatest magnitude (-0.69) seen so far. The negative sign of the coefficient once more confirms the robustness of the results and supports the underlying hypothesis of the ceiling effect. MEs suggest banks in the treatment group are 1.73%, 0.74% and 0.47% more likely to receive the downgrade by one, two and more than three points than banks in the other group (see Table 5.15). In terms of goodness of fit, the model improves its specification amongst all other versions (pseudo r-squared of 0.214). The explanatory power also remains the highest thus far (log likelihood of -2246) without sacrificing the size of the model. The AIC and BIC values are the smallest, amongst all variations, which suggest that this is the preferred model.

5.6 Robustness tests

5.6.1 Falsification tests

To link the impact of regulation on the bank rating changes this section focuses on the differences arising in the treatment group in comparison to the control group. In this setting, one needs to rule out the possibility that any other events coincide with the adoption of the disclosure rules. This relates to the notion that changes (due to disclosure rules) should only be observed across banks incorporated in the treated countries and not for the opposite group or at a different time than the first quarter of 2011.

To confirm that no undetected issues interfere with the results, I run a set of placebo regressions focusing on: (a) time spectrum variations and (b) cross-sectional variations. This directly relates to the randomisation assumption noted by Roberts and Whited (2013; p.20) which *“ensures that our estimate of the counterfactual outcome is unbiased.”*

5.6.1.1 Time variations

The first test aims to rule out the possibility that the unobserved events, which could be driving the results, do not occur at the same time in which the treatment is measured. To perform this each of the Models (I-VIII), estimated in section 5.5 is run with the treatment assigned to earlier dates than its true occurrence. Using this identification strategy, it is expected that leads before the intervention yield insignificant results. The applied method is similar to Autor (2003) who employs leads and lags in his study on contract exceptions in the employment law.

For instance, in the specification VIII when the regulatory intervention is assumed 1, 2 and 3 months earlier the estimates for the treatment dummy become insignificant. The results of this model (which controls for various fixed effects) are depicted in Appendix 5.B Table 5.B.2. The three consecutive columns present results when leads of 1, 2 and 3 months are applied. As a result of adding subsequent leads more observations drop from the regressions.

5.6.1.2 Cross-sectional variations

The second falsification test examines whether any unobserved effect, which could be driving the results, is due to a selection bias. It is investigated whether the treatment yields significant results if the group which received it was altered. Namely, it is examined whether the treatment, henceforth the placebo effect, received by the control group rather than treatment group is statistically different from zero (since the control group did not receive the treatment). This randomisation is based on a bank (a) and the sovereign level (b).

a) Bank level randomisation

In the first exercise random number generator in STATA assigns a placebo¹⁷⁹ to a subset of banks from the control group. The placebo equals one when the (randomly assigned) bank in question belongs to the control group and if the observation is from the post-treatment period. There are 29 sovereigns in the control (untreated group). The treatment group is excluded entirely from the sample which explains its lower number of observations. Following that numerous replicates of the model are run with inclusion of randomly assigned placebo effects.

¹⁷⁹. Previously known as POST*TREATMENT equals one when the bank in question belongs to control group and if the observation is from the post-treatment period.

It is expected that the coefficient on the placebo will be statistically indistinguishable from zero since banks assigned with placebo never received the treatment.

The results of three trials with use of model VIII are presented in Table 5.B.3 in Appendix 5.B. In the first trial, the software assigns the placebo to 36 banks originating from 21 countries, version 1b appoints the value of one to 36 banks from 23 countries. The final replication 1c treats 37 intermediaries originating from 24 countries. As expected the results in all three instances are insignificant.

b) Sovereign level randomisation

In the second exercise the generator randomly selects a fraction of sovereigns belonging to the control group and assigns the placebo effect to all banks which operate in those sovereigns. Subsequently, replicated regressions with the placebo effect follow. As in the first instance, the treatment group is excluded from the sample.

The first three consecutive trials are presented in Table 5.B.3 Appendix 5.B in columns 5-7. The test 2a assigns the placebo to all 36 banks across 14 sovereigns. The next attempt allocates placebo to 30 intermediaries from 12 states whereas the last simulation assigns effects to 12 sovereigns and their 26 banks.¹⁸⁰ The placebo estimates for all replicates are insignificant proving that the initial findings remain robust and hold for the group in question only.

5.6.2 Matching methods

The univariate analysis (section 5.4.2) indicated some significant differences between the treatment and control groups prior to solicitation conversions. This could be a violation of the parallel trend assumption which dictates that to be able to estimate the effect of the treatment on the treated both groups need to have similar distributions before the event takes place. As a result one cannot be certain that the estimates obtained in section 5.5 are unbiased.

The matching methods help in projecting the average treatment effect which is calculated by estimating the unobserved potential outcome for each observation in the sample (Abadie et al., 2004). Specifically, the matching estimators assign the missing outcome by substituting it with another entity (individual) in the data which has similar characteristics but was exposed to the opposite treatment.

180. The list of the intermediaries along with the country selected by the software in each trial is available upon request.

The underlying assumptions of matching estimators are as follows:

- the assigned treatment is exogenous to the outcomes;
- the assignment of treatment is bound by the covariates and finally
- the probability of assignment is assumed far from the interval between zero and one (Abadie et al., 2004).

With use of matching the sample is constructed in the way such the control and treatment share similar characteristics prior the treatment. The analysis applies two versions of matching: covariate and propensity score matching.

5.6.2.1 Covariate matching (CVM)

The first form of matching applied in this analysis is matching on covariates which is performed with help of nearest-neighbour matching estimator.¹⁸¹ Variations of the matching methods feature one-to-one match and multiple neighbours match. The matching estimator isolates the treated banks and, from the population of non-treated banks, chooses observations which match the treated ones on multiple levels (covariates). In this setting, “the set of counterfactuals is restricted to the matched controls which is in the absence of the treatment the treatment group would behave similarly to the control group” (Almeida et al., 2016; p.12).

The individuals (banks) originating from the control group are matched with banks from the treatment group using observable covariates. These include: sovereign and bank ratings, bank accounting data and macroeconomic indicators. The estimator with replacement allows the same participant to be used repeatedly when it becomes the nearest match for another observation. This procedure lessens the risk of eliminating the potential quality matches and lowers the estimates’ bias (Abadie et al., 2004). These authors suggest that the estimator allows many options for adjusting the match which entails little input from the researcher.

The results can be found in Appendix 5.B Table 5.B.4. The estimator produces the average treatment effect of the treated, control group or the entire sample depending on preferences. The Average Treatment Effect (SATE) as well as the Average Treatment for the Treated (SATT) for various model specifications is reported.

181. The *nnmatch* command by Abadie et al. (2004) is introduced.

Model 1, 2, 4 and 5 incorporates single matching whereas Model 3 and 6 applies four nearest matches.¹⁸² The latter minimises the risk of depending on observations with less similar characteristics. Each specification uses a sovereign and bank rating together with bank characteristics including size and leverage and profitability measure among others. Finally, to capture the macroeconomic environment inflation growth¹⁸³ is included. In the first three models bank and sovereign ratings are tested using the 58-point scale (column 1-3; Appendix 5.B Table 5.B.4). Three consecutive models (column 4-6, Appendix 5.B Table 5.B.4) replace them with use of 20-notch rating scale to remove the outlook and watch status, and aim at reducing matching requirements. This is in line with Firth and Poon (2005) who apply a lower classification of ratings in their matching process.¹⁸⁴ Additionally, two different specifications for inflation pressures are applied. In Model 4, 5 and 6 the inflation is fixed over time.¹⁸⁵

Regardless of the used covariates and specifications, the estimates for the treatment dummy are negative and statistically significant (see Appendix 5.B, Table 5.B.4).¹⁸⁶ Moreover, the one-to-one match estimates outperform the multiple neighbour's results by producing higher coefficients for the treatment dummy (see Model 1 vs. 3 and 4 vs. 6; Appendix 5.B Table 5.B.4).

Although the results convey the message of the negative effect of sovereign solicitation status on bank ratings, its magnitude is significantly lower than in the non-matched sample (see Table 5.10). To test this issue further matching with use of propensity score is performed.

5.6.2.2 Propensity Score Matching (PSM)

Instead of relying on the similarity between treatment and control group, originating from covariates, propensity score matching depends on the probability of receiving the treatment-propensity score. According to Rosenbaum and Rubin (1983) the "*propensity score is the conditional probability of assignment to a particular treatment given vector of observed covariates*" (p.41). Smith and Todd (2005) stress that for the conditional mean independence

182. Four nearest neighbors performed well in terms of the mean-squared errors in the study by Abadie and Imbens (2002) and therefore were applied here.

183. Inflation is measured as average annual consumer price inflation growth on a year-over-year basis for the previous three years in percent terms to correct for procyclicality. The empirical literature suggests this method helps in eliminating the business cycle effect of sovereigns (see Cantor and Packer, 1996; Bennell et al., 2006; Alsakka and ap Gwilym, 2012c).

184. These authors use a letter scale equal to 12 rating subgroups.

185. Similar approach is taken in section 5.6.2.2. The covariates used for matching should not be influenced by the event being studied. It has been suggested by Grilli and Rampichini (2011) fixing covariates over time solves this issue.

186. Models 1, 3, 4 and 6 are significant at 1 percent. Model 2 (5) is significant at 5 (10) percent respectively (see Table 5.B.4).

assumption to hold the outcome variable must be independent of treatment bounded by the propensity score.

To calculate the propensity score, all variables which affect both the fact that the treatment is observed (solicitation status switch) as well as the outcome of that treatment (bank rating changes) need to be included. Selecting an appropriate set of variables depends on theory and economic principles as there are no algorithms available. This strongly affects the bias estimates of the matching estimator (Heckman et al., 1999; Lechner, 2008). According to Rubin and Thomas (1996) when choosing covariates for the score it is advisable to include the controls which are known to be related to the outcome even if they are statistically insignificant.

To select the most appropriate covariates affecting the outcome variable (bank rating changes), the existing literature on bank rating determinants is used together with the empirical model estimated in section 5.4.2.1. The control variables included in the score are: sovereign and bank ratings, bank characteristics including leverage, total assets, loan loss reserves to gross loans, return on average equity. These are also covariates tested in the earlier matching estimation.

To the best of my knowledge, there is no literature examining the economics (determinants) of the sovereign solicitation status and, for this reason this chapter relies on economic principles. The observable characteristics which could potentially influence the decision of the sovereign to request (or not, which could result in the CRA issuing an unsolicited rating) a rating from the CRA might be triggered by the state of the national economy represented by inflation among other factors. Nonetheless, there is a possibility that the treatment has impact on the factor which is selected to explain its phenomenon. Specifically, the macroeconomic position of the country could be easily affected by the treatment itself.¹⁸⁷ To ensure that the macroeconomic factors used for the propensity score are unaffected by the treatment, they are fixed over time. Therefore the mean value of inflation is incorporated throughout the sample years which ensures that its levels are not pre-determined by regulation.

The procedure of the PSM matching is as follow. The propensity score is calculated by regressing the treatment dummy on the necessary covariates with use of the probit model (see Appendix 5.B Table 5.B.4 for list of covariates). The obtained propensity score is used in the regression, with use of *psmatch2* command, where the treatment is regressed on the given score

187. E.g. the sovereign solicitation status together with sovereign rating downgrades might spillover onto the banking system. In the extreme scenario collective insolvency of banks could in turn result in the wide economic turmoil which puts inflationary pressures and affects country's per capita income or unemployment.

and the outcome variable (dependent variable- bank rating changes). The test implements the default specification which includes one-to-one nearest neighbour matching with replacement and without common support restrictions.

Further, the balancing assumption is tested to ensure that the means of covariates in the opposing groups do not differ from each other after the matching (Rubin and Thomas, 1996). The resulting balancing test using *pstest* command confirms that all the covariates are insignificant at 1 and 5 percent after the matching is performed (see Appendix 5.B Table 5.B.5).

As soon as the balancing property is satisfied, the standard bias (developed by Rosenbaum and Rubin, 1985) obtained in the sample prior and post matching are compared. As suggested by Rubin and Thomas (1996), matched sampling proposes a technique of minimising bias at the time of studying a causal effect. The rule of thumb suggests that bias in the matched sample should not exceed 5 percent. Table 5.B.5 suggests a significant reduction in bias as a result of matching. On average, covariates bias decreases by 90 percent.

To confirm that the control group is sufficiently similar to the treatment group, it is required that the maximum difference between the propensity score of the two groups (caliper) does not exceed 1% in absolute value.¹⁸⁸ ROAE and INCREV from the main regression analysis were excluded to meet this requirement.

5.6.2.3 Regression based estimates

Further, the intensity and sign of the treatment effect is compared with use of the matched sample by running set of regressions with model specifications introduced in section 5.5. The ordered probit model is estimated where the bank rating change is a function of the propensity score, calculated in section 5.6.2.2, treatment dummy and variety of fixed effects (see Appendix 5.B, Table 5.B.6).

The regression based estimates with use of the matched sample closely imitate the initial results from unrestricted sample obtained in section 5.5 (Table 5.10). All tested models produce negative and statistically significant coefficients for the treatment dummy. Specification 2-5 (equivalent to earlier II-V) produces significant results for that variable at 1 percent and is reported in Appendix 5.B Table 5.B.6. For instance, the coefficient on the treatment dummy in the unmatched (matched) sample model IV and V equals -0.132 (-0.41). The estimates for

188. The reported p-value of the difference in mean P-scores ranges between 0.113 and 0.821.

Model 1 (earlier I) produce higher magnitude of the treatment effect from the original sample significant at 5 percent. The coefficient on the treatment dummy in the unmatched (matched) sample model I equals -0.10 (-0.18) respectively.

The regression approach confirms that the estimates used prior to matching exercise robustly represented the economic significance of the effect of the solicitation disclosure on the studied sample.

5.6.2.4 *Collapsing the sample*

To rule out the possibility that the estimates are driven by the choice of sovereigns the analysis with use of the collapsed sample is replicated. The treatment group of sovereigns is randomly matched with the control group using one-to-one method and the model specifications (II-VI) studied in section 5.5 are estimated. The collapsed sample includes sovereign ID's between 1 and 26. Sovereigns are coded such that ID's 1-13 represent the treatment group whereas the remaining 14-26 sovereigns belong to the control group. The results are depicted in Appendix 5.B Table 5.B.7.

The collapsed sample includes sovereigns such as: *Argentina, Australia, Austria, Bolivia, Cambodia, Chile, China, Czech Republic, Denmark, Finland, France, Georgia, Germany, Greece, Hong Kong, Hungary, India, Indonesia, Ireland, Italy, Japan, the Netherlands, Singapore, Switzerland, Taiwan and the United Kingdom*. The treatment group sovereigns are marked with the italic font.

The sign and significance of the treatment dummy closely imitates the results of all specifications in the unmatched sample tested in section 5.5 (Table 5.10). The economic inference once more confirms that the studied effect is robust and not induced by the sample selection bias.

5.6.3 Exogeneity tests

For the estimation of unbiased and consistent parameters, which allow a reliable inference, one the possible sources of endogeneity need to be considered and minimised.¹⁸⁹ The first viable concern is that all explanatory variables which determine the dependent variable are not included in the model. This could be due to many reasons. For instance, rating decisions are based not only on public but also on private information suggesting some of the components driving the CRAs' banks ratings are not observable to researchers and will be inherently omitted from the model. When these omitted components are correlated with the explanatory variables included in the model the endogeneity causes the inferences to break down. This is because the error term becomes correlated with the explanatory variables (Roberts and Whited, 2013).

To correct for external factors which could be driving differentials, between sovereigns across different time periods, the interacting country and year fixed effects (seen in Model II-VIII in Table 5.10) are included. Additionally, to ensure that the unobservable differences in banks profiles are corrected for, hence their creditworthiness, bank fixed effects are incorporated as suggested in Roberts and Whited (2013) (see Model IV, V, VIII in Table 5.10).

Secondly, the proper estimation of the effect of regulation on bank rating changes requires that the shock is randomly assigned, hence not influenced by the dependent variable (among other control variables). As suggested by Roberts and Whited (2013) if the intervention is not randomly assigned the regression model will be unidentified as the selection bias will confuse its estimates. The authors emphasise that using a non-randomised assignment is similar to including an endogenous treatment dummy variable in the regression model.

For this assumption to hold one must ensure that the assignment is self-determining and not driven by the potential outcomes. For this reason the main endogeneity concern is that of the treatment dummy. Specifically, it is interesting to know whether the regulatory events were exogenous with respect to bank rating changes. The potential concern could be that, the negative rating events among banks (and sovereigns) in the pre-disclosure period were a reason for regulators to press for transparency on unsolicited ratings. The concerns which led to

189. Roberts and Whited (2013) classify the sources of endogeneity as: omitted variable bias, simultaneity and the measurement error.

regulatory changes in my sample period could be justified if there were signs of the anticipated decline in the creditworthiness of banks and sovereigns.

The descriptive statistics in section 5.3 invalidate this explanation given that bank upgrade outweighed downgrades in the period prior to introduction of the disclosure rules¹⁹⁰ (see Table 5.7). The period is in fact characterised by relatively high proportion of investment grade ratings (approximately 75 percent) in comparison with the speculative grade bank ratings.¹⁹¹

On the contrary, the post-regulatory period proves to be much more volatile, with 201 (56) bank (sovereign) rating changes, representing 39% (36%)¹⁹² of the total events in the sample which accumulate in the course of only two years. The post-regulatory period commences on the 1st March 2011 and continues until Jan 2013. The deteriorating economic climate, as the analysis points out, is observed through high proportion of rating downgrades in relation to upgrades.¹⁹³

Economic rationale further disqualifies the possibility that S&P converted the solicitation status on several sovereigns due to operations of banks incorporated in these countries. It is implausible that the bank rating changes would in any way affect the decision of the CRA since the ceiling effect is observed in 97.1 per cent of cases. It is very rare to find bank rating actions which would precede their home sovereign actions within a short time window. Similarly to Alsakka et al. (2014) no evidence is found of bank-to-sovereign rating channel.

The motivation of the new disclosure rules was linked to better transparency, disclosure and presentation of credit ratings rather than anticipated declines in economic activity. To further reduce potential endogeneity concerns, the propensity score matching procedure is employed to identify statistically indistinguishable subsamples characterised by bank and country covariates. The results remain robust (see Table 9, Section 6.2).

190. There were 156 positive and 159 negative actions among banks and 52 positive and 46 negative sovereign events in the pre-regulatory period.

191. This proportion changes to 65 percent vs. 35 in the latter period.

192. Bank (sovereign) events represent 5.8 (5.06) percent of the total observations. The post-treatment period includes 201 (56) bank (sovereign) actions which translate into 2.26% (1.84%) of sample events. These are based on the author's own calculations.

193. In the data sample, 133 (37) bank (sovereign) downgrades versus 68 (19) upgrades are observed. This effect is especially strong for unsolicited sovereign ratings with 2 (13) positive (negative) actions respectively (see Table 5.7).

Although it is not possible to completely eliminate the endogeneity problems to guarantee the exact inferences this section proposed possible explanations and rationale as to why it is believed the treatment effect is an exogenous shock.

5.6.4 OLS regression

The final robustness test involves estimating the Model (specifications I-VIII) using Ordinary Least Squares which takes the form of difference-in-difference (DD) estimation. Given the experimental design of the model, including treatment dummy variable (POST*TREATMENT) together with various fixed effects, DD allows capturing the endogenous shock in the sample (effect of regulation) and its effect on variable of interest (changes in bank ratings).¹⁹⁴ The estimates of this method are based on assumption of group invariant omitted variables (Angrist and Pischke, 2009).

Although the discrete nature of dependent variable is best estimated with the ordered probit model, it became a common practice to use the OLS as an alternative method (e.g. Becker and Milbourn, 2011; Doherty et al., 2012; Jiang et al., 2012; Van Roy, 2013). Van Roy (2013) suggests literature might regard discrete variable as a continuous when the number of responses is sufficient enough. Secondly, author suggests results in the credit rating literature are not sensitive whether the OLS or ordered probit model is applied (e.g. Cantor and Packer, 1996). Moreover, estimation by means of OLS also simplifies the interpretation of the coefficients (Jiang et al., 2012).

The results reported in section 5.5 remain robust if Eq. (5.1) is re-estimated using an OLS (see Appendix 5.B Table 5.B.8). The economic inference does not change and the treatment effect remains negative throughout all specifications. Similarly to the earlier method, all models except specifications I, IV and V yield significant results for the treatment dummy. For instance, the coefficient on the treatment dummy, in specification VIII, shows that banks in the treatment group will be downgraded 0.116 CCR point due to treatment (relative to banks in the control group over the same period). The sign and significance of the remaining variables is consistent with the earlier estimations applying ordered probit model.

These results imply that the increase in number of downgrades amongst banks ratings is due to switch in the solicitation status of sovereigns by S&P as a result of adoption of the EU law.

194. According to Angrist and Pischke (2009) DD is a version of fixed effect estimation but on aggregated level.

5.7 Remarks and conclusions

Recently, the regulatory oversight of CRAs in Europe underwent significant reform with the introduction of the CRA I Regulation in September 2009 and assigning to ESMA the function of supervising and certifying CRAs across the EU from July 2011. In February 2011, as a result of Article 10 (5) of EU Regulation 1060/2009, S&P converted the solicitation status on 13 sovereigns to unsolicited. This chapter considers whether the regulatory change on CRAs negatively affected bank ratings in countries whose sovereign ratings were converted to unsolicited. The dataset comprises S&P ratings of 147 listed banks from 42 sovereigns in Europe, Asia-Pacific and Latin America for January 2006-January 2013. The direct impact of disclosure rules on banks is examined using an ordered probit model.

It is found that banks incorporated in states which switched their solicitation status demonstrate higher probabilities of rating downgrades and lower probabilities of rating upgrades in comparison to other banks. The results are statistically robust and economically relevant. Several model specifications with a number of fixed effects and clustering options are applied. The sign and significance of the effect remains unchanged. The inferences endure when the Eq. (5.1) is estimated using OLS instead of ordered probit model. Several falsification tests are applied to rule out the possibility that any other events coincide with the adoption of the regulation or that selection bias is present in the sample.

The summary statistics in section 5.3 illustrate a constraint sovereigns impose on bank ratings by pushing them downwards. The descriptive statistics in Table 5.6 suggest that mean bank ratings are lower than their home ratings by 7 CCR points on average, which translates into 2 notches difference in the 20 notch scale. This evidence is in line with Alsakka et al. (2014), where the ceiling effect in the European sample was estimated with the same magnitude. The evidence of ceiling effect is present in the pre (Jan 2006- Feb 2011) as well as post (March 2011-Jan 2013) regulatory period. Table 5.7 illustrates that proportion of bank ratings capped in relation to the sovereign ratings is prevailing. It is observed that approximately 52% (26%) of bank observations prior (post) the regulation are rated below sovereign ceiling. On the other hand, 11.6% (7.2%) of bank ratings are rated at the sovereign ceiling and 2.56% (0.38%) pierce the ceiling in the pre (post) treatment period. These results show significantly stronger ceiling effect in comparison to Williams et al. (2013). The ceiling effect is graphically presented in Figures 5.8-5.17 in section 5.3.4.

The multivariate analysis confirms that the ceiling effect imposed by the S&P between sovereign and bank ratings is strong and significant. This is in line with Alsakka et al. (2014) who suggest that S&P is the most likely CRA to migrate its ratings under a ceiling effect. According to S&P (2001), bank ratings do not exceed those of their home countries as in the situation of default of a government the intermediaries might also be pushed to default. This can be potentially caused by failing to meet their external obligations due to exchange controls amongst other factors.

The ceiling effect pronounced in the previous empirical literature does not differentiate between the solicitation statuses of sovereigns. For this reason the bank ratings changes in the treatment group are expected to be pushed downwards even more by the sovereign rating actions. This assumption derives from the banking literature of lower unsolicited ratings (Poon et al., 2009; Bannier et al., 2010; Van Roy, 2013, see section 5.2.1.2). The ceiling effect is captured by two variables: the treatment dummy and the sovereign rating changes. Although findings in this study cannot be directly translated and justified by the literature on banks,¹⁹⁵ the same conclusion is derived.

The negative sign of the treatment dummy affirms that banks which belong to the treatment group are more likely to be downgraded and less likely to be upgraded compared with banks not in the treatment group. The marginal effect suggests that such banks are 1.73%, 0.74% and 0.47% more likely to be downgraded by one, two and more than three CCR points respectively (see Table 5.15).

The sovereign rating change control variable is also consistent with the ceiling effect. As expected the sign on the sovereign rating change coefficient is positive which confirms the premise that sovereign ratings stimulate bank ratings changes (upgrades and downgrades) in the same direction with the three month time horizon addressed. The economic magnitude of sovereign upgrades on bank ratings is smaller than downgrades and can be seen in Tables 5.11-5.15. The asymmetry of a given effect is in line with Borenstein et al. (2013). It is found that the a bank is -0.59%, -0.22% and 0.12% more likely to be downgraded by one, two and more than two CCR points if the sovereign is downgraded by one CCR point recently (Table 5.15).

195. The literature offers explanation as to why banks ratings might be inflated. There is no theoretical nor empirical literature which would suggest why unsolicited ratings of sovereigns might be biased downwards and penalise banks as a result of the spillover effect.

The marginal effect is economically stronger for downgrades in a first threshold (i.e. rating downgrade by one CCR point).

The significance of MEs should be considered with respect to the number of bank rating downgrades by one, two and more than two CCR points which represent 1.56%, 0.80% and 0.92% of the entire observations. The sovereign rating downgrades of one, two and more than two points represent 1.09%, 0.53 % and 1.12% of the sample observations (see Table 5.3).

The results of this chapter suggest that sovereign ratings adversely influence bank ratings through the rating channel. These findings fill the clear void in the literature by examining the dynamics of the sovereign solicitation status on other asset classes. In addition, the study supplements scarce empirical efforts examining the rating channel between sovereigns and banks recently addressed by Alsakka et al. (2014). According to Correa et al. (2014), the rating channel is closely connected to the collateral dependency of banks. This is due to the fact lower ratings of sovereigns affect the cost of debt and funding that intermediaries can secure for themselves (Correa et al., 2014).

These findings address a clear gap in the literature by examining the effect of sovereign solicitation status on the banking sector. The synergy of three overlapping themes of research reveals a phenomenon which has not been tackled by earlier theoretical nor empirical papers.

The chapter contributes to research on unsolicited credit ratings by uncovering the significance of the solicitation status of sovereigns and its role in the domestic markets. In addition, the study supplements recent empirical efforts examining the rating channel between sovereigns and banks. It is found that the sovereign solicitation status matters for market participants in each country due to the rating ceiling effect. Last but not least, the chapter incorporates the new EU regulatory changes imposed on CRAs and is one of the first to report its impact on relevant markets.

CRAs' use of the sovereign-bank rating ceiling has surprisingly been neglected by researchers until quite recently (Borensztein et al., 2013; Williams et al., 2013; Alsakka et al., 2014; Huang and Shen, 2015). It has also seemingly fallen under the radar of regulations to some extent. Similarly, rating solicitation has attracted wide attention in the corporate sphere (e.g. Poon et al., 2009; Bannier et al., 2010), but no attention whatsoever in sovereign rating research literature. In designing new disclosure requirements for CRAs in 2009-11 (with good intentions), EU regulators failed to connect the issues of unsolicited rating and sovereign-bank

linkages. It is somewhat surprising that any consultation process failed to highlight this issue, but the lack of closely relevant academic research could be a contributing factor. This chapter fills this void and identifies a clear case of an unintended consequence of regulatory disclosure. Future regulatory reforms need to be undertaken with caution as they might further aggravate the conditions for debt issuers.

The findings are also of importance to CRAs and market participants. There are obvious implications of how the sovereign rating methods influence the functioning of financial markets. Governments need to appreciate the consequences of their decision-making with regard to rating solicitations.

Table 5.1 Change of solicitation status according to S&P

Country	Change of status
Argentina (Republic of)	Apr 4, 2011
Australia (Commonwealth of)	Feb 25, 2011
Belgium (Kingdom of)	Feb 17, 2011
Cambodia (Kingdom of)	Feb 25, 2011
France (Republic of)	Feb 17, 2011
Germany (Federal Republic of)	Feb 17, 2011
India (Republic of)	Feb 25, 2011
Italy (Republic of)	Feb 17, 2011
Japan	Feb 25, 2011
Netherlands (The) (State of)	Feb 17, 2011
Republic of Madagascar	May 11, 2009
Singapore (Republic of)	Feb 25, 2011
Swiss Confederation	Feb 17, 2011
Taiwan (Republic of China)	Feb 25, 2011
Turkey (Republic of)	Jan 14, 2013
United Kingdom	Feb 17, 2011
United States of America	Feb 24, 2011

Notes: This Table presents sovereigns rated by S&P which underwent solicitation switch from solicited to unsolicited as a result of EU Regulation on CRAs 1060/2009 (Article 10(5)). The sample includes 13 of the above sovereigns excluding: Belgium, Republic of Madagascar, Turkey and the US.

Source: Collected from individual reports released by S&P upon withdrawal of solicited status of the sovereign issuer. See S&P (2009; 2011e, c, d; 2013b).

Table 5.2 Sovereign rating events on the 20-Notch Scale

No. of Rating Events			
		% of obs.	
1	No. of 1-Notch Upgrade Actions (Solo)	27	0.89
2	No. of 2-Notch Upgrade Actions (Solo)	1	0.03
3	Total Upgrade Actions (row 1+2)	28	0.92
4	No. of 1-Notch Downgrade Actions (Solo)	13	0.43
5	No. of 2-Notch Downgrade Actions (Solo)	1	0.03
6	Total Downgrade Actions (row 4+5)	14	0.46
7	No. of Positive Outlook Actions (Solo)	30	0.99
8	No. of Negative Outlook Actions (Solo)	27	0.89
9	Total Outlook Actions (row 7+8)	57	1.87
10	Watch Positive (Solo)	1	0.03
11	Watch Negative (Solo)	14	0.46
12	Total Watch Actions (row 10+11)	15	0.49
13	No. of Negative Outlooks changed from Negative Watch	6	0.20
14	No. of 1-Upgrade + Positive Outlook (Combined)	6	0.20
15	No. of 1-Downgrade + Negative Outlook (Combined)	14	0.46
16	No. of 2-Downgrade + Negative Outlook (Combined)	6	0.20
17	No. of 3-Downgrade + Negative Outlook (Combined)	3	0.10
18	No. of 1-Downgrade + Negative Watch (Combined)	2	0.07
19	No. of 2-Downgrade + Negative Watch (Combined)	3	0.10
20	Total No. Combined Actions (row 14+ 15+16+17+18+19)	34	1.12
21	Total No. of Events (row 3+6+9+12+13+20)	154	5.06
22	<i>Positive events (row 3+7+10+13+14)</i>	71	2.33
23	<i>Negative Events (row 6+8+11+15+16+17+18+19)</i>	83	2.73
Observations		3045	
Mean rating		14.5	

Notes: This Table presents summary statistics of rating events for 42 sovereigns encompassed in the credit rating dataset which consists of monthly observations for January 2006-January 2013 period. The ratings are expressed in 20 notch scale. % obs. defines percentage of all sample observations.

Table 5.3 Sovereign rating events on the 58-Point Scale

No. of Rating Events		% of obs.	
1	UP 1-Point	33	1.08
2	UP 2-Points	20	0.66
3	UP 3-Points	15	0.49
4	UP 4-Points	2	0.07
5	UP 5-Points	1	0.03
6	Total No. of Upgrade Points (row 1+2+3+4+5)	71	2.33
7	DW 1-Point	33	1.08
8	DW 2-Points	16	0.53
9	DW 3-Points	19	0.62
10	DW 4-Points	1	0.03
11	DW 5-Points	5	0.16
12	DW 6-Points	5	0.16
13	DW 7-Points	1	0.03
14	DW 8-Points	2	0.07
15	DW 9-Points	1	0.03
16	Total No. of Downgrade Points (row 7+8+9+10+11+12+13+14+15)	83	2.73
17	Total Rating Events (row 6+16)	154	5.06
	Observations	3045	
	Mean rating	43.86	

Notes: This Table presents summary statistics of rating events for 42 sovereigns encompassed in the credit rating dataset which consists of monthly observations for January 2006-January 2013 period. The ratings are expressed in 58 point scale. % obs. defines percentage of all sample observations.

Table 5.4 Sovereign ratings group comparison

No. of Rating Events-58 Point Scale		
	Control group	Treatment group
UP 1-Point	28	5
UP 2-Points	17	3
UP 3-Points	13	1
UP 4-Points	2	-
UP 5-Points	1	-
UP 6-Points	1	-
Total No. of Upgrade Points	62	9
DW 1-Point	23	10
DW 2-Points	9	7
DW 3-Points	16	3
DW 4-Points	1	-
DW 5-Points	4	1
DW 6-Points	5	-
DW 7-Points	1	-
DW 8-Points	2	-
DW 9-Points	1	-
Total No. of Downgrade Points	62	21
Total No. of Rating Events	124	30

Notes: This Table presents rating events for sovereigns from control (29 sovereigns) versus treatment (13 sovereigns) group encompassed in the credit rating dataset which consists of monthly observations for January 2006-January 2013 period. The ratings are expressed in 58 point scale.

Table 5.5 Bank rating events on the 20-Notch Scale

No. of Rating Events		% of obs.	
1	No. of 1-Notch Upgrade Actions (Solo)	74	0.83
2	No. of 2-Notch Upgrade Actions (Solo)	4	0.04
3	No. of 4-Notch Upgrade Actions (Solo)	1	0.01
4	No. of 1-Notch Downgrade Actions (Solo)	53	0.60
5	No. of 2-Notch Downgrade Actions (Solo)	3	0.03
6	No. of 4-Notch Downgrade Actions (Solo)	1	0.01
7	Total No. Rating Events (row 1+2+3+4+5+6)	136	1.53
8	No. of Positive Outlook Actions (Solo)	73	0.82
9	No. of Negative Outlook Actions (Solo)	92	1.03
10	Total No. of Outlook Actions (row 8+9)	165	1.85
11	Watch positive (Solo)	36	0.40
12	Watch negative (Solo)	64	0.72
13	Total No. of Watch Actions (row 11+12)	100	1.12
14	No. of 1-Upgrade + Positive Outlook (Combined)	12	0.13
15	No. of 2-Upgrade + Positive Outlook (Combined)	1	0.01
16	No. of 1-Upgrade + Negative Outlook (Combined)	6	0.07
17	No. of 3-Upgrade + Negative Outlook (Combined)	2	0.02
18	No. of 1-Upgrade + Negative Watch (Combined)	1	0.01
19	No. of 1-Downgrade + Negative Outlook (Combined)	47	0.53
20	No. of 2-Downgrade + Negative Outlook (Combined)	8	0.09
21	No. of 3-Downgrade + Negative Outlook (Combined)	5	0.06
22	No. of 1-Downgrade + Negative Watch (Combined)	11	0.12
23	No. of 2-Downgrade + Negative Watch (Combined)	5	0.06
24	No. of 3-Downgrade + Negative Watch (Combined)	3	0.03
25	Negative Outlook changed from Negative Watch	14	0.16
26	Total No. Combined Actions (row 14+15+16+17+18+19+20+21+22+23+24)	101	1.13
27	Total No. of Events (row 7+10+13+26)	516	5.80
28	<i>Positive events (row 1+2+3+8+11+14+15+16+17+18+25)</i>	224	2.52
29	<i>Negative Events (row 4+5+6+9+12+19+20+21+22+23+24)</i>	292	3.28
Observations		8900	
Mean rating		13.00	

Notes: This Table presents summary statistics of rating events for 147 banks encompassed in the credit rating dataset which consists of monthly observations for January 2006-January 2013 period. The ratings are expressed in 20 notch scale. % obs. defines percentage of all sample observations.

Table 5.6 Bank rating events on the 58-Point Scale

No. of Rating Events		% of obs.	
1	UP 1-Point	116	1.30
2	UP 2-Points	67	0.75
3	UP 3-Points	27	0.30
4	UP 4-Points	6	0.07
5	UP 5-Points	1	0.01
6	UP 6-Points	4	0.04
7	UP 8-Points	2	0.02
8	UP 12-Points	1	0.01
9	Total No. of Upgrade Points (row 1+2+3+4+5+6+7+8)	224	2.52
10	DW 1-Point	139	1.56
11	DW 2-Points	71	0.80
12	DW 3-Points	47	0.53
13	DW 4-Points	10	0.11
14	DW 5-Points	4	0.04
15	DW 6-Points	10	0.11
16	DW 7-Points	2	0.02
17	DW 8-Points	4	0.04
18	DW 9-Points	4	0.04
19	DW 12-Points	1	0.01
20	Total No. of Downgrade Points (row 10+11+ 12+13 +14+15+16+17+18+19)	292	3.28
21	Total Rating Events (row 9+20)	516	5.80
	Observations	8900	
	Mean rating	36.80	

Notes: This Table presents summary statistics of rating events for 147 banks encompassed in the credit rating dataset which consists of monthly observations for January 2006-January 2013 period. The ratings are expressed in 58 point scale. % obs. defines percentage of all sample observations.

Table 5.7 Descriptive statistics of the data sample

PANEL I						
No. of listed banks	147					
Average numerical rating	36.8					
Bank observations-monthly data			%		%	
No. of observations	8900					
Positive events	224	2.52		B=S	1672	18.79
Negative events	292	3.28		B>S	262	2.94
Total events	516	5.80		B<S	6966	78.27
Banks pre-treatment events				Banks post-treatment events		
No. of observations	5882			3018		
B=S	1031	11.58		B=S	641	7.20
B>S	228	2.56		B>S	34	0.38
B<S	4623	51.94		B<S	2343	26.33
Positive events	156	1.75			68	0.76
Negative events	159	1.79			133	1.49
Total	315	3.54			201	2.25
Events related to speculative grade sovereign ratings	81	15.70			69	13.37
Events related to investment grade sovereign ratings	234	45.35			132	25.58

Table 5.7 Continued

PANEL II						
Sovereign actions						
No. of countries	42					
No. of “unsolicited” countries	13					
No. of “solicited” countries	29					
Average numerical rating	49.51					
		Unsolicited sovereigns	Solicited sovereigns	Total		
No. of observations*	2102	%	%		%	
Positive actions	9	0.30	62	2.04	71	2.34
Negative actions	21	0.69	62	2.04	83	2.73
Total	30	0.99	124	4.08	154	5.07
Events related to speculative grade sovereign ratings	9	0.30	52	41.94	61	39.61
Events related to investment grade sovereign ratings	21	0.70	72	58.06	93	60.39
Sovereign pre-treatment events						
Pre-treatment positive actions	7	0.23	45	1.48	52	
Pre-treatment negative actions	8	0.26	38	1.25	46	
Sovereign post-treatment events						
Post-treatment positive actions	2	0.07	17	0.56	19	
Post-treatment negative actions	13	0.43	24	0.79	37	

Notes: This Table presents summary statistics for the credit rating dataset (section 4.3.3.1), which uses monthly bank (PANEL I) and sovereign ratings (PANEL II) including outlook and watch for 147 banks from 42 countries for pre-regulatory (January 2006 to February 2011) and post-regulatory (March 2011 to January 2013) periods. B=S, B < S, and B > S can be defined as follows: banks rated the same as the sovereign, banks rated worse than the sovereign, and banks rated better than the sovereign, respectively. Investment grade consists of ratings including BBB- and above; Speculative grade includes ratings below BBB. *Number of observations relates to sovereign data set only. Period covers ratings which match sovereigns and banks.

Table 5.8 - Summary statistics monthly frequency

Variable	Units	Definition	n	Mean	S.D.	Min	P25	Median	P75	Max	
<i>Dependent variable</i>											
Δ BANKORDINAL _{j,t-1}	+-{0,1,2,3}	Change in bank ratings using CCR scale; coded as ordinal values: -3,-2,-1, 0, 1,2,3.	8900	-0.02	0.46	-3	0	0	0	3	
<i>Independent variables</i>											
POST*TREATMENT	0/1	Post dummy= 1 if the observation is from the post-treatment period; =0 otherwise. Treatment dummy= 1 if the country belongs in the treatment group; =0 otherwise.	8900	0.17	0.38	0	0	0	0	1	
Δ SOVORDINAL	+-{0,1,2,3}	Change in sovereign ratings using CCR scale; coded as ordinal values: -3,-2, -1,0,1,2,3.	8900	-0.05	0.72	-3	0	0	0	3	
BANK58ALL	1-58	Banks credit ratings expressed in CCR scale, taking values 1-58.	8900	36.80	10.19	1	31	40	43	55	
Bank characteristics											
1) Size											
LN(ASSETS)	(\$)	ln	Logarithm of book value of total assets	8900	18.12	1.87	13.3	17.18	17.99	19.42	22.06
2) Leverage											
LEVERAGE	multiple	Total assets over equity	8900	15.16	6.75	2.59	10.63	14.33	17.92	47.50	
3) Profitability											
ROAE	%	Return on average equity: Net income over average equity	8900	9.96	11.85	-98.32	4.66	9.77	16.44	39.48	
4) Asset quality											
LLR/GL	%	Loan loss reserves to gross loans	8900	2.89	3.07	0.08	1.17	2.05	3.50	32.5	
5) Revenues											
INCREV	%	Non-interest income over gross revenue	8900	35.77	18.49	2.24	22.90	32.31	42.44	97.78	

Notes: This Table presents summary statistics, abbreviations and definitions of variables used in the univariate and multivariate analysis for monthly observations of the sample of 147 banks originating from 42 countries for the period January 2006- January 2013. “n” stands for number of observations, “S.D.” is standard deviation. The sample represents a balanced panel data with regards to the dependent variable and main explanatory variables.

Table 5.9 Mann-Whitney U test results

Variable	No. of observations	Sample period	Mean (control)	Mean (treatment)	Difference	Wilcoxon p-value
PANEL I						
¹ change in bank ratings	886	whole	0	-0.128	0.128	0.085*
change in bank ratings	486	pre-treatment	-0.076	0.032	-0.108	0.539
change in bank ratings	400	post-treatment	0.091	-0.328	0.419	0.002***
PANEL II						
² bank mean ratings	886	whole	32.976	40.039	-7.062	0.000***
bank mean ratings	486	pre-treatment	33.568	41.158	-7.590	0.000***
bank mean ratings	400	post-treatment	32.281	38.636	-6.355	0.000***

Notes: This Table presents results of the Mann-Whitney U test where differences between financial profiles of treatment and control group are tested with use of two covariates (PANEL I and PANEL II) for the pre-treatment (January 2006 to February 2011), the post-treatment (March 2011 to January 2013) and the entire period using yearly data (see section 5.4.1.2).

Notes: *** indicates significance at the level of 1%; ¹The ratings are coded in a six-point scale where positive/negative change of 1 point =1, 2 points=2 and 3 and above/below =3. ² The ratings are presented as an average mean of all bank ratings occurring at each particular time period with distinction between treatment and control group. The rating are expressed in the 58 point CCR scale.

Table 5.9a Mann-Whitney U test results: Bank characteristics

Variable	No. of observations	Sample period	Mean (control)	Mean (treatment)	Difference	Wilcoxon p-value
LN(ASSETS)	886	whole	17.447	18.740	-1.292	0.000***
LN(ASSETS)	486	pre-treatment	17.395	18.760	-1.364	0.000***
LN(ASSETS)	400	post-treatment	17.508	18.714	-1.206	0.000***
LEVERAGE	886	whole	12.717	17.133	-4.415	0.000***
LEVERAGE	486	pre-treatment	13.313	17.798	-4.485	0.000***
LEVERAGE	400	post-treatment	12.018	16.299	-4.281	0.000***
LLR/GL	886	whole	3.611	2.384	1.226	0.000***
LLR/GL	486	pre-treatment	3.063	2.247	0.815	0.008***
LLR/GL	400	post-treatment	4.256	2.556	1.700	0.001***
INCREV	886	whole	33.674	38.007	-4.332	0.137
INCREV	486	pre-treatment	34.585	37.539	-2.953	0.616
INCREV	400	post-treatment	32.603	38.594	-5.991	0.085
ROAE	886	whole	12.494	7.578	4.915	0.000***
ROAE	486	pre-treatment	13.602	8.425	5.177	0.000***
ROAE	400	post-treatment	11.191	6.517	4.674	0.000***

Notes: This Table presents results of the Mann-Whitney U test where differences between financial profiles of treatment and control group are tested with use of five covariates for the pre-treatment (January 2006 to February 2011) and the entire period (see section 5.4.1.2) using yearly data frequency. The remaining variable definitions are presented in Table 5.8..Significance level such that: *** p<1%, ** p<5%, * p<10%.

Table 5.10 Ordered probit model results

MODEL	I	II	III	IV	V	VI	VII	VIII
VARIABLES								
POST*TREATMENT	-0.1016 (-1.21)	-0.5998*** (-4.87)	-0.5998*** (-4.18)	-0.1328 (-1.13)	-0.1328 (-0.85)	-0.4536*** (-2.66)	-0.4536*** (-2.71)	-0.6949*** (-2.73)
ΔSOVORDINAL window	0.3667*** -12.81	0.3989*** (12.81)	0.3989*** (11.83)	0.4038*** (13.09)	0.4038*** (12.02)	0.3945*** (11.66)	0.3945*** (10.56)	0.3925*** (10.50)
BANKS58ALL	0.0340*** -5.96	0.0488*** (6.30)	0.0488*** (6.01)	0.1583*** (8.07)	0.1583*** (5.76)	0.0357*** (4.99)	0.0357*** (4.39)	0.1344*** (5.38)
LN(ASSETS)	-0.1180*** (-4.38)	-0.1667*** (-5.46)	-0.1667*** (-4.62)	-0.6927*** (-6.40)	-0.6927*** (-5.29)	-0.1461*** (-4.83)	-0.1461*** (-3.89)	-0.6943*** (-5.40)
LEVERAGE	-0.0038 (-0.73)	0.0047 (0.74)	0.0047 (0.81)	-0.0139 (-1.00)	-0.0139 (-0.93)	-0.0043 (-0.74)	-0.0043 (-0.78)	-0.0234* (-1.75)
ROAE	0.001 -0.43	-0.0008 (-0.20)	-0.0008 (-0.25)	-0.0065 (-1.22)	-0.0065 (-1.32)	-0.0022 (-0.65)	-0.0022 (-0.89)	-0.0108** (-2.45)
LLR/GL	0.0019 -0.22	-0.0007 (-0.07)	-0.0007 (-0.09)	-0.0124 (-0.73)	-0.0124 (-0.54)	0.0053 (0.55)	0.0053 (0.64)	-0.0159 (-0.75)
INCREV	0.0012 -0.86	0.0026* (1.65)	0.0026** (2.42)	-0.0010 (-0.20)	-0.0010 (-0.19)	0.0011 (0.67)	0.0011 (0.93)	0.0027 (0.47)
Observations	8900	8900	8900	8900	8900	8900	8900	8900
Log likelihood	-2553	-2436	-2436	-2368	-2368	-2318	-2318	-2246
Pseudo R2	0.107	0.149	0.148	0.171	0.171	0.189	0.189	0.214
Number of clusters	.	.	147	.	147	.	147	147
AIC	5224.496	5323.65	5063.65	5376.777	4902.7771	5279.60	4927.6	4773.07
BIC	5643.03	6926.85	5744.66	7646.795	5491.563	7563.81	5963.295	5773.29
Year and country dummies	yes	no	no	no	no	no	no	no
Year-country dummies	no	yes	yes	yes	yes	yes	yes	yes
Bank dummy	no	no	no	yes	yes	no	no	yes
Cluster by bank ID	-	-	yes	no	yes	-	yes	yes
Month dummy	-	-	-	-	-	yes	yes	yes

Notes: This Table reports the estimated coefficients and robust z-statistics in parentheses from various specifications of the ordered probit model using Eq. (5.1) (see section 5.5). The credit rating dataset consists of monthly sovereign and bank ratings for 147 banks originating from 42 countries for the period January 2006-January 2013. The dependent variable is ΔBANKORDINAL. The variables definitions and summary statistics are presented in Table 5.8. Fixed effects are included (“yes”), not included (“no”) or not applicable in given specification (“-”).The year-country fixed effect is the interaction term between full set of country and year dummies. The month fixed effect comprises a fixed effect for every (but one) year: month during the sample period. Significance level such that: *** p<0.01, ** p<0.05, * p<0.1.

Table 5.11 Marginal effects results- Model I

Variables	Coefficient	t-value	Marginal effect %						
			-3	-2	-1	0	1	2	3
POST*TREATMENT	-0.1016	(-1.21)	0.12	0.14	0.27	-0.14	-0.20	-0.12	-0.07
ΔSOVORDINAL window	0.3667***	(-12.81)	-0.40	-0.46	-0.93	0.28	0.78	0.46	0.26
BANK58ALL	0.0340***	(-5.96)	-0.04	-0.04	-0.09	0.03	0.07	0.04	0.02

Notes: This Table presents the impact of three main control variables on the probability of bank rating change (marginal effect) resulting from specification I of the Model (see Table 5.10). Significance levels such that: *** p<0.01, ** p<0.05, * p<0.1.

Table 5.12 Marginal effects results- Models II and III

Variables	Coefficient	t-value	Marginal effect %						
			-3	-2	-1	0	1	2	3
POST*TREATMENT	-0.599***	(-4.18)	0.79	0.93	1.85	-2.23	-0.76	-0.39	-0.18
ΔSOVORDINAL window	0.398***	(11.83)	-0.28	-0.38	-0.85	0.21	0.72	0.39	0.20
BANK58ALL	0.048***	(6.01)	-0.03	-0.05	-0.10	0.03	0.09	0.05	0.02

Notes: This Table presents the impact of three main control variables on the probability of bank rating change (marginal effect) resulting from specification II and III of the Model (see Table 5.10). The same MEs estimates are obtained for both versions since Model III only supplements Model II specification with one way clustering on bank level which does not change the economic magnitude of the results (only the statistical inference). Significance levels such that: *** p<0.01, ** p<0.05, * p<0.1.

Table 5.13 Marginal effects results- Models IV and V

Variables	Coefficient	t-value	Marginal effect %						
			-3	-2	-1	0	1	2	3
POST*TREATMENT	-0.1328	(-0.85)	0.09	0.13	0.28	-0.15	-0.20	-0.10	-0.04
ΔSOVORDINAL window	0.4038***	(12.02)	-0.23	-0.35	-0.79	0.20	0.67	0.34	0.15
BANK58ALL	0.1583***	(5.76)	-0.09	-0.14	-0.31	0.08	0.26	0.13	0.06

Notes: This Table presents the impact of three main control variables on the probability of bank rating change (marginal effect) resulting from specification IV and V of the Model (see Table 5.10). The same MEs estimates are obtained for both versions since Model V only supplements Model IV specification with one way clustering on bank level which does not change the economic magnitude of the results (only the statistical inference). Significance levels such that: *** p<0.01, ** p<0.05, * p<0.1.

Table 5.14 Marginal effects results- Models VI and VII

Variables	Coefficient	t-value	Marginal effect %						
			-3	-2	-1	0	1	2	3
POST*TREATMENT	-0.453***	(-2.66)	0.31	0.46	1.08	-0.98	-0.51	-0.25	-0.11
ΔSOVORDINAL window	0.394***	(11.66)	-0.16	-0.27	-0.69	0.09	0.59	0.30	0.14
BANK58ALL	0.035***	(4.99)	-0.01	-0.02	-0.06	0.01	0.05	0.03	0.01

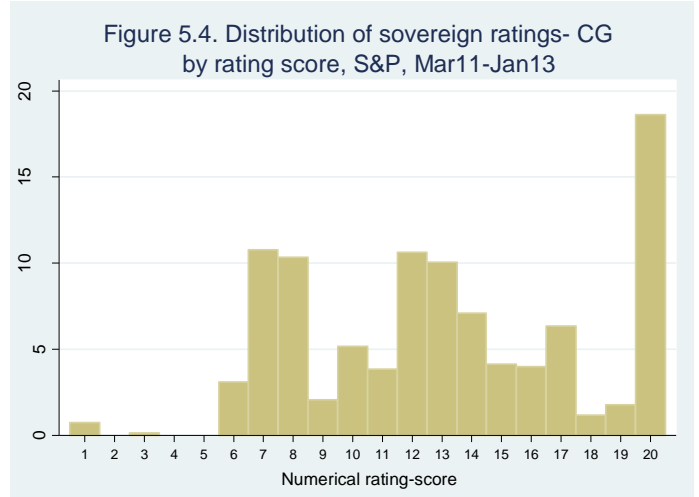
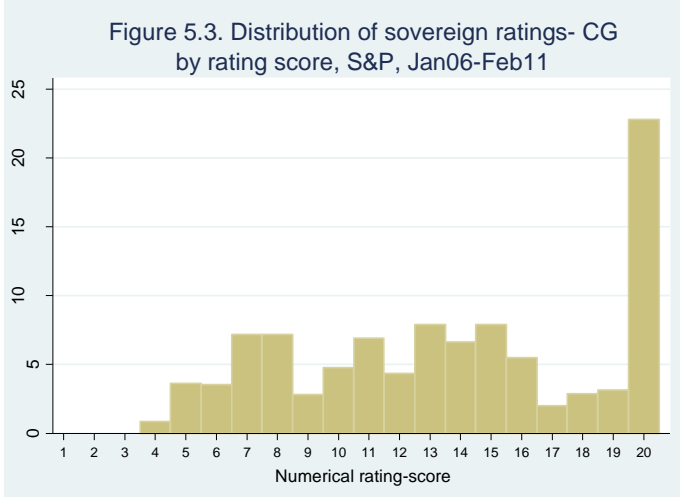
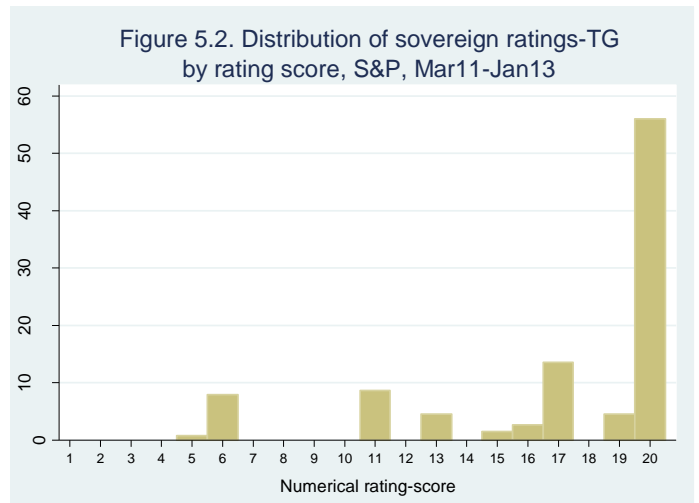
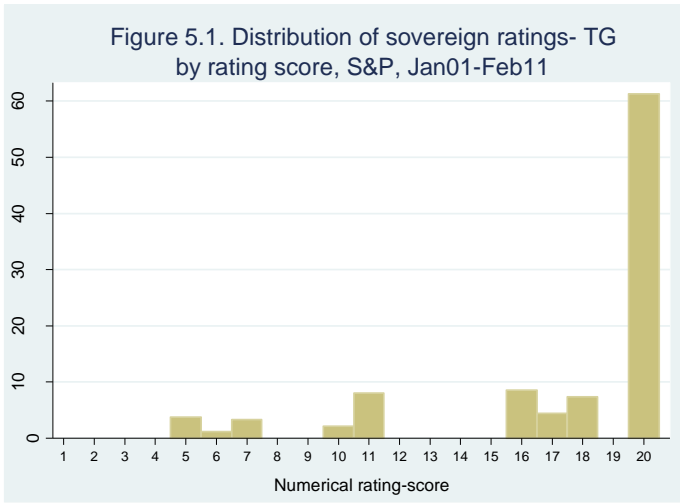
Notes: This Table presents the impact of three main control variables on the probability of bank rating change (marginal effect) resulting from specification VI and VII of the Model (see Table 5.10). The same MEs estimates are obtained for both versions since Model VII only supplements Model VI specification with one way clustering on bank level which does not change the economic magnitude of the results (only the statistical inference). Significance levels such that: *** p<0.01, ** p<0.05, * p<0.1.

Table 5.15 Marginal effects results- Model VIII

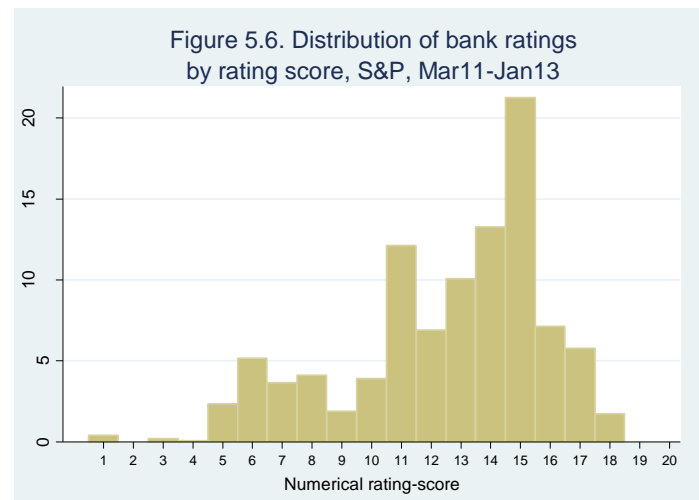
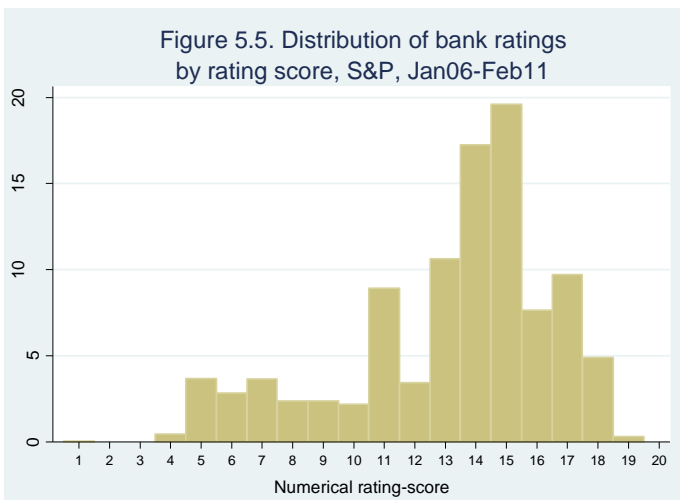
Variables	Coefficient	t-value	Marginal effect %						
			-3	-2	-1	0	1	2	3
POST*TREATMENT	-0.694***	(-2.73)	0.47	0.74	1.73	-1.98	-0.59	-0.27	-0.11
ΔSOVORDINAL window	0.392***	(10.5)	-0.12	-0.22	-0.59	0.06	0.52	0.25	0.11
	0.134***	(5.38)	-0.04	-0.08	-0.20	0.02	0.18	0.08	0.04
BANK58ALL									

Notes: This Table presents the impact of three main control variables on the probability of bank rating change (marginal effect) resulting from specification VIII of the Model (see Table 5.10). Significance levels such that: *** p<0.01, ** p<0.05, * p<0.1.

Figures 5.1- 5.4 Distribution of sovereign credit ratings¹⁹⁶

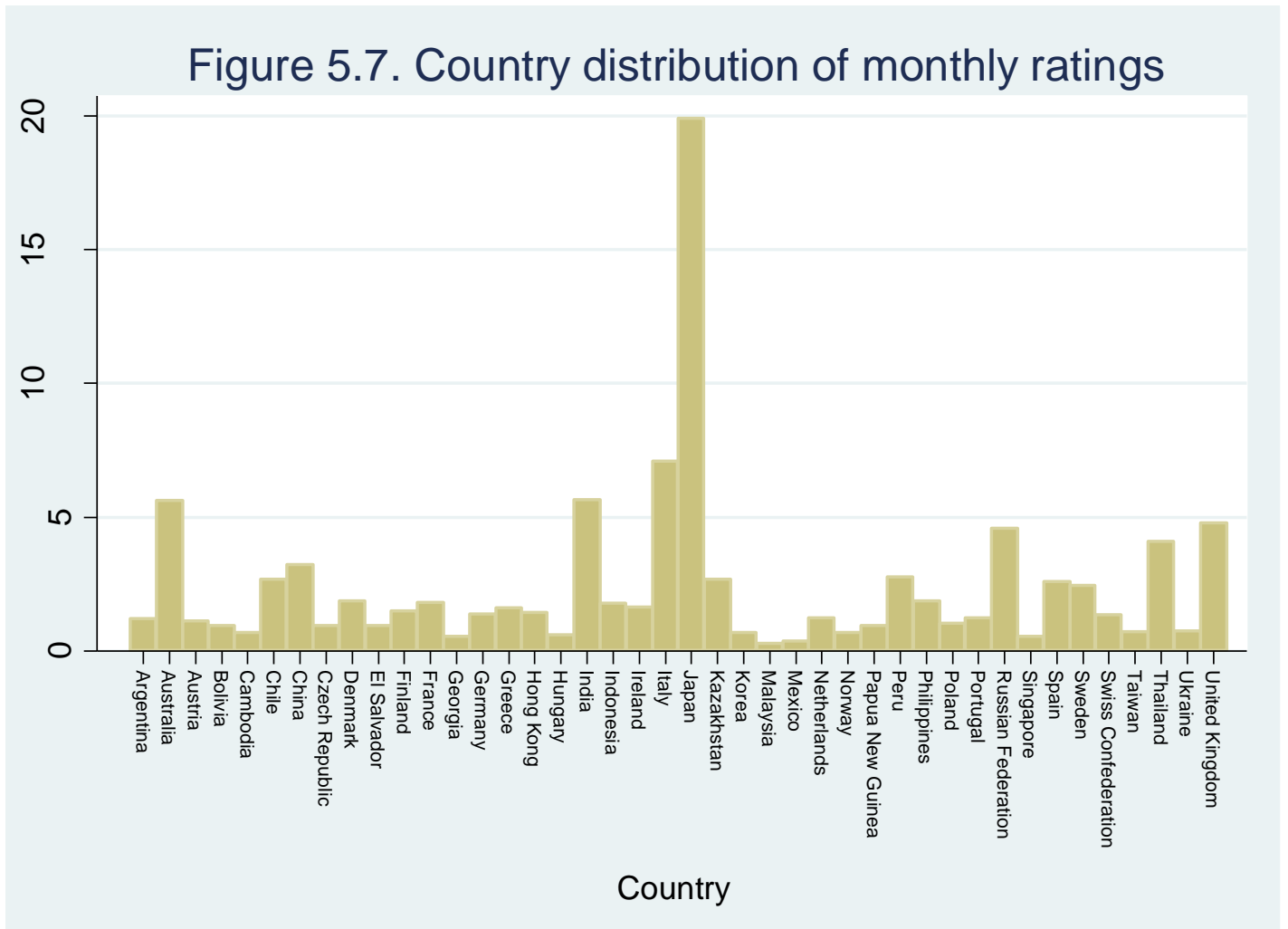


Figures 5.5 - 5.6 Distribution of bank ratings



196. TG and CT stand for treatment and control group respectively.

Figure 5.7 Country distribution of monthly bank ratings



Figures 5.8- 5.17 Sovereign vs bank ratings

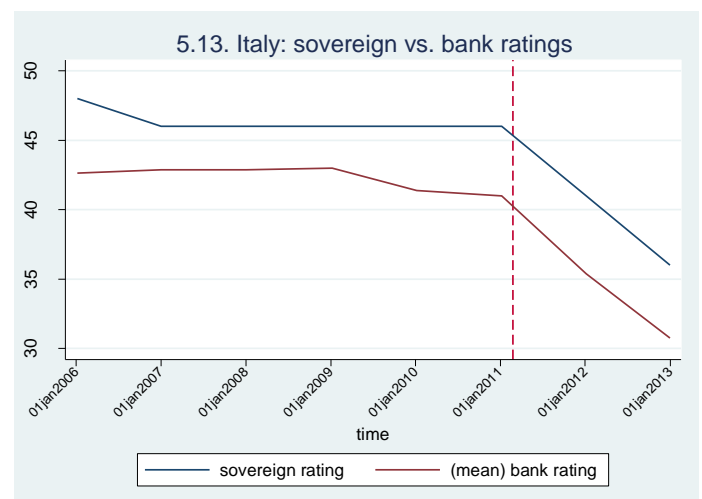
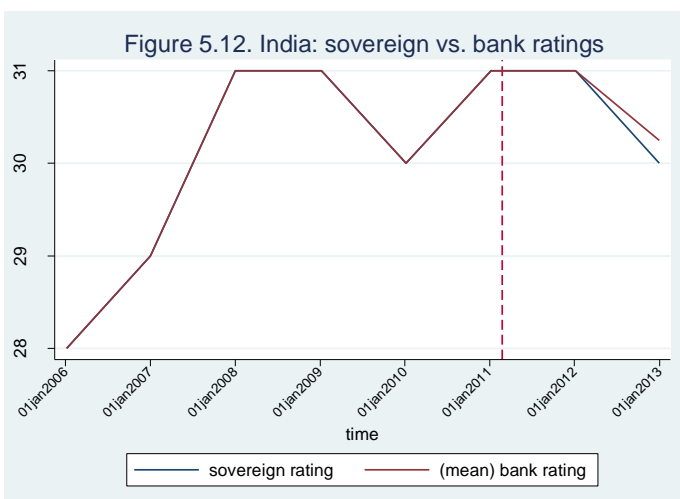
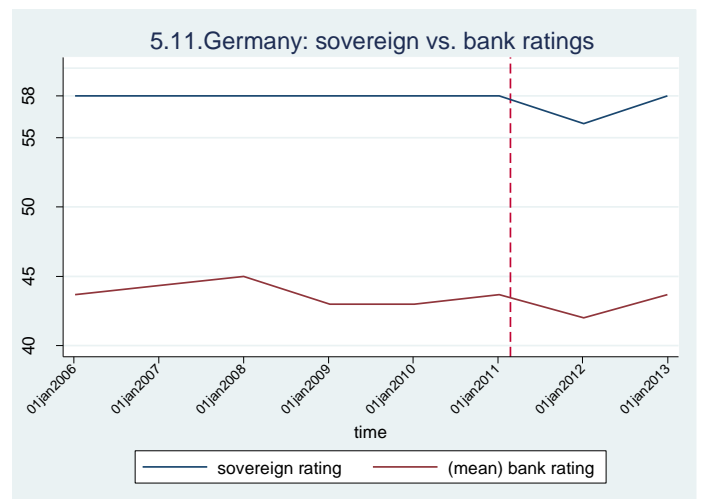
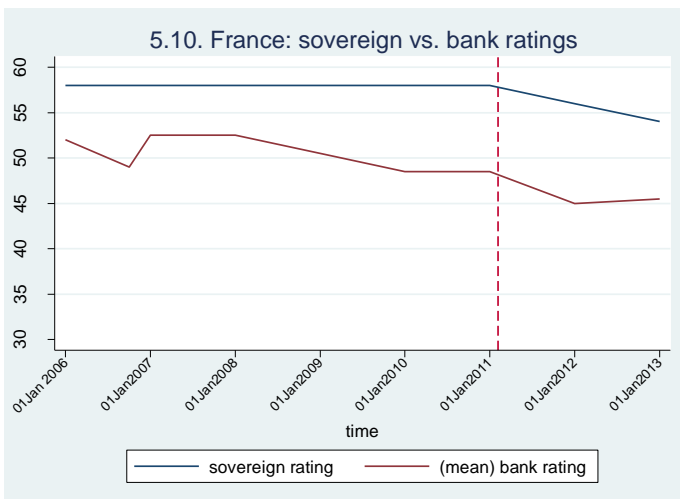
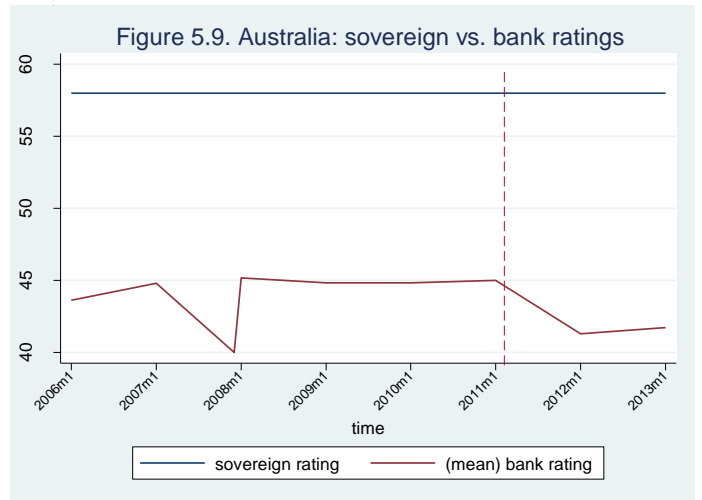
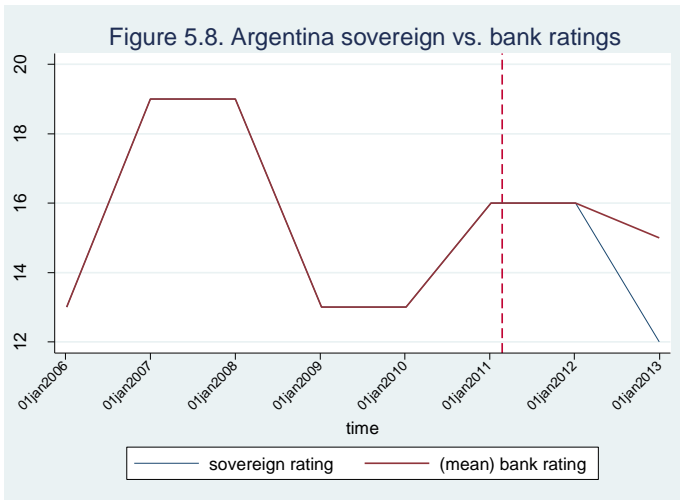


Figure 5.14. Japan: sovereign vs. bank ratings

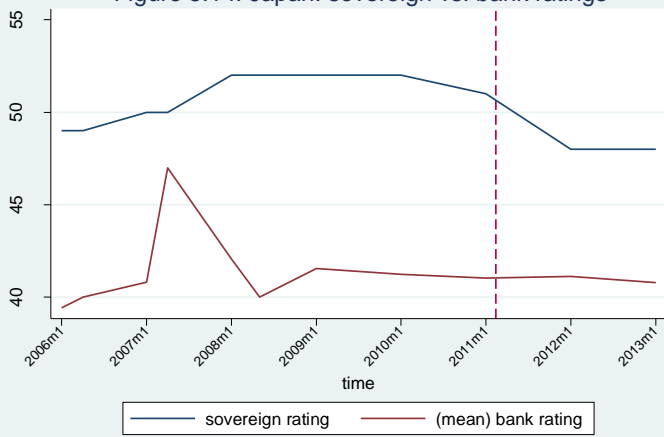


Figure 5.15. Netherlands: sovereign vs. bank ratings

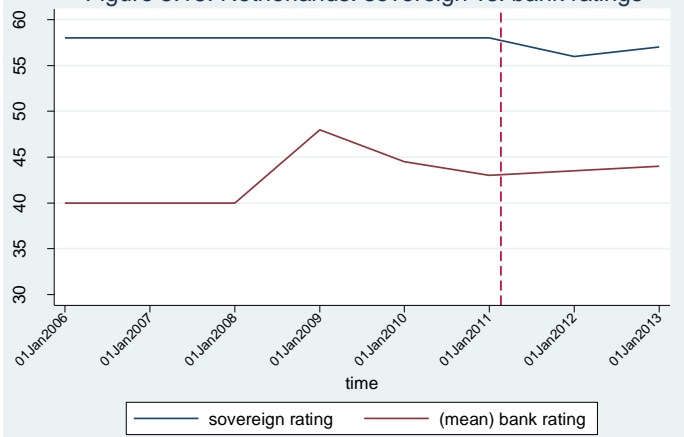


Figure 5.16. Switzerland: sovereign vs. bank ratings

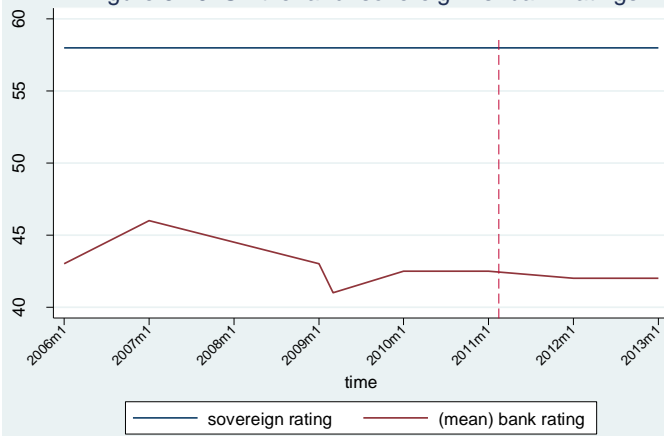
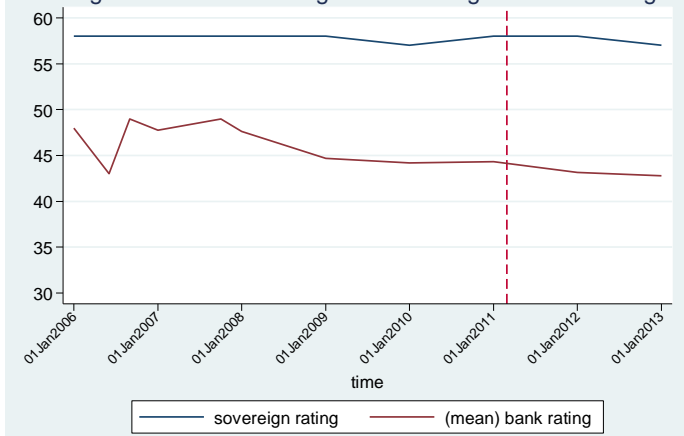


Figure 5.17. United Kingdom: sovereign vs. bank ratings



Appendix 5.A Data

Table 5.A.1 Withdrawal of financial institutions in the sample

Entity Published Name	Country	Long-term Rating Date	Solicitation status: (Y: unsolicited, N: solicited)
Bank of Baroda	India	30/12/2011	Y
BTA Bank JSC	Kazakhstan	10/11/2011	N
Caja de Ahorros del Mediterraneo CAM	Spain	10/12/2008	N
Canara Bank	India	30/12/2011	Y
Chugoku Bank, Ltd. (The)	Japan	09/04/2009	N
Credit Saison Co Ltd	Japan	09/04/2009	Y
Daishi Bank Ltd (The)	Japan	09/04/2009	Y
Gunma Bank Ltd. (The)	Japan	31/08/2009	N
Hiroshima Bank Ltd*	Japan	09/04/2009	N
Hong Leong Bank Berhad*	Malaysia	30/12/2011	Y
Industrial Bank of Taiwan	Taiwan	10/06/2009	N
Juroku Bank Ltd. (The)	Japan	28/10/2011	N
Metropolitan Bank & Trust Company	Philippines	30/12/2011	Y
Nadra Bank	Ukraine	28/05/2009	N
Nanto Bank Ltd. (The)*	Japan	09/04/2009	N
Promsvyazbank OJSC	Russian Federation	17/05/2010	N
PT Bank CIMB Niaga Tbk	Indonesia	30/12/2011	Y
Rizal Commercial Banking Corp.*	Philippines	29/12/2008	N
Shiga Bank, Ltd (The)*	Japan	09/04/2009	N
Westpac Banking Corporation	Australia	20/12/2007	N
Wing Hang Bank Ltd*	Hong Kong	20/11/2008	Y

Notes: This Table presents institutions excluded from the data sample of financial institutions rated by S&P originating from 42 countries (this gives the final 147 entities used in the dataset). *Financial institutions with the asterisk do not have rating in the sample period between January 2006-January 2013 (NR- withdrawn status in the database).

Remainder of excluded entities comprises FIs which ratings are withdrawn at some point in the sample period and for this reason are also omitted from the sample.

Table 5.A.3 List of sovereigns used in the sample

	Sovereigns
1	Argentina
2	Australia
3	Austria
4	Bolivia
5	Cambodia
6	Chile
7	China
8	Czech Republic
9	Denmark
10	El Salvador
11	Finland (Republic of)
12	France
13	Georgia
14	Germany
15	Greece
16	Hong Kong
17	Hungary
18	India
19	Indonesia
20	Ireland
21	Italy
22	Japan
23	Kazakhstan
24	Korea (Republic of)
25	Malaysia
26	Mexico
27	Netherlands
28	Norway
29	Papua New Guinea
30	Peru
31	Philippines
32	Poland
33	Portugal
34	Russian Federation
35	Singapore
36	Spain
37	Sweden
38	Swiss Confederation
39	Taiwan
40	Thailand
41	Ukraine
42	United Kingdom

Notes: This Table lists 42 sovereigns included in the sample.

Table 5.A.3 List of banks used in the sample

	Financial intermediaries	Country of incorporation
1	Banco de Galicia y Buenos Aires SA	Argentina
2	Banco Hipotecario SA	Argentina
3	Banco Patagonia SA	Argentina
4	Australia and New Zealand Banking Group	Australia
5	Bank of Queensland Limited	Australia
6	Bendigo and Adelaide Bank Limited	Australia
7	Commonwealth Bank of Australia	Australia
8	Macquarie Group Ltd	Australia
9	MyState Limited	Australia
10	National Australia Bank Limited	Australia
11	Erste Group Bank AG	Austria
12	Raiffeisen Bank International AG	Austria
13	Banco Mercantil Santa Cruz SA	Bolivia
14	ACLEDA Bank PLC	Cambodia
15	Banco Bilbao Vizcaya Argentaria Chile	Chile
16	Banco de Chile	Chile
17	Banco de Credito e Inversiones - BCI	Chile
18	Banco Santander Chile	Chile
19	CorpBanca	Chile
20	Bank of China Limited	China
21	Bank of Communications Co. Ltd	China
22	Bank of Nanjing	China
23	China Construction Bank Corporation	China
24	China Merchants Bank Co Ltd	China
25	Komerčni Banka	Czech Republic
26	Danske Bank A/S	Denmark
27	Jyske Bank A/S	Denmark
28	Banco Agrícola	El Salvador
29	Pohjola Bank plc-Pohjola Pankki Oyj	Finland
30	Sampo Plc	Finland
31	BNP Paribas	France
32	Société Générale	France
33	Bank of Georgia	Georgia
34	Deutsche Bank AG	Germany
35	Deutsche Postbank AG	Germany
36	Alpha Bank AE	Greece
37	Eurobank Ergasias SA	Greece
38	Piraeus Bank SA	Greece
39	AEON Credit Service (Asia) Company Limited	Hong Kong
40	Hang Seng Bank Ltd.	Hong Kong
41	OTP Bank Plc	Hungary
42	AXIS Bank Limited	India

43	Bank of Baroda	India
44	Bank of India	India
45	Canara Bank	India
46	HDFC Bank Ltd	India
47	ICICI Bank Limited	India
48	Indian Bank	India
49	Indian Overseas Bank	India
50	Bank Negara Indonesia (Persero) - Bank BNI	Indonesia
51	Bank Rakyat Indonesia (Persero) Tbk	Indonesia
52	PT Bank CIMB Niaga Tbk	Indonesia
53	Allied Irish Banks plc	Ireland
54	Bank of Ireland	Ireland
55	Banca Carige SpA	Italy
56	Banca Monte dei Paschi di Siena SpA-Gruppo Monte dei Paschi di Siena	Italy
57	Banca popolare dell'Emilia Romagna	Italy
58	Banca Popolare di Milano SCaRL	Italy
59	Credito Bergamasco	Italy
60	Credito Emiliano SpA-CREDEM	Italy
61	Intesa Sanpaolo	Italy
62	Mediobanca SpA	Italy
63	77 Bank (The)	Japan
64	Aozora Bank Ltd	Japan
65	Bank of Kyoto	Japan
66	Chiba Bank Ltd.	Japan
67	Chugoku Bank, Ltd. (The)	Japan
68	Credit Saison Co Ltd	Japan
69	Daishi Bank Ltd (The)	Japan
70	Daiwa Securities Group Inc	Japan
71	Gunma Bank Ltd. (The)	Japan
72	Hachijuni Bank	Japan
73	Higo Bank (The)	Japan
74	Hiroshima Bank Ltd	Japan
75	Hitachi Capital Corporation	Japan
76	Hokkoku Bank Ltd. (The)	Japan
77	Hyakugo Bank Ltd.	Japan
78	Joyo Bank Ltd.	Japan
79	Juroku Bank Ltd. (The)	Japan
80	Kagoshima Bank Ltd. (The)	Japan
81	Keiyo Bank, Ltd. (The)	Japan
82	Mitsubishi UFJ Financial Group Inc-Kabushiki Kaisha Mitsubishi UFJ Financial Group	Japan
83	Mizuho Financial Group	Japan
84	Nomura Holdings Inc	Japan
85	Orix Corporation	Japan
86	Shinkin Central Bank	Japan
87	Shinsei Bank Limited	Japan

88	Shizuoka Bank	Japan
89	BTA Bank JSC	Kazakhstan
90	Delta Bank	Kazakhstan
91	Eurasian Bank	Kazakhstan
92	Nurbank JSC	Kazakhstan
93	OJSC Halyk Savings Bank of Kazakhstan	Kazakhstan
94	Industrial Bank of Korea	Korea (Republic of)
95	Woori Finance Holdings Co. Ltd-Woori Financial Group	Korea (Republic of)
96	Malayan Banking Berhad - Maybank	Malaysia
97	Financiera Independencia, S.A.B. De C.V. Sofom	Mexico
98	ABN AMRO Bank NV	Netherlands
99	ING Groep NV	Netherlands
100	DnB ASA	Norway
101	Bank of South Pacific Ltd.	Papua New Guinea
102	Banco Continental-BBVA Banco Continental	Peru
103	Banco de Credito del Peru	Peru
104	Banco Internacional del Peru - Interbank	Peru
105	Scotiabank Peru SAA	Peru
106	Metropolitan Bank & Trust Company	Philippines
107	Philippine National Bank	Philippines
108	Bank Polska Kasa Opieki SA-Bank Pekao SA	Poland
109	Powszechna Kasa Oszczednosci Bank Polski SA - PKO BP SA	Poland
110	Banco Comercial Português, SA-Millennium bcp	Portugal
111	Banco Espirito Santo SA	Portugal
112	Bank UralSib	Russian Federation
113	Credit Bank of Moscow	Russian Federation
114	International Bank of St Petersburg	Russian Federation
115	JSC VTB Bank	Russian Federation
116	MDM Bank	Russian Federation
117	Public joint-stock company ROSBANK	Russian Federation
118	West Siberian Commercial Bank-Zapsibcombank	Russian Federation
119	Oversea-Chinese Banking Corporation Limited OCBC	Singapore
120	Banco Bilbao Vizcaya Argentaria SA	Spain
121	Banco de Sabadell SA	Spain
122	Banco Popular Espanol SA	Spain
123	Bankinter SA	Spain
124	Nordea Bank AB	Sweden
125	Skandinaviska Enskilda Banken AB	Sweden
126	Svenska Handelsbanken	Sweden
127	Credit Suisse Group AG	Swiss Confederation
128	UBS AG	Swiss Confederation
129	Vontobel Holding AG-Vontobel Group	Swiss Confederation
130	Chang Hwa Commercial Bank Ltd.	Taiwan
131	China Development Financial Holding Corp	Taiwan
132	First Financial Holding Company Limited	Taiwan
133	Fubon Financial Holding Co Ltd	Taiwan

134	Sinopac Financial Holdings	Taiwan
135	Bangkok Bank Public Company Limited	Thailand
136	Bank of Ayudhya Public Company Ltd.	Thailand
137	Kasikornbank Public Company Limited	Thailand
138	Krung Thai Bank Public Company Limited	Thailand
139	Siam Commercial Bank Public Company Limited	Thailand
140	Alfa Bank PJSC	Ukraine
141	Nadra Bank	Ukraine
142	Barclays Plc	United Kingdom
143	HSBC Holdings Plc	United Kingdom
144	Lloyds Banking Group Plc	United Kingdom
145	Royal Bank of Scotland Group Plc (The)	United Kingdom
146	Schroders Plc	United Kingdom
147	Standard Chartered Plc	United Kingdom

Notes: This Table presents the banks and their country of incorporation which are included in the sample.

Appendix 5.B Robustness tests

Bank rating's determinants

- 1) Profitability measures: ROAE= return on average equity¹⁹⁷
- 2) Asset quality measures: LLR/GL= loan loss reserves to gross loans¹⁹⁸
- 3) Size: LNASSET= log of book value of total assets
- 4) Leverage: assets to equity multiple.
- 5) Non-interest income over gross revenue

Table 5.B.1 Clustering options

Variation	Dimension of clustering	No of clusters	Variable	Robust Std. Err.	z	p-value
I	No clustering	0	Treatment	0.123	-4.87	0.000***
			SOVORDINAL window	0.031	12.81	0.000***
			Bank58all	0.007	6.30	0.000***
II	Bank ID	147	Treatment	0.143	-4.18	0.000***
			SOVORDINAL window	0.033	11.83	0.000***
			Bank58all	0.008	6.01	0.000***
III	Month	85	Treatment	0.177	-3.37	0.001***
			SOVORDINAL window	0.057	6.88	0.000***
			Bank58all	0.012	3.95	0.000***

Notes: This Table compares single clustering options to determine whether the time or the firm effect is present in the dataset comprising 147 banks from 42 countries over period January 2006-January 2013. This relates to discussion in section 5.5.2 where competing fixed effect and clustering options are applied to test for robustness of the regression model (Eq. (5.1)). Significance levels such that: *** p<0.01, ** p<0.05, * p<0.1.

197. Net income/average equity

198. Gross loans= loans + loan loss reserves (LLR)

Table 5.B.2 Placebo effects-time variations

MODEL VARIABLES	VIII f1.	VIII f2.	VIII f3.
PLACEBO	0.4204 (0.99)	-0.1481 (-0.60)	-0.0460 (-0.26)
ΔSOVORDINAL window	0.3959*** (10.80)	0.4026*** (10.86)	0.4071*** (11.10)
BANK58ALL	0.1419*** (5.56)	0.1450*** (5.81)	0.1504*** (5.87)
LN(ASSETS)	-0.6731*** (-5.06)	-0.7187*** (-5.63)	-0.7263*** (-5.73)
LEVERAGE	-0.0215 (-1.54)	-0.0206 (-1.46)	-0.0248* (-1.78)
ROAE	-0.0130*** (-2.60)	-0.0130** (-2.44)	-0.0114** (-2.33)
LLR/GL	-0.0215 (-1.54)	-0.0119 (-0.54)	-0.0153 (-0.66)
INCREV	0.0026 (0.43)	0.0036 (0.61)	0.0039 (0.66)
Statistics			
Observations	8702	8512	8330
Log likelihood	-2215	-2165	-2119
Pseudo R2	0.217	0.218	0.221
Number of clusters	144	144	144
Year -country dummies	yes	yes	yes
Month dummy	yes	yes	yes
Cluster by bank ID	yes	yes	yes
Bank ID dummy	yes	yes	yes

Notes: This Table presents results of falsification tests performed in section 5.6.1 to test the results of the ordered probit model estimation on the sample of 147 banks from 42 countries seen in Table 5.10. The dependent variable is ΔBANKORDINAL. f.1; f.2; f.3 are leads in which the treatment was assigned (1, 2 and 3 months earlier than the regulatory action was announced respectively). Fixed effects are included (“yes”). The year-country fixed effect is the interaction term between full set of country and year dummies. The month fixed effect comprises a fixed effect for every (but one) year: month during the sample period. Variables definitions and summary statistics are presented in Table 5.8. Significance level such that: *** p<0.01, ** p<0.05, * p<0.1. Robust z-statistics in parentheses.

Table 5.B.3 Placebo effects-cross section variation

VARIABLES	a) Subset of banks			b) All banks		
	1a	1b	1c	2a	2b	2c
PLACEBO	0.1421 (0.70)	-0.0687 (-0.39)	-0.0328 (-0.21)	-0.4805 (-0.88)	0.5946 -1.4	-0.2955 (-0.70)
ΔSOVORDINAL window	0.3843*** (7.73)	0.3849*** (7.73)	0.3849*** (7.74)	0.3851*** (7.73)	0.3873*** -7.75	0.3833*** (7.66)
BANK58ALL	0.1475*** (4.17)	0.1473*** (4.12)	0.1482*** (4.20)	0.1487*** (4.33)	0.1466*** -4.12	0.1483*** (4.24)
LN(ASSETS)	0.5231 (1.61)	0.5376* (1.67)	0.5299* (1.65)	0.5233 (1.63)	0.6075* -1.83	0.4821 (1.50)
LEVERAGE	0.0447** (1.98)	0.0409* (1.87)	0.0404* (1.86)	0.0418* (1.92)	0.0348 -1.55	0.0445** (2.01)
ROAE	-0.0028 (-0.49)	-0.0026 (-0.42)	-0.0031 (-0.53)	-0.0029 (-0.50)	-0.0053 (-0.80)	-0.0019 (-0.33)
LLR/GL	-0.0044 (-0.20)	-0.0055 (-0.25)	-0.0059 (-0.27)	-0.0056 (-0.25)	-0.0067 (-0.30)	-0.0055 (-0.25)
INCREV	-0.0101 (-1.22)	-0.0101 (-1.22)	-0.0099 (-1.20)	-0.0099 (-1.20)	-0.0096 (-1.17)	-0.0101 (-1.22)
Statistics						
Observations	4050	4050	4050	4050	4050	4050
Log likelihood	-1119	-1120	-1120	-1119	-1118	-1119
Pseudo R2	0.228	0.228	0.228	0.228	0.229	0.228
Number of clusters	70	70	70	70	70	70
Year times country dummies	yes	yes	yes	yes	yes	yes
Month dummy	yes	yes	yes	yes	yes	yes
Cluster by bank ID	yes	yes	yes	yes	yes	yes
Bank dummy	yes	yes	yes	yes	yes	yes

Notes: This Table presents results of falsification test performed in section 5.6.1.2 to test the results of the ordered probit model estimation on the sample of 147 banks from 42 countries seen in Table 5.10. The dependent variable is ΔBANKORDINAL. The placebo tests are applied to model VIII specifications. Test 1a-c involves randomly assigning the placebo to subset of banks which belong to the control group sovereigns. Test 2a-c randomly picks sovereigns which belong to the control group and assigns placebo to all banks belonging in that subset. The number of entities selected by the random number generator in each trial is shown in section 5.6.1.2. The sample is restricted to the control group only and for this reason the number of observations is constant in all trials. Robust z-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 5.B.4 Covariate matching methods

	(1)	(2)	(3)	(4)	(5)	(6)
Sample and matching model	CVM: Nearest neighbour covariates- 1 match	CVM: Nearest neighbour covariates- 1 match	CVM: Nearest neighbour covariates- 4 matches	CVM: Nearest neighbour covariates- 1 match	CVM: Nearest neighbour covariates- 1 match	CVM: Nearest neighbour covariates- 4 matches
Covariates	SOV58SCALE; BANK58ALL; LN(ASSETS); LEVERAGE; ROAE; LLR/GL; INCREV; CPI	SOV58SCALE; BANK58ALL; LN(ASSETS); LEVERAGE; ROAE; LLR/GL; INCREV; CPI	SOV58SCALE; BANK58ALL; LN(ASSETS); LEVERAGE; ROAE; LLR/GL; INCREV; CPI	SOV20SCALE; BANK20SCALE; LN(ASSETS); LEVERAGE; ROAE; LLR/GL; INCREV; MEANCPI	SOV20SCALE; BANK20SCALE; LN(ASSETS); LEVERAGE; ROAE; LLR/GL; INCREV; MEANCPI	SOV20SCALE; BANK20SCALE; LN(ASSETS); LEVERAGE; ROAE; LLR/GL; INCREV; MEANCPI
Match est.	a) SATE	b) SATT	SATE	SATT	SATE	SATT
Std. err.	0.059	0.044	0.033	0.036	0.043	0.020
p-value	0.008	0.048	0.002	0.001	0.100	0.000
Coefficient	-0.159	-0.087	-0.103	-0.120	-0.063	-0.073
N	6808	6808	6808	8559	8559	8559

Notes: This Table presents results of nearest neighbour matching exercise outlined in section 5.6.2.1; CVM- Covariate Matching; a) Applies Average Treatment Effect matching estimator and an inverse variance weighting matrix; b) Applies Average Treatment Effect on the Treated matching estimator an inverse variance weighting matrix; Variables definitions and summary statistics are presented in Table 5.8. Additionally: SOV58SCALE (BANK58ALL) is sovereign (bank) credit rating based on 58-point scale; SOV20SCALE (BANK20SCALE) is sovereign (bank) credit rating based on 20-notch scale; CPI stands for Consumer Price Index whereas MEANCPI takes the mean value per sovereign. The remaining covariates with their definitions are outlined in Table 5.8.

Table 5.B.5 Balancing test- Propensity Score Matching

Variable		Mean			%reduct bias	t-test	
		Treated	Control	%bias		t	p>t
SOV20SCALE	Unmatched	16.36	15.357	25.4		8.74	0
	Matched	16.36	16.426	-1.7	93.4	-0.48	0.628
BANK20SCALE	Unmatched	13.598	12.845	24.5		7.94	0
	Matched	13.598	13.752	-5.0	79.6	-1.59	0.113
LN(ASSETS)	Unmatched	18.673	18.009	37.4		12.76	0
	Matched	18.673	18.734	-3.4	90.9	-0.99	0.322
LEVERAGE	Unmatched	16.283	14.923	20.9		7.2	0
	Matched	16.283	16.118	2.5	87.9	0.72	0.47
LLR/GL	Unmatched	2.5377	2.9592	-15.1		-4.91	0
	Matched	2.5377	2.5937	-2.0	86.7	-0.71	0.477
MEANCPI	Unmatched	2.2738	3.3611	-141.6		-39.8	0
	Matched	2.2738	2.2716	0.3	99.8	0.23	0.821

Notes: This Table presents results of balancing exercise performed directly after the propensity score matching (see section 5.6.2.2). The null hypothesis states that difference in means of covariates is equal to zero. Variables definitions and summary statistics are presented in Table 5.8. Additionally: SOV20SCALE (BANK20SCALE) is sovereign (bank) credit rating based on 20-notch scale; CPI stands for Consumer Price Index whereas MEANCPI takes the mean value per sovereign. Robust z-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 5.B.6 Regression approach

MODEL VARIABLES	(1)	(2)	(3)	(4)	(5)
POST*TREATMENT	-0.1832** (-2.19)	-0.4275*** (-3.52)	-0.4275*** (-3.42)	-0.4133*** (-3.60)	-0.4133*** (-3.32)
PSCORE	1.0598*** (2.97)	0.8533** (2.03)	0.8533** (2.42)	2.5561*** (2.90)	2.5561*** (3.02)
Statistics					
Observations	8900	8900	8900	8900	8900
Log likelihood	-2694	-2533	-2533	-2501	-2501
Pseudo R2	0.0575	0.114	0.114	0.125	0.125
Number of clusters	.	.	147	.	147
Year and country dummies	yes	no	no	no	no
Year-country dummies	no	yes	yes	yes	yes
Bank dummy	no	no	no	yes	yes
Cluster by bank ID	-	-	yes	no	yes
Month dummy	-	-	-	-	-

Notes: This Table reports the estimated coefficients and robust z-statistics in parentheses from the ordered probit model performed on the matched sample. Models 1-5 imitate the specifications I-V from Table 5.10. The dependent variable is Δ BANKORDINAL. Fixed effects are included (“yes”), not included (“no”) or not applicable in given specification (“-”). The year-country fixed effect is the interaction term between full set of country and year dummies. The month fixed effect comprises a fixed effect for every (but one) year: month during the sample period. The Pscore is an estimate of a conditional probability that the treatment will be assigned based on vector of observed covariates. These comprise: sovereign and bank credit ratings (20-notch-scale), bank financial data: leverage, LN(ASSETS), loan loss reserves to gross loans, and macroeconomic indicators: MEANCPI. CPI is the Consumer Price Index and MEANCPI takes the mean value per sovereign. Significance level such that: *** p<0.01, ** p<0.05, * p<0.1.

Table 5.B.7 Random sample manual

MODEL	II	III	IV	V	VI
VARIABLES					
POST*TREATMENT	-0.3674*** (-2.89)	-0.3674*** (-2.82)	-0.2712** (-2.24)	-0.2712** (-1.98)	-0.7068*** (-2.69)
ΔSOVORDINAL window	0.3679*** (8.76)	0.3679*** (8.47)	0.3701*** (8.68)	0.3701*** (8.54)	0.4126*** (8.87)
BANK58ALL	0.0686*** (6.40)	0.0686*** (5.53)	0.2447*** (8.26)	0.2447*** (4.54)	0.0679*** (6.88)
LN(ASSETS)	-0.1540*** (-4.40)	-0.1540*** (-3.92)	0.1555 (0.58)	0.1555 (0.59)	-0.1658*** (-4.72)
LEVERAGE	-0.0051 (-1.02)	-0.0051 (-1.44)	-0.0108 (-1.49)	-0.0108* (-1.95)	-0.0030 (-0.66)
ROAE	-0.0204 (-1.47)	-0.0204* (-1.91)	-0.0177 (-0.66)	-0.0177 (-0.77)	-0.0225 (-1.62)
LLR/GL	0.0004 (0.06)	0.0004 (0.07)	-0.0213 (-1.40)	-0.0213 (-1.41)	0.0012 (0.16)
INCREV	0.0039** (2.03)	0.0039*** (3.10)	0.0038 (0.60)	0.0038 (0.76)	0.0035* (1.85)
Statistics					
Observations	6404	6404	6404	6404	6404
Log likelihood	-1725	-1725	-1650	-1650	-1593
Pseudo R2	0.141	0.141	0.178	0.178	0.207
Number of clusters	.	104	.	104	
Year-country dummies	yes	yes	yes	yes	yes
Bank ID dummy	no	no	yes	yes	no
Month dummy	no	no	no	no	yes
Cluster by bank ID	no	yes	no	yes	no

Notes: This Table presents results of model specifications (II-VI), studied in section 5.5, using manual matching of treatment group with the control group using one-to-one method on sovereign level (see section 5.6.2.4). The dependent variable is ΔBANKORDINAL. The collapsed subsample includes sovereigns with ID's between 1-26 over the period January 2006-January 2013. Sovereign ID's 1-13 represent treatment group and 14-26 are control group sovereigns. For complete list of sovereigns see section 5.6.2.4. Robust z-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 5.B.8 Monthly data results: OLS

MODEL VARIABLES	I	II	III	IV	V	VI	VII	VIII
CONSTANT	0.2747*** (3.53)	0.3965*** (4.03)	0.3965*** (3.67)	2.0520*** (5.91)	2.0520*** (5.47)	0.3012*** (3.80)	0.3012*** (3.36)	2.0000*** (4.74)
POST*TREATMENT	-0.0104 (-0.50)	-0.1177*** (-4.28)	-0.1177*** (-3.97)	-0.0294 (-1.09)	-0.0294 (-0.94)	-0.0751** (-2.04)	-0.0751** (-2.11)	-0.1166* (-1.94)
ΔSOVORDINAL window	0.1352*** (9.88)	0.1406*** (9.95)	0.1406*** (9.30)	0.1404*** (9.90)	0.1404*** (9.23)	0.1383*** (9.55)	0.1383*** (9.52)	-0.1378** (9.29)
BANK58ALL	0.0105*** (6.79)	0.0109*** (5.62)	0.0109*** (5.40)	0.0454*** (7.03)	0.0454*** (6.06)	0.0075*** (4.57)	0.0075*** (4.22)	0.1919*** (3.84)
LN(ASSETS)	-0.0354*** (-5.54)	-0.0373*** (-5.22)	-0.0373*** (-4.75)	-0.2090*** (-6.36)	-0.2090*** (-5.87)	-0.0296*** (-4.45)	-0.0296*** (-3.96)	-0.1800*** (-4.48)
LEVERAGE	-0.0004 (-0.27)	0.0018 (1.16)	0.0018 (1.36)	-0.0019 (-0.52)	-0.0019 (-0.44)	-0.0005 (-0.38)	-0.0005 (-0.43)	-0.0040 (-1.15)
ROAE	0.0014 (1.52)	0.0002 (0.17)	0.0002 (0.28)	-0.0009 (-0.66)	-0.0009 (-0.86)	-0.0002 (-0.20)	-0.0002 (-0.40)	-0.0019* (-1.86)
LLR/GL	0.0005* (1.80)	0.0004 (0.19)	0.0004 (0.27)	0.0006 (0.49)	0.0006 (0.46)	0.0012 (0.57)	0.0003 (1.28)	-0.0019 (-0.44)
INCREV	0.0010 (0.55)	0.0007** (2.04)	0.0007** (2.48)	-0.0006 (-0.16)	-0.0006 (-0.10)	0.0003 (1.02)	0.0012 (0.77)	0.0013 (0.98)
Observations	8,900	8,900	8,900	8,900	8,900	8,900	8,900	8,900
R-squared	0.0896	0.1153	0.1153	0.1319	0.1319	0.1369	0.1369	0.1521
Root MSE	0.444	0.442	0.442	0.440	0.440	0.438	0.438	0.437
Number of clusters	.	.	147	.	147	.	147	147
Year and country dummies	yes	no	no	no	no	no	no	no
Year-country dummies	no	yes	yes	yes	yes	yes	yes	yes
Bank dummy	no	no	no	yes	yes	no	no	yes
Cluster by bank ID	no	no	yes	no	yes	no	yes	yes
Month dummy	no	no	no	no	no	yes	yes	yes

Notes: This Table reports the estimated coefficients and robust z-statistics in parentheses from various specifications of Models I-VIII from section 5.4.2.1 using Ordinary Least Squares exercising Eq. (5.1) (details section 5.6.4). The credit rating dataset consists of monthly sovereign and bank ratings for 147 banks originating from 42 countries for the period January 2006-January 2013. The dependent variable is ΔBANK58ALL and stands for change in bank ratings using 58-point scale. The dependent variable is the same as ΔBANKORDINAL used in Table 5.10 with an exception that the responses are not coded into 7 discrete categories. The remaining variables definitions and summary statistics are presented in Table 5.8. Fixed effects are included (“yes”), not included (“no”) or not applicable in given specification (“-”). The year-country fixed effect is the interaction term between full set of country and year dummies. The month fixed effect comprises a fixed effect for every (but one) year: month during the sample period. Significance level such that: *** p<0.01, ** p<0.05, * p<0.1.

Appendix 5.C Correlation matrix

Table 5.C.1 – Correlation matrix

	Post*Treatment	ΔSov	BankR	ln(Assets)	LEVER	ROAE	LLR/GL	INCREV
Post*Treatment	1.00							
ΔSovR	-0.14	1.00						
BankR	0.08	-0.02	1.00					
ln(Assets)	0.13	-0.08	0.73	1.00				
LEVERAGE	0.08	-0.05	0.48	0.64	1.00			
ROAE	-0.12	0.20	0.04	-0.12	-0.19	1.00		
LLR/GL	-0.05	0.05	-0.26	-0.20	-0.16	-0.18	1.00	
INCREV	0.05	0.01	0.00	0.09	-0.02	0.09	0.03	1.00

Notes: This Table reports correlation coefficients for the variables used in Eq. (5.1). The sample includes 147 banks originating from 42 countries for the period January 2006 - January 2013. See Table 5.8 for variable definitions.

Chapter 6: The impact of ESMA regulatory identifiers on the quality of ratings

6.1 Introduction

The recent financial crisis brought mounting criticism of the CRAs for their role amid deteriorating economic conditions. During both the subprime crisis and the European debt crisis, concerns were raised that the CRA system is flawed and that the existing regulation exacerbates the problem further by hardwiring ratings into regulations (Hau et al., 2013).

In December 2009, the European Commission (EC) released new laws relating to CRAs. Amongst other requirements, the EU Regulation obliges CRA to be registered or certified by ESMA before performing rating activities (ESMA, 2013c). Further, (as of April 30, 2012) ESMA requires CRAs to reveal which ratings originate in the EU and which are issued outside the Member states but are EU endorsed. To distinguish between them, the identifiers “EU” and “EE” are assigned. The former case relates to ratings where the lead analyst is based in the EU or a centre which is a branch of the EU legal entity. Endorsement (Article 4.3 CRA Regulation) is aimed at CRAs whose ratings are systemically important for the financial stability of the Member States (Alcubilla and Del Pozo, 2012). For the ratings to be eligible as endorsed, the analyst must be located in a jurisdiction which has a comparable regulatory regime with that of the EU (EC, 2011d).

Attaining information and measuring creditworthiness is costly and time consuming for investors, therefore many entrust this task to the CRAs. However, the recent evidence from CRAs shows that poor quality ratings can aggravate a crisis and might lead to possible cliff-effects (Manso, 2013). Despite regulatory efforts aimed at maintaining high quality ratings, relatively little is known about the determinants of ratings quality. Possible determinants of ratings quality include CRAs’ incentives, rating-contingent regulation, complexity of rated assets, reputational concerns of CRAs and competition between them (Hau et al., 2013).

Via the use of identifiers, the EU aims to enable supervisory integration of the CRAs and co-operation of outside supervisors at the same time protecting EU investors by standardised and comparable methodologies and assumptions. Identifiers intend to increase transparency and integrity via releasing more information to investors and enabling them to perform internal credit worthiness assessment. This improved reliability and good governance arisen from the equivalence rules is meant to increase rating quality.

The aim of this chapter is to assess whether ESMA's requirement for identifiers (from April 2012) led to changes in the quality of ratings reported by CRAs. It investigates the impact that rating status identifiers had on the market. The study questions whether the market works better, in the sense that bond yields are more aligned with ratings. Did the overall quality of ratings improve or not? The quality of ratings refers to the information content which surfaces through the ability of ratings to explain bond yields (Becker and Milbourn, 2011). Namely, high quality ratings should be disseminating information about bond values. For instance, when ratings accurately reflect the risk of an issuer, and therefore correlate highly with its bond yields, they have the power to protect investors by reducing information asymmetries. On the other hand, lower quality of ratings via lower correlations with bond yields signal that the ratings echo other traits than the expected payoff. In this setting it is evaluated whether the ratings comprise information about bond values different than commonly perceived attributes including bond contracts and firm fixed effects. The main research question is: *Does the quality of ratings (captured by their informativeness) change after the introduction of ESMA identifiers?*

The closely related literature on ratings quality measures the effect of entry (i.e. certification) of one of the CRAs and its impact on the rest of the CRA industry (Kisgen and Strahan, 2010; Becker and Milbourn, 2011; Doherty et al., 2012; Bongaerts et al., 2012). This chapter considers the effect of regulation (i.e. identifiers) applied to the existing CRAs. Is important to investigate the effect of disclosure rules as it is believed ESMA's endorsement rules could add credibility to CRAs' opinions and result in making ratings more, rather than less, influential. The outcomes of such actions are important for future policies and regulations and for avoiding unintended consequences. Asserting a high quality of sovereign ratings is of utmost importance for practitioners and governments alike since they influence how nations raise capital and influence ratings on other asset classes.

This novel study is the first attempt to measure the impact of the recent EU CRA regulation in relation to ESMA identifiers. It examines the direct consequence of regulatory authorization on ratings quality. This contrasts with Kisgen and Strahan (2010) who study the price impact of regulation. Investigating current regulatory undertakings and assessing their impact on the quality of ratings will add to the debate about the influence of the regulation in the wider spectrum (see Bongaerts et al., 2012; Doherty et al., 2012). This research differs in terms of the studied sample since the latest literature considers periods before regulation took place. For instance, Bongaerts et al. (2012) explore a sample between 2002 and 2008. Becker and

Milbourn (2011) utilize a sample from 1995 to 2006 while Kisgen and Strahan (2010) use the period between 2001 and 2005. Data sample in this study comprises sovereign ratings from Fitch, Moody's and S&P originating from 69 countries and covers the period between Sept 2007- Sept 2014.

The structure of this chapter is as follows. Sections 6.2 and 6.3 introduce the background of the EU CRA Regulation regime along with a summary of the relevant academic literature. Section 6.4 presents data and descriptive statistics then section 6.5 describes research methodologies. Section 6.6 and 6.7 report empirical results together with robustness checks whereas section 6.8 concludes the study.

6.2 Recent regulatory developments

6.2.1 Disclosure rules in the EU

The recent EU regulatory initiatives (CRA I, II and III) aim to reduce conflicts of interest, overreliance on ratings and spillover effects, to increase independence and soundness of rating processes and to improve quality of rating methodologies and ratings (ECB, 2012). Alsakka et al. (2015) classifies recent regulatory efforts in Europe into three phases: reactive, implementation and enhancement. To influence the quality of ratings, ESMA requires CRAs to be registered as a regulated CRA in the EU to be able to endorse ratings (into the EU) which were originated outside the EU. To meet the equivalence regime, the ratings are to be assigned in a jurisdiction which operates in a regulatory establishment for CRAs which is “*at least as stringent as the relevant EU rules set out in Articles 6 to 12*” (EC, 2011d).

The interpretation of the endorsement rules (Article 4.3 (b)) caused debates between national authorities, CRAs themselves and the EC (Alcubilla and Del Pozo, 2012). The views split since market participants and leading CRAs deduce that requirements should rest on the *conduct* of the third country CRAs' operations whereas the EC provides that requirements should be formed around the *legislation* of that jurisdiction. A joint declaration was submitted to the EU Council in 2010 where concerned countries¹⁹⁹ demanded clarification and updating of regulation. There were fears that few countries might be considered equivalently stringent relative to the EU regulation and therefore a high number of ratings would be withdrawn since they could not be used for regulatory purposes. In effect this would lead to the amplification of

199. Declaration submitted by: UK, Spain, the Netherlands, Sweden, Austria, Finland, Hungary and Ireland. EU Council 2344th meeting in Brussels (8, 10, 13 December) 2010.

the regulatory capital held by financial firms as fewer ratings would be available for standardised approach calculations and securitization purposes. Further, limited endorsement of foreign ratings could impede market liquidity within Europe and lead to intensification of risk in the market. Despite these issues, ESMA published its final guidance on the subject in May 2011, which confirmed the earlier interpretation (ESMA, 2011d).

The endorsement permits CRAs which operate and are registered in the EU to authorise ratings of entities which are part of their own groups and which operate outside the EU. Both the ratings assigned in the EU as well as ratings from non-EU countries but endorsed based on the equivalence regime can be used for regulatory purposes (e.g. by banks). The equivalence tests conducted by ESMA, announced before April 30 2012, concluded that ratings originating from Argentina, Australia, Brazil, Canada, Hong Kong, Japan, Mexico, Singapore and the United States fulfil this requirement. Since that date, market participants in the EU are forbidden from using ratings originating from other unrecognised jurisdictions for regulatory purposes.

There are currently 23 registered and two certified CRAs in the EU (ESMA, 2014b). Fitch, Moody's and S&P function in a group structure representing approximately 90 percent of the market share (ESMA, 2014c). See Appendix 6.A.1.

6.2.2 The objective of identifiers

Steven Maijoor (ESMA chair) commented that endorsing ratings from third countries enables supervisory integration of the CRAs. Greater co-operation between outside supervisors benefits the functioning of financial markets and protects investors in the EU (ESMA, 2011b). According to the EC, a CRA in a third country needs to conform to supervisory customs in the EU. Identifiers help to achieve this by disseminating information amongst investors. The regulators try to ensure that in the current framework, “*users of ratings in the EU benefit from equivalent protections in terms of a CRA's integrity, transparency, good governance and reliability*” (ESMA, 2011c; p.4).

When assessing the equivalence of third countries, the rules incorporate all provisions of the EU CRA Regulation.²⁰⁰ The equivalence in quality of ratings and methodologies (enabled through the identifiers) helps to protect the stability of financial markets. High quality ratings

200. (i) extent of regulatory and supervisory framework; (ii) corporate governance; (iii) conflict of interest; (iv) organisational constraints; (v) quality of methodologies and ratings; (vi) disclosure rules; (vii) supervision and enforcement rules.

lead to improved efficiency of capital markets and improve transparency and competition (ESMA, 2011e).²⁰¹ In their consultation paper on the application of the endorsement regime ESMA (2011e) divides the benefits for the market participants arising from identifiers into four categories:

- (i) Quality of ratings
- (ii) Efficiency of securities or capital markets
- (iii) Availability of ratings
- (iv) Access to funding.

With relation to the first point ESMA believes that the additional supervisory layer performed by the local supervisory body in the third country CRA will support efforts of the EU competent authorities. It is believed that such cooperation in scrutinising and implementing equally stringent regulatory requirements can protect against the supervisory risks.²⁰² It is also considered that market participants will benefit from the higher quality of endorsed ratings owing to the fact investors will make judgements build on robust creditworthiness assessments of assets. This improved information about solvency of issuers or debtors should enable financial organizations to improve their facilities aimed at managing expected losses. At the same time, it should help securing capital buffers for the unforeseen credit incidents. As a consequence organizations will benefit from better resistance to the potential crises situations or issues arising at the firm level (e.g. illiquidity issues). As a whole improved quality of ratings through identifiers supports contagion prevention and ensures stability and efficacy of the system. The framework assumes the endorsement rules will provide an enhanced quality of ratings in the medium/long term depending on the cooperation between the EU and third countries' authorities. At the same time, ESMA points out that the effectiveness of the regime relies on the compliance of the third country regulators to make the necessary amendments in order to meet the “*as stringent as*” requirement of the EU Regulation.

The second point relates to the fact that higher quality endorsed ratings should lead to the reliable credit assessment of financial assets which as a result influences efficacy and creates

201. For example, inflated ratings might result in undercapitalisation of concerned entities and pose a stability threat to the system (see Coval et al., 2009). On the other hand, ratings which overestimate the risk and are too stringent, might enforce excessive capital constraints on banks or other issuers, imposing costs on the entire economy.

202. The risk in this context relates to the possibility that the regulator is not able to alleviate consequences of misconduct or avert behaviour which violates the regulation.

less volatile markets. Nevertheless, the regulator admits there are possible side effects in the short run. As suggested by market participants, in their response to the Act, financial institutions might need to modify their portfolios as a result of some ratings not being endorsed in the EU. This might have serious repercussions on the prices of assets and lead to fire sales and losses for investors which might result in volatility of the system such as a cliff-effect.

Thirdly, ESMA recognises that non-endorsable ratings might lessen the financial information released to the market participants in the short run by disrupting the price discovery and restraining issuance of some types of securities.

Lastly, pointed out by commentators in reply to the endorsement rules, the gains achieved through the endorsement might be offset by the effects caused by non-endorsability of some ratings. This as a result could hinder access to capital for numerous investors or individuals. ESMA acknowledges these issues might spread through the channel of securitization. This is because supply of credit might be limited to various parties since less investors demand structured finance products as holding them carries capital or information costs. Nevertheless, this issue should be corrected for in the medium/long term when modifications in the procedures and working of the CRAs take place and when ratings issued by the competing CRAs are used.

The regulator mentions another cost of the endorsed ratings as part of their cost benefit analysis. There could be a decrease in the number of ratings issued from the third countries since they do not pass the stringency requirements. This would induce pressure on the release of non-conventional ratings still allowed in the EU or prompt CRAs to get involved in costly modifications and actions which will allow them to retain the market share and defend their position. These increase costs of producing ratings would then be shifted on investors.

To summarize, the cost benefit analysis anticipates that the advantages to the market participants are low/medium in the short run (due to the losses of numerous ratings) and high in the medium/long run (because market efficacy and integrity is improved by potentially higher quality of endorsed ratings in the EU).

6.3 Prior literature

Although credit ratings play a vital role in financial markets, the literature specifically investigating their quality is surprisingly limited. It is of utmost importance to understand its determinants since creditworthiness announced by CRAs includes the information on the issuers during the course of the business cycle which is not easily deduced from market prices.

6.3.1 Quality of ratings

The main stream of prior literature concentrates on the quality (i.e. information content) of ratings which is approached by considering the association between credit ratings (or their changes) and bond yields (or their changes) (West, 1973; Ederington et al., 1986; Hand et al., 1992; Ederington and Goh, 1998; Becker and Milbourn, 2011).

For instance, Becker and Milbourn (2011) define the quality of ratings as the ability of ratings to transmit reliable information to market participants and their ability to categorise the risk of a rated product. The latter relates to the fact that rating classifications are durable and do not change frequently. Classification is especially important for regulations, and EU regulation in particular, since they require stable interpretations of ratings when they are used in contracts and capital requirements. For this reason, ratings higher than they should otherwise be, are considered to be a lower quality of rating which is key to the EU regulation presumably. Becker and Milbourn (2011) emphasize that low quality (inflated) ratings might harm the information diffusion of ratings unless all market participants are well informed (sophisticated). Not all investors are able to extract the inflation effect from the ratings, when interpreting them. This lessens the value of ratings paradoxically to those investors who should be making risk assessments and decisions based on them. As a result, the benefits for the financial system derived from ratings are reduced (Boot et al., 2006; Bolton et al., 2012). Additionally, low quality ratings complicate regulations and make contracting with ratings more difficult as they depend on established denotations of categories.

The authors measure the quality of ratings in terms of their informativeness, in three ways: (i) the rating levels;²⁰³ (ii) correlation between ratings and market implied yields²⁰⁴ and (iii) default rates compared against the current ratings or investment grade dummy variables.²⁰⁵

203. Where any rating inflation conveys decreasing rating quality.

204. Where higher correlations are expected to signal higher quality of ratings and vice versa.

205. To verify whether the ratings are good predictors of default.

Investigation of the quality of ratings often takes the form of natural experiments (Kliger and Sarig, 2000; Jorion et al., 2005; Tang, 2009). Other studies focus on the effect of ratings on the supply of debt capital with the use of leverage (instead of cost of capital) as a dependent variable (Faulkender and Peterson, 2006; Kisgen, 2006, 2009; Sufi, 2009). According to Kisgen (2006), around the time when a new rating is to be published, companies are found to reduce their leverage. Moreover, subsequent to a downgrade, a firm is more likely to reduce its leverage in the hope of regaining its previous rating (Kisgen, 2009). The strongest effect can be observed around the investment/speculative threshold.

Kisgen and Strahan (2010) differs because they investigate the regulatory influence of various levels of ratings, and not the impact of having a rating, on bond yields. Using the event of certification of Dominion Bond Rating Service (DBRS) for regulatory purposes in 2003, the authors establish that rating-contingent regulation influences a firm's cost of debt capital (bond yields). The natural experiment finds the effect to be asymmetric, namely only better ratings of the newly certified CRA in contrast to the other CRAs correspond to change (i.e. decline) in firms' cost of capital. Moreover, the results also support Bongaerts et al. (2012) who state that ratings by Fitch are important mainly due to regulatory reasons as they are known to "*break the tie*" between Moody's and S&P when their views about issuer's creditworthiness differ. Both studies find results to be stronger around the investment-grade cut-off where the impact of regulatory restraint is the most binding.

6.3.2 Effect of regulation of CRAs

The impact of regulation on the rating industry is mainly examined by looking at the effect of entry of a regulated CRA and the corresponding effect of increased competition on the rest of the CRA industry (Becker and Milbourn, 2011; Doherty et al., 2012; Bongaerts et al., 2012).

Faure-Grimaud et al. (2009) suggests that competition amongst CRAs might result in reduced information revelation to the market. Bolton et al. (2012), Bar-Isaac and Shapiro (2013) and Dimitrov et al. (2015) also confirm that the overall quality of ratings drops with increased competition. Bolton et al. (2012) conclude that increased competition between CRAs might lead to increased *rating shopping* and as a result a decreased wealth effect. They find that when more naïve investors are present the countercyclical quality of ratings is reinforced. This is based on the notion that the reputation costs are not significant therefore the incentives to provide high quality ratings diminish.

Dimitrov et al. (2015) study the impact of the Dodd-Frank Act Wall Street Reform on ratings of corporates and find that their quality, measured by accuracy and informativeness, drops after the introduction of new laws. These authors associate the behaviour of CRAs with the reputational concerns outlined by Morris (2011). The results are consistent with Becker and Milbourn (2011), who suggest that increased competition from Fitch, corresponds with Moody's and S&P releasing higher (less accurate) ratings as they are not concerned about their reputation.

Becker and Milbourn (2011) consider the transition in competition as observed from a two-CRA setting to three CRAs. In contrast, Doherty et al. (2012) capture the conversion from monopoly to duopoly studying the insurance ratings market (not the bond market). These authors find that the new entrant CRA chooses higher standards than the incumbent company. They proxy ratings quality (informativeness) using the insurer's probability of default calculated with a discrete-time hazard model and conclude that increased competition results in improved precision of default rate estimates.

The default rate probability mentioned earlier as an informativeness measurement of quality applies to rating accuracy (Cantor and Mann, 2007; Kiff et al., 2012). The existing proxies of accuracy include different market-based measures of default risk, investment-grade default rates, or average rating levels prior to default (Altman and Rijken, 2004; Löffler 2004). Since CRAs face a dilemma whereby greater accuracy is at the expense of rating stability, they apply additional credit warnings such as outlook and watch status (Hamilton and Cantor, 2004). For instance, Bannier and Hirsch (2010) find that the introduction of the watchlist instrument by Moody's in 1991 improved the informativeness of rating opinions for market participants. This is because the rating changes of entities placed on the watchlist reveal different information to the market than do direct rating changes of issuers not subject to watchlist status at the time. The study supplements literature on the responses of CRAs to regulatory pressures, similarly to Cheng and Neamtiu (2009). These authors find that as a response to the threat to their market power CRAs increase the timeliness and accuracy of ratings. This contrasts with the studies in the first paragraph of this section.

The related literature on the effect of regulation which does not include a competition perspective is very scarce. Alsakka et al. (2015) is the only study to date which looks at the effect of new regulatory regime in Europe (supervised by ESMA since July 2011) on the CRA market. Study aims to find if the perceptions of investors towards CRA operations changed due

to new regulatory actions. These are measured by studying stock returns and volatility of 44 publicly listed European banks rated by the largest three CRAs over period 2008-2013. There are differing perceptions amongst participants towards the three CRAs whereas the evidence of improved quality of released ratings or enhanced stability of the market is mixed.

Lemmon and Roberts (2010) examine the influence of intensifying regulation imposed by NAIC in 1990 together with simultaneous restrictions on saving and loan investment on the financing and investment. They find that a shock in supply of credit (i.e. contraction) strongly affects firms' financing and investment decisions. Moreover, Ellul et al. (2011) conclude that insurance companies, which are strongly constrained by regulation, are more likely to fire-sale bonds which fall below investment grade. These authors stress that this causes the prices of bonds to plummet below their fundamental value which sheds light on the possible effect of regulatory pressures on market imbalances.

A theoretical paper by Opp et al. (2013) suggests that ratings-contingent regulation diminishes the incentives of CRAs for information provision. The framework integrates the applicability of ratings for regulatory purposes and its effect on rating quality. Namely, there is known to exist a threshold level of regulatory gain beyond which the regulatory arbitrage brings in the same advantage as delegated information attainment by the CRA. When issuers receive favourable rating treatment and its economic advantage is higher than that of obtaining information, regulation causes the collapse of the information provision process and leads to ratings inflation. Similarly to Mathis et al. (2009) and Skreta and Veldkamp (2009), the study suggests that it might be cost-effective for CRAs to release lower-quality ratings instead of dealing with proper assessment of complicated bank structures. This is especially important since ratings are found to shape prices via the channel of regulation independent of the actual risk they signal to the market (Ashcraft et al., 2011; Kisgen and Strahan, 2010).

In his proposal for regulatory changes to CRAs, Calomiris (2009b) suggests hardwiring ratings into regulations results in inflated ratings as investors and CRAs exploit regulatory arbitrage. Nevertheless, according to Efung (2013), even when information is freely available, ratings might be inflated since the CRAs and issuers can jointly benefit from it. Arguably, this can only be a temporary effect, as one would expect an efficient market to re-calibrate accordingly.

6.3.3 Inflated ratings

Inflated ratings might be conflicting with the reputational concerns of CRAs (Cantor and Packer, 1995b; Covitz and Harrison, 2003). However, it has been documented that the incentive to release high-quality ratings drops when the economy is booming, thereby suggesting counter cyclical in ratings quality (Benmelech and Dlugosz, 2009; Bar-Isaac and Shapiro, 2013; Hau et al., 2013; Hilscher and Wilson, 2013; Opp et al., 2013).

Hau et al. (2013) find that bank characteristics such as loan share and bank size influence ratings quality. Broto and Molina (2014) also find that the CRAs tighten their rating standards during the economic downturns. Therefore, due to reputational concerns the rating inflation in that period would be very unlikely. Broto and Molina (2014) is the first to empirically test the asymmetry of the sovereign rating responses to fundamentals. Using an extensive sample of 67 countries the paper disentangles the determinants of sovereign ratings cycles for rating upgrades and downgrades. They find that favourable fundamentals²⁰⁶ help in easing and evening the series of rating downgrades whereas they do not improve during the rating upgrade stage.

Since there are no other published studies, except Alsakka et al. 2015, questioning and assessing the consequences of the new regulatory regime for CRAs (i.e. including workings of CRAs supervisor- ESMA), this study fills the literature gap. The novelty derives from measuring the impact of recent CRA regulation, conveyed via the ESMA identifiers, on the ratings quality (measured by their informativeness). Investigating the disclosure rules is important for future policies and regulatory actions as ESMA's endorsement regulations might make CRAs more credible resulting in ratings more rather than less prominent.

6.4 Design of the study

Changes in the quality of ratings are assessed in the 'before' and 'after' sense with the introduction of ESMA identifiers in April 2012. This is a reasonable 'cut-off' point because henceforth ESMA does not allow market participants in the EU to use ratings originating from unrecognised jurisdictions for regulatory purposes. The beginning of the sample period (Sept

206. Domestic variables such as GDP per capita, GDP growth, current balance on GDP, public debt on GDP were found to have different impact during upgrades and downgrades of sovereigns. However, there might be some omitted variables as the authors do not know the CRA's model.

2007) is chosen as it does not coincide with any major regulatory change in Europe nor the US.²⁰⁷

Since bond prices change far more frequently than ratings, sovereign bond spreads are used and matched with daily rating events. Using corporate bonds would restrict the data to monthly frequency due to rating data availability. Using sovereign bonds also allows a more manageable sample size and enables us to study the differentials among CRAs found in the previous literature on split ratings (e.g. Livingston et al., 2010; Bongaerts et al., 2012). The study uses sovereign ratings from three main rating CRAs (Fitch, Moody's and S&P) to explore if there is variation in the way they rate the same bonds (i.e. bond rating) depending on the location of the analyst. For example, Moody's rates the sovereign bonds of Belarus, Croatia, Romania, Russia, Serbia, Slovakia and Ukraine outside of the EU (EE identifier) whereas S&P rates them within the EU area (EU identifier). Using corporate data would not provide this setting.

Although the studied phenomenon of a regulatory intervention provides grounds for applying the quasi-experimental research design such as the difference-in-difference estimation, all CRAs registered in the EU are required by regulation to enforce the identifiers. This prevents the usage of a counterfactual group where the intervention was not introduced. Therefore, the time variation (before and after) and not the cross sectional variation (treated versus non-treated group) is observed. However, one cannot guarantee that the inferences in this setting are causally related to the treatment or are just an effect of time (i.e. variables which might be correlated with time but are not the effect of the intervention). For this reason, fixed effects models are implemented with the use of complementary approaches.

For example, following Finkelstein (2007), the comparison is made (on the sovereign level) whether the intensification of the treatment among two groups which received it is different. The reason why the perceptibility would be different could be due to two reasons. Firstly, the treatment might bring different entities to different levels. Alternatively, different entities might demonstrate distinct pre-intervention levels which as a result of treatment are raised to the same level as others. In the context of this study, it is investigated whether the EU regulation affected sovereigns (with "EU registered" versus "EU endorsed" CRA identifiers) from both groups to a different extent. Specifically, are EU originated ratings of higher or lower quality in comparison to EU endorsed ratings? The categorical variable (identifier) *EE (EU)* and the

207. For example, in the aftermath of the Credit Rating Reform Act (September 2006), in June 2007 operative stipulations including registration and supervision were introduced by the SEC. During this time, ten CRAs were registered as NRSROs (Alcubilla and Del Pozo, 2012).

interaction between the binary variable $\Delta Rating$ with EE (EU) attempt to answer this question (see Eq. (6.1b) later). The interaction is the key variable reflecting patterns of the rating levels in areas where it might have more pronounced impact with those where it is less influential. To rule out the concern that other issues might have changed over time and influenced the outcome, global time-varying risk factor covariates are included.²⁰⁸

6.4.1 Data sources

The bond characteristics and pricing data, including remaining maturity, coupon rate per annum, yield to maturity per annum and the issue amount are accessed using Bloomberg L.P. The selection criteria includes publicly placed, unsecured, straight sovereign government bonds with fixed coupon and with remaining maturity between 1 to 30 years, issued in US dollars. Structured notes, inflation-linked notes, hybrid or dual-currency bonds as well as restructured debt are excluded.

These criteria are met by 812 bonds where 763 have the pricing information available (historical data such as YTM). There are 494 non-US bonds. The availability of bond data predetermined the sovereigns for which rating data was collected. The initial sample included 86 sovereigns. Since US Treasury bonds are used as a benchmark for the sovereign credit spread the few rating events for the United States are excluded from the sample.

Bond spreads, in basis points, are calculated by taking the difference between the yield to maturity of the sovereign bond subject to the rating action and subtracting the yield to maturity of the comparable US benchmark bond. Herein rating action data is referred as credit ratings together with outlook and watch status represented in the 58 point CCR scale (see section 6.4.1.1). To decide on the choice of the benchmark bond to be matched to each sovereign bond with the closest remaining maturity and coupon amount is chosen. The long term foreign currency rating information is gathered from the three CRAs' publications. The coverage of countries per CRA is listed in Appendix 6.A.2. Data on identifiers for the three CRAs is obtained from the Interactive Data Credit Ratings International (CRI) database.

The rating action data is matched with the bond data based on the rating events. Multiple bonds are often observed on the day of the rating action. Unlike Gande and Parsley (2005) who

208. Similarly to Finkelstein (2007) an alternative specification includes an independent variable which counts the number of days before (or since) the identifiers were implemented by CRAs. The results remain unchanged.

observe one particular bond for each sovereign throughout their sample period, this study samples the bond with the highest issue amount per sovereign on the particular rating event date. This enables to minimise risk of discarding too many bonds for which data is not available (Vu et al., 2015). For any one rating event only one bond is observed. The dataset comprises 556 rating events for three CRAs which originate from 69 sovereigns and are represented by 99 individual sovereign bonds. 40 US bonds are used as benchmarks for spread calculations. Details of this exercise along with the description for each CRA are in the next paragraphs.

6.4.1.1 S&P

The matched sample of sovereign credit information with bond spreads has 238 rating changes of which 118 are positive and 120 negative. These events originate from 64 sovereigns, among which 20 are within Europe. 83 unique sovereign bonds are selected²⁰⁹ whereas 35 US Treasury bonds are used as benchmark for spread calculations. The sample excludes observations where the spreads are negative (1 case of Netherlands)²¹⁰ or where there is no US bond matching the issue amount criteria needed to calculate the spread on the date of event.²¹¹

6.4.1.2 Moody's

There are 166 Moody's rating actions, with 86 positive and 80 negative events, from 49 sovereign states among which 17 are in Europe. 61 unique bonds are selected for this purpose whereas 34 US Treasury bonds are used as benchmark bonds to calculate the spread. Actions which were dropped either resulted from (a) the negative spread calculation (1 case for Netherlands)²¹² or (b) did not have available data for the US bonds matched according to the applied criteria on the given event dates, which thus prevented calculation of the spread.²¹³

6.4.1.3 Fitch

The matched sample includes 152 rating events where 82 (70) are positive (negative) actions respectively. The number of sovereigns includes 49 (out of which 17 are European) represented by 59 sovereign bonds matched with the 31 US Treasury bonds acting as a benchmark for

209. Each event is represented by only one bond which might change within the same event 'period' for the same country.

210. The event on Netherlands from the 29-11-2013 with 2 CCR point downgrade in rating is deleted from the sample.

211. Two events were omitted on this basis: Barbados on the 22-10-10 with the 2 CCR points downgrade and Costa Rica on the 14-07-08 with the 1 CCR point upgrade in rating.

212. Netherlands on the 07-03-2014 with 1 CCR point downgrade is dropped from the sample.

213. Costa Rica on the 12-08-2008 with 1CCR upgrade is deleted from the sample.

spread calculations. In the process one event was eliminated because there was no close match of the US Treasury bond on the event date (e.g. Ytm was not available for the bond which was selected).²¹⁴ Additionally, there were two instances when the spread for a bond on Netherlands was negative.²¹⁵

These results and subsequently Tables 6.1-6.4 already exclude the outliers in the data. Outliers in sub-samples are identified using the MM-robust regression method (see section 6.5.1).

6.4.2 Descriptive statistics

Rating events (in the robustness section) are identified using 20-notch scale (see Tables 6.17-6.19). The numerical scores are as follows: SD, CC, D=1, CCC-=2, AA+=19, AAA=20. To add weight to the rating changes the ratings scale is supplemented with watch and outlook status which results in the comprehensive credit rating scale (CCR-58 points scale). Rating values range between 1-58 as follows: AAA=58, AA+=55, ..., C/SD/CC/D=1. For positive watch (outlook) +2 (+1) is added whereas for negative watch (outlook) 2 (1) is subtracted respectively. Possible events include rating change events (positive/negative), outlook or watch signals (positive/negative) with no corresponding rating change. Further, the combined events (positive/negative) are those when a rating change occurs together with either watch or outlook signal. Lastly, change from negative (positive) watch to negative (positive) outlook is also an event on the 58 point scale. Every increase to the CCR scale is considered a positive event whereas every decrease to the scale is considered a negative event.

Table 6.1 presents the number of events in the sample, distinguishing between the three CRAs. Overall, the events by one CCR point constitute the biggest share among all CRAs (above 44% for positive events and above 34% for the negative). The most extreme upgrade (downgrade) for S&P is 12 CCR points²¹⁶ (11 CCR points)²¹⁷ whereas Fitch records upgrade of 15 CCR points²¹⁸ and downgrade by 11 and 13 CCR points.²¹⁹ Moody's events stay in range of up to 9 CCR points (see Table 6.1 for more information). The descriptive statistics of the sub-samples

214. Observation for Argentina with 2 CCR points downgrade on the 30-10-2012 is deleted from the sample.

215. Netherlands received 1 CCR point upgrade on the 11-07-2014, whereas on the 05-02-2013 it received 1 CCR point downgrade.

216. This is equivalent to 4 notches on the 20 notch rating scale recorded for Jamaica on the 24-02-2010.

217. For Jamaica on the 12-02-2013.

218. Argentina on the 12-07-2010.

219. Jamaica on the 12-02-2013 and Argentina on the 27-11-2012 respectively.

of the three CRAs for the 20-notch scale used in the robustness section (see 6.7.3) are depicted in Table 6.2.

Table 6.3 extends statistics on the credit events of qualifying sovereigns per CRA giving average numerical rating, number of observations and proportions of the events exceeding the +/-4 CCR points. The highest average numerical rating amongst the three sub-samples is observed for Fitch (28) followed by Moody's (27) and S&P (26). Overall S&P releases the highest proportion of downgrades among the identifying CRAs. S&P as being the most conservative corresponds with prior split ratings literature (e.g. Alsakka and ap Gwilym, 2010c). Fitch has the highest proportion (30%) of positive actions by more than 4 CCR points. In terms of downgrades, Moody's delivered the highest proportion of 4 and above CCR points (40%).

Additionally, the sample is partitioned into the pre-regulatory period (Sept 2007-April 2012) and post-regulatory period (May 2012-Sept 2014). From the total 556 events, 297(259) actions occur in the pre-event (post-event) periods. Positive (negative) actions in the first period constitute 53% (47%) of events whereas they amount to 50% (50%) in the second period. Interestingly, the average rating is higher in the pre-event period and drops in the post-event phase.

Table 6.4 illustrates basic statistical properties of three event samples. For instance, the pooled sample for S&P (Moody's), including cumulative two-day [0,+1] yield spread is represented by a mean of -0.6% (0.34%) and a standard deviation of 18.85% (12.38%). For Fitch, the former amounts to -0.15% with standard deviation of 12.49%. The mean term to maturity is the highest for Moody's sub-sample (8.1 years with s.d. of 5.65) followed by S&P (7.66 years with s.d. 5.16) and Fitch (7.62 with s.d. 4.2). Further statistics representing the variables used in the multivariate analysis can also be found in Table 6.4.

6.5 Multivariate analysis

6.5.1 Measures of quality

Following the empirical literature (see section 6.3), the quality of ratings is captured by the information content of ratings (Kisgen and Strahan, 2010; Becker and Milbourn, 2011). The quality is examined by testing whether the market is more aligned with ratings through bond yields after the certification period. Because bond prices change far more frequently than ratings, the change in informativeness (accuracy) levels is assessed rather than any absolute match to market measures. Kliger and Sarig (2000) suggest using rating changes, rather than actual rating levels, because in this setting each firm controls for itself meaning that all price relevant elements are included. Specifically, it is tested whether rating changes are able to explain bond yield changes (decreases or increases in bond spreads). This capability differentiates ratings into less or more informative. To do this, the correlations between the credit ratings changes and the bond yields changes are compared prior and post the regulatory event date. High quality ratings are expected to explain bond values by correlating strongly with the bond yields. Low quality ratings, on the other hand, reveal factors other than the expected repayment (pay-off), and thus correlate less with the yields on bonds. The second proposition ultimately tests whether ratings encompass information regarding bond values, other than the easily detected properties including bond contracts and issuers' fixed effects.

Ordinary Least Squares (OLS) regressions are estimated, where the changes in bond yield spread are regressed on change in credit ratings, an indicator variable depicting regulation which is defined in two ways (Eq. (6.1a) & Eq. (6.1b)), a vector of global risk characteristics, ratings on the 58 CCR scale followed by bond characteristics and year and/or country fixed effects. Outliers in sub-samples are identified using Yohai's (1987) MM-robust regression method, similar to Kurov (2010). The observations with extreme standardized residual values, which lie outside of the 'normal range', are outliers and hence are eliminated from the sample before estimating Eq. (6.1a) & Eq. (6.1b). There is no rule of thumb, which would suggest the range in which the observations (as well as their robust distance) need to lie as it depends on the properties of each particular sample.²²⁰

220. The rule applied here is that the robust standardized residuals (vertical dimension outlier) which lie outside the range $[-20, +20]$ and $[0, 40]$ of the robust distance of the distribution (horizontal dimension outlier) are excluded from the analysis. This method discards 8 events for S&P (1 for positive events and 7 for negative). For Moody's 14 events are eliminated (7 each for positive and negative events). Lastly, 7 outliers for Fitch are dropped (4 for positive and 2 for negative events).

Similar to Livingston et al. (2010), separate sets of regressions for rating upgrades and downgrades are used. Unlike their paper each of the three CRAs are tested separately. The rationale for benchmark regressions is to observe whether the rating actions result in substantial information content for the sovereigns bonds and whether bonds react differently to the actions issued by each CRA.

In the first specification, the effect of disclosure rules by ESMA is measured by using a *Regulation* dummy as well as its interaction with the (change in) sovereign bond ratings (Eq.(6.1a)).

$$\begin{aligned} \Delta Yield_{i,t} = & \beta_1 \Delta Rating_{i,t} + \beta_2 Regulation_{i,t} + \beta_3 (\Delta Rating * Regulation)_{i,t} + \beta_4 Rating58_{i,t} \\ & + \beta_5 X_{i,t} + \beta_6 Maturity_{i,t} + \lambda_1 CF + \gamma_1 TF + \varepsilon_{i,t} \end{aligned}$$

$$\varepsilon_{i,t} \sim N(0, 1) \tag{6.1a}$$

Where $\Delta Yield_{i,t}$ is the change in the sovereign's yield spread to the closest maturity minus the treasury bond for country-*i*, day-*t* in the time window [0, +1] expressed in basis points.²²¹

$\Delta Rating$ is the change in sovereign issuer CCR by one of the three CRAs coded as absolute ordinal values 0, 1, 2, 3 for ease of interpretation²²² (in separate upgrade and downgrade specifications). The coefficient β_1 captures the marginal effect of yield spreads as a result of a unit change in the CCR scale (on the event date and zero on the non-event date). For negative events (downgrade in CCR sovereign rating) coded as absolute values, a positive sign is expected as the yields spreads increase to reflect the underlying risk on the bonds. On the other hand, the positive events (upgrades in CCR) lead to decreased risk for investors (i.e. spreads are narrowing) hence negative sign is expected.

The *Regulation* indicator variable equals 1 for dates after the endorsement rules introduced by ESMA took effect on April 30 2012, 0 otherwise. The β_2 coefficient captures whether the regulatory intervention had a positive or negative effect on the bond yields. An insignificant sign would indicate about no discernible effect of regulation.

$\Delta Rating * Regulation$, the key variable in this model, measures the linkage between quality of ratings and ESMA's requirement for identifiers by observing correlations between ratings and yields in the post-intervention period. In the case of positive rating changes, if the sign is

221. Similarly to Gande and Parsley (2005) and Ferreira and Gama (2007) this window is used to minimise the impact of clusters of credit events that could possibly affect the results.

222. This refers to rating change (upgrade or downgrade) by 0, 1, 2 or 3 CCR points.

negative (corresponding to the expected sign on the $\Delta Rating$ variable) and significant, the effect of rating changes on bond yields is stronger in the post regulatory period. This corresponds to a higher quality of ratings. On the other hand, if the interaction produces a positive significant coefficient, the effect is weaker and implies that ratings are of lower quality. Similarly, in the case of negative events, if the interaction has a positive significant coefficient stronger links are detected between rating changes and spreads after the regulation took place, indicating higher quality of ratings. Conversely, if the sign is negative there is a weaker effect suggesting lower quality of ratings.

$Rating58$ represents the sovereign's CCR taking values 1-58 and represents a proxy for the macroeconomic conditions of the sovereigns considered in the sample.

$X_{i,t}$ is a set of global risk factors which are common to all countries. As suggested by Broto and Molina (2014), these variables control for the diversity among the panel data. Following Longstaff and Schwartz (1995), Favero et al. (2010), Oliveira et al. (2012) and Eichler (2014), one of three risk factors are included on the right hand side. These include CBOE VIX volatility index, Treasury rate (5 and 10 years maturity), and interest rate swap spreads (5 and 10 years maturity). All data is accessed from Bloomberg. The factors (index or rates) are in the form of the logarithmic changes in the window $[0, +1]$ around the event. Since the bond spreads are calculated using the US benchmark US based measures of international risk are used due to exogeneity to the rest of the data sample.

$Maturity_{i,t}$ is the bond's time to maturity and deals with possible heterogeneity among spread changes which derive due to differences in the remaining years to maturity of bonds. The natural logarithm of the remaining years to maturity of the bond i on the event date t is obtained.

CF and TF are country (year) fixed effects respectively. They control for geographic and time specific effects (trends).

The second specification uses most of the previous variables. However, instead of using the Regulation indicator variable it defines the regulation using the EE and EU dummies, together with their interactions with the change in sovereign ratings ($\Delta Rating$).

$$\begin{aligned} \Delta Yield_{i,t} = & \beta_1 \Delta Rating_{i,t} + \beta_2 EE_{i,t} + \beta_3 EU_{i,t} + \beta_4 (\Delta Rating * EE)_{i,t} + \beta_5 (\Delta Rating * EU)_{i,t} \\ & + \beta_6 Rating58_{i,t} + \beta_7 X_{i,t} + \beta_8 Maturity_{i,t} + \lambda_1 CF + \gamma_1 TF + \varepsilon_{i,t} \\ & \varepsilon_{i,t} \sim N(0, 1) \end{aligned} \tag{6.1b}$$

EE (*EU*) specifies whether the rating is EU endorsed (EU originated) in the post-regulatory period (after 30 April 2012) by taking the value of 1, 0 otherwise. β_2 and β_3 captures the whether having a rating issued by an analyst who is located outside or within Europe, after the regulation was passed on, has any effect on bond yields.

$\Delta Rating * EE / EU$ measures whether any change in rating quality depends on the identifiers and hence the location of the analyst. It is tested whether ratings originated outside the EU induce more (less) reaction in yield spreads than the ratings issued in the EU. For instance, if the interaction $\Delta Rating * EE$, tested on the positive events sample, produces a negative significant coefficient, this implies a stronger link between bond yields and ratings in the post-regulation period when the rating is endorsed (rather than originated in the EU). If the sign is positive and significant, the effect between yields and ratings decreased, implying a lower quality of ratings in the post-regulation period when the ratings are assigned the EE identifier. The reverse logic applies to negative events, i.e. when the coefficient on the interaction is positive and significant it means that the sovereign rating assigned by the analyst outside the EU in the post-event period is of better quality. Finally, when the sign is negative there is a weaker link between the spreads and ratings in the post-regulation period for ratings issued in a jurisdiction outside the EU. A similar logic applies to β_5 and comparisons can be made.

Following Ferreira and Gama (2007), a sample of non-events is compiled where each bond on the rating event date is randomly assigned a non-event date. This randomisation was performed using the random number generator in STATA. The reasoning behind using non-events together with the events data lies in the fact if the model was estimated using only the latter one would be measuring the incremental effect of a rating action exceeding one CCR point (on the 58-point scale) in the yield spreads (Gande and Parsley, 2005).

The non-event sample is compiled in the same time frame as the event sample whereas it includes only clean observations. A clean observation is defined as:

- a) no credit event for that sovereign issued by any of the three CRAs in a time window of 30 days before and after the non-event date.
- b) no credit event regarding the US sovereign issued by any of the three CRAs in the window of 30 days prior and post the non-event date.
- c) not within proximity of the date of the regulatory change regarding disclosure (30 April 2012), specifically within a window of 30 days prior and post that event.

Additionally, when the non-event date is being matched to the event date recorded in the pre-regulatory period (September 2007-April 2012), only the clean observations from this period are available for random selection. Equivalently, when the non-event is matched to an event date which took place after the regulation cut-off date (May 2012-September 2014), only clean non-event observations in that pool are selected.

The non-event sample for each CRA equals the same number of observations as the event sample (556 total, 238 S&P, 166 Moody's, 152 Fitch) which results in a total sample of 1112 observations with 476 for S&P, 332 for Moody's and for 304 Fitch sub-samples respectively.

6.5.1.1 Likelihood ratio (LR) test

Specifications (a) and (b), estimating Eq.(6.1a) and Eq.(6.1b) respectively for all models and CRAs, were tested using the likelihood-ratio (LR) test (see Tables 6.5-6.19). The LR test is calculated using the formula: $(-2\ln (LO/LI))$: where LI is the value of the likelihood function for the un-nested full model that includes all the variables with unconstrained coefficients and LO is the value of the likelihood function for the nested model in which coefficients on variable(s) are restricted to zero. The LR statistic follows a Chi-square distribution with degrees of freedom equal to the number of constraints imposed (see Greene, 2012).

The LR test, with two degrees of freedom, was performed in STATA by estimating two models (constrained versus unconstrained) and comparing their fit against each other using the log likelihood information. To choose the preferred model, the procedure is to test the statistical significance of the difference between the two models. If the difference between the models is significant the less restrictive model (with more variables: unconstrained) is preferred as it better fits the data.

In all tests, specification (a) was identified as a constrained model while specification (b) as an unconstrained model. The difference between the two models was statistically insignificant in all cases suggesting that the two models do not differ in terms of fitting the data. The only exception were the robustness tests (see section 6.7) using sub-sample of European data pooled from three CRAs (see Table 6.10) and the negative events sample for Fitch using the 20-notch scale (see Table 6.19). In these two cases, the LR ratio suggests that the less restrictive model (unconstrained: specification (b)) is preferred.

The model selection indices such as Akaike criterion (AIC) and Bayesian information criterion (BIC) also suggested that both models fit the data very similarly in all tested examples.²²³

6.6 Empirical results

Specifications (a) and (b) in Tables 6.5-6.7 present the results of Eq. (6.1a) and Eq. (6.1b) for the three CRAs by separating positive (Panel I) and negative events (Panel II). The coefficient on $\Delta Rating$ has the expected sign for all CRAs in the majority of specifications. However, only positive events by S&P and negative events by Fitch have significant coefficients for the effect on bond yields. The second specification (b) minimally improves explanatory power of the model for all sub-samples for the three CRAs.

The inverse relationship between S&P rating upgrades and yields is significant (at 1%) and economically relevant (see Panel I Table 6.5). The estimates remain robust to the inclusion of country²²⁴ and/or year fixed effects, which control for unobserved differences across the time or country spectrum. The coefficient in specification (b-IV) suggests that bond spreads narrow by 9.57 (3.19*3) basis points after S&P issues an upgrade by one notch (three CCR points). This suggests a strong link between ratings and bond spreads. Negative events of S&P do not demonstrate a strong link with the spreads. The presented results for S&P do not find evidence of the impact of regulation on rating quality neither via the interaction ($\Delta Rating * Regulation$) in specification (a) nor via the use of identifiers ($\Delta Rating * EE/EU$) in specification (b).²²⁵

The coefficients for market reactions to Moody's rating changes have the expected sign for both positive and negative events, however these are insignificant. The 58 CCR scale rating ($Rating_{58}$) in Panel I is negative and significant across specifications implying the higher the rating by Moody's the lower the yield on the sovereign. No evidence is found that the effect is stronger or weaker for sovereigns with ratings issued either in the EU or outside.

Fitch negative events yield significant and economically relevant results for bond spreads. The coefficient in specification (b-IV) implies that on average bond spreads increase by up to 11.37 (3.79*3) basis points when Fitch issues a one notch downgrade. Only specification b (I and II),

223. These results are not reported in the interest of brevity but are available on request.

224. Additionally, the same exercise was performed using regional instead of country dummies, for all CRAs, but the results were similar.

225. However, when a different measure of global risk is applied (VIX index) it is found that in specification (a) the interaction between $\Delta Rating * Regulation$ yields positive significant results at 10% or 5% for models (I), (II) and (IV). Continuation: The positive sign on the coefficient indicates about decreased effect on yields and hence lower quality of ratings after the regulation took effect. These results are reported in Appendix 6.A.3.

shows modest effects of regulation on the quality of ratings (although only significant at 10%). Coefficient on $\Delta Rating * EE$ suggests that the effect on yields of sovereign bonds originated outside EU in the post-event period is weaker at the same time implying a lower quality of these ratings.

Inclusion of the global risk factor in the model considerably strengthens the explanatory power, especially in the negative events samples for S&P and Moody's. In addition to using country and/or year fixed effects, it protects from the omitted variable bias. The importance of including international exposure to common risks when predicting sovereign spreads has been stressed in the literature (Favero et al., 2010). Among the three global risk factors suggested in section 6.5.1, in Tables 6.5-6.7 only the interest rate swap spreads are presented as they bring the most explanatory benefits. The yield spreads are found to positively correlate with the swap spreads.²²⁶

6.7 Robustness tests

6.7.1 Pooled CRAs sample

To eliminate the risk that estimates are driven by the characteristics of a particular CRA the sample of positive (negative) events are merged for the three CRAs and Eq. (6.1a) and (6.1b) are re-estimated. The positive events sample (depicted in Table 6.8) has the expected sign on the $\Delta Rating$ for both specifications (a) and (b). In contrast with the positive events by three CRAs separately, the results are stronger in terms of the size of the coefficients and their sign. Although the effect for $\Delta Rating$ is weaker than for the S&P alone, it provides middle ground between the mostly insignificant results (and mixed signs) for Moody's and Fitch. Regulation related variables are not significant in either specification in the pooled sample. This does not differ much from the previous results with an exception of Fitch in two rare cases when the coefficients on *Regulation* and *EU* in specification (a-I) and (b-I) respectively are marginally significant. Further, a control variable measuring the time before (since) the regulation took place is added, however the results do not change.²²⁷ Since the model is run on different CRAs their unobservable effects could be driving the results and be of potential endogeneity problem

226. The volatility index (Treasury rate) is inversely (positively) related to the sovereign bond yields. Although results are not reported in the interests of brevity they are available on request.

227. The adjusted R-squared remains the same and in some cases becomes marginally smaller. Results are not reported in the interest of brevity but are available on request.

via omitted variable bias. When CRA fixed effects are included, the results do not change significantly.^{228, 229}

In the negative events pooled CRAs sub-sample similar results are found (see Table 6.9). The sign on $\Delta Rating$ is as expected and significant at 5% for all model specifications.²³⁰ The coefficients are consistent in terms of their size and hold the predicted correct sign across specifications. They are marginally lower in magnitude to those on Fitch sub-sample alone. When the CRAs fixed effects are applied results remain the same similarly when the time before (since) the regulation control variable is included. Collectively no effect of the regulation on the quality of ratings is recorded either via the *Regulation* dummy or its interaction with ratings in specification (a) or via the use of identifiers in specification (b).²³¹

6.7.2 Regional differences

As a further investigation, the regressions (specification (a) and (b)) are estimated using regional sub-samples. The sample is split into Europe, Asia and “Other” countries (the latter includes Africa, Latin America & Caribbean, North America, Oceania and Sub-Saharan Africa). The regions are based on the United Nations country classification (2012).²³² See Appendix 6.A.4 for country classification in the sample.

The results for positive events in European subsample using specification (a) show influence of *Regulation* on the quality of ratings significant at 10% and 5% whereas the interaction $\Delta Rating * Regulation$ does not yield significant results. The coefficient on the $\Delta Rating$ is also insignificant and with the wrong sign. In specification (b), the coefficient $\Delta Rating * EE$ is significant at 1% yielding positive result with quite substantial magnitude (see Table 6.10). These strong results suggest that the effect between yields and ratings decreased, implying a lower quality of ratings in the post-regulation period when the ratings are assigned with the *EE* identifier.²³³

228. The coefficient on the main variable ($\Delta Rating$) gains significance with the expected sign after inclusion of the CRA fixed effects in both specifications (a) and (b). However, the adjusted R-squared of the model remains the same or marginally lower.

229. Additionally, the positive sample consists of 61 sovereigns. The number of events which are representing EU (EE) issued ratings after April 2012 is 132 (126) respectively. The distribution of the identifiers in both positive and negative pooled sub-samples is depicted in Figure 6.1 and 6.2. Grey (black) colour is assigned to EE (EU) respectively.

230. With one exception for model (VI) is specification (a) where it is significant at 10%.

231. The negative pooled sample comprises of 51 sovereigns. The EU (EE) issued rating events after April 2012 amount to 114 (146) respectively.

232. The only exception is Turkey, which is classified as Europe in the sample.

233. After closer investigation the large magnitude of the coefficient $\Delta Rating * EE$ is explained by small number of observations (5), from more than one country, where the interaction is different from zero.

One would expect to see the impact of regulation on sovereigns issued with *EU* identifiers in European sub-sample since that is where ESMA regulation was introduced. However, the results are somewhat different and do not show any significant effect.

Asian positive events sub-sample, does not find any evidence of the relationship nor does it show significant results for the main variable ($\Delta Rating$) coefficient. These results are reported in Table 6.11.

The last group of sovereigns “Other” includes regions of sovereigns outside from Europe and Asia (e.g. Africa and America however, non-US since it is used as a benchmark for bond spread calculations). It yields correct significant sign on the $\Delta Rating$ in all specifications. The *Regulation* dummy and its interaction are insignificant in specification (a) when Swap rate is used as a global risk factor (consistent with other reported results; see Table 6.12). Neither there is effect of regulation captured in specification (b), via identifiers or their interactions with rating changes, with use of this global risk measure. When VIX index or Treasury rate are applied instead $\Delta Rating * Regulation$ in specification (a) shows significant results at 10% (two cases are significant both at 10% and 5% significance level) in majority of cases (see Table 6.13 which incorporates the Treasury Rate as global risk factor instead of the Swap rate). This suggests that the effect on yields has decreased since identifiers were introduced, and therefore the quality of ratings has decreased. If specification (b) is considered with VIX or a Treasury rate, the interaction $\Delta Rating * EE$ with differing fixed effects yields positive results significant at 10% and/or 5% with the same proportions. This suggests the effect decreased for those ratings originated outside the EU.²³⁴

Regarding negative events, the European sub-sample does not suggest any effect of the regulation on quality of ratings when varying fixed effects are used. The only coefficient marginally significant is the $\Delta Rating$ (at 10%). Somewhat stronger correlation with yields has the Asian sub-sample. The $\Delta Rating$ is significant at 10% and 5%, however there is no effect of regulation. The last sub-sample does not show any effect of regulation neither does it show any correlation of ratings with yield spread (see Tables 6.14-6.16).

234. For the distribution of identifiers across the sample, see Figure 6.4.

6.7.3 20-Notch Scale

To investigate whether the results are sensitive to the inclusion of the outlook and watch status, Eq. (6.1a) and Eq. (6.1b) are estimated using the 20-notch scale rating rather than the 58-point CCR scale. All variables relating to ratings are re-defined accordingly. Events are rearranged so that any non-event in the 20-notch scale, which equals to solely outlook or watch action is deleted from the sample along with its corresponding non-event. As before the number of non-event observations equals to the number of event observations.

Both positive and negative sub-sample results for S&P do not vary from the earlier tests and suggest that regulation does not influence the quality of ratings. Amongst two samples only the former reports significant variable. $\Delta Rating$ with 5% significance level holds correct sign for all specifications. These results are reported in Table 6.17.²³⁵ The same holds for Moody's positive sample meaning the new scaling does not reveal any regulatory effects on the quality of ratings. In the negative sample model (a), the *Regulation* dummy is significant in two specifications at 10% and 5%.²³⁶ In specification (b) *EE* identifier's coefficients turns significant on the same level. None of the interaction terms shows statistical significance using 20-scale ratings (see Table 6.18). Positive events by Fitch also do not show significant results similarly with other CRAs in the sample. Negative events in specification (b) produce significant result for *EE* identifier when country fixed effects are used and significant coefficient on $\Delta Rating * EE$ when year fixed effect is applied (both at 5%) (see Table 6.19). The negative sign on the latter suggests the effect between ratings and yields decreased implying lower quality of ratings in the post regulatory period and for the ratings, which originate outside the EU.²³⁷

235. Since the remaining results do not present any changes to the original estimations, they are excluded from this analysis but are available on request. The same applies to other sub-samples which did not produce significant results for any of the variables.

236. High magnitude cannot be explained by the low number of observations as the ratio between *Regulation* equal to "1" and "0" is almost ½ (48 vs. 46 observations).

237. The magnitude of the coefficient is high mainly because $\Delta Rating * EE$ has only 10 rating events after April 2012. Additionally, the $\Delta Rating * EU$ identifier yields inflated results which could also be due to low number of observations (10 rating events were also recorded after April 2012). For distribution of identifiers in this sample, see Figure 6.5.

6.8 Conclusion

Using an extensive sovereign rating sample from Fitch, Moody's and S&P covering 69 countries during the period Sept 2007-Sept 2014, the chapter investigates the impact of the recent EU CRA regulation with regards to ESMA identifiers. The regulation, which took effect in April 2012, obliges CRAs to identify the location of the analyst preparing the rating, which can be either the EU or a jurisdiction outside the EU with a comparable regulatory regime to that of the EU. It is important to investigate the effect of disclosure rules by ESMA on the market because there is a possibility that endorsement rules might add credibility to CRAs and consequently make ratings more, rather than less, influential.

The study is located within a limited related literature measuring the quality of ratings from the information content perspective. The quality refers to the ability of ratings to explain bond yields. In contrast to the recent literature (Kisgen and Strahan, 2010; Becker and Milbourn, 2011; Bongaerts et al., 2012), the study does not measure the effect of a new entrant (i.e. competition levels among the CRAs) on the quality of ratings. This study looks directly at the information disclosure rules applied to the already existing CRAs.

The majority of rating changes fall at 1 or 2 CCR points suggesting that all CRAs rely considerably on the outlook and watch signals to imply future downgrades and upgrades. Similarly to Alsakka and ap Gwilym (2010c), this study finds that S&P is the most conservative among the three CRAs by issuing the highest proportion of downgrades during the sample period. S&P also represents the lowest mean value of ratings in both pre- and post-regulatory periods. Interestingly, positive actions by S&P are reported to have a stronger effect on sovereign yields than the negative ones. In this setting, high quality ratings are expected to explain bond values by correlating strongly with the bond yields, therefore the positive actions by S&P are of higher quality. This could imply that S&P dedicates more time to issue ratings which are not inflated to avoid penalties from the regulators and to protect their reputation (Dimitrov et al., 2015). There is no evidence, however, that the rating quality improved after the introduction of identifiers. In other words, the quality of S&P positive actions was high to start with and remained at that level throughout the sample, regardless of regulatory pressures.²³⁸

238. The same logic applies to negative events by S&P. Namely negative ratings were of poorer quality and remained as such regardless of the introduced regulation.

The opposite is true for Fitch. Although the CRA issues the highest proportion of positive actions by more than 4 CCR points, upgrades have a weak connection with bond spreads, thus suggesting their lower quality. The negative events by Fitch have the strongest effect on bond spreads amongst the three CRAs, yielding statistically significant and economically relevant results. Except for two specifications, where there is a minor link between identifiers and rating quality, Fitch subsample does not provide evidence on the impact of the ESMA regulation on quality of ratings. The results on Moody's actions also do not yield significant results, therefore identifiers do not have any discernible effect on rating quality.

This study is of interest to policymakers, market participants and academics alike. The quality of ratings inspected in the current setting is an underdeveloped area in the empirical literature. It is also closely linked to banking regulation and maintaining financial stability. The effects of recent European CRA regulation are at a preliminary stage yet much more concrete evidence is needed on the effectiveness of the regime. ESMA itself should find this work of relevance as at this stage, it is highly questionable whether the adoption of rating identifiers served any meaningful purpose or achieved any of the regulator's aims. Another contributing factor of this work lies in addressing the fact that there were no well-defined goals and objectives stated by the regulator when the identifiers were first introduced. The objectives remained opaque in the regulatory developments in subsequent years. This chapter fills a gap in knowledge by demonstrating that the identifiers did not alter the methods or relevance of the CRAs, at least in the short term. Nevertheless, future regulatory reforms need to be undertaken with caution as they might further aggravate the quality of ratings and thereby influence the stability and efficacy of the financial system. The findings are also of importance to market participants. There are obvious implications of how sovereign ratings can influence the functioning of financial markets. Ratings are known to affect many aspects of capital markets and shape access to funding (Bissoondoyal-Bheenick, 2004; Duff and Einig, 2009a; BIS, 2011; Correa et al., 2014).

Table 6.1 Rating Events on the 58-Point scale

	S&P		Moody's		Fitch	
Up +1	61	51.69%	46	53.49%	36	43.90%
Up +2	26	22.03%	24	27.91%	21	25.61%
Up +3	22	18.64%	11	12.79%	17	20.73%
Up +4	4	3.39%	4	4.65%	3	3.66%
Up +5	1	0.85%	1	1.16%	0	0.00%
Up +6	0	0.00%	0	0.00%	4	4.88%
Up +7	1	0.85%	0	0.00%	0	0.00%
Up +8	1	0.85%	0	0.00%	0	0.00%
Up +9	1	0.85%	0	0.00%	0	0.00%
Up+12	1	0.85%	0	0.00%	0	0.00%
Up +15	0	0.00%	0	0.00%	1	1.22%
Down -1	57	47.50%	27	33.75%	31	44.29%
Down-2	24	20.00%	21	26.25%	14	20.00%
Down -3	26	21.67%	13	16.25%	14	20.00%
Down-4	2	1.67%	7	8.75%	3	4.29%
Down-5	5	4.17%	4	5.00%	2	2.86%
Down-6	5	4.17%	4	5.00%	0	0.00%
Down-7	0	0.00%	2	2.50%	2	2.86%
Down-8	0	0.00%	1	1.25%	0	0.00%
Down-9	0	0.00%	1	1.25%	2	2.86%
Down-10	0	0.00%	0	0.00%	0	0.00%
Down-11	1	0.83%	0	0.00%	1	1.43%
Down-12	0	0.00%	0	0.00%	0	0.00%
Down-13	0	0.00%	0	0.00%	1	1.43%
Upgrades	118		86		82	
Downgrades	120		80		70	
Total	238		166		152	

Notes: The Table presents summary statistics of rating events for 69 sovereigns encompassed in the credit rating dataset which consists of daily pooled observations for Sept 2007-Sept 2014 period. The ratings are expressed on the 58 point scale. % obs. defines percentage of all sample observations. S&P up to 12 CCR points for Jamaica 24.02.2010 upgrade to B- Stable since the last rating on the 14.01.2010 marked as default (SD=1 CCR point). Down 11 CCR points for Jamaica which on the 12.02.2013 was issued default rating (SD) whereas the previous issued rating on the 13.08.2012 was B- Neg Outlook. Moody's down 9 CCR points Barbados on the 02.06.2014 B3 Negative Outlook from the earlier rating on the 20.12.2013 with Ba3 Negative Outlook. Fitch 11 CRR point downgrade for Jamaica on the 12.02.2013 which dropped to C from B- Negative Outlook on the 18.01.2013. 13 CCR point downgrade for Argentina on the 27.11.2012 to CC which dropped from B Negative Watch on the 30.10.2012. Finally, up to 15 CCR point upgrade for Argentina on the 12.07.2010 to B Stable from CC issued on the 01.01.2007.

Table 6.2 Rating Events on the 20-Notch scale

		S&P	Moody's	Fitch
1	No. of 1-Notch Upgrade Actions (Solo)	50	40	33
2	No. of 2-Notch Upgrade Actions (Solo)	3	1	6
3	No. of 3-Notch Upgrade Actions (Solo)	1	0	0
4	No. of 4-Notch Upgrade Actions (Solo)	1	0	0
5	No. of 5-Notch Upgrade Actions (Solo)	0	0	1
6	Total Upgrade Actions (row 1+2+3+4+5)	55	41	40
7	No. of 1-Notch Downgrade Actions (Solo)	53	34	30
8	No. of 2-Notch Downgrade Actions (Solo)	8	10	4
9	No. of 3-Notch Downgrade Actions (Solo)	0	3	2
10	No. of 4-Notch Downgrade Actions (Solo)	1	0	1
11	No. of 5-Notch Downgrade Actions (Solo)	0	0	1
12	Total Downgrade Actions (row 7+8+9+10+11)	62	47	38
21	Total actions	117	88	78

Notes: This Table presents summary statistics for the credit rating dataset expressed on the 20-notch scale, which includes daily pooled sovereign rating observations by S&P, Moody's and Fitch originating from 57 countries for pre-regulatory (Sept 2007-April 2012) and post-regulatory (May 2012-Sept 2014) periods.

Table 6.3 Credit events in pre- and post- regulation periods

Entire sample	S&P		Moody's		Fitch		Total
Observations	238		166		152		556
Average numerical rating	26		27		28		
Upgrade by 1 CCR point	61	51.69%	46	53.49%	36	43.90%	143
Upgrade by > 3 CCR point	31	26.27%	16	18.60%	25	30.49%	72
Downgrade by 1 CCR point	57	47.50%	27	33.75%	31	44.29%	115
Downgrade by > 3 CCR point	39	32.50%	32	40.00%	25	35.71%	96
Positive events	118	49.58%	86	51.81%	82	53.95%	286
Negative events	120	50.42%	80	48.19%	70	46.05%	270
Total no of events	238	100.00%	166	100.00%	152	100.00%	556
Pre-regulatory							
Observations	123		88		86		297
Average numerical rating	27		28		30		
Upgrade by 1 CCR point	27	45.00%	28	57.14%	20	41.67%	75
Upgrade by > 3 CCR point	21	35.00%	7	14.29%	15	31.25%	43
Downgrade by 1 CCR point	28	44.44%	13	33.33%	18	47.37%	59
Downgrade by > 3 CCR point	23	36.51%	17	43.59%	14	36.84%	54
Positive events	60	48.78%	49	55.68%	48	55.81%	157
Negative events	63	51.22%	39	44.32%	38	44.19%	140
Total no of events	123	100.00%	88	100.00%	86	100.00%	297
Post-regulatory							
Observations	115		78		66		259
Average numerical rating	26		26		27		
Upgrade by 1 CCR point	34	58.62%	18	48.65%	16	47.06%	68
Upgrade by > 3 CCR point	10	17.24%	9	24.32%	10	29.41%	29
Downgrade by 1 CCR point	29	50.88%	14	34.15%	13	40.63%	56
Downgrade by > 3 CCR point	16	28.07%	15	36.59%	11	34.38%	42
Positive events	58	50.43%	37	47.44%	34	51.52%	129
Negative events	57	49.57%	41	52.56%	32	48.48%	130
Total no of events	115	100.00%	78	100.00%	66	100.00%	259

Notes: This Table presents summary statistics for the credit rating dataset, which includes daily pooled sovereign rating observations by S&P, Moody's and Fitch including outlook and watch originating from 69 countries for pre-regulatory (Sept 2007-April 2012) and post-regulatory (May 2012-Sept 2014) periods.

Table 6.4 Summary statistics for the credit events sample

Sample	S&P	Moody's	Fitch
No of countries	64	49	49
No of sovereign bonds	83	61	59
No of benchmark bonds	35	34	31
Mean Δ Yield	-0.6	0.34	-0.15
S.D. Δ Yield	18.85	12.38	12.49
Mean Δ CCR Positive events (abs. 1-3)	0.86	0.85	1
S.D. Δ CCR Positive events (abs. 1-3)	1.05	0.99	1.12
Mean Δ CCR Negative events (abs. 1-3)	0.93	0.99	0.88
S.D. Δ CCR Negative events (abs. 1-3)	1.11	1.19	1.13
Mean Rating58 (1-58)	26.6	27.52	28.48
S.D. Rating58 (1-58)	11.85	12.06	11.46
Mean term to maturity (years)	7.66	8.14	7.62
S.D. term to maturity (years)	5.16	5.65	4.24
Mean coupon rate (%)	6.98	6.85	6.61
S.D. coupon rate (%)	2.19	2.09	1.97
Mean amount issued (billion USD)	1.27	1.14	1.39
S.D. amount issued (billion USD)	1.35	1.09	1.28
Mean CBOE VIX	20.64	20.13	19.85
S.D. CBOE VIX	9.89	8.93	8.05
Mean Treasury rate (5 years maturity)	1.53	1.58	1.54
S.D. Treasury rate (5 years maturity)	0.7	0.67	0.64
Mean Interest rates swap spreads (5 years maturity)	28.49	26.97	26.35
S.D. Interest rates swap spreads (5 years maturity)	23.05	20.84	17.68

Notes: This Table presents summary statistics of credit events for each CRA for 69 sovereigns from Sept 2007 to Sept 2014. $\Delta Yield_{i,t}$ is the change in yield spread to the closest maturity Treasury Bond i - country, t - day in the time window $[0, +1]$. ΔCCR Positive (Negative) events is the change in sovereign issuer or issue CCR coded as absolute ordinal values 1, 2, 3. *Rating58* represents sovereign's CCR taking values 1-58. CBOE VIX volatility index, Treasury rate and interest rates swap spreads are three global risk factors. Since the bond spreads are calculated using the US benchmark US measure of international risk is used as it is exogenous to the rest of data sample. $Maturity_{i,t}$ is bond's time to maturity and deals with possible heterogeneity among spread changes which derive due to distinctive remaining years to maturity of bonds.

Table 6.5 Estimation of Equation 6.1(a) and (b) S&P

VARIABLES	Specification (a)				Specification (b)			
	(I)	(II)	(III)	(IV)	(I)	(II)	(III)	(IV)
Δ Rating	-2.4159*** (-2.92)	-2.7271*** (-3.24)	-2.6844*** (-3.02)	-3.1171*** (-3.47)	-2.4174*** (-2.91)	-2.7286*** (-3.23)	-2.7973*** (-3.14)	-3.1899*** (-3.54)
Regulation	0.3351 (0.18)	-2.0433 (-0.58)	0.4420 (0.16)	-1.1311 (-0.27)				
Δ Rating*Regulation	1.7029 (1.32)	1.8290 (1.40)	1.7798 (1.30)	2.0527 (1.49)				
Rating58	0.0917 (1.54)	0.0609 (1.00)	0.4729 (1.65)	0.3120 (0.99)	0.0885 (1.47)	0.0579 (0.94)	0.6913** (2.14)	0.5087 (1.39)
Maturity	0.2716 (0.27)	0.5581 (0.53)	0.2607 (0.12)	1.0928 (0.39)	0.2924 (0.28)	0.5657 (0.54)	0.1350 (0.06)	0.5477 (0.19)
Global risk	15.3692 (1.14)	19.0476 (1.40)	5.1575 (0.34)	8.6542 (0.58)	15.5881 (1.15)	19.2029 (1.41)	8.4494 (0.56)	10.7810 (0.71)
EE					0.0290 (0.01)	-2.2016 (-0.58)	-2.7929 (-0.76)	-3.4194 (-0.70)
EU					0.5029 (0.24)	-1.7757 (-0.48)	3.4696 (1.00)	1.1991 (0.25)
Δ Rating*EE					1.4593 (0.90)	1.6334 (1.00)	1.8079 (1.07)	2.0303 (1.19)
Δ Rating *EU					2.0622 (1.24)	2.1315 (1.28)	1.9867 (1.14)	2.1943 (1.25)
Observations	236	236	236	236	236	236	236	236
R-squared	0.067	0.112	0.248	0.298	0.068	0.113	0.257	0.303
LR	0.35	0.26	0.28	0.15				
year fe	no	yes	no	yes	no	yes	no	yes
country fe	no	no	yes	yes	no	no	yes	yes

Table 6.5 Continued

VARIABLES	Specification (a)				Specification (b)			
	(I)	(II)	(III)	(IV)	(I)	(II)	(III)	(IV)
Δ Rating	1.8618 (1.16)	1.8582 (1.10)	1.5068 (0.83)	1.7102 (0.90)	1.8707 (1.17)	1.8667 (1.11)	1.5272 (0.84)	1.7240 (0.91)
Regulation	1.3003 (0.37)	-3.0582 (-0.45)	-0.4518 (-0.08)	-8.3840 (-1.02)				
Δ Rating*Regulation	0.9606 (0.40)	0.6798 (0.27)	1.6601 (0.64)	1.3352 (0.49)				
Rating58	0.1258 (1.10)	0.1091 (0.93)	-0.2818 (-0.55)	-0.0361 (-0.06)	0.1323 (1.16)	0.1178 (1.00)	-0.2577 (-0.50)	-0.0092 (-0.02)
Maturity	1.0667 (0.52)	1.3676 (0.63)	0.8101 (0.15)	3.6287 (0.62)	1.1139 (0.53)	1.5578 (0.69)	0.6072 (0.11)	3.7190 (0.62)
Global risk	35.5444 (1.41)	39.7877 (1.54)	45.3697 (1.51)	58.4469* (1.89)	35.6377 (1.41)	39.7435 (1.53)	44.1384 (1.47)	56.7282* (1.83)
EE					-3.9593 (-0.81)	-8.7151 (-1.10)	-5.8765 (-0.70)	-12.8557 (-1.20)
EU					4.2083 (1.05)	-0.5227 (-0.08)	2.1319 (0.36)	-6.0327 (-0.70)
Δ Rating*EE					5.1612 (1.54)	4.5926 (1.31)	5.7083 (1.58)	4.8820 (1.28)
Δ Rating *EU					-1.4662 (-0.53)	-1.3836 (-0.49)	-0.7330 (-0.24)	-0.5704 (-0.18)
Observations	240	240	240	240	240	240	240	240
R-squared	0.029	0.045	0.114	0.144	0.044	0.057	0.126	0.152
LR	3.60	3.03	3.25	2.28				
year fe	no	yes	no	yes	no	yes	no	yes
country fe	no	no	yes	yes	no	no	yes	yes

Notes: This Table presents the estimated coefficients and robust z-statistics in parentheses from specifications of Eq. (6.1a) and (b) using OLS. Eq. (6.1a) and (b) is estimated separately for positive and negative events as absolute values (Panel I and II) for interpretation reasons. The credit rating dataset consists of daily pooled sovereign events by S&P in 58 CCR scale originating from 64 countries for pre-regulatory (Sept 2007-April 2012) and post-regulatory (May 2012-Sept 2014) periods. Outliers are excluded using the MM-robust regression method. For every event observation there is a randomly selected non-event observation. The dependent variable is $\Delta Yield$ which measures, in basis points, the changes in the window $[0, +1]$ sovereign yield spreads towards the benchmark US bonds on a particular sovereign bond i on the event day t . The independent variables are explained in section 6.5.1. Global risk includes interest rates swap spreads over US Treasury curve with 5 years maturity. The choice of US measures of international risk is determined by the fact that the spread variable is benchmarked against US bonds yields. Likelihood-ratio (LR) compares model specifications for best fit. Here, LR in column 2 compares model I specification (a, column 2) with (b, column 6). Insignificant results suggest that the unrestricted model (specification b) does not have statistically significantly better fit. Year (country) fixed effects are included (“yes”), not included (“no”). Significant levels such that: *** p<1%, ** p<5%, * p<10%.

Table 6.6 Estimation of Equation 6.1(a) and (b) Moody's

Panel I Positive events		Specification (a)				Specification (b)			
VARIABLES	(I)	(II)	(III)	(IV)	(I)	(II)	(III)	(IV)	
Δ Rating	-1.9588 (-0.98)	-1.5159 (-0.73)	1.8368 (0.85)	1.4272 (0.65)	-1.9517 (-0.97)	-1.5107 (-0.73)	2.1237 (0.97)	1.8845 (0.84)	
Regulation	0.2138 (0.06)	4.8817 (0.67)	4.1878 (0.84)	8.7850 (1.20)					
Δ Rating*Regulation	1.6517 (0.72)	1.1212 (0.47)	-2.0666 (-0.87)	-1.6657 (-0.69)					
Rating58	-0.1388 (-1.60)	-0.1130 (-1.26)	-0.9329** (-2.15)	-1.1081** (-2.41)	-0.1409 (-1.53)	-0.1096 (-1.15)	-0.8989** (-2.06)	-1.0416** (-2.26)	
Maturity	-0.6530 (-0.49)	-0.7600 (-0.56)	-6.5717 (-1.60)	-5.5737 (-0.99)	-0.6853 (-0.49)	-0.8707 (-0.60)	-7.0942* (-1.67)	-5.2372 (-0.89)	
Global risk	-4.3997 (-0.25)	-4.2584 (-0.24)	-16.8030 (-0.97)	-21.4313 (-1.20)	-4.2934 (-0.24)	-4.4146 (-0.24)	-17.3304 (-0.99)	-22.3509 (-1.25)	
EE					-0.3340 (-0.08)	3.7121 (0.50)	4.3664 (0.81)	8.8014 (1.16)	
EU					1.5700 (0.33)	5.7764 (0.75)	0.3429 (0.05)	3.6505 (0.38)	
Δ Rating*EE					2.3216 (0.96)	1.9590 (0.79)	-1.6585 (-0.66)	-1.3662 (-0.53)	
Δ Rating *EU					0.0190 (0.01)	-1.0455 (-0.35)	-4.2066 (-1.43)	-4.2606 (-1.42)	
Observations	122	122	122	122	122	122	122	122	
R-squared	0.056	0.092	0.496	0.538	0.063	0.103	0.509	0.553	
LR	0.92	1.55	3.06	4.13					
year fe	no	yes	no	yes	no	yes	no	yes	
country fe	no	no	yes	yes	no	no	yes	yes	

Table 6.6 Continued

VARIABLES	Specification (a)				Specification (b)			
	(I)	(II)	(III)	(IV)	(I)	(II)	(III)	(IV)
Δ Rating	1.0372 (0.99)	0.6940 (0.60)	0.9625 (0.78)	0.6431 (0.48)	1.0364 (0.98)	0.6923 (0.60)	0.9522 (0.75)	0.5335 (0.39)
Regulation	-2.6955 (-1.12)	-2.6579 (-0.39)	-4.9165 (-1.20)	-2.6500 (-0.32)				
Δ Rating*Regulation	0.0018 (0.00)	0.3715 (0.24)	0.3211 (0.19)	0.6259 (0.35)				
Rating58	0.0695 (1.03)	0.0690 (0.95)	0.0543 (0.17)	-0.0032 (-0.01)	0.0709 (1.03)	0.0712 (0.97)	0.0507 (0.16)	-0.0775 (-0.20)
Maturity	-2.0707 (-1.44)	-2.0611 (-1.38)	-5.3948 (-0.99)	-8.7568 (-1.33)	-2.1052 (-1.45)	-2.1210 (-1.40)	-5.3855 (-0.97)	-9.3757 (-1.38)
Global risk	47.9153*** (2.68)	48.5420*** (2.65)	51.0093*** (2.50)	50.2324** (2.40)	48.1727*** (2.66)	48.7230*** (2.63)	51.1394** (2.48)	49.9505** (2.36)
EE					-2.7260 (-1.11)	-2.4839 (-0.36)	-4.9426 (-1.20)	-1.2758 (-0.14)
EU					-2.1824 (-0.29)	-2.5050 (-0.25)	-4.5872 (-0.33)	-6.5238 (-0.44)
Δ Rating*EE					0.0625 (0.04)	0.4373 (0.27)	0.3625 (0.21)	0.7249 (0.40)
Δ Rating *EU					-1.0330 (-0.22)	-0.7547 (-0.16)	-0.2802 (-0.05)	0.3981 (0.07)
Observations	160	160	160	160	160	160	160	160
R-squared	0.085	0.100	0.179	0.204	0.086	0.101	0.179	0.205
LR	0.07	0.11	0.02	0.32				
year fe	no	yes	no	yes	no	yes	no	yes
country fe	no	No	yes	yes	no	no	yes	yes

Notes: This Table presents the estimated coefficients and robust z-statistics in parentheses from specifications of Eq. (6.1a) and (b) using OLS. Eq. (6.1a) and (b) is estimated separately for positive and negative events as absolute values (Panel I and II) for interpretation reasons. The credit rating dataset consists of daily pooled sovereign events by Moody's in 58 CCR scale originating from 49 countries for pre-regulatory (Sept 2007-April 2012) and post-regulatory (May 2012-Sept 2014) periods. Outliers are excluded using the MM-robust regression method. For every event observation there is a randomly selected non-event observation. The dependent variable is $\Delta Yield$ which measures, in basis points, the changes in the window $[0, +1]$ sovereign yield spreads towards the benchmark US bonds on a particular sovereign bond i on the event day t . The independent variables are explained in section 6.5.1. Global risk includes interest rates swap spreads over US Treasury curve with 5 years maturity. The choice of US measures of international risk is determined by the fact the spread variable is benchmarked against US bonds yields. Likelihood-ratio (LR) compares model specifications for best fit. Here, LR in column 2 compares model I specification (a, column 2) with (b, column 6). Insignificant results suggest that the unrestricted model (specification b) does not have statistically significantly better fit. Year (country) fixed effects are included ("yes"), not included ("no"). Significant levels such that: *** $p < 1\%$, ** $p < 5\%$, * $p < 10\%$.

Table 6.7 Estimation of Equation 6.1(a) and (b) Fitch

VARIABLES	Specification a				Specification b			
	(I)	(II)	(III)	(IV)	(I)	(II)	(III)	(IV)
Δ Rating	1.1533 (1.26)	0.6733 (0.68)	1.1591 (1.17)	0.3483 (0.31)	1.1516 (1.26)	0.6818 (0.69)	1.0597 (1.07)	0.1710 (0.15)
Regulation	3.8161* (1.72)	4.6511 (1.18)	0.5043 (0.13)	5.2495 (1.05)				
Δ Rating*Regulation	-1.3742 (-0.95)	-0.6952 (-0.44)	-0.7830 (-0.50)	0.4353 (0.25)				
Rating58	0.0899 (1.17)	0.0747 (0.94)	-0.5545* (-1.67)	-0.5485 (-1.40)	0.0986 (1.27)	0.0857 (1.06)	-0.4671 (-1.39)	-0.4871 (-1.24)
Maturity	-0.0116 (-0.01)	0.1973 (0.15)	-7.4933** (-2.14)	-6.4854 (-1.47)	-0.0513 (-0.04)	0.2722 (0.21)	-7.8665** (-2.25)	-6.0301 (-1.36)
Global risk	11.6406 (1.06)	10.4532 (0.92)	10.3426 (0.78)	7.6761 (0.56)	10.8281 (0.97)	9.4180 (0.82)	6.4473 (0.48)	3.4613 (0.25)
EE					2.5789 (0.83)	2.7571 (0.57)	-4.3174 (-0.85)	-0.9031 (-0.14)
EU					4.4681* (1.77)	5.2968 (1.32)	3.6402 (0.77)	8.5493 (1.55)
Δ Rating*EE					0.3409 (0.17)	1.4561 (0.67)	1.3215 (0.60)	2.7920 (1.17)
Δ Rating *EU					-2.5299 (-1.48)	-1.9259 (-1.08)	-2.0022 (-1.09)	-0.8700 (-0.44)
Observations	164	164	164	164	164	164	164	164
R-squared	0.038	0.065	0.230	0.264	0.049	0.078	0.246	0.284
LR	1.76	2.32	3.41	4.48				
year fe	no	yes	no	yes	no	yes	no	yes
country fe	no	no	yes	yes	no	no	yes	yes

Notes: This Table presents the estimated coefficients and robust z-statistics in parentheses from specifications of Eq. (6.1a) and (b) using OLS. Eq. (6.1a) and (b) is estimated separately for positive and negative events as absolute values (Panel I and II) for interpretation reasons. The credit rating dataset consists of daily pooled sovereign events by Moody's in 58 CCR scale originating from 49 countries for pre-regulatory (Sept 2007-April 2012) and post-regulatory (May 2012-Sept 2014) periods. Outliers are excluded using the MM-robust regression method. For every event observation there is a randomly selected non-event observation. The dependent variable is $\Delta Yield$ which measures, in basis points, the changes in the window $[0, +1]$ sovereign yield spreads towards the benchmark US bonds on a particular sovereign bond i on the event day t .

Table 6.7 Continued

Panel II Negative events VARIABLES	Specification (a)				Specification (b)			
	(I)	(II)	(III)	(IV)	(I)	(II)	(III)	(IV)
ΔRating	2.4566*	2.6749*	3.3409**	3.7713**	2.4894*	2.7130*	3.3591**	3.7930**
	(1.71)	(1.79)	(2.10)	(2.31)	(1.74)	(1.82)	(2.11)	(2.30)
Regulation	1.3867	0.9573	1.2062	5.8843				
	(0.41)	(0.14)	(0.20)	(0.65)				
ΔRating*Regulation	-2.3262	-3.0001	-2.5671	-3.7173				
	(-1.10)	(-1.38)	(-1.13)	(-1.59)				
Rating58	0.0167	0.0735	0.5336	0.5948	0.0241	0.0781	0.5455	0.5941
	(0.16)	(0.67)	(1.28)	(1.27)	(0.23)	(0.71)	(1.29)	(1.24)
Maturity	1.0418	0.2939	-0.4736	0.9891	1.3806	0.6712	-0.4189	0.9031
	(0.44)	(0.12)	(-0.09)	(0.18)	(0.58)	(0.27)	(-0.08)	(0.16)
Global risk	28.7587	33.2585	25.3548	29.5135	31.3169	35.8860	27.0467	30.9904
	(1.27)	(1.43)	(0.94)	(1.06)	(1.39)	(1.54)	(0.99)	(1.10)
EE					0.9922	-0.2131	1.6123	6.8306
					(0.24)	(-0.03)	(0.20)	(0.62)
EU					1.6271	1.7265	0.0960	4.6076
					(0.41)	(0.25)	(0.01)	(0.46)
ΔRating*EE					-4.4287*	-4.4826*	-4.4716	-4.7979
					(-1.68)	(-1.68)	(-1.57)	(-1.66)
ΔRating *EU					-0.1628	-1.2167	-0.7630	-2.5561
					(-0.06)	(-0.45)	(-0.27)	(-0.86)
Observations	140	140	140	140	140	140	140	140
R-squared	0.034	0.101	0.201	0.276	0.059	0.123	0.211	0.279
LR	3.85	3.36	1.76	0.62				
year fe	no	yes	no	yes	no	yes	no	yes
country fe	no	no	yes	yes	no	no	yes	yes

Continued: The independent variables are explained in section 6.5.1. Global risk includes interest rates swap spreads over US Treasury curve with 5 years maturity. The choice of US measures of international risk is determined by the fact that the spread variable is benchmarked against US bonds yields. Likelihood-ratio (LR) compares model specifications for best fit. Here, LR in column 2 compares model I specification (a, column 2) with (b, column 6). Insignificant results suggest that the unrestricted model (specification b) does not have statistically significantly better fit. Year (country) fixed effects are included (“yes”), not included (“no”). Significant levels such that: *** p<1%, ** p<5%, * p<10.

Table 6.8 Estimation of Equation 6.1(a) and (b): Pooled CRAs positive events

VARIABLES	Specification (a)						Specification (b)					
	(I)	(II)	(III)	(IV)	(V)	(VI)	(I)	(II)	(III)	(IV)	(V)	(VI)
Δ Rating	-1.0273*	-1.1669**	-0.6043	-0.8323	-1.0355*	-1.1953**	-1.0276*	-1.1669**	-0.6371	-0.8625	-1.0378*	-1.2004**
	(-1.79)	(-2.00)	(-1.03)	(-1.38)	(-1.79)	(-2.02)	(-1.79)	(-2.00)	(-1.08)	(-1.43)	(-1.79)	(-2.03)
Regulation	1.6663	1.8738	1.1862	2.1315	1.5846	1.6267						
	(1.32)	(0.80)	(0.70)	(0.86)	(1.24)	(0.69)						
Δ Rating*Regulation	0.5878	0.5501	0.3648	0.4672	0.6136	0.5971						
	(0.70)	(0.64)	(0.43)	(0.53)	(0.72)	(0.69)						
Rating58	0.0391	0.0301	-0.3223**	-0.4267**	0.0402	0.0308	0.0404	0.0316	-0.2925*	-0.4003**	0.0411	0.0314
	(0.95)	(0.72)	(-1.98)	(-2.43)	(0.98)	(0.74)	(0.97)	(0.74)	(-1.76)	(-2.25)	(0.98)	(0.74)
Maturity	-0.0755	0.1003	-2.3482	-1.6868	-0.0527	0.1348	-0.0875	0.1011	-2.3599	-1.5928	-0.0607	0.1457
	(-0.11)	(0.15)	(-1.58)	(-0.93)	(-0.08)	(0.20)	(-0.13)	(0.15)	(-1.58)	(-0.88)	(-0.09)	(0.21)
Global risk	9.3737	10.3138	8.8015	9.2245	8.9676	9.7993	9.1645	10.0968	8.3369	8.7887	8.7443	9.5302
	(1.22)	(1.34)	(1.10)	(1.15)	(1.16)	(1.27)	(1.19)	(1.31)	(1.04)	(1.09)	(1.13)	(1.23)
EE							1.2153	1.2109	0.0304	0.8478	1.1040	0.8715
							(0.80)	(0.48)	(0.02)	(0.31)	(0.71)	(0.34)
EU							2.1010	2.2657	2.6794	3.4811	2.0435	2.0853
							(1.39)	(0.92)	(1.20)	(1.22)	(1.35)	(0.85)
Δ Rating*EE							1.1145	1.1478	0.9546	1.0850	1.1355	1.2027
							(1.09)	(1.11)	(0.93)	(1.04)	(1.10)	(1.15)
Δ Rating *EU							-0.0223	-0.1487	-0.2826	-0.2192	0.0163	-0.0919
							(-0.02)	(-0.14)	(-0.26)	(-0.20)	(0.02)	(-0.08)
Observations	522	522	522	522	522	522	522	522	522	522	522	522
R-squared	0.026	0.043	0.156	0.173	0.028	0.045	0.027	0.045	0.158	0.176	0.029	0.047
LR	0.85	1.10	1.80	1.89	0.82	1.11						
year fe	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes
country fe	no	no	yes	yes	no	no	no	no	yes	yes	no	no
CRA fe	no	no	no	no	yes	yes	no	no	no	no	yes	yes

Notes: This Table presents the estimated coefficients and robust z-statistics in parentheses from specifications of Eq. (6.1a) and (b) using OLS. The credit rating dataset consists of daily pooled positive sovereign events by 3 CRAs in 58 CCR scale originating from 69 countries for pre-regulatory (Sept 2007-April 2012) and post-regulatory (May 2012-Sept 2014) periods. For every event observation there is a randomly selected non-event observation. The dependent variable $\Delta Yield$ measures, in basis points, the changes in the window [0, +1] sovereign yield spreads towards the benchmark US bonds for sovereign bond i on the event day t . The independent variables are explained in section 6.5.1. Global risk includes interest rates swap spreads over US Treasury curve with 5 years maturity. The choice of US measures of international risk is determined by the fact that the spread variable is benchmarked against US bonds yields. Likelihood-ratio (LR) compares model specifications for best fit. Here, LR in column 2 compares model I specification (a, column 2) with (b, column 6). Insignificant results suggest that the unrestricted model (specification b) does not have statistically significantly better fit. Year/country/CRA fixed effects are included (“yes”), not included (“no”). Significant levels such that: *** $p < 1\%$, ** $p < 5\%$, * $p < 10\%$.

Table 6.9 Estimation of Equation 6.1(a) and (b): Pooled CRAs negative events

VARIABLES	Specification (a)						Specification (b)					
	(I)	(II)	(III)	(IV)	(V)	(VI)	(I)	(II)	(III)	(IV)	(V)	(VI)
Δ Rating	1.8395** (2.16)	1.9147** (2.14)	2.0064** (2.20)	2.0869** (2.21)	1.8348** (2.15)	1.9071** (2.13)	1.8514** (2.17)	1.9274** (2.16)	2.0082** (2.20)	2.0885** (2.21)	1.8327** (2.15)	1.8966** (2.12)
Regulation	0.2711 (0.14)	-0.7980 (-0.20)	0.0803 (0.03)	-2.7031 (-0.59)	0.2542 (0.13)	-0.8418 (-0.21)						
Δ Rating*Regulation	-0.4045 (-0.32)	-0.6051 (-0.47)	-0.2333 (-0.18)	-0.4609 (-0.35)	-0.4027 (-0.32)	-0.5958 (-0.46)						
Rating58	0.0806 (1.38)	0.0898 (1.50)	0.1137 (0.55)	0.1393 (0.62)	0.0806 (1.37)	0.0910 (1.51)	0.0803 (1.38)	0.0889 (1.48)	0.1173 (0.57)	0.1443 (0.64)	0.0784 (1.33)	0.0886 (1.47)
Maturity	-0.0366 (-0.03)	-0.1297 (-0.11)	-0.0811 (-0.03)	1.0516 (0.35)	-0.0523 (-0.04)	-0.1508 (-0.12)	0.2263 (0.19)	0.2077 (0.17)	-0.1414 (-0.05)	1.1208 (0.36)	0.2299 (0.19)	0.2098 (0.17)
Global risk	36.5730*** (2.68)	37.3887*** (2.73)	38.3870*** (2.64)	41.2342*** (2.82)	36.4718*** (2.67)	37.3246*** (2.71)	38.3954*** (2.80)	39.4069*** (2.85)	38.2703*** (2.62)	41.2108*** (2.81)	38.3084*** (2.79)	39.3377*** (2.84)
EE							-1.2536 (-0.56)	-3.0051 (-0.70)	-0.3798 (-0.12)	-3.4503 (-0.70)	-1.5649 (-0.68)	-3.5244 (-0.81)
EU							2.2817 (0.92)	0.8561 (0.20)	0.6350 (0.18)	-1.8895 (-0.38)	2.5387 (1.01)	0.9255 (0.22)
Δ Rating*EE							0.0107 (0.01)	-0.1439 (-0.10)	0.1295 (0.09)	-0.0715 (-0.05)	0.0172 (0.01)	-0.1196 (-0.08)
Δ Rating *EU							-0.9153 (-0.55)	-1.1379 (-0.67)	-0.7763 (-0.44)	-1.0324 (-0.58)	-0.9021 (-0.54)	-1.1088 (-0.65)
Observations	540	540	540	540	540	540	540	540	540	540	540	540
R-squared	0.028	0.042	0.086	0.104	0.028	0.042	0.032	0.045	0.087	0.105	0.032	0.046
LR	1.87	2.20	0.24	0.32	2.30	2.67						
year fe	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes
country fe	no	no	yes	yes	no	no	no	no	yes	yes	no	no
CRA fe	no	no	no	no	yes	yes	no	no	no	no	yes	yes

Notes: This Table presents the estimated coefficients and robust z-statistics in parentheses from specifications of Eq. (6.1a) and (b) using OLS. The credit rating dataset consists of daily pooled negative sovereign events by 3 CRAs in 58 CCR scale originating from 69 countries for pre-regulatory (Sept 2007-April 2012) and post-regulatory (May 2012-Sept 2014) periods. For every event observation there is a randomly selected non-event observation. The dependent variable $\Delta Yield$ measures, in basis points, the changes in the window [0, +1] sovereign yield spreads towards the benchmark US bonds for sovereign bond i on the event day t . The independent variables are explained in section 6.5.1. Global risk includes interest rates swap spreads over US Treasury curve with 5 years maturity. Likelihood-ratio (LR) compares model specifications for best fit. Here, LR in column 2 compares model I specification (a, column 2) with (b, column 6). Insignificant results suggest that the unrestricted model (specification b) does not have statistically significantly better fit. Year/country/CRA fixed effects are included (“yes”), not included (“no”). Significant levels such that: *** p<1%, ** p<5%, * p<10.

Table 6.10 Estimation of Equation 6.1(a) and (b): Pooled CRAs positive events (Europe)

VARIABLES	Specification (a)						Specification (b)					
	(I)	(II)	(III)	(IV)	(V)	(VI)	(I)	(II)	(III)	(IV)	(V)	(VI)
Δ Rating	0.4428 (0.32)	-0.0184 (-0.01)	0.4040 (0.28)	0.2178 (0.14)	0.3901 (0.28)	0.0313 (0.02)	0.4818 (0.36)	0.0160 (0.01)	0.4178 (0.31)	0.1954 (0.13)	0.5150 (0.38)	0.1265 (0.09)
Regulation	4.9951** (2.22)	6.9254* (1.87)	5.2493* (1.81)	7.5644* (1.86)	4.5961** (2.03)	7.0670* (1.89)						
Δ Rating*Regulation	-0.9994 (-0.59)	-0.9680 (-0.55)	-0.7931 (-0.46)	-0.8724 (-0.48)	-0.8570 (-0.51)	-0.9014 (-0.51)						
Rating58	-0.0166 (-0.23)	-0.0290 (-0.39)	-0.3353 (-1.07)	-0.5379 (-1.58)	-0.0108 (-0.15)	-0.0239 (-0.32)	0.0125 (0.18)	-0.0045 (-0.06)	-0.2069 (-0.68)	-0.3804 (-1.14)	0.0186 (0.26)	0.0022 (0.03)
Maturity	0.4743 (0.39)	0.4357 (0.34)	-1.4427 (-0.43)	-2.8101 (-0.57)	0.5104 (0.42)	0.4910 (0.38)	0.3851 (0.33)	0.4312 (0.34)	-1.8983 (-0.59)	-4.1218 (-0.87)	0.3686 (0.31)	0.4026 (0.32)
Global risk	-5.3038 (-0.38)	-1.8594 (-0.14)	-3.5090 (-0.24)	-0.9584 (-0.07)	-6.4892 (-0.47)	-3.0693 (-0.22)	-1.1479 (-0.09)	1.3493 (0.10)	0.9684 (0.07)	3.2800 (0.23)	-2.0098 (-0.15)	0.6165 (0.05)
EE							-1.9991 (-0.44)	0.5242 (0.10)	-3.7398 (-0.72)	0.0991 (0.02)	-2.2837 (-0.47)	1.4363 (0.25)
EU							5.0241** (2.28)	7.4999** (2.09)	5.1784* (1.82)	8.3424** (2.11)	4.7914** (2.17)	7.8751** (2.18)
Δ Rating*EE							16.8290*** (3.45)	16.0047*** (3.25)	16.6277*** (3.35)	15.8259*** (3.16)	16.7993*** (3.44)	16.0608*** (3.26)
Δ Rating *EU							-1.6530 (-1.01)	-1.4843 (-0.86)	-1.6118 (-0.95)	-1.5117 (-0.86)	-1.5978 (-0.98)	-1.4630 (-0.85)
Observations	180	180	180	180	180	180	180	180	180	180	180	180
R-squared	0.038	0.099	0.129	0.192	0.054	0.110	0.122	0.171	0.203	0.258	0.136	0.183
LR	16.50***	15.4***	16.08***	15.31***	16.25***	15.48***						
year fe	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes
country fe	no	no	yes	yes	no	no	no	no	yes	yes	no	no
CRA fe	no	no	no	no	yes	yes	no	no	no	no	yes	yes

Notes: This Table presents estimated coefficients and robust z-statistics in parentheses from specifications of Eq. 6.1(a) and (b) using OLS. The credit rating dataset consists of daily pooled positive sovereign events by 3 CRAs in 58 CCR scale divided between regions for pre-regulatory (Sept 2007-April 2012) and post-regulatory (May 2012-Sept 2014) periods. For every event observation there is a randomly selected non-event observation. The dependent variable $\Delta Yield$ measures, in basis points, the changes in the window $[0, +1]$ sovereign yield spreads towards the benchmark US bonds for sovereign bond i on the event day t . The independent variables are explained in section 6.5.1. Global risk includes interest rates swap spreads over US Treasury curve with 5 years maturity. The choice of US measures of international risk is determined by the fact that the spread variable is benchmarked against US bonds yields. Likelihood-ratio (LR) compares model specifications for best fit. Here, LR in column 2 compares model I specification (a, column 2) with (b, column 6). Significant results suggest that the unrestricted model (specification b) has statistically significantly better fit. Year/country/CRA fixed effects are included (“yes”), not included (“no”). Significant levels such that: *** $p < 1\%$, ** $p < 5\%$, * $p < 10\%$.

Table 6.11 Estimation of Equation 6.1(a) and (b): Pooled CRAs positive events (Asia)

VARIABLES	Specification (a)						Specification (b)					
	(I)	(II)	(III)	(IV)	(V)	(VI)	(I)	(II)	(III)	(IV)	(V)	(VI)
Δ Rating	0.3665 (0.40)	0.2000 (0.21)	0.7130 (0.76)	0.4001 (0.41)	0.3442 (0.37)	0.1375 (0.14)	0.3662 (0.40)	0.1999 (0.21)	0.7865 (0.83)	0.4920 (0.49)	0.3374 (0.36)	0.3374 (0.36)
Regulation	3.3056 (1.08)	4.3248 (0.84)	1.4079 (0.35)	2.9407 (0.54)	3.1805 (1.02)	4.2232 (0.81)						
Δ Rating*Regulation	0.1161 (0.06)	0.2307 (0.12)	0.2985 (0.16)	0.4557 (0.24)	0.0844 (0.05)	0.2193 (0.12)						
Rating58	0.0142 (0.17)	-0.0321 (-0.35)	-0.7537** (-2.02)	-0.9416** (-2.35)	0.0121 (0.14)	-0.0358 (-0.38)	0.0151 (0.18)	-0.0322 (-0.34)	-0.9437** (-2.24)	-1.1524** (-2.54)	0.0154 (0.18)	0.0154 (0.18)
Maturity	-0.8182 (-0.37)	-0.0404 (-0.02)	-4.5430 (-1.08)	0.6762 (0.08)	-0.9278 (-0.42)	-0.1517 (-0.06)	-0.8467 (-0.38)	-0.0235 (-0.01)	-5.6355 (-1.29)	-0.1980 (-0.02)	-0.9885 (-0.44)	-0.9885 (-0.44)
Global risk	26.8785 (1.59)	25.7849 (1.49)	25.5488 (1.46)	19.9238 (1.09)	25.5990 (1.50)	24.3187 (1.39)	26.5034 (1.55)	25.6205 (1.46)	26.6444 (1.50)	20.9316 (1.13)	25.0546 (1.44)	25.0546 (1.44)
EE							3.1495 (0.94)	4.2098 (0.78)	2.9339 (0.66)	4.2118 (0.72)	2.8124 (0.82)	2.8124 (0.82)
EU							4.0584 (0.78)	4.5826 (0.69)	-1.9490 (-0.30)	-0.8081 (-0.11)	4.3778 (0.84)	4.3778 (0.84)
Δ Rating*EE							0.2025 (0.11)	0.2745 (0.14)	0.2535 (0.14)	0.4052 (0.21)	0.2194 (0.12)	0.2194 (0.12)
Δ Rating *EU							-1.0995 (-0.16)	-0.4476 (-0.06)	-1.2296 (-0.18)	-1.3639 (-0.19)	-1.1511 (-0.17)	-1.1511 (-0.17)
Observations	116	116	116	116	116	116	116	116	116	116	116	116
R-squared	0.056	0.091	0.164	0.197	0.060	0.098	0.056	0.091	0.173	0.207	0.061	0.061
LR	0.04	0.01	1.20	1.38	0.09	0.07						
year fe	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes
country fe	no	no	yes	yes	no	no	no	no	yes	yes	no	no
CRA fe	no	no	no	no	yes	yes	no	no	no	no	yes	yes

Notes: This Table presents estimated coefficients and robust z-statistics in parentheses from specifications of Eq. (6.1a) and (b) using OLS. The credit rating dataset consists of daily pooled negative sovereign events by 3 CRAs in 58 CCR scale divided between regions for pre-regulatory (Sept 2007-April 2012) and post-regulatory (May 2012-Sept 2014) periods. For every event observation there is a randomly selected non-event observation. The dependent variable Δ Yield measures, in basis points, the changes in the window [0, +1] sovereign yield spreads towards the benchmark US bonds for sovereign bond i on the event day t. The independent variables are explained in section 6.5.1. Global risk includes interest rates swap spreads over US Treasury curve with 5 years maturity. The choice of US measures of international risk is determined by the fact that the spread variable is benchmarked against US bonds yields. Likelihood-ratio (LR) compares model specifications for best fit. Here, LR in column 2 compares model I specification (a, column 2) with (b, column 6). Insignificant results suggest that the unrestricted model (specification b) does not have statistically significantly better fit. Year/country/CRA fixed effects are included (“yes”), not included (“no”). Significant levels such that: *** p<1%, ** p<5%, * p<10.

Table 6.12 Estimation of Equation 6.1(a) and (b): Pooled CRAs positive events (“Other” sub-sample I)

VARIABLES	Specification (a)						Specification (b)					
	(I)	(II)	(III)	(IV)	(V)	(VI)	(I)	(II)	(III)	(IV)	(V)	(VI)
Δ Rating	-2.5161*** (-2.94)	-2.8145*** (-3.12)	-1.9817** (-2.27)	-2.2311** (-2.40)	-2.4105*** (-2.75)	-2.7164*** (-2.95)	-2.5056*** (-2.92)	-2.8023*** (-3.10)	-1.9997** (-2.27)	-2.2676** (-2.42)	-2.4319*** (-2.77)	-2.7308*** (-2.95)
Regulation	-1.2378 (-0.64)	-3.0572 (-0.79)	-2.7807 (-1.08)	-3.2157 (-0.79)	-0.9727 (-0.48)	-2.7104 (-0.68)						
Δ Rating*Regulation	1.8386 (1.42)	2.1458 (1.58)	1.6158 (1.24)	1.8662 (1.35)	1.7563 (1.34)	2.0821 (1.52)						
Rating58	0.1282* (1.72)	0.1047 (1.35)	-0.1322 (-0.56)	-0.1860 (-0.71)	0.1280* (1.71)	0.1056 (1.35)	0.1410* (1.86)	0.1160 (1.47)	-0.1157 (-0.48)	-0.1699 (-0.64)	0.1390* (1.82)	0.1154 (1.45)
Maturity	-0.8075 (-0.79)	-0.4942 (-0.47)	-2.9615 (-1.57)	-2.4042 (-1.12)	-0.7201 (-0.70)	-0.4265 (-0.40)	-0.8023 (-0.78)	-0.4975 (-0.47)	-2.6368 (-1.29)	-1.8386 (-0.78)	-0.7329 (-0.70)	-0.4435 (-0.41)
Global risk	13.3923 (1.17)	11.4751 (0.97)	9.6242 (0.83)	8.8419 (0.73)	13.4214 (1.16)	11.5086 (0.96)	13.1497 (1.14)	11.2017 (0.94)	9.3863 (0.80)	8.4279 (0.69)	13.1103 (1.13)	11.2338 (0.94)
EE							-1.7015 (-0.83)	-3.1986 (-0.82)	-2.6402 (-1.01)	-3.1928 (-0.78)	-1.4695 (-0.68)	-2.9300 (-0.73)
EU							0.4136 (0.12)	-1.3845 (-0.28)	-1.0558 (-0.16)	-0.7241 (-0.10)	0.3822 (0.11)	-1.3775 (-0.28)
Δ Rating*EE							1.8484 (1.37)	2.1427 (1.53)	1.5353 (1.14)	1.8095 (1.28)	1.7824 (1.31)	2.0860 (1.48)
Δ Rating *EU							2.5813 (0.83)	2.8585 (0.89)	2.2884 (0.74)	2.6736 (0.82)	2.5154 (0.81)	2.8259 (0.88)
Observations	226	226	226	226	226	226	226	226	226	226	226	226
R-squared	0.065	0.082	0.214	0.221	0.067	0.084	0.069	0.086	0.214	0.222	0.071	0.086
LR	1.04	0.81	0.25	0.45	0.81	0.64						
year fe	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes
country fe	no	no	yes	yes	no	no	no	no	yes	yes	no	no
CRA fe	no	no	no	no	yes	yes	no	no	no	no	yes	yes

Notes: This Table presents estimated coefficients and robust z-statistics in parentheses from specifications of Eq. (6.1a) and (b) using OLS. The credit rating dataset consists of daily pooled positive sovereign events by 3 CRAs in 58 CCR scale divided between regions for pre-regulatory (Sept 2007-April 2012) and post-regulatory (May 2012-Sept 2014) periods. The group labelled “Other” includes regions such as Africa, Latin America & Caribbean, North America, Oceania and Sub-Saharan Africa. For every event observation there is a randomly selected non-event observation. The dependent variable $\Delta Yield$ measures, in basis points, the changes in the window $[0, +1]$ sovereign yield spreads towards the benchmark US bonds for sovereign bond i on the event day t . The independent variables are explained in section 6.5.1. Global risk includes interest rates swap spreads over US Treasury curve with 5 years maturity. The choice of US measures of international risk is determined by the fact that the spread variable is benchmarked against US bonds yields Likelihood-ratio (LR) compares model specifications for best fit. Here, LR in column 2 compares model I specification (a, column 2) with (b, column 6). Insignificant results suggest that the unrestricted model (specification b) does not have statistically significantly better fit. Year/country/CRA fixed effects are included (“yes”), not included (“no”). Significant levels such that: *** $p < 1\%$, ** $p < 5\%$, * $p < 10\%$.

Table 6.13 Estimation of Equation 6.1(a) and (b): Pooled CRAs positive events (“Other” sub-sample II)

VARIABLES	Specification (a)						Specification (b)					
	(I)	(II)	(III)	(IV)	(V)	(VI)	(I)	(II)	(III)	(IV)	(V)	(VI)
Δ Rating	-2.8547*** (-3.66)	-3.1874*** (-3.93)	-2.3087*** (-2.87)	-2.6405*** (-3.11)	-2.7934*** (-3.50)	-3.1717*** (-3.82)	-2.8451*** (-3.63)	-3.1772*** (-3.90)	-2.3260*** (-2.88)	-2.6738*** (-3.13)	-2.8056*** (-3.51)	-3.1803*** (-3.82)
Regulation	-1.6112 (-0.91)	-2.0066 (-0.58)	-2.5084 (-1.06)	-1.8061 (-0.49)	-1.3562 (-0.74)	-1.3044 (-0.36)						
Δ Rating*Regulation	2.3272* (1.96)	2.6035** (2.13)	1.9484 (1.63)	2.2010* (1.75)	2.2742* (1.90)	2.5967** (2.11)						
Rating58	0.0945 (1.39)	0.0683 (0.97)	-0.0246 (-0.11)	-0.1073 (-0.45)	0.0982 (1.43)	0.0733 (1.03)	0.1038 (1.49)	0.0762 (1.06)	-0.0057 (-0.03)	-0.0893 (-0.37)	0.1061 (1.51)	0.0800 (1.11)
Maturity	-0.3630 (-0.39)	-0.0335 (-0.04)	-1.7217 (-0.98)	-1.0968 (-0.56)	-0.3652 (-0.38)	-0.0660 (-0.07)	-0.3783 (-0.40)	-0.0603 (-0.06)	-1.3678 (-0.72)	-0.5195 (-0.24)	-0.3913 (-0.41)	-0.1013 (-0.10)
Treasury Rate	-102.38*** (-6.57)	-109.96*** (-6.92)	-93.93*** (-5.77)	-100.22*** (-5.99)	-103.22*** (-6.54)	-111.45*** (-6.93)	-101.87*** (-6.49)	-109.67*** (-6.86)	-94.06*** (-5.74)	-100.40*** (-5.96)	-102.81*** (-6.47)	-111.26*** (-6.87)
EE							-2.0316 (-1.08)	-2.2142 (-0.63)	-2.4642 (-1.02)	-1.9055 (-0.51)	-1.7894 (-0.91)	-1.5661 (-0.43)
EU							0.0660 (0.02)	-0.2859 (-0.06)	0.2510 (0.04)	1.7732 (0.27)	0.0786 (0.03)	0.1666 (0.04)
Δ Rating*EE							2.4262* (1.97)	2.7008** (2.14)	1.9710 (1.59)	2.2479* (1.74)	2.3820* (1.91)	2.6983** (2.12)
Δ Rating *EU							2.0517 (0.72)	2.1383 (0.74)	1.7264 (0.60)	1.9554 (0.66)	2.0144 (0.70)	2.1576 (0.74)
Observations	226	226	226	226	226	226	226	226	226	226	226	226
R-squared	0.214	0.248	0.328	0.345	0.216	0.251	0.216	0.249	0.328	0.347	0.218	0.252
LR	0.60	0.46	0.31	0.58	0.44	0.35						
year fe	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes
country fe	no	no	yes	yes	no	no	no	no	yes	yes	no	no
CRA fe	no	no	no	no	yes	yes	No	no	no	no	yes	yes

Notes: This Table presents estimated coefficients and robust z-statistics in parentheses from specifications of Eq. (6.1a) and (b) using OLS. The credit rating dataset consists of daily pooled positive sovereign events by 3 CRAs in 58 CCR scale divided between regions for pre-regulatory (Sept 2007-April 2012) and post-regulatory (May 2012-Sept 2014) periods. The group labelled “Other” includes regions such as Africa, Latin America & Caribbean, North America, Oceania and Sub-Saharan Africa. For every event observation there is a randomly selected non-event observation. The dependent variable Δ Yield measures, in basis points, the changes in the window [0, +1] sovereign yield spreads towards the benchmark US bonds for sovereign bond *i* on the event day *t*. The independent variables are explained in section 6.5.1. The Treasury Rate represents the global risk factor. Likelihood-ratio (LR) compares model specifications for best fit. Here, LR in column 2 compares model I specification (a, column 2) with (b, column 6). Insignificant results suggest that the unrestricted model (specification b) does not have statistically significantly better fit. Year/country/CRA fixed effects are included (“yes”), not included (“no”). Significant levels such that: *** p<1%, ** p<5%, * p<10.

Table 6.14 Estimation of Equation 6.1(a) and (b): Pooled CRAs negative events (Europe)

VARIABLES	Specification (a)						Specification (b)					
	(I)	(II)	(III)	(IV)	(V)	(VI)	(I)	(II)	(III)	(IV)	(V)	(VI)
Δ Rating	2.6102*	2.6650*	2.7398*	2.9049**	2.4932*	2.4618*	2.6387*	2.6887*	2.7751*	2.9047**	2.4829*	2.4474*
	(1.90)	(1.87)	(1.91)	(1.97)	(1.80)	(1.72)	(1.92)	(1.89)	(1.93)	(1.97)	(1.80)	(1.71)
Regulation	3.4888	3.3975	3.9467	2.1392	3.6848	3.1708						
	(1.01)	(0.54)	(0.84)	(0.30)	(1.06)	(0.50)						
Δ Rating*Regulation	-0.5549	-0.5620	-0.1746	-0.0420	-0.5619	-0.4985						
	(-0.24)	(-0.24)	(-0.07)	(-0.02)	(-0.25)	(-0.21)						
Rating58	0.1543	0.1583	0.0726	0.2389	0.1492	0.1547	0.1557	0.1622	0.1053	0.2857	0.1384	0.1450
	(1.45)	(1.42)	(0.23)	(0.66)	(1.40)	(1.39)	(1.45)	(1.44)	(0.33)	(0.78)	(1.28)	(1.28)
Maturity	1.4126	0.7491	4.0988	2.7757	1.4387	0.7789	1.4359	0.7018	3.7616	1.5373	1.5403	0.8323
	(0.65)	(0.32)	(0.92)	(0.57)	(0.66)	(0.34)	(0.66)	(0.30)	(0.82)	(0.30)	(0.71)	(0.36)
Global risk	59.3552**	57.8705**	55.5444**	58.9375**	58.1409**	55.7014**	62.7974**	60.4894**	57.9817**	60.4547**	62.8431**	59.9238**
	(2.29)	(2.16)	(2.02)	(2.09)	(2.24)	(2.07)	(2.40)	(2.23)	(2.11)	(2.14)	(2.40)	(2.21)
EE							-1.9162	-1.1095	-0.2573	-0.0203	-4.0501	-4.1920
							(-0.31)	(-0.14)	(-0.04)	(-0.00)	(-0.64)	(-0.51)
EU							5.2102	5.3080	5.2623	3.0431	6.0237	5.6828
							(1.40)	(0.82)	(1.00)	(0.41)	(1.59)	(0.88)
Δ Rating*EE							3.3993	3.4735	3.8099	4.1322	3.3548	3.4654
							(0.93)	(0.93)	(1.02)	(1.08)	(0.92)	(0.93)
Δ Rating *EU							-2.1066	-2.1627	-1.7905	-1.6692	-2.0015	-1.9664
							(-0.82)	(-0.83)	(-0.68)	(-0.63)	(-0.78)	(-0.76)
Observations	232	232	232	232	232	232	232	232	232	232	232	232
R-squared	0.044	0.065	0.105	0.136	0.049	0.074	0.053	0.073	0.114	0.146	0.060	0.085
LR	2.05	2.08	2.08	2.53	2.64	2.66						
year fe	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes
country fe	no	no	yes	yes	no	no	no	no	yes	yes	no	no
CRA fe	no	no	no	no	yes	yes	no	no	no	no	yes	yes

Notes: This Table presents estimated coefficients and robust z-statistics in parentheses from specifications of Eq. (6.1a) and (b) using OLS. The credit rating dataset consists of daily pooled negative sovereign events by 3 CRAs in 58 CCR scale divided between regions for pre-regulatory (Sept 2007-April 2012) and post-regulatory (May 2012-Sept 2014) periods. For every event observation there is a randomly selected non-event observation. The dependent variable $\Delta Yield$ measures, in basis points, the changes in the window $[0, +1]$ sovereign yield spreads towards the benchmark US bonds for sovereign bond i on the event day t . The independent variables are explained in section 6.5.1. Global risk includes interest rates swap spreads over US Treasury curve with 5 years maturity. The choice of US measures of international risk is determined by the fact that the spread variable is benchmarked against US bonds yields. Likelihood-ratio (LR) compares model specifications for best fit. Here, LR in column 2 compares model I specification (a, column 2) with (b, column 6). Insignificant results suggest that the unrestricted model (specification b) does not have statistically significantly better fit. Year/country/CRA fixed effects are included (“yes”), not included (“no”). Significant levels such that: *** $p < 1\%$, ** $p < 5\%$, * $p < 10\%$.

Table 6.15 Estimation of Equation 6.1(a) and (b): Pooled CRAs negative events (Asia)

VARIABLES	Specification (a)						Specification (b)					
	(I)	(II)	(III)	(IV)	(V)	(VI)	(I)	(II)	(III)	(IV)	(V)	(VI)
Δ Rating	2.5905*	2.0367	3.3145**	3.4142**	2.6037*	2.0919	2.6147*	2.0630	3.3996**	3.4654**	2.6330*	2.1361
	(1.87)	(1.32)	(2.18)	(1.99)	(1.87)	(1.35)	(1.87)	(1.32)	(2.21)	(2.00)	(1.88)	(1.37)
Regulation	-3.9171	-0.5958	-5.2347	2.1037	-3.4304	1.4146						
	(-1.06)	(-0.06)	(-1.02)	(0.15)	(-0.91)	(0.15)						
Δ Rating*Regulation	-0.5529	-0.0017	-0.9273	-0.4947	-0.6092	-0.1249						
	(-0.24)	(-0.00)	(-0.39)	(-0.19)	(-0.27)	(-0.05)						
Rating58	-0.0740	-0.1697	0.4072	0.7744	-0.0394	-0.1278	-0.0652	-0.1607	0.4490	0.7902	-0.0279	-0.1091
	(-0.60)	(-1.05)	(0.81)	(1.31)	(-0.31)	(-0.76)	(-0.52)	(-0.98)	(0.88)	(1.32)	(-0.21)	(-0.64)
Maturity	-2.2145	-1.0601	-5.7325	-0.3951	-1.9153	-1.0429	-2.5884	-1.6357	-6.5428	-1.7659	-2.3646	-1.8843
	(-0.74)	(-0.29)	(-1.06)	(-0.05)	(-0.63)	(-0.28)	(-0.85)	(-0.43)	(-1.19)	(-0.20)	(-0.76)	(-0.48)
Global risk	36.0148*	38.1417*	32.7899	32.4679	31.3376	33.9118	35.6071*	37.5286*	32.0836	32.1935	30.4676	33.1301
	(1.75)	(1.77)	(1.52)	(1.44)	(1.44)	(1.49)	(1.71)	(1.71)	(1.47)	(1.41)	(1.40)	(1.45)
EE							-4.7126	-0.3888	-5.9479	0.8971	-4.0514	2.9296
							(-1.20)	(-0.04)	(-1.08)	(0.06)	(-0.99)	(0.27)
EU							-2.7730	-0.7257	-5.2233	-0.7797	-2.9870	1.0672
							(-0.45)	(-0.07)	(-0.70)	(-0.05)	(-0.49)	(0.11)
Δ Rating*EE							0.4112	0.5752	0.1926	-0.0221	0.5360	0.5928
							(0.16)	(0.21)	(0.07)	(-0.01)	(0.21)	(0.21)
Δ Rating *EU							-2.7490	-1.4401	-3.5024	-1.8957	-3.1132	-1.8383
							(-0.76)	(-0.35)	(-0.95)	(-0.45)	(-0.86)	(-0.45)
Observations	96	96	96	96	96	96	96	96	96	96	96	96
R-squared	0.119	0.150	0.176	0.229	0.136	0.165	0.126	0.155	0.187	0.235	0.146	0.175
LR	0.75	0.52	1.29	0.67	1.18	1.12						
year fe	no	yes	no	yes	no	yes	no	no	yes	yes	no	yes
country fe	no	no	yes	yes	no	no	no	no	no	yes	no	no
CRA fe	no	no	no	no	yes	yes	no	no	no	no	yes	yes

Notes: This Table presents estimated coefficients and robust z-statistics in parentheses from specifications of Eq. (6.1a) and (b) using OLS. The credit rating dataset consists of daily pooled negative sovereign events by 3 CRAs in 58 CCR scale divided between regions for pre-regulatory (Sept 2007-April 2012) and post-regulatory (May 2012-Sept 2014) periods. For every event observation there is a randomly selected non-event observation. The dependent variable Δ Yield measures, in basis points, the changes in the window [0, +1] sovereign yield spreads towards the benchmark US bonds for sovereign bond *i* on the event day *t*. The independent variables are explained in section 6.5.1. Global risk includes interest rates swap spreads over US Treasury curve with 5 years maturity. The choice of US measures of international risk is determined by the fact that the spread variable is benchmarked against US bonds yields. Likelihood-ratio (LR) compares model specifications for best fit. Here, LR in column 2 compares model I specification (a, column 2) with (b, column 6). Insignificant results suggest that the unrestricted model (specification b) does not have statistically significantly better fit. Year/country/CRA fixed effects are included (“yes”), not included (“no”). Significant levels such that: *** $p < 1\%$, ** $p < 5\%$, * $p < 10\%$.

Table 6.16 Estimation of Equation 6.1(a) and (b): Pooled CRAs negative events (“Other” sub-sample)

VARIABLES	Specification (a)						Specification (b)					
	(I)	(II)	(III)	(IV)	(V)	(VI)	(I)	(II)	(III)	(IV)	(V)	(VI)
ΔRating	0.6767 (0.45)	-0.1054 (-0.06)	0.2810 (0.17)	-0.4423 (-0.21)	0.6959 (0.46)	-0.1477 (-0.08)	0.7021 (0.46)	-0.0153 (-0.01)	0.2873 (0.17)	-0.4367 (-0.21)	0.7123 (0.47)	-0.0903 (-0.05)
Regulation	-0.7276 (-0.23)	-3.4714 (-0.51)	-3.7738 (-0.81)	-4.9240 (-0.66)	-0.6023 (-0.19)	-2.8896 (-0.42)						
ΔRating*Regulation	0.4382 (0.23)	1.1360 (0.51)	1.0522 (0.52)	1.6430 (0.69)	0.3926 (0.20)	1.1924 (0.53)						
Rating58	0.0531 (0.50)	0.0415 (0.40)	-0.0312 (-0.09)	0.0093 (0.02)	0.0487 (0.45)	0.0401 (0.38)	0.0590 (0.55)	0.0525 (0.50)	-0.0293 (-0.08)	0.0111 (0.03)	0.0533 (0.49)	0.0490 (0.46)
Maturity	0.4469 (0.22)	0.4458 (0.22)	-3.7778 (-0.84)	0.3435 (0.07)	0.7599 (0.36)	0.7849 (0.37)	0.7573 (0.36)	0.9592 (0.46)	-4.0301 (-0.87)	0.8331 (0.16)	0.9387 (0.44)	1.0778 (0.50)
Global risk	23.0529 (1.11)	13.0519 (0.64)	26.0348 (1.16)	16.6290 (0.75)	22.0277 (1.06)	12.6668 (0.62)	24.4063 (1.17)	14.3621 (0.70)	26.7251 (1.19)	17.4712 (0.78)	23.3733 (1.11)	14.0797 (0.68)
EE							-0.8169 (-0.25)	-4.4822 (-0.65)	-3.0642 (-0.62)	-5.4229 (-0.68)	-0.6745 (-0.20)	-3.7363 (-0.53)
EU							-0.0162 (-0.00)	-2.3684 (-0.32)	-5.8595 (-0.89)	-4.9299 (-0.58)	-0.2858 (-0.06)	-2.3602 (-0.32)
ΔRating*EE							0.1047 (0.05)	0.8265 (0.36)	0.7007 (0.32)	1.3856 (0.56)	0.0661 (0.03)	0.9006 (0.39)
ΔRating *EU							1.5388 (0.53)	2.0499 (0.67)	2.1964 (0.72)	2.5061 (0.77)	1.4867 (0.51)	2.1302 (0.69)
Observations	212	212	212	212	212	212	212	212	212	212	212	212
R-squared	0.013	0.099	0.061	0.143	0.016	0.104	0.016	0.104	0.062	0.144	0.018	0.107
LR	0.71	1.28	0.34	0.30	0.52	0.79						
year fe	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes
country fe	no	no	yes	yes	no	no	no	no	yes	yes	no	no
CRA fe	no	no	no	no	yes	yes	no	no	no	no	yes	yes

Notes: This Table presents estimated coefficients and robust z-statistics in parentheses from specifications of Eq. (6.1a) and (b) using OLS. The credit rating dataset consists of daily pooled negative sovereign events by 3 CRAs in 58 CCR scale divided between regions for pre-regulatory (Sept 2007-April 2012) and post-regulatory (May 2012-Sept 2014) periods. The group labelled “Other” includes regions such as Africa, Latin America & Caribbean, North America, Oceania and Sub-Saharan Africa. For every event observation there is a randomly selected non-event observation. The dependent variable $\Delta Yield$ measures, in basis points, the changes in the window $[0, +1]$ sovereign yield spreads towards the benchmark US bonds for sovereign bond i on the event day t . The independent variables are explained in section 6.5.1. Global risk includes interest rates swap spreads over US Treasury curve with 5 years maturity. The choice of US measures of international risk is determined by the fact that the spread variable is benchmarked against US bonds yields. Likelihood-ratio (LR) compares model specifications for best fit. Here, LR in column 2 compares model I specification (a, column 2) with (b, column 6). Insignificant results suggest that the unrestricted model (specification b) does not have statistically significantly better fit. Year/country/CRA fixed effects are included (“yes”), not included (“no”). Significant levels such that: *** $p < 1\%$, ** $p < 5\%$, * $p < 10\%$.

Table 6.17 Estimation of Equation 6.1(a) and (b): Positive events S&P (20-Notch scale)

VARIABLES	Specification (a)				Specification (b)			
	(I)	(II)	(III)	(IV)	(I)	(II)	(III)	(IV)
Δ Rating	-6.1085** (-2.35)	-6.8104** (-2.59)	-6.2077** (-2.12)	-7.3966** (-2.37)	-6.1162** (-2.33)	-6.8158** (-2.57)	-6.2959** (-2.16)	-7.3472** (-2.35)
Regulation	0.3211 (0.09)	-2.8373 (-0.40)	2.6946 (0.38)	1.7771 (0.18)				
Δ Rating*Regulation	3.7109 (0.96)	3.0371 (0.76)	3.8327 (0.89)	3.6669 (0.80)				
Rating20	0.1029 (0.28)	-0.0228 (-0.06)	1.5768 (0.81)	2.0769 (0.81)	0.0825 (0.22)	-0.0513 (-0.13)	1.7191 (0.89)	2.0491 (0.79)
Maturity	0.5683 (0.28)	0.7127 (0.35)	2.9208 (0.66)	3.3552 (0.66)	0.4854 (0.24)	0.6595 (0.31)	1.0944 (0.24)	1.9645 (0.38)
Global risk	11.6971 (0.52)	16.7417 (0.71)	2.4621 (0.09)	10.4468 (0.35)	11.7688 (0.51)	16.9577 (0.71)	15.0231 (0.53)	17.7100 (0.58)
EE					-0.2726 (-0.07)	-3.0011 (-0.40)	-2.2800 (-0.29)	-2.1314 (-0.20)
EU					1.2709 (0.26)	-2.4349 (-0.31)	23.9946 (1.66)	18.7499 (1.13)
Δ Rating*EE					3.5817 (0.81)	2.2359 (0.48)	3.8728 (0.80)	3.3850 (0.65)
Δ Rating *EU					3.9984 (0.69)	4.4966 (0.79)	4.5800 (0.72)	5.2519 (0.80)
Observations	110	110	110	110	110	110	110	110
R-squared	0.075	0.167	0.235	0.287	0.077	0.170	0.265	0.307
LR	0.26	0.53	4.41	3.15				
year fe	no	yes	no	yes	no	yes	no	yes
country fe	no	no	yes	yes	no	no	yes	yes

Notes: This Table presents the estimated coefficients and robust z-statistics in parentheses from specifications of Eq. (6.1a) and (b) using OLS. The credit rating dataset consists of daily pooled negative sovereign events originated from 30 sovereigns by S&P in 20-notch scale for pre-regulatory (Sept 2007-April 2012) and post-regulatory (May 2012-Sept 2014) periods. Outliers are excluded using the MM-robust regression method. For every event observation there is a randomly selected non-event observation. The dependent variable is $\Delta Yield$ which measures, in basis points, the changes in the window $[0, +1]$ sovereign yield spreads towards the benchmark US bonds on a particular sovereign bond i on the event day t . The independent variables follow those explained in section 6.5.1 and where rating is involved the 20-notch scale rating is applied. Δ Rating is identified as change by 1 (1-notch) and 2 (>1-notch). Global risk includes interest rates swap spreads over US Treasury curve with 5 years maturity. The choice of US measures of international risk is determined by the fact that the spread variable is benchmarked against US bonds yields. Likelihood-ratio (LR) compares model specifications for best fit. Here, LR in column 2 compares model I specification (a, column 2) with (b, column 6). Insignificant results suggest that the unrestricted model (specification b) does not have statistically significantly better fit. Year (country) fixed effects are included (“yes”), not included (“no”). Significant levels such that: *** p<1%, ** p<5%, * p<10%.

Table 6.18 Estimation of Equation 6.1(a) and (b): Negative events Moody's (20-Notch scale)

VARIABLES	Specification (a)				Specification (b)			
	(I)	(II)	(III)	(IV)	(I)	(II)	(III)	(IV)
Δ Rating	-0.0296 (-0.01)	-1.5398 (-0.59)	-0.7821 (-0.30)	-2.2719 (-0.77)	-0.0466 (-0.02)	-1.5977 (-0.61)	-0.8457 (-0.32)	-2.5284 (-0.82)
Regulation	-5.5949* (-1.72)	-6.5881 (-0.81)	-11.8209** (-2.12)	-11.8859 (-1.16)				
Δ Rating*Regulation	1.6992 (0.54)	3.4407 (1.01)	2.1763 (0.66)	3.5645 (0.97)				
Rating20	-0.0888 (-0.31)	-0.0362 (-0.12)	-0.5038 (-0.41)	-0.4510 (-0.28)	-0.0748 (-0.26)	-0.0120 (-0.04)	-0.5284 (-0.42)	-0.7903 (-0.41)
Maturity	-2.9045 (-1.45)	-2.8018 (-1.32)	-11.5051 (-1.51)	-8.7334 (-0.88)	-3.0170 (-1.43)	-3.0456 (-1.35)	-11.5771 (-1.49)	-9.7681 (-0.93)
Global risk	24.5517 (1.00)	24.0089 (0.96)	9.0345 (0.31)	5.1554 (0.17)	25.1674 (1.01)	24.8266 (0.98)	9.0848 (0.31)	5.0501 (0.16)
EE					-5.6406* (-1.70)	-6.0619 (-0.72)	-11.7579** (-2.07)	-9.6277 (-0.79)
EU					-5.2932 (-0.43)	-7.1124 (-0.50)	-13.0670 (-0.83)	14.7364 (-0.87)
Δ Rating*EE					1.9091 (0.59)	3.7635 (1.07)	2.2949 (0.67)	3.7489 (0.98)
Δ Rating *EU					-0.3515 (-0.04)	1.2096 (0.13)	1.6057 (0.17)	3.2018 (0.33)
Observations	94	94	94	94	94	94	94	94
R-squared	0.069	0.101	0.214	0.239	0.069	0.104	0.214	0.240
LR	0.21	0.35	0.10	0.19				
year fe	no	yes	no	yes	no	yes	no	yes
country fe	no	no	yes	yes	no	no	yes	yes

Notes: This Table presents the estimated coefficients and robust z-statistics in parentheses from specifications of Eq. (6.1a) and (b) using OLS. The credit rating dataset consists of daily pooled negative sovereign events originated from 21 sovereigns by Moody's in 20-notch scale for pre-regulatory (Sept 2007-April 2012) and post-regulatory (May 2012-Sept 2014) periods. Outliers are excluded using the MM-robust regression method. For every event observation there is a randomly selected non-event observation. The dependent variable is $\Delta Yield$ which measures, in basis points, the changes in the window $[0, +1]$ sovereign yield spreads towards the benchmark US bonds on a particular sovereign bond i on the event day t . The independent variables follow those explained in section 6.5.1 and where rating is involved the 20-notch scale rating is applied. Δ Rating is identified as change by 1 (1-notch) and 2 (>1-notch). Global risk includes interest rates swap spreads over US Treasury curve with 5 years maturity. The choice of US measures of international risk is determined by the fact that the spread variable is benchmarked against US bonds yields. Likelihood-ratio (LR) compares model specifications for best fit. Here, LR in column 2 compares model I specification (a, column 2) with (b, column 6). Insignificant results suggest that the unrestricted model (specification b) does not have statistically significantly better fit. Year (country) fixed effects are included ("yes"), not included ("no"). Significant levels such that: *** $p < 1\%$, ** $p < 5\%$, * $p < 10\%$.

Table 6.19 Estimation of Equation 6.1(a) and (b): Negative events Fitch (20-Notch scale)

VARIABLES	Specification (a)				Specification (b)			
	(I)	(II)	(III)	(IV)	(I)	(II)	(III)	(IV)
Δ Rating	2.6075 (0.77)	4.9484 (1.48)	3.7839 (1.02)	5.3414 (1.42)	2.6214 (0.79)	4.9402 (1.50)	4.0190 (1.13)	5.1340 (1.39)
Regulation	-0.5287 (-0.11)	-5.1275 (-0.53)	-12.0497 (-1.43)	-10.8463 (-0.74)				
Δ Rating*Regulation	-4.6575 (-0.94)	-6.8504 (-1.44)	-3.2165 (-0.63)	-6.0834 (-1.20)				
Rating20	-0.2247 (-0.58)	0.0308 (0.08)	1.0487 (0.71)	0.0837 (0.05)	-0.2487 (-0.65)	-0.0591 (-0.15)	1.5332 (1.06)	0.9045 (0.50)
Maturity	1.8552 (0.63)	0.7104 (0.25)	-5.1757 (-0.89)	-2.6830 (-0.47)	1.9846 (0.68)	0.6094 (0.22)	-4.7268 (-0.85)	-1.7161 (-0.30)
Global risk	18.7573 (0.62)	27.3838 (0.93)	7.0007 (0.19)	9.5467 (0.26)	23.9406 (0.80)	34.3487 (1.17)	13.8367 (0.40)	17.4385 (0.48)
EE					-1.2014 (-0.22)	-4.6847 (-0.48)	-23.9042** (-2.28)	-31.7579 (-1.65)
EU					-2.7884 (-0.47)	-8.0277 (-0.77)	-4.6659 (-0.45)	-7.8566 (-0.53)
Δ Rating*EE					-8.5935 (-1.58)	-10.5046** (-2.02)	-6.1111 (-1.12)	-7.1818 (-1.29)
Δ Rating *EU					5.0432 (0.70)	3.0139 (0.42)	4.3293 (0.60)	-0.3112 (-0.04)
Observations	76	76	76	76	76	76	76	76
R-squared	0.035	0.220	0.286	0.410	0.099	0.265	0.367	0.460
LR	5.21*	4.49	9.46***	6.70**				
year fe	no	yes	no	yes	no	yes	no	yes
country fe	no	no	yes	yes	no	no	yes	yes

Notes: This Table presents the estimated coefficients and robust z-statistics in parentheses from specifications of Eq. (6.1a) and (b) using OLS. The credit rating dataset consists of daily pooled negative sovereign events originated from 40 sovereigns by Fitch s in 20-notch scale for pre-regulatory (Sept 2007-April 2012) and post-regulatory (May 2012-Sept 2014) periods. Outliers are excluded using the MM-robust regression method. For every event observation there is a randomly selected non-event observation. The dependent variable is $\Delta Yield$ which measures, in basis points, the changes in the window $[0, +1]$ sovereign yield spreads towards the benchmark US bonds on a particular sovereign bond i on the event day t . The independent variables follow those explained in section 6.5.1 and where rating is involved the 20-notch scale rating is applied. Δ Rating is identified as change by 1 (1-notch) and 2 (>1-notch). Global risk includes one of the three risk measures i.e. interest rates swap spreads over US Treasury curve with 5 years maturity. The choice of US measures of international risk is determined by the fact that the spread variable is benchmarked against US bonds yields. Likelihood-ratio (LR) compares model specifications for best fit. Here, LR in column 2 compares model I specification (a, column 2) with (b, column 6). Significant results suggest that the unrestricted model (specification b) has statistically significantly better fit. Year (country) fixed effects are included (“yes”), not included (“no”). Significant levels such that: *** $p < 1\%$, ** $p < 5\%$, * $p < 10\%$.

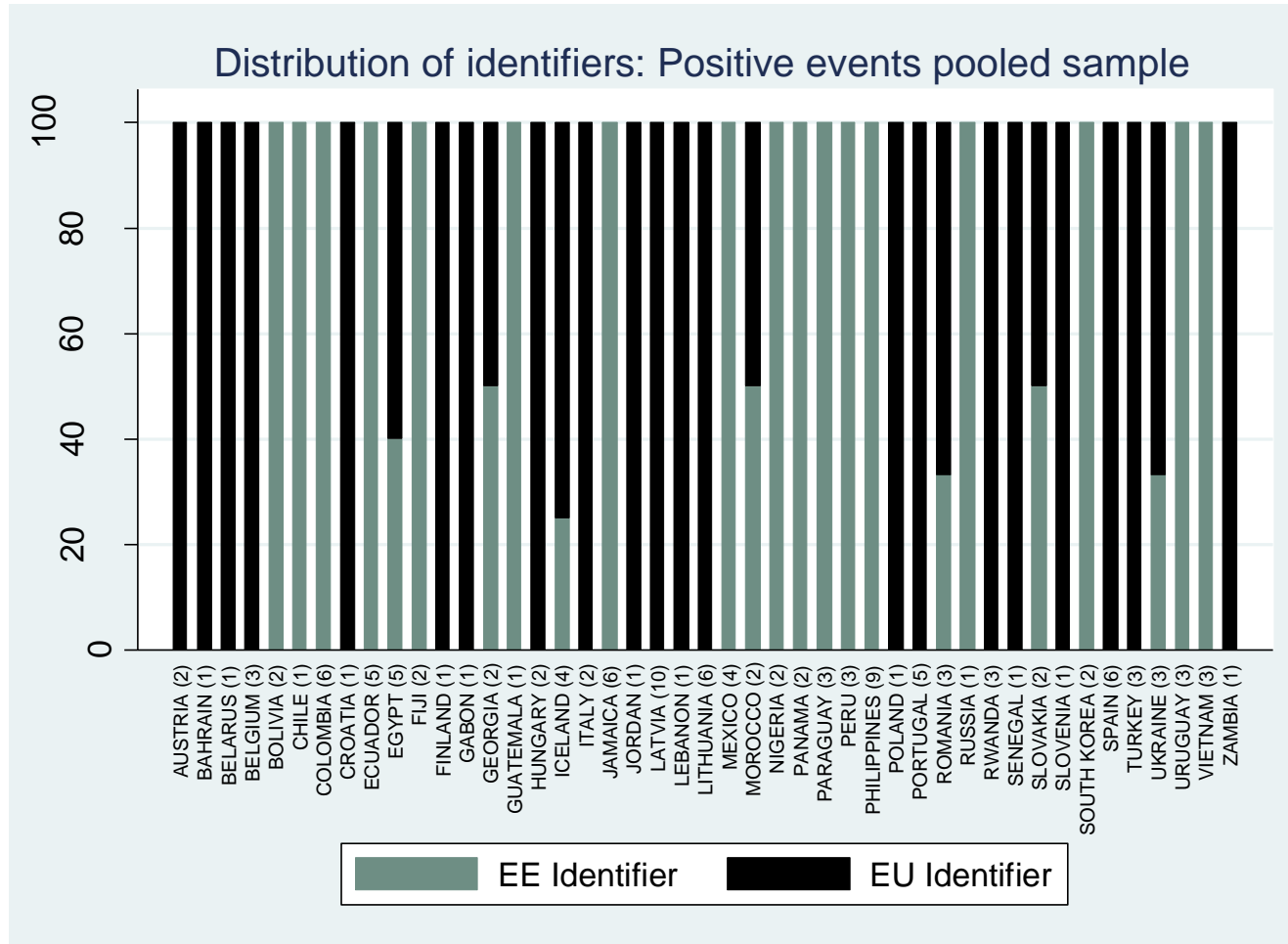


Figure 6.1 This graph presents the distribution of identifiers amongst three CRAs in the positive events pooled sample which consists of 61 sovereigns out of which 7 cases have split identifiers and 38 share common identifiers (out of which 17 are EE and 21 EU). 16 sovereigns were dropped (from the graph) since their EE and EU identifier variables were equal to “0”.²³⁹ Split identifiers amount to 7.36% of the observations/rating actions (upgrades) in the pooled sample. The values in the brackets indicate number of rating events per country in the sample.

239. Argentina, Aruba, Australia, Bermuda, Brazil, Bulgaria, China, Costa Rica, Ghana, Indonesia, Israel, Pakistan, Qatar, South Africa, Sri Lanka and Venezuela.

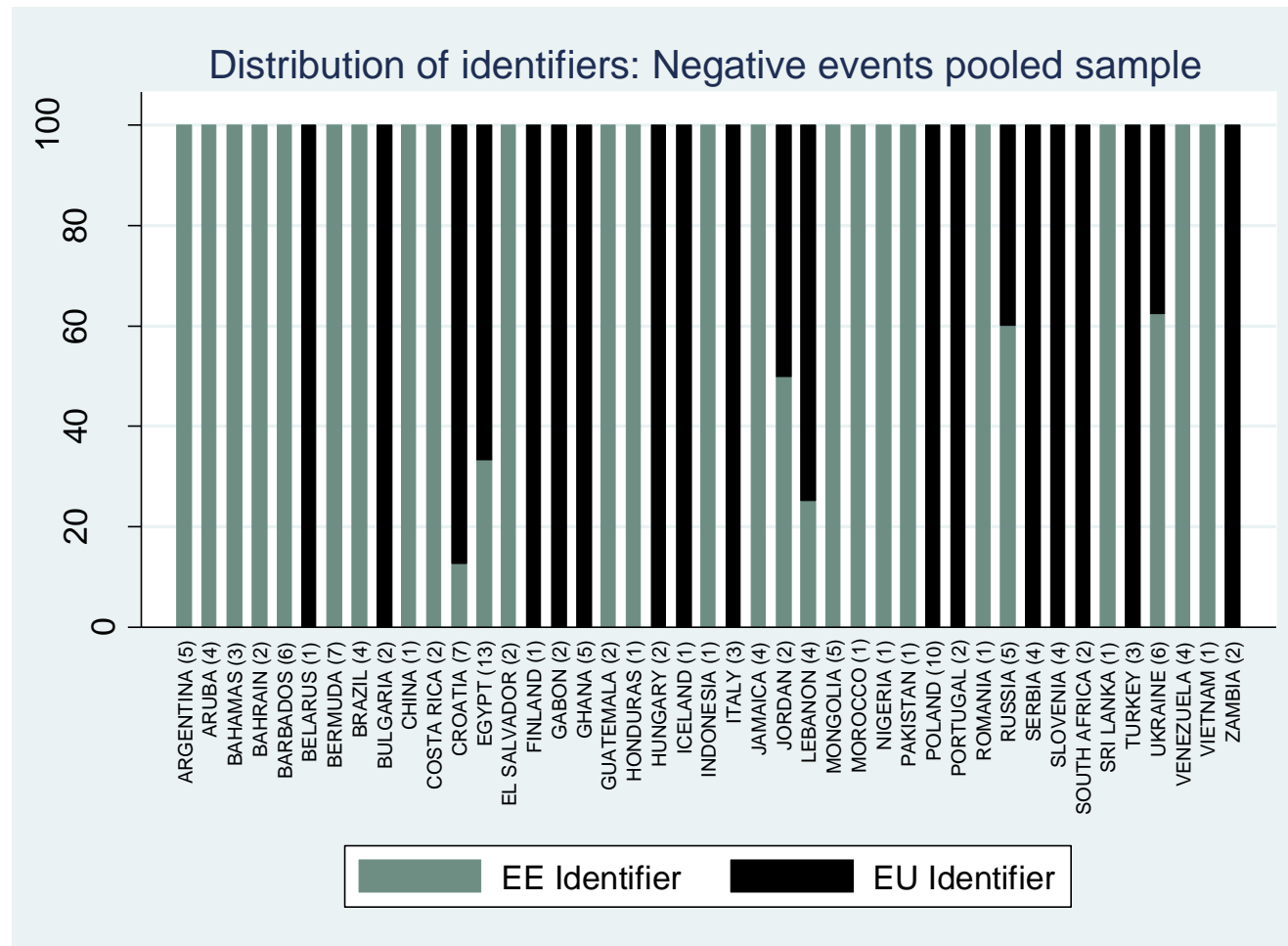


Figure 6.2 This graph presents the distribution of identifiers amongst three CRAs in the negative events pooled sample which consists of 51 sovereigns out of which 6 have split identifiers and 37 share common identifiers (out of which 22 are EE and 15 EU). 8 sovereigns were dropped from the graph since their *EE* and *EU* identifiers were equal to “0”.²⁴⁰ The values in the brackets indicate number of rating events per country in the sample.

240. Austria, Belgium, Latvia, Lithuania, Mexico, Namibia, South Korea and Trinidad and Tobago.

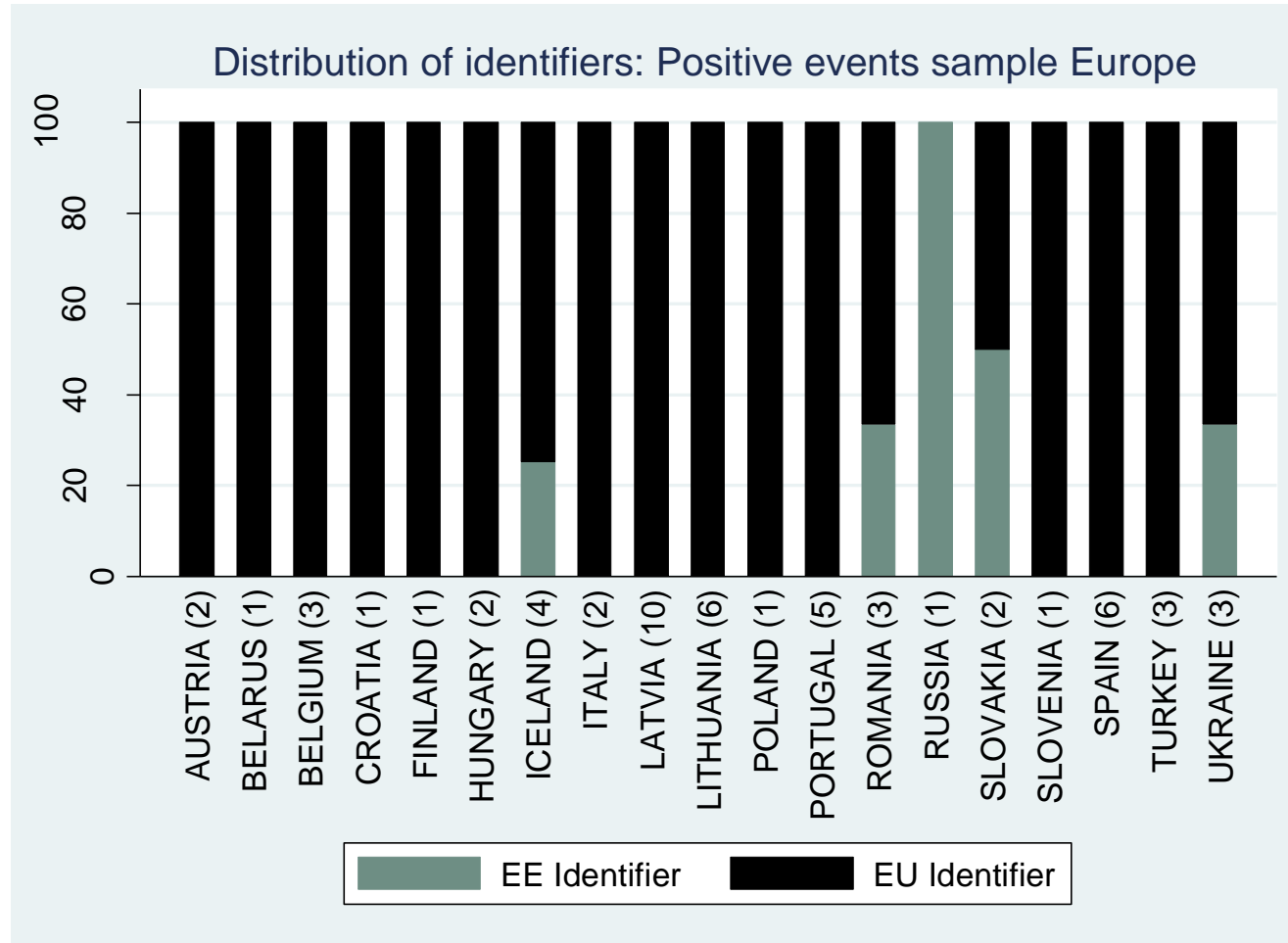


Figure 6.3 This graph presents the distribution of identifiers amongst three CRAs in the positive events pooled sample for Europe. From the 20 sovereigns in the regional sub-sample one country was dropped (Bulgaria) due to identifier equal to “0”. The sovereigns with split identifiers amount to 20 observations out of 192 which comprises 10.4% of the data sample. The values in the brackets indicate number of rating events per country in the sample.

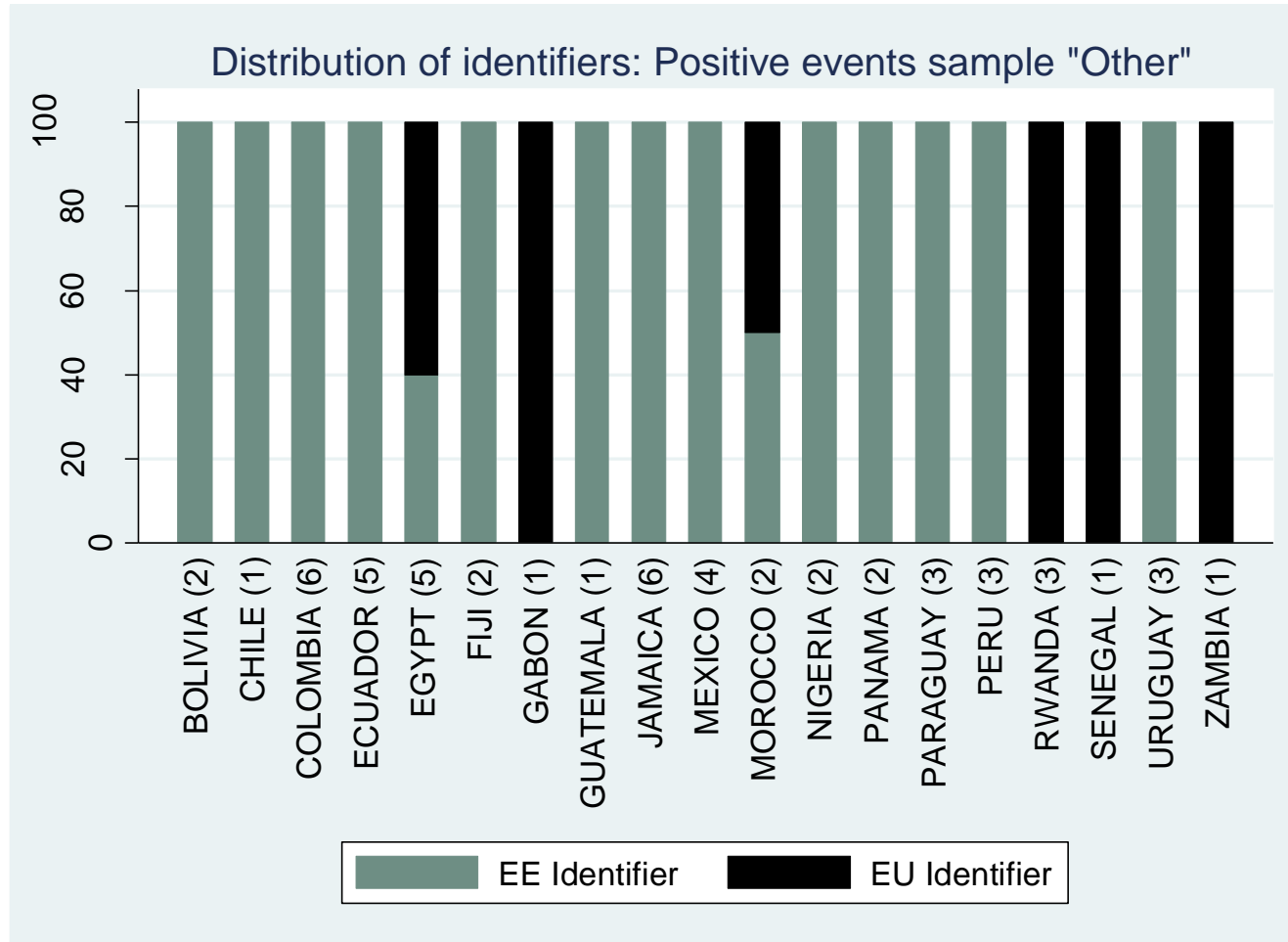


Figure 6.4 This graph presents the distribution of identifiers amongst three CRAs in the positive events pooled sample for regional sub-sample “Other”. The sub-group comprises countries from areas/regions such as: Africa, Latin America & Caribbean, North America, Oceania and Sub-Saharan Africa. Nine sovereigns yielding “0” in both their identifiers are excluded from this graph.²⁴¹ The values in the brackets indicate number of rating events in the sample.

241. Argentina, Aruba, Australia, Bermuda, Brazil, Costa Rica, Ghana, South Africa and Venezuela.

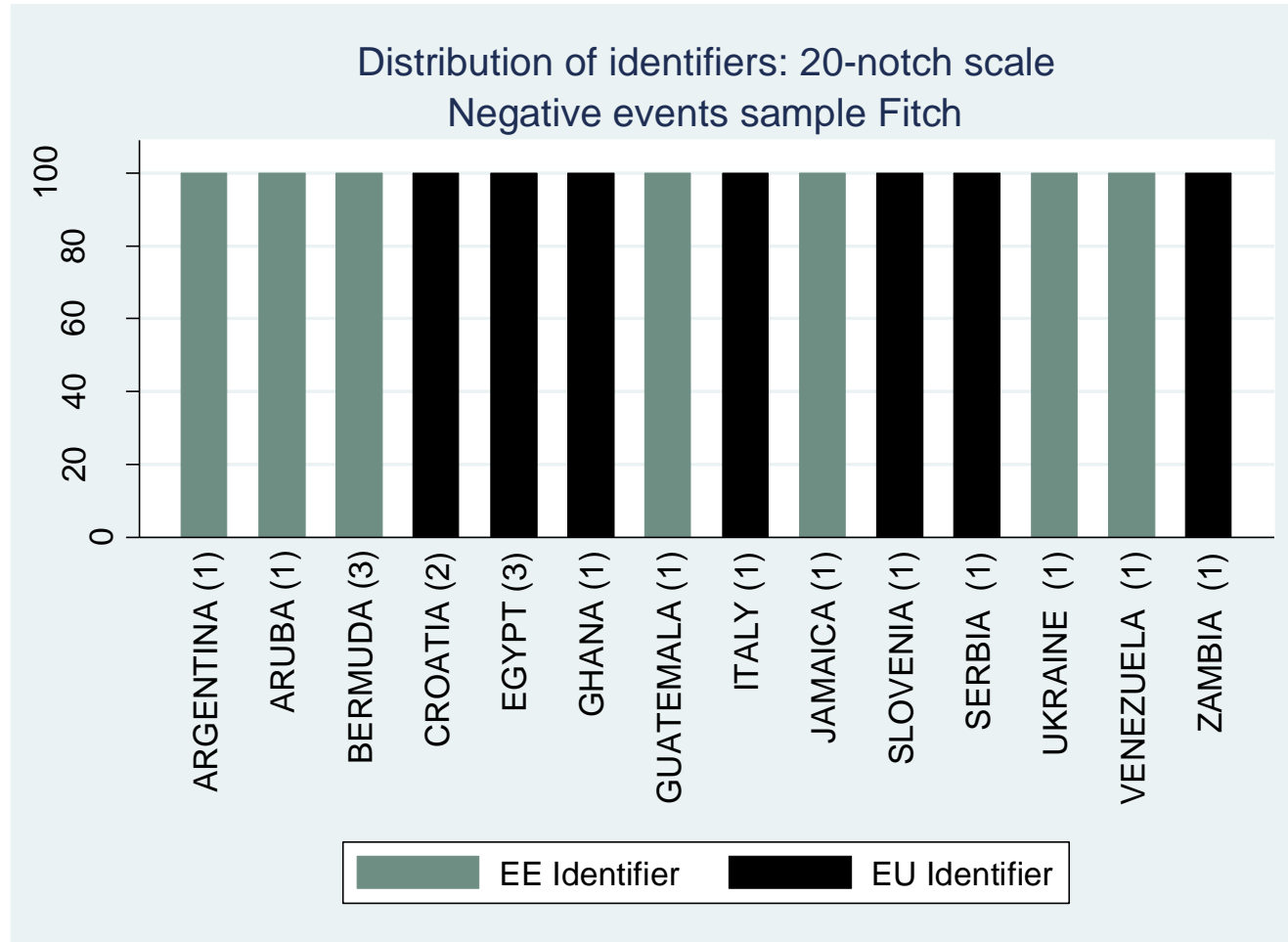


Figure 6.5 This graph presents the distribution of identifiers for Fitch in the negative events sample using 20-notch scale. Six sovereigns were dropped since their identifiers were equal to “0”²⁴² amounting to 31.57% of the sample observations/rating actions. The values in the brackets indicate number of rating events in the sample.

242. Bahrain, Belgium, Hungary, Mexico, Portugal and Vietnam.

Appendix 6.A Sample considerations

Table 6.A.1 Market share of CRAs

CRA	Market share	Rates corporates	Rates sovereigns
AM Best	0.72%	yes	no
CERVED Group	2.19%	yes	no
Creditreform Rating	0.53%	yes	no
DBRS	1.27%	yes	yes
Economist Intelligence	0.83%	no	yes
Feri EuroRating	0.67%	no	yes
Fitch	16.22%	yes	yes
ICAP	0.75%	yes	no
Moody's	34.53%	yes	yes
S&P	39.69%	yes	yes

Notes: This Table presents market share of major CRAs (exceeding 0.5%) in the EU (based on 2013 turnover generated by the CRAs registered in the EU) along with types of rated assets (as of December 2014) (ESMA, 2014c).

Table 6.A.2 Sample of included sovereigns

	S&P		Moody's		Fitch	
	Initial sample	Final sample	Initial sample	Final sample	Initial sample	Final sample
ARGENTINA	v	v	v	v	v	v
ARMENIA	x	x	v	x	v	x
ARUBA	v	v	x	x	v	v
AUSTRALIA	v	x	v	x	v	v
AUSTRIA	v	v	v	v	v	x
AZERBAIJAN	v	x	v	x	v	x
BAHAMAS	v	v	v	v	x	x
BAHRAIN	v	v	v	v	v	v
BARBADOS	v	v	v	v	x	x
BELARUS	v	v	v	v	x	x
BELGIUM	v	v	v	v	v	v
BERMUDA	v	v	v	v	v	v
BOLIVIA	v	v	v	x	v	v
BRAZIL	v	v	v	v	v	v
BULGARIA	v	v	v	v	v	v
CANADA	v	x	v	x	v	x
CHILE	v	v	v	x	v	v
CHINA	v	v	v	v	v	v
COLOMBIA	v	v	v	v	v	x
COSTA RICA	v	v	v	v	v	x
CROATIA	v	v	v	v	v	v
DENMARK	v	x	v	x	v	x
DOMINICAN REPB.	v	x	v	x	v	x
ECUADOR	v	v	v	v	v	v
EGYPT	v	v	v	v	v	v
EL SALVADOR	v	v	v	v	v	x
FIJI	v	v	v	v	x	x
FINLAND	v	v	v	x	v	x
GABON	v	v	x	x	v	v
GEORGIA	v	v	v	v	v	v
GHANA	v	v	x	x	v	v
GUATEMALA	v	v	x	x	v	v
HONDURAS	v	x	v	v	x	x
HUNGARY	v	v	v	v	v	v
ICELAND	v	v	v	v	v	v
INDONESIA	v	v	v	v	v	v
ISRAEL	v	v	v	x	v	v
ITALY	v	v	v	v	v	v
JAMAICA	v	v	v	v	v	v
JORDAN	v	v	v	v	x	x
KAZAKHSTAN	v	x	v	x	v	x

KENYA	v	x	x	x	v	x
LATVIA	v	v	v	v	v	v
LEBANON	v	v	v	v	v	v
LITHUANIA	v	v	v	v	v	v
MEXICO	v	v	v	v	v	v
MONGOLIA	v	v	v	v	v	v
MOROCCO	v	v	v	v	v	x
NAMIBIA	x	x	v	x	v	v
NETHERLANDS	v	x	v	x	v	x
NIGERIA	v	v	x	x	v	v
PAKISTAN	v	v	v	v	x	x
PANAMA	v	v	v	v	v	v
PARAGUAY	v	v	v	v	v	v
PERU	v	v	v	v	v	v
PHILIPPINES	v	v	v	v	v	v
POLAND	v	x	v	x	v	v
PORTUGAL	v	v	v	v	v	v
QATAR	v	v	v	x	x	x
ROMANIA	v	v	v	v	v	v
RUSSIA	v	v	v	v	v	v
RWANDA	v	v	x	x	v	x
SENEGAL	v	v	v	x	x	x
SLOVAKIA	v	v	v	v	v	x
SLOVENIA	v	v	x	x	v	v
SOUTH AFRICA	v	v	x	x	v	x
SOUTH KOREA	x	x	v	v	v	v
SPAIN	v	v	v	v	v	v
SRI LANKA	v	v	v	v	v	x
SWEDEN	v	x	v	x	v	x
SERBIA	v	v	x	x	v	v
TRINIDAD AND TOBAGO	v	v	v	x	x	x
TURKEY	v	v	v	v	v	v
TURKS & CAICOS	v	x	x	x	x	x
UKRAINE	v	v	v	v	v	v
UAE	x	x	v	x	x	x
URUGUAY	v	v	v	v	v	v
VENEZUELA	v	v	v	v	v	v
VIETNAM	v	v	v	v	v	v
ZAMBIA	v	v	x	x	v	v
	76	64	68	49	68	49

Notes: This Table presents the initial number of sovereigns for which rating information was available before the sample was merged with bond data versus the final dataset.

Table 6.A.3 Estimation of Equation 6.1(a)- Positive events S&P

VARIABLES	(I)	(II)	(III)	(IV)
Δ Rating	-3.0003*** (-3.63)	-3.4972*** (-4.17)	-3.0704*** (-3.38)	-3.7116*** (-4.03)
Regulation	0.2914 (0.16)	-3.3187 (-0.95)	0.9494 (0.35)	-1.1007 (-0.26)
Δ Rating*Regulation	2.2175* (1.74)	2.5259** (1.97)	2.0162 (1.47)	2.4944* (1.80)
Rating58	0.0793 (1.34)	0.0519 (0.86)	0.5142* (1.79)	0.4118 (1.32)
Maturity	0.9961 (0.98)	1.1963 (1.16)	1.1300 (0.50)	2.0182 (0.73)
CBOE VIX	30.5308*** (2.92)	28.2885*** (2.69)	25.0130** (2.12)	23.0378* (1.93)
Observations	229	229	229	229
R-squared	0.116	0.170	0.268	0.325
year fe	no	yes	no	yes
country fe	no	no	yes	yes

Notes: This Table presents the estimated coefficients and robust z-statistics in parentheses from specifications of Eq. (6.1a) using OLS. The credit rating dataset consists of daily pooled positive sovereign events by S&P in 58 CCR scale originating from 64 countries for pre-regulatory (Sept 2007-April 2012) and post-regulatory (May 2012-Sept 2014) periods. Outliers are excluded using the MM-robust regression method. For every event observation there is a randomly selected non-event observation. The dependent variable is $\Delta Yield$ which measures, in basis points, the changes in the window [0, +1] sovereign yield spreads towards the benchmark US bonds on a particular sovereign bond i on the event day t . The independent variables are explained in section 6.5.1. The global risk includes one of the three risk measures i.e. CBOE VIX volatility index. Year (country) fixed effects are included (“yes”), not included (“no”). Significant levels such that: *** p<1%, ** p<5%, * p<10%.

Table 6.A.4 Country classification for regional regressions

	Country	Region		Country	Region
1	ARGENTINA	Other	36	LATVIA	Europe
2	ARUBA	Other	37	LEBANON	Asia
3	AUSTRALIA	Other	38	LITHUANIA	Europe
4	AUSTRIA	Europe	39	MEXICO	Other
5	BAHAMAS	Other	40	MONGOLIA	Asia
6	BAHRAIN	Asia	41	MOROCCO	Other
7	BARBADOS	Other	42	NAMIBIA	Other
8	BELARUS	Europe	43	NIGERIA	Other
9	BELGIUM	Europe	44	PAKISTAN	Asia
10	BERMUDA	Other	45	PANAMA	Other
11	BOLIVIA	Other	46	PARAGUAY	Other
12	BRAZIL	Other	47	PERU	Other
13	BULGARIA	Europe	48	PHILIPPINES	Asia
14	CHILE	Other	49	POLAND	Europe
15	CHINA	Asia	50	PORTUGAL	Europe
16	COLOMBIA	Other	51	QATAR	Asia
17	COSTA RICA	Other	52	ROMANIA	Europe
18	CROATIA	Europe	53	RUSSIA	Europe
19	ECUADOR	Other	54	RWANDA	Other
20	EGYPT	Other	55	SENEGAL	Other
21	EL SALVADOR	Other	56	SERBIA	Europe
22	FIJI	Other	57	SLOVAKIA	Europe
23	FINLAND	Europe	58	SLOVENIA	Europe
24	GABON	Other	59	SOUTH AFRICA	Other
25	GEORGIA	Asia	60	SOUTH KOREA	Asia
26	GHANA	Other	61	SPAIN	Europe
27	GUATEMALA	Other	62	SRI LANKA	Asia
28	HONDURAS	Other	63	TRINIDAD AND TOBAGO	Other
29	HUNGARY	Europe	64	TURKEY	Europe
30	ICELAND	Europe	65	UKRAINE	Europe
31	INDONESIA	Asia	66	URUGUAY	Other
32	ISRAEL	Asia	67	VENEZUELA	Other
33	ITALY	Europe	68	VIETNAM	Asia
34	JAMAICA	Other	69	ZAMBIA	Other
35	JORDAN	Asia			

Notes: This Table presents the regional classification of sovereigns used in the Pooled regional regressions (section 6.7.2). The three groups are in line with the UN classification except Europe where Turkey is included. The sub-group “Other” comprises countries from areas/regions such as: Africa, Latin America & Caribbean, North America, Oceania and Sub-Saharan Africa.

Chapter 7: Thesis conclusions

The research presented here investigates the recent regulatory reform of the CRA industry, with a particular focus on Europe. The main chapters involve empirical examination of sovereign and bank ratings employing extensive datasets covering a wide cross-section of economies. Overall the Thesis utilises rating events, outlooks and watch status for up to 69 sovereigns and 147 banks covering period from 2006-2014. Inclusion of several CRAs enables a comprehensive analysis of the market and its reactions to the rules imposed since 2009 when the first formal CRA regulation was enacted in the EU.

Chapters 2 and 3 introduce the main principles of the CRA industry, explain the recent changes in the regulatory framework for CRAs in Europe and discuss the related empirical and theoretical literature concerning ratings. The unique contribution of this Thesis derives from Chapters 4, 5 and 6 which empirically test aspects of the recent regulatory interventions in the CRA market. The aim of these chapters is to seek answers to the question: “*Do the new regulations achieve their purpose or do they lead to unintended consequences?*” Additionally, each empirical topic examines more specific questions relating to particular aspects of legislation. Chapter 4 inquires whether “*the profitability and competitiveness of CRAs has been harmed by the increased transparency and disclosure requirements*”. Chapter 5 questions whether the “*conversion to sovereign unsolicited rating status (due to new disclosure rules) resulted in lower bank ratings*”. Chapter 6 investigates whether the “*introduction of ESMA identifiers changed the quality of ratings assigned by CRAs*”.

By answering these questions, the Thesis makes significant contributions to the literature on regulation and on credit ratings. For example, Chapter 4 presents a critical assessment of the legislation’s aim of reducing mechanistic reliance on ratings. No published research exists on this aspect. The study also provides a complete comparison of CRAs in two major jurisdictions: the US and Europe. Chapter 5 is the first study to expose the dynamics and stress the importance of sovereign solicitation status. Further, the chapter synthesises three themes in the literature (unsolicited ratings, sovereign-bank ceiling and regulation) which meaningfully overlap and have not been investigated together before. Chapter 6 adds a new angle to the literature on regulating CRAs and the quality of ratings. Significant novelty stems from the investigation of ESMA identifiers which have not received any attention whatsoever in the prior literature.

The first empirical topic (Chapter 4) adds to the debate on the formal regulation aspect of CRAs in Europe since 2010. The chapter contributes to knowledge in several ways. Firstly, it offers

a critical appraisal of the recent regulatory efforts aimed at reducing reliance on ratings realised through increased transparency requirements which did not receive much attention in the empirical literature (except Alsakka et al., 2015). Secondly, novelty derives from linking human capital and analyst coverage literature to explain the externalities of regulation. The chapter stresses the importance of rating analysts and shows that transparency requirements might lead to pressures on CRAs with regards to staffing. This has cost implications and might lead to reduced profitability in the long run. On the other hand, the effectiveness of the rating process might improve as a result of employing an increased number of analysts. Further, the chapter complements studies investigating regulations in the US and compares the US regulatory efforts to those of the European authorities. Additionally, the study covers a large set of CRAs operating in both jurisdictions. Finally, the chapter offers a critical discussion of the measures introduced and suggests some reconsideration of policy.

Although the concentration index (HHI) does not change dramatically, it shows a negative shift after 2011 when regulation in Europe was in its ‘Implementation Phase’ (for the chronology of events, see Chapter 2). In terms of profitability measures, the results are mixed. S&P recorded the biggest drop in profitability since the regulation was in place. This is partly due to the regulatory penalties and restructuring costs this CRA faced in 2013-2014. Fitch demonstrates most volatility with respect to the Ratings to Analysts (R/A) ratio defined in this chapter. The ratio compares the number of analysts with the issuance of ratings across years. The measure tests whether the costs of the CRA increased as a result of staffing needs arising due to growing number of ratings²⁴³ or increased due to regulatory pressures (i.e. need to employ more analysts for transparency purposes).

Further, the chapter offers a discussion of the recent regulatory actions in terms of their objectivity, practicality and reliability. For example, it finds that some of the assumptions and perceived flaws of the CRA system were based on subjective opinions and lacked underlying evidence. Many inconsistencies in the reporting styles across CRAs were also found. This lack of standardisation made it very difficult to compare the findings and restricts the scope for recommendations. Specifically, some CRAs have been reporting amounts of outstanding issuer ratings whereas other CRAs recorded issue ratings when submitting to the SEC annual reports. This sheds light on the lack of robust and explicit requirements in the regulation, which then gives scope for interpretation on the side of CRAs. Compliance by CRAs has also raised doubts

243. The number of ratings depends on (a) issuers’ demand (i.e. debt issuance) and (b) unsolicited ratings.

in a couple of instances (i.e. solicitation status disclosures, identifiers). Another aspect under review is the suggestion of commentators to introduce the *investor-pays* model as an ultimate solution to conflict of interest problems. The chapter sheds light on the recent scandal relating to the only CRA working under this paradigm (EJR); while identifying possible drawbacks of the model and suggesting reconsideration of this option. Fines and penalties also attract some attention as the only CRA from the big three which has been penalised (with respect to structured finance products) is S&P. Nevertheless, it is known that all three big CRAs contributed towards deteriorating economic conditions by failing to adequately evaluate the creditworthiness of structured finance instruments. For this reason it would be interesting to follow the actions of the regulators in the coming years to see if similar penalties will be imposed on the other two CRAs (Fitch and Moody's). The length of these processes leads to another question about the effectiveness of regulatory oversight and enforcement.

This chapter has strong economic significance because it draws policy implications from the empirical evidence. The presented issues contribute on different levels and have strong potential to inform future policy and are additionally of importance to market practitioners and academics.

Chapter 5 presents unique evidence on the impact of the solicitation status of sovereigns on bank ratings, with the effect being transmitted via the rating channel. The study generates a synergy across three streams of literature which have not been studied together in prior literature. Firstly, the chapter reveals the importance of the solicitation status of sovereigns. The literature suggests that ratings of banks and corporations which are based on an unsolicited basis are considerably lower than those requested and paid for by the issuer (solicited) (e.g. Poon et al., 2009; Bannier et al., 2010; Van Roy, 2013), but there is no literature examining this phenomenon for sovereigns. The latter ratings are important for governments and economies because they influence the cost of funding for non-sovereigns. The second literature stream suggests that sovereign risks spill over to financial institutions through numerous channels (BIS, 2011; De Bruyckere et al., 2013; Correa et al., 2014). In line with Alsakka et al. (2014) and Huang and Shen (2015), it is hypothesised that the risk transfers onto banks via the rating channel. Therefore it is important to investigate whether the solicitation status increases that risk. Lastly, the chapter brings together the impact of the EU regulation in terms of disclosures by CRAs. There is no published work except Alsakka et al. (2015) which considers the effects of disclosure rules imposed by ESMA. There is no other prior empirical paper investigating regulatory actions on CRAs in Europe.

The chapter uses 147 banks originating from 42 countries for the period between 2006-2013. The methodology includes ordered probit modelling, with numerous robustness checks applied such as placebo tests, matching on covariate level and use of the propensity score matching (PSM). Strenuous attempts are made to ensure that endogeneity does not drive the results and to rule out the possibility that other events caused the given effects on bank ratings. In addition, the reverse regressions are estimated.

The results suggest that the application of the unsolicited status to sovereigns adversely affects bank ratings operating in those countries via the rating channel. Specifically, banks in sovereigns which converted their status face a higher likelihood of downgrades and a lower likelihood of upgrades in comparison to banks in countries which did not undergo the switch of solicitation status and remained solicited at all times. Among the theories explaining the deflated unsolicited ratings, strategic conservatism is the most likely to be reconciled with these findings. The CRA might prefer to rate too low rather than too high as it receives less information about the issuer after the solicitation switch.

The marginal effects (MEs) imply that banks in the first group are 1.73%, 0.74% and 0.47% more likely to receive downgrades by 1, 2 and 3 or more CCR points respectively. The strength of the relationship is especially highlighted when the significance of MEs is considered against the total number of sovereign and bank rating downgrades (i.e. 2.73% and 3.28% respectively).

The chapter proposes strong implications for future policies and regulations and stresses the importance of unsolicited sovereign ratings. The economic significance is relevant to market participants since the regulation might induce additional costs to banks and other firms in obtaining capital. Such unintended effects of disclosure need greater attention in the future. Also the issue of unsolicited sovereign ratings needs to be revisited by policymakers as their implications are discernible.

Chapter 6 examines whether the ESMA requirement for rating identifiers to be introduced in April 2012 affected the quality of ratings reported by CRAs. By investigating the influence of the location of the analyst on the quality of ratings, the chapter contributes towards the stream of literature measuring the impact of CRA regulation (Kisgen and Strahan, 2010; Becker and Milbourn, 2011; Bongaerts et al., 2012). This chapter is different from those studies because it does not consider the effect of regulation on the competitiveness of CRAs. Additionally, this is the first study investigating disclosure rules via the channel of identifiers. The regulation requires that CRAs report which ratings are issued by analysts/offices located in the EU and

which are issued outside the EU (which can be either ‘endorsed’ or ‘not endorsed’ dependent on the EU deeming the CRA regulation in that jurisdiction to be sufficiently rigorous). It is important to measure the effect of identifiers as it is perceived that endorsement rules can add credibility to the CRAs’ opinions and thus result in an increase rather than decrease in their market influence. Studying the sovereign ratings also has an impact for the future policies and market participants alike since it affects the sources of funding for nations and therefore the economies as a whole. For this reason ensuring that ratings are of the highest possible quality is of importance to all market participants.

By including the regulation aspect in the discussion, the chapter complements earlier studies on the information content of ratings which pursue different angles (Kisgen and Strahan, 2010; Bongaerts et al., 2012). This chapter utilises a more recent sample period (Sept 2007- Sept 2014) than other papers. In comparison, Bongaerts et al. (2012) is based on data between 2002-2008 while Kisgen and Strahan (2010) between 2001-2005. The chapter also contributes by implementing analysis of the sovereign ratings issued by the big three CRAs for 69 countries. The applied methodology, which uses the intensification of the treatment, is also unique as it has not been used in this setting before. Finally, the chapter reveals some important issues which add to the discussion of the effectiveness of the EU CRA regulation. This policy aspect is of importance to regulators (ESMA in particular), market participants and academics because it aims at improving the functioning of the CRA market, protecting investors and contributing to overall financial stability.

The results suggest that rating events mainly concentrate at 1 and 2 CCR points which indicate the importance of outlook and watch announcements. The chapter confirms earlier studies finding S&P to be the most conservative amongst the three CRAs for sovereign ratings (e.g. Alsakka and ap Gwilym, 2010c). The upgrades by S&P are found to have a stronger effect on sovereign yields than negative events. Since higher quality ratings explain the bond values better by correlating more closely, it is inferred that positive actions by S&P are of higher quality than the negative actions. This could be explained by the fact that CRAs aim to avoid inflated ratings in order to protect their reputation (Dimitrov et al., 2015). The results do not find any discernible effect of the ESMA identifiers on the quality of released ratings. The same applies to Moody’s which yields insignificant results for all its coefficients except one control variable. In the Fitch subsample, a strong correlation between negative events and bond yields is found, which indicates a high quality of these ratings. This effect is not induced by regulation since only two specifications record significant results (at the 10% level) for the interaction

between identifiers and the rating change. Except for these cases, Fitch actions do not suggest any link between the identifiers and rating quality.

To ensure the results are robust, a number of tests follow the estimation. The sample is split into regions and pooled regressions of three CRAs are performed. Also, a different scale for rating events is introduced to examine whether the results are sensitive to the watch and outlook status announcements.

The research direction in this Thesis is new and original. It therefore deserves more attention from academics. It is also of relevance to regulators, market participants and CRAs themselves. Although the empirical work uses various methods and was supplemented by robustness tests, there are some limitations to this research. For example, in Chapter 4 there is no global data on the number of analysts and outstanding ratings available for 2014 and 2015 from the SEC reports. Also, the reporting style of CRAs is not standardised (issuer vs issue ratings) and impedes intra-CRA comparisons. The ESMA transparency reports also suffer from standardisation issues while their time series is relatively short to conduct any type of more detailed analysis. Chapter 5 is restricted to analysis solely on S&P ratings which results from a failure in the new disclosure rules. Namely, solicitation status data was not available for other CRAs at the time when the study was conducted. Also, S&P is the only CRA to have publicly announced changes in the solicitation status induced by regulation. The limitation of Chapter 6 is the fact that the time-series is only able to cover 2 years after the identifiers regulation was introduced.

Since this is a ground-breaking research in the area of ratings and regulation, future research on the current efforts of ESMA's CRA supervision is an interesting direction for investigation. Additionally, it would be interesting to investigate what determines the fact that the sovereign rating is solicited or not, in the context of Chapter 5. What is the role of governments in that process in terms of selecting to have solicited ratings? Utilising a theoretical model similar to the one suggested by Opp et al. (2013) would be a valuable future extension to the ideas in Chapter 6.

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