Stock Market Impact of Sovereign Credit Rating Announcements: The Case of GIIPS and BRIC countries during the European Sovereign Debt Crisis of 2009-2013

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Abstract

In this study, we analyse the effects of sovereign credit rating reviews on national stock market performances in GIIPS and BRIC countries during the European Sovereign Debt Crisis of 2009-2013. Through an event study, we test the Null Hypothesis that cumulative abnormal returns on national stock market indices are zero and find that sovereign debt downgrades produce negative cumulative abnormal returns for GIIPS countries, the effect being larger for small economies compared to big economies. Negative reviews are found to have more impact than actual downgrades; positive reviews are not proven to be of influence in this study. Furthermore, we find that S&P's announcements carry more weight in the stock markets than competing Credit Rating Agencies. The analysis also shows an evolution of the Credit Rating Agencies' impact throughout the crisis, with decreasing effects towards the second half of the period of interest.

Key Words: Sovereign Credit Rating, Cumulative Abnormal Return, GIIPS, BRIC, Credit Rating Agency

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I. Introduction

The "Big Three" rating agencies (Standard and Poor's, Moody's and Fitch) play an essential role in the modern financial system, providing information to key players in the market and building a common point of reference for the risk assessment of different financial instruments. This central positioning of the agencies has exposed them to heavy criticism; in particular it has been argued that credit ratings played a key role in the build-up of excessive credit risk in the financial system in the years leading up to the 2008 financial crisis (Becker, 2011) as well as the recent sovereign debt crisis in Europe (Host, Cvečić and Zaninović, 2012).

Following the over-optimistic ratings of risky mortgage-related securities that led to the collapse of the US housing market and the bankruptcy of Lehman Brothers in 2008, regulatory authorities started to question their reliance on credit ratings and the rating agencies suffered a notable loss in credibility amongst investors and with the public. Since 2010, agencies set their focus on European sovereign credit solvency and Standard & Poor's stripped the United States of its triple-A rating for the first time in 2011. The Greek, Irish and Portuguese sovereign credit ratings were demoted to "junk" grade and more recently, nine Eurozone countries were demoted, with both France and Austria stripped of their triple-A ratings. The ensuing sell-offs of global assets and increase in market volatility sparked hostility amongst politicians and regulators against the rating agencies that were then blamed for worsening the current recession.

This thesis aims at revealing whether allegations against credit rating agencies exacerbating the crisis are justified and, in particular, we look at whether stock market returns for selected countries are affected by sovereign rating changes. Because they carry information on the state of the economy and macroeconomic developments within a country, credit rating announcements should affect investor decisions if markets are efficient and if the ratings are deemed to carry new and relevant information. The efficiency of stock markets in dealing with new information should serve as a good indicator of investor reactivity to credit rating announcements and as such should help measure the credit rating agencies' impact on financial markets and credibility.

To assess whether rating announcements do in fact carry new information and have an impact on national stock market performance, the cumulative abnormal returns (CARs) of national

stock indices will be calculated. The presence of abnormal returns should signal new information and the reaction of the market to it. The direction of the cumulative abnormal returns should be indicative of the news announced: we expect a decrease for negative news and a rise for positive news.

Signs of anticipation will also be scrutinised and identified by unexpected movements in cumulative abnormal returns in the days before an announcement. It is also expected that rating reviews will have a higher impact on markets that suffer from lack of transparency (i.e. where ratings do bring unaccounted-for news to the marketplace).

This paper is constructed as follows: Section I consists of the literature review, a summary of the history of Credit Rating Agencies (CRAs), their rating scale and the parameters used to estimate them, a discussion on the recent scandal concerning their role and implication in the 2007 financial crisis, a definition and understanding of the Sovereign credit notes (the debt instrument of concern in this thesis) as well as the differences in grading and possible effects of investment-grade and speculative-grade instruments. The last element of the literature review will focus on previous research on the matter, findings and limitations as well as the motivation behind our research topic. In section II, the underlying data will be presented and described. Next, in section III, we outline the methodology used in terms of event definition, Cumulative Abnormal Return computation using a Single-Index Market Model, and issues faced with regards to the data, the model and the testing process. Section IV consists of the presentation of the results, separated into seven categories: a) anticipation and stabilisation effects, b) GIIPS versus BRIC countries, c) the impact of the rating agencies, d) the nature of the event, e) the magnitude of the credit rating announcement, f) the effect on small versus big economies, g) the year of downgrade and h) the statistical significance of results. Finally, section V concludes the paper and presents limitations and suggestions as to further research on the matter.

II. Literature Review

In order to fund their daily operations, companies need to raise funds. This can be done in two ways: raising equity or issuing debt securities. While equity is priced according to the market, debt is priced in a more ambiguous manner. Indeed, debt securities consist of, amongst others, bonds (corporate, government) or securitised obligations (collaterised debt obligations, mortgage-backed securities) (Carbó-Valverde et al, 2012). While debt issuance is deemed to be a cheaper method of obtaining financing than issuing equity, due to the costs associated with Initial Public Offerings (IPOs) (Hovakimian et al, 2001), debt securities vary in terms of their construction and the capital used to back them up, which makes their evaluation relatively complicated (Gande et al, 1997).

An important factor in pricing debt is assessing its risk of default. Default refers to either the impossibility or unwillingness to pay interest rates or principal payments, or to the breach of loan covenants embedded in a debt contract (Sullivan et al, 2003). Loan covenants are clauses in the debt contract stating conditions to be fulfilled and/or prohibitions of pre-defined actions. As debt holders are senior in the case of bankruptcy or bond issuer default, it is essential they know the probability of losing their investment when buying a debt security, and how much they can hope to collect as a settlement should the default occur (Hovakimian et al, 2001). This is the crucial stage in which Credit Rating Agencies (CRAs) are important: by issuing credit ratings that assess the default probability of a bond, CRAs become essential "market providers of information helpful to investors worldwide" (Alessi et al, 2013).

In this literature review, we will first look at the history and players in the credit rating field. Secondly, an examination of the rating estimation and the different ratings issued will be discussed from the CRA reports and research on the matter. Thirdly, a discussion on the recent scandal relating to the exactitude of CRA ratings will be analysed. Next follows a description of the credit rating of importance in this paper, sovereign credit ratings, with a comparison to corporate credit ratings and mention of their specificities, as well their role during the crisis. As a fifth section, the differences in bond investment categories (investment- and speculative-grade) and their effect on stock markets will be explained. In the following section, previous research on the influence of sovereign rating changes on stock market performance will be exposed. Lastly, the purpose of our study will be motivated, as well as the reasoning behind our assumptions.

2.1 History and players

Credit rating has originated in the late 19th century, with prevalent companies such as Standard & Poor's (S&P's) and Moody's. These firms operated on a "subscriber-fee" model where CRAs would issue ratings reports and distribute them to subscribed investors on a "non-public, proprietary basis" (Darcy, 2010). While this system seemed to work in the past, the technological progress has rendered the model obsolete - it has become harder to protect copyright (printing, scanning and photocopying being readily available and hard to control) and the rise in institutional investors (hedge funds, mutual funds, insurance companies and the like) require more numerous credit assessments of companies. The "subscriber-fee" model has thus been replaced by an "issuer-fee pays" model – companies issuing debt pay a fee to one or several CRAs of their choice in order to obtain a rating on their debt that is then freely available to the entire market worldwide (Kettering, 2008). Although this system has been greatly beneficial for market efficiency purposes, it has nonetheless been deemed as flawed in recent years due to the "natural tension between the interest of subscribers versus the interests of issuers" (Darcy, 2010). A third model under discussion is the "government utility model", where a rating organisation is run or directed by a government; however its complexity and costly implementation renders the model unrealistic (Sweeney, 2009).

Three major CRA agencies (also known as "The Big Three"), Standard & Poor's, Moody's and Fitch essentially share around 95% of the ratings market (Hill, 2004). S&P's and Moody's are the major players with a combined market share of around 80% (The Economist, 2007), while Fitch has around 13% (Alessi et al, 2013). Fitch has benefited from a noticeable growth, seeing its recent arrival in the Credit Rating market in the mid-1970s (Fitch Ratings website). These companies issue an "opinion on the general creditworthiness of an obligor, or the creditworthiness of an obligor with respect to a particular debt security or other financial obligation" (S&P's website). The rating of debt is an essential process in obtaining finance – it determines the risk of default of a purchased bond, through which the interest rates and purchase prices can be derived. From theoretical research on behavioural finance, when the risk acquired from the purchase of a bond is high, investor risk aversion calls for a demand for higher compensation (Cox et al, 1985), increasing the cost of debt for a debt issuer.

2.2 Structure of Credit Ratings

The ratings are measured along a methodology and published along a scale expressing the level of risk that varies from one CRA to the next – usually an alphabetical scale starting

from ‘AAA’ or ‘Aaa’ for the safest investments to ‘D’ or ‘C’ for default ones. In addition to ratings, CRAs publish CreditWatches and Outlooks on investments which aim to anticipate events and trends that could influence a country’s fundamentals. CreditWatches announce a possibility for revision to an actual rating in the short term horizon (within 90 days) with a probability of 0.5 (S&P’s Sovereign Credit Weathervane, 2013). Outlooks have the same function, but for longer horizons – 6+ months - accompanied by an indication of the direction in which the rating revision would go: “developing”, “stable”, “positive” and negative” (Fitch website), and with probability of rating change of 1/3 (S&P’s Sovereign Credit Weathervane, 2013). The time horizon for Outlooks and CreditWatches to concretise into rating changes differs whether the debt under review is investment-grade or speculative-grade – longer for investment-grade but with higher probability of occurrence (S&P’s Sovereign Credit Weathervane, 2013).

The determination of ratings and the process behind their calculation can be readily obtained from any of The Big Threes. The information they use to derive the ratings is mostly publicly available information. The determinants of sovereign ratings are economical, social and political factors, not always quantifiable. The 5 key factors used by credit rating agencies to design sovereign credit analysis are, according to S&P’s RatingsDirect (2013), Institutional and Governance Effectiveness score (security risks), Economic score (structure and growth prospects), External score (external liquidity and international investment position), Fiscal score (fiscal performance and flexibility, debt burden) and Monetary score (monetary flexibility). On a six-point scale, each factor is assigned a score, the combination of which leads to a raise or decrease of the current rating by one or several notches. S&P’s also mentions that foreign-currency ratings are usually issued in foreign-currency as “local-currency creditworthiness can be controlled locally by the government” through regulations and legislations for example. This distinction is not applicable to countries that are members of the European Union, benefiting from a monetary union, as their local-currency is the same as their foreign-currency (S&P’s RatingsDirect, 2013). Below, Table 1 illustrates the formation of a rating opinion according to the aforementioned key factors.

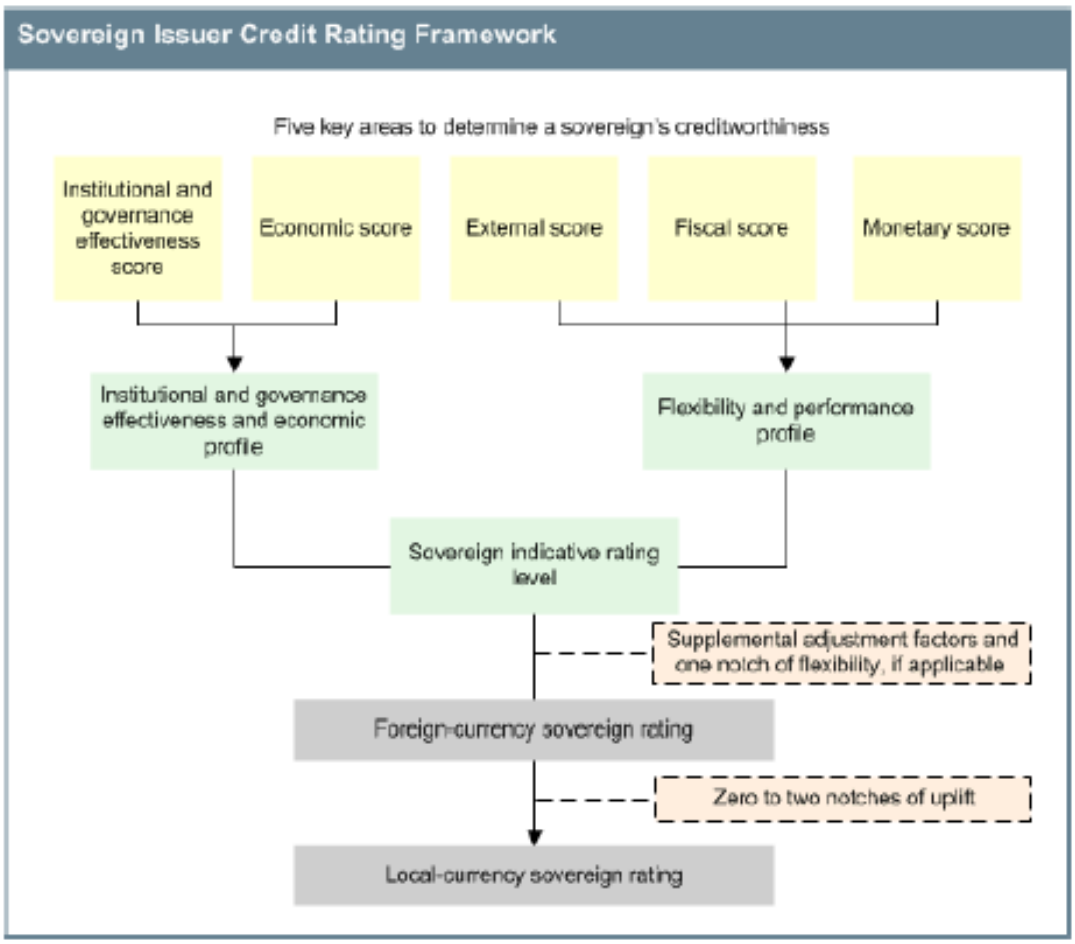


Figure 1: S&P's Sovereign Government Rating Methodology and Assumptions, 2013

Nonetheless, there exists complementary research on the determinants of ratings – as discussed by Cantor and Packer (1996), who find eight determinants of sovereign ratings: per capita income, inflation, external balance, external debt, economic development, default history, fiscal balance and GDP growth (the last two suffer from endogeneity and have less influence). The authors create a regression using these 8 variables and find that they explain 90% of sample variation. A credit rating announcement can thus be seen as an informed opinion on the aggregate macroeconomic standing of a given country. Another finding is the correlation of rating and yields: a single rating variation explains 92% of the variation in spreads, but there is lack of evidence that ratings directly influence yields as it could be the coincidence of investors and CRAs sharing the same opinion on publicly available information. Furthermore, sovereign bonds rated below the A-level have higher spreads than US corporate securities of comparable rating. Cantor and Packer (1996) believe the difference in spreads shows more pessimism from credit markets than CRAs with regards to sovereign credit risks – probably linked to the sovereign "principle of immunity", explained

further below. When they regress these spreads against the 8 variables used to predict credit ratings (mentioned above), they find an 86% fit – a signal that ratings appear to "provide additional information beyond that contained in standard macroeconomic country statistics incorporated in market yields" (Cantor and Packer, 1996). In other words, ratings contain information not available publicly. Therefore, a change in the rating of a sovereign should indeed send a significant signal to the markets, with a potential observable impact on equity markets.

As mentioned above, credit ratings are primordial in the financial world as a measure for relative risk and creditworthiness, and are widely used by investors (from issuers, investment brokers, broker-dealers to governments) (Sweeney, 2009). They provide investors with an independent view of creditworthiness, following six requirements: transparency and efficiency of markets, freedom from conflicts of interest, high-quality ratings issued, coverage of a wide range of securities to facilitate access to capital, ongoing scrutiny and freedom to choose ratings from multiple sources (Sweeney, 2009). The accuracy of credit ratings allows for an increase in the range of investment alternatives – indeed, by spreading information in an understandable scale, they create a more efficient marketplace by lowering borrowing and lending costs for both borrowers and lenders. Also, it allows for stronger growth as it enhances the total supply of risk capital in an economy by opening capital markets to borrowers – such as small governments, start-ups, hospitals and universities – to whom it might otherwise be inaccessible (Sinclair, 2005). Ratings open up markets as investors will rarely purchase unrated bonds and if they do, these bonds may be priced too low in relation to their "real" risk (West, 1997). In structured finance, issuers require some approval for the structure of the products issued and ratings are essential to define loan agreements as well as the amount of capital to hold in the face of the risk taken on by investing in structured products. CRAs have thus had a key role by issuing top ratings on structured products that were, as is written in the Financial Crisis Enquiry Report of 2011, "harder to understand and to price than individual loans" due to the lack of transparency linked to the fundamentals underlying the securities. These top ratings have since come into question, following the 2008 financial crisis and the default of those premium-rated products.

2.3 The Credit Rating Agencies and the Financial Crisis

The Big Three have benefited from great power as well as great profits (50% operating margin for Moody's), and their ratings issued have been widely recognised and

used. However, the recent 2008 financial crisis has brewed some disbelief and doubts in their assessment as well as business model.

As mentioned previously, credit rating agencies have suffered from criticism in recent years with regards to conflicts of interest, lack of expertise, poor macro projections and slow updates which have lead to demands for policy reforms in the area of info sharing and transparency, and reduction of regulatory reliance on third party credit ratings (Becker, 2011). Nonetheless, CRAs have proved to be "providers of stability and avoiders of excessive swings by being slow" (Becker 2011) in changing ratings. Due to this lag in ratings, credit ratings are less representative of the risks linked to macroeconomic fluctuations but are still useful for controlling credit risks. According to Becker (2011), sovereign ratings played no role in the financial crisis, as they are "less important because they transmit little information to financial markets, [they are] only necessary for effect on regulated institutions".

Since the crisis and the misleading ratings issued on structured finance instruments, governments are more concerned with their interdependence on CRA ratings, as ratings are often embedded in regulation, such as the Basel regulations and Solvency regulations (Nouy, 2012). Because of this reliance on ratings in regulation, the impacts of the crisis have had destructive consequences for nations, be it contagion among banks worldwide and their necessary bail-outs, but also downgrades of many notches of countries (Greece, Spain etc). However, there is growing awareness that countries over-rely on ratings and that they have suffered from a "lack of competence and ability of regulation to follow-up" (Becker 2011) on this financial innovation. The holding of sovereign debt is highly encouraged in countries and counts as part of the capital requirement since it is considered one of the safest investments (risk-free investment) (Nouy, 2012). The reduction of the use of ratings in regulation is an active discussion, which might make sovereign ratings less useful in the future since it causes an admittance of severance between the quality of ratings and the investor demand for ratings (Nouy, 2012). Nevertheless, despite the criticism CRAs face and while alternatives to ratings could be used (market prices, CDS spreads, issuer track records), ratings provide an undeniable advantage in terms of information sharing (as they share the data and information underlying their ratings) and will most surely continue to be used as reference in financial markets.

The failures of CRAs mentioned in the 2011 SEC Financial Crisis Enquiry report are the "failure to downgrade promptly" (lag in ratings) as shown in the Enron case, an "incestuous

relationship with issuers" due to investment-grade restrictions of funds, "unwillingness to spend on human resources despite high margins", the "self-fulfilling prophecy of downgrades" (higher interest rates, adverse effects on contracts, decrease in credit worthiness, "rating triggers", "death spiral") and the industry concentration of The Big Three (holding 95% of all credit ratings). This self-fulfilling prophecy, in addition to suspicions of a conflict of interest in assigning sovereign ratings because of the accusation against CRAs about being overly critical in their assessment of governments to avoid stricter regulation (IOSCO Code of Conduct), has been put forward in the case of sovereign debt downgrades (Greece, Spain).

In contradiction, empirical studies have shown increasing yield spreads of bonds preceding rating downgrades and cast doubt on the information value of credit ratings (Kaminsky et al, 2002). Because of this, there have been strong suggestions for financial regulation to require credit spreads as a reliable measure when calculating portfolio risk, over credit ratings (SEC Financial Crisis Enquiry Report).

2.4 Sovereign Credit Ratings

Like other credit ratings, sovereign ratings are assessments of the relative likelihood that a borrower will default on its obligations (Cantor et al 1996), whose reliance on ratings is similar to corporate issuers (Becker, 2011). They are traded on a secondary liquid market, but differ from corporate bonds in the sense that they supposedly "transmit little information to markets" (Becker, 2011), as they "lag prices and publicly available indicators" (Mora, 2006). According to Mora (2006), it is therefore "unlikely that ratings transmit much information or move [stock prices] much". For a map of issued sovereign ratings, refer to Appendix 1. Unlike corporate bond default, government bonds differ in the sense that there are more uncertainties in investing in them. Firstly, there is the "principle of immunity" (Borensztein and Panizza, 2010) in which sovereign bondholders suffer from the lack of supreme legal authority to turn to for enforcing debt contracts - as illustrated by Ecuador's numerous defaults on their foreign-currency bonds (Porzecanski, 2010). From a country perspective, country default would be cheaper than paying back debt, as they do not suffer from legal consequences, however they would suffer from the "four costs of default" (Borensztein, 2010): loss of reputation, reduction to trade, costs to domestic economy and political costs (Inter-American Development Bank, 2006). Secondly, assets are difficult to identify or to seize by investors in case of default – they are ill-defined and inaccessible (Borensztein,

2010). These uncertainty elements have, during the crisis, caused added distress to financial markets – the effect which we will attempt to identify in this paper.

Nonetheless, ratings have been blamed for exacerbating the 2009-2013 European sovereign debt crisis by creating a "self-fulfilling" prophecy in downgrading countries' bonds such as was the case for Greece (Gärtner et al, 2012). Indeed, the authors blame downgrades of investments to below investment-grade for causing the more expensive procurement of further investments and thus setting the motion for a more probable default. However, Becker (2011) also argues this could have also been caused by rating-based regulation, as "rating-based capital requirements prolonged unrealistic book values of bank holdings". With regards to regulators, Langohr and Langohr (2010) argue that credit ratings have been "woven into everything from allowable alternatives for many investors to required capital for most global banking firms". The Basel II agreements in particular, with the aim to increase objectivity, independence and transparency in the banking sector, state that credit ratings from approved CRAs can be utilised by banks to calculate their net capital reserve requirements (Kashyap et al, 2003). More precisely, higher rated securities such as government bonds - the debt instruments of interest in this paper - are deemed less risky and thus require smaller reserves to protect against a "run on the bank". However, should these bonds lower in credit rating (i.e. are assessed as riskier), the calculation of the capital reserves would be erroneous and could have dramatic rebalancing consequences for banks and corporations.

2.5 Investment-grade and Speculative-grade

In recent years, portfolio management groups have risen in popularity and become of increased importance in the finance arena (Brunnermeier, 2008). These groups, such as Hedge Funds, Mutual Funds and Insurance companies to name a few, have had their toll on the rating industry. As Brunnermeier (2008) explains, these institutional investors are required by policy to hold investments above speculative-grade (i.e. above BB), thus hold only investment-grade assets. The down- or upgrade of a rating below or above investment grade proves therefore to be crucial for the survival of a debt instrument. The same applies for sovereign ratings – the movement above or below investment-grade can be decisive in the demand for such a bond and then indirectly affect a national's stock market. Authors such as Aizenmaier, Binici and Hutchinson demonstrate in their 2013 study the rise of a non-linear shift from pre-crisis and crisis between the GIIPS and other EU groupings, dependent on the level of credit rating. Additionally, the authors find presence of high sensitivity at low-end of credit ratings due to the U-shape pattern in Credit Default Swap (CDS) spread versus rating

level, which is insensitive for low end and very high end of credit levels, but very sensitive at the cut-off level for investment-grade bonds. The U-shape suggests that there is a cut-off point at which investors would become very sensitive to changes in ratings – the border between an investment being categorised as investment-grade or speculative-grade. Thanks to this finding, it is reasonable to assume that changes in ratings that would imply a movement from one category to another may have higher effects on stock market returns than simple changes in ratings within an investment category.

2.6 Importance and influence on countries

From Cantor and Packer's (1996) research, it was proven that CRAs are valuable in pricing debt as they appear to provide precious information about speculative-grade sovereigns that are unavailable to the public. Building on this research, many others such as Larraín et al (1997), Reisen and von Maztlan (1999) and Kaminsky and Schmukler (2002) have examined the impact of rating changes, finding impacts on emerging markets and cross-country contagion of sovereign debt rating and outlook announcements. These are stronger in periods of crisis in non-transparent economies and their neighbouring countries, contributing to instability in emerging financial markets (Masson, 1998). Ratings issued always seem to "reveal new information, particularly in the case of emerging markets" (Kaminsky et al, 2002), which suffer from transparency and asymmetric information issues indicating the valuable information provided by rating agencies in information-lacking countries. Also, according to Kaminsky and Schmukler (2002) ratings can act as "wake-up calls for other, similar economies".

For nations that have a rating circling the investment-grade threshold, re-evaluations of their ratings can be quite dramatic as it changes the investor pool. This is where the Sovereign Debt Ceiling Doctrine comes into play – "the rating assigned to non-sovereign debt issues (or issuers) is the same as or lower than the rating assigned to the sovereign of the country of domicile" (Ferreira and Gama, 2007). As the government is the senior claimant on a country's debt and it being considered the safest institution of the nation in question, it is often impossible for the private sector to obtain more advantageous terms on borrowing than their government. The reason behind this can be explained with the Treasury bond rate. Usually the Treasury bond is used as indicator of the risk-free rate, since the government should be the representation of the "safest" entity in a country (Hull, Predescu and White, 2004). If a sovereign undergoes a downgrade on its debt, this subsequently implies a higher interest rate, i.e. higher risk-free rate, which increases the cost of debt for companies within

the country. Deducting from this Sovereign Debt Ceiling Doctrine, a downgrade in a country's sovereign debt could mean a downgrade in all debt instruments in that country as it would be more costly to issue debt and thus an "isolation of that country from international capital markets" (Kaminsky, Schmukler, 2002)

Regarding spill-over contagion, Kaminsky and Schmukler (2002) assert that co-movement and financial instability can be large and magnified by CRA rating. Eichengreen and Mody (1998) and Herrera and Perry (2000) discuss "economic vulnerability" and economic links between countries as triggers for large domestic reactions to international events. This economic fragility is usually included in the ratings. Two spill-over effects are pinpointed in Kaminsky et al's (2002) paper: cross-country (e.g. effect of the Russian default on industrial and developing economies) and cross-asset (e.g. increase of taxes by the government on firms to balance the higher interest rate due to a sovereign downgrade affects stock markets). Furthermore, the authors find that rating changes have effect not only on the instruments being rated but also on the other instruments in the same country. The authors find a significant influence of sovereign rating changes on stock markets with stock returns declining 1% on average following a downgrade. An interesting finding of theirs is the significantly larger coefficient on outlooks then on ratings. They also observe a sustained spill-over effect of 0.4 to 0.8% (mostly limited to neighbouring countries) especially in emerging markets, smaller than the domestic effect but less persistent, which is more or less big according to the region the nation is located in and the fragility of its economy. Ferreira et al (2007) confirm these results by finding that a change in sovereign debt rating and credit outlook of one country has "an asymmetric and economically significant effect on the stock market returns of other countries" – but only for downgrades - with "closeness and emerging market status amplifying the spill-over effect".

Despite this, criticism still exists. Reinhart (2002) claims that "rating changes are far from being leading indicators of crises but are lagging indicators of financial collapse" – upgrading in good times and downgrading in bad times – which extends the boom-bust situation stock markets might be enduring. In addition to this procyclical behaviour, there seems to be an anticipation effect that persists for downgrades, but reverses within 2 days for upgrades (Kaminsky and Schmukler, 2002) with a stock market spread increase in the 10 days prior to downgrade of as much as 4% and in case of market rallies (upgrades) of a 2% in stock spreads. Therefore, the actual announcement seems to have no effect on stock spreads as they find them to remain unchanged while maintaining the losses/gains accounted for in the

anticipation. However, the authors stress that these findings, although statistically significant, do not have a large economic impact. As Rigobon (2002) points out, "this type of news [rating announcements] is not very informative to investors, so there is no strong reaction from markets".

On average, there is not much expectancy from researchers that rating changes should have a large market impact due to anticipation. Hand, Holthausen and Leftwich (1992) show that "agency announcements of a change in sovereign risk assessments appear to be preceded by similar change in the market's assessment of sovereign risk" (around 29 days before, 2% fall for positive announcements, 3.3% rise for negative, with movement disappearing 6 days before announcement for negative, shortly before for positive). Despite the anticipation of rating changes, the actual announcement does carry significant weight: Cantor and Packer (1996) find in a 2-day window (on and post-announcement day) a small drift in spread for both up- and downgrades that is higher than daily drifts - spreads rise 0.9% for negative announcements and fall 1.3% for positive. This is a puzzle, as rating announcements that are more fully anticipated apparently have a larger impact. Furthermore, the two authors find that rating announcements have a highly significant impact on speculative-grade sovereigns but a statistically insignificant effect on investment-grade sovereign debt, unlike the result Hand, Holthausen and Leftwich (1992) find for corporate bonds: significant effect for both grades. Furthermore, there seems to be a CRA-impact: "the immediate impact of an announcement is greater if made by a CRA, with Moody's announcement bigger than S&P's, or if it is related to speculative-grade credit" (Hand et al, 1992). Also, there seems to be succession in CRA announcement impact: "the impact of one agency's announcement is greater if it confirms the other agency's rating or a previous rating announcement". Finally, they do not find that the impact of an announcement changes according to its nature (rating change or outlook). Cantor et al (1996) do find another "puzzle" linked to the stronger impact of announcements on speculative-grade investments compared to investment grade ones. This can however be explained by the investment requirements of big investors, discussed above.

Although the Sovereign Debt Ceiling provides the rationality for one to assume a significant impact on national stock market of a sovereign debt downgrade, firms in emerging markets that are quoted internationally automatically suffer less from this restriction. Indeed, being quoted on international markets and having operations globally automatically entails that the business is no longer directly subjected to its country's sole economic issues. Multi-national

companies would then suffer less from transparency, moral hazard and liquidity issues and their debt rating would not be limited to its country's debt rating.

The sovereign-debt crisis has particularly threatened Greece, Ireland, Italy and Spain, which were spared from default thanks to bail-out funds provided by the European Financial Stability Facility (EFSF) and the International Monetary Fund (IMF) (The Economist). These funds also functioned as a back-up to funding the governments, should they suffer from lack of renewed funding from the bond markets. The focus of this study will be on the GIIPS countries, due to them being particularly affected – both in terms of debt rating and stock market index performance - during the late economic crisis. We will also consider the BRIC countries to analyse the effect on emerging markets. However, as these are growing markets and have been subject to less important rating changes, we expect the impact to be of lesser magnitude than for the GIIPS.

III. Data Selection

3.1 Historical Sovereign Credit Ratings

This study looks at the effect of credit rating announcements from all three major agencies (S&P, Moody's and Fitch) over a 5-year period starting in September 2008 and ending in September 2013. The focus on this particular period is of interest in order to understand whether some of the criticism towards the rating agencies for their role during the financial crisis is justified. More specifically, results from this period in time may help us determine if announcements are lagging the market (i.e. that rating announcements contain no new information and are disregarded by investors) rather than exacerbating stock market volatility by creating a negative sentiment in the financial markets.

The study further directs its focus on the GIIPS (Greece, Italy, Ireland, Portugal & Spain) and BRIC (Brazil, Russia, India & China) countries. The first group of nations has been under significant economic stress during the financial crisis, sustaining several downgrades of their credit ratings and enabling us to effectively study these events over time. Our geographical focus is also motivated by the intuition that these relatively "smaller" financial markets tend to be less efficient and more sensitive to new information. Our second group of countries are large emerging markets, which have been able to sustain decent levels of economic growth during the recessionary period, allowing us to test market efficiency also in developing markets, which are known to be more volatile. The choice of these countries over influential financial markets (such as the USA or United Kingdom) is also due to the fact that the latter have undergone very few major downgrades, making it difficult to assess the impact of credit rating announcements in these economies.

The database thus created contains 163 historical rating announcements (or events) from S&P, Moody's and Fitch over the past 5 years. While local currency international ratings measure the likelihood of repayment in the currency of the jurisdiction in which the issuer is domiciled, Foreign currency ratings additionally consider the profile of the issuer or note after taking into account transfer and convertibility risk (the risk associated with converting local currency into foreign currency, or make transfers between sovereign jurisdictions) and constitute a more considered assessment of a Sovereign's credit riskiness. The rating announcements used in this study are therefore for foreign currency ratings and are distributed as follows:

Count of Events	Brazil -	China -	France -	Greece -	India -	Ireland -	Italy -	Portugal -	Russia -	Spain -	Grand Total
Fitch	**2**	**2**	**2**	**13**	**3**	**10**	**5**	**7**	**3**	**7**	**54**
Downgrade			1	9		4	3	5		4	26
Negative Review			1	2	1	2	1	1	1	2	11
Positive Review	1				1	1			2		5
Stable		2			1	3	1	1		1	9
Upgrade	1			2							3
Moody's	**3**	**2**	**2**	**11**	**3**	**8**	**5**	**9**		**9**	**52**
Downgrade			2	7		5	3	5		5	27
Negative Review		1		4		3	2	3		3	16
Positive Review	1				1						2
Stable		1						1		1	3
Upgrade	2				2						4
S&P	**5**	**1**	**2**	**14**	**2**	**10**	**5**	**9**	**2**	**7**	**57**
Downgrade			1	8		6	3	4		5	27
Negative Review	1		1	4	1	2	2	4		2	17
Positive Review	1				1	2		1	1		6
Stable	2								1		3
Upgrade	1	1		2							4
Grand Total	**10**	**5**	**6**	**38**	**8**	**28**	**15**	**25**	**5**	**23**	**163**

Figure 2: Distribution of events by country and type.

3.2 Stock Market Indices

The event study looks at the impact of the above-mentioned rating announcements on stock market returns in the target countries. We use a broad based index, **the S&P Global 1200**, as a market portfolio rather than the S&P 500, which yields lower R^2 values when regressed against other indices (i.e. the goodness of fit is lower). The S&P Global 1200 is a free-float weighted stock market index of global equities, capturing around 70% of global market capitalisation, composed of 7 leading regional indices over 31 countries: the S&P 500 (US), S&P Europe 350, S&P TOPIX 150 (Japan), S&P/TSX 60 (Canada), S&P/ASX All Australian 50, S&P Asia 50 and S&P Latin America 40. This "world index" contains the top blue chip companies from all ten GICS (global industry classification standard) sectors from each market, the largest being the financial sector.

For all GIIPS and BRIC countries, we have used indices of stocks listed on national stock exchanges, converted into US dollars to account for exchange rate fluctuations. We use closing prices exclusively since the exact time of the credit rating announcements is unknown, and then compute daily returns for each index.

- **Greece**: the ASE Index, capitalisation-weighted index created with base value of 100 as of December 31st 1980

- **Ireland**: ISEQ Overall Index, capitalisation-weighted index created with base value 1000 as of January 4th 1988

- **Italy**: FTSE MIB, consisting of the 40 most liquid and capitalised stocks listed on the Borsa Italiana

- **Spain**: IBEX 35, comprising o the 35 most liquid stocks, free float shares, traded on the continuous market. Created with a base level of 3000 as of December 29th 1989.

- **Portugal**: PSI 20, uses free float shares, created with a base value of 3000 as of December 1992.

- **Brasil**: IBOVESPA Index, a gross total return index weighted by traded volume & comprised of the most liquid stocks created January 1st 1985

- **Russia** :RTS index, a capital weighted composite index calculated based on prices of the 50 most liquid Russian stocks launched September 1st 1995 at base value 100

- **India:** BSE SENSEX, a cap-weighted index based on liquidity, depth, floating-stock-adjustment depth and industry representation. Created in 1978-1979 with base value 100, has switched to free-float methodology since January 9th 2003.

- **China**: SSE Composite Index, cap-weighted tracking the daily price performance of all A-shares and B-shares listed on the SSE created with base level 100 on December 19th 1990.

- **France**: The CAC 40 represents a capitalization-weighted measure of the 40 most significant values among the 100 highest market caps on the Euronext Paris.

3.3 Issues pertaining to the data selection

One limitation arising from studying credit rating announcement effects on financial markets is the lack of positive events (i.e. upgrades or positive outlooks) having occurred during the past financial crisis. This of course greatly affects our ability to measure effects of this type of event on national stock markets in the target countries. Since BRICs have also been relatively less affected by the financial meltdown they haven't experienced as many credit rating reviews as the European GIIPS countries.

Another bias can occur because of the unknown hour of the actual announcement during the day. This in turn hinders us from using shorter intervals and more frequent sampling intervals.

IV. Methodology

4.1 Event definition

In order to analyse the effect of changes in sovereign credit ratings and outlooks on national stock market returns, an event study will be carried out. Event studies allow for the identification of dynamic effects of upgrades, downgrades or outlook announcements over time. One underlying assumption here is that the market processes information about the event in an efficient and unbiased manner. We use two different event windows, one ranging from 3 days before to 2 days after a given announcement date, the other ranging from 2 days before to 1 day after the aforementioned date. The longer event window allows us to measure an eventual anticipation of the event by market participants (i.e. investors) as well as to see whether abnormal returns persist over at least a short horizon of time. The shorter window gives us more precise figures for the actual effect on the announcement day and the following day, which we believe may also capture a lot of the abnormal returns seeing as trading may occur the day after if a credit rating change happens late during the given event date or after the markets have closed.

4.2 Computing Abnormal Returns using the Single-Index Market Model

4.2.1 The Market Model

The market model is a statistical model, which relates the return of any given security (in our case, national index returns) to the return of the market portfolio. Stock market returns are then assumed to be jointly multivariate normal and independently and identically distributed through time. For any country index *i*, the market model is:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}$$

$$E(\varepsilon_{it} = 0) \qquad var(\varepsilon_{it}) = \sigma_{\varepsilon_i}^2$$

Where R_{it} and R_{mt} are the period-*t* returns on index *i* and the market portfolio, respectively, and ε_{it} is the zero mean disturbance term. α_i, β_i and $\sigma_{\varepsilon_i}^2$ are the parameters of the market model. The benefit of using the market model depends on the R^2 of the regression between the market index and national stock indices. The higher the R^2, the greater is the power to detect abnormal performance because the variance reduction of abnormal returns is more consequent. Other more complex models may be used, but often prove to be ineffective, as explained by Craig MacKinlay (1997), according to whom there is no great need in using a

multi-factor models to explain more of the variance because the "explanatory power of additional factors […] is small, and hence, there is little reduction in the variance of the abnormal return".

4.2.2 Parameter Estimations

In order to estimate the parameters in our market model, we use Ordinary Least Squared (OLS) regression over a 120-days estimation window (of length L_1) prior to the event window for each event (our model allows for parameters to change over time according to the specified event date). T_{0+1} is the first date in the estimation window, T_1 being the last, and the event window ranges from τ_1 to τ_2. For country *i* in the event window, the parameters are estimated using the following formulas,

$$\hat{\beta}_i = \frac{\sum_{\tau=T_0+1}^{T_1}(R_{i\tau} - \hat{\mu}_i)\,(R_{m\tau} - \hat{\mu}_m)}{\sum_{\tau=T_0+1}^{T_1}(R_{m\tau} - \hat{\mu}_m)^2}$$

$$\hat{\alpha}_i = \hat{\mu}_i - \hat{\hat{\beta}}_i\hat{\mu}_m$$

$$\hat{\sigma}_{\varepsilon_i}^2 = \frac{1}{L_1 - 2}\sum_{\tau=T_0+1}^{T_1}(R_{i\tau} - \hat{\alpha}_i - \hat{\beta}_i R_{m\tau})^2$$

And :

$$\hat{\mu}_i = \frac{1}{L_1}\sum_{\tau=T_0+1}^{T_1} R_{i\tau}$$

$$\hat{\mu}_m = \frac{1}{L_1}\sum_{\tau=T_0+1}^{T_1} R_{m\tau}$$

Where $R_{i\tau}$ is the return in event period τ for country index *i* and $R_{m\tau}$ is the returns in the same event period for the S&P 1200 Global Index. α represents the average return of an index compared to the market average of the S&P 1200. β is the sensitivity of this index's return to the market return. $\hat{\sigma}_{\varepsilon_i}^2$ is the estimated disturbance variance. As mentioned previously the market model allows taking both market trends and country risk into account.

4.2.3 Calculating Abnormal Returns

The abnormal return for an event in period τ, ranging from T_{0+1} to τ_2, is as follows:

$$\widehat{AR}_{i\tau} = R_{i\tau} - \hat{\alpha}_i - \hat{\beta}_i R_{m\tau}$$

This term represents the disturbance term of the market model, that is the observed returns generated by a given stock index over a period of time that is different from the expected rate of return. The expected rate of return is the estimated return based on the market model. Abnormal returns are calculated on an out of sample basis and conditional on the event window market returns. Abnormal returns will be jointly normally distributed and have a zero conditional mean and conditional variance:

$$\sigma^2(\widehat{AR}_{i\tau}) = \sigma_{\varepsilon_i}^2 + \frac{1}{L_1}\left[1 + \frac{(R_{m\tau} - \hat{\mu}_m)^2}{\hat{\sigma}_m^2}\right]$$

Where the first term $\sigma_{\varepsilon_i}^2$ is the disturbance variance from the market return formula, and the second is the additional variance that occurs if there is a presence of sampling error in α_i and β_i. Even though true disturbances should be independent through time, sampling error can cause serial correlation in the abnormal returns. However, a larger estimation window L_1 makes the sample error of the parameters (the second term) approach zero. Therefore, only the first term of the equation will remain – which is independent across time.

4.2.4 CARs - Aggregating Abnormal Returns

It is first necessary to aggregate abnormal returns through time (over the event window) for each individual event affecting a particular country's index returns. $\widehat{CAR}_i(\tau_1, \tau_2)$ is the sample cumulative abnormal return (CAR) from τ_1 to τ_2 where $T_1 < T_2 < \tau_1 < \tau_2$. The CAR from τ_1 to τ_2 is the sum of the estimated abnormal returns:

$$\widehat{CAR}_i(\tau_1, \tau_2) = \sum_{\tau=\tau_1}^{\tau_2} \widehat{AR}_{i\tau}$$

And the variance of $\widehat{CAR}_i$ for each event and for a large L_1 is,

$$\sigma_i^2(\tau_1, \tau_2) = (\tau_2 - \tau_1 + 1)\sigma_{\varepsilon_i}^2$$

In order to draw inferences on a particular type of event (in our case, the announcement of a change in credit rating) we then need to aggregate the CARs across the observed events, N:

$$\overline{CAR}(\tau_1, \tau_2) = \frac{1}{N} \sum_{i=1}^{N} \widehat{CAR}_i(\tau_1, \tau_2)$$

We then have $\overline{CAR}(\tau_1, \tau_2)$, the arithmetic average of cumulative abnormal returns for the event window across observations of the event. Its variance is as follows:

$$var\left(\overline{CAR}(\tau_1, \tau_2)\right) = \frac{1}{N^2} \sum_{i=1}^{N} \sigma_i^2(\tau_1, \tau_2)$$

The aggregation across events windows and observed events relies on the assumption that there is no overlap in the event windows of the included index returns (i.e. no clustering of events). In this particular study, events may cluster due to the tendency of rating agencies to announce sovereign reviews in quick succession or rating several countries in a same region at the same time. How we account for serial-correlation is explained later on.

4.3 Parametric testing for significance

4.3.1 Ordinary Testing

Once aggregated, cumulative abnormal returns allow us to make inferences about possible effects of a type of event on national stock market returns. Testing these results is necessary to determine whether they are statistically significant. Setting the null hypothesis, H_o, that abnormal returns are zero, our normally distributed test statistic is

$$J_1 = \frac{\overline{CAR}(\tau_1, \tau_2)}{var\left(\overline{CAR}(\tau_1, \tau_2)\right)^{1/2}} \sim N(0,1)$$

We are therefore able to reject the null hypothesis only if the absolute value of θ_1 is greater than the corresponding t-value of the two-tailed Student's t-distribution for N-1 degrees of freedom with an alpha of 5%. The significance level, alpha, represents a type I error, that is, the probability of rejecting the null hypothesis when it is in fact true. In our case, and if $|\theta_1|$ > t-value, then there is a 97.5% chance that the observed cumulative abnormal returns are statistically significant. The test statistic increases with the average $\overline{CAR}$ across events (mean effect), and decreases when the standard deviation of $\overline{CAR}$ is higher (variation effect - the

standard deviation is positively affected by longer estimation windows, shorter event windows and a higher number of observed events).

4.3.2 Standardized Testing

If true cumulative abnormal returns are constant across countries, then it is useful to standardize them in order to give more weight to events with lower abnormal return variance (Patell, 1976). Standardized cumulative abnormal returns (SCAR) are then computed as

$$\widehat{SCAR}(\tau_1, \tau_2) = \frac{\widehat{CAR}_i(\tau_1, \tau_2)}{\sigma_i^2(\tau_1, \tau_2)}$$

And aggregating across countries we get,

$$\overline{SCAR}(\tau_1, \tau_2) = \frac{1}{N}\sum_{i=1}^{N} \widehat{SCAR}_i(\tau_1, \tau_2)$$

The test statistic then becomes

$$J_2 = \overline{SCAR}(\tau_1, \tau_2) / \sqrt{\frac{L_1 - 2}{N(L_1 - 4)}} \sim N(0,1)$$

4.3.3 Accounting for Cross-Sectional Variance and Correlation

In order to observe mean effects exclusively, we also control for variance changes by estimating the cross-sectional variance of the standardized cumulative abnormal returns within the event window (Boehmer et al., 1991). We now get the following test statistic:

$$J_2' = \frac{N * \overline{SCAR}(\tau_1, \tau_2)}{\sqrt{\sum_{i=1}^{N}(SCAR_i(\tau_1, \tau_2) - \overline{SCAR}(\tau_1, \tau_2))^2}}$$

This method of testing allows adjusting for event-induced variance around the event date. Now, relaxing the assumption that abnormal returns are uncorrelated across countries (because of the clustering of event dates in our study), we can further develop our test statistic:

$$J_3 = J_2' * \sqrt{\frac{1 - \bar{r}}{(1 + (N-1)\bar{r})}}$$

Where $\bar{r}$ is the average cross-sectional correlation coefficient of abnormal returns in the estimation period. This test statistic should correct for the effect of clustering and event-induced variance in our data according to Kolari and Pynnönen (2010).

4.4 Adequacy of the market model

One major issue pertaining to the use of the market model in our event study is the goodness of fit of our market index (the S&P 1200) with respect to national stock market indices. R^2 provides a measure of how well observed outcomes are replicated by the model, as the proportion of total variation of outcomes explained by the model. While the R^2 values for larger European countries are relatively high (R^2 above 50%), those of smaller European countries and the BRIC countries are slightly lower (at about 20% to 40%). The Chinese index returns in particular seem to correlate only very slightly with those of the S&P 1200 (R^2 of about 5% only). The lower goodness of fit figures may be an issue when predicting expected returns and may lower the accuracy of estimated cumulative abnormal returns. However, regardless of the R^2, the significant coefficients still represent the mean change in the response for one unit of change in the predictor and as such contain valuable information. Aggregating events should also mitigate this effect through the Law of Large Numbers. The benefits from using other models, such as multivariate regression models, are also limited by the length of our event window, which focuses on a short time horizon around an announcement (Brown and Warner, 1980, 1985).

V. Results

In this section, we present and interpret the results obtained from the model explained above. First, we state the Null Hypothesis: an announcement of a sovereign credit rating change has no effect on sovereign market performance, measured by its stock market index.

If announcements do convey information to investors about a sovereign's credit and economic situation, we expect an announcement to have an impact on the market index. Its magnitude and timeliness will depend on how unexpected the rating announcement is - measured by the deviation of the actual index performance from expected market index performance (estimated using pre-announcement data and parameters) i.e. the cumulative abnormal return. This measure is constructed by estimating the nationals' expected market abnormal return through historical data analysis.

Abnormal returns above expected market returns should follow positive rating announcements, while negative abnormal returns should follow adverse rating announcements. Therefore, using the deviation of the actual returns from the expected returns, we can classify announcement into three categories: positive announcement (rating or outlook), no news or negative announcement (rating or outlook). We use five types of testing to verify the statistical significance of our results: the Ordinary Test Statistic, the Standardized Test, the Standardized Test accounting for cross-sectional variance, the Standardized Test with Cross-sectional correlation and the Mean Effect test with cross-sectional correlation. Detailed statistical test results are available in the Appendix.

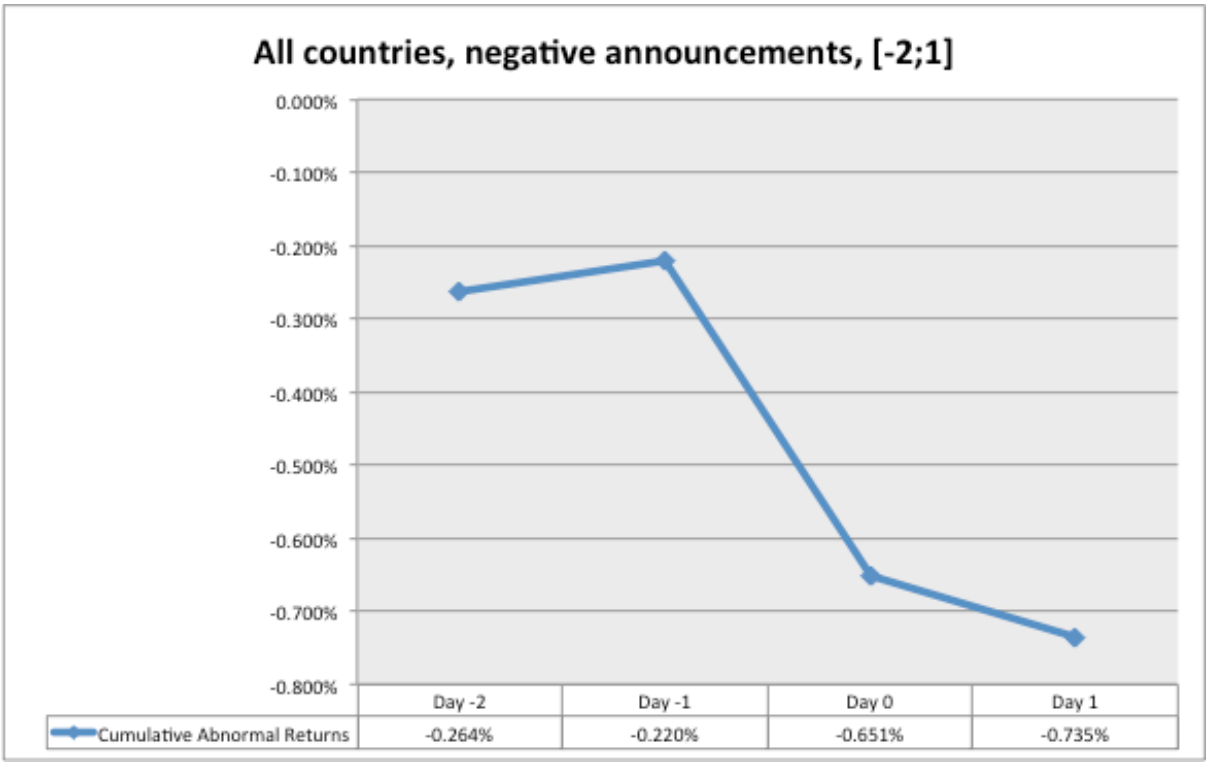
From our data analysis, we obtain statistically significant results supporting or contradicting several previously researched topics. We present our findings in the following manner: 1) the anticipation & stabilization of CARs around the event date; 2) the impact on different economic groups (GIIPS vs. BRICs); 3) the market influence of each major credit rating agency; 4) the market sensitivity to different types of events (outlooks, credit watches, reviews); 5) the importance of the investment-grade threshold; 6) the impact of announcements on Big economies versus Small economies; 7) the evolution of credit rating impacts throughout the crisis.

5.1 Anticipation & stabilization around the event date

Previous research by Kaminsky and Schmuckler (2002) has shown that stock market investors fully anticipate credit rating announcements 10 days prior to the actual release date of a rating review and that these effects are sustainable ex-post. Our research tends to contradict some of these findings as we do find statistically significant abnormal returns of about -0.43% on the day of the event, suggesting rating announcements are at least partly unexpected and do carry valuable macroeconomic information about the country to investors. Cumulative abnormal returns stabilize at -0.7% two days after an event. A longer event window could have been used to verify the sustainability of these effects ex-post, but the resulting findings would have suffered from event clustering and noise arising from exogenous factors.

5.1.1 The 4-day event window

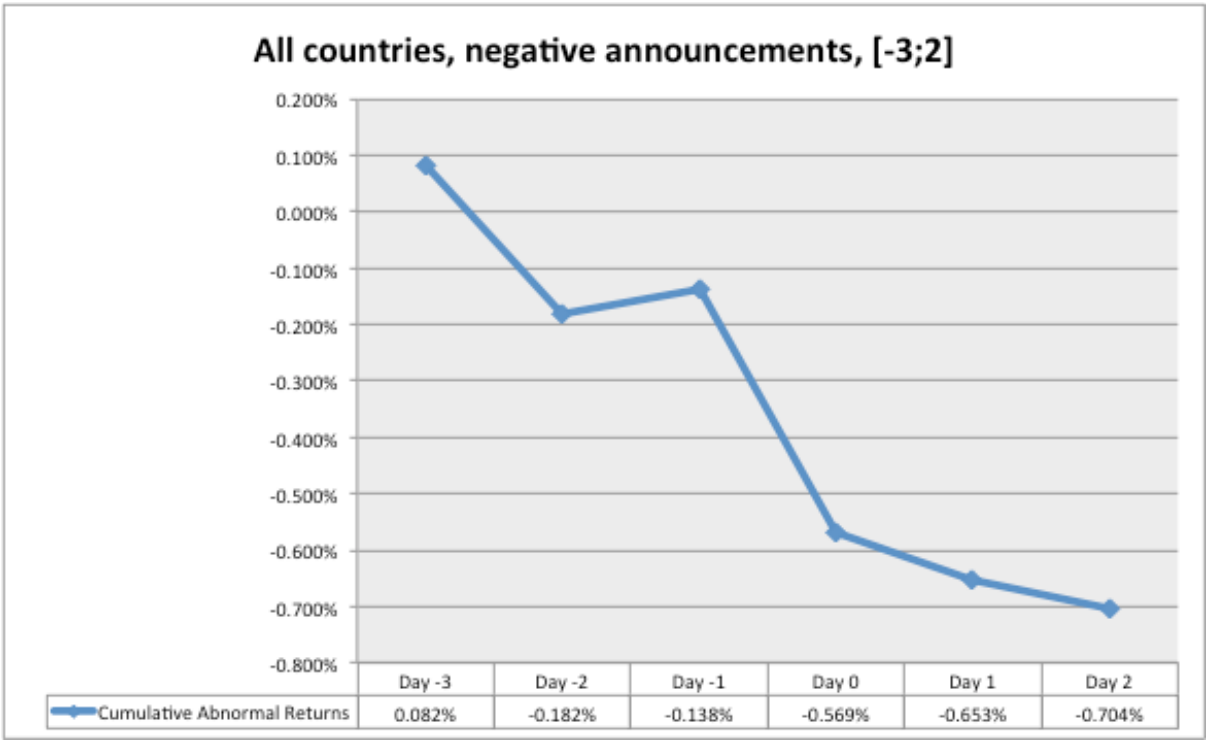
We obtain a standardized significant t-stat of -3.14 when considering all negative events and rating agencies, with a cumulative abnormal return of -0.75% at day 1. Within this 4-day event window, the countries with significance are Greece (-1.73% CARs) and Portugal (-1.56% CARs). All other countries prove to be individually insignificant at the 95% confidence interval.



Graph 1: CARs, Negative announcements, 4-day event window

5.1.2 The 6-day event window

The 6-day window also provides significant t-stats when considering all negative events. When looking at Greece and Portugal only the negative announcements (downgrades and reviews) cause significant t-stats: -2.70 for Greece and -3.17 for Portugal, although lower than in the shorter event window. At day 2, Greece shows a cumulated abnormal return of -2.24% and Portugal -1.60%.



Graph 2: CARs, Negative announcements, 6-day event window

By increasing the event window, we allow for a longer observation of CARs. The CARs continue to decrease after day 1, a signal that markets continue to incorporate the announcement into market index prices. Also, there is a very slight sign of anticipation as returns decrease two days prior to the event (drop of around -0.26%), stabilize from day -2 to -1 until the actual announcement where the bulk of the drop occurs (-1.08% for Greece, -0.42% for Portugal in particular). The cumulative effect over the event window stabilizes at -0.704% CARs at day 2.

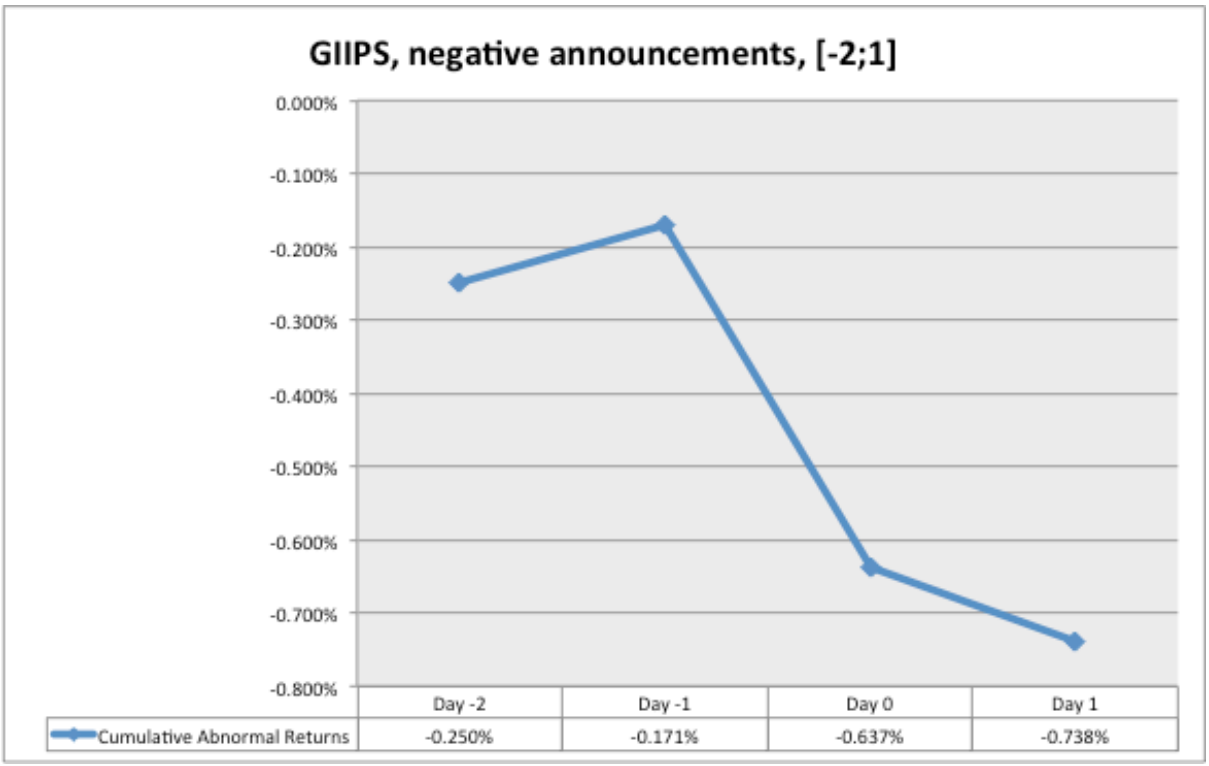
5.2 Regional effects (BRICS vs. GIIPS)

Kaminsky and Schmuckler (2002) have also shown that co-movement and contagion effects can be large and magnified by CRA ratings, and that spillover effects can amount to about 0.4% in abnormal returns. They also find that ratings issued always seem to "reveal new information, particularly in the case of emerging markets", which suffer from transparency and asymmetric information issues. During the recent crisis, BRIC economies have been relatively spared and for the fewer rating announcements observed in this period we find no statistically significant abnormal returns. This may also be explained by the fact that these geographically dispersed markets have monetary independence and, as such, are more flexible when adapting their monetary policy.

When looking at the GIIPS region on the other hand we do find that there are significant CARs of -0.74% over the event window. The focus of credit rating agencies on European sovereign debt instruments during the recent crisis has led to serial downgrades (especially in Greece and Portugal) and simultaneous negative rating announcements for several E.U. members at once. We believe that the clustering of events (geographical and chronological) and the pessimistic media coverage surrounding the rating issues has led to significant co-movement effects in the region. Investors seem to have had difficulties anticipating future macroeconomic trends and the rating announcements added to the market panic, increasing market volatility. These results strongly contrast with those of the BRICs in which rating issues were fewer and of lesser magnitude, which rather confirms the theory of agencies exacerbating the European Sovereign debt crisis.

5.2.1 GIIPS

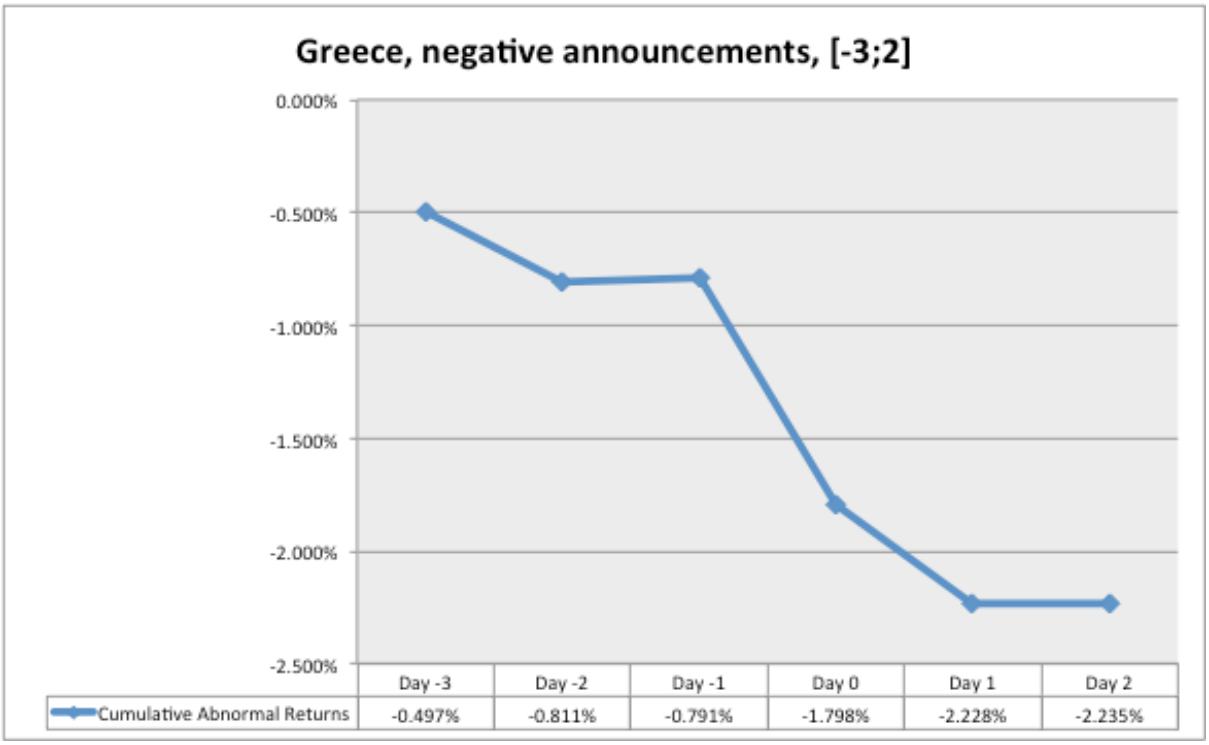
There are 129 events pertaining to GIIPS countries. For negative events (113 events), GIIPS as a whole suffers from -0.74% significant cumulative abnormal returns (t-stat: -2.95, R^2: 34.72%) over the 4-day event window. The biggest decrease (-0.56% points) occurs in day 0, which corresponds to the day of the announcement as we are considering closing prices.



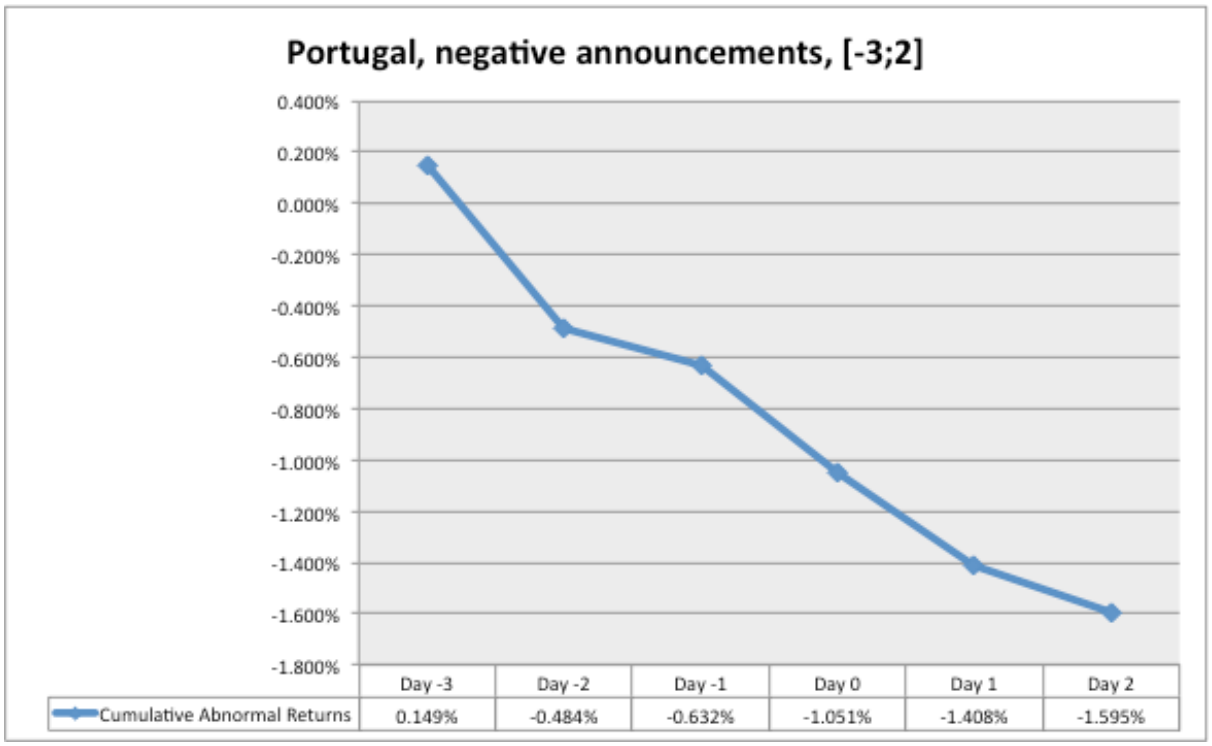
Graph 3: CARs, Negative announcements, GIIPS, 4-day event window

Taking each country individually, Spain, Italy, and Ireland produce insignificant results in both event windows. The country with most negative announcements available for the time frame used in this study is Greece (34 events) which, along with Portugal (22 events), have significant results for negative credit rating announcements. Over the 4-day event window, Greece endured a drop of -1.73%, while Portugal experienced an abnormal cumulative return of 1.56% on its stock index.

Over the 6-day event window the Greek stock market suffered a drop of -2.24% CARs, with anticipation of -0.32% ARs two days before the announcement date and a drop of -1.00% in ARs on the event date. The longer event window shows stabilisation in cumulative abnormal returns at -2.235% CARs.



Graph 4: CARs, Negative announcements, Greece, 6-day event window



Graph 5: CARs, Negative announcements, Portugal, 6-day event window

5.2.2 BRICs

The BRIC countries produce insignificant results, for the economic group as a whole and for individual countries, controlled in turn for positive, negative and all event types. However, results may be biased due to their small representation in the data sample (28 events).

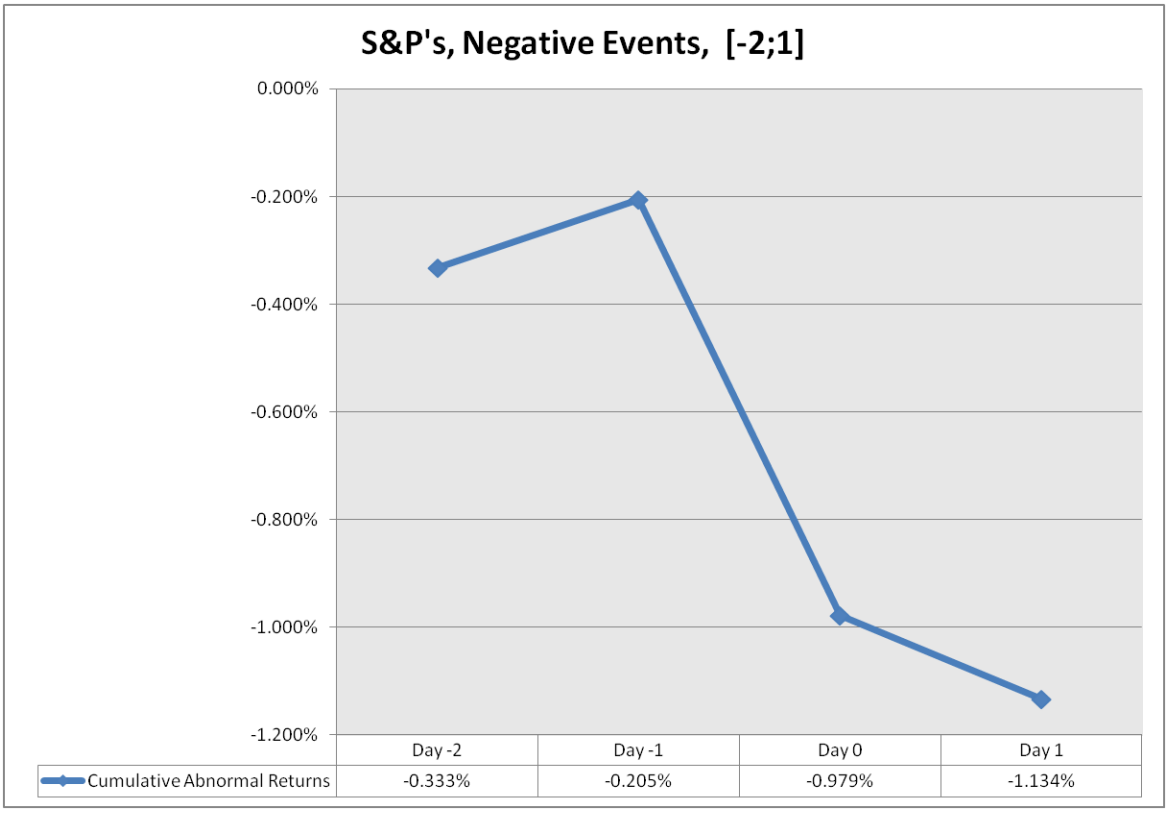
A reason for the GIIPS grouping having more significant results than the BRICs could be because a default in their case has higher consequences than for other countries not constrained by union policies. In fact, being part of the Eurozone means that the GIIPS countries cannot depreciate their exchange-rate (Eichenberg, 2007) as being part of a monetary union prevents them from having the monetary flexibility the BRIC countries can benefit from. Having the power to control currency exchange rate reduces investment risk by showing a government's responsiveness, pro-activeness and ability to adapt to upcoming challenges as, for instance, it allows a country to remain competitive in terms of exports/imports by inflating or deflating its currency (S&P's RatingsDirect, 2013).

Furthermore these markets, undergoing important growth and having monetary independence, are less subject to the sovereign debt crisis that European nations have experienced. Also, these nations have had ratings that always bordered the investment- and speculative-grade border, and are hence valued as more risky than European bonds. Investors in these bonds are probably well prepared and aware that they are investing in riskier assets and are less reactive to changes in ratings. European stock markets are reputably less volatile and subject to more stringent transparency rules, which could in turn lead to greater market efficiency and incorporation of new information by investors (a drop in itself signals the incorporation of new information, and the rapidity of the drop signals market efficiency).

5.3 The credit rating agency effect

Previous research has looked at the differences in impact of different credit rating agencies. Moody's was found to have larger impacts than S&P's and Hand et al. (1992) show that the impact is greater when one of the big agencies is the first to confirm a recent issue by another agency. These findings are relevant because they stress the importance of timing of rating issues and reputation of the individual agencies. Our research finds that S&P has been the most influential of the Big Three with -1.15% in cumulative abnormal returns over the 4-day event window (t-stat: -3.26, R^2 : 35.72%). Results for Moody's and Fitch are erratic and statistically insignificant. This signals S&P's market share and reputation is higher amongst investors. We also observe that S&P is generally the first one to confirm Fitch's

announcements in our sample, supporting the findings of Hand et al. on the importance of timeliness.



Graph 6: CARs, Negative announcements, S&P's, 4-day event window

S&P's credit rating announcements also have significant results for GIIPS (CAR of -1.13% at day 1, t-stat: -3.04, R^2: 34.94%), but have insignificant results for positive announcements. Again, this could be due to the lack of data for positive announcements in this region at this time period. The results show that no credit rating agency has significant announcement effect on BRIC indices.

Although Fitch seems to be the first of the Big Three to issue ratings, it is the smallest of the three agencies and its ratings may carry less weight. In the sample, S&P's seems to issue ratings ahead of Moody's; therefore it could also be for this reason that S&P's obtain an is greater than that of Moody's.

5.4 Market sensitivity to different types of events

According to Kaminsky et al. (2002) negative reviews and watches are the rating announcement types that carry the most weight in the stock market. This is to a great extent confirmed in our study of the crisis: Negative outlooks & watches have large significant effects of -1.6% CARs over the 5 day event window, while downgrades have a lower impact.

This signals that the markets react in anticipation of the downgrade to come, the outlook and watches having a higher informational value and being more unexpected than the actual rating change.

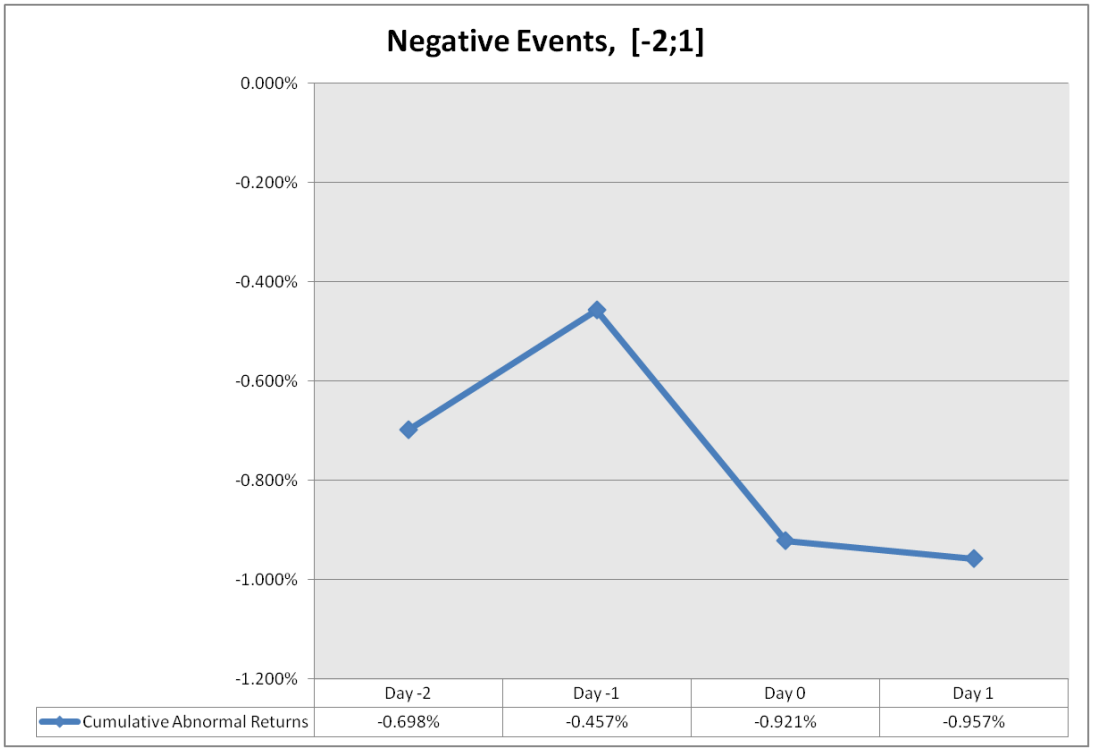
Positive announcements have on the other hand led to erratic (even negative) insignificant abnormal returns. This indicates that they carry less quantitatively relevant information: the IMF (2012) suggests that debt levels play a greater role in negative actions than positive ones, which are more dependent on political factors.

Surprisingly, announcements of stable sovereign debt prospects are the only events, which have led to positive CARs (2.29% CAR for Fitch rating issues). These results may be explained by the rather low number of observations in our sample and the presence of outliers.

To test these finding we dispose of a sample of 163 events are used: 124 negative out of which 44 are negative reviews and 80 are downgrades; 24 positive out of which 13 are positive reviews and 11 are upgrades; finally 15 are neutral reviews.

5.4.1 Negative

Our results show significance in the results for negative reviews (outlooks and credit watches) CAR of -0.96% at day1 (t-stat -2.78, R^2 of 37.26%), however downgrades alone are insignificant. Although this result may seem surprising, it is in accordance to the findings of authors Kaminsky et al (2002) who have found that outlooks and credit watches carry the most weight, due to the predictive element of a downgrade to come. Indeed, it has been previously studied that 33% of negative reviews do lead to a downgrade (S&P's Sovereign Credit Weathervane, 2013), hence the market would be reacting in anticipation to the higher probability of the downgrade to come. The highest significance in terms of t-stat occurs when negative reviews and downgrades are jointly considered (-0.74% CARs at day 1, t-stat -3.14, R^2 = 35.67%).



Graph 7: CARs, Negative outlooks and credit watches, 4-day event window

5.4.2 Positive

When it comes to positive events, they are insignificant over the event windows considered. There also seems to be a sign of incoherence, albeit being statistically insignificant, in the movement of abnormal return reaction to positive event occurrence. Slightly negative abnormal returns appear in the indices when it would be expected that positive abnormal returns appear as good news is issued on a rating. This anomaly in returns is probably due to the lack of positive events in our sample. Indeed, the period observed is a period of economic turmoil and the ratings are mostly negative in reaction to the crisis. For instance, for GIIPS we have 8 positive events versus 113 negative ones. However, for the BRICs, the positive events are higher than the negative ones: 16 positive and 5 negative.

5.4.3 Stable

Stable reviews are the only events that produce positive abnormal returns in our study, with Fitch ratings producing significant cumulative abnormal returns; S&P's and Moody's are insignificant. Upon stable announcements, Fitch seems to have a positive influence on markets with +2.29% positive abnormal returns (t-stat: 2.89, R^2: 24.85%). This effect is increased when limiting countries to the GIIPS: 2.83% CAR (t-stat: 2.86, R^2: 30.31%). This result could be due to a sample bias due to the low number of events: 6 for GIIPS and 3 for

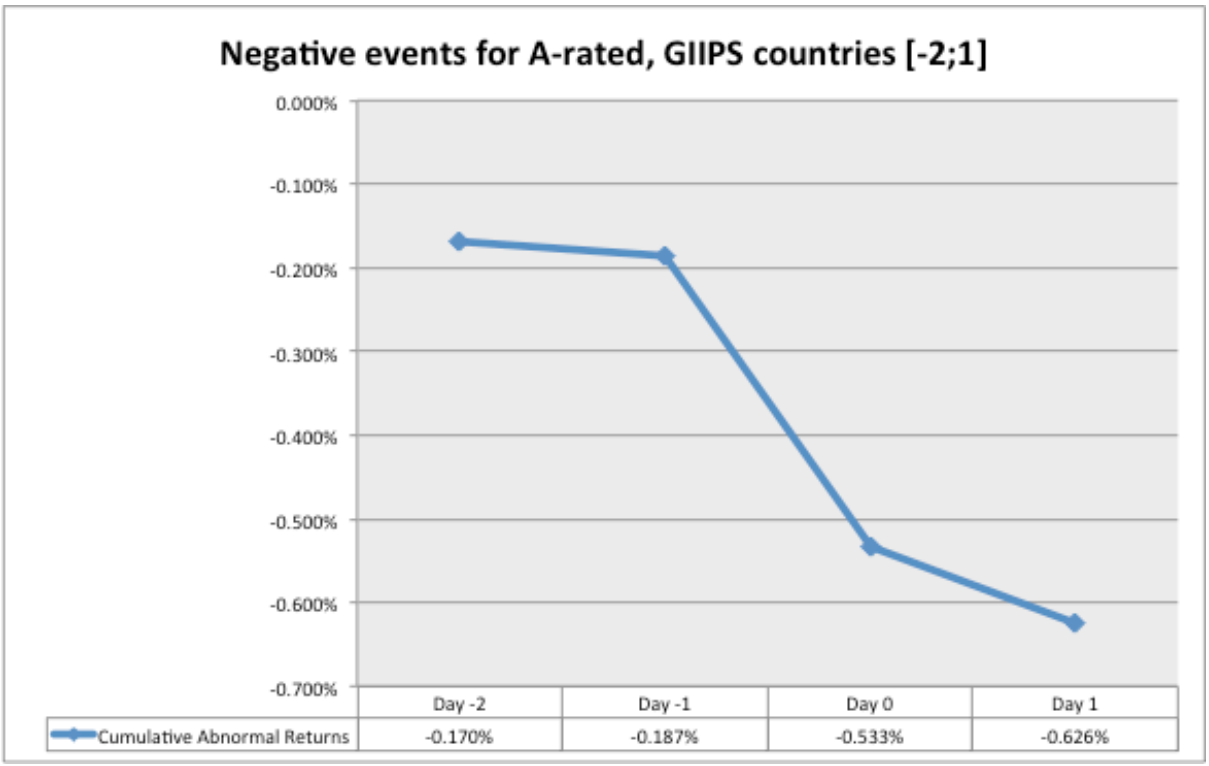
BRICS. It could also be explained by the fact that investors view a stable credit rating as a positive sign of financial market stability.

The results above show that the market reacts in anticipation of the downgrade to come (higher informational value). Positive announcements may be found to carry less quantitatively relevant information, as suggested by the IMF (2012) that states they may be more dependent on political factors than negative events.

5.5 A-rated vs. lower rated Sovereigns

Cantor & Packer (1996) have found that rating announcements have a highly significant impact on speculative-grade sovereign debt (BBB- and above), but a statistically insignificant effect on investment-grade markets. We would expect this to be the case since lower rated markets are generally those with the least available information to investors who rely more willingly on credit rating agencies. Also, it has been suggested that rating changes that alter the status of a country's sovereign debt from investment to speculative grade should have a significant impact since regulations require financial institutions and others to hold only certain types of highly rated instruments as reserves and collateral. A higher impact on markets is expected when the rating review imposes the passing of the sovereign bond from one grade to another – in the case of negative events from investment-grade to speculative-grade and vice-versa for positive events. As mentioned previously, this is because of the investment requirements of investors due to their risk aversion or the nature of their business, such as institutional investors' requirement to only hold investment-grade products in their portfolio (Sy, 2002). A passing from a grade to another would therefore entail bond dumping (lower abnormal returns) in case of downgrades or bond purchasing (higher abnormal returns) in case of upgrades – as found by Cantor and Packer (1996).

We find that there is a significant effect for downgrades of A-rated GIIPS countries. For the 71 events under observation, we find an average CAR of -0.63% with a t-stat of -2.46 and R^2 of 42.81%.



Graph 8: CARs, Negative events for A-rated countries, GIIPS, 4-day event window

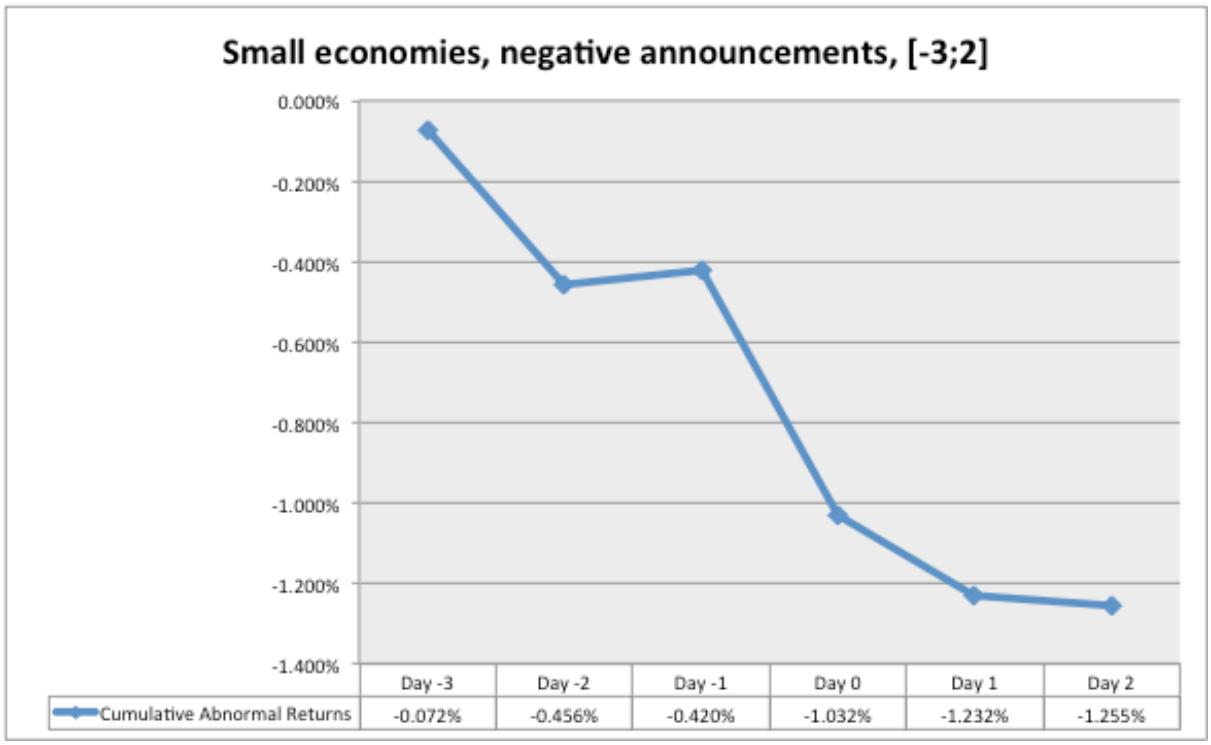
Our study thus suggests the exact opposite impact of credit rating announcements with GIIPS countries rated A- and above being significantly influenced, while rating changes occurring around the investment grade threshold and below do not have a significant impact. This can be explained by the fact that the European countries under scrutiny have had historically high and stable ratings, and as such, the sudden and unexpected rating downgrades at the beginning of the Sovereign Debt crisis came as a shock to investors who used to over rely on this benchmark. Later on in the crisis credit rating announcements for the GIIPS countries rated below the investment grade threshold have had no impact, suggesting a lack of confidence in the quality of credit ratings, as well as exaggerated pessimism of investors with regards to the solvency of European sovereign debt instruments. Passing the investment grade threshold does not seem to have had any particular effect either, as this had probably been anticipated by investors concerned by regulatory issues.

5.6 Small versus Big Economies

As shown by Cantor & Packer (1996) a country's historical ratings and track record with regards to sovereign debt repayments are key when assessing credit ratings. Consequently, our study also aims at determining whether highly rated, larger, economies have enjoyed a certain immunity against credit rating downgrades during the recent crisis and whether investors believe these countries are "too big to fail", unlike smaller, more

vulnerable, economies. The small economies we consider are Greece, Ireland, Portugal and the big ones are France, Italy and Spain - based upon the size of their financial markets and their GDP output (around the 250bn USD for small economies and from 1.3 to 2.6trn USD for big economies as cited by the World Bank Group).

Looking at small economies (Greece, Portugal and Ireland) having been affected during the recession, we find that they have suffered from economically significant cumulative returns of 1.26% (t-stat: -3.14, R^2: 26.18%). Much of this effect can be attributed to serial-downgrading of their sovereign debt leading to market panics and an exacerbation of the recession.



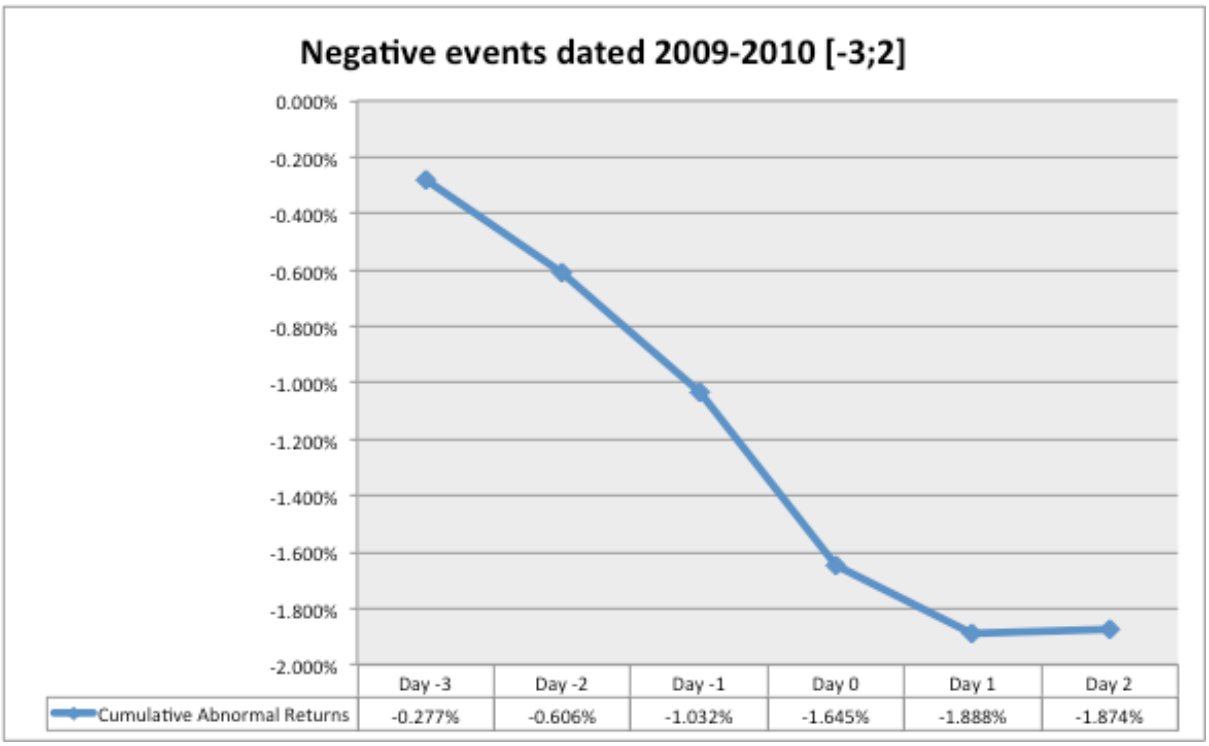
Graph 9: CARs, Small economies, Negative announcements, 6-day event window

Larger countries (France, Spain and Italy) however display non-significant erratic abnormal returns. This could support the presence of a "too big to fail" sentiment among investors who may not be as sensitive to rating issues in larger countries. Another possibility could be that the higher informational transparency and efficiency in the more developed financial markets allow market participants to anticipate rating issues to a great extent, leading to null event-date effects. That is, information concerning a country's macroeconomic situation contained in new ratings may be more readily available and already incorporated by numerous, well-informed, investors.

5.7 Evolution of the impact of credit rating issues throughout the crisis

The IMF (2010) considers rating downgrades in quick succession to be failures in rating issues, since they reflect the catching up of credit rating agencies with current economic developments and the integration of additional risks that should have been accounted for in their assessments. Studying the impact of credit rating issues throughout the crisis, we find that negative events prior to 2010 have had a significant impact on stock markets, with -1.85% of cumulative abnormal returns on average. Events dated 2011 to 2013 have had non-significant effects however.

For the 2009-2010 period, 44 events occurred, and prove to be significant: in the 4-day time frame the average CAR amounts to -1.61% with a t-stat of -4.34 and R^2 of 36.22%. In the 6-day time frame we get an average CAR of -1.87% with a t-stat of -4.03 and R^2 of 36.22%.



Graph 10: CARs, Events dated 2009-2010, Negative announcements, 6-day event window

For the 2011-2013 time frame (85 events for 4-days, 91 events for 6-days), the results are insignificant, even when expanding for an all-country inclusion and also controlling for the CRAs individually.

From these results, we can infer that during the 2009-2010 period, rating announcements have had a strong influence on market index performance, particularly for S&P's reviews. Ratings issued in 2009-2010 carry more significance than ratings issued at

later dates because of the novelty of the crisis and the uncertainty with regards to its future development. This evolution in credit rating impacts may also suggest sovereign rating failures at the beginning of the crisis have led to a loss in credibility of CRAs and that investors began doubting the informational value carried in rating announcements. Since the scandal erupted (around 2010) on the credit rating agencies' role in the build-up to the crisis, investors have lost confidence in the issuing institutions and may have increasingly turned to other instruments such as CDS spreads to assess market riskiness.

5.8 Statistical significance of results

The results obtained using the cross-sectional testing method are the most powerful, accounting for both contagion effects between country returns as well as event-induced variance. This test consistently rejects the Alternative Hypothesis that cumulative abnormal returns aren't 0 mostly because of the clustering effect of event dates. We believe however that this form of testing is overly considerate of correlations between abnormal returns due to the fact that our R^2 values may have led to an overstatement of abnormal return variance, which could in turn lead to a type II error (not rejecting a false null hypothesis). Even when considering only "clean" events (i.e that are not clustered), this test fails to reject all emitted hypothesis, confirming its overreliance on cross-correlation figures. While this type of testing still transmits valuable information on the contagion effects between countries, we believe clustering of events is recurrent for credit rating announcements, and will become even more so as regulations evolve (rating agencies will be obliged to rate Sovereigns following a more frequent schedule). As such, the magnitude of observed CARs is likely to be replicated in the future and the more basic standardized tests can evaluate whether this impact is significant.

Also, we notice little change in significance when accounting for event induced-variance. This tends to show that the magnitude of CARs is of importance, regardless of cross-sectional variance. This moderately powerful test, along with the more basic standardized tests, yield significant results in each category described above (see appendix 3)

VI. Conclusion

Credit rating agencies have been widely criticized during the European Sovereign Debt crisis for exacerbating financial market volatility and aggravating an already tense economic and political situation by focusing their attention on vulnerable countries within the region and nurturing negative market sentiments. The frequency and magnitude of sovereign downgrades has led investors to question the quality of these ratings and their propensity to predict economic change. All the while, the reputation of credit rating agencies has been shaken and has prompted regulators to review the rules governing agencies and the use of their ratings as benchmark measures for regulations of other financial institutions. Sovereign credit ratings and their impact on stock markets during the crisis allow us to make valuable inferences about the reactivity of investors to new information (market efficiency), regional discrepancies, the credibility of credit rating agencies and the importance of the economic size of the sovereigns being rated.

During this time of economic uncertainty, we find that the role and impact of credit rating agencies have changed in several manners. First of all, we do observe a reaction in stock market indices (-0.43% ARs) on the day of a negative announcement, which signals investors value the opinion expressed by the agencies and that some new information concerning future macroeconomic trends is conveyed to market participants. While this effect is clear for negative events, and especially for negative outlooks and watches (-1.6% CARs over 6 days), positive and neutral announcements seem to carry little weight in financial market performance. The Eurozone countries, and particularly the GIIPS, have been especially targeted by rating agencies throughout the crisis, leading to a series of downgrades and negative reviews of sovereign credit ratings within the region, and ultimately to decreases in stock market performances (-0.74% CARs over the 4-day event window on average). Emerging markets such as the BRICs have been relatively spared during the crisis and reveal no apparent reactivity to credit rating announcements, suggesting that investors have been more watchful of market conditions in these countries and anticipated macroeconomic changes beforehand. These findings reveal the growing impact of agencies when focusing on a particular economic region and the negative effect it can have on investor confidence, especially when coupled with extensive media coverage. While previous research had placed Moody's as the most influential of the Big Three, S&P's seems to have gained a new status as the most reputable and influential of the agencies during the crisis, with -1.134% in CARs

on average (over the 4-day event window) upon announcement of a downgrade or negative review. The passing of the investment grade threshold, with important regulatory concerns for many financial institutions present in the European countries in our sample, has had no particular impact on stock markets. Investors must have anticipated the shift of certain countries' sovereign debts from investment-grade to speculative-grade and financial institutions may have made adjustments to their reserve assets beforehand. We also find that the largest effects on stock market indices occurred in the beginning of the crisis (2009-2010), with negative announcements taking investors in A-rated countries by surprise and leading to -1.87% in CARs over the 6-day window on average. As the series of sudden downgrades occurring in the GIIPS had shaken investor confidence in the opinions issued by rating agencies and as investors became increasingly prepared to such announcements, their impact lessened over time with no significant abnormal returns being observed in the period from 2011 to 2013. Looking at small versus big economies in the Eurozone, there is also evidence that the former group of countries is much more sensitive to rating announcements than the latter: Small countries saw their stock market performance decrease by -1.25% CARs on average over the 6-day event window, while large countries were not significantly affected. This may be due to the fact that in larger countries financial markets are more efficient, investors are more attentive to future market conditions, the track record of their sovereign debt repayments is more favourable and there might be a feeling amongst investors that these countries are "too big to fail".

While this study proposes a comprehensive perspective on the evolution of the impact of credit rating agencies throughout the crisis, we hope it can also contribute towards further understanding whether or not credit rating agencies are in fact lagging financial markets and whether they exacerbate negative market performance in times of economic turmoil. Our evidence suggests that although markets reacted efficiently to rating announcements in the beginning of the crisis by rapidly incorporating the news into stock prices on and around the event date, investor reactiveness to rating issues became much lower during the second half of the period under scrutiny. As the perceived informational value of Sovereign rating changes decreased among market participants, the role of credit rating agencies in aggravating the crisis becomes more and more questionable. Investors, having lost confidence in the opinions issued by the agencies, have also become more aware of the factors driving the crisis and as such can anticipate macroeconomic trends more efficiently.

In order to assess the real magnitude of the impact on financial markets, further research focusing on long-term effects of credit rating changes would complement our findings. By looking at the anticipated and sustained abnormal returns caused by a rating issue over time, we can with more accuracy determine the exact extent to which the agencies contribute to market pessimism, and whether they lag other market participants in issuing their opinion on sovereign debt and future macroeconomic trends. Also, an increase in event window between negative watches and the actual downgrades they entail might isolate the true effect of a downgrade on national stock markets. Since negative watches signal a downgrade to come, anticipation in markets may bias the impact of downgrades. This longer window would allow determining if negative watches actually do have more influence on markets than downgrades.

The indices used in this thesis are composed of many of the largest national companies within a country, of which many may be multinational companies, with globally diversified operations, being quoted internationally and thus being more transparent, unlike smaller national companies. This biases results as smaller companies may suffer more from Sovereign debt downgrade and the ensuing negative market sentiment. Taking this into consideration, it would be of interest to further research in this area so as to to include firms with exclusive national operations and observe whether there is a difference in impact.

Finally, our findings reveal that the impact of credit rating agencies is particularly large when focusing on a specific region and warranting extensive media coverage. As suggested by the series of downgrades that occurred during the crisis, the focus on economically vulnerable and smaller European nations has led to larger abnormal returns of stock indices in the targeted countries. This underlines the importance of coordinated changes among credit rating agencies: If several agencies issue rating reviews in a short time interval and in the same economic region, this might send a stronger signal to investors about the state of a country's financial markets. Disentangling the exact magnitude of contagion effects amongst neighbouring countries and of serial-downgrades can be of vital importance when assessing the impact of credit rating changes in future recessions. The underlying factors warranting such a change in credit ratings make it a valuable benchmark for understanding medium term macroeconomic prospects in a country and should help us identify future risks leading up to a recession, especially if it accounts for the complexity of financial innovation.

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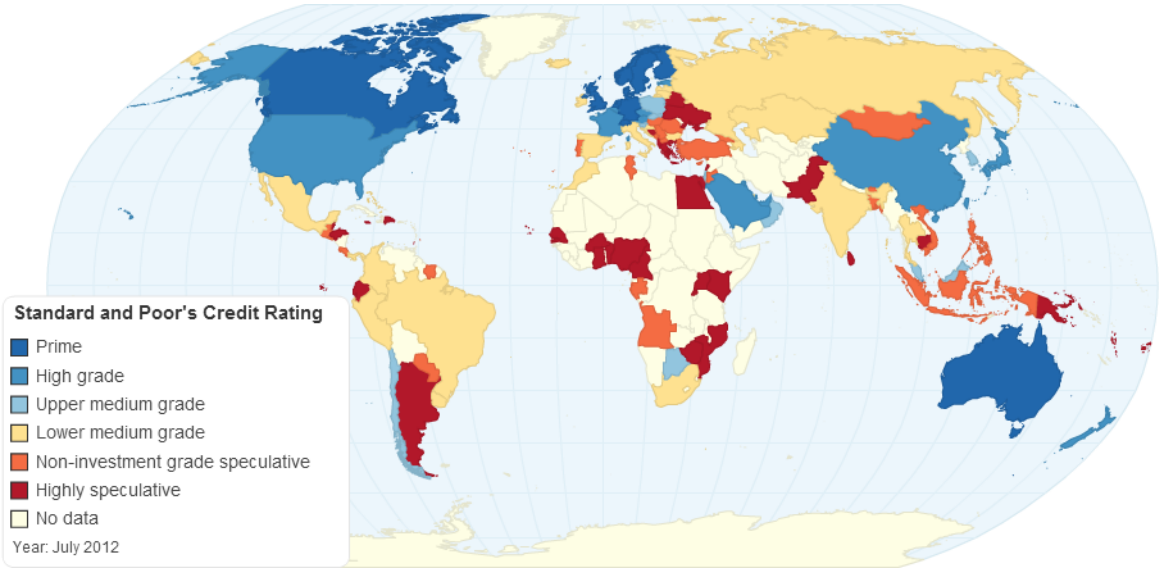
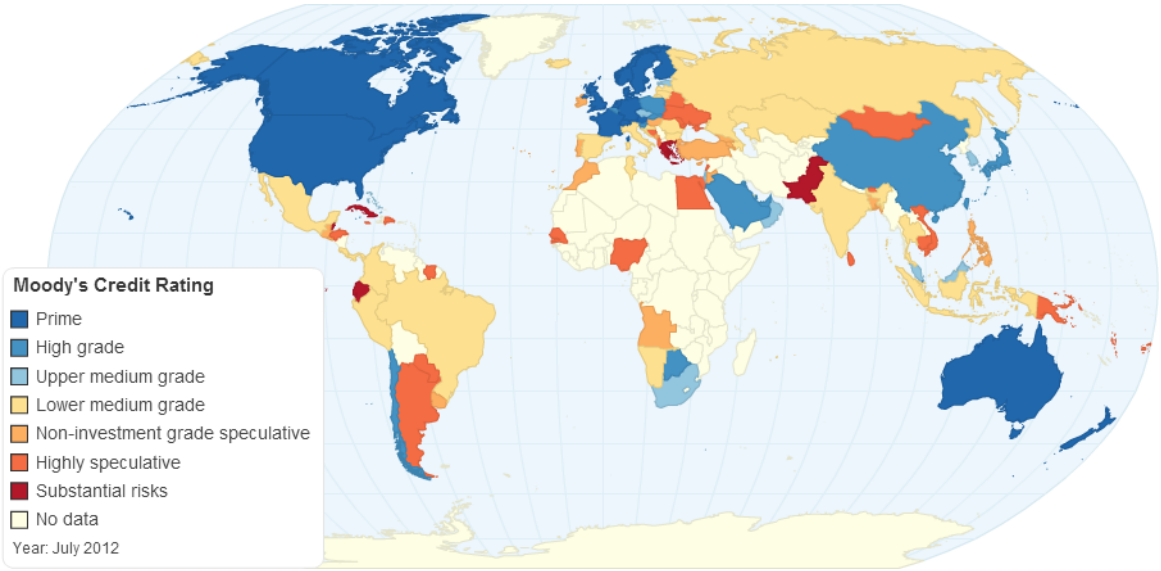
VIII. Appendices

Appendix 1 – Maps of issued Sovereign ratings worldwide according to CRA (July, 2012)

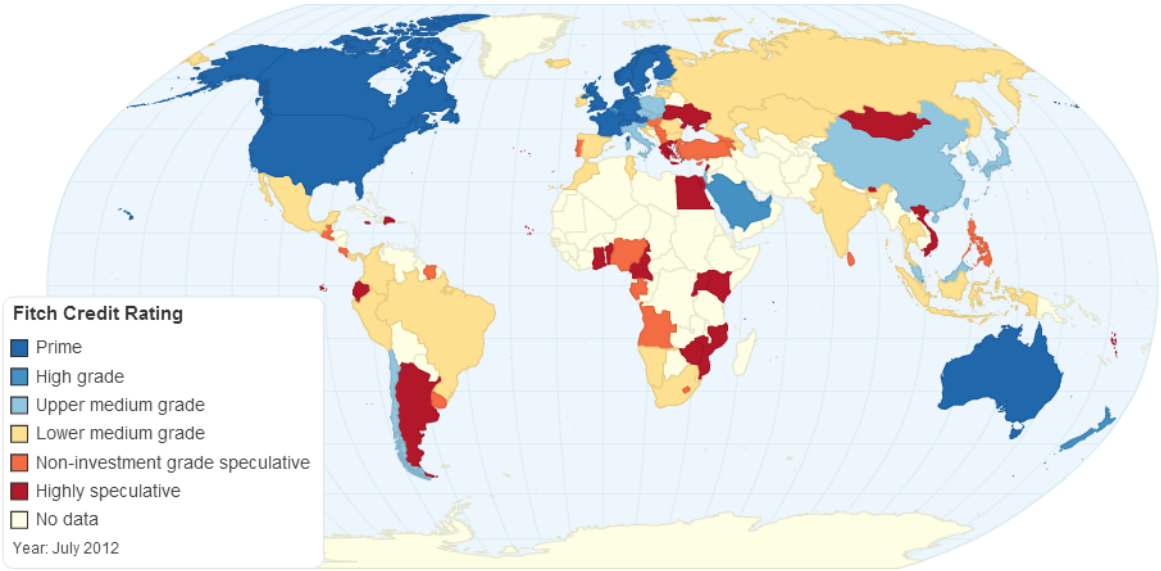
Standard & Poor's



Moody's



Fitch



Appendix 2 – Credit Rating Scale per Agency

	Moody's		S&P		Fitch		
	Long-term	Short-term	Long-term	Short-term	Long-term	Short-term	
Investment	Aaa	P-1	AAA	A-1+	AAA	F1+	Prime
	Aa1		AA+		AA+		
	Aa2		AA		AA		
	Aa3		AA-		AA-		High Grade
	A1		A+	A-1	A+	F1	
	A2		A		A		
	A3	P-2	A-	A-2	A-	F2	Upper Medium Grade
	Baa1		BBB+		BBB+		
	Baa2	P-3	BBB	A-3	BBB	F3	
	Baa3		BBB-		BBB-		Lower Medium Grade
Speculative	Ba1	Not prime	BB+	B	BB+	B	
	Ba2		BB		BB		Non - Investment Grade (speculative)
	Ba3		BB-		BB-		
	B1		B+		B+		
	B2		B		B		Highly Speculative
	B3		B-		B-		
	Caa1		CCC+	C	CCC	C	Substantial risk
	Caa2		CCC				Extremely speculative
	Caa3		CCC-				In default with little
	Ca		CC				In default with little prospect for recovery
			C				
	C		D	/	DDD	/	In default

Appendix 3 – Significance Test Results

Testing for Ho=0	J1: Ordinary Test Statistic	J2: Standardized Test	J2': Mean-effect test (Cross-sectional VAR)	J2*: Standardized test w/ cross sectional correlation	J3: Mean-effect test w/ cross sectional correlation
Test Statistic	-2.604	-3.136	-3.017	-0.523	-0.426
Student-t with N-2 degrees of freedom	1.980	1.980	1.980	1.980	1.980
Statistically significant	YES	YES	YES	NO	NO

Table 1: Significance Tests, Negative announcements, 4-day event window

Testing for Ho=0	J1: Ordinary Test Statistic	J2: Standardized Test	J2': Mean-effect test (Cross-sectional VAR)	J2*: Standardized test w/ cross sectional correlation	J3: Mean-effect test w/ cross sectional correlation
Test Statistic	-2.035	-2.474	-2.459	-0.413	-0.347
Student-t with N-2 degrees of freedom	1.980	1.980	1.980	1.980	1.980
Statistically significant	YES	YES	YES	NO	NO

Table 2: Significance Tests, Negative announcements, 6-day event window

Testing for Ho=0	J1: Ordinary Test Statistic	J2: Standardized Test	J2': Mean-effect test (Cross-sectional VAR)	J2*: Standardized test w/ cross sectional correlation	J3: Mean-effect test w/ cross sectional correlation
Test Statistic	-2.453	-2.947	-2.766	-0.514	-0.408
Student-t with N-2 degrees of freedom	1.982	1.982	1.982	1.982	1.982
Statistically significant	YES	YES	YES	NO	NO

Table 3: Significance Tests, Negative announcements, GIIPS, 4-day event window

Testing for Ho=0	J1: Ordinary Test Statistic	J2: Standardized Test	J2': Mean-effect test (Cross-sectional VAR)	J2*: Standardized test w/ cross sectional correlation	J3: Mean-effect test w/ cross sectional correlation
Test Statistic	-2.616	-2.700	-2.287	-0.859	-0.622
Student-t with N-2 degrees of freedom	2.037	2.037	2.037	2.037	2.037
Statistically significant	YES	YES	YES	NO	NO

Table 4: Significance Tests, Negative announcements, Greece, 6-day event window

Testing for Ho=0	J1: Ordinary Test Statistic	J2: Standardized Test	J2': Mean-effect test (Cross-sectional VAR)	J2*: Standardized test w/ cross sectional correlation	J3: Mean-effect test w/ cross sectional correlation
Test Statistic	-2.737	-3.170	-2.593	-1.197	-0.828
Student-t with N-2 degrees of freedom	2.086	2.086	2.086	2.086	2.086
Statistically significant	YES	YES	YES	NO	NO

Table 5: Significance Tests, Negative announcements, Portugal, 6-day event window

Testing for Ho=0	J1: Ordinary Test Statistic	J2: Standardized Test	J2': Mean-effect test (Cross-sectional VAR)	J3: Standardized test w/ cross sectional correlation	J3': Mean-effect testing w/ cross sectional correlation
Test Statistic	-2.20137	-3.043706889	-2.549003988	-0.872153125	-0.616896951
Student-t with N-2 degrees of freedom	2.02439	2.02439	2.02439	2.02439	2.02439
Statistically significant	YES	YES	YES	NO	NO

Table 6: Significance Tests, Negative announcements, S&P's, 4-day event window

Testing for Ho=0	J1: Ordinary Test Statistic	J2: Standardized Test	J2': Mean-effect test (Cross-sectional VAR)	J3: Standardized test w/ cross sectional correlation	J3': Mean-effect testing w/ cross sectional correlation
Test Statistic	-2.20804	-2.78458096	-2.93984592	-0.756803176	-0.675638894
Student-t with N-2 degrees of freedom	2.01669	2.01669	2.01669	2.01669	2.01669
Statistically significant	YES	YES	YES	NO	NO

Table 7: Significance Tests, Negative outlooks and credit watches, 4-day event window

Testing for Ho=0	J1: Ordinary Test Statistic	J2: Standardized Test	J2': Mean-effect test (Cross-sectional VAR)	J3: Standardized test w/ cross sectional correlation	J3': Mean-effect testing w/ cross sectional correlation
Test Statistic	-1.78031	-2.468114741	-2.18222736	-0.531875167	-0.395322622
Student-t with N-2 degrees of freedom	1.99495	1.99495	1.99495	1.99495	1.99495
Statistically significant	NO	YES	YES	NO	NO

Table 8: Significance Tests, Neg. events for A-rated countries, GIIPS, 4-day event window

Testing for Ho=0	J1: Ordinary Test Statistic	J2: Standardized Test	J2': Mean-effect test (Cross-sectional VAR)	J2*: Standardized test w/ cross sectional correlation	J3: Mean-effect test w/ cross sectional correlation
Test Statistic	-2.657	-3.148	-2.918	-0.657	-0.516
Student-t with N-2 degrees of freedom	1.992	1.992	1.992	1.992	1.992
Statistically significant	YES	YES	YES	NO	NO

Table 9: Significance Tests, Small economies, Negative announcements, 6-day event window

Testing for Ho=0	J1: Ordinary Test Statistic	J2: Standardized Test	J2': Mean-effect test (Cross-sectional VAR)	J2*: Standardized test w/ cross sectional correlation	J3: Mean-effect test w/ cross sectional correlation
Test Statistic	-2.996	-3.980	-3.103	-1.069	-0.694
Student-t with N-2 degrees of freedom	2.020	2.020	2.020	2.020	2.020
Statistically significant	YES	YES	YES	NO	NO

Table 10: Significance Tests, Events dated 2009-2010, Negative announcements, 6-day event window