

Sovereign Credit Rating Changes and Its Impact on Financial Markets of Europe during Debt Crisis Period in Greece and Ireland

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Abstract *The purpose of this study is to examine the impact of sovereign credit rating changes on financial markets using database of two countries (Greece, Ireland) in the European union over the period March, 2008-Dec, 2015. By analyzing the influence of sovereign credit rating on bond market yield We also examine the correlation between sovereign credit rating and bond market yield of each country during crisis period. Quarterly basis data of all variables is used in the research. By using regression analysis with Durbin Watson test and Pearson correlation for each country financial markets the findings indicated that sovereign credit rating has a significant impact on bond markets. Sovereign ratings are negatively correlated with Bond yield in both countries. The finding summarized that credit rating has a major influence on financial markets during crisis period.*

Key words Credit ratings, Moody, S&P, Fitch, bond yield, inflation, current account

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1. Introduction

“There are two superpowers in the world today in my opinion. There’s the United States and there’s Moody’s Bond Rating Service. The United States can destroy you by dropping bombs, and Moody’s can destroy you by downgrading your bonds. And believe me, it’s not clear sometimes who is more powerful”, Thomas L. Friedman on 28 March 1999, in the New York Times Magazine.

The 1980 Latin American Financial crises, Asian financial crises in 1997, Russian debt crises in 1998, and recent Eurozone crises that started after U.S crises in 2008, demonstrated sovereign credit risk. When a Country unable to meet its financial obligations especially public debt, it means it may be default. This study explores the debt crisis and importance of credit ratings during financial crisis period.

1.1. Role of Credit Rating Agencies in International financial markets:

Credit rating agencies played a vital role in International markets. Many researchers examined the role of credit ratings (Kaminsky and Schmukler 2002) using rating changes data of S&P, Moody’s and Fitch examined the contagion across securities & countries. Its research confirmed the spillover among markets. Event study is used to examine the impact of credit ratings on stock market indices conveyed information that only downgraded in ratings have impact on financial markets (Brooks *et al.*, 2004). By constructing Speculative market pressure index to examine rating impact on financial markets, they found that Sovereign rating changes & credit outlooks have a significant effect on the size & volatility in case of ratings downgrades & negative outlook (Kraussal, 2005).

1.2. Credit Rating Agencies Industry

There are three rating agencies that capture the International financial markets: Moody’s, S&P, Fitch Moody was first rating agency that published its rating in 1909 while S&P published its first ratings in 1923. In 1997-2000, Fitch came into being as a result of Merger between Fitch Investor services, IBCA & Duff

&Phelps. Moody's& S&P have captured the market with 80% of all rating revenue. Fitch rating had successfully captured the niche market for third opinion on many obligors.

1.3. Sovereign Credit Ratings History

Modern sovereign ratings are a relatively new phenomenon. Moody started rated sovereigns in 1974, At First, Moody rated Canada, USA and Australia, and in 1975, S&P rated only Canada and United States and the Predecessors Fitch posed no serious challenge to the industry duopoly. Sovereign rating actively grew steadily through the 1980s, but their major focus was on the industrialized countries. In 1990, Sovereign ratings continued to flourish by which time emerging market and transition economics become the key source of growth. At the end of 2002, Moody had its public ratings on 109 Sovereign Governments, S&P 93 and Fitch on 77. Generally, Sovereign rating downgrades are considered to be indications of crisis (Juttner and Crathy, 2000) define rating as a three-notch Sovereign credit rating downgrade on long term foreign currency debt over any six month period.

1.4. Sovereign Credit Rating Criteria

Sovereign credit ratings are assessments of likelihood that a borrower will default on her obligations & that is based on overall creditworthiness of a country. Credit rating agencies consider their ratings as forward indications of country risk that debt issuers will not able & willing to made payments of particular rated Instruments. Sovereign credit risk is categorized into two major components economic risk and political risk.

Economic risk tells about the ability of sovereign government to repay its obligations on time by considering the qualitative and quantitative factors. There are some determinants which is necessary to assess the solvency and liquidity of Sovereigns for Example, S&P divides these factors into eight categories: political risk, Income and economic structure, economic growth prospects, fiscal flexibility, public debt burden, price stability, Balance of payments flexibility and external debt and liquidity (See Appendixes 1) Moody's & Fitch also consider the above factors to assess the country willingness or ability to pay its obligations.

Table 1. S&P's Sovereign Credit Rating Criteria

Political Risk	<ul style="list-style-type: none"> •Form of government and adaptability of political institutions •Extent of popular participation •Orderliness of leadership succession •Degree of consensus on economic policy objectives •Integration in global trade and financial system •Internal and external security risks
Income and Economic Structure	<ul style="list-style-type: none"> •Living standards, income, and wealth distribution •Market versus non-market economy •Resources endowments and degree of diversification
Economic Growth Prospects	<ul style="list-style-type: none"> •Size and composition of savings and investment •Rate and pattern of economic growth
Fiscal Flexibility	<ul style="list-style-type: none"> •General government operating and total budget balances •Tax competitiveness and tax-raising flexibility •Spending pressures
Public Debt Burden	<ul style="list-style-type: none"> •General government financial assets •Public debt and interest burden •Currency composition and structure of public debt •Pension liabilities •Banking, corporate and other contingent liabilities
Price Stability	<ul style="list-style-type: none"> •Trends in price inflation •Rates of money and credit growth •Exchange rate policy •Degree of central bank autonomy

Balance of Payments Flexibility	<ul style="list-style-type: none"> •Impact of fiscal and monetary policies on external accounts •Structure of the current account •Composition of capital flows
External Debt and Liquidity	<ul style="list-style-type: none"> •Size and currency composition of public external debt •Importance of banks, public and private entities as contingent liabilities •Maturity structure and debt service burden •Level and composition of reserves and other public external assets •Debt service track record

Source: Standard & Poor’s (2002)

1.5. Sovereign Credit Rating System

In order to assign their sovereign ratings the credit ratings apply an ordinal scale. Sovereign credit ratings are divided into three broad categories:

1. Upper Investment Grade;
2. Lower Investment Grade;
3. Speculative Grade.

Table 2. Long Term Sovereign ratings Rules

S&P	Moody’s	Fitch	Linear Break
Upper Investment Grade			
AAA	Aaa	AAA	21
AA+	Aa1	AA+	20
AA	Aa2	AA	19
AA-	Aa3	AA-	18
A+	A1	A+	17
A	A2	A	16
A-	A3	A-	15
Lower Investment Grade			
BBB+	Baa1	BBB+	14
BBB	Baa2	BBB	13
BBB-	Baa3	BBB-	12
Speculative Grade			
BB+	Ba1	BB+	11
BB	Ba2	BB	10
BB-	Ba3	BB-	9
B+	B1	B+	8
B	B2	B	7
B-	B3	B-	6
CCC+	Caa1	CCC+	5
CCC	Caa2	CCC	4
CCC-	Caa3	CCC-	3
CC	Ca	CC	2
C	C	C	1
SD/D	Default	DDD/DD/D	0

Investment grade issues are considered acceptable for Institutional investors. Fitch and S&P issues rated BBB- and above are as investment grade and Moody’s split it at Baa3 and above. Sovereign ratings rules described in the research shows that S&P and Fitch run from AAA, the highest through AAA up to BBB which is considered as Investment grade and then when it is going to be down at D which shows the potential default of a country. In contrast, Moody sovereign ratings range from “Aaa” category at the top Ca, Cc, C category at the last which is consider to be default. Different numeral values are assigned to these rating ranges from A to D. Linear transformation scales are used for giving numeral values to ratings, they

used values from 1 to 20 top value given to top rating and lowest to lowest ratings (Kraussal, 2003; Lee 2003). By using as a base (Yun Lai 2013): I assigned 0 value to D, 1 for C, 2 for cc/ca,3 for ccc-/caa3,4 for ccc/caa2,5 for ccc+/caa1,6 for B-/B,7 for B/B2,8 for B+/B,9 for BB-/Baa3,10 for BB/Ba2,11 for BB+/Ba1, 12 for BB-/Baa3, 13 for BBB/Baa2,14 for BBB+/Baa1,15 for A-/A3,16 for A/A2,17 for A+/A1,18 for AA-/Aa3,19 for AA/Aa2, 20 for Aa1/AA+ and 21 for AAA/Aaa. Long term foreign currency ratings and short term foreign currency ratings are used as a major variable in the research. So, I also assigned numeral values to short term ratings 0 for D/D, 1 for C/C, 2 for B/B, 3 for A-3/F3, 4 for F2/A-2, 5 for F1/A-1, and 6 for F1+/A-1+.

Table 3. Short Term Ratings Rules

S&P	Fitch	Linear Break	Moody's	Linear Break
A-1+	F1+	6	P-1	3
A-1	F1	5	P-2	2
A-2	F2	4	P-3	1
A-3	F3	3	Not prime	0
B	B	2		
C	C	1		
D	D	0		

Ordinal Scales of Credit rating agencies like “AAA” have a stronger capacity to meet its financial obligations and “SD” means default. All the grades of credit rating agencies are detailed discussed in table 4 and 5.

Table 4. S&P's Long-Term Issuer Sovereign Credit Rating Scale

Rating Category Definition	
AAA	An obligor rated AAA has extremely strong capacity to meet its financial commitments. AAA is the highest Issuer Credit Rating assigned by S&P's.
AA	An obligor rated AA has very strong capacity to meet its financial commitments. It differs from the highest-rated obligors only in small degree.
A	An obligor rated A has strong capacity to meet its financial commitments but is somewhat more susceptible to the adverse effects of changes in circumstances and economic conditions than obligors in higher-rated categories.
BBB	An obligor rated BBB has adequate capacity to meet its financial commitments. However, adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity of the obligor to meet its financial commitments.
BB	An obligor rated BB is less vulnerable in the near term than other lower-rated obligors. However, it faces major ongoing uncertainties and exposure to adverse business, financial, or economic conditions which could lead to the obligor's inadequate capacity to meet its financial commitments.
B	An obligor rated B is more vulnerable than the obligors rated BB, but the obligor currently has the capacity to meet its financial commitments. Adverse business, financial, or economic conditions will likely impair the obligor's capacity or willingness to meet its financial commitments.
CCC	An obligor rated CCC is currently vulnerable, and is dependent upon favorable business, financial, and economic conditions to meet its financial commitments.
CC	An obligor rated CC is currently highly vulnerable.
SD	An obligor rated SD is in selective default.

In recent years, Credit rating agencies have divided their ratings into actual ratings and outlook/watch. And these ratings is further divided into long term ratings and short term ratings which are seen in both sense foreign and local currency ratings. There is no imminent difference while assigning foreign or local currency ratings so I used long term foreign currency ratings and short term foreign currency ratings as a major variable in this research. Three moderating variables Gdp, current account and inflation is used in my research.

Table 5. Rating Category definition

Rating Category	Definition
Aaa	Issuers rated Aaa offer exceptional financial security. While the creditworthiness of these entities is likely to change, such changes as can be visualized are most unlikely to impair their fundamentally strong position.
Aa	Issuers rated Aa offer exceptional financial security. Together with the Aaa group, they constitute what are generally known as high grade entities. They are rated lower than Aaa entities because long-term risks appear somewhat larger.
A	Issuers rated A offer good financial security. However, elements may be present which suggest a susceptibility to impairment sometime in the future.
Baa	Issuers rated Baa offer adequate financial security. However, certain protective elements may be lacking or may be unreliable over any great period of time.
Ba	Issuers rated Ba offer questionable financial security. Often the ability of these entities to meet obligations may be moderate and not well safeguarded in the future.
B	Issuers rated B offer poor financial security. Assurance of payment of obligations over any long period of time is small.
Caa	Issuers rated Caa offer very poor financial security. They may be in default on their obligations or there may be present elements of danger with respect to punctual payment of obligations.
Ca	Issuers rated Ca offer extremely poor financial security. Such entities are often in default on their obligations or have other market shortcomings.
C	Issuers rated C are the lowest rated class of entity, are usually in default on their obligations, and potential recovery values are low.

Source: Moody's Investors Service (2001)

1.6. Objectives of Research

1. To examine the impact of sovereign credit ratings on financial markets during crises period.
2. To examine the significant impact of Sovereign credit ratings on Bond market yield of Greece, Ireland during financial crises period.
3. To investigate the correlation between sovereign credit ratings and bond yield during financial crises period.

2. Literature Review

Creighton *et al.* (2007) analyzed the impact of rating changes in financial markets of Australia. Credit ratings changes information was taken from two leading rating agencies (S&P, Moody's). Actual changes and credit watches were considered in the research. Data related bonds were taken from UBS Australia or Merrill Lynch. Time period of dataset covered from January 1990 to July 2003. Ordinary least square method and Standard deviation were used as an econometric tool in the research. The results stated that news about credit ratings had impact on both bond and equity prices in Australia. High bond spreads appeared in case of negative rating announcements and low spread in case of positive announcements. In case of ratings downgrades equity prices fall and in case of upgrades in ratings equity prices goes up. The study shows clear picture as compare to past researches that did not provide the clarification how credit ratings impacts on markets. In case of equity events they had a large sample size, and in case of bonds their focus was spreads rather than prices. But they found that agencies had no access to important information that was not in the public domain.

Christopher *et al.*, (2013) investigated the short terms and long terms effects of sovereign credit ratings on stock market and bond markets, and checked the correlations with their respective region markets for this research, they give a data set of nineteen emerging countries classified into four groups (ASIA) Europe, Latin America and Middle East/Africa over the period from 1st January 1994 to 1st July 2007. They found that there is a significant difference in effects of rating information on both bond and stock markets interrelated over different time period. Asset correlation is more liaisons to ratings in long run then short run. So they observed that there is positive regional ratings and outlooks on stock markets co-

movements if there is upgrade in ratings lead to higher return. In case of down grade, investors shifting funds from downgraded markets to nearest region on the other hand there is a negative regional ratings effects of sovereign ratings and out looks on bond co movements it mean when ratings and outlooks are revised downwards investors may be withdraw funds from nearest regions as well as downgraded markets when sovereign ratings improves investors shift funds from other bond markets in favor of affected markets and that give a result of fall in regional correlations.

Lee *et al.* (2007) examined the impact of changes in sovereign credit ratings and out looked on capital markets. The Study also explained the feedback of global bond and stock markets to credit rating changes also differentiate that feedback under macroeconomics and rating factors. For that purpose of research, they used a set of 34 countries including developed and emerging economies. Credit watch list issued by S&P was used for data stream. The date of dataset starts from January 1, 1990 and ends at June 30, 2000. Country's daily price indexes which we measured were in US Dollars and were collected from DataStream's Global Indices Section. The finding showed that credit rating agencies provide new beneficial information to financial markets. Credit rating announcements affects both bond and stock markets, but they react in different form. But positive reaction is linked with upgraded outlook in bond market only. The findings reflect that positive impact is significant for bond market returns. ODowngraded ratings and economic outlook exists during bond market downturns raising a possibility that rating agencies may aggravate a bearish bond market. Analysis shows credit rating downgrades have a negative impact on stock market returns. Negative impact of credit rating downgrade on stock return was prominent in case of high rate of inflation, fiscal balances and sovereign debts etc. Credit rating downgrades on bond return shows negative impact in case of low inflation, and during non-crises period.

Lee (2003) conducted a research on sovereign rating changes and their impact on financial markets during crises period. Stock prices and Bond Yield is examined during study of that research. Effects of interest rates were also part of that research. Five Asian countries were included in the dataset of research and others are included on availability of data. They used JP Morgan global index for bond yield and country stock prices in local currency. Data regarding Sovereign credit ratings of Moody's, S&P, and Fitch was taken from Bloomberg. Panel regression with different model is used as an econometric tool in that research. The findings stated that there is a strong evidence of sovereign credit rating news on own stock markets and bond yield spreads. That research also indicated foreign country effects of ratings downgrades in one country had a significant impact on stock prices as well as bond yield spread.

2.1. Rating Impact during Crises Periods

Christopher *et al.* (2013) analyzed the impact of credit rating agency announcements on the value of Euro and Yield of German, Italian, French and Spanish sovereign bonds during the euro zone debt crises in (2011-2012). Information regarding rating changes was taken from websites of rating agencies S&P, Moody's, and Fitch's. They tested three types of events: watch, outlook and downgrade. Data regarding yield of bond was taken from each country's data stream. They adopted event study methodology along with GAARCH Model in order to examine the impact of rating announcements by credit rating (S&P, Moody's & Fitch's). Exchange rate Model and two CAPM models were used to explain sovereign bond yields for selected countries. The major findings of research were following: Credit rating Agency watch list and outlook events had no significant influence on the value of euro. However decrease in sovereign ratings had statistically impact because euro depreciates against other crises. Yield of French, Italian and Spanish Sovereign bonds increases but German bond yield decreases in case of credit rating downgrades. Sometimes volatility of euro exchange rates and sovereign bond yields increased due to CRA announcements that showed uncertainty in markets. However CRA announcements may have distributional effects.

2.2. Sovereign market news impact on market Volatility

Afonso *et al.* (2014) investigated the reaction of bond & equity markets volatilities to sovereign ratings announcements (Moody's standard & poor, Fitch) using a panel of daily stock markets and bond market return they covered 21 EU countries data set starts from January 1995 to October 2011. It also covered the tenure of euro debt crises sovereign ratings announcements and ratings outlook changes is

provided by three ratings agencies S&P Moody's & Fitch. They used fixed effect analysis of EU stock market and bond market to see the impact of ratings agencies announcements on financial markets volatilities practically the also filtered the equity and bond return volatilities through EGAARCH models they also analyzed the information of sovereign downgrade and upgrade on these volatilities they concluded that sovereign ratings changes have lopsided effects on both bond and equity volatilities in fact upgrade ratings don't have any high effect on volatility, but downgrades rating increase stock market volatility moreover rating announcements create interlinked among European financial markets with upgrade in one country leadings to downgrade in volatility in other countries they also explained financial gains and risk reductions for portfolio returns.

3. Methodology of research

3.1. Introduction

This chapter presents the research methodology in order to conduct the research study in our research we examined the impact of sovereign credit ratings on financial markets of two core countries namely Greece, Ireland of Europe that are badly affected during euro-zone financial crises. Researchers have worked on that problem in many ways. Simon (2012), Brooks (2014) used various nonparametric tests like Kurtosis, skewness to develop the multivariate model and also used Granger Causality test to analyze the effects of credit ratings announcements on European stock market returns and currency markets. Kraussal (2003) used Autocorrelation function (ACF), Augmented Dickey-Fuller (ADF) test, Jarque Bera test to investigate the impact of credit ratings on emerging markets. OLS with Standard deviation techniques used for analyzing the impact of credit rating announcements in Australian markets. Gower and Richards (2007).Regression Analysis with EGAARCH Model is used for investigating the reaction of bond markets and equity markets volatility to sovereign rating announcements Afonso and Gomes (2013). OLS Models with Bresusch Godfrey Durbin Watson test was used to examine the credit rating effects on banking sector of emerging markets (Faul *et al.*, 2014). Weber (2004) used separate regression models for stock markets and CDS to check the impact of rating announcements.

3.2. Research Hypothesis

For Greece

H1 = There is significant impact of sovereign rating news on bond market yield of Greece during debt crises period.

H2 = There is no significant impact of sovereign rating news on bond market yield of Greece during debt crises period.

For Ireland

H1 = There is significant impact of sovereign rating news on bond market yield of Ireland during debt crises period.

H2 = There is no significant impact of sovereign rating news on bond market yield of Ireland during debt crises period.

3.3. Description of Data

3.3.1. Data Type

Dataset consists of Greece and Ireland. Secondary data is used for quantitative analyses to examine the impact of sovereign rating news on financial market of European countries during crises period. Data about all variables which are used in the research is included in tables 6 and 7.

Table 6. Greece Data File

Date	Avg Long term Rating	Avg Short term rating	Inflation	%age return	Current Account	Gdp ECB	Bond Yield OECD
1-Mar-08	16	5	0.004233	1.167062	-4.75977	2.4	4.393333333
1-Jun-08	16	5	0.0041	7.082626	-5.18137	-1.1	4.816666667
1-Sep-08	16	5	0.0008	18.97244	-4.92546	-0.7	4.966666667
1-Dec-08	16	5	-0.00247	4.811945	-4.35535	-1.5	5.033333333

Date	Avg Long term Rating	Avg Short term rating	Inflation	%age return	Current Account	Gdp ECB	Bond Yield OECD
1-Mar-09	15.83333333	7	0.002	-3.66168	-3.88183	-6.8	5.723333333
1-Jun-09	16	7	0.001567	-5.03159	-3.7916	-3.5	5.35
1-Sep-09	16	7	0.001367	-4.17477	-3.46172	-4.1	4.656666667
1-Dec-09	15.33333333	6.666667	0.003867	9.484304	-3.26413	-2.8	4.966666667
1-Mar-10	14.66666667	6	0.006267	3.37519	-4.6883	0.4	6.24
1-Jun-10	12.22222222	5	0.005733	3.811104	-2.00678	-5.3	8.3
1-Sep-10	11.33333333	5	0.002533	2.905602	-3.04018	-7.9	10.79333333
1-Dec-10	11.33333333	5	0.002633	-0.74889	-2.75353	-9.1	11.03333333
1-Mar-11	10.44444444	3	0.004167	3.570658	-4.11229	-10.2	11.85666667
1-Jun-11	7.333333333	2.666667	0.001933	5.384595	-3.4589	-9	15.49666667
1-Sep-11	4	1.5	0.001733	14.9694	-3.18339	-7.6	16.61
1-Dec-11	4	1.5	0.000533	1.42164	-2.55741	-9.9	19.03333333
1-Mar-12	3.666666667	1.166667	0.001733	4.352571	-2.36143	-8.4	24.73666667
1-Jun-12	3	1.666667	0.000767	6.450729	-0.90748	-8.3	25.4
1-Sep-12	3	1.5	0.000333	-9.4488	0.233471	-8	23.69
1-Dec-12	3.222222222	1.666667	0.000233	-6.61176	-0.46881	-4.5	16.16333333
1-Mar-13	3.666666667	2	-0.00163	1.025648	-0.64294	-5.1	11.14333333
1-Jun-13	4.111111111	2.666667	0.000133	3.298295	0.097412	-3.5	10.24
1-Sep-13	4.333333333	3	-0.0021	-9.23012	1.437232	-1.8	10.23
1-Dec-13	4.777777778	3	-0.0017	0.322025	0.712885	-2	8.603333333
1-Mar-14	5	3	-0.00047	-1.22896	-0.0375	0.4	7.593333333
1-Jun-14	5.111111111	3	0.001033	1.603604	0.195303	0.2	6.17
1-Sep-14	5.888888889	3	-0.0013	8.602663	0.12222	1.2	6.026666667
1-Dec-14	6.333333333	3	-0.00773	8.543475	0.18888	1	7.926666667
1-Mar-15	5.777777778	2.666667	0.001133	-3.54898	-0.15	0.4	7.33
1-Jun-15	4.222222222	1.5	0.000967	0.834579	-0.14113	0.9	11.86
1-Sep-15	4	1.5	0.000133	5.335171	-0.15268	-1.1	17.86
1-Dec-15	4	1.5	-0.00253	4.135819	-0.14446	-0.5	6.33

Table 7. Ireland Data

Date	Avg long-term	Avg short-term	Inflation	Gdp imf	Current Account	%age return	BYD OECD
1-Mar-08	21.00000	6.00000	0.00573	0.43333	-5.69394	1.73124	4.24333
1-Jun-08	21.00000	6.00000	0.00437	0.68137	-7.04018	13.39436	4.76000
1-Sep-08	21.00000	6.00000	0.00153	0.31620	-2.60657	13.68510	4.63333
1-Dec-08	21.00000	6.00000	-0.00770	2.93796	3.17972	9.68379	4.56333
1-Mar-09	20.88889	6.00000	-0.00693	3.14311	-2.92303	-3.45028	5.65667
1-Jun-09	20.22222	6.00000	-0.00517	1.82169	-1.80237	-2.04297	5.53000
1-Sep-09	19.66667	6.00000	-0.00260	2.31442	-0.97918	-0.19669	4.87333
1-Dec-09	19.22222	6.00000	-0.00230	1.17931	-0.09078	-1.18812	4.87000
1-Mar-10	19.00000	6.00000	-0.00033	0.69940	-0.30492	-4.15109	4.65000
1-Jun-10	19.00000	6.00000	0.00233	0.46006	2.14635	5.46062	5.14667
1-Sep-10	18.44444	6.00000	0.00197	0.45531	2.65212	2.85194	5.76333
1-Dec-10	16.66667	5.00000	0.00033	0.33411	-0.47730	-1.90332	8.41000
1-Mar-11	14.44444	4.16667	0.00520	0.28575	1.26609	-1.65192	9.55333
1-Jun-11	13.33333	4.00000	0.00130	4.61115	2.21898	2.14305	11.06667
1-Sep-11	13.00000	4.00000	0.00160	2.06444	1.65532	1.43334	9.04000
1-Dec-11	13.00000	4.00000	0.00000	3.41267	1.10076	-3.22501	8.65000
1-Mar-12	13.00000	4.00000	0.00473	1.60250	6.49795	-2.24570	7.04667
1-Jun-12	13.00000	4.00000	-0.00067	0.32357	3.51765	0.63444	6.79333
1-Sep-12	13.00000	4.00000	0.00130	0.14577	5.57913	-0.79973	5.61333
1-Dec-12	13.00000	4.00000	-0.00130	-1.43220	5.71781	-2.87414	4.51333
1-Mar-13	13.00000	4.00000	0.00230	-0.52014	6.14753	-2.69969	4.01667
1-Jun-13	13.00000	4.00000	0.00000	-1.52536	6.19829	-2.01732	3.81333
1-Sep-13	13.00000	4.00000	-0.00033	4.92836	6.81780	-2.32510	3.98333
1-Dec-13	13.00000	4.00000	-0.00133	2.86105	4.86965	-1.79422	3.50000
1-Mar-14	13.33333	4.00000	0.00233	4.13262	1.50000	-1.47981	3.14000
1-Jun-14	13.88889	4.00000	0.00067	6.99680	4.30000	1.77233	2.59000
1-Sep-14	14.66667	4.50000	-0.00067	3.74526	4.30000	-0.78855	1.88000
1-Dec-14	14.77778	4.66667	-0.00323	5.98455	4.20000	-4.50648	1.44667
1-Mar-15	15.00000	5.00000	0.00133	7.33726	5.50000	-3.20678	1.22200
1-Jun-15	15.11111	5.00000	0.00227	6.83638	5.10000	-2.39567	1.15550
1-Sep-15	15.33333	5.00000	-0.00130	6.95290	2.90000	0.49103	1.00000
1-Dec-15	15.33333	5.00000	-0.00200	4.60000	3.50000	-1.76846	2.22220

3.3.2. Sources of Data

Dataset comprises of credit rating figures and information regarding indicators of financial markets. Data regarding rating news is taken from three leading credit rating companies (Moody's, S&P, and Fitch websites) of the world, Countryeconomy.com and The Guardian.com. Data related to ten year Bond Yield is taken from website of economic research Federal Reserve Bank of St. Louis (FRED). Data related to/moderating variables is taken from IMF, OECD and European central bank website. Data related to inflation of European countries is taken from the website <http://www.inflation.eu>.

3.3.3. Time Horizon

We examined the sovereign rating changes and their impact on five countries over the period of 2008-2015. Because Effects of Global crises exist in that period and European crises was started from 2009 in Greece; therefore, I selected that time period in my research.

3.4. Research Models

3.4.1. Regression Analysis with Explanation

Different econometric models are used in research. In this research we used Linear Multiple Regression model with Pearson correlation. Regression analysis is that model which is used to check the impact of independent variables on the dependent variables. Sovereign Long term and Short term foreign currency is used as an independent variable in the research. We measured the impact of sovereign ratings on bond markets during crisis period.

$$BYD = \alpha + \beta_1 LFC + \beta_2 SFC + \beta_3 Inf + \beta_4 Gdp + \beta_5 CA + \epsilon_i \quad (1)$$

The Regression Equation is given below for Bond markets:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \epsilon_i \quad (2)$$

Where:

Y = Bond market Yield (dependent variable);

X₁ = Long term foreign currency ratings (independent variable);

X₂ = Short term Foreign currency ratings (independent variable);

X₃ = Gdp real Index (Moderating Variable);

X₄ = CPI inflation (Moderating Variable);

X₅ = Current account to Gdp (Moderating Variable);

α = Constant;

c = Regression Coefficient;

ε_i = Error arising due to other variables.

$$STR = \alpha + \beta_1 LFC + \beta_2 SFC + \beta_3 Inf + \beta_4 Gdp + \beta_5 CA + \epsilon_{ii} \quad (3)$$

3.4.2. Durbin –Watson test

Durbin Watson test is used to check the multicollinearity between independent variables. If the value of D-W is equal to 2 it means there is no collinearity between two variables if it exceeds up to 4. It means there is collinearity between variables which is harmful for research.

3.4.3. Pearson Correlation

Correlation analysis is used to determine the relationship between variables. This research tool measures of how two variables move in relation to each other. Correlation is used in advance portfolio management.

Correlation Coefficient is computed into what is known as the correlation coefficient, which ranges between -1 to +1. Value of correlation co-efficient +1 describes that one security moves up or down other will also moves in same direction. And value of correlation coefficient -1 describes if one security moves in up direction other will moves in opposite direction. If results of correlation coefficient will be zero it means there is no correlation between variables that are used in the research.

4. Data Analysis and Results

4.1. Greece Bond market Results and its Interpretation

Table 8. Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.886 ^a	0.784	0.743	3.124119	0.784	18.899	5	26	0.000	1.318

a. Predictors: (Constant), CA, GDP, INF, SFC, LFC

b. Dependent Variable: BYD

Interpretation

The results of table 8 represents about correlation coefficient r which is equivalent to 0.886 and coefficient of determination r^2 value is equivalent to 0.784 it represent that 78.4% of variation in Bond yield is explained by Long term foreign currency rating, short term ratings and other three moderating variables current account, inflation and Gdp. Durbin Watson test is used to check the multicollinerity about independent variables its value is equivalent to 1.318 which shows there is no autocorrelation among variables. The result also represents the significance level of model. It shows the value of significance is 0.000 which is less than 0.01. It means modal is more significant at 0.01 level. F statistic shows that significance of overall model. The value of F is 18.899

Table 9. Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients		t	Sig.
	B	Std. Error	Beta			
(Constant)	15.219	1.580			9.630	.000
LFC	-.239	.660	-.202		-.363	.720
SFC	-1.689	1.204	-.519		-1.403	.172
INF	235.831	267.431	.105		.882	.386
GDP	-.793	.203	-.497		-3.909	.001
CA	-.178	.922	-.058		-.193	.848

a. Dependent Variable: BYD

Interpretation

$$BYD = 15.219 - .239LFC - 1.689SFC + 235.831INF - .793GDP - .178CA$$

Here, $a = 15.219$ and its significance value is equivalent to $.000 < 0.01$ which shows that constant value is significant at .01 level. β_1 shows that with unit change in long term foreign currency rating then stock market returns are decreased by $-.239$ and its significance value is $.720$ which shows the negatively impact on market. β_2 shows that with a unit change in short term ratings return will decrease by -1.689 its significance value is $0.172 > 0.05$ which shows that it has negative impact on market. β_3 shows that with unit change in inflation returns is decreased by 235.831 which is highly insignificant with value $.386$. β_4 represents Gdp with unit change returns also changed by $-.793$ its value of significant at $.001 < 0.05$. β_5 shows with the change of unit of current account return is also changed by $-.178$ its value of significance is $.848 > 0.05$ level but it has negative impact on bond market yield. Probability value of F is less than 5% it means whole model is significant and F statistic also shows the fitness of model.

Table 10. Correlations

		BYD	LFC	SFC	INF	GDP	CA
Pearson Correlation	BYD	1.000	-.648	-.693	-.042	-.631	.265
	LFC	-.648	1.000	.930	.480	.124	-.822
	SFC	-.693	.930	1.000	.412	.132	-.635
	INF	-.042	.480	.412	1.000	-.259	-.611
	GDP	-.631	.124	.132	-.259	1.000	.217
	CA	.265	-.822	-.635	-.611	.217	1.000
Sig. (1-tailed)	BYD	.	.000	.000	.411	.000	.071

		BYD	LFC	SFC	INF	GDP	CA
	LFC	.000	.	.000	.003	.249	.000
	SFC	.000	.000	.	.010	.235	.000
	INF	.411	.003	.010	.	.076	.000
	GDP	.000	.249	.235	.076	.	.116
	CA	.071	.000	.000	.000	.116	.
	BYD	32	32	32	32	32	32
N	LFC	32	32	32	32	32	32
	SFC	32	32	32	32	32	32
	INF	32	32	32	32	32	32
	GDP	32	32	32	32	32	32
	CA	32	32	32	32	32	32

Interpretation

Table 10 results shows that a correlation between STR and LFC is -.648 which is negatively correlated with each other but there is strong negative correlation among these variables with the value of significance at $0.000 < 0.001$. Short term ratings -.693 and returns shows strong but negatively correlation among each other with the value of significance at $.000 < 0.001$. correlation between inflation and SSTR is equivalent to -.042 which shows negative correlation between these variables. Gdp and BYD has also strongly negative correlation among each other with a value of -.631 with value of significance at $.000 < .001$. While current account and BYD has weak positively correlation among each other with the value of .265 at .071 significant value which is insignificant at 5% level. Pearson correlation signifies that there is indirect correlation among long term ratings inflation Gdp short term rating and bond yield while direct correlation with current account of Greece among bond yield.

4.2. Ireland Bond market Results and its Interpretation

Table 11. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				Durbin-Watson	
					R Square Change	F Change	df1	df2		Sig. F Change
1	.631 ^a	0.398	0.282	2.144768	0.398	3.436	5	26	0.016	0.598

a. Predictors: (Constant), CA, INF, GDP, SFC, LFC

b. Dependent Variable: BYD

Interpretation

Table 11 results represents about correlation coefficient r which is equivalent to 0.631 and coefficient of determination r^2 value is equivalent to 0.398 it represent that 39.8% of variation in Bond yield is explained by Long term foreign currency rating, short term ratings and other three moderating variables current account, inflation and Gdp. Durbin Watson test is used to check the multicollinearity about independent variables its value is equivalent to 0.598 which shows there is no autocorrelation among variables. The result also represents the significance level of model. It shows the value of significance is 0.016 which is less than 0.05. It means modal is significant at 0.05 level. F statistic shows that significance of overall model. The value of F is 3.436.

Table 12. Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	B	Std. Error	Beta			
(Constant)	15.315	3.984		3.844	.001	
1	LFC	-.122	.695	-.151	-.175	.863
	SFC	-1.350	2.049	-.475	-.659	.516
	INF	-60.903	143.608	-.075	-.424	.675
	GDP	-.411	.165	-.415	-2.493	.019
	CA	-.423	.211	-.589	-2.006	.055

a. Dependent Variable: BYD

Interpretation

$$BYD=15.315-0.122LFC-1.350SFC-60.903INF-0.411GDP-0.423CA$$

Here $a=15.315$ and its significance value is equivalent to $.001 < 0.05$ which shows that constant value is significant at .05 level. β_1 shows that with unit change in long term foreign currency rating then stock market returns are decreased by -0.122 and its significance value is $.863$ which shows the negatively impact on market. β_2 shows that with a unit change in short term ratings return will decrease by -1.350 its significance value is $0.516 > 0.05$ which shows that it has negative impact on market. β_3 shows that with unit change in inflation returns is decreased by -60.903 which is insignificant with value 0.675 . β_4 represents Gdp with unit change returns also changed by -0.411 its value of significant at $0.019 < 0.05$. β_5 shows with the change of unit of current account return is also changed by -0.411 its value of significance is $0.05 = 0.05$ level is slightly significant at 0.05 level. Probability value of F is less than 5% it means whole model is significant and F statistic also shows the fitness of model.

Table 13. Correlations

		BYD	LFC	SFC	INF	GDP	CA	
Pearson Correlation	BYD	1.000	-.060	-.152	.191	-.454	-.243	
	LFC	-.060	1.000	.969	-.250	-.186	-.775	
	SFC	-.152	.969	1.000	-.257	-.118	-.681	
	INF	.191	-.250	-.257	1.000	-.203	-.038	
	GDP	-.454	-.186	-.118	-.203	1.000	.235	
	CA	-.243	-.775	-.681	-.038	.235	1.000	
		BYD	.	.373	.203	.147	.005	.091
Sig. (1-tailed)	LFC	.373	.	.000	.084	.154	.000	
	SFC	.203	.000	.	.078	.260	.000	
	INF	.147	.084	.078	.	.132	.418	
	GDP	.005	.154	.260	.132	.	.097	
	CA	.091	.000	.000	.418	.097	.	
		BYD	32	32	32	32	32	32
	N	LFC	32	32	32	32	32	32
SFC		32	32	32	32	32	32	
INF		32	32	32	32	32	32	
GDP		32	32	32	32	32	32	
CA		32	32	32	32	32	32	

Interpretation

Table 6 results shows that a correlation between STR and LFC is -0.060 which is negatively correlated with each other, but there is weak negative correlation among these variables with the value of significance at 0.373 which is insignificant at 0.05 level. Short term ratings $-.15$ and yield shows strong but negatively correlation among each other with the value of significance $.203$ which is insignificant at 0.05 level. Correlation between inflation and yield is equivalent to 0.191 which shows the positive correlation between these variables. Gdp and BYD have also strongly negative correlation among each other with a value of -0.454 with value of significance at 0.005 which is significant at 0.05 level. While current account and BYD has negatively correlation among each other with the value of $-.243$ at $.091$ significant value which is significant at 0.1% level. Pearson correlation signifies that there is indirect correlation among long term ratings Gdp short term rating, current account and bond yield while direct correlation with inflation of Ireland among bond yield.

5. Conclusions and recommendations

5.1. Greece Concluding Remarks

In case of Bond markets, ten year bond yield is used as a dependent variable because it is used as a benchmark in Greece. The findings of research reject the null hypothesis and confirmed that p-value of Model is $0.000 < 0.01$ shows that model is highly significant at 0.01 level. By using Pearson correlation, it is concluded by findings there is negative correlation among sovereign credit ratings and bond Yield. If sovereign credit ratings downgrades Bond yield moves to up. As Gower and Richard (2007) confirmed that

high bond spread appears while negative rating announcements and low bond spread in case of positive rating announcements.

5.1.2. Ireland Concluding Remarks

In case of Bond markets ten year bond yield is used as a dependent variable because it is used as a benchmark in Ireland. The findings of research reject the null hypothesis and confirmed that p-value of Model is $0.016 < 0.05$ shows that model is highly significant at 0.05 level. By using Pearson correlation It is concluded by findings there is negative correlation among sovereign credit ratings and bond Yield. If sovereign credit ratings downgrades Bond yield moves to up. In moderating variables Gdp is perfectly negative correlated with yield. As Gower and Richard (2007) confirmed that high bond spread appears while negative rating announcements and low bond spread in case of positive rating announcements. The findings describe that sovereign credit ratings along with its moderating variables play an important role in secondary markets during crises period.

5.1.3. Recommendations of Study

At the end, it is concluded that credit ratings have a much power to influence the secondary markets.

- In Greece by getting bailouts their Leadership fails to overcome the financial crisis financial markets of Greece are affected by rating announcements and these procyclical effects transfer to other countries.
- By observing Ireland economy, It is concluded that their financial markets don't have power to absorb the reaction of announcements during crisis period. Financial markets shows instability during crisis period.

5.1.4. Implications and Future Research

Further in future this study may be extended by examining the contagion effect among markets and to examine the cross country correlation among markets by considering pre and post time period of financial crises. It might be a better approach to decide the role of credit ratings and to check the spillover among markets during crises period. It may be extended to foreign exchange and derivatives markets.

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