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Credit rating changes and the government cost of borrowing in Turkey

Murat Gürer
Middle East Technical University, Department of Economics, Ankara
e-mail: mrtgrr@gmail.com

Pınar Derin-Güre
Middle East Technical University, Department of Economics, Ankara
e-mail: pderin@metu.edu.tr

Abstract

Standard and Poor's (S&P), Moody's and Fitch have been producing credit ratings for government bonds and corporate bonds. Changes in credit ratings affect the investors' decisions and government cost of borrowing as well. 2008 global financial crisis is an important milestone for the credit rating agencies since during the crisis period high rated countries faced with deep economic fluctuations, which decreased creditworthiness of these agencies. This paper investigates the relationship between sovereign bond spreads and rating changes during the post-crisis period for Turkey. The relationship between credit rating/outlook changes and cost of borrowing in Turkey has not been investigated in an academic paper before. Therefore we perform vector autoregression (VAR) model including Granger causality test and impulse response functions (IRFs) analysis to investigate the effects of rating changes on the Turkish government bond spreads from July 2007 to March 2013. We also apply event study analysis in order to capture the dynamic effects of rating changes on Turkish government bond spreads. This analysis gives some evidences that rating announcements are often anticipated by the market so investors take their position before announcement day, which leads to insignificant results in VAR estimates.

Key words: Credit rating, government borrowing, vector autoregression, event study, market anticipation.

JEL codes: G15, G23, E62.

1. Introduction

Standard and Poor's (S&P), Fitch, and Moody's are the largest and well-known credit rating agencies. They are private companies issuing ratings for companies, states, special purpose entities, or sovereign nations. Credit rating

agencies (CRAs) have been producing credit ratings for sovereign bonds (government bonds) and corporate bonds for many years. CRAs each have their own rating methodology and rating scale. The notes are issued by these agencies as letter grade, which indicates the creditworthiness of debt issuers. They might change country's rating or outlook when country's sovereign creditworthiness has changed significantly. Even though there is no legal obligation for issuers of bonds to get a credit rating, financial market participants pay more attention to the assessment of rating agencies before investing in bonds. Since sovereign bond rating is an indicator for the likelihood of public debt default, investors take credit ratings into account when they invest in bonds.

As a key method of funding many economies employ debt securities, and this method generates an important asset class for many investors. In international financial market investors pay more attention to the government bond yield spreads before taking long/short positions in these securities. Country bond yield spreads often represent the government's cost of borrowing and it is adopted as an average measure of country default risk. It is calculated by differencing the yield of country bond from the yield of a developed country bond, which has same currency denomination and maturity. Governments have huge amount of debts so a small deviation in bond spreads may result in significant cost for taxpayers. Since any change in spreads is critical for governments and investors, they deal with the developments that affect spreads. Even though in many studies it is pointed out those country specific indicators are main factors that affect the sovereign bond yield spreads, in this paper we aim to analyze reciprocal relationship between rating/outlook announcements (changes) and government bond yield spreads for Turkey.

The relationship between rating announcements and government bond yields has been investigated in several papers. Cantor and Packer (1996) find that low inflation, low ratio of foreign currency external debt to exports, more rapid growth, high per capita income, and high level of economic development are all associated with high ratings. This study is conducted by using rating data from S&P and Moody's for 49 countries. Their analysis shows that the information contained in macroeconomic indicators are effectively summarized and supplemented by sovereign ratings. Also, authors observe in their study that these indicators can be explanatory variables in the explanation of bond spreads. They conclude that credit ratings are strongly correlated with market determined government bond spreads, so rating changes influence sovereign spreads due to their correlation with macroeconomics indicators. In follow-up study, Larrain et al. (1997) employing panel data analysis and event study analysis provides econometric analysis on the fact that changes in credit ratings have a significant effect on global financial market.

There exist some studies showing that credit ratings are the main determinants in the process of pricing government bonds, so investors' expectations about sovereign bond spreads are shaped by credit rating changes. Erb et al. (1996) investigate the relation between country risk rating and countries' bond yield spreads for a sample of developed countries. The conclusion of this paper supports the view that country risk ratings are the main determinants in the explanation of cross-section of real yields. Therefore, portfolio managers track changes in credit ratings closely because their investment decisions basically depend on credit ratings, especially, for institutional investors.

This paper tries to find out the relationship between the rating changes and Turkish sovereign bond spreads and whether it changed after the Global Financial Crisis. We aim to construct a broader outline for the effects of CRAs' views on financial markets by observing the Turkish government bond instruments. As a main methodology we use vector autoregressive (VAR) method to examine the inter-relationship between variables of credit rating/outlook changes and spread changes (Eurobond or EMBI Global) of Turkey. We employ Granger causality test and show impulse response functions (IRFs). The study of anticipation effects is crucial for these types of studies to obtain unbiased results because rating or market participants generally anticipate outlook changes. In this study, delayed effects of rating and outlook changes are investigated because rating/outlook changes can be made at any time of day. By using Turkish government bond spreads and CRAs' ratings for long term foreign currency debt from July 2007 to March 2013, we focus on the role of well-known credit rating agencies on Turkish government bond spreads.

Our main contributions in this paper can be summarized as follows. First, in our study we take the latest period as a sample, so this allows us to examine the impact of the 2008 global crisis to the financial markets, especially for Turkish government bonds. We examine not only crisis period but also post crisis period to reach a reasonable result. Global financial crisis is an important milestone for the credit rating agencies since during the crisis high rated countries faced with deep economic fluctuations. The success and reliability of a credit rating agency depends on the quality of information that is produced. If information is unbiased, timely, and accurate then its reputation increases. Surprisingly, global financial crisis has proven that ratings can be inaccurate, untimely, and biased. According to Bahena (2010), the central problem that leads to the global financial crisis is the inaccurate credit ratings. Reurink (2012) investigates the political aspect of CRAs in the international financial system. The author evaluates the question of why American CRAs are at the heart of the international financial system and their position during the global financial crisis. The author reaches the conclusion that there exists American firms' oligopoly in rating industry, so this situation produces biased

information for the financial market. These types of studies indicate that global financial crisis starts a controversy about the CRAs reputation and their position in the world economy. In the light of these controversies focusing on the post-crisis period to evaluate the relationship between Turkish government bond spreads and ratings is more reasonable than taking pre-crisis period. Most of the literatures about this issue take pre-crisis period as a time zone and there are few studies that take crisis and post-crisis period. Taking updated time zone and focusing on the Turkey's government bonds will be our main contribution to the existence literature. Second, in literature researchers generally use Emerging Market Bond Index (EMBI)[1] spreads issued by JP Morgan. The EMBI spreads are constructed by taking weighted average of spreads on a variety of Brady bonds issued by the developing countries and these bonds typically have a long-term maturity. However, in our study we use Turkey 5-year government bond yields (Eurobonds) occurring at the secondary market and Emerging Market Bond Index Global (EMBIG) spreads for Turkey. EMBIG includes US dollar-denominated Brady bonds, loans, and Eurobonds with an outstanding face value of at least $500 million. We investigate the medium-term and long-term effect of rating changes on the sovereign bond spreads for Turkey. While there is no set definition of what constitutes the medium-term, it is generally accepted bonds are those that mature somewhere between two and ten years, so we take 5-year government bond spreads as a represent of the medium term. Data is taken from Bloomberg.

As far as we know the only study in literature that investigates how rating changes affect government cost of borrowing in Turkey is one page of a short report prepared by the Banking Regulation and Supervision Agency of Turkey (BDDK, 2009), The report includes only OLS estimation results and the findings are significantly different from our findings where we use VAR estimations. That study also does not include event study analysis. Therefore our paper is significantly different from the report mentioned.

We examine the relationship between Turkey's 5-year government bond spreads, EMBIG (Emerging Markets Bond Index Global) spreads and rating changes announced by S&P, Moody's, and Fitch using daily data from July 2007 to March 2013. The vector autoregressive (VAR) model suggests that there is no inter-relationship between the variables of credit rating/outlook change and spread change for Turkey. Therefore there exists no Granger causality between variable of credit/outlook rating change and spread change for Turkey. Performed impulse response functions (IRFs) study market participants' attention to the credit rating agencies' announcement. It does not significantly affect their decision for the Turkish government bond after the 2008 global financial crisis. The event study

[1] A benchmark to measure the total performance of government bonds issued by emerging countries.

analysis indicates that spreads begin to move in the anticipated path before the announcement day.

The rest of the paper is organized as follows: Section 2 reviews existing literature on the relationship between credit rating announcements and the government bond yield spreads. Section 3 describes the data and methodology facts. Section 4 discusses the details of empirical results of VAR, Granger causality test, IRFs, and event study analysis results. In section 5 we present our main findings and we provide some possible further directions for the research investigated in this area.

2. Literature review

In this section we aim to summarize the existing literature dealing with the effect of credit rating changes on the government cost of borrowing.

The existing studies can be divided into two groups. First group of studies focuses on the determinants of credit rating. In these papers some methods are used to reveal the determinants of credit rating. For example, Afonso (2003), Bissoondoyal-Bheenick (2005) and Afonso et al. (2011) conclude in their studies that real GDP growth, the public debt level, level of GDP per capita, external debt, and the government budget balance mainly explain credit rating of countries. At the second group of studies authors deal with the impact of credit rating changes on the government bond spreads. Kräussl (2005) performs an event study analysis by using long-term foreign currency denominated credit ratings announced by S&P and Moody's for the period of January 1997 to December 2000. Paper concludes that credit rating and outlook changes have significant effect on the government bond spreads, especially rating downgrade and negative outlook announcements significantly affect the government bond spreads. By performing event study analysis for the period 1989-1997, Reisen and von Maltzan (1999) conclude in their study that when a country faces with a downgrade in rating then there occurs a significant change in sovereign bond spreads. In this study event study analysis provides information about the market reaction for 30 trading days before and after the rating announcement day.

Afonso et al. (2011) examine the effect of sovereign credit rating changes on the government bond yield spreads. For this study authors use European Union countries' daily data from January 1995 to October 2010. Similar to previous studies event study analysis is used. Authors find that rating/outlook change, especially negative changes, significantly affect the government bond yield spreads.

Flores (2010) investigates the impact of rating and outlook changes on the domestic and foreign financial market by using 18 emerging market data. The sampling period in the paper is from January 1997 to December 2010 and EMBI Global spreads have been used as sovereign bond yield spreads. In this paper panel

estimations are performed to release the immediate effects of a rating or outlook change. Also author performs event study analysis to investigate the dynamic reaction of financial markets by considering relative returns of bonds during the pre-announcement, post-announcement, and announcement day. Author finds that domestic rating and outlook changes significantly affect the government bond yield spreads and foreign rating changes also significantly affect the domestic markets but in smaller absolute terms.

Larrain et al. (1997) present econometric evidence using panel data analysis and event study analysis to evaluate the effect of the credit rating changes on global financial markets. Authors perform Granger causality test using yearly observed unbalanced data for period 1988-1995; also, they investigate the effect of rating changes on the sovereign yield spreads for 26 OECD and non-OECD countries. Result of event study analysis shows that there is a highly significant rating change effect when emerging-market government bond takes negative outlook. Findings of paper indicate that negative rating change has stimulated the private capital inflows to the countries that have lower default risk- higher credit ratings. Granger causality is also tested and a bi-directional causality is found which means changes in credit rating and changes in bond yields are mutually interdependent. Furthermore, authors catch the market expectation towards the rating change as a critical point in the explanation of the government bond spreads.

Kaminsky and Schmukler (2002) examine data from 16 emerging countries, covering the period from January 1990 to June 2000. For country selection authors consider contagion effect, crisis experience of country, and availability of data. As sovereign bond spreads they use EMBI, and they perform panel regressions and event study analysis to examine how dynamically rating and outlook change affect the sovereign spreads. Authors find that bond market is significantly affected by rating/outlook changes; government bond yield spreads increase 2 percentage points as a response to a domestic downgrade. Rating announcements causes the spillover effects, that is, rating changes in one emerging country triggers changes in other emerging countries' bond yield spreads.

Scholtens (1999) tries to find the relationship how country risk in 1990s affects the Eurobond yield spreads by calculating rank correlations for countries including developing and industrialized countries. Regression equations describing the relationship between yield spreads and country risk are built and interpreted. Then he examines this relationship through time, whether it holds or not. To obtain best judgment on the association between yield spreads and country risks he calculates as many Spearman rank correlations as possible. Author concludes that there is a strong and positive association between yield spread and country risk.

After the Global Financial Crisis there has there has been a revised interest on the determinants of emerging markets sovereign bond spreads. Comelli (2012) finds

that during crisis only having good macroeconomic indicators helped in having low sovereign debt spread but not as much as good times. The study mainly focuses on the determinants of sovereign debt spreads and author mainly finds that better macroeconomic indicators results in lower spreads and this effect is stronger at good times compared to crises period. The paper doesn't focus on the credit ratings but many macroeconomic fundamentals that might change the credit ratings are argued to be less effective at crisis time and this might break the link between credit ratings and sovereign debt spreads. This might support our findings in this paper. Authors also find that global factors affect the spreads. They find Volatility Index has a significant impact but US short and long-term interest rates are no longer significant determinants of sovereign debt spread during the crisis therefore we will control for Volatility Index but not for US interest rates. A similar study on the determinants of emerging market sovereign bond spreads is Csontó (2014). This paper does not concentrate on the relation between sovereign bond spread and credit ratings but it is on the determinants of sovereign bond spreads in emerging market economies in general. Using fixed effects estimation the author finds that importance of global economic variables becomes more important in high volatility countries although domestic variables might be important as well. Therefore during the financial crises period in our study global factors might be more important and that might be one of the reasons of not having a significant relation between sovereign bond spreads and credit rating in Turkey.

As mentioned before it is the first time such a detailed study conducted for Turkey on the impact of credit ratings on government cost of borrowing in Turkey. On the other hand there are studies in Turkey on the determinants of credit ratings in Turkey. Kalaycı et al. (2010) find that credit ratings in Turkey are determined by Gross Domestic product, inflation, external debt and general government budget balance in Turkey. Authors also argue that Turkey gets lower credit ratings then indicated by the economic and financial data. Authors argue that political and social factors play a role in here. Sezgin et al. (2015) also finds out the determinants of credit rating in Turkey for 2000-2014. It is important to note that this study includes post crises period as well. Authors find that Gross Domestic Product and political risk index are both important for the three credit rating agencies. They also find that stock market return, current account balance, external debt and unemployment rate and interest rate has a significant effect on credit ratings of some agencies but not on the other. So these variables do not have a robust impact on credit ratings of all credit rating agencies in Turkey. Following Kalaycı et al. (2010), Sezgin et al. (2015) also argue that there is no clear line on how much the objective factors like economic and financial factors play a role compared to the subjective factors. These studies on Turkey suggest that there might be more to the credit ratings than fundamental changes on economic and financial indicators and if subjective factors

play a role here it might break the link between sovereign bond spread and credit ratings in Turkey.

The only study on the impact of credit ratings on the government's cost of borrowing in Turkey is the Turkey Banking Regulation and Supervision Agency (BDDK) report in 2009. This report performed a narrowed study and it is indicated that the credit ratings of countries is key factor on both bond price and bond spreads. In this study, regression analysis is done with monthly data for the period February 2001 to November 2009. Eurobond spreads are used as a dependent variable and credit ratings announced by S&P, Moody's and Fitch are used as independent variables. It is important to mention that this report is conducted for report purposed only OLS estimation results are given and no detailed statistical analysis is maintained including the stationarity of the variables. The problem of endogeneity has not been addresses and the period that they include is different from this paper. In the report mainly before crises period is taken whereas we do include the period where global financial crises effect had been felt and credit rating agencies lost the trust of the market.

During 2008 financial crisis high rated countries faced with deep economic fluctuations, which decreased the creditworthiness of credit rating agencies as we mentioned earlier. Therefore, post-crisis period is a new field in order to investigate the relationship between credit rating changes and government bond yield spreads. The studies explained above aim to examine different questions and investigate the effects of credit rating changes on bond yield spreads. Most of these studies use panel data or simple regression models during the analysis process. However, in this study, we follow vector autoregression (VAR) model including Granger causality test, impulse response functions (IRFs), and event study analysis. We use 5-year Turkish government bond spreads and EMBI Global spread for Turkey with credit ratings/outlooks announced by S&P, Moody's, and Fitch. In this study we demonstrate the relationship between Turkish government bond yield spreads and credit rating changes can be used in the analysis of financial market for Turkish sovereign bonds.

3. Data

We employ Turkey's 5- year government bond spreads, EMBIG (Emerging Markets Bond Index Global) spreads and rating changes announced by S&P, Moody's, and Fitch as a data set. Also, we use VIX (volatility index) in our model as an indicator of global risk or degree of risk appetite of investors. Eurobond Spread/EMBIG Spread, rating/outlook change, and VIX are the variables used in our models. Among these variables Eurobond Spread and EMBIG Spread are the dependent variables used interchangeably. All other variables are explanatory

variables. Data set used in models consists of daily data and the data period is from July 2007 to March 2013.

For dependent variable we use two types of variables; one is Eurobond spread, which is calculated, and the other one is EMBIG spread for Turkey announced by JP Morgan. EMBI Global includes US dollar-denominated Brady bonds, loans, and Eurobonds with an outstanding face value of at least $500 million. Sovereign Eurobond yield spreads are calculated by using 5-year foreign currency denominated Turkey bond and 5-year US government bond as a benchmark instrument. In financial market, countries' default risk usually is demonstrated by government bond yield spreads. When default risk increases bond prices decrease and bond yield spreads increase. The data for bond yields are taken from Bloomberg, and the data for credit ratings come from sovereign rating agencies' web pages. Following figures demonstrate Eurobond spread and EMBI Global spread for Turkey. Since economic crisis creates uncertain circumstance for investors, countries' willingness to pay more interest increases, and it directly widens sovereign bond spreads. As it can be seen in figures Turkey sovereign bond spreads increase sharply after 2008 global financial crisis. This situation provides an opportunity for researchers to investigate the role of CRAs in Turkey's cost of borrowing.

Figure 1
Turkey Eurobond Spread

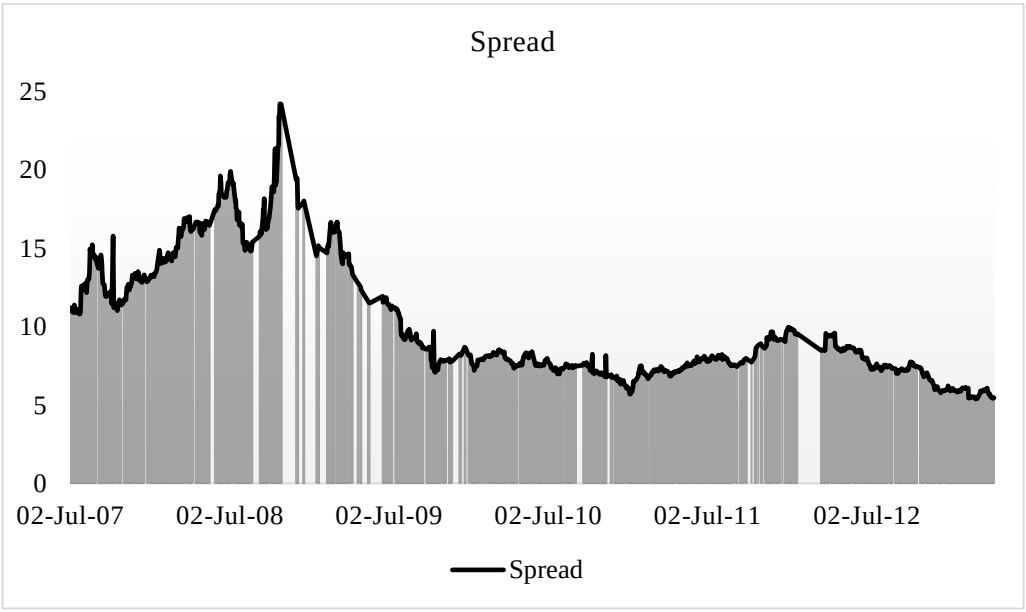
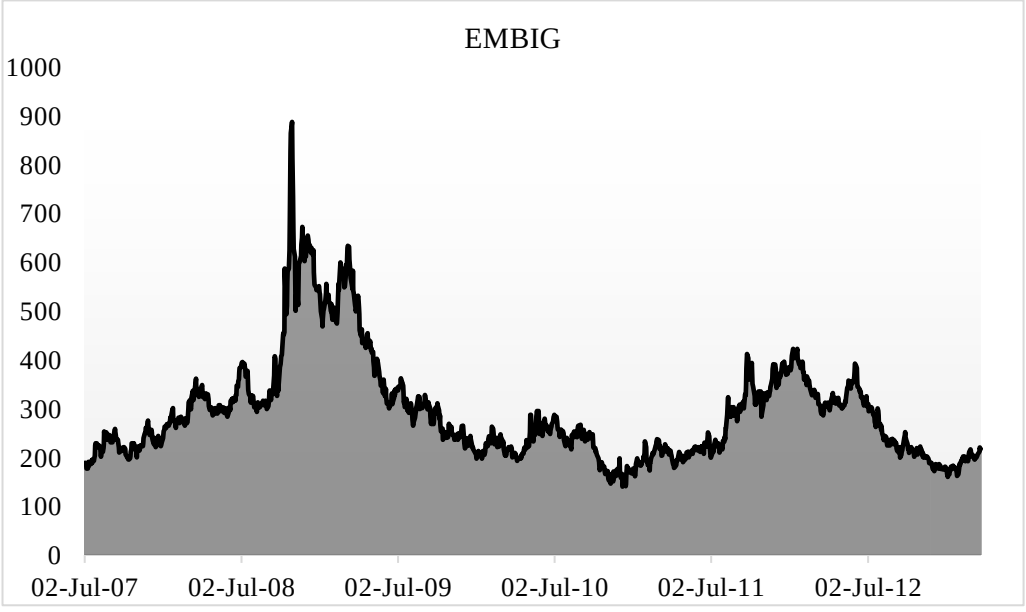


Figure 2
Turkey EMBIG Spread



Since rating/outlook changes are prone to provide new information for emerging market that have less transparent economic structure compared to developed ones, in literature authors mostly focus on the emerging markets for these types of studies. On the other hand, for developed countries rating and outlook changes are most likely to support the completeness and transparency of the economy. The more crucial benefit of CRAs to investors arises when investors have limited information for the solvency of any country. CRAs provide these people more information about the country via assigning a rate for these countries. Turkey is a developing country, and it is assumed that credit ratings provide new information for people. This study investigates the question whether credit ratings provide new information or not for Turkey by observing the relation between ratings and spreads.

In this paper and other studies volatility index (VIX) is used as an indicator of global risk or degree of risk appetite of investors. Using VIX as an explanatory variable gives us the chance of accounting global economic trend in our estimates. It is a well-known measure of the implied volatility of S&P 500 index options. It is calculated by the Chicago Board Options Exchange (CBOE), and referred to as the fear index or the fear gauge of investors. In our models it is used as an exogenous variable to represent global market risk. In our estimations we use daily data VIX changes. There might be other important exogenous variables that effect government cost of borrowing rather than VIX. Larrain et al. (1997) includes annual averages of credit ratings and yield spreads and use the total foreign debt as a percentage of exports, central government spending as a percentage of GDP, annual rate of consumer price inflation, current account deficit as a percentage of GDP, real rate of annual GDP growth, savings as a percentage of GDP as exogenous variables. In this paper we cannot use these variables, as they don't change daily but only available annually. On the other hand we do have daily data on VIX. We also do not use US interest rates in our estimations. US interest rates are used when we calculate the spreads, besides Comelli (2012) mentions that US long term and short term interest rates are no longer significant when the data includes the Global Crises period. Therefore we will only include VIX as exogenous variable in our estimations.

Sovereign ratings and outlooks are taken from sovereign credit rating agencies' webpages. Rating agencies publish credit ratings for long and short-term local and foreign currency denominated bonds. Also, they assign the credit outlook for each country in both currencies but rating agencies note that outlook does not guarantee future changes in the assessments of ratings.

Although many studies take log of bond yield spread and examine the relationship between spreads and index of cardinal numbers assigned to the sovereign credit ratings, there is little evidence to support this specification.

However, in recent papers authors assign dummy numbers to the credit ratings/outlooks when modeling their studies. In this study we follow the recent studies' method to perform our models.

The spread for financial assets is calculated by differencing the yields of lower credit quality bonds from the yield of higher credit quality bonds. Usually, US treasury bonds rates or LIBOR (London Interbank Offered Rate) are used as a reference rate or risk free benchmark security that represents the higher credit quality asset.

Treasury spread or government bond spread is the basic relative value calculated by using appropriate government bond. In this study the bond spread is calculated as the difference between Turkish 5-year Bond Yield and US 5 year Bond yield.

In this paper US 5-year bond is accepted as a risk free benchmark security, and deduction of both countries bond yields gives us the spread value. In financial market spread value is used for many purposes like pricing, categorizing, comparing the riskiness of bonds. Widening in spreads is a sing for rising default risk of the country, and opposite of this –narrowing in spreads implies that country is less risky in fulfilling its obligations.

Although majority of the authors use the EMBI as a spread value, in this paper we run our models with EMBI Global spread for Turkey and calculated spread value separately to extend our perspective. Since any change in the US directly affects all world economy, using these spread values in our models give us the opportunity by indirectly adding US factor to our models.

Variables used in models are displayed in Table 1 with their names.

Table 1
Variable Names

EMBIG	Emerging Markets Bond Index Global
Spread	Turkey Eurobond Spread
SPGrade	Standard & Poor's (S&P) Credit Rating Change
POutlook	Standard & Poor's (S&P) Outlook Change
FitchG	Fitch Credit Rating Change
FitchO	Fitch Outlook Change
MoodysG	Moody's Credit Rating Change
MoodysO	Moody's Outlook Change
VIX	Volatility Index

SPGrade, SPOutlook, FitchG, FitchO, MoodysG, and MoodysO are dummy variables and they take values according to rating/outlook changes.

$$Grade/Outlook_t \begin{cases} 1 \ if\ Turkey\ takes\ a\ rating/outlook\ upgrade\ on\ day\ t \\ 0 \ if\ Turkey\ \ does\ not\ exprience\ a\ rating/o.change\ at\ t \\ -1 \ if\ Turkey\ expriences\ a\ rating/o.downgrade\ on\ day\ t \end{cases}$$

Before moving vector autoregressive analysis (VAR), testing the order of integration is essential in VAR method. It is a crucial subject to construct appropriate VAR models, and to make the correct inferences. Augmented Dickey-Fuller (ADF) and Phillips–Perron (PP) tests are the most common test for testing whether variables are stationary or not. For ADF test we determine the lag length according to general-to-specific approach. That is, the maximum lag length is set to 12 and we drop the insignificant lags sequentially till the last lag become significant. In Phillips–Perron (PP) we take the lag length 6 as automatically. Results of unit root test for all variables are documented in Table 2 and 3. According to the results Spread and EMBIG variables are I(1) (integrated order one) in both cases at 1 percent critical values. On the other hand, VIX is I(0) in both cases at 1 percent critical values. Since other variables are dummy variables, we do not need to test whether there are stationary or not.

Table 2
ADF Unit Root Test Results

		Level		First Difference	
Variable	Case	Lag	t-ADF	Lag	t-ADF
Spread	Intercept	12	-1.423	12	-8.638***
			(0.57)		(0.00)
Spread	Intercept & Trend	12	-2.661	12	-8.697 ***
			(-0,25)		(0.00)
EMBIG	Intercept	11	-2.589*	11	-9.112 ***
			(0.095)		(0.00)
EMBIG	Intercept & Trend	11	-2.822	11	-9.144***
			(0.189)		(0.00)
VIX	Intercept	12	-3.49***		
			(0.008)		
VIX	Intercept & Trend	12	-3.999***		
			(0.009)		

*,** and *** denote rejection at 10 percent, 5 percent and 1 percent critical values

Note: MacKinnon approximate p-value in parentheses. Tests have the null hypothesis that the variable has a unit root. Null hypothesis are accepted when p-values are greater than 0.05.

Table 3
Phillips-Peron Unit Root Test Results

		Level		First Difference	
Variable	Case	Lag	t-PP	Lag	t-PP
Spread	Intercept	6	-1.286	6	-32.566***
			(0.635)		(0.00)
Spread	Intercept & Trend	6	-2.407	6	-32.579***
			(0.376)		(0.00)
EMBIG	Intercept	6	-2.709*	6	-32.113***
			(0.072)		(0.00)
EMBIG	Intercept & Trend	6	-2.917	6	-32.118***
			(0.156)		(0.00)
VIX	Intercept	6	-3.477***		
			(0.008)		
VIX	Intercept & Trend	6	-3.949**		
			(0.01)		

*,** and *** denote rejection at 10 percent, 5 percent and 1 percent critical values

Note: MacKinnon approximate p-value in parentheses. Tests have the null hypothesis that the variable has a unit root. Null hypothesis are accepted when p-values are greater than 0.05.

First difference graphs of Spread and EMBIG are given in Appendix A.

3.2. Empirical methodology and results

3.2. 1. Vector Autoregression (VAR) Model

In the last period VAR is mostly used method for time series models. VAR analysis gives us the chance of examining the inter-relationships between economic variables. With VAR method we are able to investigate the inter-relationship between credit rating/outlook change and spread changes (Eurobond or EMBI Global), Also, with VAR we can obtain the impulse response functions, which trace out the response of current and future values of variables to a given shock. This provides us an idea about how Turkey spreads react over time to exogenous impulses, which is a rating or outlook change for our models. IRF is based on a VAR model, and in our study IRF tracks the effect of one standard deviation shock in credit/outlook change to the spread changes. The vector autoregression method was first introduced by Sims (1980) and it can be represented in a general VAR (p) as follows:

$$y_t = v + A_1 y_{t-1} + \cdots + A_p y_{t-p} + u_t \quad (1)$$

where, y_t is a vector of endogenous variables, $A_1$to A_p are coefficient matrices, v is a vector of intercept and u_t is a vector of white noise.

In VAR model each variable is regressed on its own lag as well as the lags of the other variables. In our case we select spread of Turkey and credit/outlook changes as endogenous variables but we determine VIX variable as exogenous variable. We perform VAR model for outlook and rating changes for each agencies separately because each agencies announcement in rating or outlook provides different information to market. At these points we need to decide on the number of lags for each VAR model. The number of lags is usually determined by statistical criteria of Akaike Information Criterion (AIC), Hannan-Quinn Information Criterion (HQIC), and Schwarz's Bayesian Information Criterion (SBIC), In this study we focus on these criteria in order to select appropriate lag lengths for our VAR estimates. However, according to results given in Appendix A, we cannot determine the optimal lag size so we start lag selection by performing VAR estimates with lag 1, and we increase lag length till the last selected lag length provides us no autocorrelation in VAR estimates. By following this rule we get the appropriate lag lengths for our VAR estimates. Table 4 gives us the appropriate lag length for the models.

Table 4
Lag Selection

	Eurobond Spread Change	EMBI Global Change
Variable	Lag	Lag
SPGrade	2	4
SPOutlok	1	3
FitchG	1	4
FitchO	1	3
MoodysG	1	7
MoodysO	2	3

For example, VAR model constructed with endogenous variables of SPGrade and Eurobond Spread Change we determine lag length of 2. Also, for the case of SPGrade and EMBI Global spread change we determine lag length of 4. [2]

We may also get concerned about the existence of a structural break in the data especially after 2009 crises. Structural break test results after the VAR analysis

[2] Correlation matrix for the model variables are given in Appendix Table A4.

suggests that we find that the structural break test cannot reject the null hypothesis of no structural break.

3.2. 2. Granger causality

The three hypothesis-credit/outlook change affects spread changes, spread changes affect credit/outlook change, and both demonstrate a reciprocal relationship- were tested using the Granger causality approach. Before performing Granger causality test we checked the stationarity of variables in the previous part. After getting stationary variable we determine the lag length of VAR models. Then we perform VAR model and Granger causality test with these stationary variables and determined lag lengths.

$$\Delta \text{Spread}_t = \alpha_1 + \beta_{11}\text{SPGrade}_{t-1} + \beta_{12}\text{SPGrade}_{t-2} + \delta_{11}\,\Delta \text{Spread}_{t-1} + \delta_{12}\,\Delta \text{Spread}_{t-2} + u_{1t} \quad (2)$$

$$\text{SPGrade}_t = \alpha_1 + \beta_{21}\text{SPGrade}_{t-1} + \beta_{22}\text{SPGrade}_{t-2} + \delta_{21}\,\Delta \text{Spread}_{t-1} + \delta_{22}\,\Delta \text{Spread}_{t-2} + u_{2t} \quad (3)$$

To test whether SPGrade Granger causes Spread Change (Δ Spread) in the above system, the joint significance of the coefficients, $H_0 = \beta_{11} = \beta_{21} = 0$ in (2) was tested, and similar testing procedure was applied to test the hypothesis of Spread Change Granger causes SPGrade, $H_0 = \delta_{21} = \delta_{22} = 0$. By following same logic we perform the other VAR models and we get the relation how credit rating changes affect the government bond spreads or vice versa.

3.2. 3. Impulse response function (IRF)

With Granger causality test we can determine the predictive power of SPGrade change to Spread change or vice versa. However, in order to explain the sign and the power of relationship between these variables we need to create an impulse response function (IRF), By performing IRF we can catch out the effect of a shock to one variable to the other variables in the system. Impulse response function measures the effects of a shock to endogenous variable on itself or on another endogenous variable. For our case we aim to trace the effect of any shock occur in credit rating to government bond spread changes. For example, we can observe the movement of Eurobond spread change or EMBI Global spread change due to a shock arises from SPGrade change. We perform IRF for each VAR estimates and we get some conclusions about the power of the relationship between variables of credit rating change and the government bond spread (Eurobond & EMBIG spread) changes. In our study IRF is based on a VAR model so IRF tracks the effect of one standard deviation shock in credit/outlook change to the spread changes.

To compute Impulse response functions (IRFs) VAR estimates need to be stable so we perform stability test for each VAR estimates, and we get stabile VAR models. According to stability test results, all eigenvalues lie inside the unit circle which means VAR models satisfy the stability condition.

3.2. 4. Event study analysis

In finance, event study analysis is generally used to examine the price reactions of financial instruments to the occurred events. To examine this reaction generally financial instruments' relative price changes are considered according to event date. In event study analysis timing of announcement events for companies are standardized which enables us to measure the average security price reactions at day 1,2, etc. days after or before the event occurs. By following the similar logic we focus on the Turkey's government bond spreads reactions by taking rating or outlook announcement date as base period so timing of rating agencies' announcements are standardized.

In VAR, Granger Causality and IRF analysis we are able to examine the inter-relationships between the credit rating/outlook change and spread change. Also, we are not able to investigate the dynamic effect of credit rating/outlook change on the spread change using these analyses. However, in event study analysis we are able to evaluate the dynamic effect of rating/outlook changes on the relative price changes instead of focusing on the spread change. In a sense event study analysis provides us the evidence on whether CRAs act procyclically or market participants anticipate agencies actions. That is, downgrading countries grade or outlook when the countries have weak macroeconomic indicators, and upgrading them when the countries have strong macroeconomic indicators. Event study analysis gives us a clue about market anticipation towards rating agencies actions. If there exists market anticipation towards the rating changes than we expect a noticeable trend in bond spreads even before the announcement is made. Also, by performing event studies we can observe whether the effects of rating announcements are temporary or not.

In this paper we use 21-day event window for event study analysis and in this window rating changes are occurring on day 11. The evolution of sovereign bond yield spreads is examined during ±10day window around an upgrade or downgrade of a credit rating/outlook change. Event study analysis is normally interested in excess return during the event window so we can detect the behavior of the government bond spreads relative to US bond in this window. In event study analysis other events may take place with rating/outlook changes. Since we cannot control those factors we accept that these events do not bring bias results in our analysis. That is, we accept that there exists randomness in other factors influencing bond spreads either positively or negatively. On the other hand, if CRAs change

country ratings/outlook in a series sequence then the results of the event study analysis will be biased. In order to eliminate these types of biases we deal with the "clean events" in which rating/outlook changes do not overlap during the 21-day event window. Especially, during the crisis periods CRAs announce ratings/outlooks serially so sometimes rating/outlook changes overlap in this event window. Since it is difficult to distinguish the effects of one rating change from another, we reach biased results at the end of the event study analysis. By considering this issue we checked the Turkey data, and we concluded that all data for Turkey is clean. Table 5 shows the number of clean events with 21-day window taken as a sample for event study analysis.

Table 5
Number of Clean Events with 21 day Event Window for Turkey

	Upgrade	Downgrade	Total
Ratings	7	0	7
Outlooks	6	5	11

In event study analysis we focus on the bond returns relative to the base period (t=11) instead of taking daily change of the bond yield. We normalize the total 18 events by taking the announcement date as a starting point, and then we apply the following formula to reach the relative return of bond yield according to starting point.

$$R_t = \log(X_t) - \log(X_1)$$

where t represents time in 21-day event window (1 to 21), X_t represents bond yield spreads on day t and X_1 represents the bond yield spread at rating/outlook announcement date that is the first day of the event window.

With this analysis we expect behavior of bond yield spreads changes according to market anticipation for the CRAs' actions. That is, if CRAs' actions are anticipated by the market, bond yield spreads begin to increase (decrease) before announcement day for the case of rating/outlook downgrade (upgrades).

Developments in the foreign currency credit rating of Turkey are given at Appendix part for the period from 2004 to 2014, and for each agency.

4. Empirical results

4. 1. VAR Analysis

In this part, VAR models are generated to investigate the dynamic relationship between credit rating changes and government bond spread changes. To represent of government bond spread we take two variables; Turkey Eurobond spread and EMBI Global spread for Turkey. We perform VAR models separately according to these variables. In the literature in order to get reliable results in the VAR analysis all variable used in VAR estimations need to ensure stationary condition. In this perspective we perform unit root test for the variables, and we conclude that Eurobond spread and EMBI Global spread variables are non-stationary so we use their first differences, which satisfy the stationary assumption. For VIX as a proxy for global factor we perform stationary test we conclude that VIX is stationary and no need to take its first differences in VAR estimates. Furthermore, we use the VIX variable as an exogenous variable in VAR models. As mentioned for dummy variables there are no need to check the stationary.

After satisfying stationary condition we determine the lag length of VAR estimates as mentioned in previous part. Then we perform VAR estimates according to stationary variables and determined lag lengths.

Based on the lag lengths given in Table 4 we perform VAR estimates and the related results are given in Table 6.a, 6.b, 6.c, 6.d, 6.e, 6.f for Turkey Eurobond spread and Table 7.a, 7.b, 7.c, 7.d, 7.e, 7.f for EMBI Global spread for Turkey. Main findings in VAR analysis indicate that only intercept and VIX (exog) term seem to have a noteworthy effect on the spread changes. Estimated VAR models for the variable of rating/outlook changes indicate us that rating/outlook changes and their lagged values are not statistically significant variables on the Turkey's spread changes. These results support the concepts of market anticipation and procyclicality, which will mention in the following parts. These results show us that investors expect a rating/outlook change for Turkey so they take their position before announcement date. There are two explanations for this situation; one is market anticipation of investors, and the other one is procyclicality which means rating agencies announce their rating according to Turkey main economic indicators so not providing new information for the market.

Table 6.a
Vector Autoregression Estimates for Eurobond Spread of Turkey

Dependent Variable	Eurobond Spread Change	
Regressors	Coefficient	P-Value
SpreadChange (-1)	0,01	0,75
SpreadChange (-2)	0,02	0,45
SPGrade (-1)	0,01	0,98
SPGrade(-2)	0,21	0,58
VIX (exog)	-0,001	0,58
Intercept	0,021	0,65

*, ** and *** denotes significance at 10 percent, 5 percent and 1 percent critical values.

Table 6.b
Vector Autoregression Estimates for Eurobond Spread of Turkey

Dependent Variable	Eurobond Spread Change	
Regressors	Coefficient	P-Value
SpreadChange (-1)	0,01	0,75
SPOutlook (-1)	-0,11	0,65
VIX (exog)	-0,001	0,60
Intercept	0,02	0,67

*, ** and *** denotes significance at 10 percent, 5 percent and 1 percent critical values.

Table 6.c
Vector Autoregression Estimates for Eurobond Spread of Turkey

Dependent Variable	Eurobond Spread Change	
Regressors	Coefficient	P-Value
SpreadChange (-1)	0,01	0,74
FitchG (-1)	-0,12	0,71
VIX (exog)	-0,001	0,60
Intercept	0,02	0,66

*, ** and *** denotes significance at 10 percent, 5 percent and 1 percent critical values.

Table 6.d
Vector Autoregression Estimates for Eurobond Spread of Turkey

Dependent Variable	Eurobond Spread Change	
Regressors	Coefficient	P-Value
SpreadChange (-1)	0,01	0,74
FitchO (-1)	-0,07	0,83
VIX (exog)	-0,001	0,60
Intercept	0,02	0,67

*, ** and *** denotes significance at 10 percent, 5 percent and 1 percent critical values.

Table 6.e
Vector Autoregression Estimates for Eurobond Spread of Turkey

Dependent Variable	Eurobond Spread Change	
Regressors	Coefficient	P-Value
SpreadChange (-1)	0,01	0,74
MoodysG (-1)	-0,09	0,81
VIX (exog)	-0,001	0,60
Intercept	0,02	0,66

*, ** and *** denotes significance at 10 percent, 5 percent and 1 percent critical values.

Table 6.f
Vector Autoregression Estimates for Eurobond Spread of Turkey

Dependent Variable	Eurobond Spread Change	
Regressors	Coefficient	P-Value
SpreadChange (-1)	0,01	0,75
SpreadChange (-2)	0,02	0,45
MoodysO (-1)	-0,04	0,91
MoodysO (-2)	0,09	0,78
VIX (exog)	-0,001	0,59
Intercept	0,02	0,66

*, ** and *** denotes significance at 10 percent, 5 percent and 1 percent critical values.

Table 7.a
Vector Autoregression Estimates for EMBI Global Spread for Turkey

Dependent Variable	EMBIG Spread Change	
Regressors	Coefficient	P-Value
EMBIGChange (-1)	0,004	0,89
EMBIGChange (-2)	0,03	0,29
EMBIGChange (-3)	-0,01	0,79
EMBIGChange (-4)	0,01	0,78
SPGrade (-1)	8,07	0,36
SPGrade (-2)	15,68	0,075*
SPGrade (-3)	-23,22	0,008 ***
SPGrade (-4)	-4,12	0,008 ***
VIX (exog)	0,23	0,000***
Intercept	-5,14	0,000***

*, ** and *** denotes significance at 10 percent, 5 percent and 1 percent critical values.

Table 7.b
Vector Autoregression Estimates for EMBI Global Spread for Turkey

Dependent Variable	EMBIG Spread Change	
Regressors	Coefficient	P-Value
EMBIGChange (-1)	0,003	0,93
EMBIGChange (-2)	0,03	0,34
EMBIGChange (-3)	-0,01	0,75
SPOutlook (-1)	0,99	0,86
SPOutlook (-2)	1,08	0,85
SPOutlook (-3)	-4,85	0,39
VIX (exog)	0,23	0,000 ***
Intercept	-5,23	0,000 ***

*, ** and *** denotes significance at 10 percent, 5 percent and 1 percent critical values.

Table 7.c
Vector Autoregression Estimates for EMBI Global Spread for Turkey

Dependent Variable	EMBIG Spread Change	
Regressors	Coefficient	P-Value
EMBIGChange (-1)	0,002	0,94
EMBIGChange (-2)	0,03	0,34
EMBIGChange (-3)	-0,01	0,74
FitchO (-1)	-2,26	0,75
FitchO (-2)	3,36	0,64
FitchO (-3)	4,83	0,50
VIX (exog)	0,23	0,000***
Intercept	-5,24	0,000***

*, ** and *** denotes significance at 10 percent, 5 percent and 1 percent critical values.

Table 7.d
Vector Autoregression Estimates for EMBI Global Spread for Turkey

Dependent Variable	EMBIG Spread Change	
Regressors	Coefficient	P-Value
EMBIGChange (-1)	0,002	0,94
EMBIGChange (-2)	0,03	0,34
EMBIGChange (-3)	-0,01	0,68
EMBIGChange (-4)	0,009	0,77
FitchG (-1)	-7,65	0,29
FitchG (-2)	2,97	0,68
FitchG (-3)	-2,38	0,74
FitchG (-4)	0,90	0,90
VIX (exog)	0,23	0,000***
Intercept	-5,18	0,000***

*, ** and *** denotes significance at 10 percent, 5 percent and 1 percent critical values.

Table 7.e
Vector Autoregression Estimates for EMBI Global Spread for Turkey

Dependent Variable	EMBIG Spread Change	
Regressors	Coefficient	P-Value
EMBIGChange (-1)	0,004	0,90
EMBIGChange (-2)	0,03	0,37
EMBIGChange (-3)	-0,01	0,76
MoodysO (-1)	6,32	0,38
MoodysO (-2)	-3,59	0,62
MoodysO (-3)	1,68	0,82
VIX (exog)	0,23	0,000***
Intercept	-5,24	0,000***

*, ** and *** denotes significance at 10 percent, 5 percent and 1 percent critical values.

Table 7.f
Vector Autoregression Estimates for EMBI Global Spread for Turkey

Dependent Variable	EMBIG Spread Change	
Regressors	Coefficient	P-Value
EMBIGChange (-1)	0,003	0,92
EMBIGChange (-2)	0,03	0,31
EMBIGChange (-3)	-0,01	0,76
EMBIGChange (-4)	0,01	0,79
EMBIGChange (-5)	-0,04	0,20
EMBIGChange (-6)	-0,01	0,65
EMBIGChange (-7)	0,05	0,12
MoodysG (-1)	-1,32	0,88
MoodysG (-2)	1,96	0,82
MoodysG (-3)	-0,71	0,94
MoodysG (-4)	7,22	0,41
MoodysG (-5)	3,38	0,70
MoodysG (-6)	0,63	0,94
MoodysG (-7)	-6,25	0,48
VIX (exog)	0,23	0,000***
Intercept	-5,25	0,000***

*, ** and *** denotes significance at 10 percent, 5 percent and 1 percent critical values

4.2. Granger causality

Granger causality test is performed for all cases for our study, and concluded remarks are showed in Table 8 and 9 for two different types of spread changes.

Table 8
Granger Causality for Eurobond Spread Change for Turkey

Null Hypothesis	*χ2 (chi square)*	Probability	Degree of freedom (df)
SPGrade does not cause SpreadChange	0.3101	0.86	2
SpreadChange does not cause SPGrade	0.0055	0.99	2
SPOutlook does not cause SpreadChange	0.0008	0.98	1
SpreadChange does not cause SPOutlook	0,0051	0.94	1
FitchG does not cause SpreadChange	0.1359	0.71	1
SpreadChange does not cause FitchG	0.0313	0.86	1
FitchO does not cause SpreadChange	0.0468	0.83	1
SpreadChange does not cause FitchO	21.925	0.00***	1
MoodysG does not cause SpreadChange	0.0592	0.81	1
SpreadChange does not cause MoodysG	0.6397	0.42	1
MoodysO does not cause SpreadChange	0.0925	0.96	2
SpreadChange does not cause MoodysO	0.6482	0.72	2

*, ** and *** denotes significance at 10 percent, 5 percent and 1 percent critical values.

According to our Granger causality test results in Table 8 and 9, we find that there exists no Granger causality between variable of credit/outlook rating change and spread change for Turkey. In order to examine the price reactions of financial instruments to credit/outlook rating changes we perform event study analysis.

Table 9
Granger Causality for EMBI Global Spread Change for Turkey

Null Hypothesis	*χ2 (chi square)*	Probability	Degree of freedom (df)
SPGrade does not cause EMBIGChange	11.226	0.03**	4
EMBIGChange does not cause SPGrade	31.344	0.54	4
SPOutlook does not cause EMBIGChange	0.8232	0.84	3
EMBIGChange does not cause SPOutlook	5.326	0.15	3
FitchG does not cause EMBIGChange	1.4174	0.84	4
EMBIGChange does not cause FitchG	2.691	0.61	4
FitchO does not cause EMBIGChange	0.7687	0.86	3
EMBIGChange does not cause FitchO	0.3025	0.96	3
MoodysG does not cause EMBIGChange	1.4043	0.99	7
EMBIGChange does not cause MoodysG	0.7535	1.00	7
MoodysO does not cause EMBIGChange	1.068	0.79	3
EMBIGChange does not cause MoodysO	2.7028	0.44	3

*, ** and *** denotes significance at 10 percent, 5 percent and 1 percent critical values.

4.3. IRF analysis

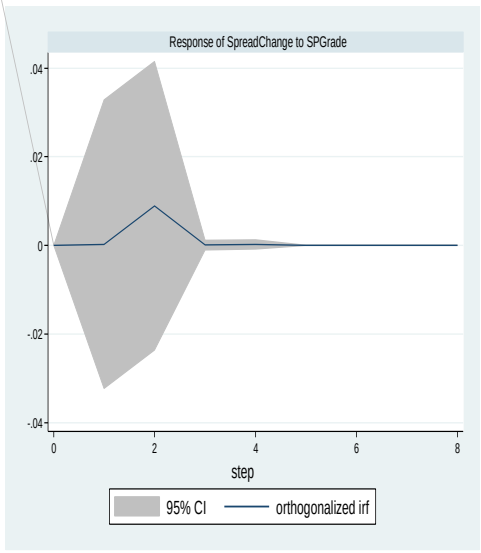
Impulse response function we are able to examine the effect of a shock in one variable to the other variables in the system. For our case study we aim to trace the effect of any shock occur in credit rating to government bond spread changes.

Horizontal axis (X-axis) of IRF graph indicates us that length of response and the vertical axis (Y-axis) of graph indicate us the size of the response as a standard error. Continuous line in the graph indicates the response of Turkey's spread change variables against the shock (1 standard error) occurring in error terms. Grey area shows the confidence intervals according to ±2 standard error.

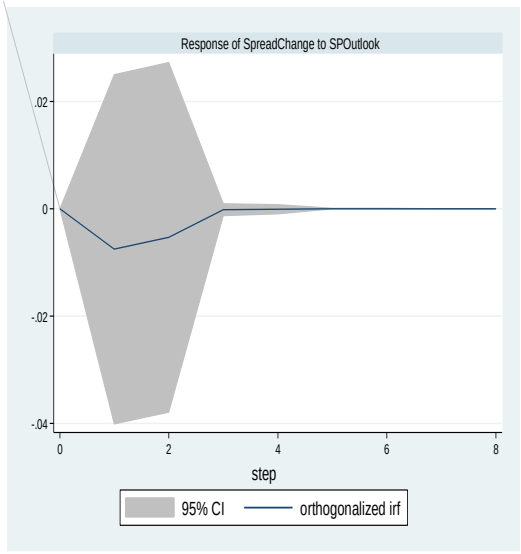
In order to display the response function clearer, we plot the charts as Figure 3 and Figure 4 according to response of Eurobond spread change and EMBI Global spread change of Turkey.

Figure 3
Impulse Responses of Eurobond Spread Change

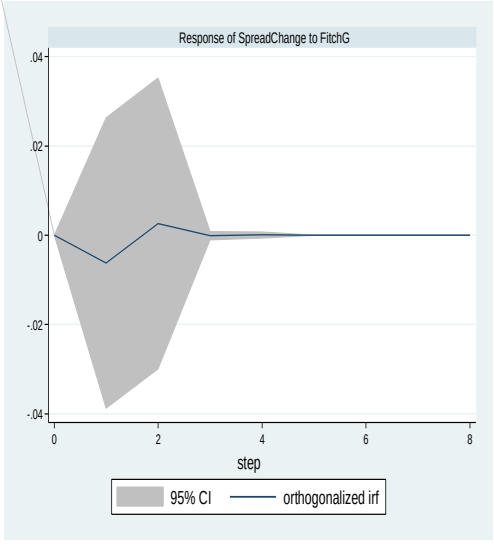
Response of SpreadChange t o SPGrade



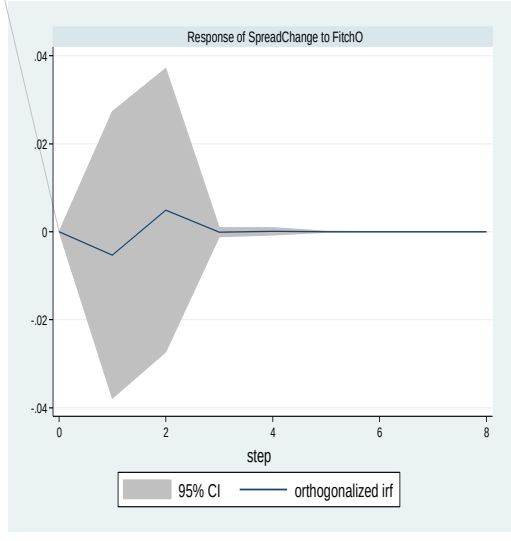
Response of SpreadChange to SPOutlook



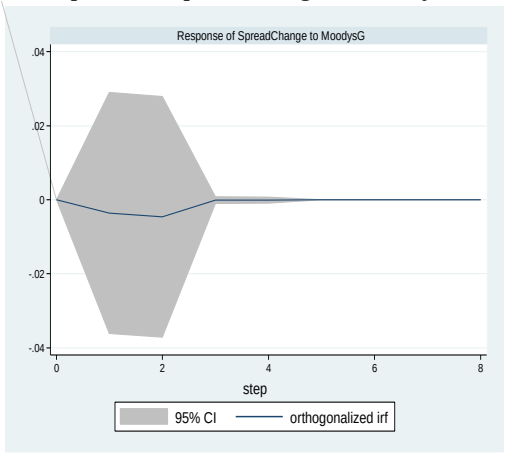
Response of SpreadChange to FitchG



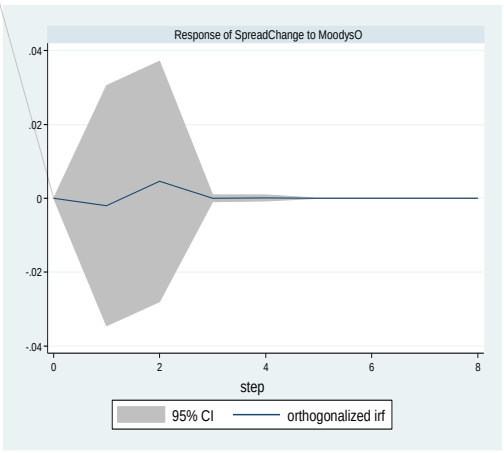
Response of SpreadChange to FitchO



Response of SpreadChange to MoodysG



Response of SpreadChange to MoodysO



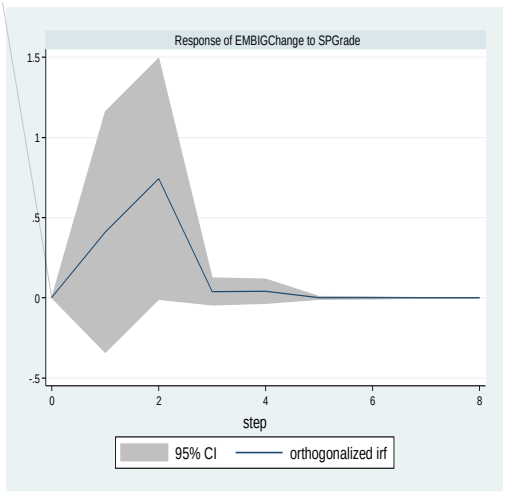
Responses of the Spread Change variable to an impulse in variables SPGrade, SPOutlook, FitchG, FitchO, MoodysG, and MoodysO can be seen together in Figure 3. From the figures we can see that response of Eurobond spread change to the positive impulse of credit rating/outlook changes is mostly positive but for the case of SPOutlook and MoodysG impulses the response is negative. According to our expectation we anticipate a negative response in spread change against to a positive impulse in credit rating/outlook change because a rating/outlook increase will normally decrease Turkey sovereign bond spreads. In figures we observe that spread change firstly decreases then increases during the response length when shock is given to the endogenous variable. When the impulse is given to SPOutlook or MoodysG, response of spread change is negative during the length of response. Moreover, size of the response is approximately 1% and the effect of the shock disappears in a very short time. When the impulse is given to FitchG, FitchO or MoodysO, response of spread change is negative during the first day and then response turns to positive. All these figures indicate us that all variables provides different information to market so markets participants pay their interest according to event and credit rating agency. IRFs support the view of market anticipation or procyclicality concept that is why we get such different results in this method. According to these concepts if there exists a rating/outlook change expectation in the market then the impact of rating/outlook change will decrease because market participants will take their positions before rating/outlook change. Also, if there exists procyclicality in the market, that is, if credit rating agencies are upgrading Turkey in good times and downgrading during bad times then we expect no more impact of credit rating/outlook change on the spread change because before the rating/outlook change market participants already take their positions for the

Turkish government bonds. These concepts will be detailed in the event study analysis.

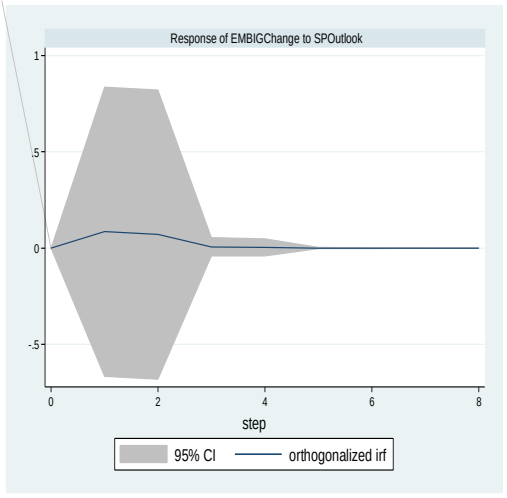
In Figure 4 we see the result of impulse response function for the case of EMBI Global spread for Turkey.

Figure 4
Impulse Responses of EMBI Global of Turkey Spread Change

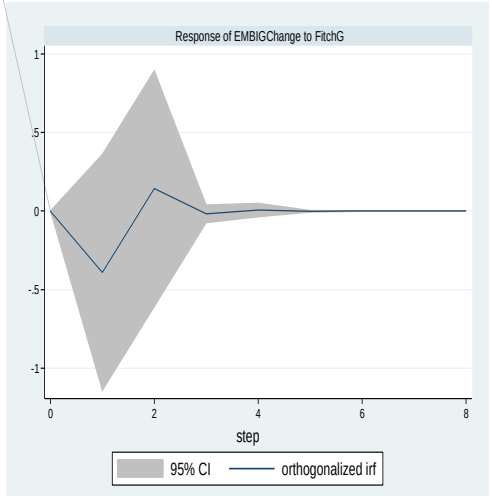
Response of EMBIGChange to SPGrade



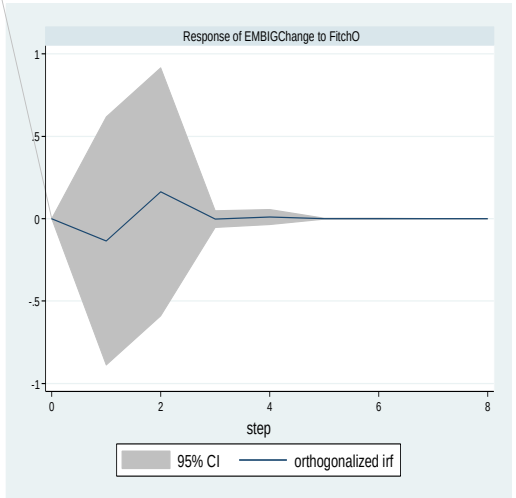
Response of EMBIGChange to SPOutlook



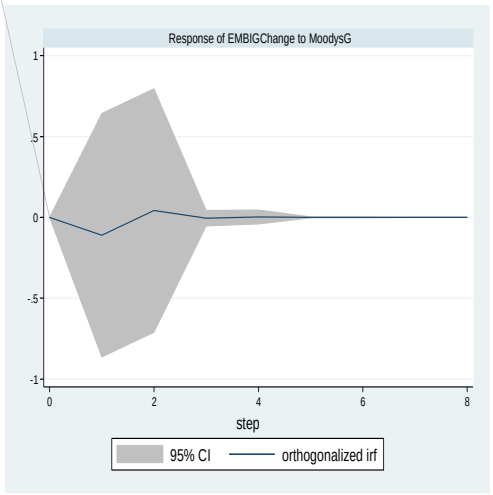
Response of EMBIGChange to FitchG



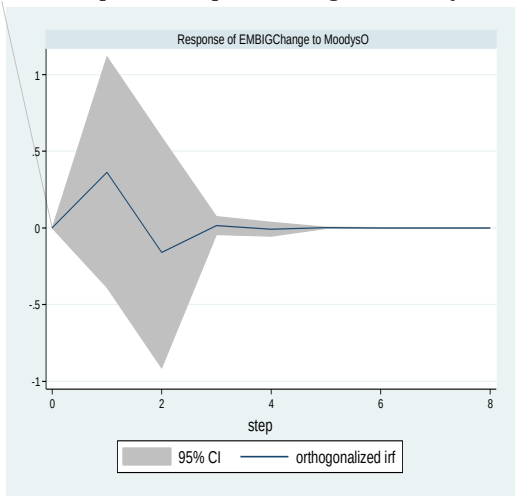
Response of EMBIGChange to FitchO



Response of SpreadChange to MoodysG



Response of SpreadChange to MoodysO



Similar to main findings in the Eurobond spread change case for Turkey we conclude that credit rating/outlook change impulse causes positive or negative responses in the EMBI Global spread change of Turkey. Also, responses of EMBIG spread change do not last for a long time, and they vanish during first 2-3 days.

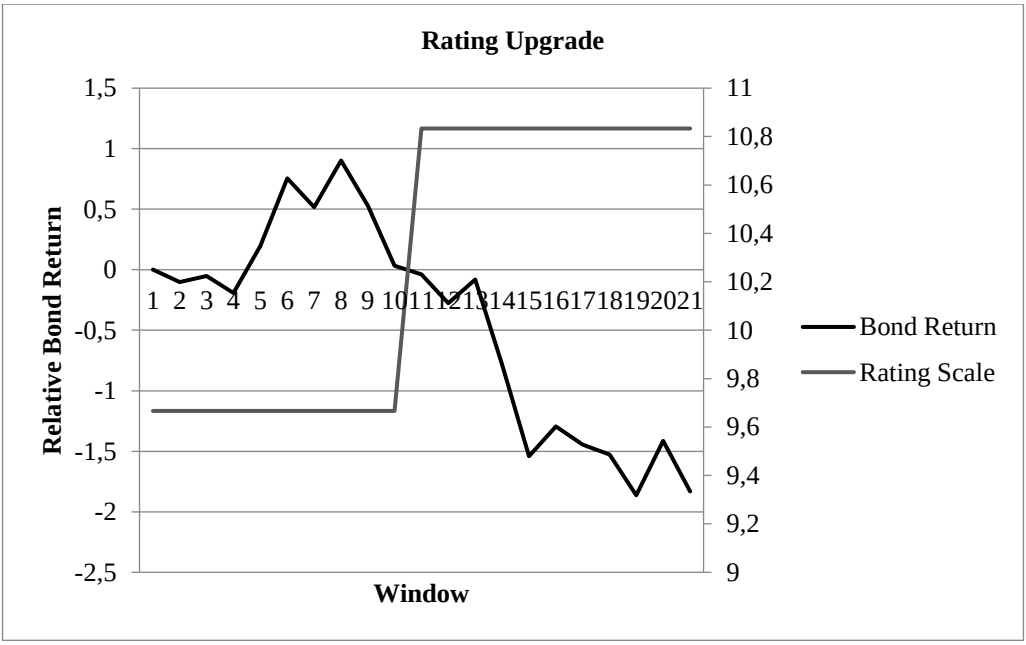
Variable of EMBI Global spread for Turkey includes Turkey's long-term government bond instruments and Eurobond spread of Turkey is calculated using Turkey's middle-term government bond instruments (5 year Turkey' Eurobonds), Performed IRF studies with these two variables indicate us that market participants' attention to credit rating agencies' announcement does not significantly affect their decision for the Turkish government bonds.

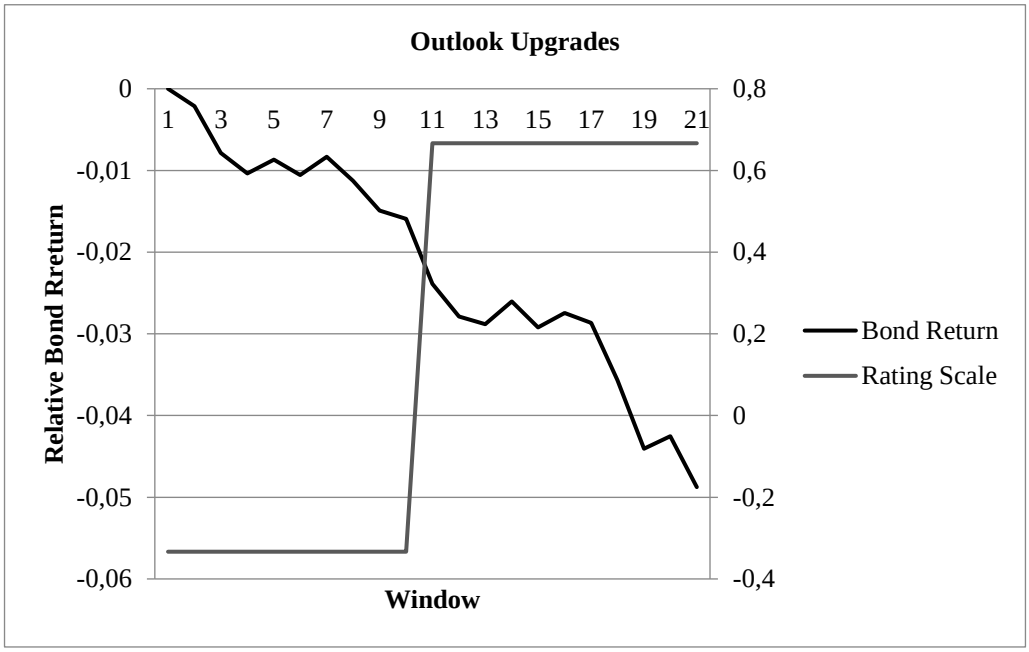
4. 4. Event study analysis

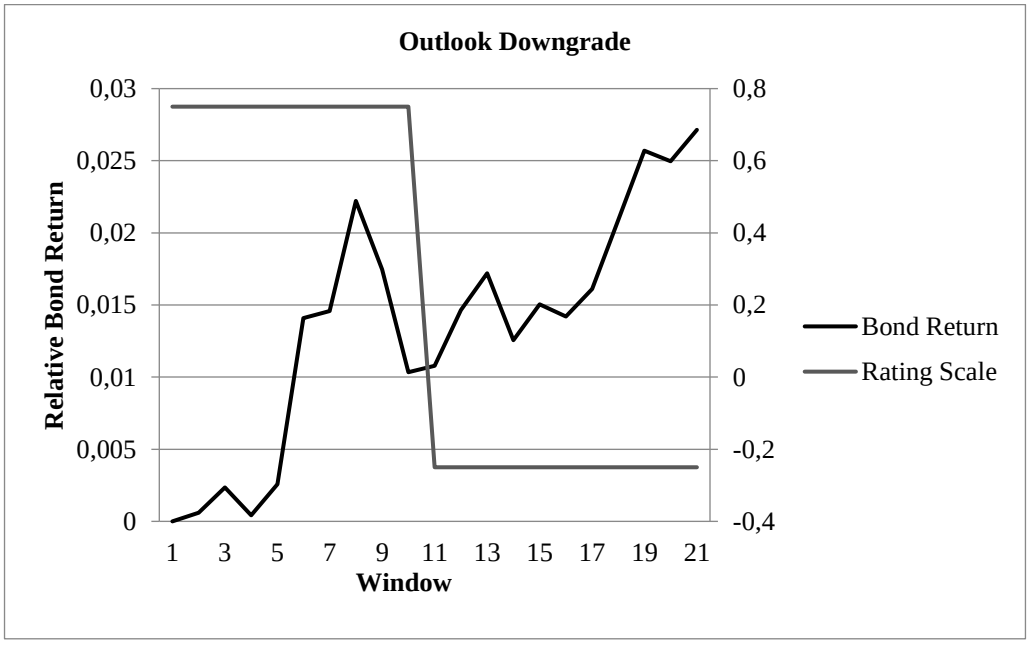
For our study we design a 21-day event window to perform event study analysis. 10 days of this event window contains pre-announcement period and other 10 days include the post-announcement period. By following this strategy we aim to investigate how spreads and bond prices move around the time of rating/outlook change. In this analysis as mentioned previously we focus on the clean events simply in order to confirm that simply the effect of one rating/outlook change will be studied in per window. In this perspective we deal with 18 clean events. Main featured property of event study methodology arises from dealing with the excessive returns of bond yield spreads. That is, for our study event study analysis deals with excessive returns of Turkish government bond spreads according to rating/outlook change day.

Our findings in event study analysis indicate that sovereign yield spreads start to increase or decrease before the rating/outlook change occurs which support our expectation. To illustrate, excessive returns of Turkish government bond have already decreased before the CRAs announce the rating upgrade. For outlook downgrade case, spreads have already increased by the time of the outlook change which ensures us that market participants take their position before the agencies' announcements. Figure 5 illustrates the event study analysis for the case study of Turkey. Since there is not rating downgrade during our data period, there is no graph for the rating downgrade case.

Figure 5
Event Study Analyses for Turkey




Outlook Upgrades
Relative Bond Rreturn
0
-0,01
-0,02
-0,03
-0,04
-0,05
-0,06
0,8
0,6
0,4
0,2
0
-0,2
-0,4
1 3 5 7 9 11 13 15 17 19 21
Window
Bond Return
Rating Scale


Outlook Downgrade
Relative Bond Return
0,03
0,025
0,02
0,015
0,01
0,005
0
0,8
0,6
0,4
0,2
0
-0,2
-0,4
1 3 5 7 9 11 13 15 17 19 21
Window
Bond Return
Rating Scale

These results could be interpreted as an indication that there exists market anticipation towards rating/outlook change or CRAs behave procyclically. That is, CRAs make decision according to the price of financial instruments. When the prices of financial instruments increase then credit rating agencies decide to downgrade the related country. The price action in the days before rating/outlook changes may reveal an effect of market anticipation which motivates investors to take action before rating/outlook announcement time.

When we look at the literature we face with different approaches explain the behavior of bond yield spreads over the event window. According to Kaminsky and Schmukler (2002) movement of bond yield spreads before announcement day indicates that credit rating agencies act procyclically. However, for Cavallo et al. (2008) this situation is evidence of the market anticipation in rating/outlook changes. In this perspective investors anticipate CRAs' actions so they take their position before announcement day which cause sovereign bond yield spreads move before the announcement time. It should be also noted that although Kaminsky and Schmukler (2002) do not mention market anticipation effects, and they points out the procyclically action of CRAs, there is a clear issue that spreads show the expected movements before a rating/outlook change occurred.

5. Conclusion

Most of the existent literatures for the studies that investigate the impact of rating changes on the government bond yield spreads find a negative and significant relation, and most of them use panel regression model as a main method. However, in this paper we use the VAR method in order to investigate the inter-relationship between the variables of credit rating/outlook change and Turkey sovereign bond spreads. As a Turkey bond spread we use two types of data: Turkey's 5-year Eurobond spread change and EMBI Global spread change. Having different types of data set gives us the chance of getting broader remarks. Main difference of our study arises from the fact that we use the newest data set and we use different types of data for Turkey spread variables. Also, our sample period includes post financial crisis years so we are able to investigate how rating agencies' impression on the financial market is affected by the crisis. After 2008 global financial crisis credit rating agencies' creditworthiness started to be debated. Due to their inability in foreseeing the 2008 global crisis, in fact, giving higher rates to very risky financial instruments which caused the crisis decreased the creditworthiness of these agencies. Therefore, by doing such a study for Turkey we make some contributions to this debate. The outcomes of this study are significant for the literature because Turkey is one of the emerging market, and there is a common sense for rating agencies that any announcements made by them directly affect these markets.

During our analysis we perform vector autoregression estimations including Granger causality and Impulse Response Function analysis, and lastly we perform event study analysis.

In this paper we mainly get two main findings that somehow contribute to the related literature. Our first finding is that empirical results support that there is no inter-relationship between the variables of credit rating/outlook change and spread change for Turkey in contrast to findings in literature for this issue. According to our Granger causality test results there exists no Granger causality between variable of credit/outlook rating change and spread change for Turkey. Impulse responses indicate that market participants' attention to credit rating agencies' announcement does not significantly affect their decision for the Turkish government bonds.

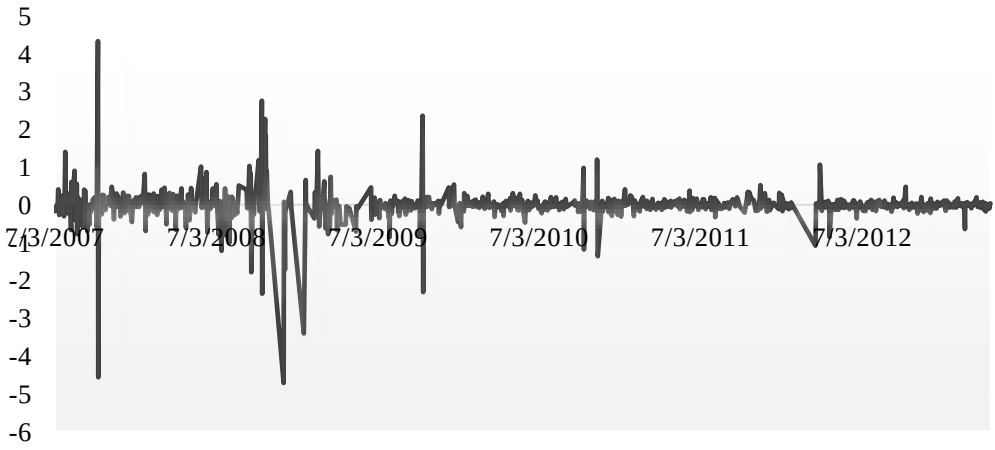
Our second finding is related to market anticipation for the rating/outlook changes. We observe in the event study analysis that sovereign spreads move in a certain event window according to market anticipation concept. The most crucial contribution of this study is that market anticipation and procyclicality has been considered as a key factor in spread movements. Fundamentally, this provides more proper analysis in the estimation of market reaction to rating/outlook changes. What the event study analysis indicates us is that government bond yield spreads have started to move before rating/outlook change announced.

After 2008 global financial crises credit rating agencies' creditworthiness started to be debated by investors and academicians which is the our starting point to write this paper in order to evaluate whether rating/outlook changes still provide information to market participants. However, the estimation results indicate us that rating changes by agencies do not add new information for investors, that is, rating or the market mostly anticipates outlook changes. Other aspect of these types of studies is that daily data of bond spreads is formed in the market and it is mostly possible that any information transmitted by changing rating/outlook may already be included in a daily change of bond spreads. According to this aspect credit rating agencies and market are feeding from the same source-publicly available indicators- so rating changes is introducing noise in the financial markets. This supports the idea that if CRAs announcements are entirely anticipated by the market then participants take their positions before announcement so we would see no relation between the rating/outlook changes and sovereign spreads.

For further studies performing same study using corporate bonds will give broader remarks. In this study we use foreign currency denominated instruments - five year government Eurobonds- but performing the same study using domestic currency denominated instruments could be interesting as well.

Appendix a
Supplementary Figures and Tables

Figure A.1
First difference of Spread



Source: Bloomberg.

Figure A.2
First difference of EMBIG

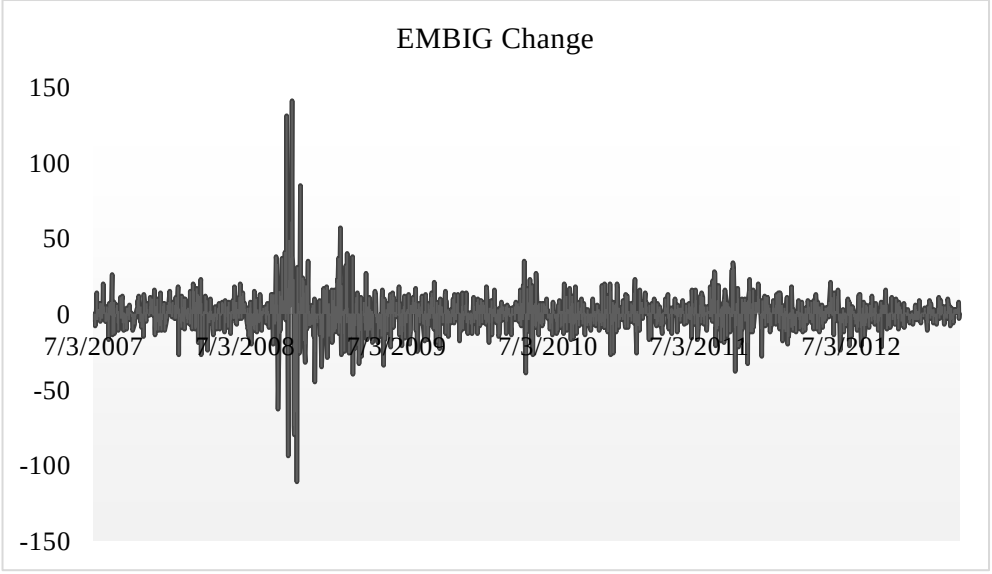


Table A.1
Developments in the Foreign Currency Credit Rating of Turkey

	S&P's	Moody's	**Fitch**
YE 2004	BB- (stable)	B1 (stable)	B+ (positive)
13.01.2005			BB- (stable)
11.02.2005		B1 (positive)	
06.12.2005			BB- (positive)
14.12.2005		Ba3 (stable)	
YE 2005	BB- (stable)	Ba3 (stable)	BB- (positive)
23.01.2006	BB- (positive)		
27.06.2006	BB- (stable)		
YE 2006	BB- (stable)	Ba3 (stable)	BB- (positive)
10.05.2007			BB- (stable)
YE 2007	BB- (stable)	Ba3 (stable)	BB- (stable)
03.04.2008	BB- (negative)		
31.07.2008	BB- (stable)		
13.11.2008	BB- (negative)		
YE 2008	BB- (negative)	Ba3 (stable)	BB- (stable)
17.09.2009	BB- (stable)		
18.09.2009		Ba3 (positive)	
03.12.2009			BB+ (stable)
YE 2009	BB- (stable)	Ba3 (positive)	BB+ (stable)
08.01.2010		Ba2 (stable)	
19.02.2010	BB (positive)		
05.10.2010		Ba2 (positive)	
24.11.2010			BB+ (positive)
YE 2010	BB (positive)	Ba2 (positive)	BB+ (positive)
23.11.2011			BB+ (stable)
YE 2011	BB (positive)	Ba2 (positive)	BB+ (stable)
01.05.2012	BB (stable)		
20.06.2012		Ba1 (positive)	
05.11.2012			BBB- (stable)
YE 2012	BB (stable)	Ba1 (positive)	BBB- (stable)
27.03.2013	BB+ (stable)		
16.05.2013		Baa3 (stable)	
24.10.2013			BBB- (stable)
YE 2013	BB+ (stable)	Baa3 (stable)	BBB- (stable)
07.02.2014	BB+ (negative)		
11.04.2014		Baa3 (negative)	
YE 2014	BB+ (negative)	Baa3 (negative)	BBB- (stable)
Current	BB+ (negative)	Baa3 (negative)	BBB- (stable)

Source: Turkish Treasury, Bloomberg.

Table A.2
Lag Length Selection for Spread Change Variable

SpreadChange		Lag 1	Lag 2	Lag 3	Lag 4	Lag 5	Lag 6	Lag 7	Lag 8	Lag 9	Lag 10	Lag 11	Lag 12
SPGrade	AIC	-1.77	-1.77	-1.76	-1.76	-1.75	-1.75	-1.74	-1.74	-1.73	-1.73	-1.72	-1.71
	HQIC	-1.76	-1.75	-1.73	-1.72	-1.71	-1.70	-1.69	-1.67	-1.66	-1.65	-1.64	-1.62
	SBIC	-1.74	-1.71	-1.68	-1.66	-1.64	-1.62	-1.59	-1.57	-1.54	-1.52	-1.50	-1.47
SPOutlook	AIC	-0.86	-0.85	-0.84	-0.84	-0.83	-0.83	-0.83	-0.82	-0.81	-0.81	-0.81	-0.80
	HQIC	-0.84	-0.83	-0.81	-0.80	-0.79	-0.78	-0.77	-0.75	-0.74	-0.73	-0.72	-0.71
	SBIC	-0.82	-0.79	-0.77	-0.74	-0.72	-0.70	-0.68	-0.65	-0.63	-0.61	-0.58	-0.55
MoodysG	AIC	-1.78	-1.77	-1.76	-1.76	-1.75	-1.75	-1.74	-1.74	-1.73	-1.73	-1.72	-1.72
	HQIC	-1.76	-1.75	-1.73	-1.72	-1.71	-1.70	-1.69	-1.67	-1.66	-1.65	-1.64	-1.62
	SBIC	-1.74	-1.71	-1.69	-1.66	-1.64	-1.62	-1.59	-1.57	-1.54	-1.52	-1.50	-1.47
MoodysO	AIC	-1.37	-1.36	-1.35	-1.35	-1.35	-1.34	-1.34	-1.33	-1.33	-1.33	-0.13	-1.32
	HQIC	-1.35	-1.34	-1.33	-1.32	-1.30	-1.29	-1.28	-1.27	-1.25	-1.25	-1.23	-1.22
	SBIC	-1.33	-1.30	-1.28	-1.26	-1.23	-1.21	-1.19	-1.16	-1.14	-1.12	-1.09	-1.07
FitchG	AIC	-1.37	-1.36	-1.36	-1.35	-1.35	-1.34	-1.34	-1.33	-1.33	-1.33	-1.32	-1.31
	HQIC	-1.36	-1.34	-1.33	-1.32	-1.30	-1.30	-1.28	-1.27	-1.25	-1.25	-1.23	-1.22
	SBIC	-1.33	-1.31	-1.28	-1.26	-1.23	-1.21	-1.19	-1.16	-1.14	-1.12	-1.09	-1.07
FitchO	AIC	-1.39	-1.38	-1.37	-1.37	-1.36	-1.36	-1.36	-1.35	-1.34	-1.34	-1.34	-1.33
	HQIC	-1.37*	-1.36	-1.35	-1.33	-1.32	-1.31	-1.30	-1.29	-1.27	-1.27	-1.25	-1.24
	SBIC	-1.35	-1.32	-1.30	-1.27	-1.25	-1.23	-1.21	-1.18	-1.16	-1.14	-1.11	-1.09

Table A.3
Lag Length Selection for EMBIG Change Variable

EMBIGChange		Lag 1	Lag 2	Lag 3	Lag 4	Lag 5	Lag 6	Lag 7	Lag 8	Lag 9	Lag 10	Lag 11	Lag 12
SPGrade	AIC	4.48	4.49	4.49	4.49	4.50	4.50	4.50	4.51	4.51	4.51	4.52	4.52
	HQIC	4.50	4.51	4.51	4.53	4.54	4.55	4.56	4.57	4.59	4.59	4.60	4.61
	SBIC	4.52	4.54	4.56	4.59	4.61	4.63	4.65	4.68	4.70	4.72	4.74	4.76
SPOutlook	AIC	5.40	5.41	5.41	5.42	5.42	5.43	5.43	5.44	5.44	5.44	5.44	5.45
	HQIC	5.42	5.43	5.44	5.45	5.47	5.48	5.49	5.50	5.51	5.52	5.53	5.54
	SBIC	5.44	5.46	5.49	5.51	5.54	5.56	5.59	5.60	5.63	5.64	5.67	5.69
MoodysG	AIC	4.48	4.49	4.50	4.51	4.51	4.52	4.52	4.53	4.53	4.53	4.54	4.54
	HQIC	4.50	4.51	4.53	4.54	4.55	4.57	4.58	4.59	4.60	4.61	4.62	4.63
	SBIC	4.52	4.55	4.57	4.60	4.62	4.65	4.67	4.70	4.72	4.74	4.76	4.79
MoodysO	AIC	4.89	4.90	4.90	4.91	4.91	4.92	4.92	4.93	4.94	4.93	4.94	4.94
	HQIC	4.91	4.92	4.93	4.94	4.96	4.97	4.98	4.99	5.01	5.01	5.03	5.04
	SBIC	4.93	4.95	4.98	5.00	5.03	5.05	5.07	5.10	5.12	5.14	5.17	5.19
FitchG	AIC	4.89	4.89	4.90	4.91	4.91	4.92	4.92	4.93	4.94	4.93	4.93	4.93
	HQIC	4.90	4.91	4.93	4.94	4.96	4.97	4.98	4.99	5.01	5.01	5.02	5.02
	SBIC	4.93	4.95	4.98	5.00	5.03	5.05	5.07	5.10	5.12	5.13	5.16	5.18
FitchO	AIC	4.89	4.90	4.91	4.91	4.92	4.92	4.93	4.93	4.94	4.94	4.94	4.95
	HQIC	4.91	4.92	4.93	4.95	4.96	4.97	4.99	5.00	5.01	5.02	5.03	5.04
	SBIC	4.93	4.95	4.98	5.01	5.03	5.06	5.08	5.10	5.13	5.15	5.17	5.19

Table A.4
Correlation Matrix for Model Variables

	Spread Change	Spread Change (-1)	Spread Change (-2)	SPGrade (-1)	SPGrade(-2)	VIX
Spread Change	1,0000					
Spread Change (-1)	0,0104	1,0000				
Spread Change (-2)	0,0229	0,0104	1,0000			
SPGrade (-1)	0,0005	-0,0005	0,0019	1,0000		
SPGrade(-2)	0,0163	0,0005	-0,0005	-0,0019	1,0000	
VIX	-0,0164	-0.0212	0.0011	0.023	0.0331	1,0000

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Özet

Kredi notu değişiklikleri ve Türkiye'nin devlet borçlanma maliyetleri

Standard and Poor's (S&P), Moody's ve Fitch şirket ve devlet tahvilleri için kredi notu üretmektedir. Ülke kredi derecelerinde değişiklikler yatırımcıların kararlarını ve dolayısıyla devlet borçlanma maliyetlerini etkiler. 2008 küresel finansal krizi kredi derecelendirme kuruluşları için önemli bir kilometre taşıdır çünkü kriz sürecinde yüksek dereceli ülkeler derin ekonomik dalgalanmalarla karşı karşıya kalmışlar ve bu durum kredi derecelendirme kuruluşlarının güvenirliliğini azaltmıştır. Bu çalışma kriz sonrası dönemde Türkiye'nin devlet tahvili spreadleri ile kredi notu değişikleri arasındaki ilişkiyi incelemektedir. Temmuz 2007- Mart 2013 arasında vektör otoregresyon (VAR), Granger nedenselliği, etki-tepki fonksiyonları ve olay çalışması yöntemleri kullanılarak Türkiye'nin kredi notlarındaki değişikliklerin spread değişimleri üzerindeki etkisi incelenmiştir. Ayrıca kredi notu değişiklerinin Türkiye'nin devlet tahvili spreadleri üzerindeki dinamik etkisini incelemek için olay çalışması yöntemi uygulanmıştır. Bu çalışmalar sonucunda kredi notu değişiklerinin genellikle piyasa tarafından sezildiğine dair kanıtlar bulunmuş olup, not değişikliği öncesinde pozisyon alan yatırımcıların VAR sonuçlarında önemsiz sonuçlar çıkmasına neden olduğu tahmin edilmektedir.

Anahtar kelimeler: Kredi notu, devlet borçlanması, vektör otoregresyon (VAR), olay çalışması, piyasa beklentisi.

JEL kodları: G15, G23, E62.