

THE IMPACT OF CREDIT RATING CHANGES ON  
THE GOVERNMENT COST OF BORROWING IN TURKEY

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## ABSTRACT

### THE IMPACT OF CREDIT RATING CHANGES ON THE GOVERNMENT COST OF BORROWING IN TURKEY

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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 the creditworthiness of these agencies. This thesis investigates the relationship between sovereign bond spreads and rating changes during the post-crisis period for Turkey. 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 perform event study analysis in order to capture the dynamic effects of rating changes on Turkish government bond spreads. We find some evidence that rating announcement are often anticipated by the market so investors take their position before announcement day which give us insignificant results in VAR estimates.

Keywords: Credit Rating, Government Borrowing, Vector Autoregression,, Event Study, Market Anticipation

ÖZ

KREDİ NOTU DEĞİŞİKLİKLERİNİN TÜRKİYE’NİN DEVLET BORÇLANMA  
MALİYETLERİNE ETKİSİ

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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 kaldı ve bu durum kredi derecelendirme kuruluşlarının güvenilirliğini azalttı. Bu çalışma kriz sonrası dönemde Türkiye'nin devlet tahvili spreadleri ile kredi notu değişiklikleri arasındaki ilişkiyi inceliyor. 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 değişikliklerinin Türkiye'nin devlet tahvili spreadleri üzerindeki dinamik etkisini incelemek için olay çalışmasını uyguladık. Bu çalışmalar sonucunda kredi notu değişikliklerinin genellikleri piyasa tarafından sezildiğine dair kanıtlar bulunmuş olup not değişikliği öncesinde pozisyon alan yatırımcılar VAR sonuçlarında önemsiz sonuçlar çıkmasına neden oluyor.

Anahtar Kelimeler: Kredi Notu, Devlet Borçlanması, Vektör Otoregresyon (VAR),  
Olay Çalışması, Piyasa Beklentisi

*To My Parents*

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## LIST OF ABBREVIATIONS

AIC	Akaike Information Criterion
CDO	Collateralized Debt Obligation
CRA	Credit Rating Agency
EMBI	Emerging Market Bond Index
EMBIG	Emerging Markets Bond Index Global
HQIC	Hannan-Quinn Information Criterion
IRF	Impulse-Response Function
MBS	Mortgage-Backed Security
S&P	Standard and Poor's
SBIC	Schwarz's Bayesian Information Criterion
VAR	Vector Autoregression

## **CHAPTER 1**

### **INTRODUCTION**

Standard and Poor's (S&P), Fitch, and Moody's are the largest credit rating agencies and they are private companies issuing ratings of state and other debt obligations. The notes are issued by these agencies as letter grade which indicates the creditworthiness of debt issuers such as governments, corporates etc. 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 a bond. The sovereign credit rating indicates the risk level of a country's investment environment, taking political risk of that particular country into account and is used by investors looking to invest abroad. 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. They might change country's rating or outlook when country's sovereign creditworthiness has changes significantly. Table 1.1 shows the characterization of debt and issuer, letter grades and linear transformation of these grades according to scale 21 and 17.

To believe that the rating agencies can influence financial markets and so, investors' decisions, there exist several reasons. The main influence of CRAs' arises from whether rating announcements adding new and valuable information on the sovereign credit markets. However there is a controversy whether rating changes provide new information to markets at all because sovereign yield spreads as an indicator of government credit risk are determined daily by the market and there is a possibility that any information provided by announcing rating change might be previously included in a change of sovereign yield spreads. The fact that rating announcements of CRAs are based on public information makes this case stronger. This situation causes a conflict of noise in the financial markets, that is, if yield

spreads and rating grades really follow the same unobserved facts then one of them may simply introducing noise in the financial markets.

**Table 1.1 Ratings of the Agencies**

Characterization of debt and issuer (source: Moody's)	Rating			Linear transformations	
	S&P	Moody's	Fitch	Scale 21	Scale 17
Highest quality	AAA	Aaa	AAA	21	17
High quality	AA+	Aa1	AA+	20	16
	AA	Aa2	AA	19	15
	AA-	Aa3	AA-	18	14
Strong payment capacity	A+	A1	A+	17	13
	A	A2	A	16	12
	A-	A3	A-	15	11
Adequate payment capacity	BBB+	Baa1	BBB+	14	10
	BBB	Baa2	BBB	13	9
	BBB-	Baa3	BBB-	12	8
Likely to fulfil obligations, ongoing uncertainty	BB+	Ba1	BB+	11	7
	BB	Ba2	BB	10	6
	BB-	Ba3	BB-	9	5
High credit risk	B+	B1	B+	8	4
	B	B2	B	7	3
	B-	B3	B-	6	2
Very high credit risk	CCC+	Caa1	CCC+	5	
	CCC	Caa2	CCC	4	
	CCC-	Caa3	CCC-	3	
Near default with possibility of recovery	CC	Ca	CC		
			C	2	1
Default	SD	C	DDD		
	D		DD	1	
			D		

**Source: Moody's**

As a key method of funding many economies employ debt securities and this method generate an important asset class for many investors. In international financial market investors pay more attention to the government bond yield spreads in order to take position. Country bond yield spreads often represent the governments cost of borrowing in the international financial markets. The country bond yield spreads is adopted as an average measure of country default risk and it is calculated by differencing the yield of country bond from the yield of a developed bond which have same currency denomination and maturity. Policymakers and practitioners have to be interested in understanding what drives the developments in spreads. Policymakers and investors try to clarify the question of whether the government bond spread is priced according to the country specific indicators. In this perspective, if sovereign debt spreads remain at low levels for a long time without reflecting

economy's specific indicators then an unexpected change in market participants' perception of risk can lead to sudden changes in the debt spreads (borrowing cost) for that country. Sovereign debt spreads are also very important for governments because governments have huge amount of debts so a small deviations in bond prices may result in significant cost for tax payers. In addition to that, in modern financial markets, government bonds play crucial role on allocating assets and pricing assets.

The fact that rating announcements have significant impact for government bond yields more than expected information contained in country specific indicators have found in many 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 spread as well. Therefore, 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, Reisen, and Maltzan (1997) employing panel data analysis and event study analysis provides econometric analysis on the fact that changes in credit rating 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 government bond spreads incorporate the investors' expectation to credit rating changes. Erb, Harvey, and Viskanta (1996) investigate the relation between country risk rating and countries' bond yield spreads for a sample of developed countries. The conclusion supports view that country risk ratings are main determinants in the explanation of the 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 thesis investigates the relationship between the rating changes and sovereign bond spreads by taking the long-term foreign currency credit rating for Turkish government bonds. In this study 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 in this study we use vector autoregressive (VAR) method to examine the inter-relationship between variables of credit rating/outlook change and spread changes (Eurobond or EMBI Global) of Turkey. Granger causality test and impulse response functions (IRFs) are also implemented for Turkey in order to increase the strength of the VAR analysis for Turkey case study. The study of anticipation effects is crucial for these types of studies to obtain unbiased results because rating or outlook changes are generally anticipated by market participants. In this study delayed effects of rating and outlook changes is investigated because rating/outlook changes can be made at any time of day. Using Turkish governments bond spreads and CRAs' ratings for long term foreign currency debt from July 2007 to March 2013, we analyze a few stylized facts and explain how the relationship between Turkish government bond spreads and credit ratings can be used in order to analyze the market and CRAs' views to financial markets, especially for Turkish government bonds.

We contribute some basic facts to the existing literature and our main contribution to the literature as follows. First, in our study we take latest period as a sample period so our sampling period is more recent compared to others (Kaminsky and Schmukler (2002), Cantor and Packer (1996), Larrain, Reisen, and J. Von Maltzan (1997) and etc.) and 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 its reputation, that is, how a credit rating agency (CRA) produces information in an unbiased, timely, and accurate way then its reputation increases. The 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 rating of agencies. CRAs



rated billions of dollars of structured finance instruments such as mortgage-backed securities (MBSs) and collateralized debt obligations (CDOs) too highly, although these instruments were very risky and caused the financial crisis. An additional concern that decreased the reputation of CRAs is that the US firms' dominance of the CRA market. There exist an American CRAs oligopoly (S&P, Moody's, and Fitch) in the rating industry so CRA market requires listed companies and governments around the world to conform to American business ideals to get high marks. A study conducted by 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 then he evaluates their position during the global financial crisis. Reurink reaches the conclusion that there exists an American CRAs oligopoly in the 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 literature use pre-crisis period data and there are few studies that uses crises and post-crisis data. Also for Turkey we deal with such an issue in the first time and we think this thesis stimulates such studies for Turkey. Therefore, taking updated time zone and focusing on the Turkey's government bonds is our main contribution to the existence literature. Second, in the literature researchers generally use Emerging Market Bond Index (EMBI)<sup>1</sup> 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 governments of developing countries and these bonds typically have a long term maturity. However, in our study we use Turkey five year government bond yields (Eurobonds) occurring at the secondary market as well as Emerging Market Bond Index Global (EMBIG) spreads for Turkey. EMBI Global includes U.S.dollar-denominated Brady bonds, loans, and Eurobonds with an outstanding face value of at least \$500 million and it is issued by JP Morgan as well. Since EMBIG

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<sup>1</sup> A benchmark to measure the total performance of government bonds issued by emerging countries that are considered sovereign.

spreads include long term maturity Turkish government bonds researchers look at the relation between the credit rating changes and government bond yield spreads on the long-term view. However, we investigate the medium-term and long-term effect of rating changes on the sovereign government bonds yields 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 might show the medium run effects. Therefore we take five year government bond spreads as a represent of the medium term. We obtained data from Bloomberg so my data set is shaped by limited Bloomberg data pool.

In literature there is only one study that investigates how rating changes affect government cost borrowing in Turkey. This is a financial market report prepared by the Banking Regulation and Supervision Agency (BDDK, 2009). This study investigates this relation in narrow sense so they do not give us reasonable results for Turkey. In this thesis we investigate this relation in more details. Also our main findings are different than the BDDK report.

According to analysis at the end of this thesis we reach some remarks:

- i) according to vector autoregressive (VAR) model there is no inter-relationship between the variables of credit rating/outlook change and spread change for Turkey;
- ii) according to Granger causality test results there exists no Granger causality between variable of credit/outlook rating change and spread change for Turkey;
- iii) according to performed impulse response functions (IRFs) study market participants' attention to credit rating agencies' announcement does not significantly affect their decision for the Turkish government bond after the 2008 global financial crisis;
- iv) event study analysis indicates that spreads begin to move in the anticipated path before the announcement day for Turkish government bonds.

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

## CHAPTER 2

### REVIEW OF THE LITERATURE

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

The existing studies which deal with credit ratings announced by agencies can be generally divided into two groups. First group of studies focuses on the determinants of credit rating. In these papers some methods are used such as linear estimation methods and ordered response methods to reveal what the determinants of credit rating are. For example, Afonso, 2003; Bissoondoyal-Bheenick, 2005 and Afonso, Gomes and Rother, 2011 try to investigate the determinants of credit rating. They conclude that real GDP growth, the public debt level, level of GDP per capita, external debt, and the government budget balance mainly explain the rating scale. At the second group of studies there exist papers that are investigating the impact of credit rating changes on the government bond spreads. That is, they focus on the how credit rating changes affect the cost of government borrowing. Kräussl (2005) performs an event study analysis by using long-term foreign currency denominated credit ratings from S&P and Moody's for the period of January 1997 to December 2000. In this study an index is constructed in order to measure the speculative market pressure that is used for the evaluation of rating effect on the financial market. Paper concludes that credit rating and outlook changes have significant effect on the government bond spreads, especially rating downgrade and negative outlook changes significantly affect the government bond spreads. Furthermore, 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. Also, in this paper authors conclude that there exists a two-way causality between credit ratings and sovereign bond spreads for 29 emerging markets-Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, Colombia, Czech Republic, Denmark, Finland, Germany, Hungary,

Indonesia, Ireland, Italy, Korea, Malaysia, Mexico, New Zealand, Norway, Philippines, Poland, Portugal, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, UK, USA, and Venezuela. Event study analysis explores the market reaction for 30 trading days before and after the rating changes and authors finds a significant impact of rating changes for a set of ratings by the three leading rating agencies of S&P, Fitch, and Moody's, although, there exists strong market anticipation for rating changes. Furthermore, Granger causality test indicates that changes in credit rating and changes in bond yields are mutually interdependent.

Afonso, Furceri, and Gomes (2011) examines the how the sovereign credit rating changes affect the government bond yield spreads by taking European Union countries' daily data from January 1995 to October 2010. In this study event study analysis is conducted for two day window, that is, authors examine the reaction of bond yield spreads within two days of the rating change. Also, authors apply the Granger causality test between the credit ratings and the yield spreads and their main findings are as follows: i) rating/outlook change, especially negative changes, significantly affect the government bond yield spreads; ii) rating and outlook changes are not expected in the previous one or two months however; iii) there exist two-way causality between sovereign credit ratings and government bond yield spreads in a one or two week window; iv) there exist a transmission mechanism from countries that have lower credit rating to countries that have higher credit rating; v) countries face higher spreads if they have faced downgrade less than six months ago compared to countries having same rate but they have not faced downgrade within the last six months. Actually these type of findings shed light on the behavior of financial markets in relation to sovereign credit rating changes.

Flore (2010) investigate the impact of rating and outlook changes on the domestic and foreign financial market by using 18 emerging market data- Argentina, Brazil, Bulgaria, Chile, China, Colombia, Indonesia, Korea, Malaysia, Mexico, Peru, the Philippines, Poland, the Russian Federation, Thailand, Turkey, Uruguay, and Venezuela. The sampling period in the paper is from January 1997 to December 2010 and EMBI Global spreads has been used as sovereign bond yield spreads. In this paper panel estimations are performed to release the immediate effects of a

rating or outlook changes, then, the 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 during the credit rating announcement time. The paper suggests the following results: i) domestic rating and outlook changes significantly affect the government bond yield spreads, for example, author finds that domestic rating upgrades led to a 1.7% decrease in government bond yield spreads and domestic outlook upgrades led to a 0.8% decrease in spreads; ii) foreign rating changes also significantly affect the domestic markets but in smaller absolute terms; iii) foreign country rating changes are more effective than foreign country outlook changes for domestic country; iv) large rating changes have a greater effect than smaller ones; v) lastly, the author finds that rating changes are mostly expected by the market players. The event studies supported this result by observing the expected movement direction in bond spreads before announcement is actually made.

Larrain, Reisen, and von Maltzan (1997) present econometric evidence using panel data analysis and event studies to evaluate the effect of credit rating changes on global financial markets. The authors perform Granger causality tests using yearly observed unbalanced data for the period 1988-1995; also, they investigate the effect of rating changes on sovereign yield spreads for the period 1987 and 1996 and for 26 OECD and non-OECD countries. Their event study analysis indicates that there is a highly significant rating change effect when emerging-market government bonds take a negative outlook. Findings of the paper indicate that a negative rating change announced by CRAs has stimulated private capital inflows to countries that have lower default risk - higher credit ratings. Granger causality is also tested and a bi-directional causality is found which indicates changes in credit ratings and changes in bond yields are mutually interdependent. Furthermore, the authors catch the market expectation towards the rating change as a critical point in the explanation of government bond spreads which is a representation of the governments' cost of borrowing.

Sy (2001) documents a few stylized facts and shows how rating changes affect sovereign spreads by using J.P. Morgan EMBI+ data. This study was conducted for 17 emerging market countries from January 1994 to April 2001 by following

unbalanced panel data estimation instead of cross-sectional analysis- Argentina, Brazil, Bulgaria, Colombia, Ecuador, Korea, Mexico, Morocco, Panama, Peru, the Philippines, Poland, Qatar, Russia, South Africa, Turkey, and Venezuela. In this paper author tries to explore the relationship how credit rating changes affect the country spreads by taking EMBI+ country indices as a country spreads. He concludes that higher ratings are linked to lower spreads, that is, a negative relation is found in the Spearman rank correlation. He also finds that a one-notch increase in credit rating decreases government bond yield spreads on average by 14%. He argues that rating downgrade follows often spreads “excessively high” countries. Similarly, spreads “too low” are often followed by upgrades, suggesting that markets anticipate future changes in ratings, that is, credit rating agencies are late to change ratings. Focusing on the relationship between secondary market spreads on the EMBI+ country indices and rating changes differs this study from others and we followed similar methodology in our study.

In Kaminsky and Schmukler (2002), the authors examine data from 16 emerging countries, covering the period from January 1990 to June 2000- Argentina, Brazil, Chile, Colombia, Indonesia, Malaysia, Mexico, Peru, the Philippines, Poland, the Republic of Korea, the Russian Federation, Taiwan (China), Thailand, Turkey, and Venezuela. Countries are chosen from three regions such that countries suffered crises and contagion and have available data. EMBI is used as sovereign bond yield spreads and they estimate panel regressions and perform event study analysis to examine how dynamically rating and outlook change affect the sovereign spreads. Authors reach six outcomes for the effect of credit rating changes on financial markets. First, bond market is significantly affected by rating/outlook changes; government bond yield spreads increase 2 percentage points as a response to a domestic downgrade. Second, rating announcements cause the spillover effects, that is, rating changes in one emerging country triggers changes in yield spreads of bonds in other emerging countries. The spillover effect due to the credit rating changes arises mostly at the regional level as in the case of contagious crises. Third, domestic markets and global financial markets are both affected more in times of crises by changes in credit ratings and outlooks. Also contagion effects are stronger during crises. Crises-contingent theories that explain the how shocks are transmitted

internationally are supported by this theory. Mason (1998) indicates that a crisis in one country can coordinate expectation of investors', moving them from good position to a bad position so it causes deterioration in the other country's financial markets. CRAs announcements give idea about this coordinating signal. Fourth, credit rating changes contains more information for nontransparent countries compared to transparent countries since investors do not get further information for nontransparent countries so investors' pay more attention to credit rating changes for nontransparent markets to get information for the situation of that country. Fifth, CRAs upgrade countries in good times and downgrade them in bad times so the perception of credit rating agencies might contribute to the instability of financial markets in emerging markets is consistent with this evidence. Since CRAs announce bad news in bad times and good news in good times, the impact of upgrades/downgrades do not appear to be large, although, they are statistically significant. Finally, changes in US interest rates affects fragile countries more severely than other countries. In fact, the rising interest in fuel financial centers increase in sovereign risk by 50 percent more in weaker countries compared to countries having higher level of credit rating. Understanding of the effects of credit rating and outlook change will be improved by the several possible extensions to this research.

Scholtens (1999) tries to find the relationship how country risk in the 1990s affects the Eurobond yield spreads by calculating rank correlations for countries including developing and industrialized countries. Furthermore, 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. He concludes that there is a strong and positive association between yield spread and country risk.

Steiner and Heinke (2001) investigate the association of daily excess Eurobond returns with rating changes by S&P and Moody's for period 1985 to 1996. For downgrading announcements and negative watch listings there exists a significant bond price responses are observed while upgrading announcements and outlook



upgrades do not have any significant effect on the bond price responses. According to authors nationality of issuer is the main factor in determining the strength of price reactions after credit rating changes. Also, rating downgrade into speculative grade level causes significant and stronger bond price reactions. The main finding of this paper show us that volatility of daily bond prices in the key determinant of the market reactions to CRAs' announcements.

Gande and Parsley (2003) study the effect of a sovereign credit rating change of a country on the government bond yield spreads of other countries by using sample data for period 1991 to 2000. Authors take the market closing market data for the interest rate spread for period that cover January 1991 to December 2000. For this analysis 34 countries are used- Argentina, Austria, Belgium, Brazil, Canada, Chile, China, Columbia, Denmark, Finland, Greece, Hungary, Iceland, Indonesia, Ireland, Israel, Italy, Korea, Lebanon, Malaysia, Mexico, New Zealand, Panama, Philippines, Poland, South Africa, Spain, Sweden, Thailand, Tunisia, Turkey, United Kingdom, Uruguay, and Venezuela. They find the evidence of spillover effects which is a significant effect on bond spreads for countries that are affected by other country's rating announcements. This effect is asymmetric: the association of negative ratings events with increase in spreads does not have detectable impact. Authors find that one-notch decrease in rating for government bonds associated with a 12 basis point increase in spreads of other countries' government bond spreads. These types of studies indicate us that rating changes not only affect domestic sovereign spreads but also affect the foreign spreads.

As mentioned in previous part for Turkey we deal with such an issue in the first time and till now we summarize the literature related to our issue. For Turkey Banking Regulation and Supervision Agency (BDDK, 2009) performed a narrowed study and in this study it is seen that the credit ratings of countries and the path of this credit ratings is key factor on both pricing the bonds and changes in sovereign bond spreads. Bond spreads of the countries whose credit ratings are expected to increase may decrease. That is, it is useful to analyze the effect of credit rating changes on borrowing cost by clarifying the magnitude of impact of possible credit rating changes of countries on sovereign bond spreads. In this context, the impact of

changes in credit ratings of Turkey on monthly Turkey's Eurobond spread is investigated. In the study, regression analysis is done with monthly data for the period February 2001 and November 2009. Eurobond spreads is used as dependent variable and credit ratings announced by S&P, Moody's and Fitch is used as independent variables. The main findings of this study as follows:

- i) A 1 percent increase (decrease) in Turkey's credit rating by S&P decreases (increases) Eurobond spreads by 0.5 percent; a 1 percent increase (decrease) in credit rating by Fitch decreases Eurobond spreads by 0.4 percent. A 1 percent increase (decrease) in combined rating created by taking arithmetic average of 3 credit rating decreases (increases) Eurobond spreads by 0.63 percent, that is , there exist a negative relation between these two variables,
  
- ii) Borrowing cost decreases/increases as response to decrease/increase in Eurobond spreads which is the result of increase/decrease in credit ratings. Increase of combined rating to investment grade BBB will decrease Eurobond spreads about 160 basis points. This situation causes a 16 million dollars decrease in cost for 1 billion dollars borrowing. That is, borrowing cost of turkey decreases as a result of increase of credit rating to investment grade. About 1.6 percent decrease in borrowing cost provides better opportunities for borrowing. Because the rating of the country is used as a reference for borrowing of private sector, this situation also makes positive impact on borrowing costs of private sector. When the country has investment grade credit rating, it helps the country get less affected liquidity conditions resulted by global fluctuations.

During 2008 financial crisis high rated countries faced with deep economic fluctuations which decreased the creditworthiness of credit rating agencies. Therefore, post-crisis period is new field in order to investigate the relationship between credit rating changes and government bond yield spreads. The studies explained above aimed 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 the VAR and event study analysis to evaluate the impact of credit rating/outlook change on the Turkish government bond spreads.

We use five 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 thesis we document few facts and demonstrate how the relationship between Turkish government bond yield spreads and credit rating changes can be used in the analysis of market and CRAs' views of financial market for Turkish government bonds.

## CHAPTER 3

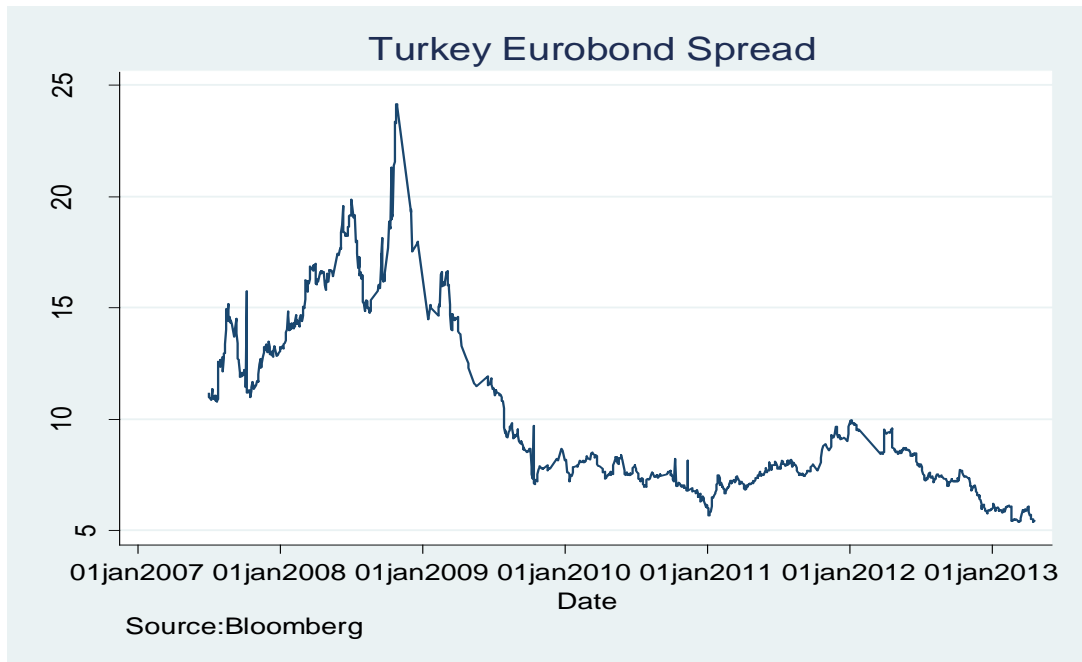
### DATA AND METHODOLOGY

#### 3.1. DATA

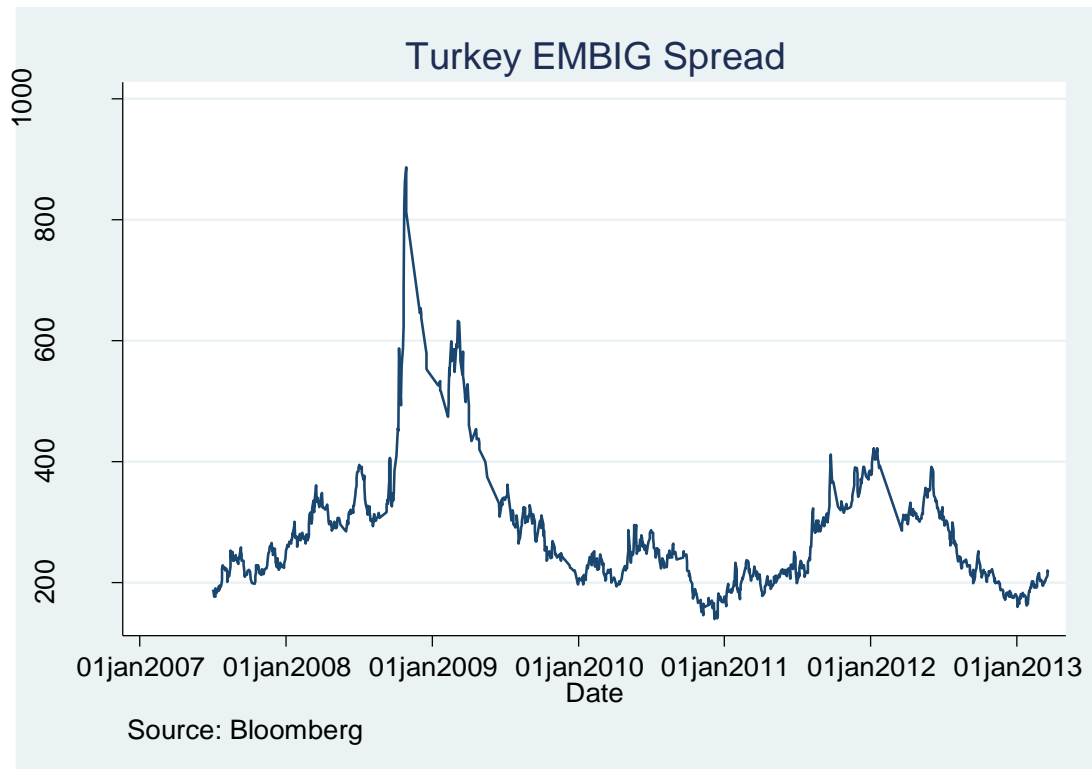
##### 3.1.a. Introduction of Variables and Data Sources

We examine the Turkey's five year government bond spreads, EMBIG (Emerging Markets Bond Index Global) spreads and rating changes announced by S&P, Moodys, and Fitch. Also we use VIX (volatility index) in our model as an indicator of global risk or degree of risk appetite of investors. Three variables are used in our model; Eurobond Spread/EMBIG Spread, rating/outlook change, and VIX. Among these variables Eurobond Spread/EMBIG Spread is the dependent variable however all other variables are used as explanatory variables. Data set used in the model consists of daily data and the data period is from June 2007 to March 2013.

For dependent variable we use two types of variables; one is Eurobond spread which is calculated and the other one EMBIG spread for Turkey announced by JP Morgan. EMBI Global includes U.S.dollar-denominated Brady bonds, loans, and Eurobonds with an outstanding face value of at least \$500 million. Sovereign Eurobond yields spreads are calculated by using five year foreign currency denominated government bond yields and five year US government bond yields as a benchmark instrument. In financial market countries' default risk usually is demonstrated by government bond yield spreads. When default risk increases then 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 agency's web pages. Figure 3.1 and 3.2 shows the Eurobond spread and EMBI Global spread for Turkey respectively.



**Figure 3.1: Turkey Eurobond Spread**



**Figure 3.2: Turkey EMBIG Spread**

In this thesis and in literature authors mostly focus on the emerging markets for these types of studies since rating/outlook changes are prone to provide new information for emerging market that have less transparent economic structure compared to developed ones. On the other hand, for developed countries rating and outlook changes are most likely to support the completeness and the transparency of the economy. The more crucial benefit of CRAs to investors arises from the fact that if 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. The sample period runs from June 2007 to April 2013. The main reason of why this period is chosen arises from the 2008 global financial crisis and Eurozone crisis. In this thesis we focus only on the effect of credit rating changes on the Turkish government bond spreads-Eurobond spread and EMBI Global spread for Turkey.

In our thesis and other studies volatility index (VIX) is used as an indicator of global risk or degree of risk appetite of investors. Using VIX as explanatory variable gives us the chance of accounting global economic trend in our estimates. In the construction progress of the VIX the implied volatilities of a wide range of options on the 500 S&P index is used.

Sovereign ratings and outlooks are taken from sovereign credit rating agencies' web pages. In general, most rating agencies publish credit ratings for long and short-term local and foreign currency denominated bonds. In addition, they assign the credit outlook for each country in both currencies, although the rating agencies noted that their outlook does not guarantee future changes in the assessments themselves. Short-term ratings, however, do not seem to add very basic information from the time of their development coincides generally with the changes in long-term ratings.

Although many studies take log of bond yield spread and examine the relationship between spreads and an index of cardinal numbers assigned to the sovereign credit ratings of long-term, there is little evidence to support provided to this specification. Often, the index is formed such that its value increases by a certain increment when classified deteriorates, or vice versa. In this thesis we perform vector autoregression

(VAR) model to capture the linear interdependencies among multiple times series variables of Turkish government bond spreads, credit rating changes, and VIX.

### **3.1.b. Yield Spreads and Bond Yields**

The spread of financial credit term is the yield spread; it is calculated by differencing the yields of the different credit quality securities. That means differencing yield of lower credit quality bonds from the yield of higher credit quality bonds. Usually US treasuries or LIBOR are used as reference rate or risk free benchmark security that represents the higher credit quality.

Treasury spread or government bond spread is the basic relative value calculated by using appropriate government bond. In this thesis the bond spread is calculated as follows;

$$BS = Y - T$$

T: US five year bond yield

Y: Country five year bond yield

BS: Bond Yield Spread

According to this formula bond yield spread is calculated by deducting yield of government bond from the yield of risk free bond and in this thesis five year US government bonds are used as a risk free benchmark security. In financial market spread value is used to price bonds and to comprise the different credit quality bonds as a relative value. For example, for bonds having a spread of 50 basis points above the five year US government bond means that yield to maturity of that bond is 0.50% greater than the yield to maturity of the five year US government bond. As previously mentioned yield spread is calculated by differencing the yield of one bond from the benchmark bond, therefore, higher the spread of country mean the higher the default risk for that country.

In using yield spreads in country risk analysis a basic assumption is that one country's bonds is accepted as risk-free like US bonds. From this assumption we accept that US T-bond yield is the country risk free interest rate. Most of the

existence literature uses the EMBI as country spreads, however, in our thesis we calculate country spread values for five year maturity bonds as an Eurobond spread and we use EMBI Global spread for Turkey.

Variable names are displayed in Table 3.1.

**Table 3.1 Variable Names**

<b>EMBIG</b>	Emerging Markets Bond Index Global
<b>Spread</b>	Turkey Eurobond Spread
<b>SPGrade</b>	Standard & Poor's (S&P) Credit Rating Change
<b>SPOutlook</b>	Standard & Poor's (S&P) Outlook Change
<b>FitchG</b>	Fitch Credit Rating Change
<b>FitchO</b>	Fitch Outlook Change
<b>MoodysG</b>	Moodys Credit Rating Change
<b>MoodysO</b>	Moodys Outlook Change
<b>VIX</b>	Volatility Index

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

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

### 3.1.c. Unit Root Tests

Before moving vector autoregressive analysis (VAR) for our case study, testing the order of integration is essential in VAR method because the order of integration is an crucial subject to construct appropriate VAR model and 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 dropped the insignificant lags sequentially till the last lag become significant. In Phillips–Perron (PP) we take the 6 lag length as automatically. Unit root test results for all variables are documented in Table 3.2 and 3.3. According to the results from Table 3.2 and 3.3 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 3.2 ADF Unit Root Test Results**

Variable	Case	Level		First Difference	
		Lag	t-ADF	Lag	t-ADF
Spread	Intercept	12	-1.423 (0.57)	12	-8.638*** (0.00)
Spread	Intercept & Trend	12	-2.661 (-0,25)	12	-8.697 *** (0.00)
EMBIG	Intercept	11	-2.589* (0.095)	11	-9.112 *** (0.00)
EMBIG	Intercept & Trend	11	-2.822 (0.189)	11	-9.144*** (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 3.3 Phillips-Peron Unit Root Test Results**

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

### 3.2.a. Vector Autoregression (VAR) Model

VAR model in the time series models is the mostly used one in the last period. For example Sims (1980), Dijk and Franses (2000), Johansen (2000), Kilian and Chang (2000) are example in the literature using VAR modeling and analysis. VAR analysis gives us the chance of examining the inter-relationships between economic variables. For our study we able to investigate the inter-relationship between variables of credit rating/outlook change and spread changes (Eurobond or EMBI Global). The vector autoregression method was first introduced by Sims (1980) and it can be represented in a general VAR (p) as follows:

$$y_t = v + A_1y_{t-1} + \dots + A_p y_{t-p} + u_t \quad (1)$$

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 provide different information to market. In this perspective 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). For our 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 3.4 gives us the appropriate lag length for the models.

**Table 3.4 Lag Selection**

	<b>Eurobond Spread Change (Turkey)</b>	<b>EMBI Global Change (Turkey)</b>
<b>Variable</b>	<b>Lag</b>	<b>Lag</b>
SPGrade	2	4
SPOutlok	1	3
FitchG	1	4
FitchO	1	3
MoodysG	1	7
MoodysO	2	3

For example, for the 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.

### 3.2.b. Granger Causality

The three hypothesis-credit/outlook change affects spread changes, spread changes affects credit/outlook change, and both demonstrate a reciprocal relationship- were tested using the Granger causality approach. Before performing Granger causality test we make stationary tests of ADF and PP in 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 ( $\Delta$  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.c. Impulse Response Function (IRF)**

By performing 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 study 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 based on a VAR model so IRF tracks the effect of one standard deviation shock to credit/outlook change on the spread changes.

For Impulse Response Functions (IRFs) to be computed, VAR estimates need to be stable so we perform stability test for each VAR estimates and we get stable VAR models. According to results all eigenvalues lie inside the unit circle so VAR models satisfy the stability condition.

### **3.2.d. Event Study Analysis**

In finance event study methodology 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. To illustrate, assume there are two companies in financial market and assume their profitability information announced to market on February 10 and March 10 for companies Alpha and Beta respectively. To examine the how these announcements affect the companies' share prices we take two base periods for companies – for Company Alpha it is February 10 ( $t=0$ ) and for Company Beta it is March 10 ( $t=0$ ). February 11 and March 11-one day after the events- will be represented as  $t=1$  for these companies. Therefore, 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 able to examine the inter-relationships between the credit rating/outlook change and spread change. Also, we able to investigate the dynamic effect of credit rating/outlook change on the spread change by using these analyses. However in event study analysis we able to evaluate the dynamic effect of rating/outlook changes on the relative price changes instead of focusing on the spread change. Actually event study analysis provides us the evidence on whether CRAs act procyclically or market participants anticipate their actions, that is, downgrading countries grade or outlook during the countries have weak macroeconomic indicators and upgrading them during the countries have strong macroeconomic indicators. Therefore, event studies give us a clue about market anticipation towards to 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 the effects of rating announcements whether they are temporary or not.

In this thesis 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  $\pm 10$  day window around an upgrade or downgrade of a credit rating/outlook change. Event study analysis normally interested in excess return during the event window so we can detect the behavior of the government bond spreads relative to a benchmark of US bonds 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 both positively and negatively. On the other hand, if CRAs changes 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. Particularly during crisis periods CRAs announce ratings/outlook 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. During crisis period rating changes from three leading CRAs follow each other so many changes occurred in this period were not clean that cause the biased result in event study analysis. Therefore, many rating/outlook changes made during crisis period are dropped from our sample and we examine only clean events as sample data. By following this way, we ensure that only the effects of one upgrade or downgrade in each event is examined for Turkey case study. Table 2 shows the number of clean events with 21-day window taken as sample for event study methodology.

**Table 3.5 Number of Clean Events with 21 day Event Window**

	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 starting point for Turkey and then we apply the following formula for the government bond spreads to reach the relative return of bond yield according to starting point.

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

where t represent time in 21 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.

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



## CHAPTER 4

### EMPIRICAL ANALYSES

#### 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. As a represent of government bond spread we take two variables; Turkey Eurobond spread and EMBI Global spread for Turkey. We perform VAR models according to these variables separately. In the literature in order to get reliable results in the VAR analysis all variable used in VAR estimation 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 no need to check stationary test so we perform VAR estimates under these conditions.

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 3.4 we perform VAR estimates and the related results are given in Table 4.1.a, 4.1.b, 4.1.c, 4.1.d, 4.1.e, 4.1.f for Turkey Eurobond spread and Table 4.2.a, 4.2.b, 4.2.c, 4.2.d, 4.2.e, 4.2.f for EMBI Global spread for Turkey. Main findings in VAR analysis indicate us that only intercept and VIX (exog) terms 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 variables. These results support the concepts of market anticipation and procyclicality which will mention in event study analysis. That means investors expect a rating/outlook change for Turkey so they take their position before announcement date that defines the market anticipation or rating agencies announce their rating according to Turkey economical conjecture so rating changes follow the Turkey government bond spreads or EMBI Global spread that defines the procyclicality.

**Table 4.1.a Vector Autoregression Estimates for Eurobond Spread of Turkey**

Dependent Variable	Eurobond Spread Change	
	Coefficient	P-Value
Regressors		
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 4.1.b Vector Autoregression Estimates for Eurobond Spread of Turkey**

Dependent Variable	Eurobond Spread Change	
	Coefficient	P-Value
Regressors		
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 4.1.c Vector Autoregression Estimates for Eurobond Spread of Turkey**

<b>Dependent Variable</b>	<b>Eurobond Spread Change</b>	
<b>Regressors</b>	<b>Coefficient</b>	<b>P-Value</b>
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 4.1.d Vector Autoregression Estimates for Eurobond Spread of Turkey**

<b>Dependent Variable</b>	<b>Eurobond Spread Change</b>	
<b>Regressors</b>	<b>Coefficient</b>	<b>P-Value</b>
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 4.1.e Vector Autoregression Estimates for Eurobond Spread of Turkey**

<b>Dependent Variable</b>	<b>Eurobond Spread Change</b>	
<b>Regressors</b>	<b>Coefficient</b>	<b>P-Value</b>
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 4.1.f Vector Autoregression Estimates for Eurobond Spread of Turkey**

<b>Dependent Variable</b>	<b>Eurobond Spread Change</b>	
<b>Regressors</b>	<b>Coefficient</b>	<b>P-Value</b>
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 4.2.a Vector Autoregression Estimates for EMBI Global Spread for Turkey**

<b>Dependent Variable</b>	<b>EMBIG Spread Change</b>	
<b>Regressors</b>	<b>Coefficient</b>	<b>P-Value</b>
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 4.2.b Vector Autoregression Estimates for EMBI Global Spread for Turkey**

<b>Dependent Variable</b>	<b>EMBIG Spread Change</b>	
<b>Regressors</b>	<b>Coefficient</b>	<b>P-Value</b>
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 4.2.c Vector Autoregression Estimates for EMBI Global Spread for Turkey**

<b>Dependent Variable</b>	<b>EMBIG Spread Change</b>	
<b>Regressors</b>	<b>Coefficient</b>	<b>P-Value</b>
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 4.2.d Vector Autoregression Estimates for EMBI Global Spread for Turkey**

Dependent Variable	EMBIG Spread Change	
	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 4.2.e Vector Autoregression Estimates for EMBI Global Spread for Turkey**

Dependent Variable	EMBIG Spread Change	
	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 4.2.f Vector Autoregression Estimates for EMBI Global Spread for Turkey**

Dependent Variable	EMBIG Spread Change	
	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

After performing VAR estimates we continue with Granger causality test in order to determine the reciprocal relationship between the variables of credit rating/outlook change and Turkey spread change. For Granger causality test we construct null hypothesis that credit rating change does not cause spread change or spread change does not cause credit rating change. Granger causality test is performed for all cases

for our study and concluded remarks are showed in Table 4.3 and 4.4 for two different types of spread change.

**Table 4.3 Granger Causality for Eurobond Spread Change for Turkey**

Null Hypothesis	$\chi^2$ ( <i>chi square</i> )	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			



**Table 4.4 Granger Causality for EMBI Global Spread Change for Turkey**

Null Hypothesis	$\chi^2$ ( <i>chi square</i> )	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
Moody'sG does not cause EMBIGChange	1.4043	0.99	7
EMBIGChange does not cause Moody'sG	0.7535	1.00	7
Moody'sO does not cause EMBIGChange	1.068	0.79	3
EMBIGChange does not cause Moody'sO	2.7028	0.44	3
*, ** and *** denotes significance at 10 percent, 5 percent and 1 percent critical values			

Granger causality test provides us whether there exists a correlation between the current value of spread change of Turkey with the past values of credit/outlook change in rating of Turkey or vice versa. Granger causality does not mean that change in one variable cause changes is another variable. According to our Granger

causality test results in Table 4.3 and 4.4 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 which is generally used in finance literature.

### **4.3 IRF Analysis**

By performing Granger causality test we can determine the predictive power of SPGrade change to Spread change or vice versa. However with impulse response function of VAR we able to examine the effect of a shock to 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. Aim of using these functions is to explain the sign and the power of relationship between these variables. In this analysis we give a particular exogenous shock on an endogenous variable of credit/outlook rating change and then we can able to measure the movement of other endogenous variable of Turkey spreads. Before calculating and plotting IRFs we firstly perform the stability test for the VAR estimates and we conclude that all the eigenvalues lie inside the unit circle so VAR estimates satisfy the stability condition.

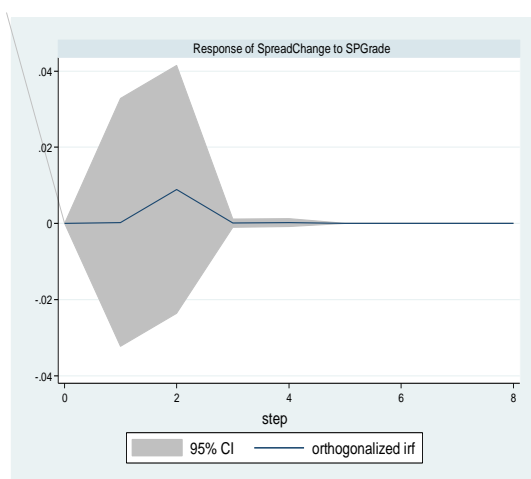
Before moving to the impulse-response graphs it is useful to explain some points about the impulse response functions (IRFs) in order to understand and interpret graphs accurately. Horizontal axis (X-axis) of IRF graph indicate us that length of response and the vertical axis (Y-axis) of graph indicate us the size of the response as a standard error. Continuous line in the graph indicate 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  $\pm 2$  standard error.

As mentioned the impulse response function of VAR is to analysis dynamic effects of the system when system received the impulse (shock). In our model we have two variables of credit/outlook rating change and spread change. We work with response of Turkey's spread change to the impulse of credit rating/outlook change. In our models we used two types of spread for Turkey which are Turkey's five year

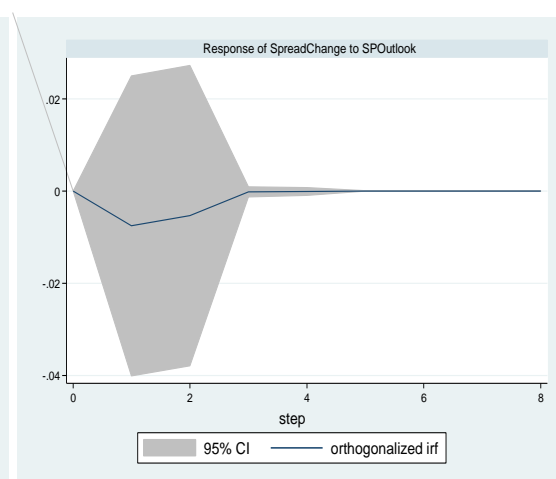
Eurobond spreads and EMBI Global spread of Turkey. We perform VAR model to these variables separately in order to get broader conclusions about the impact of credit rating/outlook changes on the Turkish government marginal cost of borrowing.

In order to display the response function clearer, we plot the chart as figure 4.1 and figure 4.2 according to response of Eurobond spread change and EMBI Global spread change of Turkey.

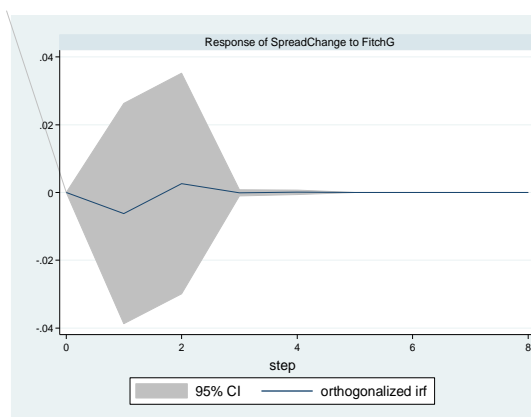
Response of SpreadChange to SPGrade



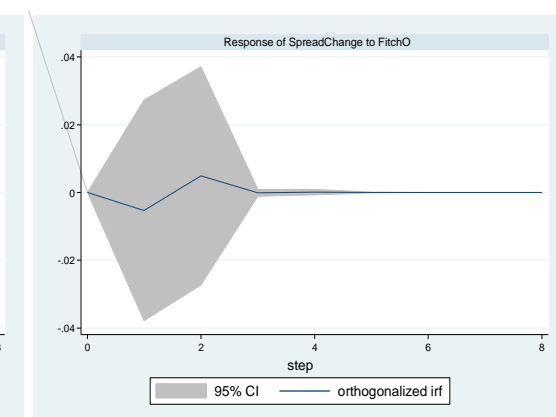
Response of SpreadChange to SPOutlook



Response of SpreadChange to FitchG

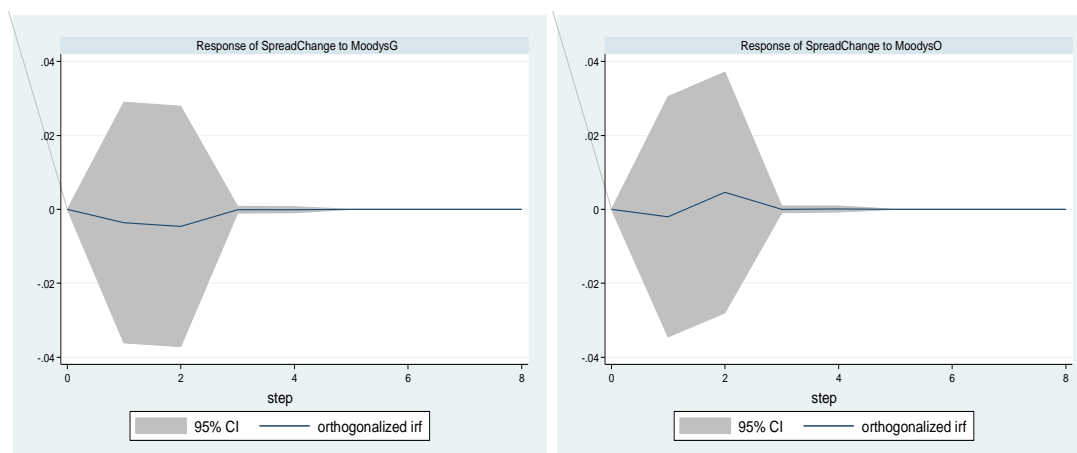


Response of SpreadChange to FitchO



**Figure 4.1 Impulse Responses of Eurobond Spread Change**

Response of SpreadChange to MoodysG      Response of SpreadChange to MoodysO



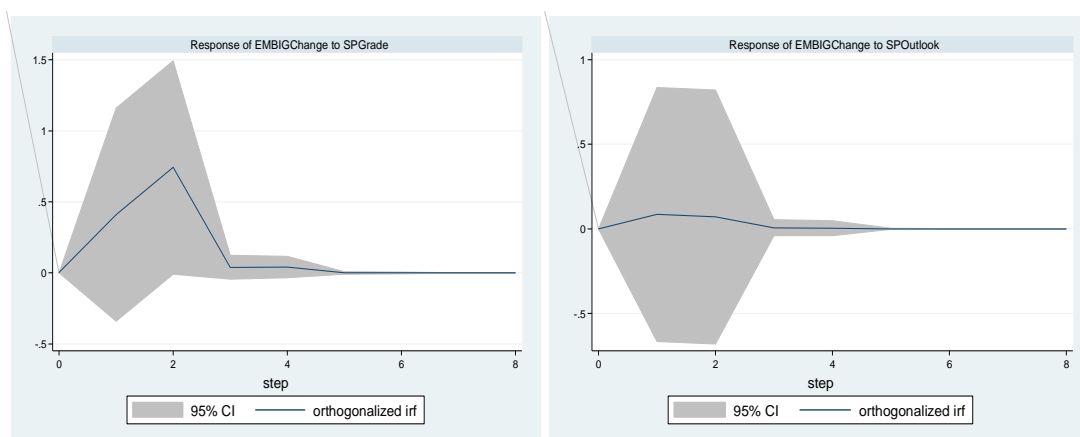
**Figure 4.1 (cont'd)**

Responses of the Spread Change variable to an impulse in variables SPGrade, SPOutlook, FitchG, FitchO, MoodysG, and MoodysO can be seen together in Figure 4.1. From the figures we 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 response of spread change is negative. According to our expectation we anticipate a negative response in spread change of Turkey due to a positive impulse of credit rating/outlook change because a rating/outlook increase will decrease spreads of Turkey and it will cause a negative spread change. In graphs we observe that spread change firstly decreases then increase during the response length when shock is given to the endogenous variable of spread change. When the impulse is SPOutlook or MoodysG, then 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 during a very short time. When the impulse is FitchG, FitchO or MoodysO, then response of spread change is negative during the first day and then its response turns to positive. All these graphs indicates 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 of credit rating agencies 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 Turkey 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.

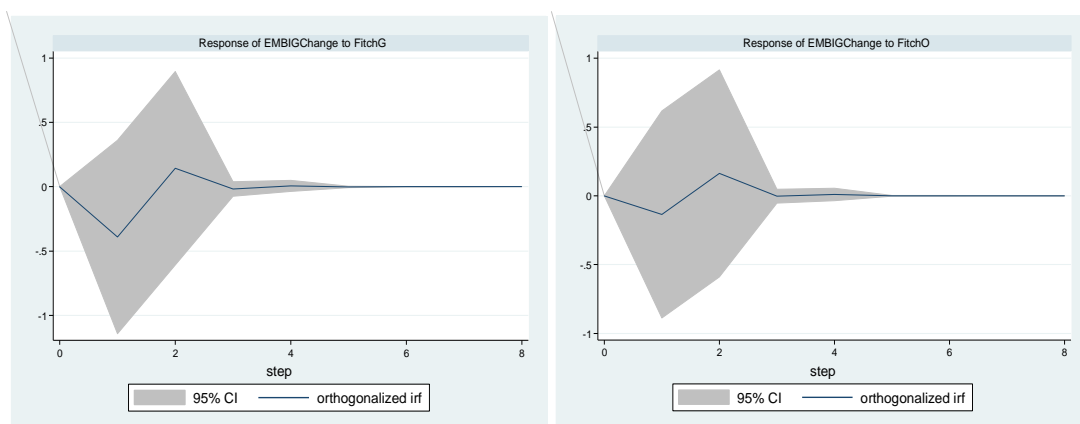
In Figure 4.2 we see the result of impulse response function for the case of EMBI Global spread for Turkey.

Response of EMBIGChange to SPGrade    Response of EMBIGChange to SPOutlook



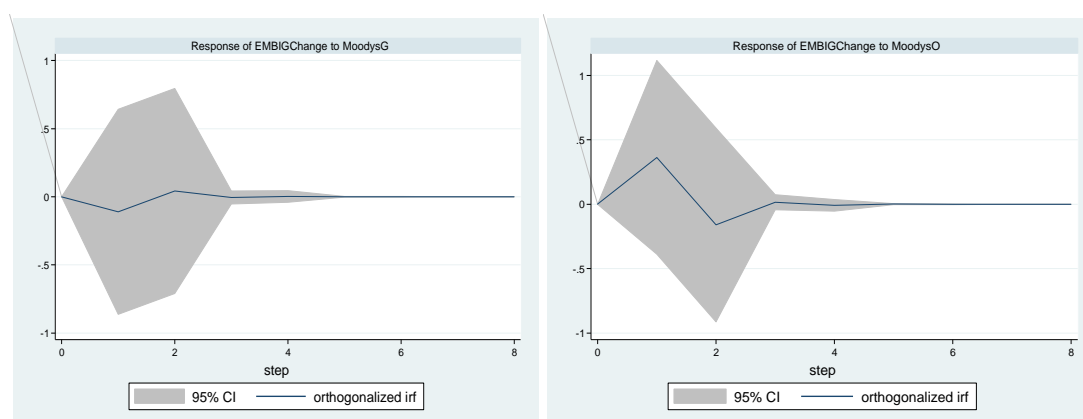
Response of EMBIGChange to FitchG

Response of EMBIGChange to FitchO



**Figure 4.2 Impulse Responses of EMBI Global of Turkey Spread Change**

## Response of SpreadChange to MoodysG      Response of SpreadChange to MoodysO



**Figure 4.2 (cont'd)**

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, response of EMBIG spread change do not last for a long time and response of EMBIG spread change vanishes during first 2-3 days.

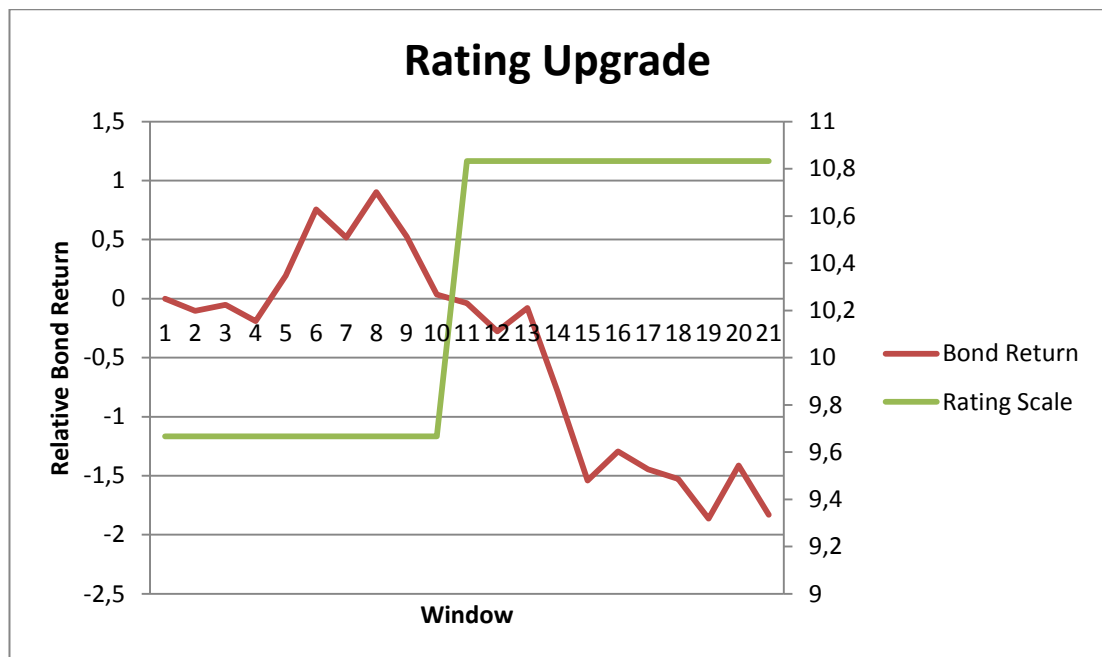
Variable of EMBI Global spread for Turkey includes Turkey's long term government bond instruments and Eurobond spread of Turkey is calculated by using Turkey's middle-term government bond instruments (5 year Turkey' Eurobonds). Performed IRF study by using these two variables indicates us that market participants' attention to credit rating agencies' announcement does not significantly affect their decision for the Turkish government bond after the 2008 global financial crisis.

### 4.4 Event Study Analysis

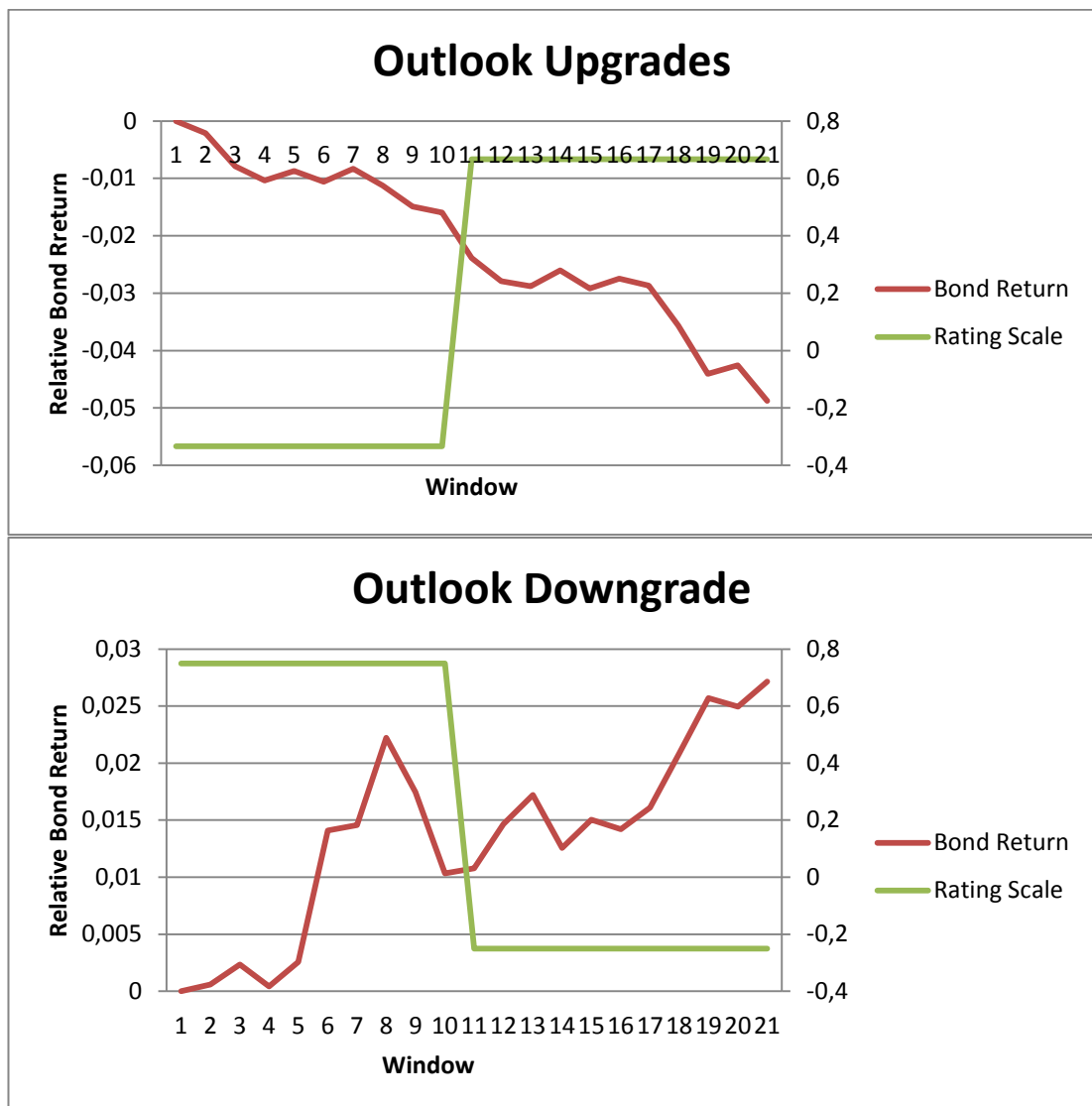
For our thesis we design a 21-day event window to perform event study analysis. 10 days of this event window contains pre-announcement period and other part includes the post-announcement period. By following this strategy we aim to investigate how spreads and bond prices move around the time of rating/outlook 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 drop some events to get clean events and we deal with 18 domestic. 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 deal with excessive returns of Turkish government bond spreads according to rating/outlook change day. In this view we construct a 21-day event window where rating/outlook changes are occurred on day 11 and we able to observe how sovereign yield spreads behave in this window.

Our findings in event study analysis indicate that sovereign yield spreads start to increase or decrease before the rating/outlook change occurs that support our expectation. For example, for rating increases case excessive returns of Turkish government bond have already decreased before the CRAs announce the rating change. 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' rating announcements. Figure 4.3 illustrates the event study analysis for the case study of Turkey.



**Figure 4.3 Event Study Analyses for Turkey**



**Figure 4.3 (cont'd)**

These results could be interpreted as an indication that there exists market anticipation towards to rating/outlook change or CRAs behave procyclically. That is, CRAs make decision according to the price of financial instruments. When the price of financial instruments increases then credit rating agencies decide to downgrade the related country. Otherwise, the price action in the days before rating/outlook changes may reveal an effect of market anticipation. Investors expect the rating/outlook changes so they consider this effect before they take positions.

When we look at the literature we face with different approach explaining 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, Cavallo, Powell, and Rigobon (2008) evaluate the same situation from different perspective that movement of bond yield spreads before rating/outlook change is the evidence of market anticipation of the rating/outlook change for them. In this perspective investors anticipate CRAs' actions so they take their position before announcement day which cause sovereign bond yield spreads move before the actual rating change is announced. It should be 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 movement even before a rating/outlook change occurred.

## CHAPTER 5

### CONCLUSIONS

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 thesis we use the VAR method in order to investigate the inter-relationship between the variables of credit rating/outlook change and Turkish government bond spread changes. For Turkey bond spread we use two types of data; Turkey's five year Eurobond spread change and EMBI Global spread change. Difference of our study arises from the fact that we use newest data set and we use different types of data for Turkey spread variables- Eurobond spread and EMBI Global spread for Turkey. Our sample period includes 2008 global financial crisis so we able to investigate how rating agencies' influence on the financial market is affected by the crisis. After 2008 global financial crises credit rating agencies' business started to be debated so in this study we examine the after crisis period for Turkish government bonds. Having different types of data set gives us the chance of getting broader remarks. We, also, perform event study analysis to investigate the dynamic effect of government bond yield spreads to rating and outlook changes by focusing on the excessive returns of bond. During our analysis we perform vector autoregression (VAR) model including Granger causality and Impulse Response Function (IRF) analysis and lastly we perform event study analysis. VAR model focuses on the dynamic relationship between credit rating changes and government bond spread changes. VAR analysis gives us the chance of examining the inter-relationships between economic variables. For our study we able to investigate the inter-relationship between variables of credit rating/outlook change and spread changes (Eurobond or EMBI Global). By event study analysis we able to analyze market anticipation and procyclicality effect for Turkish government bonds.

At the end of this study we get two main findings that somehow contribute useful remarks for the related literature. Especially, for Turkey we deal with such an issue in the first time and we think this thesis stimulates such studies for Turkey. Our first finding is that results of VAR, Granger causality, and IRF analysis support the view 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 we find that there exists no Granger causality between variable of credit/outlook rating change and spread change for Turkey. Also, with impulse response function of VAR we able to examine the effect of a shock to 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. Aim of using these functions is to explain the sign and the power of relationship between these variables. IRF study indicates us that market participants' attention to credit rating agencies' announcement does not significantly affect their decision for the Turkish government bond after the 2008 global financial crisis.

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. However, when we investigate the rating action literature we see that most of the related literature does not consider the market anticipation as factor that affect the sovereign spread movement. In this study we focus on the market anticipation and procyclicality concepts since VAR model gives us 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. In order to explain this situation we pay more attention the event study analysis which shed light to market anticipation and procyclicality. Therefore, the most crucial strength of this thesis is that it considers the market anticipation and procyclicality factor as a key factor in the rating action so that it provides a more proper analysis in the estimation of market reaction to rating/outlook changes. What the event study analysis indicates us that government bond yield spreads has started to move according to our expectation before rating/outlook change is announced. In previous parts two approaches are explained that explain

such movement of spreads, these approaches are market anticipation and procyclical action of credit rating agencies. Actually, event study analysis gives us some clue about the creditworthiness of rating agencies after the 2008 global financial crisis. After 2008 global financial crises credit rating agencies' business started to be debated by investors and academicians. 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 the agencies. However after the crisis period and uptill now CRAs improve their creditworthiness in market even if just a bit. This is our starting point to write this thesis in order to evaluate whether rating/outlook change still provide information to market participants. However, the results of VAR estimates indicate us that rating changes by agencies do not add new information for investors, that is, rating or outlook changes are mostly anticipated by market. Other aspect of this type of studies is that daily data of bond spreads is formed in the market and it mostly possible that any information transmitted by changing rating/outlook may already be included in a daily change of bond spreads. That means according to this aspect credit rating agencies and market are feeding from the mostly same source-publicly available indicators- so bond spreads and ratings follow the same indicators thereby rating changes is introducing noise in the financial markets. That is, if CRAs announcements are entirely anticipated then market participants take their positions before announcement so we would see any relation between the rating/outlook changes and sovereign spreads.

For further studies performing same study by using corporate bonds will give us broader remarks. In this study we use foreign currency denominated instruments-five year government Eurobonds- so performing same study by using domestic currency denominated instruments will give us more workable results.

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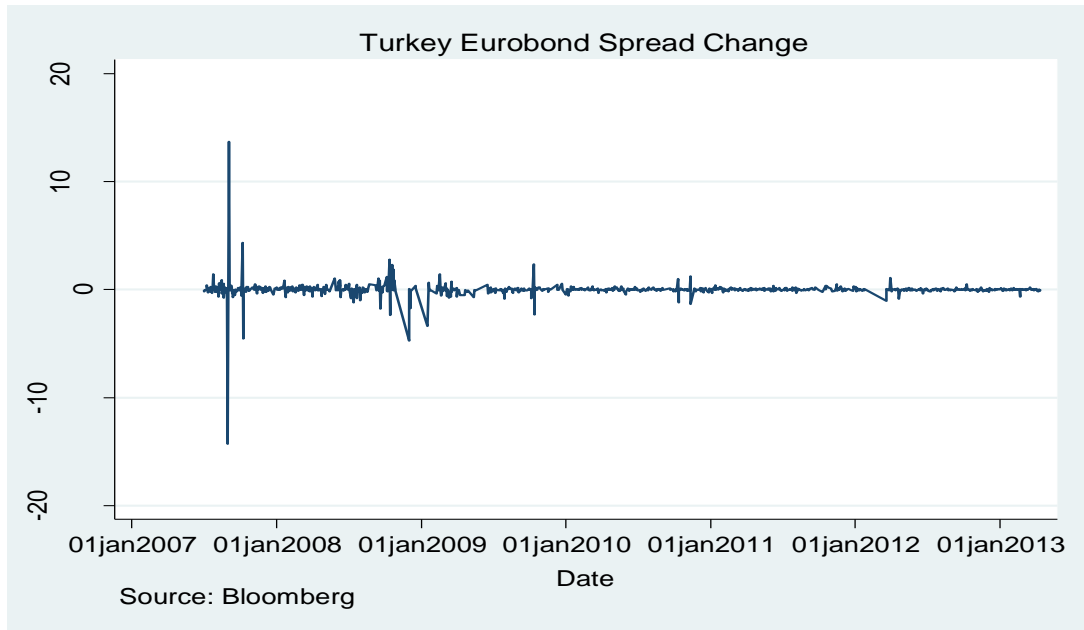
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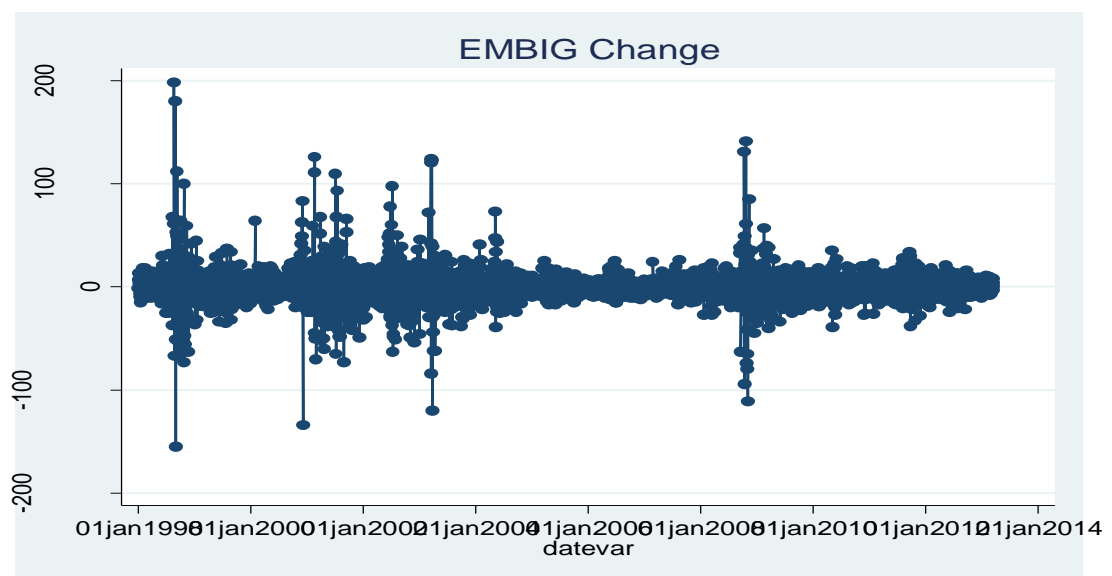
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## APPENDIX A

### SUPPLEMENTARY FIGURES AND TABLES



**Figure A.1 First difference of Spread**



**Figure A.2 First difference of EMBIG**



Table A.1 Lag Length Selection for Spread Change Variable

Spread Change	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	-1,74	-1,74	-1,73	-1,73	-1,72	-1,71
	HQIC	-1,76	-1,75	-1,73	-1,72	-1,71	-1,69	-1,67	-1,66	-1,65	-1,64	-1,62
	SBIC	-1,74	-1,71	-1,68	-1,66	-1,64	-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	-0,82	-0,81	-0,81	-0,81	-0,80
	HQIC	-0,84	-0,83	-0,81	-0,80	-0,79	-0,78	-0,77	-0,74	-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
MoodyysG	AIC	-1,78	-1,77	-1,76	-1,76	-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	-1,69	-1,67	-1,66	-1,65	-1,64	-1,62
	SBIC	-1,74	-1,71	-1,69	-1,66	-1,64	-1,59	-1,57	-1,54	-1,52	-1,50	-1,47
MoodyysO	AIC	-1,37	-1,36	-1,35	-1,35	-1,35	-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	-1,23	-1,22
	SBIC	-1,33	-1,30	-1,28	-1,26	-1,23	-1,21	-1,19	-1,16	-1,14	-1,09	-1,07
FitchG	AIC	-1,37	-1,36	-1,36	-1,35	-1,35	-1,34	-1,34	-1,33	-1,33	-1,32	-1,31
	HQIC	-1,36	-1,34	-1,33	-1,32	-1,30	-1,30	-1,28	-1,27	-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	-1,09	-1,07
FitchO	AIC	-1,39	-1,38	-1,37	-1,37	-1,36	-1,36	-1,36	-1,35	-1,34	-1,34	-1,33
	HQIC	-1,37*	-1,36	-1,35	-1,33	-1,32	-1,31	-1,30	-1,29	-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	-1,09

**Table A.2 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	4,50	4,50	4,50	4,51	4,51	4,51	4,52	4,52
	HQIC	4,50	4,51	4,51	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
SPOutlook	AIC	5,40	5,41	5,41	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	5,54
	SBIC	5,44	5,46	5,49	5,51	5,54	5,56	5,59	5,60	5,63	5,64	5,67
MoodySG	AIC	4,48	4,49	4,50	4,51	4,51	4,52	4,52	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	4,62	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
MoodySO	AIC	4,89	4,90	4,90	4,91	4,91	4,92	4,92	4,93	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	5,03	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
FitchG	AIC	4,89	4,89	4,90	4,91	4,91	4,92	4,92	4,93	4,94	4,93	4,93
	HQIC	4,90	4,91	4,93	4,94	4,96	4,97	4,98	4,99	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
FitchO	AIC	4,89	4,90	4,91	4,91	4,92	4,92	4,93	4,93	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	5,04
	SBIC	4,93	4,95	4,98	5,01	5,03	5,06	5,08	5,10	5,13	5,15	5,17

## APPENDIX B

### TURKISH SUMMARY

#### KREDİ NOTU DEĞİŞİKLİKLERİNİN TÜRKİYE’NİN DEVLET BORÇLANMA MALİYETLERİNE ETKİSİ

##### GİRİŞ ve LİTERATÜR TARAMASI

Standard and Poor’s (S&P) , Fitch ve Moody's üç büyük kredi derecelendirme kuruluşları olup şirket ve devlet tahvilleri için kredi notu üretmektedirler. Bu kuruluşlar tarafından üretilen kredi notları tahvil ihraç eden kurumların kredi güvenilirliğini gösteriyor olup tahvil ihraç edenler için kredi notu almak yasal zorunluluk olmamasına rağmen yatırımcılar yatırım tercihlerinde derecelendirme notlarını dikkate almakta. Ülke derecelendirmesi (sovereign rating), ana amacı itibariyle tahvil veya kredi yoluyla borçlanan ülkelerin ödeme taahhütlerini yerine getirememesi olasılıklarını değerlendirir. Uluslararası tahvil piyasalarında geçerli olan derecelendirme, ülkenin döviz cinsinden kredi notudur. Uluslararası piyasada ülke notu o ülkenin yatırım ortamı riskini gösteriyor olması nedeniyle kredi derecelendirme kuruluşlarının yayınladığı notlar çoğunlukla yatırımcılar tarafından dikkate alınır ve yatırımcılar bu notlardaki gidişata göre pozisyon alırlar. Her bir kredi derecelendirme kuruluşunun kendisine ait derecelendirme metodolojisi olup bu metodoloji çerçevesinde yıllardır şirket ve devlet tahvilleri için derecelendirme notu yayınlamaktadırlar ve ülkenin kredibilitesinde önemli değişiklikler olduğunda bu direkt olarak derecelendirme notuna da yansıtılmaktadır.

Derecelendirme notlarının finansal piyasaları ve yatırımcıların kararlarını etkileyip etkilemediği yıllardır tartışılmaktadır. Özellikle derecelendirme notlarının yatırımcılara devlet tahvilleri hakkında yeni enformasyon sağlayıp sağlamadığı 1990’lı yıllardan itibaren tartışılmaktadır. Bu konuda yapılan en önemli tartışma devlet tahvili getiri spreadlerinin günlük piyasada oluşuyor olması ve kredi derecelendirme kuruluşlarının açıkladığı kredi notlarının mevcut günlük spread değişimlerinin içinde yer alma olasılığı. Derecelendirme kuruluşları genelde kamuya açık bilgileri modellerinde kullanarak ülkeler için bir kredi notu

oluşturmaktadır. Bundan dolayı bazı araştırmacılar devlet tahvili getiri spreadlerindeki değişimin nedeni olarak makro-ekonomik verilerin açıklanmasını göstermektedir. Yani kredi notu değişimi öncesinde açıklanan makro-ekonomik veriler devlet tahvili getiri spreadlerini etkilemekte ve aslında kredi notu açıklamalarının yatırımcılar için yeni bir enformasyon sağlamadığı belirtilmektedir. Derecelendirme sisteminin başlıca eleştiri konusu olan konjonktürü takip etme (procyclicality) özelliği ve derecelendirme kuruluşlarının finansal piyasada etkinliğini azaltan piyasa beklentisi (market anticipation) bu çalışma kapsamında ilerleyen bölümlerde tartışılacaktır.

Uluslararası finans piyasasında yatırımcılar ülkelerin tahvil getiri spreadlerine ve kredi kuruluşlarının özellikle Standard and Poor's (S&P) , Fitch ve Moody's gibi üç büyük derecelendirme kuruluşunun yayınladığı kredi notlarına büyük önem vermekte. Tahvil getiri spreadleri devletlerin dış piyasalardan borçlanma maliyetlerini gösteriyor olup bu çalışma kapsamında üç büyük kredi derecelendirme kuruluşunun yayınladığı kredi notlarının Türkiye'nin kamu dış borçlanma maliyetlerine etkisi üzerine çeşitli incelemelerde bulunulacaktır. Devletlerin ihraç ettiği ve ikincil piyasalarda işlem gören Eurobondların, finansal sistemde dünya çapında risksiz getiri olarak kabul edilen aynı vadeli ABD devlet tahvilleriyle olan ve diğer Gelişmekte Olan Ülkelerin (GOÜ) tahvillerine göre oluşan getiri marjları, gerek devletlerin Eurobond ihracı yoluyla dış borçlanma olanaklarını uygun maliyetler üzerinden sürdürebilmesi, gerekse böylece oluşan risk primlerinin analizi yoluyla ekonominin gidişatının değerlendirilmesi açısından önem taşımaktadır. Bu çalışma kapsamında kredi derecelendirme kuruluşlarının yayınlamış olduğu kredi notlarının Türkiye'nin kamu borçlanma maliyetleri üzerine etkisini çeşitli yönlerden inceleyen çalışmalardan elde edilen bulgulardan bahsedilmiştir.

Cantor ve Packer (1996) gerek derecelendirme notlarını belirleyen faktörlerin, gerekse derecelendirme notlarının tahvil getirileri üzerindeki etkilerinin karşılıklı analizini yapmıştır. Makalede gelişmiş ve gelişmekte olan 49 ülkeye S&P ve Moody's tarafından verilen notları belirleyen faktörlerin analizi yapılmıştır. Cantor ve Packer'e göre ülke derecelendirme notlarını kişi başına düşen Gayri Safi Millî

Hâsıla (GSMH), enflasyon oranı, bütçe dengesi, cari denge, dış borç stoku gibi makro değişkenler etkilemekte. Cantor ve Packer aynı makalede, S&P ve Moody's tarafından derecelendirilmiş 35 ülkenin notları ile ülkelerin Eurobondlarının getiri spreadleri arasındaki ilişkiyi panel veri analizi ile incelemiş olup derecelendirme notlarının tahvil getiri farkını açıklama gücünü %92 olarak bulmuştur. Derecelendirme notlarının ülke faiz marjları üzerindeki etkisini inceleyen Cantor ve Packer'e göre ülke notlarının makro-ekonomik verilerin etkisini taşıdığı ve tahvil getiri spreadleri üzerinde istatistiki olarak önemli derecede ve beklenen yönde değişim oluşturduğunu tespit etmiştir.

Sy, 2001 yılında yayınladığı makalesinde 1994-2001 yılları arasında EMBI+ Endeksine dahil 17 ülkenin uzun vadeli döviz cinsinden derecelendirme notları ile endeksin ilişkisini araştırmıştır. Sy derecelendirme kuruluşlarının yapmış olduğu açıklamaların endeks üzerindeki etkisinin asimetric olduğunu öne sürmüştür, endeks yükselişlerinin kredi not düşüşlerinden ortalama 1 ay sonra etkisinin görüldüğünü vurgulamıştır. Bir başka bulgusunda ise bir harflik kredi notu artışının %14'lük endeks düşüşüne neden olduğunu tespit etmiştir. Ayrıca Sy çalışmasında tahvil getiri spreadlerinin yüksek olduğu ülkelerde genellikle kredi notu düşüşünün ve tahvil getiri spreadlerinin düşük olduğu ülkelerde ise kredi notu artışının olduğunu gözlemlemiş olup bunu derecelendirme kuruluşlarının kredi notu değişimlerinde piyasadan geç reaksiyon verdiğini vurgulamıştır. Sy'ın yapmış olduğu çalışmayı farklı kılan ise bizim yapmış olduğumuz çalışmaya yöntem olarak yakın olmasıdır. Biz de çalışmamızda Sy'ın yapmış olduğu gibi devlet tahvili getiri spreadleri için ikincil piyasalarda oluşan günlük verileri kullandık. Zira ikincil tahvil piyasaları, yatırımcı ve alım-satım yapanların piyasa algılamasını daha iyi yansıtmaktadır.

Beck (2001) yapmış olduğu çalışmada reel milli gelir büyümesi ve enflasyonun tahvil marjları üzerinde en çok etkili iki makro değişken olduğunu, uluslararası piyasalardaki faiz değişikliklerinin de bu etkilere katkıda bulunduğunu öne sürmüştür. Beck makalesinde panel veri analizi yaparak devlet tahvili spreadlerinde değişimin nedeni olarak uzun ve orta vadeli makro-ekonomik değişkenlerin olduğunu ileri sürmekte. Bu değişkenleri ise reel GSYİH artışı, enflasyon oranı ve uluslararası piyasalardaki faiz değişiklikleri olarak ifade etmekte. Beck, sonuç olarak

ülke makro verilerinin devlet tahvili getiri spreadlerinde kredi derecelendirme kuruluşlarının yayınladığı notlardan daha çok belirleyici olduğunu öne sürmekte. Bu kapsamda aslında kredi derecelendirme kuruluşlarının yayınlamış oldukları kredi notlarının yatırımcılar için yeni bir enformasyon sağlamadığı sonucuna ulaşıyor.

BDDK'nın 2009 yılında yayınlanan Finansal Piyasalar Raporu'nda yer alan çalışmada Türkiye'nin kredi derecelendirme notlarıyla borçlanma maliyeti arasındaki ilişki analiz edilmiş olup kredi notundaki artış/azalış sonucu Eurobond spreadlerinin azalmasına/artmasına bağlı olarak borçlanma maliyetinin düşmekte/artmakta olduğu tespit edilmiştir. Türkiye'nin borçlanma maliyetleri kredi notunun yatırım yapılabilir seviyeye yükselmesine bağlı olarak azalmaktadır.

Scholtens (1999) çalışmasında ülke riski ile tahvil getiri değişimi arasında kuvvetli bir ilişki bulmuştur. 1990lı yıllarda gelişmekte olan ülkelerin ve sanayileşmiş 12 ülkenin tahvil getirileri-ülke riski ilişkisini araştırdığı makalesinde bu ülkeler için çeşitli Spearman'ın sıralama korelasyon katsayısı hesaplamıştır. Scholtens sonuçta çalışmasında tahvil getiri değişimi ile ülke riski arasında kuvvetli ilişki bulmuştur. Söz konusu makalelerden önemli olarak nitelendirilenlerin sonuçları dikkate alındığında derecelendirme notlarının, ülkenin borç stoku, milli gelir, faiz dışı fazla ve net döviz rezervi başta olmak üzere makro-ekonomik verilerinin bir özet göstergesi olduğu sonucu ortaya çıkmaktadır. Ancak derecelendirme sisteminin makro-ekonomik veri açıklamaları ile olan ilişkisi çerçevesinde oluşan konjonktürü etkileme/izleme etkisi ve derecelendirme kuruluşlarının tartışılan konumu, makalelerde tahvil getiri marjları ve ülke risk primleri üzerinde farklı görüş ve yorumların oluşmasına yol açmaktadır.

Bazı makalelerde ülke risk primlerinin okunmasında borsa endekslerinden yararlanılmıştır. Fakat borsa endeksleri kredi riskini ifade etmekten çok, yatırımcı davranışlarının ve kararlarının kısa vadeli izdüşümlerini gösterdiği için birçok makalede uluslararası risk primleri karşılaştırmasında ağırlıklı olarak JP Morgan EMBI endeksleri kullanılmaktadır. Bu çalışmayı diğer çalışmalardan farklı kılan ise Türkiye'nin ülke risk priminin göstergesi olarak EMBI Global ve ikincil piyasalarda oluşan 5 yıllık Eurobond devlet tahvili getiri spreadlerinin kullanılıyor

olmasıdır. Bu çalışma için Türkiye'nin Temmuz 2007-Nisan 2013 arasında ikincil piyasalarda oluşan 5 yıllık devlet tahvili spreadlerini ve Türkiye'nin EMBI Global spread verilerini vektör otoregresyon (VAR) ve olay çalışmasında (event study analysis) kullanarak Türkiye'nin uzun vadeli yabancı para kredi notlarının ülke borçlanma maliyetleri üzerinde etkisi incelenmiştir. Bu tür bir çalışmaya girmemizin en önemli nedeni olarak özellikle 2008 küresel finans krizi kredi derecelendirme kuruluşları için önemli bir kilometre taşı olup kriz sürecinde yüksek kredi derecesine sahip ülkeler derin ekonomik dalgalanmalarla karşı karşıya kalmıştır. Bu durumun ortaya çıkmasıyla kredi derecelendirme kuruluşlarının özellikle önde gelen kredi derecelendirme kuruluşları olan S&P, Moody's ve Fitch'in finansal piyasalardaki güvenilirliği ve pozisyonları tartışılmaya başlanmıştır. Kredi derecelendirme kuruluşlarının başarısı ve güvenilirliğini onların saygınlıklarına bağlıdır yani kredi derecelendirme kuruluşları tarafsız, doğru ve hızlı bir şekilde piyasaya enformasyon sağladıkça saygınlıkları artar. 2008 küresel finans krizinde kredi kuruluşlarının vermiş olduğu taraflı, yanlış ve zamansız enformasyonların sonucunda piyasa katılımcıları kredi derecelendirme kuruluşlarının görevlerini tartışmaya başladı. Derecelendirme kuruluşları ile ilgili en önemli problem çıkar çatışmasıdır (conflict of interest). Bankalarla ve diğer mali kuruluşlarla ilgili notlar veren derecelendirme kuruluşları bu firmalar tarafından finanse edilmektedir. Hal böyle olunca derecelendirme kuruluşlarının objektif değerlendirme yapma kabiliyetleri azalmaktadır.

Reurink 2012 yılında yapmış olduğu çalışmasında kredi derecelendirme kuruluşlarının küresel finansal sistem içerisindeki politik yanını incelemiştir. Araştırmacı bu çalışmasında Amerikan kredi derecelendirme kuruluşları olan S&P, Moody's ve Fitch gibi şirketlerin neden uluslararası finans sisteminin merkezinde yer aldığını sorgulamış ve bu şirketlerin uluslararası finans sistemindeki pozisyonlarını analiz edip çeşitli sonuçlara ulaşmıştır. Reurink çalışmasında ulaştığı en önemli nokta kredi derecelendirme sektöründe Amerikan şirketleri oligopol bir yapı oluşturduğu dolayısıyla sektörde bu şirketlerin piyasaya taraflı (biased) enformasyon sağladığı vurgulanmıştır. Özellikle 2008 kriz öncesinde krize neden olan ipoteğe dayalı menkul kıymetlerin (mortgage-backed securities) ve teminatlandırılmış borç yükümlülüklerinin (collateralized debt obligations) bu kredi

derecelendirme kuruluşları tarafından yüksek bir notla derecelendirilmesi kriz sonrasında kredi derecelendirme kuruluşlarının finansal piyasalardakini rolünü tartışmaya açmıştır. Aynı zamanda bu durumun oluşması üç önemli kredi derecelendirme kuruluşu olan S&P, Moody's ve Fitch gibi şirketlerin uluslararası finansal piyasadaki saygınlıklarının kaybolmasına neden olmuştur. Bu tartışmalar ışığında 2008 küresel finans krizi sonrasında kredi derecelendirme kuruluşlarının finans piyasasına sağladığı enformasyonun piyasalar tarafından ne ölçüde değerlendirildiğini analiz eden çalışmaların yapılması gerekliliği doğmakta. Yukarıda bahsettiğimiz makalelerin birçoğu 2008 küresel finans krizi öncesi dönemde yapılmış olup kredi derecelendirme kuruluşlarının açıkladığı not değişimleri ülkelerin EMBI+ spreadleri üzerinde etkili olduğu gözlenmiştir. Bizim bu çalışmamızı farklı kılan en önemli özelliği 2008 kriz sonrasında oluşan piyasa koşulları göz önünde bulundurarak gerekli analizlerin yapılmış olmasıdır. Ayrıca bu kapsamda Türkiye için kredi derecelendirme kuruluşlarının yaptığı not değişimlerinin yabancı para cinsinden Türkiye'nin kamu borçlanma maliyetleri üzerine etkisini incelemiş olduk. Bu çalışma Türkiye için bir ilk olup özellikle 2008 küresel finans krizi sonrasında kredi notlarındaki değişimin devlet borçlanma maliyetlerini nasıl etkilediği ayrı bir bölümde detaylıca incelenmiştir. Burada borçlanma maliyetinden kastedilen yabancı para cinsinden çıkarılan devlet tahvili getiri spreadlerindeki değişimdir. Bu çalışma kapsamında kullanılan veri seti, metotlar ve elde edilen sonuçlar bir sonraki kısımda aktarılmıştır.

## VERİ SETİ

Bu çalışmamızda Türkiye'nin Temmuz 2007-Mart 2013 arasında günlük şekilde oluşan 5 yıllık devlet tahvili getiri spreadleri ve Türkiye'nin EMBI Global spread verileriyle birlikte bu aralıkta üç büyük kredi derecelendirme kuruluşu tarafından yayınlanmış kredi notları veri seti olarak kullanılmıştır. Ayrıca yine bu dönem içerisinde küresel riski veya yatırımcıların risk iştahını gösteren volatility index (VIX) verisi dışsal değişken olarak analizlerimizde kullanılmıştır. Bu veriler için Bloomberg veri tabanından ve kredi derecelendirme kuruluşlarının web sayfalarından yararlanılmıştır. Bu dönem içerisinde Türkiye'nin 18 defa kredi notu



ya da görünüm değişikliği olmuştur. Bu değişimlerin 13 tanesi kredi notu ya da görünüm artışı olup geriye kalan 5 tanesi ise kredi notu ya da görünüm düşüşünü oluşturmaktadır. Türkiye'nin kamu tahvili getirisi spread değerleri hesaplanırken aşağıdaki formül kullanılmakta olup spread hesaplamasında Türkiye'nin yabancı para cinsinden çıkardığı beş yıllık devlet tahvili getirisinden aynı vadeli risksiz kabul edilen US devlet tahvili getirisinden çıkarılmıştır.

$$BS = Y - T$$

T: US beş yıllık tahvil getirisi

Y: Ülke beş yıllık tahvil getirisi

BS: Devlet tahvili getiri spreadı

Devlet tahvili getiri spreadı devletlerin diğer ülkelere göre risk primini gösteriyor olup bu değer artıka ülkelerin kredi riskinin arttığını ve devletlerin dolayısıyla borçlanma maliyetlerinin de arttığını söyleyebiliriz. Yukarıda da bahsettiğimiz gibi birçok makalede ülkeler için kredi riskinin gösteren devlet tahvili spread hesaplamaları yerine JP Morgan tarafından yayınlanan EMBI endeksi kullanılmıştır. Dolayısıyla bu çalışmada farklı veri setiyle 2008 küresel finans krizi sonrasında kredi notu değişimlerinin Türkiye'nin kamu borçlanma maliyeti üzerindeki etkisi incelenmiş olup bu konuda yapılmış olan mevcut çalışmalara yeni bir bakış açısı kazandırılmıştır.

## **METODOLOJİ**

Bu çalışmamızda kredi derecelendirme kuruluşlarının yapmış olduğu not değişimlerinin kamu borçlanma maliyetleri üzerindeki etkisini incelemek için vektör otoregresyon (VAR) tekniği ve olay çalışması metodundan yararlanılmıştır. Ayrıca VAR tekniğinden elde edilen etki-tepki fonksiyonları (IRF) sayesinde rassal hata terimlerinden birindeki bir standart sapmalı şokun, içsel değişkenlerin şimdiki ve gelecekteki değerlerine olan etkisi incelenmiştir. Bu analiz sayesinde Türkiye'nin kredi notu değişimleriyle spread değişimleri arasındaki etkileşimin

gücü tespit edilmeye çalışılmıştır. Kredi notları değişimleriyle spread değişimleri arasındaki karşılıklı ilişkiyi tespit etmek için ise yine VAR tekniğine dayalı Granger nedensellik testlerinden yararlanılmıştır. Olay çalışması analiziyle Türkiye'nin kamu tahvillerinin göreceli getiri hareketleri incelenerek piyasa beklentisi (market anticipation) ve konjonktürü takip etme (procyclicality) konseptleri üzerine incelemelerde bulunulmuştur. Yukarıda da belirttiğimiz gibi bu çalışma Türkiye için bir ilk olup elde edilen bulgularla bu konuda akademik dünyada yapılan çalışmalara yenilikler katılmakta. Bundan sonraki kısımlarda kullanılan teknikler hakkında ve bu tekniklerden elde edilen sonuçlar hakkında bilgi verilecektir.

### **Vektör Otoregressif Model (VAR)**

VAR modeli zaman serisi modelleri içinde son zamanlar en fazla kullanılanı olup bu konuda Sims (1980), Dijk ve Franses (2000), Johansen (2000), Kilian ve Chang (2000) çalışmaları son dönemde yapılan VAR modellemesi ve analizi konusunda örnek verilebilir. VAR modellemesi bize değişkenler arasındaki ilişkiyi analiz etme şansını sunuyor. VAR modellemesiyle birlikte Türkiye'nin kredi notu veya görünüm değişiklikleriyle Türkiye'nin kamu tahvilleri spread değişimleri arasındaki ilişkiyi analiz ediyoruz. Bir VAR'daki tüm değişkenler, modeldeki değişkenin kendi gecikmeleri ve diğer tüm değişkenlerin gecikmelerine bağlı olarak, değişkenin gelişimini açıklayan her bir değişken için bir denklem ile simetrik olarak ele alınıyor. Bu sayede Türkiye'nin kredi notu veya görünüm değişiklikleriyle Türkiye'nin kamu tahvilleri spread değişimleri arasındaki analizler yapılırken gecikmelerde göz önünde bulundurulduğundan daha kapsamlı sonuçlar elde etmiş oluyoruz. VAR analizi esnasında kullanmış olduğumuz değişkenler Tablo 1'de yer almakta olup SPGrade, SPOutlook, FitchG, FitchO, MoodysG ve MoodysO değişkenleri kukla (dummy) değişkendir. Bu değişkenler not değişimlerine göre 1,0 veya -1 değeri alırlar.

$$Grade/Outlook_t \begin{cases} 1 & \text{Türkiye'nin } t \text{ zamanında notu veya görünümü artarsa} \\ 0 & \text{Türkiye'nin } t \text{ zamanında notu/ görünümü değişmezse} \\ -1 & \text{Türkiye'nin } t \text{ zamanında notu veya görünümü düşerse} \end{cases}$$

**Tablo B.1 Değişken İsimleri**

<b>EMBIG</b>	Emerging Markets Bond Index Global
<b>Spread</b>	Türkiye'nin Eurobond Spreadı
<b>SPGrade</b>	Standard & Poor's (S&P) Kredi Notu Değişimi
<b>SPOutlook</b>	Standard & Poor's (S&P) Görünüm Değişimi
<b>FitchG</b>	Fitch Kredi Notu Değişimi
<b>FitchO</b>	Fitch Görünüm Değişimi
<b>MoodysG</b>	Moodys Kredi Notu Değişimi
<b>MoodysO</b>	Moodys Görünüm Değişimi
<b>VIX</b>	Volatilite Endeksi

VAR analizine göre, analiz sonuçlarının güvenilir olması için, analizde kullanılan serilerin durağanlığının sağlanması gereklidir. Tablo 1'deki değişkenler EMBIG ve Spread değişkenleri durağan olmadığından bu değişkenlerin durağan olan ilk farkları analiz sürecinde kullanılmıştır. Durağanlık testlerinden sonra gecikme uzunluğunun tespiti için Akaike, Hannan-Quinn ve Schwarz kriterlerinden yararlanılarak en uygun gecikme uzunlukları bulunmaya çalışılmıştır. Elde edilen gecikme uzunluklarıyla kredi not veya görünüm değişimi ile tahvil spread değişimleri arasında ikili VAR modelleri tahmin edilmiştir. Kredi notu değişimi ve görünüm değişimi piyasaya farklı bilgiler sunduğundan VAR modelleri ayrı ayrı tahmin edilmiştir. VAR analizi sonucunda elde edilen bulgulara göre kredi notu veya görünüm değişimleri ve bunları gecikmeli değerleri Türkiye'nin devlet tahvil spreadlerinde üzerinde istatistiki olarak bir önemi yoktur. Böyle bir sonucun yıkması özellikle 2008 küresel kriz sonrasında oluşan güvensizlik ortamında

piyasadaki yatırımcıların kredi notu değişimlerini öncesinde tahmin ederek pozisyonlarını alması veya kredi derecelendirme kuruluşlarının konjektüre bakarak spread değerlerindeki değişimlere göre not açıklaması neden olarak gösterilebilir.

### Granger Nedenselliği

Granger nedensellik sınaması, bir zaman serisinin başka bir zaman serisini tahmininde kullanışlı olup olmadığının bir istatistiksel hipotez sınamasıdır. Bu çalışmamızda kredi notu veya görünüm değişimleriyle Türkiye'nin devlet tahvil spread değişimlerinin karşılıklı tahmin gücünü analiz etmek için bu yöntemden yararlanılmıştır. Bu yöntem için oluşturulan modeller ve hipotezler şu şekilde oluşturulmuştur:

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

$$\text{SPGrade}_t = \alpha_2 + \beta_{21} \text{SPGrade}_{t-1} + \beta_{22} \text{SPGrade}_{t-2} + \delta_{21} \Delta \text{Spread}_{t-1} + \delta_{22} \Delta \text{Spread}_{t-2} + u_{2t} \quad (2)$$

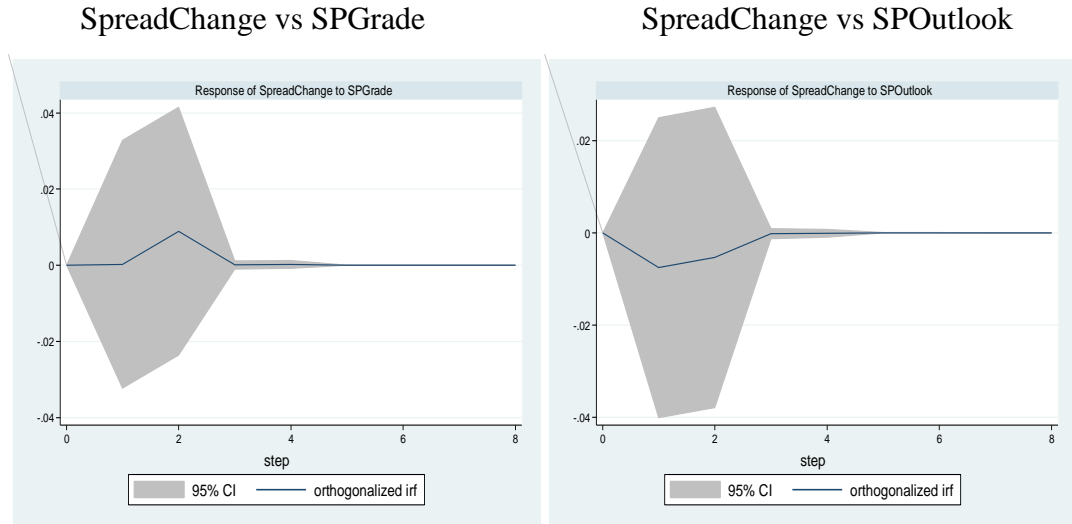
$H_0 = \beta_{11} = \beta_{21} = 0$  (SPGrade SpreadChange değişkeninin Granger nedeni değildir)

$H_0 = \delta_{21} = \delta_{22} = 0$  (SpreadChange SPGrade değişkeninin Granger nedeni değildir)

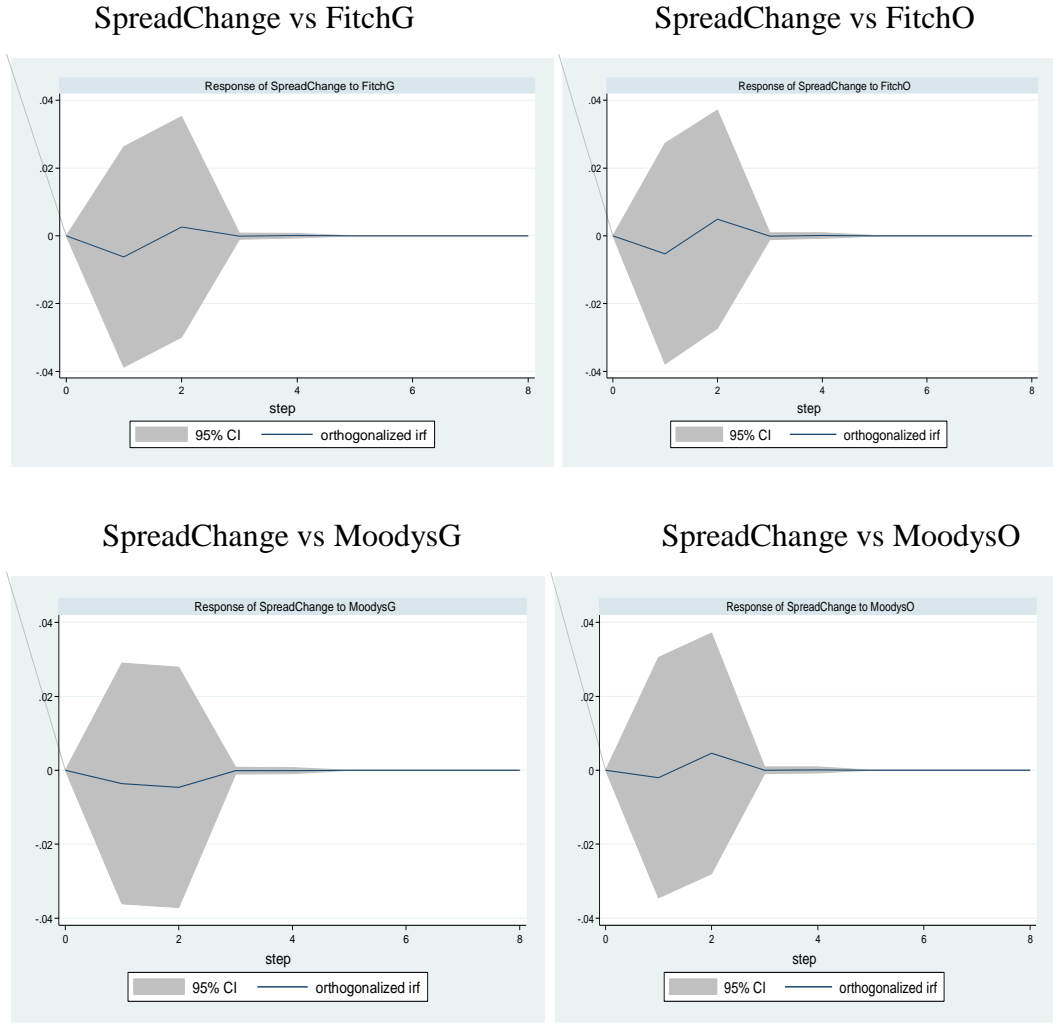
Granger nedensellik sınaması tüm VAR modelleri için uygun olan gecikme uzunluklarında uygulanmış olup, kredi notu veya görünüm değişimleri ile Türkiye'nin devlet tahvili spread değişimleri arasında Granger nedenselliği tespit edilememiştir.

## Etki-Tepki Fonksiyonları

Etki-tepki fonksiyonları, rassal hata terimlerinden birindeki bir standart sapmalı sokun, içsel değişkenlerin şimdiki ve gelecekteki değerlerine olan etkisini yansıtır. Etki-tepki fonksiyonları sayesinde sisteme içsel şoklar vererek bu şokların diğer değişkenler üzerindeki etkisini inceleme fırsatı buluyoruz. Bizim çalışmamızda kredi notu veya görünüm değişimlerini sisteme şoklayarak Türkiye'nin kamu tahvil spread değişimleri üzerindeki hareketliliği tespit edebiliyoruz. Özet olarak bu metot bize kredi notu veya görünüm değişimlerinin tahvil spread değişimleri için ne kadar önem arz ettiğini görmemizi sağlıyor. Türkiye'nin 5 yıllık kamu tahvil spread değişimlerini inceleyecek olursak Şekil 1'de görüldüğü gibi kredi notu veya görünüm değişimlerinin tahvil spread değişimlerine etkisinin çok olmadığı ve verilen şokun etkisinin kısa sürede söndüğünü görüyoruz. Bu metotla elde edilen bulgular piyasa beklentisi (market anticipation) ve konjonktürü takip etme (procyclicality) konseptlerini destekleyici nitelikte olup bu konudaki son metot olarak olay çalışması (event study) uygulanmıştır.



Şekil B.1 Spread Değişimlerinin Kredi Notu / Görünüm Değişimlerine Tepkisi

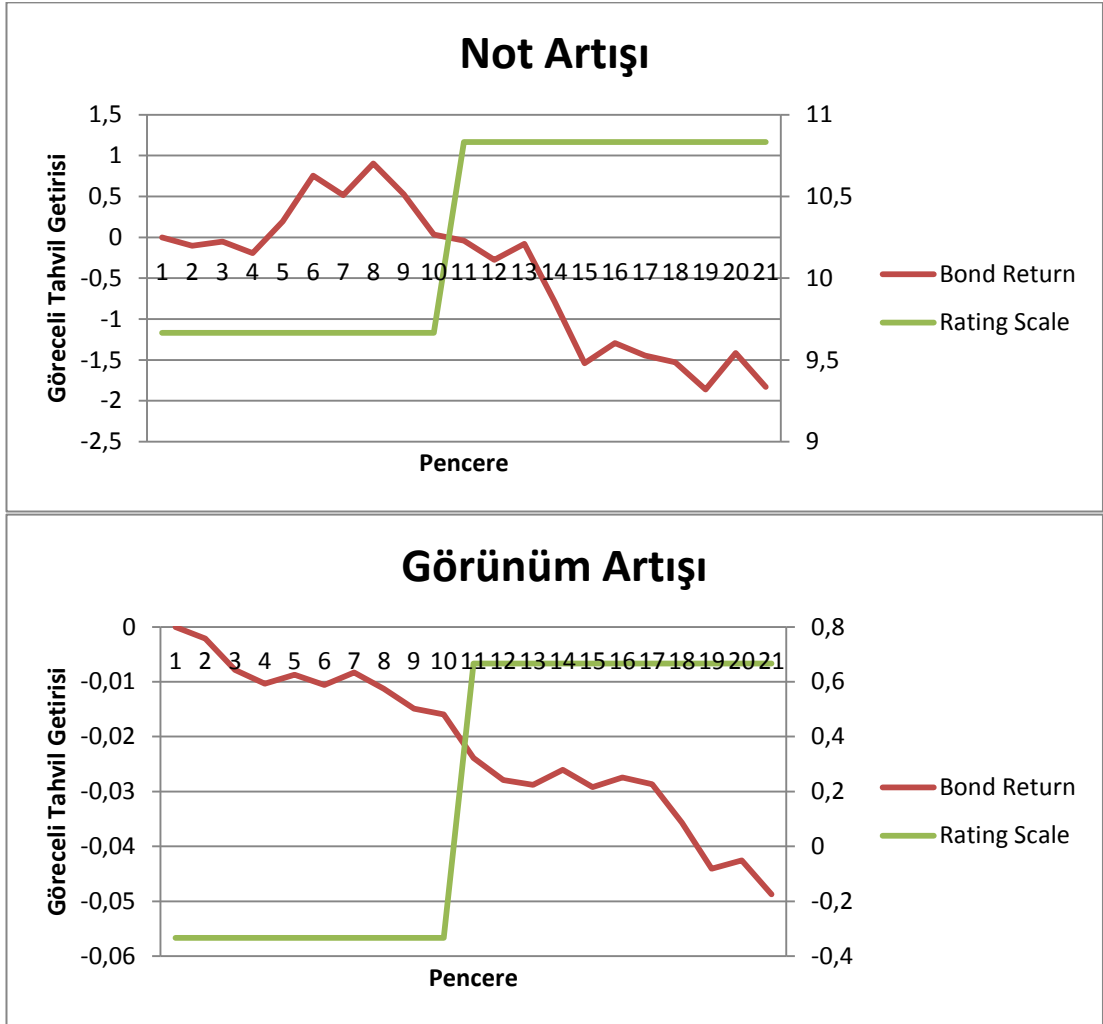


**Şekil B.1 (devam)**

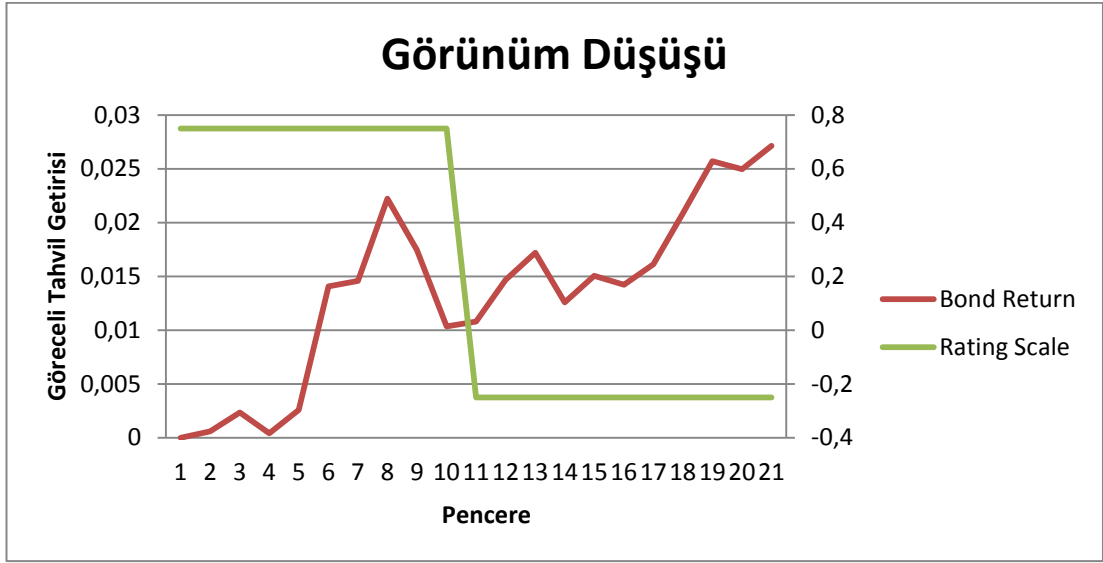
### **Olay Çalışması (Event Study)**

Olay çalışması sonucunda elde edilen bulgulara göre kredi derecelendirme kuruluşlarının not değişimleri öncesinde piyasadaki aktörlerin not değişimi öncesinde aksiyon olarak not değişiminin olduğu gün piyasada çok ciddi değişimin olmadığı görülmekte. Bunun nedeni olarak bir önceki bölümlerde bahsettiğimiz gibi derecelendirme sisteminin başlıca eleştirisi olan konjonktürü takip etme (procyclicality) özelliği olması ya da derecelendirme kuruluşlarının finansal piyasada etkinliğini azaltan piyasa beklentisi (market anticipation) olabilir. Aynı durum kredi derecelendirme kuruluşlarının görünüm değişimlerinde de rastlanılıyor olup literatürde özellikle 2008 global finans krizi sonrasında kredi derecelendirme

kuruluşlarının finans piyasasındaki yatırımcıların gözündeki güvenilirliğini kaybettiği üzerine tartışmalar başlamıştı. Yapmış olduğumuz bu çalışmayla 2008 global krizi sonrasında kredi derecelendirme kuruluşlarının Türkiye'nin kamu borçlanma maliyetleri üzerinde etkin olmadığı sonucuna ulaşılmıştır. Bu konuda yapmış olduğumuz çalışmaların sonucuna göre Şekil 2'deki grafiklerden görüleceği gibi not değişimin olduğu gün olan 11. günün öncesinde tahvilin getirisinin 11. güne göre azaldığı ya da arttığını görebiliyoruz. Grafiğin sağ eksenine göre ayarlanmış yeşil çizgi not ve görünüm değişimlerini gösteriyor olup, grafiğin sol eksenine göre ayarlanmış kırmızı çizgi göreceli tahvil getirilerini temsil etmekte.



Şekil B.2 Olay Çalışması Analizi



Şekil B.2 (devam)



## SONUÇ

Bu çalışmaya başlarken merak etmiş olduğumuz 2008 küresel finans krizi sonrasında kredi derecelendirme kuruluşlarının yatırımcıların gözündeki güvenilirliğinin azalıp azalmadığına ilişkin sorunun cevabı olarak kredi derecelendirme kuruluşlarının yapmış olduğu not değişimlerinin Türkiye'nin kamu borçlanma maliyetlerine etkisinin olup olmadığı incelenmiştir. Bu kapsamda ele almış olduğumuz veri setinde VAR modeli, Granger nedenselliği sınaması, Etki-tepki analizi ve Olay çalışmaları uygulanmıştır. Bu çalışmalar sonucunda elde edilen en önemli bulgular şu şekilde olmuştur:

VAR modeli, Granger nedenselliği sınaması, Etki-tepki analizi ve olay çalışması sonucunda elde edilen bulgulara göre kredi notu değişimleri Türkiye'nin kamu tahvili spreadlerinde istatistiki olarak değişime neden olmadığı; not değişimi öncesinde piyasa oyuncularının gerekli hamleleri yaparak not değişiminin etkisini azalttığı sonucuna varılmıştır. Bu durumun karşılığı olarak literatürde iki durumdan söz ediliyor. Bunlardan ilki market beklentisinden dolayı (market anticipaiton) piyasa katılımcıları not değişimini beklediği için not değişiminin olduğu gün öncesinde gerekli pozisyonları aldığı. Diğer açıklama ise kredi derecelendirme kuruluşlarının konjonktürü (procyclicality) takip ettiği yönündeki görüş; yani kredi derecelendirme kuruluşları piyasa koşullarına bakarak oluşan piyasa koşullarına geç tepki vererek piyasanın gerisinde kalması. Bu açıklamalar çerçevesinde özellikle 2008 küresel krizi sonrasında piyasada oluşan belirsizlikten ötürü piyasa katılımcılarının Türkiye'nin kamu tahvilleri için kredi notu değişimlerini çok dikkate almadığı sonucuna varabiliriz.

## APPENDIX C

### TEZ FOTOKOPİSİ İZİN FORMU

#### ENSTİTÜ

Fen Bilimleri Enstitüsü	<input type="checkbox"/>
Sosyal Bilimler Enstitüsü	<input checked="" type="checkbox"/>
Uygulamalı Matematik Enstitüsü	<input type="checkbox"/>
Enformatik Enstitüsü	<input type="checkbox"/>
Deniz Bilimleri Enstitüsü	<input type="checkbox"/>

#### YAZARIN

Soyadı : GÜRER  
Adı : MURAT  
Bölümü : İKTİSAT

**TEZİN ADI** (İngilizce) : THE IMPACT OF CREDIT RATING CHANGES ON THE GOVERNMENT COST OF BORROWING IN TURKEY

**TEZİN TÜRÜ** : Yüksek Lisans  Doktora

1. Tezimin tamamından kaynak gösterilmek şartıyla fotokopi alınabilir.
2. Tezimin içindekiler sayfası, özet, indeks sayfalarından ve/veya bir bölümünden kaynak gösterilmek şartıyla fotokopi alınabilir.
3. Tezimden bir (1) yıl süreyle fotokopi alınamaz.

**TEZİN KÜTÜPHANEYE TESLİM TARİHİ:**