

Co-integration Analysis between the Turkish Stock Market and its Balkan Hinterland Equivalents: Proof from the 2010-2015 Period

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Abstract: *The purpose of this study is to investigate whether there is a co-integration amongst (3) three Balkan countries; Bosnia Herzegovina, Macedonia and Turkey in relation to the German stock market (important for the Europe scale). For this purpose, the relevant stock market's weekly closing values (in the time series) were analyzed between the periods of September 2010 and August 2015. The long-term co-integrated relationship is analyzed by the Johansen Juselius Co-integration Test. The empirical results show that these three Balkan countries have a meaningful, but moderate relationship in reference to the stock markets. In addition, the German stock market has a more powerful effect on the Turkish stock exchange in comparison to the Bosnia Herzegovinian and Macedonian stock exchanges. This paper suggests that international investors can diversify their portfolios in these (3) three Balkan stock markets.*

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Introduction

The Balkans, located in the southeast portion of the European continent, is a region that has its own unique structure. Though being an important part of Europe, and having an important international place both historically and culturally, unfortunately, we cannot say the same from an economic point of view. Most especially, in financial terms, when compared to other parts of Europe, it has a quite small share. However, important developments have been observed in terms of the financial markets in the Balkan nations since 1980's.

Along with the liberalization process that occurred in these countries, the first and most important stocks and bonds exchange was established in Turkey in 1986 under the name of IMKB. Since 2013, it has continued its activities as the Borsa Istanbul. Another important stock exchange is the Athens Stock Exchange in Greece. Along with liberalization policies, it has experienced significant progress since the 1990's. Also one of the major stock exchanges in the Balkans is Romania's Bucharest Stock Exchange that experienced an important leap with the destruction of communism. These three countries both in terms of exchange trading volume and stocks traded are the most important stock markets in the Balkans.

The historical, cultural and humanistic ties with the Balkans are as important as its geographical, political and economic ones. Geographically, the Balkans forms the extension of Turkey to Europe. This has not only influenced the shaping the Turkish nation historically, but has also influenced its position as being a target for European Union membership. The common sharing of this aspect with all the regional countries is of vital importance for Turkey, thus raising its potential progression.

There are historically strong ties between Turkey and Balkan countries. Minor, cognate, coreligionist and relative members of society live in the Balkan countries and people originating from the Balkan countries are living in Turkey. There also are many important Turkish economic investments in the Balkan countries with respect to either quantitative aspects or volume. The previously mentioned Balkan countries have the characteristics of what can be called the "Hinterland of Turkey". In this study, we will investigate whether there is financial co-integration between Turkey with the Balkan hinterland countries and Germany or not. Bosnia Herzegovina and Macedonia have been chosen for this reason. In fact, the aim of this study was to investigate Albania and Kosovo, but due to the lack of transparency in their financial

markets, it was not possible to include them. In addition to these countries, Germany's financial market has also been added to this study due to its economic size and political standing as well as its historical interests in the Balkan countries.

Literature Review

From a literary perspective, there have been many studies documented regarding the securities exchange in the Balkan countries. Some of them are mentioned below:

In the study by Birau, the co-integration relationship was investigated between the Romanian Stock Exchange and the Greek Stock Exchange. The daily stock exchange index closing data for the period of January 2003 and December 2012 was investigated by the Granger Causation Method. Causation could not be determined for the first periods of January 2003 and December 2007, even though it was determined that there was a single direction effect between the Greek stock exchange and the Romanian stock exchange during the second periods of December 2007 and December 2012. (Birau, 2013).

In the studies of Birau and Trivedi, co-integration relationships were investigated between the Bucharest Stock Exchange and the Athens, Paris and Frankfurt Stock Exchanges. The daily stock exchange index closing data for the periods of January 2003 and December 2012 were investigated by the Granger Causation Method. Relationship and co-integration could not be found for the first periods of January 2003 and December 2007 between the Bucharest Stock Exchange and the Athens, Paris and Frankfurt Exchanges, even though it was determined that there was a single direction effect and co-integration between the Athens Stock Exchange and the Bucharest Stock Exchange for the second periods of January 2007 and December 2012. Co-integration between the Bucharest Stock Exchange and the Athens, Paris and Frankfurt Stock Exchanges were observed. (Birau and Trivedi, 2013).

In the study of co-integration between Croatia, Slovenia, Hungary, the Czech Republic, Poland, Germany and the middle and eastern European countries of Vizek and Dadic, it was determined that there is no co-integration between Croatia and the middle and eastern European country markets when determined by the Johansen Method for daily index data investigation during the periods of 1997 and 2005. (Vizek and Dadic, 2006).

In the study made by Papavassilou, co-integration between Montenegro, the European Union, and the USA plus 11 country markets were investigated by

Granger Causation Tests on data during the periods of March 2003 and September 2008. The existence of long-term balance was proven between the markets of Montenegro, the European countries and the USA. (Papavassilou, 2014).

In Tudor's study, the relationship between the stock markets of Central and Eastern European countries, (consisting of Russia, Poland, the Czech Republic, Hungary, Romania and Bulgaria) and the US markets were investigated during two periods including the periods before and after the global crisis. In this study, daily data from January 2006-March 2009 was analyzed by Granger Causality. After the analyses, it was concluded that there was co-integration between the US market and the markets of the six Eastern European countries during the crisis, and that this relationship was stronger in comparison to the periods before and after the crisis. It was also concluded that co-integration ran in a sole direction from the US to these six countries. (Tudor, 2011).

Syriopoulos and Roumpis had revealed the relationship between the financial markets of the Balkan countries, but their correlation with developed countries was even higher. (Syriopoulos and Roumpis, 2009).

In the study by Syriopoulos, the early European Monetary Union was examined. It was proven that mutual interaction increased between the stock exchanges of the Balkan countries and the eastern European countries especially after the establishment of the Monetary Union. The high levels of affiliation between the stock exchanges were affected by developed countries, the foremost of which was the USA stock exchange. (Syriopoulos, 2007).

Stoica and Diaconăşu's study included the investigation of the interaction between the Balkan country stock exchanges (such as Bosnia Herzegovina, Bulgaria, Croatia, Macedonia, Romania, Serbia and Slovenia) with Austria's stock exchange. It was observed that there is a long-term and mutually positive interactive relationship between the stock exchanges of the above-mentioned countries; however, they are more sensitive to Austria's Stock exchange. (Stoica and Diaconăşu, 2002).

In the study by Progonaru and Apostol, it was observed that in the relationship between the Romanian Stock Exchange and the other middle and eastern European stock exchanges, that the correlation of the Romanian Stock Exchange to the middle and eastern European stock exchanges is lower than the higher correlation with the stock exchanges of developed countries. (Progonaru and Apostol, 2000).

In the study by Drakos and Kutan, the Turkish and Greek Stock Exchanges are mutually dependent on one other in short and long-terms and their sensitivity to the stock markets of developed countries was observed as high (Drakos and Kutan, 2001).

Samitas and Kenourgios's study, in which the exchanges between the Balkan countries themselves and the integration with the stock markets in the United States, Britain and Germany for the period including the years 2000/2006 were examined concluding that the exchanges of the Balkan countries among themselves and those of three developed countries were long-term based and strong (Samitas and Kenourgios, 2011).

Syllignakis and Kouretas used Johansen's Co-integration Tests where mostly Balkan countries were involved along with the central and eastern European countries. The relationship between the financial markets and the international markets, were found to especially increase with the European Union's enlargement process (Syllignakis and Kouretas, 2010).

In the study by Horvath and Petrovski, the common transactions of country markets between the developed countries and central European countries including the Czech Republic, Hungary, Poland and also the western Balkan countries such as Serbia and Macedonia were examined. By using the multi-variate GARCH models as analyzing the data exchanges, it was observed that the integration degree of the stock markets of the central European countries was much higher than the Balkan countries. On the other hand, the integration degree and correlation of the Serbian and Macedonian stock exchanges with the developed countries were at almost a zero level, while, the Croatian Exchange integration and correlation level with the developed countries markets was much higher than the Macedonian and Serbian stock markets. (Horvath and Petrovski, February 2012).

Onay's study of the European Union candidate countries regarding the long-term financial integration of the U.S. stock market were examined using the Johansen Co-integration Tests. It was determined that Bulgaria and Romania had the highest integration between the European Union and the U.S. stock markets when compared with Turkey and Croatia's integration into the European Union and the U.S. stock markets (Onay, 2006).

Guidi and Uğur examined the integration of the stock exchanges of the southeastern European countries with the developed ones evaluating the static and dynamic analysis of co-integration between the Romanian, Bulgarian, Slovenian, and Croatian markets with the German, British and U.S. stock market for the period of 2000–2013. It was identified that the new European Union member states tended to co-integrate with the stock markets of Germany and the U.K. whereas the same trend was not identified with the U.S. stock market (Guidi and Uğur, 2014).

In the study by Gradojević and Dobardžić, the regional stock market causalities and stock markets relationships of Serbian, Croatian, Slovena, Hungarian, and Germany were also examined and daily closing data was used for the related relevant stock exchange between October 4, 2005 and August 18, 2009. When the data was analyzed, it was identified that the Serbian exchange had a partial impact on the Hungarian and Croatian exchanges whereas the Serbian and Slovenian markets had mutual two-way causation (Gradojević and Dobardžić, 2013).

In the study by Dobardžić and others, the financial markets and joint economic movements of emerging and developed countries were examined. The Serbian Exchange together with the German, Hungarian, Croatian and Slovenian markets were also discussed for the periods of 2005 – 2009. Granger Causality Tests were used in this study and it was concluded that there was a significant relationship between the Slovenian and Croatian exchanges similar to the Serbian and German stock markets, with the Serbian and German Stock Exchanges proving to have the highest correlation (Dobardžić, Dobardžić and Brničanin, 2012).

Patev and Kanaryan's study examined the behavior of stock exchanges and their characteristics. The daily values of Greek, Turkish and Romanian stock markets were also observed for the period between September 22, 1997 and May 31, 2002. As the data was analyzed in this VAR model study, it was understood that there was neither a significant relationship nor a proper integration between the stock markets of these three Balkan nations. A further result indicated that the Turkish stock market had the highest market risk, while the Greek stock market's volatility risk was very high and the Romanian stock exchange indicated the least open-tendency stock market regarding external influences. It can be assumed that the Turkish and Greek have the least stock market integration in contrast to the Romanian stock exchange that is entirely non-integrated, meaning that they are completely closed off from external influences. This is an interesting situation. (Patev and Kanaryan, 2002).

In the studies by Samitas and others, the integration of the Balkan countries' rising stock markets and the behavioral properties were analyzed along with the relationship amongst themselves and with advanced markets. In this study, daily closing data of the Romanian, Bulgarian, Serbian, Macedonian, Turkish, Croatian and Albanian, Greek, U.S., German and U.K. markets were analyzed. Johansen Co-integration Tests were used. The result of the analysis indicated that there was a meaningful and positive direction towards a strong relationship between the Greek-Romanian, Bulgarian and Serbian-Macedonian exchanges, whereas there was a strong and positive relationship observed between the German stock exchange and the Croatian-Turkish stock exchange with Albania (Samitas, Kenourgios and Paltalidis, 2008).

In the study by Karagöz and Ergun, the integration of the stock markets between the Balkan countries are discussed for both the Bulgarian, Greek, Turkish, Croatian and Romanian markets and also for the markets of the developed countries such as the U.S., Britain and Japan. Daily closing values were observed between the dates of January 2, 2006 and March 31, 2009 and once again, Johansen Co-integration Tests were used. When the data was analyzed, it was concluded that there is a two-way relationship between the stock markets of the Balkan countries. The Turkish stock exchange had the lowest interaction and the British stock exchange being the most developed, had the highest effect on these stock exchanges markets (Karagöz and Ergun, 2010).

Data, Methodology and Scope of Research

In this study, the aim was to determine whether there exists financial co-integration between Turkey and the Balkan hinterland countries and Germany or not. Bosnia Herzegovina and Macedonia were specifically chosen for this reason. In fact, Albania and Kosovo were intended to be investigated, however, for reasons of the lack of transparency in their financial markets, unfortunately, it was not possible to include them. In addition to these countries, Germany's financial market has been added due to its economic size, its political standing and its important historic interests with the Balkan countries.

In this context, the indexes used are: for Bosnia Herzegovina the SASE 10 stock exchange 10 index, for Macedonia the MIB 10 index, for Turkey the BİST 100 index and for Germany the DAX index of the period between September 2010 and August 2015. Weekly closing data was investigated. The idea of selecting the 2010-

2015 period came about because this period reflected the actual current status of last five years. The data was obtained from Bloomberg and was analyzed with Eviews 7.1 packaged software. In the analysis, serial graphics, a correlation analysis, an ADF unit root test and Johansen Co-integration Tests were used.

Mentioned time series values were taken. The first issue to be considered for the time series analysis was the subject of the static variables. Because of economic and financial variables, time series often consist of trends or seasonality, and this could lead to the violation of the principles for being stable of series, (Yurdakul, 2003). Stability can be defined as the independence of the undertaken time series average and the variances from the time.

In the absence of a stable of time series, estimated econometric models can provide misleading results. For this reason, in the time-series econometric analysis, a unit root test (test of stillness) was applied mostly to the time series.

Therefore, in this study, by using the Augmented Dickey-Fuller (ADF) Test (Eviews, with the help of the program), we determined whether the time series included unit root (stillness) or not.

Table 1: *Descriptive Statistics for Indexes*

	Mini mum	Maxim um	Mean		Std. Deviati on	Variance	Skewness		Kurtosis	
	Statist ic	Statisti c	Statistic	Std. Error	Statistic	Statistic	Statis tic	Std . Error	Statis tic	Std . Error
Bosnia	636.4 0	1118. 12	793.25 91	7.217 60	116.60 392	13596.4 74	1.30 5	.15 1	.641	.30 0
Macedonia	1556. 96	2771. 38	1931.2 657	18.70 629	302.20 932	91330.4 73	1.16 2	.15 1	.333	.30 0
Turkey	5018 2.53	9192 4.84	71011. 7848	617.4 1741	9974.6 8354	994943 11.784	- .032	.15 1	- 1.00 6	.30 0
Germany	5189. 93	1287 4.73	8206.0 667	106.3 3193	1717.8 4483	295099 0.873	.505	.15 1	- .631	.30 0

Source: Authors' own work

Table 2: *Correlation between Germany, Bosnia and Herzegovina, Macedonia and Turkey Stock Market Indexes*

		Bosnia	Macedonia	Turkey	Germany
Bosnia	r	1	0,911	-0,448	-0,534
	p		0,000	0,000	0,000
Macedonia	r	0,911	1	-0,531	-0,576
	p	0,000		0,000	0,000
Turkey	r	-0,448	-0,531	1	0,749
	p	0,000	0,000		0,000
Germany	r	-0,534	-0,576	0,749	1
	p	0,000	0,000	0,000	

Source: Authors' own work

As seen in the correlation table, there is a positive and strong correlation between Bosnia Herzegovinian and the Macedonian stock markets ($r = 0,911$). There is a negative correlation between the Bosnia Herzegovinian and the Macedonian markets with the German and Turkish markets. While the degree of correlation between the German and Bosnia Herzegovinian market closing prices was medium and negative ($r=-0,5345$), the correlation between the German and Macedonian market closing price has a medium level degree ($r=-0,576$) As for the correlation between the German and Turkish market closing prices, the correlation is positive and has a high degree ($0,749$) All three coefficients of correlation are statistically significant. ($p < 0,01$)

Figure 1: *Graphics of DAX Index*



Figure 2: *Graphics of the MIB 10 Index*

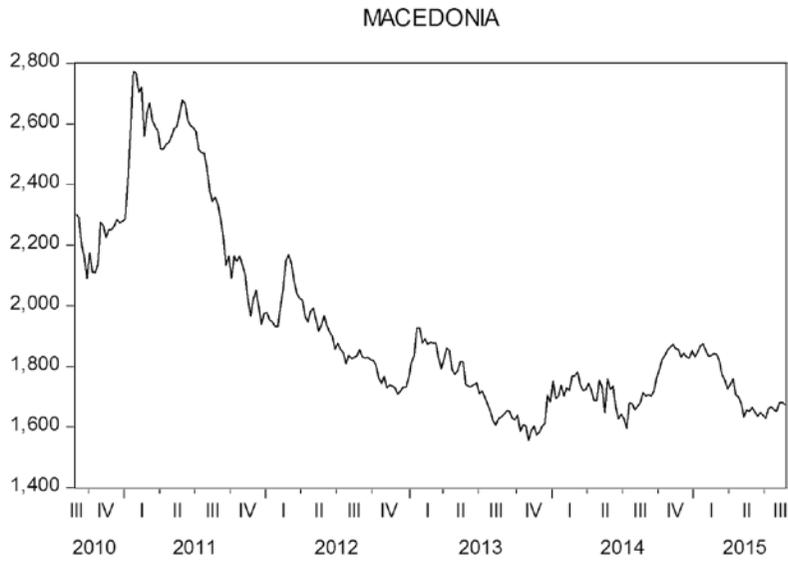


Figure 3: *Graphics of the BIST-100 Index*



Figure 4: *Graphics of the Sarajevo 30 Index*



When the graphics above were analyzed, it can be said that the German and Turkish stock exchange values had similar courses. Macedonian and Bosnian markets can be said to have similar courses as well. When the graphics were generally evaluated, suspicion that the series may not have been stationary was aroused. Stationarity of the series were then analyzed with the Dickey-Fuller Method and the test results are given below.

In time series analyses, the time series used in model must first be tested. A time series is stationary if it does not change over time and has mutual variance between the two terms depending only on the distance between the two periods, not on the period in which this mutual variance is calculated.

Augmented Dickey-Fuller (ADF) Unit Root Test

Dickey-Fuller is a test used to determine whether unit root exists (whether the series is stationary or not) or not in an observed series. There are three equation types Dickey-Fuller has propounded;

$$\text{Dickey-Fuller equation without constant or trend: } \Delta Y_t = \gamma Y_{(t-1)} + u_t \quad (1)$$

$$\text{Dickey-Fuller equation without constant or trend: } \Delta Y_t = a + \gamma Y(t-1) + u_t \quad (2)$$

$$\text{Dickey-Fuller equation without constant or trend: } \Delta Y_t = a + bt + \gamma Y(t-1) + u_t \quad (3)$$

There are two hypotheses used to test the existence of unit root. These are;
 $H_1: \gamma < 0$ ($p < 1$) (there is no unit root in the series.) (The series is stationary.)
 $H_0: \gamma = 0$ ($p = 1$) (there is a unit root in the series.) (The series is not stationary.)

Empirical Results and Discussion

Table 3: *ADF Unit Root Test Results*

	C			C+T		
	ADF-t Statistic	%5 Mac Kinnon	Possibility	ADF-t Statistic	%5 Mac Kinnon	Possibility
<i>Bosnia Herz.</i>	-1.07 (1)	-2.87	0.72	-1.82 (1)	-3.42	0.69
<i>Germany</i>	-0.96 (1)	-2.87	0.76	-2.30 (1)	-3.42	0.43
<i>Macedonia</i>	-1.37 (1)	-2.87	0.59	-1.93 (1)	-3.42	0.63
<i>Turkey</i>	-1.95 (0)	-2.87	0.30	-2.49 (0)	-3.42	0.32

1. Difference						
	C			C+T		
	ADF-t Statistic	%5 Mac Kinnon	Possibility	ADF-t Statistic	%5 Mac Kinnon	Possibility
<i>Bosnia Herz.</i>	-13.90 (0)	-2.87	0.00	-13.87 (0)	-3.42	0.00
<i>Germany</i>	-19.13 (0)	-2.87	0.00	-19.10 (0)	-3.42	0.00
<i>Macedonia</i>	-14.06 (0)	-2.87	0.00	-14.03 (0)	-3.42	0.00
<i>Turkey</i>	-15.88 (0)	-2.87	0.00	-15.85 (0)	-3.42	0.00

* Values inside the parentheses state lagged values determined in accordance with Schwarz criterion

It can be seen that all variables are not stationary in table values because ADF-t statistic values are smaller than MacKinnon critical values with a 5 % significance level in terms of absolute value. According to a new unit root test conducted by first differenced variables, it has been detected that all series are stationary in the first difference. The fact that all series are stationary in the first difference indicates the possibility of a co-integration relationship between the series.

Graphics of Stationary Series

Figure 5: *Stationary Series of DAX Index*

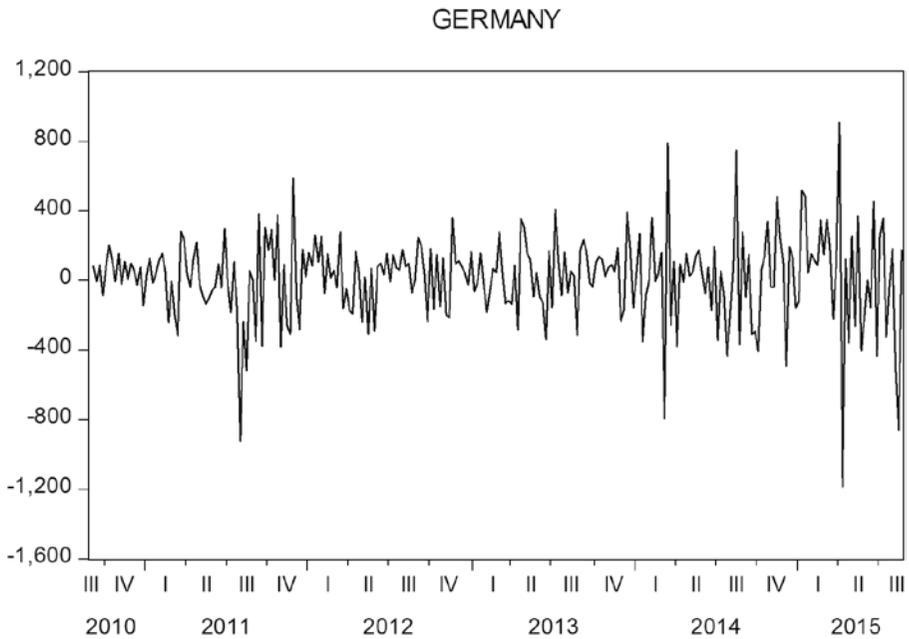


Figure 6: *Stationary Series of Sarajevo 30 Index*

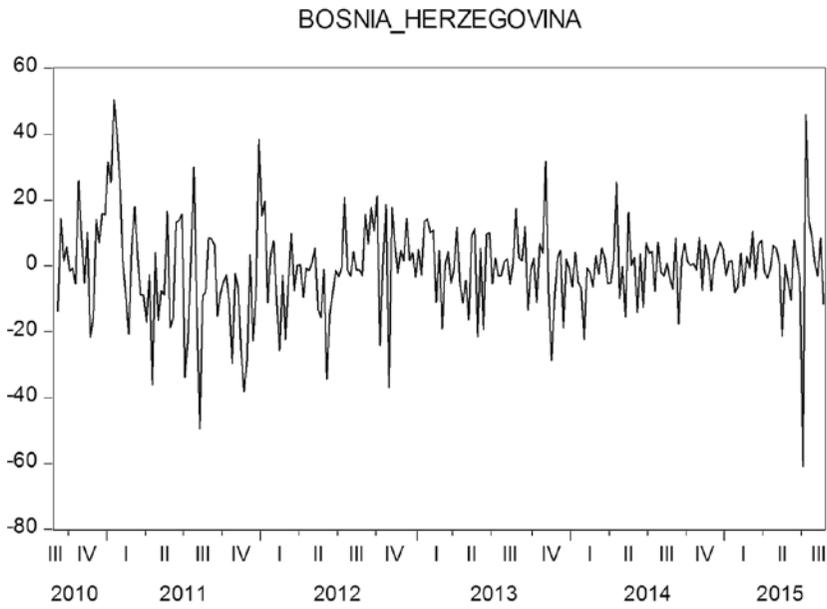


Figure 7: *Stationary Series of MIB 10 Index*

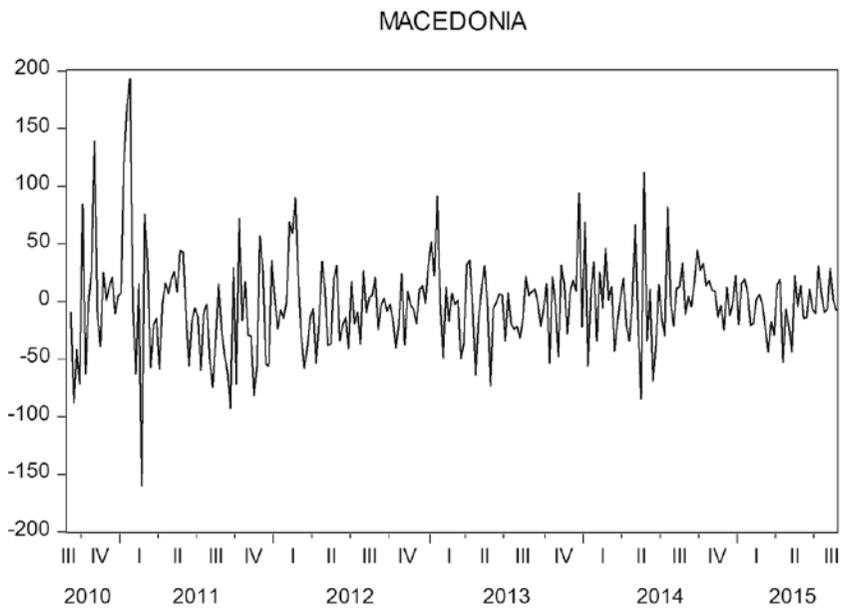
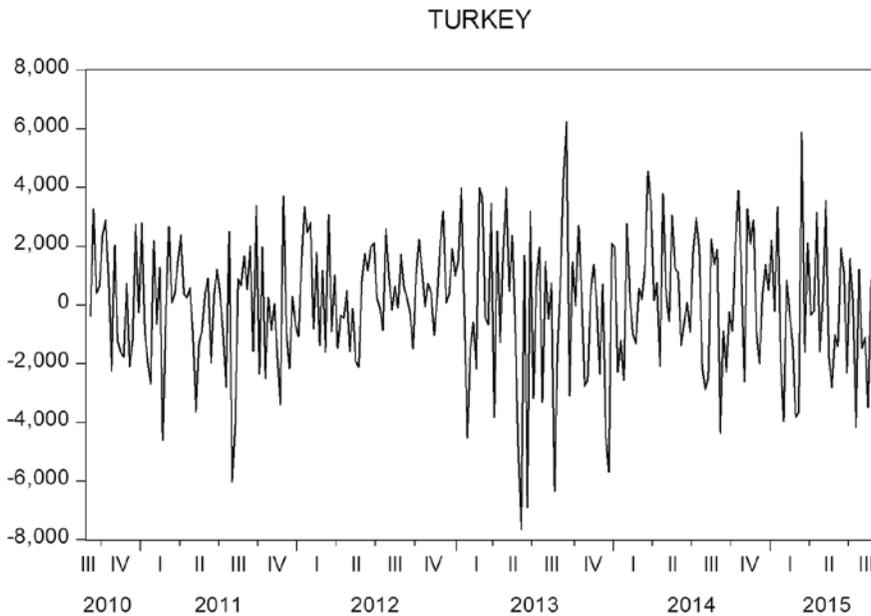


Figure 8: *Stationary Series of BIST-100 Index*



The relationship of co-integration was initiated by Engle and Granger (1987) then developed by Johansen (1988) and Johansen and Juselius (1990). Engle–Granger and Johansen’s co-integration methods were applied for investigation of the long-term relations between time series. Engle and Granger propose that serials should be integrated on the same level in order to obtain co-integration between the serials. If a serial is stable without taking the first gap, it is called stable within a serial level. In other words the integration level of serial is zero. If it is taken as d gap, that serial is integrated on d level. In this context, if the X and Y two time series are stable on the same level, it means there is co-integrative relation. In this environment, the stability of serials has been investigated by ADF Root Tests as the first phase of Johansen Co-integration Method of this study.

After the necessary pre-tests for co-integration, VAR analysis was conducted to determine the optimum lagged value, and its results are given below. Optimum lagged values have been determined within the framework of the Schwarz and Akaike information criteria.

Table 4: *Optimum Lagged Values*

	AIC	SC
<i>TURKEY-BOSNIA AND HERZEGOVINA</i>	0	0
<i>TURKEY- MACEDONIA</i>	1	1
<i>TURKEY-GERMANY</i>	0	0

As seen in the table, optimum lagged values in accordance with both information criteria.

Table 5: *Johansen-Juselius Co-integration Test Results*

	H_0 Hypothesis	Trace Statistic	Maximum Eigenvalue
<i>TURKEY-BOSNIA AND HERZEGOVINA</i>	$r=0$ $r \leq 1$	184.26 (0,00)	100.18 (0,00)
<i>TURKEY- MACEDONIA</i>	$r=0$ $r \leq 1$	190.08 (0,00)	103.30 (0,00)
<i>TURKEY-GERMANY</i>	$r=0$ $r \leq 1$	213.89 (0,00)	117.86 (0,00)

Dual co-integration relationships between Turkey and Bosnia, between Macedonia and Germany can be seen in the table.

The H_0 hypothesis that there is no co-integration relationship amongst Turkey and Bosnia Herzegovina, Macedonia and Germany is rejected. ($p < 0,01$)

In this regard, it is concluded that there is a co-integration relationship amongst Turkey and Bosnia Herzegovina, Macedonia and Germany closing prices.

Conclusion

In this study, the relationships of Balkan countries such as Turkey, Bosnia and Herzegovina and Macedonia were investigated in terms of stock exchanges and their interaction with each other. Being one of the most important in terms of the European Union, Germany's stock exchange DAX index effects on these three

countries was investigated. For this purpose, time series of the Sarajevo 10 index, the MIB 10 index and the BIST-100 index data were used and thought to representative of the stock exchanges of these countries.

The review period of the data was the weekly closing values between September January 2010 and August 2015. The Johansen Method was used for co-integration analyzes.

Upon analysis of the data, there is a statistically significant and strong ($p < 0.01$) relationship of % 91,1 between the Macedonian and the Bosnia Herzegovinian stock exchange, if one increases, the other one also increases. There is a statistically significant ($p < 0.01$) relationship of % 44,8 between the Turkish stock exchange and the Bosnia Herzegovinian exchanges. If one increases, the other one decreases. There is a statistically significant ($p < 0.01$) relationship of % 53,4 between the German stock exchange and the Bosnia Herzegovinian exchange. If one increases, the other one decreases. There is a statistically significant ($p < 0.01$) relationship of % 53,1 between the Turkish stock exchange and the Macedonian exchange. If one increases, the other one decreases. There is a statistically significant ($p < 0.01$) relationship of % 57,6 between the German stock exchange and the Macedonian exchange. If one increases, the other one decreases. There is a statistically significant ($p < 0.01$) relationship of % 74,9 between the Turkish stock exchange and the German exchange. If one increases, the other one also increases. In addition, there is a co-integrative relationship between the Turkish and Bosnia Herzegovinian, Macedonian and German closing prices.

As seen, there is a significant relationship between the Balkan countries and Turkish stock exchange. The Turkish stock exchange has the highest co-interaction with the German stock exchange. This was actually expected. This is because in terms of transaction volumes, traded stocks, sophistication and size of the financial markets, it is clear that the Turkish market has a more mature level in comparison with the other sister country markets. In addition, German and Turkish investors can hedge their risks by investing in Macedonia and Bosnia & Herzegovina because of the negative correlation between their own stock markets and these Balkan stock markets. Additionally, international investors can diversify their portfolio in these stock markets.

The loosening of investigation on capital flows, stock buying and selling methods, the extraordinary speed of telecommunication, varieties on financial instruments and

the increase in the global investments of multinational companies, are determining the country's financial markets relations.

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