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COMPARING THE EFFECT OF GLOBAL CRISIS 2008 ON THE ECONOMIC PERFORMANCE OF TURKEY WITH EU MEMBER STATES: FACTOR ANALYSIS AND TOPSIS APPLICATION

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Abstract

The purpose of this study is to rank Turkey and EU member states according to their economic performances and generally analyse the structure of this ranking pre-crisis, crisis period, and post crisis periods in 2008. The data received in the time period between 2006 and 2012 are used within the scope of this study, 6 economic indicators are based, and the economic performance of Turkey is compared with the performance of European Union member states by using Factor Analysis and TOPSIS method. In the introduction, the information about economic crises is given and the reasons behind the Global Crisis in 2008 are examined by explaining the crisis itself in the following sections and the effects of the crisis on Turkey are summarised. In the second section of the study, the works reached as a result of reviewing the literature are found, and the importance, purpose and scope of the study are explained and the information about the data set used is provided in the third section. The information related to the Factor Analysis used in the study and the TOPSIS method is provided in the fourth section. The fifth section under the heading of "Empirical Findings" is divided into two separate sub headings. In the first sub heading, the findings of Factor Analysis from multivariate statistical analysis techniques and in the other sub heading, the findings of TOPSIS are included. The relevant findings are interpreted. In the conclusion section, the findings acquired as a result of Factor Analysis and TOPSIS techniques applications are evaluated comparatively, and the results are examined in terms of Turkey and periods (pre-crisis, crisis period, and post crisis).

Keywords: Global Crisis 2008, Factor Analysis, TOPSIS, EU Member States, Economic Performance

1. Introduction

Economic crisis is defined as significantly powerful mobility realized beyond the edge of a certain changing in the price or amounts emerged in the production and service sector or exchange market. The economic crises are analysed in two different ways as real sector crises and financial sector crises (Chambers *et al.* 2004).

Real crises are the crises emerged as significant constrictions in the amounts of good-service and labour markets, in other words in production and/or employment (Kibritcioglu, 2001). The best example for real sector crisis is the petroleum crisis emerged in 1979. Financial crisis can be defined as severe fluctuations emerged in the price and amounts in good, service, production factors or finance market. Most of financial indicators shortly and cyclically deteriorate in the financial crisis. The financial crisis aroused from negativities in banking

business or undue price fluctuations in the stock and exchange markets can be analysed under various headings as “money crisis”, “banking crisis” etc (Parasiz and Bildirici, 2013). These different types of crises can be either considered separately or found collectively. For example, it is experienced that banking crisis is generally emerged by following exchange crisis (Seyidoglu, 2001).

Turkey experienced financial crises in November 2000 and February 2001. These crises emerged as financial crisis and afterwards brought along real crisis as well. The company's bankruptcy increased in these periods, the banks are confiscated, many factories and work places are closed. The number of company and cooperatives founded decreased in 2001 compared to the year 2000, the number of company and cooperatives closed increased. As a result of this and similar situations, the employment decreased and accordingly the unemployment increased, GNP, in other words the production decreased, therefore economic growth is affected adversely (Ozer, 1999).

2. Global Crisis in 2008

Mortgage (mortgaged housing financing) is a credit system that has been applying in USA for a long time to make individuals become homeowner. The American citizens using major part of their investments in investment trusts directed towards the real estate sector which they considered as a reliable type of investment with a high possibility to be at a premium as of 2000s. The purchase of houses purchased due to premium expectation continued until 2004. However, FED renounced applying low interest policy in 2004 and increased the interest rates (Saritas and Gokce, 2012). The decline witnessed in house demand as a consequence brought along decreasing in high housing prices.

In 2006, the decline experienced in housing prices after USA real estate market has been satisfied and the recession began and the decision of FED for raising interest rates in last two years made the situation difficult for the persons especially relying on the increase in housing prices and receiving credits with adjustable interest (Susam and Bakkal, 2008). In conclusion, the mortgage debtors transferred their houses to the banks and financial institutions which they used credits. This transfer further decreased the prices. Various investment banks and insurance companies that purchased the bonds issued to the market in return for mortgage credits came on the verge of bankruptcy; significant damages are incurred on their balance sheets (Dursun and Birdal, 2011).

It can be asserted that Global Crisis in 2008 starting in the financial markets (Mercan, 2014) in August 2007 and also referred as “Mortgage Crisis” broke out after the bankruptcy of Lehman Brothers in September (Bulus and Kabaklarli, 2010). The crisis emerged in the USA as mortgage crisis transformed into a liquidity crisis afterwards (Ertugrul *et al.* 2010). The banks' rigid credit policies and their applications to provide credits after making more examinations created a disadvantageous situation for real sector (Saritas and Gokce, 2012). The global economy was in the tendency to constriction with the loss of confidence caused by the crisis (Kaderli and Kucukkaya, 2012).

The crisis took effect in Europe being in the first place and throughout the world within 6 months and caused economic recession in many countries through affecting developed countries and emerging countries with different intensities (Dursun and Birdal, 2011).

As a result of global or local financial crises, it is expected to have negative consumer and producer expectations and decline in foreign capital investments and exportation (Dogru, 2012). In addition to that, it should be noted that there is a strong connection between the banking system of a country and its economic performance. The reason is that the most important resource nurturing economy is the capital; banking is the system actualising the capital (Karabicak, 2010). There was a structural transformation in Turkish banking system after the crisis in 2001. The effect of global crisis in 2008 remained relatively limited on financial sector due to this structural transformation, however real sector suffered heavy losses. The global economy diminished, the crisis was primarily affected Turkey especially through the channel of foreign trade (Ertugrul *et al.* 2010). The petroleum demand shrank together with the global crisis, and the world petroleum prices were reduced. Despite decreasing petroleum

prices, significant declines in production were experienced due to decreasing domestic and foreign demand, many companies were closed in industry sector, and it caused increasing unemployment (Karabicak, 2010).

3. Literature Review

Bulus and Kabaklarli (2010) indicated that there are similarities found between the reasons revealed in the crisis in 1929 and 2008, and they emphasized that the most important similarity is the speculative bubbles generated in the financial markets. Another aspect indicated in the study is that two major crises also resulted in significant similar consequences in the world economy.

Dogru (2012) used the date of 1995:2011 in their work, and as a result of the econometric study conducted, a significant correlation between current deficit of Turkey and the decline in the production of the USA and EU region as the trade partners of Turkey cannot be determined in the short term.

Dursun and Birdal (2011) tested whether the signal approach is an appropriate method to estimate the crisis in 2008 in Turkey and they concluded that it is a reliable instrument.

Engin and Yesiltepe (2009) analysed the situation of Turkey in terms of Maastricht Criteria, consequently it was determined that Turkey is clearly and rather far away from the objectives indicated.

Ertugrul *et al.* (2010) indicated that the crisis caused constriction in demand and growth in Turkey, the exportation decreased due to the recession experienced in the USA and Europe, the reductions emerged in industry production index and capacity usage rates, the unemployment increased and consumer confidence index decreased.

Isik and Duman (2012) emphasized that a depreciation was experienced in stock market of Turkey after the Global Crisis in 2008, an economic constriction emerged, the rate of unemployment increased, the volume of foreign trade shrank and the real sector and consumer confidence indices deteriorated.

Kaderli and Kucukkaya (2012) examined the economic indicators comparatively, in conclusion they indicated that the effects of the Global Crisis 2008 deepened in 2009, after having a slightly recovery process in 2010, the balances again changed negatively in 2011.

Karabicak (2010) indicated briefly that Turkey can be considered in the class of experienced countries about crisis, this experience created a positive impact in terms of reaction against Global Crisis in 2008, Turkey did not give overreactions as much as before against sudden speculative attacks emerged due to crisis, and moreover he made various suggestions.

Karabulut (2009) specified that GDP decreased in Turkey and Azerbaijan with the effect of constriction in domestic and foreign demands, and the growth rates also declined. In addition to that, it was emphasized that the credit usage decreased despite declining interest rates, investments came to a standstill, and while the employment rates were increasing with receding capacity usage rates to a lower levels, the unemployment figures were increasing up to higher levels.

According to the empirical findings of his, Mercan (2014) using the data of 1990:2012 indicated that public expenditures, exportation and private consumption expenditures make the greatest contribution to the economic growth of countries. In addition to that, it is concluded that the effect of crisis on economic growth is negative and statistically significant.

Urfalioglu and Genc (2013) compared economic performance of Turkey with EU member and candidate states by using the data received for 2010 through ELECTRE, PROMETHEE and TOPSIS techniques. As a result of the study, it is determined that Turkey is ranked at 31st place in economic ranking with ELECTRE method, 13th place with TOPSIS method and 32nd place with the method of PROMETHEE.

Ozden (2012) ranked the countries according to their economic performances by using 8 economic indicators for 2010. As a consequence, it is determined that Luxembourg is the country having the highest economic performance and Greece having the lowest performance. It is realized that Turkey is ranked at in 24th place among 28 countries.

Karabulut *et al.* (2008) used the data received in the period between 2001 and 2005, and it is determined as the conclusion that Turkey is ranked among the successful EU countries in terms of sourcing however the level of sourcing deteriorated in the years of 2004 and 2005. It was determined that Turkey is ranked at the 21st place according to technological change and total factor efficiency index.

Ozer *et al.* (2013) used the data received in the period between 2007 and 2010, and it is determined that the effect of crisis revealed itself strongly in 2009 for 20 Transition Countries. The findings of Clustering Analysis are compared based on years; common features of the countries taking joint action are examined. As a result of the study, it is asserted that it is an important indicator in terms of the overcoming crisis impact despite the fact that high domestic savings decreases the effect of crisis.

Saritas and Gokce (2012) concluded that global crises affect countries adversely and moreover the countries take an important place in the emergence of their own economic crises. In the study, it is asserted that production-oriented growth model should be embraced especially instead of financial investments to resolve structural problems of the economic crisis experienced.

Demirbas and Sezgin (2010) aimed to observe changes in bank activity ranking in the process of crisis. Data Envelopment Analysis Method is used in the study. According to empirical findings, as the percentage of being active for Turkish banks is low for the year 2006, this situation became reversed in 2007 and afterwards. As a result of the study, it is determined that USA and EU banks were affected in the process of crisis and their activity rates decreased, and it is indicated that Turkish banks entered into the process of recovery after restructuring programme and it reserved its effectiveness in the process of crisis.

Turgan (2013) stated that EU member states are significantly affected from the global crisis in 2008; he asserted that major reasons of that are the deficiencies in economic governance and low competitive capacity of some member states.

As a result of literature review carried out, it is realized that the number of studies researching the subject of analysing the effects of the global crisis in 2008 on Turkey through comparing with various countries or country groups by means of quantitative decision techniques is rather limited.

When analysing limited number of studies using quantitative decision techniques and making comparisons on yearly basis, it is seen that either multivariate statistical analysis techniques (Clustering Analysis) or operational research subjected techniques (Data Envelopment Analysis and Multi-Criteria Decision Taking Techniques: TOPSIS, ELECTRE, PROMETHEE) are used. In this study, the effects of global crisis on Turkey will be analysed by using TOPSIS as one of the Multi Criteria Decision Taking Technique and Factor Analysis among multivariate statistical analysis techniques through comparing with EU member states, and the findings of techniques will be interpreted by depending on period - through emphasizing similarities and differences.

3. Description of the Data and Methodology

3.1. The Database

The relations between European Union (EU) consisting of 28 independent states and Turkey started with the accession application of Turkey to European Economic Community (EEC) on 31 July 1959 (Republic of Turkey Ministry for EU Affairs, 2013). After EEC Council of Ministers accepted the application, the Ankara Agreement was signed on 12 September 1963. The process continued with the Additional Protocol signed in 1970. These two important documents initiated the relations between the Community and Turkey before many countries which afterwards became Community members are the legal grounds of Turkey-EU relations in the process that is still ongoing after those dates and the European Council Final declaration dated 17 December 2004. The relations between Turkey and EU approximately in last 45 years of the Republic period and the membership of Turkey to EU occasionally consisted of one of main items of the agenda. Within the framework of Helsinki 1999 resolutions, our country was invited

for the membership of EU and the process related to harmonisation codes was initiated (Altas and Giray, 2008). The subject is one of the important ones for Turkey still consisting of the current issue.

The purpose of this study is to rank Turkey and EU member states according to their economic performances and determine whether the structure of ranking has changed before and after the global crisis in 2008. In the performance of ranking, the TOPSIS and Factor Analysis techniques were used and relevant techniques are explained under the heading of "Methodology".

While determining variables to be used within the scope of the study, economic indicators used in the literature and Maastricht criteria (the economic indicators required to be satisfied by the countries to be a member of EU) were taken into consideration. The variables used in the study are given below:

- Gross Domestic Product Growth (annual %)
- Inflation (price deflator - with private final consumption expenditures),
- Public Debts/GDP (general outstanding public debt / GDP) ,
- Unemployment rate, GDP/Populations (gross domestic product per person- with current market prices),
- Good and service importation (as the percentage of GDP),
- Good and service exportation (as the percentage of GDP),
- Direct foreign investment (Net inflow- as the percentage of GDP).

The study is conducted for the time period between 2006 and 2012, and the data used within the scope of the study were compiled from basic macroeconomic indicators in European Union member and candidate countries report (November 2011). Additional information from various data banks as Eurostat and OECD was added to the data compiled. However, all data related to the variables within the scope of the study for some countries could not be acquired. Deficient values for missing observations that are rather few in number were completed through the Multiple Regression Analysis.

3.2. Methodology

3.2.1. Factor Analysis

Factor Analysis is one of multivariate analysis techniques applied frequently. General purposes of multivariate statistical analysis techniques may be summarised as dimension reduction, classifying units or variables, scaling or mapping, testing hypothesis and analysing dependency structure (Tatlidil, 1996).

The number of observation in multivariate statistical analysis techniques is generally shown with "n", and the number of variable is with "p". As p which is the number of variables included into the analysis increases, the work load and complexity will increase and interpreting will become more difficult. Therefore, the analysis techniques that will decrease the number of variables are required. Moreover, there is an assumption in some analyses asserting the variables are independent. In other words, by means of the technique that will make variables independent, the date can be made ready for another analysis. The techniques applied in this and similar situations are Principal Component Analysis and/or Factor Analysis.

Factor Analysis (FA) developed by Karl Pearson and Charles Spearman at the beginning of 20th Century is a technique used for transforming data structures connected each other into new data structures as few in number and independent from each other, and used for grouping the variables explaining an event (Rencher, 1998). The technique is briefly used with the purposes of making independent and reducing dimension.

The factors are determined in the FA commonly through benefitting from correlation matrix by means of Principal Components Analysis. In the FA, it is important to entitle the factors acquired; ensure the conceptual relevance referred as gathering significant variables

under same factor. It is benefitted from various spinning methods to ensure conceptual relevance.

FA can be applied solely, and can also be used with the purpose of preparing the data for other analyses to be applied. In other words, different operations or analyses can be applied to the scores related to the factors acquired as a result of FA. In this study, the ranking of the countries' economic performance are achieved through ranking the factor scores by weighting with eigen values.

3.1. TOPSIS

TOPSIS (Technique for Order Preference by Similarity to an Ideal Solution) is one of multi-purpose decision taking methods. In the multi-purpose decision taking methodology, the criteria (variables) are determined with the purpose of achieving objectives and multi dimensional data that will compare different alternatives (observations) is collected (Ozden, 2009). The significance level of aforementioned criteria may not be equal for the person performing the analysis, in other words the decision maker. In these cases, the criteria should be weighted (Conkar *et al.* 2011).

The basis of TOPSIS method is founded on the studies of Hwang and Yo in 1981. The method is developed by Chen and Hwang in 1992 by referring to aforementioned study (Demireli, 2010). Hwang and Yoon generated the TOPSIS method depending on the concepts of the closest distance to the (positive) ideal solution and the farthest distance to the negative ideal solution related to the solution alternatives (Supciller and Capraz, 2011). In this method, it is assumed that each criterion possesses the tendency of monotonically increasing or decreasing utility (Yayar and Baykara, 2012).

The functioning of TOPSIS method that was defined as the similarity index for positive ideal index may be summarised as follows (Ozguven, 2011): At the first stage, the initial matrix; in other words, decision matrix (A) is generated. The alternatives (countries, companies etc) requested ranking are given in the rows of the matrix. The criteria (the features analysed, assessment factors) consist of the columns of the matrix. A matrix comprising of a_{ij} elements has the dimension of (m x n). At the second stage, A matrix is normalised by means of below mentioned formula.

$$r_{ij} = \frac{a_{ij}}{\sqrt{\sum_{k=1}^m a_{kj}^2}}$$

By this way, normalised decision matrix R is achieved (Ustasuleyman, 2009). At the third stage, the weighting function is performed. If it is considered that decision maker criteria do not possess same significance level, the weight values to be given to the criteria are determined. To total weight value based on the subjective opinion of decision maker is 1 (Alp and Engin, 2011). Afterwards, the elements of R matrix are weighted in line with the significance given to the criteria. By this way, the matrix V (weighted normalised decision matrix) is achieved. At the fourth stage, positive and negative ideal solution is determined. Ideal solution set includes elements with the number of (n) same as the number of criteria.

Positive ideal solution consists of the best performance values of weighted normalised decision matrix. The best performance value for a criterion requested maximising will be the highest value. The best performance value for a criterion requested minimizing will be the lowest value (Alp and Engin, 2011).

Positive ideal point is shown with A^* .

$$A^* = \{ v_1^*, v_2^*, \dots, v_n^* \}$$

In the concept of negative ideal solution, it will be exact opposite; negative ideal solution will consist of the worst performance values.

Negative ideal point is shown with A^- .

$$A^- = \{ v_1^-, v_2^-, \dots, - \}$$

At the fifth stage, the distance between each alternative to these 2 ideal points is calculated. These distances are found by means of Euclidean Distance approach (Ozer *et al.* 2010).

$$S_i^* = \sqrt{\sum_{j=1}^n (v_{ij} - v_j^*)^2}$$
$$S_i^- = \sqrt{\sum_{j=1}^n (v_{ij} - v_j^-)^2}$$

Relative proximity value of an alternative to ideal solution through the distances is calculated by means of below mentioned formula.

$$C_i^* = \frac{S_i^-}{S_i^- + S_i^*}$$

The value C_i^* varies between 0 and 1, if it is 1, it shows the absolute proximity of relevant decision point to positive ideal solution; in case it is 0, it shows the absolute proximity of relevant decision point to negative ideal solution (Ozer *et al.* 2010). At the sixth and last stage, the alternatives are ranked according to their relative proximity values to the ideal solution (Ustasuleyman, 2009).

5. Empirical Findings

The analyses are performed by means of the NCSS 2007 and Sanna package programmes, and the findings are summarised under two sub headings below.

5.1. Factor Analysis Findings

To compare economic performances of the countries before the global crisis in 2008, Factor Analysis is applied on the data received related to the year. As a result of Factor Analysis applied, it is realized that the eigenvalues of 2 factors are more than 1 (2.63 and 1.81). The section explained by means of these two factors is more than the rate of 2/3. Varimax rotation is applied for separating variables into factors more explicitly. When analysing factor loads, it is observed that in the 2nd factor within 3 variables (Public Debt, Gross Domestic Product Growth, Inflation), in the 1st factor within other variables (Unemployment rate, Good and Service Importation, Good and Service Exportation, Direct Foreign Investment) are loaded. Afterwards, the factor scores are ranked by weighting eigen values. According to the findings, based on the selected indicators before last global crisis, the first three countries having the best economic performance are Luxembourg, Malta and Belgium; the worst three countries are Romania, Latvia and Turkey.

As a result of Factor Analysis applied on selected economic indicators of the countries for the year 2008 as the starting year of global crisis, it is once again realized that the eigen values of 2 factors are more than 1 (2.37 and 1.01). The section explained by means of these two factors is again more than the rate of 2/3. It is observed that the separation of variables among the factors is not changed. According to the findings, based on the selected indicators before last global crisis, the first three countries having the best economic performance are Luxembourg, Belgium and Hungary. While Malta is one of first three countries having the best economic performance according to the pre-crisis period, Hungary became the best third country in terms of economic performance in 2008 accepted as the year that the crisis emerged. As experienced in 2006, it is realized that Romania, Latvia and Turkey are the countries having the worst economic performance in 2008.

To determine the post-crisis situation, as a result of Factor Analysis applied on the data of the countries received 2012, it is realized that eigen values of 2 factors are more than 1 (2.62 and 1.52). The section explained by means of these two factors is again more than the rate of 2/3. It is observed that the separation of variables among the factors has changed in 2012. As a result of factor analyses applied for the years of 2008 and 2006, while the unemployment value is loaded for the first factor, it's come to be loaded for the 2nd factor in 2012. According to the findings, based on the selected indicators in 2012 after the global crisis, the first three countries having the best economic performance are Luxembourg, Estonia and Belgium; the worst three countries are Spain, Italy and Greece. Turkey is ranked in 24th place. Luxembourg and Belgium are among the first three countries having the most effective economic performance in all years included into the analysis. Estonia is determined as the third country having the most effective economic performance in 2012. The countries having the worst performance economically differentiated in 2012 while they remained same in the years of 2006 and 2008 (Romania, Latvia, Turkey). According to the updated data, the countries having the worst economic performance were Spain, Italy and Greece.

The findings of country rankings acquired through Factor Analysis for three periods are summarised in the Table 1 below.

Table 1. Summary table for country ranking according to Factor Analysis findings

Pre-crisis (2006)	Crisis (2008)	Post crisis (2012)
1.Luxembourg	Luxembourg	Luxembourg
2.Malta	Belgium	Estonia
3.Belgium	Hungary	Belgium
...
27.Romania	Romania	Spain
28.Latvia	Latvia	Italy
29.Turkey	Turkey	Greece

In the economic performance ranking based on the selected indicators in the years of 2006 and 2008, it is realized that our company advanced to the 24th place in 2012.

5.1. TOPSIS Findings

Another method that may be used in line with the purpose of the study it the TOPSIS as one of the Multi Criteria Decision Taking techniques. Factor Analysis findings are requested to be encouraged with the findings of TOPSIS method. In this section of the study, ranking countries according to their economic performances in 2006 before the global crisis by using TOPSIS method is performed. When analysing TOPSIS findings, it is realized that the first three countries having the best economic performance are Luxembourg, Estonia and Ireland; the worst three countries are Turkey, Portugal and Greece.

When analysing TOPSIS findings in 2008 accepted as the year that the crisis emerged, it is determined that the first three countries having the best economic performance are Luxembourg, Hungary and Belgium; the worst three countries are Turkey, Latvia and Greece.

Finally, to observe the current situation after global crisis, the analysis is repeated with the data of the year 2012; it is seen that the first three countries having the best economic performance are Luxembourg, Ireland and Latvia; the worst three countries are Portugal, Italy and Greece (Table 2).

Table 2. Summary table for country ranking according to TOPSIS findings

Pre-crisis (2006)	Crisis (2008)	Post crisis (2012)
1.Luxembourg	Luxembourg	Luxembourg
2. Estonia	Hungary	Ireland
3. Ireland	Belgium	Latvia
...
27. Turkey	Turkey	Portugal
28. Portugal	Latvia	Italy
29. Greece	Greece	Greece

Turkey is ranked in the 25th place out of 29 countries in 2012. It may be asserted that TOPSIS findings generally support the findings of Factor Analysis. When Ireland is a country that was not one of first three countries according to the Factor Analysis findings in 2006, the country confronted us as the best third country in terms of economic performance in 2006 according to the TOPSIS findings. Our country being ranked as the last country according to the Factor Analysis findings, it is ranked as the last third country according to the TOPSIS findings. While the Factor Analysis findings pointed out Turkey as having the worst performance, the TOPSIS findings indicated that Greece is the country having the worst performance.

In 2008, 2 techniques provided same results in term of the best three countries. In terms of last 3 countries, it may be asserted that similar results are achieved. Romania is the countries being assessed differently. While the Factor Analysis findings indicated Turkey as the country having the worst performance in 2008 as it was experienced in 2006, the TOPSIS findings pointed out that Greece is the country having the worst performance.

While the first three countries having the best economic performance are Luxembourg, Estonia and Belgium according to the Factor Analysis findings, the first three countries having the best economic performance are Luxembourg, Ireland and Latvia according to the TOPSIS findings. It is realized that the country having the most effective economic performance (Luxembourg) has not changed depending on the years and techniques. The worst two countries (Italy, Greece) in terms of economic performance in 2012 is an unchanging finding based on the techniques applied. While Turkey is ranked in the 24th place in economic performance ranking according to the selected indicators considering the results of the Factor Analysis in 2012, it is similarly ranked in the 25th place according to the results of TOPSIS.

5. Conclusions

In this study, the countries are ranked according to their economic performances for the years as the one (2006) before global crisis in 2008, 2008 is accepted as the year that the crisis emerged and 2012 through using two techniques. The techniques applied in line with the purpose are the Factor Analysis as one of multivariate analysis techniques and TOPSIS as the one of multi criteria decision taking techniques.

According to the findings of both techniques, Luxembourg has the best economic performance depending on the indicators dealt within the scope of the study in pre-crisis, crisis and post crisis period. Factor Analysis findings present that Turkey is the country having the worst economic performance during pre-crisis and crisis period. According to the results achieved by means of same technique, it has changed in the post crisis period, and Greece became the country having the worst economic performance. Turkey is ranked in the 24th place out of 29 countries. According to TOPSIS results, Greece is the country having the worst economic performance during pre-crisis, crisis and the post crisis period. In the light of the findings of this technique, Turkey is ranked in the 27th place in the years of 2006 and 2008; and 25th place in 2012.

To understand the reason behind the relative lower performance presented by Turkey, descriptive statistics related to the economic features are also analysed; it is realized that our country has a rather different structure compared to the other countries within the scope of the analysis especially in terms of inflation and unemployment rates. In addition to that, it is observed that Turkey made progress regarding the economic performance in 2012 compared with the year 2006 according to both techniques.

Factor Analysis results present that the countries having the best economic performance are Luxembourg, Belgium, Malta, Hungary and Estonia. On the other hand, the TOPSIS results indicate that the countries having the best economic performance are Luxembourg, Belgium, Hungary, Ireland, Estonia and Latvia. It may be asserted that the findings are similar in this respect.

Factor Analysis results present that the countries having the worst economic performance are Turkey, Greece, Romania, Latvia, Spain and Italy. On the other hand, the TOPSIS results indicate that the countries having the worst economic performance are Greece,

Turkey, Italy, Portugal and Latvia. It may be asserted that the findings are also generally overlapped in this respect.

When analysing the countries' ranking from period to period, the variation in the position of Latvia is remarked. According to the TOPSIS and Factor Analysis findings, while Latvia is the second country having the worst economic performance in the crisis period, according to the TOPSIS findings, the country became the third country having the best economic performance during the post crisis period (in 2012). In addition to that, according to the results of the year 2012 as having the most updated data within the scope of the study, it is remarked that the ranking of Turkey has positioned rather similarly according to both techniques.

In summary, the findings reached by means of different techniques are parallel; and there is not many changes observed generally in the ranking of the countries' economic performance during the pre-crisis, crisis and post crisis periods.

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