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CONTENT

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ANALYSIS OF THE MACROECONOMIC PERFORMANCES OF EUROPEAN COUNTRIES BY GREY RELATIONAL ANALYSIS

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ABSTRACT

Purpose - A macroeconomic analysis is a statistical analysis showing the current situation of the economy. Thanks to this analysis, individuals, investors, companies, states, and the public can perceive the strengths and weaknesses of the economy and make decisions accordingly. In this study, the macroeconomic performances of forty-four European countries was analyzed.

Methodology- The Grey relational analysis method was used in the study.

Findings- As evaluation criteria, nine macroeconomic variables were determined and thus two important results were obtained. The first was the indication of the Grey relational analysis (GRA) method application, an analysis method consisting of six stages. The second result was the macroeconomic performances of European countries.

Conclusion- According to the obtained findings, the ten countries with the most successful macroeconomic performance were Ireland, Russia, Germany, Azerbaijan, Malta, Luxembourg, Netherlands, United Kingdom, Armenia, and Poland, and the ten countries with the lowest macroeconomic performance were France, Serbia, Finland, Portugal, Italy, Bosnia and Herzegovina, Croatia, Belgium, Montenegro, Ukraine, and Greece. Turkey ranked thirty-third among the forty-four countries

Keywords: Grey theory, Grey relational analysis, economic performances, European countries, Index of Economic Freedom.
JEL Codes: C00, C02, G11

1. INTRODUCTION

Macroeconomic analysis is a statistical analysis showing the current situation of the economy. Thanks to this analysis, individuals, investors, companies, states, and the public can perceive the strengths and weaknesses of the economy and make decisions accordingly. In the periods of economic progress and recession, the decisions that are taken show differences.

If the price of an asset comprises all information that may affect this price, market is assumed to be active. However, in daily life, decisions are taken in an environment where the assumption of full information is not valid. If the assumption of full information were valid, each decision to be taken would be evaluated as optimal decision. Conversely, the parties have information different from each other when the missing information is valid. The party with this particular knowledge uses the current situation for its own benefit. Simply put, insiders have more information than outsiders. In such an environment, it becomes extremely important to make correct decisions.

Multi-criteria decision making methods are used in the literature to solve various decision-making problems. The solution of the problem arrives at the conclusion with the selection of the highest satisfaction rating alternative among a series of alternatives. One of these methods is the Grey relational analysis method (GRA). GRA is a method used to analyze the relationships between discrete data. The most important advantage of the GRA method is that its results are based on original data, and its calculation is easy to make. The Grey method, which consists of six steps, starts with the preparation of the decision-making matrix and ends with the comparison of the comparability series the and reference series.

In this study, the macroeconomic performances of forty-four European countries were analyzed by using the Grey relational analysis method. As evaluation criteria, nine economic variables were used. Each of these variables was a risk factor, and these risk factors are affected by every new piece of information in the market and the general condition of the economy. These risk factors consist of two components. The first is systematic risk. The second is unsystematic risk. Unsystematic risk can be completely eliminated. However, systematic risk is a risk that the entire market is exposed to. This risk can be reduced but not completely eliminated. These effects constantly change the economic performance of countries.

2. LITERATURE REVIEW

In the literature, there are a large number of studies conducted in the fields of health sciences, social sciences, and sport sciences based on the GRA method. Some of these studies are summarized below. Nevertheless, there was no study in the literature examining the economic performances of countries based on the GRA method.

Wu (2002) examined the GRA method in his study in which it was concluded that the GRA method is simple and easy to calculate and understand. On the other hand, it is not easy to determine which method is more reliable and reasonable for the problem of multiple attribute decision making (MADM). The best way to cope with this deficiency is to apply several MADM method to the same problem, compare the results, and make the final decision based on the results obtained.

Lin and Lin (2002) evaluated the process of electric discharge machining (EDM) with Grey Relational Analysis method. To solve the EDM process with multi-performance characteristics, the Grey relational classification acquired from the Grey relational analysis was used. Optimal processing parameters were then calculated with the Grey relational degree as the performance index. The experimental results show that the processing performance in EDM process could be effectively improved with this approach.

Kao and Hocheng (2003) used the Grey relational analysis method in their study. According to Grey system theory, the Grey relational analysis is a method used to analyze the relationships between multi-factor series and less data, which is considered to be more advantageous than statistical regression analysis. The analysis of multi-performance characteristics was made with the Grey relational degree. Grey relational analysis can be used for multiple input, discrete data. and uncertain experimental studies. The experiments carried out indicated the efficiency of Grey relational analysis, and the efficiency of this approach was confirmed by the experiment and variance analysis.

Tsai, Chang, and Chen (2003) used the GRA method for the selection of an appropriate vendor. They recommended this method for determining the performances of the vendors due to the advantages of the Grey multiple attributes decision. The suggested approach provided to be performed measurement in accordance with the requirements of every enterprise for the supplier evaluation. It determined the general performance of a supplier and the order of selection of suitable vendors. The optimal decision was also made in compliance with the general performance.

Chang, Tsai, and Chen (2003) indicated that Grey relational analysis method can be used in the analysis of sport technologies, the selection of a trainer, and the evaluation of general performance in the decathlon. The most important advantage of the Grey theory is to consider not only imperfect knowledge but also uncertain problems in detail. It serves as an analysis tool particularly when there is not enough data. Thanks to the quantitative analysis of the Grey relationship, more accurate and subjective data are provided. It is thought that this method might be a reliable analytic approach for the decathlon evaluation models.

Singh, Raghukandan, and Pai (2004) made use of Grey relational analysis in their study when examining the optimization of electric discharge machining parameters. In this process, they normalized the results obtained from the experiment which they conducted in the first step. In the second step, they calculated Grey's relational coefficient and, in the third step, the relational degree of Grey. After that, in the fourth step, they made a statistical variance analysis and, in the fifth step, determined the optimal level of the parameters. Finally, in the last step, the correctness of the parameters was confirmed with a validity check. During the application of this technique, the Grey relational analysis transformed the multi-response variable to a single response Grey relational degree. In this way, the optimization procedure became simple and intelligible.

In Tosun's (2006) study, the optimum parameters were determined for the multi-performance characteristics in the terebration process by using GRA (surface roughness and burr height). Optimal processing parameters were calculated with the Grey relational degree obtained from the Grey relational analysis for multi-performance characteristics. The experimental results showed that surface roughness and burr height in the terebration process can be effectively improved with the new approach.

Wu (2007) made a comparison between the Grey relational analysis to be used and RIDIT methods in order to examine the data obtained from Likert scale questionnaires. The Likert scale is one of the most used methods in social sciences for

collecting data about attitudes, perceptions, values, habits, and behavioral changes. The sample size used influences the reliability of the results produced by using conventional statistical analysis techniques. It was determined that the results obtained by applying the methods used were extremely consistent with each other.

Kuo, Yang and Huang (2008) examined the decision-making process with the GRA method. There are many different situations in daily life and workplace that cause a decision problem. Some of them are related to the selection of the best among the existing multiple alternatives. However, only one alternative does not produce the best result for the all performance features. For the solution of these kind of problems, it is suggested that the multiple attribute decision-making (MADM) method using Grey relational analysis (GRA). The two cases examined show that GRA is an effective tool for solving a MADM problem.

Hsu and Wang (2009) analyzed the effect of multiple determinants on the integrated circuit industry by using Grey relational analysis and a Grey prediction model in their study. Advanced technology industries play an important role in the period of social economic change. Reliable data are an indispensable source of information for a prediction model. Technological forecasting in general suffers from limited historical data and imperfect information. Within this framework, while conventional time series models do not exceed the requirement of historical data collection, multi-variable predictions are more suitable than single variables for complex decision problems.

Zhai, Khoo, and Zhong (2009) examined the design concept assessment with the GRA method in their study. The design concept assessment is a multi-criteria decision-making process consisting of a large quantity of generally indefinite data and expert information. The suggested rough-grey analysis indicated that indefinite design and expert information can be modelled more effectively and objectively.

Hou (2010) developed an optimization model based on the fundamental assumption of a conventional Grey relational analysis (GRA) method. Additionally, he examined multi-featured decision-making problems related to intuitionist fuzzy information in which the information is not exactly known, and the values of the features are in the form of intuitive fuzzy numbers. Consequently, the degree of the Grey relationship between every alternative and positive ideal solution was calculated. In the study, an explanatory example was given to show effectiveness and confirm the approach.

Al-Refaie, Al- Durgham, and Bata (2010) suggested an approach to optimize multiple responses in the Taguchi method by using regression models and Grey relational analysis which uses every quality response to transform a single level of Grey. Accordingly, the larger level of Grey shows a better performance. The level of factor with the highest-level degree was selected as the most appropriate level for this factor. Moreover, this approach can be used for imperfect data.

Xiao, Wang, Fu, and Zhao (2012) examined the fundamental factors of the Web service quality by using Grey relational analysis theory which concentrates on uncertain situations; however, in this process, while part of the information is known, the other par is not known. Grey relational theory argues that the objective system and data characterization are very complicated. However, the factors in the system affect each other internally, and every factor has a very significant role. Grey relational analysis is the most common and dynamic component of the Grey system theory. Although the given information is limited, GRA produces a simple result for analyzing the series relationship or system behaviors. The basic element of the method is the quantitative comparison of the effect factors in the dynamic development trend of the system.

Liu, Baniyounes, Rasul, Amanullah, and Khan (2013) analyzed the sustainability of a renewable energy system (RES) based on Grey relational analysis. The object of the study was to improve a sustainability indicator in order to evaluate the sustainability of renewable energy sources precisely and comprehensively. Grey regression analysis method was used to cope with uncertainties in the determination and assessment o sustainability. The Grey indicator is one of the best ways to evaluate the sustainability of RES. It is a suitable and better tool for users, decision-makers, and researchers.

Hashemi, Karimi, and Tavana (2015) examined supplier selection decisions with an improved GRA method, in their study. To weight the significance level of evaluation criteria, the analytic hierarchy process (AHP) method was used. The suggested approach allows the linguistic evaluation system in the green supplier selection process to be used and the decision-makers to participate in the evaluation process.

Wang, Zhang, Chong and Wang (2017) evaluated supplier performance with seventeen flexible criteria under a combined methodology consisting of an analytic hierarchy process (AHP) and Grey relational analysis (GRA). A supplier selection suitable for effective information integration was suggested for supply chain management. The flexibility capability of a supplier is considerably important for supplier selection. The flexibility criteria influencing the selection priorities of the suppliers were determined by changing the weights given to each criterion. AHP and GRA examine the criteria and then rank the suppliers, respectively.

Chen and Lee (2019) examined the Grey relational analysis (GRA) method to estimate the electricity consumption of public buildings using weather conditions. Increasing environmental awareness has increased the importance of controlling and monitoring electricity consumption. Grey relational analysis has been proposed to analyze the relationship between weather conditions and electricity consumption. In addition, adaptive network-based fuzzy inference systems (ANFIS) method was used to estimate electricity consumption according to weather conditions and human activities. There are two important results. First, it shows that ANFISs achieve higher performance with fewer parameters. Second, the GRA can evaluate the magnitude of the relationship between the factors used and a particular output.

Tan, Chen and Wu (2019) used Analytic Hierarchy Process and Grey Relational Analysis Approaches in environmentally friendly product design. Increasing public awareness of environmental protection and environmental protection laws are entering into force worldwide. Green awareness and green product design have become a critical issue for companies. On the other hand, green sensitivity increases the production costs of companies. In this context, environmental performance and market value of green design has been examined. The proposed methods are an important tool for small and medium-sized enterprises to implement green initiatives in their new product design processes.

Lin, Cheng and Chen (2020) used Grey Relational Analysis (GRA) method for product design in their study. Designers experience uncertainties during the development of their new products. Without defined design goals, new product development negatively impacts productivity. Therefore, it is important for companies to find an optimization approach that facilitates the new product development process and reduces costs. For this, the grey relational analysis method is proposed to analyze and optimize the parameters of the new product design. The results show that the proposed method can increase variety in new product designs and reduce costs.

3. DATA AND METHODOLOGY

This study has two important aims, first, to demonstrate the application of the GRA method, and, second one, to analyze the macroeconomic performances of European countries with the GRA method.

The forty-four European countries are evaluated, and the nine evaluation criteria are indicated in the range of A3 -A47 and in the range of C1-C9, respectively, in Table 1. The assessment criteria were determined as tax burden percentage of GDP, government expenditure percentage of GDP, inflation percentage, public debt percentage of GDP, unemployment percentage, GDP (billions, PPP), GDP growth rate percentage, GDP per Capita (PPP), and FDI inflow (millions).The data from 2020 were taken from the Index of Economic Freedom.

3.1. Grey Relational Analysis Method

The mathematical form of the model is as below. In its construction, we benefited from the study by Wu (2002, p. 211 -212).

Step 1. Preparation of Data Set and Decision Matrix
The series to be subjected to the comparison of the decision problem is determined.

$$x_i = (x_i(1), x_i(2), \ldots, x_i(j), \ldots, x_i(n)), \quad i = 1,2,3,\ldots m \quad j = 1,2,3,\ldots n \qquad (1)$$

Step 2. Formation of the Reference (x_0) and Compared (x_i) Series.
The reference series is (x_0) , $x_0 = (x_0(1), x_0(2), \ldots, x_0(j), \ldots, x_0(n))$. The compared series is (x_i), $x_i(1), x_i(2), \ldots, x_i(j), \ldots, x_i(n)$.
The compared xi series can be represented in a matrix form:

$$X_i = \begin{bmatrix} x_1(1) & x_1(2) & x_1(3) & . & . & . & x_1(n) \\ x_2(1) & x_2(2) & x_2(3) & . & . & . & x_2(n) \\ x_3(1) & x_3(2) & x_3(3) & . & . & . & x_3(n) \\ . & . & . & . & . & . & . \\ . & . & . & . & . & . & . \\ . & . & . & . & . & . & . \\ x_n(1) & x_n(2) & x_n(3) & . & . & . & x_n(n) \end{bmatrix} \quad (2)$$

Step 3. Normalization of the Data Set

The data can be processed as one of the three types, that is, the larger is better, the smaller is better, and the nominal is the best.

The formula for the larger-better conversion is defined as below:

$$x_i^*(j) = \frac{x_i(j) - \min_j x_i(j)}{\max_j x_i(j) - \min x_i(j)} \quad (3)$$

xi *(j) shows the value converted.

The formula to be converted for the smaller-better:

$$x_i^*(j) = \frac{\max_i x_i(j) - x_i(j)}{\max_j x_i(j) - \min x_i(j)} \quad (4)$$

The formula to be converted for nominal-the best:

$$x_i^*(j) = \frac{\left|x_i(j) - x_{0b}(j)\right|}{\max_j x_i(j) - x_{ob}(j)} \quad (5)$$

Furthermore, the reference x0 series should be normalized with the equation of (3) or (5). For example, if the larger-better transformation is applied,

$$x_i^* = \frac{x_0(j) - \min_j x_i(j)}{\max_j x_i(j) - \min x_i(j)}$$

In this way, the normalized reference series of x_0 can be calculated.

After the original data set is normalized by one of the three of them, the conversion types shown in Equation (2) can be revised as follows:

$$X_i^* = \begin{bmatrix} x_1^*(1) & x_1^*(2) & x_1^*(3) & . & . & . & x_n^*(n) \\ x_2^*(1) & x_2^*(2) & x_2^*(3) & . & . & . & x_2^*(n) \\ x_3^*(1) & x_3^*(2) & x_3^*(3) & . & . & . & x_3^*(n) \\ . & . & . & . & . & . & . \\ . & . & . & . & . & . & . \\ . & . & . & . & . & . & . \\ x_n^*(1) & x_n^*(2) & x_n^*(3) & . & . & . & x_n^*(n) \end{bmatrix} \quad (6)$$

Step 4. Calculation of the Distance of Δ_{0i} (j)
The obtained value is the absolute difference between x_0* and x_i *.

$$\Delta_{0i}(j) = \left| x_0^*(j) - x_i^*(j) \right|$$

$$= \begin{bmatrix} \Delta_{01}(1) & \Delta_{01}(2) & \Delta_{01}(3) & . & . & . & \Delta_{01}(n) \\ \Delta_{02}(1) & \Delta_{02}(2) & \Delta_{02}(3) & . & . & . & \Delta_{02}(n) \\ \Delta_{03}(1) & \Delta_{03}(2) & \Delta_{03}(3) & . & . & . & \Delta_{03}(n) \\ . & . & . & . & . & . & . \\ . & . & . & . & . & . & . \\ . & . & . & . & . & . & . \\ \Delta_{0m}(1) & \Delta_{0m}(2) & \Delta_{0m}(3) & . & . & . & \Delta_{0m}(n) \end{bmatrix} \quad (7)$$

Step 5. Application of Grey Relational Equation to Calculate the Grey Relational Coefficient Γ0i(j)
The Grey relational equation is applied to calculate the Grey relational coefficient Γ_{0i}(j) by using the equation given below:

$$\gamma_{0i}(j) = \frac{\Delta\min + \zeta\Delta\max}{\Delta_{0i}(j) + \zeta\Delta\max} \quad (8)$$

$\Delta\max = \max_i \max_j \Delta_{0i}(j), \Delta\min = \min_i \min_j \Delta_{0i}(j),$ in cases where

$and\ \zeta \in [0,1]$

Step 6. Calculation of the Degree of the Grey Coefficient Γ_{0i}.
When the weight of the criteria (W_i) is determined, the degree of the Grey coefficient Γ_{0i} is calculated as follows:

$$\Gamma_{0i} = \sum_{j=1}^{n} \left[W_i(j) \times r_{0i}(j) \right] \quad (9)$$

For the decision-making processes, if any alternative has the highest Γ0i value, it is the most important alternative. For this reason, the priorities of the alternatives can be ranked based on the Γ_{0i} values.

4. FINDINGS AND DISCUSSIONS

The study by Yıldırım (2018, p. 236-242) was used for the solution of the problem.

Step 1. Determination of the Decision Matrix
Nine assessment criteria were determined to state the macroeconomic performances of the countries in the decision problem. The countries subject to performance evaluations and criteria values are shown in Table 1 by using a Microsoft Excel spreadsheet.

Table 1: Data Set

	A	B	C	D	E	F	G	H	I	J
1		**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**
2		**Min**	**Min**	**Min**	**Min**	**Min**	**Max**	**Max**	**Max**	**Max**
3	Albania	26	29	2	69	14	38	4	13345	1294
4	Armenia	21	25	3	48	18	30	5	10176	254
5	Austria	42	49	2	74	5	463	3	52137	7618
6	Azerbaijan	13	35	2	19	5	180	1	18076	1403
7	Belarus	25	39	5	48	6	189	3	20003	1469
8	Belgium	45	53	2	101	6	551	1	48245	4873
9	Bosnia and Herzegovina	38	41	1	37	21	47	3	13491	468
10	Bulgaria	28	34	3	21	5	162	3	23156	2059
11	Croatia	39	47	2	74	9	107	3	26221	1159
12	Cyprus	34	37	1	103	8	35	4	39973	3285
13	Czech Republic	35	40	2	33	2	396	3	37371	9479
14	Denmark	46	52	1	34	5	301	1	52121	1789
15	Estonia	33	39	3	8	6	45	4	34096	1309
16	Finland	43	54	1	61	8	257	2	46430	1225
17	France	46	56	2	99	9	2963	2	45775	37294
18	Georgia	26	30	3	45	14	43	5	11485	1232
19	Germany	38	44	2	60	3	4356	1	52559	25706
20	Greece	39	48	1	183	19	313	2	29123	4257
21	Hungary	38	47	3	69	4	312	5	31903	6389
22	Iceland	38	43	3	35	3	20	5	55917	-336
23	Ireland	23	27	1	65	6	386	7	78785	-66346
24	Italy	42	49	1	132	10	2397	1	39637	24276
25	Kosovo	23	28	1	17	31	21	4	11552	3590
26	Latvia	30	37	3	38	8	58	5	29901	879
27	Lithuania	30	34	3	36	6	97	3	34826	905
28	Luxembourg	39	43	2	22	6	64	3	106705	-5615
29	North Macedonia	26	31	1	40	22	33	3	15709	737
30	Malta	33	36	2	45	5	21	6	45606	4061
31	Moldova	33	31	3	27	3	26	4	7305	228

32	Montenegro	36	48	3	72	16	12	5	19043	490
33	Netherlands	39	43	2	54	4	969	3	56383	69659
34	Norway	38	50	3	37	4	396	1	74356	-18215
35	Poland	34	41	2	48	4	1213	5	31939	11476
36	Portugal	35	45	1	121	7	329	2	32006	4895
37	Romania	25	31	5	37	4	516	4	26447	5888
38	Russia	24	35	3	14	5	4213	2	29267	13332
39	Serbia	36	41	2	54	14	123	4	17555	4126
40	Slovakia	33	41	3	49	7	191	4	35130	475
41	Slovenia	36	44	2	68	6	76	4	36746	1419
42	Spain	34	42	2	97	16	1864	3	40139	43591
43	Sweden	44	50	2	39	6	542	2	52984	11148
44	Switzerland	29	34	1	41	5	549	3	64649	-87212
45	Turkey	25	35	16	29	11	2293	3	27956	12944
46	Ukraine	34	42	11	64	9	390	3	9283	2355
47	United Kingdom	33	41	2	87	4	3038	1	45705	64487

Step 2. The Formation of the Reference Series and the Comparison Matrix
While creating the reference series of the application, the data set was calculated as indicated in Table 2 by using the values belonging to the aforesaid countries. For this reason, the formula =IF(M1="Min"; MIN(M3:M47);MAX(M3:M47)) is written in line M2.

Table 2: Adding Reference Series to the Data Set

	L	M	N	O	P	Q	R	S	T	U
1		**Min.**	**Min.**	**Min.**	**Min.**	**Min.**	**Maks.**	**Maks.**	**Maks.**	**Maks.**
2	**Referans**	**13**	**25**	**1**	**8**	**2**	**4356**	**7**	**106705**	**69659**
3	Albania	26	29	2	69	14	38	4	13345	1294
4	Armenia	21	25	3	48	18	30	5	10176	254
5	Austria	42	49	2	74	5	463	3	52137	7618
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12	Cyprus	34	37	1	103	8	35	4	39973	3285
13	Czech Republic	35	40	2	33	2	396	3	37371	9479
14	Denmark	46	52	1	34	5	301	1	52121	1789
15	Estonia	33	39	3	8	6	45	4	34096	1309
16	Finland	43	54	1	61	8	257	2	46430	1225
17	France	46	56	2	99	9	2963	2	45775	37294

18	Georgia	26	30	3	45	14	43	5	11485	1232
19	Germany	38	44	2	60	3	4356	1	52559	25706
20	Greece	39	48	1	183	19	313	2	29123	4257
21	Hungary	38	47	3	69	4	312	5	31903	6389
22	Iceland	38	43	3	35	3	20	5	55917	-336
23	Ireland	23	27	1	65	6	386	7	78785	-66346
24	Italy	42	49	1	132	10	2397	1	39637	24276
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26	Latvia	30	37	3	38	8	58	5	29901	879
27	Lithuania	30	34	3	36	6	97	3	34826	905
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29	North Macedonia	26	31	1	40	22	33	3	15709	737
30	Malta	33	36	2	45	5	21	6	45606	4061
31	Moldova	33	31	3	27	3	26	4	7305	228
32	Montenegro	36	48	3	72	16	12	5	19043	490
33	Netherlands	39	43	2	54	4	969	3	56383	69659
34	Norway	38	50	3	37	4	396	1	74356	-18215
35	Poland	34	41	2	48	4	1213	5	31939	11476
36	Portugal	35	45	1	121	7	329	2	32006	4895
37	Romania	25	31	5	37	4	516	4	26447	5888
38	Russia	24	35	3	14	5	4213	2	29267	13332
39	Serbia	36	41	2	54	14	123	4	17555	4126
40	Slovakia	33	41	3	49	7	191	4	35130	475
41	Slovenia	36	44	2	68	6	76	4	36746	1419
42	Spain	34	42	2	97	16	1864	3	40139	43591
43	Sweden	44	50	2	39	6	542	2	52984	11148
44	Switzerland	29	34	1	41	5	549	3	64649	-87212
45	Turkey	25	35	16	29	11	2293	3	27956	12944
46	Ukraine	34	42	11	64	9	390	3	9283	2355
47	United Kingdom	33	41	2	87	4	3038	1	45705	64487

Step 3. The Normalization Process and the Formation of the Normalization Matrix
In the normalization process, the calculation was made by assigning the minimization status for the criteria labeled Min and the maximization statues for the criteria labeled Max. The normalization calculations are shown in Table 3.

For this, the formula =IF(M$1="Maks";(M2-MIN(M$2:M$47))/(MAX(M$2:M$47)-MIN(M$2:M$47));((MAX(M$2:M$47)-M2)/(MAX(M$2:M$47)-MIN(M$2:M$47)))) is written in line B51.

Table 3: Normalization Process

	A	B	C	D	E	F	G	H	I	J
50		C1	C2	C3	C4	C5	C6	C7	C8	C9
51	**Reference**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**

52	Albania	0,623	0,882	0,916	0,654	0,591	0,006	0,553	0,061	0,564
53	Armenia	0,772	1,000	0,884	0,769	0,456	0,004	0,699	0,029	0,558
54	Austria	0,134	0,231	0,910	0,622	0,915	0,104	0,309	0,451	0,605
55	Azerbaijan	1,000	0,687	0,898	0,935	0,900	0,039	0,079	0,108	0,565
56	Belarus	0,641	0,559	0,734	0,773	0,883	0,041	0,362	0,128	0,565
57	Belgium	0,049	0,125	0,897	0,467	0,861	0,124	0,093	0,412	0,587
58	Bosnia and Herzegovina	0,252	0,494	0,958	0,835	0,345	0,008	0,374	0,062	0,559
59	Bulgaria	0,562	0,736	0,877	0,929	0,897	0,035	0,391	0,159	0,569
60	Croatia	0,231	0,315	0,949	0,624	0,769	0,022	0,308	0,190	0,563
61	Cyprus	0,380	0,622	0,995	0,461	0,797	0,005	0,505	0,329	0,577
62	Czech Republic	0,343	0,539	0,907	0,858	1,000	0,088	0,343	0,302	0,616
63	Denmark	0,006	0,151	1,000	0,850	0,907	0,067	0,057	0,451	0,567
64	Estonia	0,401	0,547	0,827	1,000	0,890	0,008	0,503	0,270	0,564
65	Finland	0,088	0,065	0,971	0,701	0,808	0,056	0,261	0,394	0,564
66	France	0,000	0,000	0,911	0,483	0,758	0,679	0,108	0,387	0,794
67	Georgia	0,623	0,864	0,878	0,792	0,584	0,007	0,645	0,042	0,564
68	Germany	0,264	0,404	0,922	0,705	0,964	1,000	0,096	0,455	0,720
69	Greece	0,207	0,279	0,996	0,000	0,402	0,069	0,205	0,219	0,583
70	Hungary	0,258	0,313	0,863	0,650	0,954	0,069	0,684	0,247	0,597
71	Iceland	0,258	0,428	0,874	0,844	0,982	0,002	0,629	0,489	0,554
72	Ireland	0,711	0,963	1,000	0,674	0,883	0,086	1,000	0,719	0,133
73	Italy	0,116	0,245	0,966	0,292	0,722	0,549	0,000	0,325	0,711
74	Kosovo	0,696	0,916	0,978	0,949	0,000	0,002	0,526	0,043	0,579
75	Latvia	0,480	0,617	0,882	0,831	0,804	0,011	0,656	0,227	0,562
76	Lithuania	0,498	0,734	0,883	0,841	0,872	0,020	0,432	0,277	0,562
77	Luxembourg	0,228	0,444	0,916	0,921	0,890	0,012	0,350	1,000	0,520
78	North Macedonia	0,629	0,817	0,952	0,820	0,317	0,005	0,301	0,085	0,561
79	Malta	0,410	0,643	0,934	0,787	0,922	0,002	0,929	0,385	0,582
80	Moldova	0,395	0,828	0,850	0,891	0,964	0,003	0,526	0,000	0,557
81	Montenegro	0,310	0,286	0,879	0,635	0,534	0,000	0,610	0,118	0,559
82	Netherlands	0,225	0,441	0,943	0,735	0,947	0,220	0,279	0,494	1,000
83	Norway	0,243	0,214	0,868	0,836	0,947	0,088	0,087	0,675	0,440
84	Poland	0,374	0,488	0,943	0,770	0,954	0,276	0,711	0,248	0,629
85	Portugal	0,350	0,374	0,971	0,353	0,840	0,073	0,202	0,249	0,587
86	Romania	0,653	0,806	0,749	0,837	0,932	0,116	0,547	0,193	0,593
87	Russia	0,669	0,699	0,861	0,966	0,918	0,967	0,245	0,221	0,641
88	Serbia	0,307	0,499	0,920	0,736	0,605	0,026	0,585	0,103	0,582
89	Slovakia	0,404	0,505	0,884	0,767	0,843	0,041	0,547	0,280	0,559
90	Slovenia	0,310	0,413	0,934	0,655	0,890	0,015	0,609	0,296	0,565

91	Spain	0,380	0,481	0,938	0,492	0,534	0,426	0,278	0,330	0,834
92	Sweden	0,067	0,216	0,915	0,823	0,858	0,122	0,246	0,460	0,627
93	Switzerland	0,538	0,723	0,986	0,815	0,911	0,124	0,278	0,577	0,000
94	Turkey	0,647	0,705	0,000	0,880	0,698	0,525	0,284	0,208	0,638
95	Ukraine	0,365	0,466	0,345	0,681	0,751	0,087	0,406	0,020	0,571
96	United Kingdom	0,392	0,496	0,887	0,550	0,943	0,696	0,087	0,386	0,967

Step 4. The Calculation of the Absolute Value Table

Table 4 was calculated by showing the absolute differences between the normalized reference curve value and the normalized alternative value. For this, the formula =1-B52 is written on the M52 line.

Table 4: Absolute Value Table

	L	M	N	O	P	Q	R	S	T	U
51		**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**
52	Albania	0,377	0,118	0,084	0,346	0,409	0,994	0,447	0,939	0,436
53	Armenia	0,228	0,000	0,116	0,231	0,544	0,996	0,301	0,971	0,442
54	Austria	0,866	0,769	0,090	0,378	0,085	0,896	0,691	0,549	0,395
55	Azerbaijan	0,000	0,313	0,102	0,065	0,100	0,961	0,921	0,892	0,435
56	Belarus	0,359	0,441	0,266	0,227	0,117	0,959	0,638	0,872	0,435
57	Belgium	0,951	0,875	0,103	0,533	0,139	0,876	0,907	0,588	0,413
58	Bosnia and Herzegovina	0,748	0,506	0,042	0,165	0,655	0,992	0,626	0,938	0,441
59	Bulgaria	0,438	0,264	0,123	0,071	0,103	0,965	0,609	0,841	0,431
60	Croatia	0,769	0,685	0,051	0,376	0,231	0,978	0,692	0,810	0,437
61	Cyprus	0,620	0,378	0,005	0,539	0,203	0,995	0,495	0,671	0,423
62	Czech Republic	0,657	0,461	0,093	0,142	0,000	0,912	0,657	0,698	0,384
63	Denmark	0,994	0,849	0,000	0,150	0,093	0,933	0,943	0,549	0,433
64	Estonia	0,599	0,453	0,173	0,000	0,110	0,992	0,497	0,730	0,436
65	Finland	0,912	0,935	0,029	0,299	0,192	0,944	0,739	0,606	0,436
66	France	1,000	1,000	0,089	0,517	0,242	0,321	0,892	0,613	0,206
67	Georgia	0,377	0,136	0,122	0,208	0,416	0,993	0,355	0,958	0,436
68	Germany	0,736	0,596	0,078	0,295	0,036	0,000	0,904	0,545	0,280
69	Greece	0,793	0,721	0,004	1,000	0,598	0,931	0,795	0,781	0,417
70	Hungary	0,742	0,687	0,137	0,350	0,046	0,931	0,316	0,753	0,403
71	Iceland	0,742	0,572	0,126	0,156	0,018	0,998	0,371	0,511	0,446
72	Ireland	0,289	0,037	0,000	0,326	0,117	0,914	0,000	0,281	0,867
73	Italy	0,884	0,755	0,034	0,708	0,278	0,451	1,000	0,675	0,289
74	Kosovo	0,304	0,084	0,022	0,051	1,000	0,998	0,474	0,957	0,421
75	Latvia	0,520	0,383	0,118	0,169	0,196	0,989	0,344	0,773	0,438
76	Lithuania	0,502	0,266	0,117	0,159	0,128	0,980	0,568	0,723	0,438
77	Luxembourg	0,772	0,556	0,084	0,079	0,110	0,988	0,650	0,000	0,480
78	North Macedonia	0,371	0,183	0,048	0,180	0,683	0,995	0,699	0,915	0,439

79	Malta	0,590	0,357	0,066	0,213	0,078	0,998	0,071	0,615	0,418
80	Moldova	0,605	0,172	0,150	0,109	0,036	0,997	0,474	1,000	0,443
81	Montenegro	0,690	0,714	0,121	0,365	0,466	1,000	0,390	0,882	0,441
82	Netherlands	0,775	0,559	0,057	0,265	0,053	0,780	0,721	0,506	0,000
83	Norway	0,757	0,786	0,132	0,164	0,053	0,912	0,913	0,325	0,560
84	Poland	0,626	0,512	0,057	0,230	0,046	0,724	0,289	0,752	0,371
85	Portugal	0,650	0,626	0,029	0,647	0,160	0,927	0,798	0,751	0,413
86	Romania	0,347	0,194	0,251	0,163	0,068	0,884	0,453	0,807	0,407
87	Russia	0,331	0,301	0,139	0,034	0,082	0,033	0,755	0,779	0,359
88	Serbia	0,693	0,501	0,080	0,264	0,395	0,974	0,415	0,897	0,418
89	Slovakia	0,596	0,495	0,116	0,233	0,157	0,959	0,453	0,720	0,441
90	Slovenia	0,690	0,587	0,066	0,345	0,110	0,985	0,391	0,704	0,435
91	Spain	0,620	0,519	0,062	0,508	0,466	0,574	0,722	0,670	0,166
92	Sweden	0,933	0,784	0,085	0,177	0,142	0,878	0,754	0,540	0,373
93	Switzerland	0,462	0,277	0,014	0,185	0,089	0,876	0,722	0,423	1,000
94	Turkey	0,353	0,295	1,000	0,120	0,302	0,475	0,716	0,792	0,362
95	Ukraine	0,635	0,534	0,655	0,319	0,249	0,913	0,594	0,980	0,429
96	United Kingdom	0,608	0,504	0,113	0,450	0,057	0,304	0,913	0,614	0,033

Step 5. The Formation of Grey Relational Coefficient Matrix

After the absolute values table was formed, the values of Δmax and Δmin were determined by making use of the values in this table. As distinguishing coefficient, ζ =0.5 was used. Grey relational coefficients, which were created by using the calculated parameters, are indicated in Table 5.

For this, the formula =($B$146+($B$147*$B$145))/(M52+($B$147*$B$145)) is written to the B100 line.

Table 5: Grey Relational Coefficients

	A	B	C	D	E	F	G	H	I	J
99		**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**
100	Albania	1,017	1,443	1,526	1,055	0,981	0,597	0,942	0,620	0,953
101	Armenia	1,225	1,784	1,448	1,221	0,854	0,596	1,114	0,606	0,947
102	Austria	0,653	0,703	1,511	1,016	1,524	0,639	0,749	0,850	0,996
103	Azerbaijan	1,784	1,098	1,482	1,580	1,488	0,610	0,628	0,641	0,954
104	Belarus	1,039	0,948	1,164	1,227	1,445	0,611	0,784	0,650	0,954
105	Belgium	0,615	0,649	1,481	0,864	1,397	0,648	0,634	0,820	0,977
106	Bosnia and Herzegovina	0,715	0,887	1,645	1,341	0,773	0,598	0,792	0,620	0,948
107	Bulgaria	0,951	1,168	1,432	1,562	1,479	0,609	0,804	0,665	0,958
108	Croatia	0,703	0,753	1,620	1,019	1,220	0,604	0,748	0,681	0,952
109	Cyprus	0,796	1,016	1,767	0,858	1,269	0,597	0,897	0,762	0,966
110	Czech Republic	0,771	0,928	1,505	1,389	1,784	0,632	0,771	0,745	1,010
111	Denmark	0,597	0,661	1,784	1,373	1,506	0,622	0,618	0,850	0,957
112	Estonia	0,812	0,936	1,326	1,784	1,462	0,598	0,895	0,725	0,953

113	Finland	0,632	0,622	1,685	1,116	1,289	0,618	0,720	0,806	0,953
114	France	0,595	0,595	1,514	0,877	1,202	1,087	0,641	0,802	1,263
115	Georgia	1,017	1,402	1,434	1,260	0,974	0,598	1,044	0,612	0,953
116	Germany	0,722	0,814	1,544	1,122	1,666	1,784	0,636	0,854	1,143
117	Greece	0,690	0,731	1,769	0,595	0,813	0,624	0,689	0,697	0,973
118	Hungary	0,718	0,751	1,401	1,049	1,633	0,623	1,094	0,712	0,988
119	Iceland	0,718	0,832	1,424	1,359	1,723	0,595	1,024	0,882	0,943
120	Ireland	1,131	1,660	1,783	1,080	1,445	0,631	1,784	1,142	0,653
121	Italy	0,644	0,711	1,670	0,739	1,147	0,938	0,595	0,759	1,130
122	Kosovo	1,110	1,528	1,708	1,619	0,595	0,596	0,916	0,612	0,968
123	Latvia	0,875	1,010	1,443	1,334	1,282	0,599	1,056	0,701	0,951
124	Lithuania	0,891	1,165	1,447	1,354	1,420	0,603	0,836	0,729	0,951
125	Luxembourg	0,701	0,845	1,528	1,542	1,462	0,600	0,776	1,784	0,910
126	North Macedonia	1,024	1,306	1,628	1,313	0,754	0,597	0,744	0,630	0,950
127	Malta	0,819	1,040	1,576	1,251	1,543	0,596	1,562	0,800	0,972
128	Moldova	0,807	1,327	1,372	1,465	1,666	0,596	0,916	0,595	0,946
129	Montenegro	0,750	0,735	1,436	1,031	0,923	0,595	1,003	0,646	0,948
130	Netherlands	0,700	0,843	1,601	1,167	1,612	0,697	0,731	0,887	1,784
131	Norway	0,710	0,694	1,412	1,344	1,612	0,632	0,631	1,081	0,841
132	Poland	0,792	0,881	1,602	1,222	1,633	0,729	1,131	0,712	1,024
133	Portugal	0,775	0,793	1,685	0,778	1,351	0,625	0,687	0,713	0,977
134	Romania	1,054	1,285	1,188	1,346	1,572	0,645	0,936	0,682	0,984
135	Russia	1,073	1,114	1,396	1,672	1,533	1,674	0,711	0,697	1,038
136	Serbia	0,748	0,892	1,538	1,167	0,997	0,605	0,975	0,639	0,972
137	Slovakia	0,814	0,897	1,448	1,217	1,359	0,612	0,936	0,731	0,948
138	Slovenia	0,750	0,821	1,576	1,056	1,462	0,601	1,001	0,741	0,954
139	Spain	0,796	0,875	1,588	0,885	0,923	0,831	0,730	0,763	1,339
140	Sweden	0,622	0,695	1,525	1,318	1,389	0,647	0,712	0,857	1,022
141	Switzerland	0,927	1,148	1,734	1,302	1,515	0,648	0,730	0,966	0,595
142	Turkey	1,046	1,121	0,595	1,439	1,112	0,915	0,734	0,690	1,035
143	Ukraine	0,786	0,863	0,772	1,090	1,191	0,631	0,816	0,603	0,960
144	United Kingdom	0,805	0,889	1,455	0,939	1,602	1,110	0,631	0,801	1,674
145	**Δ_{MAX}**	**1,000**								
146	**Δ_{MIN}**	**0,392**								
147	**ζ**	**0,5**								

Step 6. The Calculation of Grey Relational Degrees

Grey relational degrees are determined by using the calculated Grey relational coefficients, and then the analysis ends up with the determination of the best ideal alternative and the rankings of Grey relational degrees. When the criteria have equal importance, Grey relational degrees are the arithmetic mean of grey relational coefficients of the criteria for each alternative.

The calculations related to the above may be seen in Table 6. For this, the formula =AVERAGE (M100:U100) is written to V100 line. For the ranking of countries' performances, the formula =RANK (V100;$V$100:$V$144;0) is written to W100 line.

Table 6: Grey Relational Degrees and Their Alternative Gradation

	L	M	N	O	P	Q	R	S	T	U	V	W
99		**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**	**Rİ**	**RANK**
100	Albania	1,02	1,44	1,53	1,06	0,98	0,60	0,94	0,62	0,95	**1,01**	**22**
101	Armenia	1,23	1,78	1,45	1,22	0,85	0,60	1,11	0,61	0,95	**1,09**	**9**
102	Austria	0,65	0,70	1,51	1,02	1,52	0,64	0,75	0,85	1,00	**0,96**	**34**
103	Azerbaijan	1,78	1,10	1,48	1,58	1,49	0,61	0,63	0,64	0,95	**1,14**	**4**
104	Belarus	1,04	0,95	1,16	1,23	1,44	0,61	0,78	0,65	0,95	**0,98**	**30**
105	Belgium	0,61	0,65	1,48	0,86	1,40	0,65	0,63	0,82	0,98	**0,90**	**42**
106	Bosnia and Herzegovina	0,71	0,89	1,65	1,34	0,77	0,60	0,79	0,62	0,95	**0,92**	**40**
107	Bulgaria	0,95	1,17	1,43	1,56	1,48	0,61	0,80	0,67	0,96	**1,07**	**14**
108	Croatia	0,70	0,75	1,62	1,02	1,22	0,60	0,75	0,68	0,95	**0,92**	**41**
109	Cyprus	0,80	1,02	1,77	0,86	1,27	0,60	0,90	0,76	0,97	**0,99**	**29**
110	Czech Republic	0,77	0,93	1,51	1,39	1,78	0,63	0,77	0,74	1,01	**1,06**	**16**
111	Denmark	0,60	0,66	1,78	1,37	1,51	0,62	0,62	0,85	0,96	**1,00**	**24**
112	Estonia	0,81	0,94	1,33	1,78	1,46	0,60	0,89	0,73	0,95	**1,05**	**18**
113	Finland	0,63	0,62	1,68	1,12	1,29	0,62	0,72	0,81	0,95	**0,94**	**37**
114	France	0,59	0,59	1,51	0,88	1,20	1,09	0,64	0,80	1,26	**0,95**	**35**
115	Georgia	1,02	1,40	1,43	1,26	0,97	0,60	1,04	0,61	0,95	**1,03**	**20**
116	Germany	0,72	0,81	1,54	1,12	1,67	1,78	0,64	0,85	1,14	**1,14**	**3**
117	Greece	0,69	0,73	1,77	0,59	0,81	0,62	0,69	0,70	0,97	**0,84**	**45**
118	Hungary	0,72	0,75	1,40	1,05	1,63	0,62	1,09	0,71	0,99	**1,00**	**23**
119	Iceland	0,72	0,83	1,42	1,36	1,72	0,60	1,02	0,88	0,94	**1,06**	**17**
120	Ireland	1,13	1,66	1,78	1,08	1,44	0,63	1,78	1,14	0,65	**1,26**	**1**
121	Italy	0,64	0,71	1,67	0,74	1,15	0,94	0,59	0,76	1,13	**0,93**	**39**
122	Kosovo	1,11	1,53	1,71	1,62	0,59	0,60	0,92	0,61	0,97	**1,07**	**13**
123	Latvia	0,87	1,01	1,44	1,33	1,28	0,60	1,06	0,70	0,95	**1,03**	**21**
124	Lithuania	0,89	1,16	1,45	1,35	1,42	0,60	0,84	0,73	0,95	**1,04**	**19**
125	Luxembourg	0,70	0,84	1,53	1,54	1,46	0,60	0,78	1,78	0,91	**1,13**	**6**
126	North Macedonia	1,02	1,31	1,63	1,31	0,75	0,60	0,74	0,63	0,95	**0,99**	**28**
127	Malta	0,82	1,04	1,58	1,25	1,54	0,60	1,56	0,80	0,97	**1,13**	**5**
128	Moldova	0,81	1,33	1,37	1,47	1,67	0,60	0,92	0,59	0,95	**1,08**	**12**
129	Montenegro	0,75	0,73	1,44	1,03	0,92	0,59	1,00	0,65	0,95	**0,90**	**43**
130	Netherlands	0,70	0,84	1,60	1,17	1,61	0,70	0,73	0,89	1,78	**1,11**	**7**
131	Norway	0,71	0,69	1,41	1,34	1,61	0,63	0,63	1,08	0,84	**1,00**	**27**
132	Poland	0,79	0,88	1,60	1,22	1,63	0,73	1,13	0,71	1,02	**1,08**	**10**
133	Portugal	0,78	0,79	1,69	0,78	1,35	0,63	0,69	0,71	0,98	**0,93**	**38**

134	Romania	1,05	1,29	1,19	1,35	1,57	0,64	0,94	0,68	0,98	**1,08**	**11**
135	Russia	1,07	1,11	1,40	1,67	1,53	1,67	0,71	0,70	1,04	**1,21**	**2**
136	Serbia	0,75	0,89	1,54	1,17	1,00	0,61	0,98	0,64	0,97	**0,95**	**36**
137	Slovakia	0,81	0,90	1,45	1,22	1,36	0,61	0,94	0,73	0,95	**1,00**	**25**
138	Slovenia	0,75	0,82	1,58	1,06	1,46	0,60	1,00	0,74	0,95	**1,00**	**26**
139	Spain	0,80	0,88	1,59	0,89	0,92	0,83	0,73	0,76	1,34	**0,97**	**32**
140	Sweden	0,62	0,69	1,53	1,32	1,39	0,65	0,71	0,86	1,02	**0,98**	**31**
141	Switzerland	0,93	1,15	1,73	1,30	1,51	0,65	0,73	0,97	0,59	**1,06**	**15**
142	Turkey	1,05	1,12	0,59	1,44	1,11	0,91	0,73	0,69	1,04	**0,97**	**33**
143	Ukraine	0,79	0,86	0,77	1,09	1,19	0,63	0,82	0,60	0,96	**0,86**	**44**
144	United Kingdom	0,81	0,89	1,45	0,94	1,60	1,11	0,63	0,80	1,67	**1,10**	**8**

In Table 6, it may be seen that the ten countries that have the most successful macroeconomic performance are Ireland, Russia, Germany, Azerbaijan, Malta, Luxembourg, Netherlands, United Kingdom, Armenia and Poland, respectively. Conversely, the ten countries which have the lowest macroeconomic performance were determined as France, Serbia, Finland, Portugal, Italy, Bosnia and Herzegovina, Croatia, Belgium, Montenegro, Ukraine and Greece, respectively. The ranking of Turkey was thirty-three among forty-four countries.

Nine evaluation criteria that can affect the economic performances of the countries were used. Each of these criteria, actually, is a risk factor. This risk is divided into two categories, basically. The first is systematic risk which can be defined as the risk factors the whole market is exposed to. The effects of these risk factors can be reduced, but it is not possible to eliminate it totally. The second is nonsystematic risk which is the risk factors in relation with the country itself. Unlike the first one, this risk factor can be eliminated completely. The possible changes in these risk factors will change the macroeconomic performances of the countries.

5. CONCLUSION

Two important results were obtained from this study. The first one is the presentation of the application of the Grey relational analysis (GRA) method. The solution of the GRA method consists of six steps, the determination of a decision matrix, the formation of a reference series and a comparison matrix, the realization of the normalization process, the acquisition of the absolute value table, the calculation of the Grey relational coefficient matrix, and, finally, creating Grey relational degrees and making the alternative rankings.

The second one is knowledge of the economic performances of the European countries. Based on this. It was seen that the ten countries with the most successful macroeconomic performance are Ireland, Russia, Germany, Azerbaijan, Malta, Luxembourg, Netherlands, United Kingdom, Armenia, and Poland. respectively. Conversely, it was found that the ten countries with the lowest economic performance are France, Serbia, Finland, Portugal, Italy, Bosnia and Herzegovina, Croatia, Belgium, Montenegro, Ukraine, and Greece. respectively.

The ranking of Turkey is thirty-three among forty-four countries. These rankings change depending upon the possible variance in the values of the used criteria.

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BANK CREDITS AND RENT-PRICE RELATION: AN INTERPRETATION ON THE ROLES OF CREDITS IN ECONOMY AND TIME SERIES ANALYSIS WITH STRUCTURAL BREAK

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ABSTRACT

Purpose- This study argues that interest rate and credit usage will affect rents negatively but prices positively. The study; aims to test, explain, interpret the effect of interest rates on these two variables and offer appropriate policy recommendations.
Methodology- Theory tested on the US housing market with the structural break time series analysis between 2005Q1-2020Q1. Least squares (LS) and Newey-West estimators used, and the interpreted output was the Newey-West estimator.
Findings- According to the results reached, the increase in mortgage interest rates for the 2005Q1-2009Q1 and 2011Q4-2020Q1 period decreases the housing rent / price ratio. For the 2009Q2-2011Q3 period, in which the effects of the 2008 Global Financial Crisis are observed in the model, this relationship is observed positively.
Conclusion- As a result of the predicted model, the impact of credit usage on other economic factors evaluated. Credit usage and interest rates have different effects on prices and rents. This is explained by the substitution relationship between rental and purchase. The study states that interest rates should be evaluated as a tool to balance rents and prices. The study contributes to the literature by revealing the accuracy of this supervisory power attributed to interest rates and bank loans.

Keywords: Credit usage lease and purchase relationship, rent-price relationship, financial system, effect of interest rate on rent and price
JEL Codes: E51, G10, H81

BANKA KREDİLERİ VE KİRA-FİYAT İLİŞKİSİ: KREDİLERİN EKONOMİDEKİ ROLLERİ ÜZERİNE BİR YORUM VE YAPISAL KIRILMALI ZAMAN SERİLERİ ANALİZİ

ÖZET

Amaç- Bu çalışma faiz ve kredi kullanımının kiraları olumsuz yönde etkileyeceğini, ancak fiyatları olumlu etkileyeceğini savunmaktadır. Çalışma; faiz oranlarının bu iki değişkene etkisi test etmek, açıklamak, yorumlamak ve uygun politika önerisi sunmayı amaçlamaktadır.
Yöntem- Teori, ABD konut piyasası üzerinde 2005Ç1-2020Ç1 dönemleri arasında yapısal kırılmalı zaman serileri analizi ile test edilmiştir. En küçük kareler ve Newey-West tahmincileri kullanılmış, yorumlanan çıktı ise Newey-West tahmincisi olmuştur.
Bulgular- Ulaşılan sonuçlara göre 2005Ç1-2009Ç1 ve 2011Ç4-2020Ç1 dönemi için mortgage faiz oranlarındaki artış konut kira/fiyat oranını azaltmaktadır. Modelde 2008 Küresel Finansal Krizin etkilerinin görüldüğü 2009Ç2-2011Ç3 dönemi için ise bu ilişkinin doğrusal olduğu görülmektedir.
Sonuç- Tahmin edilen model sonucu kredi kullanımının diğer ekonomik unsurlara etkisi değerlendirilmiştir. Kredi kullanımı ve faiz oranlarının, fiyat ve kiralar üzerinde farklı etkilere neden olmaktadır. Bu durum kiralama ve satın alma arasındaki ikame ilişkisi ile açıklanmıştır. Çalışma, faiz oranlarının kiralar ve fiyatları dengeleyecek bir araç olarak değerlendirilmesi gerektiğini belirtmektedir. Çalışma faiz oranları ve banka kredileri üzerine atfedilen bu denetim gücünün doğruluğunu ortaya koyarak literatüre katkı yapmaktadır.

Anahtar Kelimeler: Kredi kullanımı kiralama ve satın alma ilişkisi, kira-fiyat ilişkisi, finansal sistem, faiz oranının fiyat ve kiralara etkisi
JEL Kodları: E51, G10, H81

1. GİRİŞ

Finansal araçların çeşitlenmesi, bankacılık sisteminin gelişmesi ve teknolojik ilerlemeyle birlikte günümüzde, fon arz ve talep eden unsurların buluşmasını oldukça kolaylaştırmıştır. Bireyler küçük ölçekli, günlük işlemlerini dahi kredi kartı kullanarak sürdürebilmektedir. Doğal olarak bu durum ve bu durumun sonuçları pek çok tartışmanın ana öğesi olmuştur.

Olağan bir ekonomide fiyat ve kiraların doğrusal hareket etmesi gerekmektedir. Oysa bu çalışmaya göre faizler ve banka kredileri fiyatlar üzerinde doğrusal, kiralar üzerinde ters yönlü etkide bulunmak yoluyla söz konusu beklentiyi kırmaktadır. Bu çalışma ilk önce türlerine göre banka kredilerinin piyasaya etkilerine değinmeyi ardından bireylerin kredi kullanma nedenlerinden yola çıkıp kredi kullanımı sonucunda varlık fiyat ve kiralarının ne gibi bir tepki vereceğini analiz ederek söz konusu durumu sistematik bir kanuna dönüştürmeyi amaçlamaktadır.

İlk bölümde faizler ve banka kredileri ele alınmıştır. İletişim teknolojilerinin gelişimiyle bankacılık sektöründe yaşanan dönüşüm, kredilerin ve borçlanma araçlarının ekonomik işlemlerde artan önemi ve değişen rolleri ele alınmıştır. Temel tüketimlerin bile borçlanarak gerçekleştirilme olanağının artması, borçlanma maliyetleri ve talep ilişkisini güçlendirmiştir. Bu çalışma, tüketicinin kredi kullanım nedeni bir malın iyeliğini satın almak biçiminde açıklamaktadır. Bu açıklamanın altında yatan varsayım tüketicinin kredi maliyetine kira ödemesinden kaçınmak amacıyla katlanacağıdır. Dolayısıyla tüketici için bir varlığın a- iyeliğini satın almak b- belirli bir süre için kullanım hakkını satın almak diğer bir deyişle kiralamak üzere iki seçenek bulunmaktadır. Bu ikame ilişkisi nedeniyle kredi kullanımı maliyetinin ana unsuru olan faizler, fiyatlar ile doğrusal, kiralar ile ters yönlü ilişki içindedir. Çalışma kredi kullanımı, kira ve fiyat arasındaki ilişkinin çeşitli kredi türlerine göre farklılık göstereceğini de öngörmektedir.

İkinci bölümde fiyat-kira ilişkisi derinlemesine ele alınmıştır. Buna göre sağlıklı bir ekonomide varlık fiyatları ve kiralarının doğrusal hareket etmesi beklenir. Ancak faiz oranlarındaki anlık düşüşler ve kredi hacminin kontrolsüz genişlemesi fiyat-kira ilişkisini ters yönlü duruma getirmektedir. Bu durumun nedeni ve etkileri incelenmiştir. Daha önce yapılan çalışmalar sağlıklı bir ekonomi için kira enflasyonunun kira dışı enflasyondan yüksek olmasını öngörmüştür. Ancak bu çalışma bu bağlantının sürdürülebilir olmadığını öngörmektedir. Söz konusu değişkenler yerine kira ve fiyat ilişkisinden yola çıkarak sağlıklı bir varsayım ortaya koymak istenmiştir. Buna göre sağlıklı bir ekonomi için kiralar ve fiyatlar eş doğrultuda seyretmelidir. Ancak fiyatlardaki artış o malın üretimini artırdığı ve ekonomide miktarı artan bu malın getirisi olan kiraların düştüğü görülmektedir. Dolayısıyla kira/fiyat oranını eş doğrultuda tutmak için faizler bir araç olarak kullanılmalıdır.

Üçüncü bölümde çalışmanın hipotezi ekonometrik model ile sınanmıştır. Zaman serisi yöntemi kullanılarak yapılan tahmin 2005Ç1-2020Ç1 dönemi arası ABD konut piyasası üzerinde gerçekleştirilmiştir. Tahmin sonucu modelde yapısal kırılma tespit edilmiştir. Yapılan testler sonucu yapısal kırılmanın 2009Ç2-2011Ç3 dönemi arası olduğu anlaşılmıştır. 2008 Küresel Finansal Krizin etkisinin görüldüğü bu dönem dışında mortgage faizlerindeki artışın, ABD konut kira/fiyat oranını azalttığı sonucuna varılmıştır. Yapısal kırılmanın olduğu dönemde ise bu ilişki pozitif eğimlidir.

Çalışmanın sonuç ve öneri kısmında ise faiz ve banka kredilerinin politika yapıcı tarafından doğru biçimde ve daha etkin bir araç olarak kullanılması için önerilerde bulunulmuştur. Kredi maliyetlerinin vadelerine göre ayrılarak değerlendirilmesi ekonomiyi pek çok iktisadi amaca ulaştırabilecek bir uygulama olacaktır. Bu iktisadi amaçlardan bazıları; yurtiçi tasarruf oranının artması, sanayinin gelişmesi, aşırı kapasite üretim nedeniyle etkin olmayan sektörlerdeki baskının azaltılması, düşük ölçekli üretim yapması nedeniyle üretim maliyetlerinin yüksek olduğu sektörlerde üretimi artırmaktır.

2. BANKA KREDİLERİ

Belirli bir vade sonunda faiz karşılığı ile birlikte bankaya geri ödenmek koşuluyla ödünç alınan banka kredileri finansal sistemin aktarım çarklarını döndüren önemli bir yatırım ve finansman aracıdır. Diğer araçlar gibi banka kredilerinin kullanımındaki temel hedef fon arz ve talepçilerini buluşturmak, parasal aktarım mekanizmasına işlerlik kazandırmaktır. Öte yandan, banka kredilerinin diğer finansal araçlardan en ayırt edici özelliği kullanım kolaylığı ve yaygınlığıdır. Firmaların bilançolarına bakıldığında banka kredilerinin ağırlıkta olduğu görülmektedir(Balkaş, 2004, p. 1). Son yıllarda ivediyle gelişen ve kullanımı yaygınlaşan teknolojinin, geleneksel alışveriş alışkanlığını değiştirmesi ve kredili alışveriş ile banka kartı kullanımının kolaylaşması gibi durumlar göz önüne alındığında en ufak tüketimin dahi banka kredileriyle yapılabileceği anlaşılmaktadır. Bu durum, bir politika aracı olarak banka kredilerinin etkinliğini de artırmıştır. Ayrıca banka kredilerinin finansal sistem içerisinde bu denli yaygın oluşu ve yerini başka araçlara bırakamayacak, başka araçların da banka kredilerinin yerini dolduramayacak oluşu finansal sistemin banka kredileri ve bankacılık sektörü ile ortak anılmasına neden olmuştur. Dolayısıyla banka kredileri, finansal sistemin durumunu anlatan en önemli ve en çok kullanılan göstergelerden biri konumuna gelmiştir. Öyle ki Kar ve Pentecost (2000), Ceylan ve Durkaya (2010), Kaya, Gülhan ve Güngör (2013), Çeştepe ve Yildirim (2016) çalışmalarında finansal genişlemenin göstergesi olarak banka kredilerine vurgu yapmaktadırlar.

Bu gün pek çok çalışmanın temel konusu olsa da finans, bankacılık ve para kesimi önceki dönemlerde göz ardı edilmiştir. Geçmişte, Neoklasik büyüme teorileri finansal genişlemeye herhangi bir rol biçmemiş(Çeştepe & Yildirim, 2016, p. 13), Keynesci görüş ise para politikalarını göz ardı etmiş, bunun sonucu olarak finansal sistem ve finansal araçlar ekonomide hak ettiği ilgiyi uzun zaman görmemiştir. Ancak bu durumu petrol krizleri bozmuştur. Özellikle petrol krizlerinden sonra önemi anlaşılan para politikaları geçmişe kıyasla günümüzde çok daha ön plandadır. Belki de bunun en büyük göstergesi 2008 Dünya Krizine neden olan yetersiz talep sorununun mali politikalarla değil, para politikaları öncülüğünde çözülmesidir. Amerikan Federal Bankası (FED) 2008 yılı başında sekiz yüz milyon dolar seviyelerinde bulunan parasal tabanı 2014 yılında dört milyar dolar seviyelerine çıkartmış (Monetary Data: FRED St. Louis Fed, 2020) ve FED'in uyguladığı politikalar sonrası faizler tarihi seviyelere düşmüştür(Arslan & Kanık, 2012, p. 4).

Para politikaları ve finansal sistem uygulamada uzunca bir dönem geri planda kalmış olsa bile, finansal sitemin büyüme ve diğer reel değişkenler üzerine etkisi konusundaki düşünce ve modeller yüzyıl öncesine uzanabilmektedir. Konu üzerinde Bagehot (1873) ilk kez durmuş ve onun ardından Schumpeter (1911) tarafından ekonomik büyümenin motoru olarak kabul edilen inovasyonu kolaylaştırdığı için finansal sistemin dolaylı olarak büyümeye katkı yapacağı vurgulanmıştır. King ve Levine (1993) Schumpeter'in çalışmasına paralel olarak, finansal sistemin verimlilik üzerine yaptığı etkilere vurgu yapmışlardır. Bunlarla birlikte Robinson (1952) ve Patrick (1966) gibi teorisyenler de finansal genişleme ve büyüme arasındaki nedensellik ilişkisine odaklanmıştır. Ülkemiz günceline gelindiğinde ise Kaya, Gülhan ve Güngör (2013) 1998-2009 dönemini kapsayan gözlemsel çalışmaları sonucu Türkiye'de finansal kesimin reel sektörü ve büyümeyi önemli derecede etkilediği sonucuna ulaşmışlardır. Bu çalışmanın hipotezi olan fiyat, faiz ve kredi değişkenleri arasındaki ters yönlü nedensellik ilişkisinin anlaşılması için kredi kullanımı ve büyüme (üretim) arasındaki bu bağlantı önem arz etmektedir(Bkz. 2.1.).

King ve Levine'nin vurguladığı gibi, finansal sistemin, verimlilik üzerine ciddi ölçüde etkisi bulunmaktadır. Yalnız, finansal piyasalar, fon aktarımı yoluyla ekonomik etkinliği artırmakla kalmayıp verilen kredilerin ve diğer finansal araçların niteliklerine göre ekonomide reel değişkenleri etkileme ve ekonomiye yön verme gücünü de elinde bulundurur. Söz gelimi, kısa vadeli ve düşük miktarlı kredilerin maliyetlerindeki bir düşüş ya da kredi kartı kullanımını kolaylaştıran bir uygulamalar günlük tüketim malları gibi bu tür kredilerin hitap ettiği ürünlerin talebi ve fiyatını artırırken, uzun vadeli kredilerdeki bir maliyet düşüşü konut ve taşıt gibi ürünlerin piyasalarını genişletecektir. Kredilerin piyasa talebini, dolayısıyla üretim ölçeğini belirlediği göz önüne alınırsa; finansal piyasalar, piyasalar arası üretim maliyetlerinin önemli bir belirleyicisidir. Banka kredilerinin, bankacılık kesiminin ve dolayısıyla para politikalarının bu öneminden dolayı para politikalarının etkin kullanımı hızla artmış ve artan bu kullanım yoğunluğunun da bir sonucu olarak reel piyasalar parasal işlemlere, finans ve bankacılık sektörlerine daha duyarlı biçime gelmiştir.

Finans ve bankacılık kesiminin piyasa içindeki rolü daha somut bir söylemle şu biçimde açıklanabilir; finans ve bankacılık sektörü tarım, sanayi, hizmet sektörleri gibi reel değer üretimine doğrudan katkı yapmaz. Yalnız, reel değer üreten sektörlere kaynak aktarımı yapmak yoluyla reel üretime dolaylı bir katkı sağlar (Alkan, 2016, p. 118). İşte bu dolaylı katkının ne denli olacağı bankacılık sektörünün kaynak aktarımı işindeki etkinliğe, bu kaynakların hangi sektörlerde kullanıldığına, kaynakları kullanan işletmelerin niteliklerine ve son olarak kaynak verme; diğer bir deyişle fonlama maliyetlerine göre değişiklik gösterir. Kredi maliyetleri ise büyük ölçüde para politikaları ve finansal piyasaların işleyişiyle belirlenir.

Özet olarak finansal sitemin en önemli aktörü olan bankacılık kesimi, reel üretim yapan sektörlerde etkinliği artırma görevini üstlenmektedir. Bu konuya şöyle de bakılabilir; bankaların fonlama işlevi, eksik sermaye nedeniyle atıl durumda kalan girişimci faktörünü piyasaya kazandırır. Özellikle gelişmekte olan ülkelerde kıt ve etkin kullanılamayan girişimcilik faktörünün etkin biçimde kullanımı işgücü talebini de artırıp, işsizliği azaltmak yoluyla çıktı miktarını çoğaltacaktır. Bankaların girişimciyi, ticari kredi yoluyla fonlaması ekonomik etkinliği ve büyümeyi artırdığı gibi, girişimci miktarındaki ve işgücü talebindeki artış girişimci karlarını düşürürken, ücretleri yükselterek gelir dağılımındaki dengeyi sağlamlaştıracaktır.

Anlaşılacağı üzere banka kredileri tüketicilerin ve üreticilerin fon taleplerini karşılamak için tercih ettikleri bir kaynaktır. Dolayısıyla banka kredilerinin ekonomiye etkileri üzerinde duran bir takım gözlemsel ve teorik çalışmalarda krediler tüketim ve ticari krediler olarak iki ana kola ayrılmaktadır. Alioğulları, Başkaya, Bulut ve Kılınç (2015) 2003-2015 yılları arası Türkiye üzerinde yaptıkları gözlemsel çalışmada tüketim ve ticari kredilerin cari açıkla ilişkisini incelemiş; tüketim kredilerinin cari açığı artırıcı etkide bulunduğu, ticari kredilerin ise istatistiki olarak anlamlı bir etkisinin olmadığı sonucuna ulaşmışlardır. Öğünç ve Sarikaya (2015) ise bu iki kredi türünün fiyat artışları üzerine etkisini inceledikleri çalışmalarında, tüketici kredilerinin ticari kredilere kıyasla fiyat artışlarının daha güçlü bir destekcisi olacağına dikkat çekmektedir.

Kredi türlerinin etkileri arasındaki farları ortaya koymak için yapılan çalışmalar göz önüne alındığında kullanım amacına göre ticari ya da tüketim kredisi olması, kredilerin fiyatlar üzerindeki etkisini değiştireceği önsel olarak anlaşılmaktadır. Bu bölümde söz konusu iki kredi türü ve ekonomi üzerine potansiyel etkilerinden kısaca bahsedilecektir.

2.1. Tüketici Kredisi

Bir miktar faiz ödemesi karşılığında bireylerin tüketimlerini fonlayan kredi türüdür. Dolayısıyla bu tür kredilerin kullanımı sonrası ekonomi üzerinde duyulması beklenen ilk etki talep ve fiyat artışıdır. Bu durumda üretim artışı, piyasa fiyat artışını takip edecektir.

Tüketici kredileri vadesine ve kullanım biçimine göre değişik ürünler için talep yaratabilme gücünü bünyelerinde barındırmaktadırlar bu nedenden dolayı tüketim kredileri piyasaya yön veren bir ekonomi aracı konumundadır. Söz gelimi; uzun vadeli mevduatlara uygulanan faiz oranlarındaki bir artış, konut kredisi gibi uzun vadeli kredilerin maliyetlerini ve faiz ödemelerini artıracak, dolayısıyla da konut talebini kısacaktır. Diğer yandan kısa dönemli mevduatlara ve kredi kartı gecikme faiz oranlarına uygulanacak faiz indirimi bireylerin gündelik tüketimlerini artıracaktır. Makroekonomik açıdan düşünüldüğünde tüketici kredilerine yönelik politikaların temel amacı, her hangi bir sektörde aşırı talep nedeniyle ortaya çıkan maliyetli üretim durumuna engel olmak ve sektörler arası karlılık farklılıklarını engellemek olmalıdır. Bu bağlamda, ekonomide aşırı kapasite üretimden dolayı birim maliyetlerin yüksek olduğu sektöre; vadesine göre mevduatlara uygulanacak faiz oranları ile cezalandırılmalıdır.

Tüketici kredilerinin diğer bir olumsuz etkisi ise uzun vadeli olan tüketici kredilerinin gelecek dönemlerde efektif talebi daraltmasıdır. 2008 Küresel Finansal Krizi nedenlerinden biri de bu durumdur. Diğer bir deyişle tüketici kredileri, kredi maliyet ve risklerini tüketiciye yükleyerek; bireylerin ekonomik özgürlüklerini daraltmak, gönülsüz ve verimsiz çalışmaya zorlamak gibi sonuçlar doğurabilir. Bu durum daha az ücrete daha çok çalışmak isteyen emek arzcıları ya da tüketici kredisi kullanıcıları ile emek talepçisi olan firmalar arasında gelir aktarımına neden olmaktadır(Daşdemir, 2017, p. 69). Dolayısıyla tüketici kredileri kullanımıyla birlikte kredinin hitap ettiği sektörde bulunan firmaya iki açıdan kazanç sağlamaktadır 1- talep ve fiyat artışı, 2- borç yükündeki artış nedeniyle emek arzı artışı ve ücretlerin düşüşü.

2.2. Ticari Krediler

Firmalarca üretim hedefiyle kullanılan ticari krediler, firmaların en önemli yabancı kaynaklarından biridir. Dolayısıyla öz sermayenin alternatifi olan ticari krediler, üretim faktörü olarak sermaye maliyetinin bir belirleyicisidir. Bu tür kredilerdeki maliyet düşüşü öz kaynak yetersizliğinden dolayı, piyasada atıl kalan girişimci faktörünün piyasaya kazandırılmasını sağlayacaktır.

Ticari kredilerin diğer bir önemi ise, yine sermayenin maliyetini belirlemek yoluyla, sermaye yoğun üretim yapan sektörlerin üretim maliyetlerini; dolayısıyla bu sektörlerin üretim ölçeklerini belirlemesidir. Diğer bir deyişle ticari krediler, sanayileşmenin belirleyicilerinden biridir.

Bu iki özelliğinden dolayı ticari krediler, gelişmekte olan ülkeler için kritik bir konumdadır.

Yine ticari kredilerin diğer bir özelliği, kullanıcısı olan girişimci ya da firmanın, bu borç yükü dolayısıyla daha çok, verimli, az maliyetle üretim yapma isteğine katkı sağlamasıdır.

2.3. Banka Kredileri Üzerine Politika Önerileri

Bu çalışma banka kredileri ve onun alt türlerine yönelik politikaların şu biçimde olması gerektiğini belirtmektedir;

- Banka kredilerine yönelik politikaların hedefi fiyat ve kiraları dengeleyip aşırı fiyat ve kira artışlarını önlemektir.
- Tüketici kredilerine yönelik politikaların hedefi sektörler arası aşırı karlılığı dengelemek, bir sektörde aşırı fiyatlanmadan kaynaklanan maliyetli üretim yapılmasını engellemektir.
- Ticari kredilere yönelik politikaların hedefi piyasada atıl durumda kalan girişimci faktörünü piyasaya kazandırmak, üretimde sermaye kullanımını artırarak emeğin verimliliğini yükseltmek ve sermaye yoğun üretim yapan kesimlere maliyet kolaylığı sağlamak yoluyla sanayileşme gibi hedeflere öncülük etmektir.

Öte yandan Türkiye Ekonomisi için banka kredileri üzerine planlı bir politika izlenmediği ve piyasa üzerine önemli etkileri bulunan bu aracın kontrolünü piyasaya bıraktığı söylenebilir. Bilgin ve Kartal, (2009) Türkiye için 2002 ve 2008 yıllarını kapsayan çalışmalarında genişleyen kredi hacmi içindeki payını artıran tüketici kredilerine dikkat çekmiştir. Söz konusu çalışmaya göre bankalar proje finansmanı şeklindeki yatırım ve ticari krediler yerine, tüketim finansmanı içeren bireysel kredilere yönelmektedir. Bu durum gelişmekte olan ülke konumundaki Türkiye için ciddi bir engel oluşturmaktadır. Özellikle tüketim kredilerinde konut kredisi oranının çokça yüksek olması, bu sektörde verimsiz üretime neden olmakla kalmayıp; diğer sektörlerdeki talebi emerek, başka sektörlere zarar vermektedir.

3. FİYAT-KİRA YAKLAŞIMI: KREDİ KULLANIMI SONRASI FİYAT VE KİRA İLİŞKİSİ ÜZERİNE

Bu çalışma faiz, kira ve fiyat ilişkisini açıklamaktadır. Bireyler bir varlığın iyeliğini ya da geçici kullanım hakkını satın almak gibi birbirinin yerine ikame edilebilir iki seçenek arasında karar vermekle yükümlüdür. Bu kararı belirleyen en önemli etkenlerden biri borçlanma koşullarıdır. Para politikaları banka mevduatlarını, banka mevduatları ise banka kredileri yoluyla konut talebini etkilemektedir (Mishkin, 2001, s. 653). Dolayısıyla, günümüzde en yaygın borçlanma aracı olan banka kredileri; bireylerin ve firmaların alacakları satın alma ya da kiralama kararı üzerinde güçlü bir belirleyicidir.

Özel durumlar görmezden gelinirse, rasyonel tüketicilerin kredi alarak faiz karşılığına katlanması durumu, ancak kira masrafından kaçınmak için yapacağı bir işlemdir. Diğer bir deyişle rasyonel davranan tüketiciler kira ödemek için değil, varlığın iyeliğini satın almak için kredi kullanacaklardır. Bununla birlikte satın almanın kazancı, satın alınan varlığın değerindeki artış şeklinde de ortaya çıkacaktır. Dolayısıyla tüketici; bir varlığın kirası, o varlığın değerindeki artış ve faiz maliyetleri toplamından küçükse kiralamayı seçmelidir.

Türkiye'de bankacılık sektörü ve kredi hacmi genişlemeleriyle birlikte özellikle son yıllarda banka kredileri ve fiyat artışları üzerine pek çok gözlemsel çalışma yapılmıştır. Arslan ve Yapraklı (2008) 1983-2007 yılları için yaptıkları gözlemsel çalışmalarında fiyat artışının banka kredilerine negatif, banka kredilerinin ise fiyat artışlarına pozitif etkide bulunduğu sonucuna ulaşmışlardır. Yalnız, diğer çalışmalar gibi, kredi kullanımının yol açtığı fiyat ve kira ilişkisi üzerinde durmamıştır.

Arslan ve Kanık (2012) konut piyasası için yaptıkları gözlemsel çalışma sonucu sağlıklı bir piyasada kira enflasyonunun, kira dışı enflasyondan yüksek olması gerektiğine vurgu yapmıştır. Söz konusu çalışmada kiraların konut talebine ve dolayısıyla konut fiyatına neden olacağı belirtilmiş, fiyatların kiralarla birlikte artacağı imasında bulunulmuş, yalnız kira ve fiyatlar arasında ters yönlü bir ilişkinin varlığı üzerinde durulmamıştır. Bu çalışma, kredi kullanımı sonucu kira ve fiyatların negatif ilişki içinde olabileceğini vurgulamakta ve bu ilişkinin olası sonuçlarını yorumlamaktadır.

Kira ve fiyat karasındaki bu negatif ilişkinin iki ana nedeni bulunmaktadır. Bu nedenler, ya da etkiler, alt başıklar halinde gözden geçirilecektir.

3.1. Üretim Etkisi

Kredi kullanımı sonrası açığa çıkan fiyat artışları üreticiyi cezbedecek, üretim artışını ardından sürükleyecektir. Bu durumda, piyasada bollaşan malın getirisi, diğer bir deyişle kiralar düşecektir.

Bu durum Tobin (1969)'in q Teorisiyle de açıklanabilir. Buna göre borçlanmanın maliyetindeki azalma, yenileme maliyetlerini düşürecek ve ürünün q değerini artıracaktır. Ürünün q değeri birden çok olduğunda ise, üretici bu ürün için yatırımları artıracak ve ürünün üretimi artacaktır. Bu durumda piyasada bollaşan ürünün getirisinin de azalması beklenir.

Söz gelimi, ekonomide konut kredilerindeki bir düşüş, konut talebini ve dolayısıyla fiyat ve üretimini artıracak ve konut sayısındaki artış konut kiralarını düşürecektir. Diğer değişkenler sabitken, böylesi bir durumda, konut başına düşen kira getirisi azalmış olacaktır.

3.2. İkame İlişkisi

Daha önce vurgulandığı üzere rasyonel birey, ancak kira maliyetinden kurtulmak için faiz giderine katlanacaktır. Şu durumda bireyin belirli bir faiz giderini göze alarak borçlanıp ürünün iyeliğini alma ya da kira karşılığı ödeyip ürünün kullanım hakkını belirli bir süre için satın alma gibi birbiri yerine ikame edilebilir iki seçeneği vardır. Diğer değişkenler sabitken, bu iki seçenekten birini seçen birey, öbürünün talebini düşürmektedir. Dolayısıyla bu ikame ilişkisi kiralar ile faiz ve fiyat arasında ters yönlü bir bağlantıya neden olmaktadır.

4. MODEL VE YÖNTEM

Çalışma kapsamında ortaya atılan soyut söylemlerin somut kanıtları ortaya konmuştur. Bunun için Amerika Birleşik Devletleri(ABD) ölçeğinde, konut piyasalarını kapsayan ekonometrik sınama yapılmıştır. Kurulan modelin amacı konut faizlerindeki artışın kira ve fiyatlar üzerindeki etkisini ölçmektir. 2005 ilk çeyrek (2005Ç1) ve 2020 ilk çeyreği (2020Ç1) dönem aralığını kapsayan modelde kullanılan seriler ABD Federal Bankası veri tabanından (Federal Reserve Economic Data, FRED) alınmıştır. Modelde kullanılan değişkenlerin gösterimi ve tanımı Tablo 1'de verilmiştir.

Tablo 1: Değişkenlerin Tanımı

Değişken	Tanım
R	Mortgage faiz oranı (ABD ortalaması)
KF	ABD konut kira endeksinin konut fiyat endeksine oranı

Tahmin edilmek istenen model aşağıdaki gibidir:

$$\triangle LKF_t = \beta_0 - \beta_1 \triangle LR_t + \beta_2\, k \triangle LR_t + \omega_t \quad (1)$$

Modelde değişkenlerin adlarına eklenen "L" göstergesi değişkenin logaritmasının alındığını, "△" göstergesi serinin türevinin alındığını belirtmektedir. "$k \triangle LR$" değişkeni logaritması ve ardından türevi alınmış "R" değişkenini için kurulan kukla değişkeni ifade eder. "β_0" sabit katsayı, "β_1" ve "β_2" önlerinde bulundukları değişkenlerin katsayılarını, "ω_t" ise kalıntıları ifade etmektedir. Model ve ilgili testler Stata 16 Paket Programı ile tahmin edilmiştir.

4.1. Birim Kök Testi Sonuçları

Modelde kullanılan serilerin durağanlıklarına ilişkin yapılan Genişletilmiş Dickey-Fuller (1979) (Augmented Dickey–Fuller, ADF) birim kök testi sınanmıştır. Sınama sonuçlarında değişkenlerin birinci farklarının durağan olduğu görülmüştür.

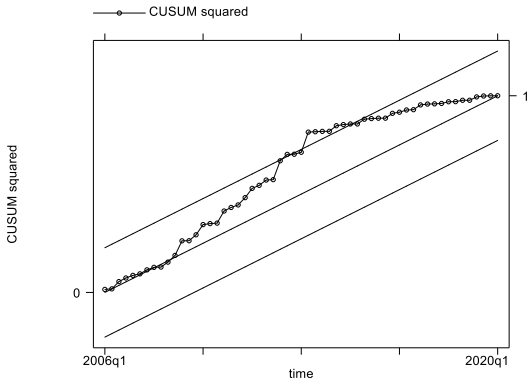
Tablo 2: ADF Birim Kök Testleri

Test		**LKF**	**Lİ**
Düzey	Düzey	0.5779	0.7666
	Birinci Gecikme	0.2659	0.6950
Birinci Fark	Düzey	0.0000	0.0000
	Birinci Gecikme	0.0000	0.0001

4.2. Yapısal Kırılmanın Tespiti ve Kukla Değişken Sonrası Elde Edilen Model

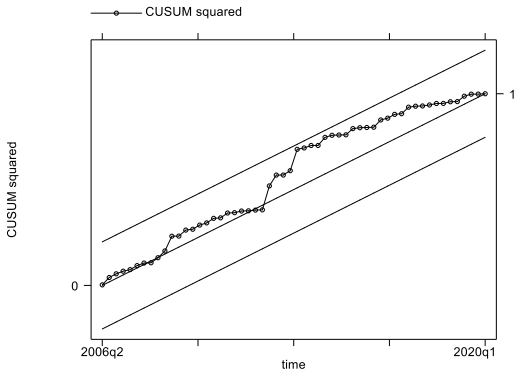
Test ölçeğinin 2008 Küresel Finansal Krizini kapması nedeniyle yapısal kırılma ya da kırılmaların modelde yer alacağı çıkarımı önsel olarak yapılabilir. Yapısal kırılmayı içsel olarak ölçen ve boş hipotezi yapısal kırılma olmadığı yönünde olan Wald Testi (Donald W. K. Andrews, 1993, p. 837) sonucuna göre %5 önem düzeyinde yapısal kırılma vardır ve yapısal kırılma tarihi 2009'un ikinci çeyreği olarak bulunmuştur. Yapısal kırılmanın grafiksel olarak gösterimi şekildeki gibidir;

Şekil 1: Yapısal Kırılmanın Grafik Üzerinde Gösterimi



Şekil 1'den görüleceği üzere, yapısal kırılma bir dönem yaşandıktan sonra, tekrar düzeyine geri dönmektedir. 2008 Krizi sonrası 2009'un ilk çeyreğinde kendini somut olarak gösteren yapısal kırılmanın çözümü için kukla değişkenler türetilerek ideal model tespit edilmek istenmiştir. Hem sabit parametrede (β_0), hem de $\triangle LR$ değişkeni parametresi üzerindeki yapısal kırılma etkisini ölçmek maksadıyla modele iki kukla değişken eklenmiş, bunlardan β_0 için türetilen kukla değişkenin anlamsız çıkması üzerine modelden çıkarılmıştır. β_0 için kurulan kukla değişken (KU) 2019 2. Çeyreği ile 2011 3. Çeyrek arası için 1, diğer dönemler için 0 şeklinde kurulmuştur. $\triangle LR$ kukla değişkeni olan $k \triangle LR$ ise $\triangle LR$ değişkeninin KU değişkeni ile çarpımı sonucu oluşturulmuştur. Yalnızca $k \triangle LR$ kukla değişkeni eklendiğinde yapısal kırılma sorunu çözülmüştür. Yapısal kırılmanın çözüldüğü Şekil 2'de görülmektedir.

Şekil 2: Yapısal Kırılmanın Düzeltilmesinden Sonra Modelin Grafiği



4.3. Varsayımdan Sapmalar ve Düzeltilmesi

Tahmin edilen modelin varsayımdan sapmalarının tespiti için yapılan testler ve sonuçları aşağıda verilmiştir.

Tablo 3: Varsayımdan Sapmaların Testleri ve Sonuçları

Test		P Değeri	Sonuç
Normal Dağılım	Jarque-Bera (1987)	0,89	Boş hipotez reddedilememiştir. Kalıntılar normal dağılmaktadır.
	Skewness/Kurtosis	0,84	
Heterokedasite	Breusch-Pagan (1979)	0,11	Boş hipotez reddedilememiştir. Heterokedasite sorunu yoktur.
	White (1980)	0,52	
Otokorelasyon	Durbin-Watson (1950)	0,00	Boş hipotez reddedilmiştir. Otokorelasyon sorunu vardır.
	Breusch (1978) - Godfrey (1978)	0,00	

Sonuçlara göre modelde normal dağılım ve heterokedasite sorunu bulunmazken otokorelasyon sorunu bulunmaktadır. Otokorelasyon sorununu düzelten Newey-West (1987) tahmincisi kullanılmıştır.

Newey-West tahmincisinde kullanılacak maksimum gecikmenin belirlenmesi için gecikme düzeylerine göre otokorelasyon testleri yapılmış ve 42. gecikmeden sonra otokorelasyon sorunu olmadığı anlaşılmıştır. Dolayısıyla Newey-West tahmincisi için kullanılan maksimum gecikme 42 olarak seçilmiştir.

4.4. Modelin Tahmini

Modelin tahmin çıktıları aşağıdaki gibidir.

Tablo 4: Tahmin Çıktıları

Yöntem	Gösterge	Sabit katsayı	$\triangle LR$	$k \triangle LR$
En Küçük Kareler (EKK)	Katsayı	0,0037	-0,1579	0,2218
	Standart Hata	0,0029	0,0594	0,1240
	t Değeri	1,25	-2,66	1,79
	P Değeri	0,217	0,010	0,079
Newey-West (Maksimum Gecikme 42)	Katsayı	0,0037	-0,1579	0,2218
	Standart Hata	0,0043	0,0780	0,1214
	t Değeri	0,84	-2,02	1,83
	P Değeri	0,402	0,048	0,073

Tahmin çıktılarına göre her iki yöntemde de sabit katsayı anlamsızken, $\triangle LR$ katsayısı %5 hata payı ile $k \triangle LR$ katsayısı %10 hata payı ile anlamlıdır. Newey-West tahmincisinde F testi %10 hata payı ile anlamlıyken, klasik EKK yöntemi ile yapılan tahminde R-kare değeri yaklaşık 0,12 ve F testi %5 ile anlamlıdır. Çıktı sonuçlarına istinaden tahmin edilen modeller aşağıda verilmiştir.

Tahmin edilen genel model;

$$\triangle LKF_i = 1{,}00 - 0{,}16 \triangle LR_t + 0{,}22\ k \triangle LR_t \quad (2)$$

2005Ç1-2009Ç1 ve 2011Ç4-2020Ç1 dönem için geçerli tahmin;

$$\triangle LKF_i = 1{,}00 - 0{,}16 \triangle LR_t + 0{,}22\ k \triangle LR_t \quad (3)$$

2009Ç2-2011Ç3 dönemi için geçerli tahmin;

$$\triangle LKF_i = 1{,}00 + 0{,}06 \triangle LR_t \quad (4)$$

Tahmin sonuçları göstermektedir ki 2008 Küresel Finansal Krizinin etkisini gösterdiği 2009Ç2 ve 2011Ç3 arası dönem dışında faizler ile kira/fiyat oranı arasında ters yönlü bir ilişki vardır. Buna göre mortgage faizlerindeki %1'lik bir artış konutlar için kira/fiyat oranını yaklaşık %0,16 düzeyinde düşürmektedir. Bununla birlikte 2008 krizinde mortgage sisteminin yol büyüttüğü balonun patlaması, bu ilişkinin yönünü kısa dönem için de olsa değiştirmiş ve faizler ile kiralar arasında doğrusal bir ilişki ortaya çıkmıştır.

Belirtmek gerekir ki, anlamsız olan sabit katsayının denklemlerde kullanıldığı hali, bağımlı değişkenin e tabanında logaritmik olmasından dolayı, katsayının e tabanında ters logaritmasının alınmış halidir. Sabit katsayı anlamsız olduğundan yorumlanmamıştır.

5. SONUÇ VE ÖNERİ

Çalışma kapsamında günümüzün en yaygın borçlanma aracı banka kredilerinin ekonomideki rolü ve kira/fiyat değişkenlerine etkisi üzerinde durulmuştur. Buna göre sermayenin maliyetini belirleyen ticari banka kredileri özellikle sermaye yoğun üretim yapan sektör ve firmaların durumları üzerinde söz sahibidir. Bu nedenle ticari krediler, gelişmekte olan ülkeler için yapısal dönüşümün önemli bir aracıdır. Tüketici kredileri ise vade ve kredi kullanım miktarlarına göre belirli ürünlerin taleplerini etkilemektedir. Söz gelimi uzun vadeli tüketici kredilerinin maliyetlerinde yaşanan değişmeler konut ve taşıt gibi ürünlerin talebine etkide bulunurken, kısa vadeli krediler günlük tüketim ürünlerine olan talebi etkilemektedir. Bu nedenden ötürü tüketici kredilerinin görevi söz konusu ürünler arasında talep dengesini korumak, aşırı ya da eksik talep durumlarını engellemek ve aşırı maliyetli üretim yapan endüstrileri daraltıp, pozitif ölçek ekonomilerinin geçerli olacağı endüstrilere talep yaratarak verimliliği artırmaktır. Öte yandan genel anlamda kredilerin görevi ise fiyat ve kira dengesini sağlayarak aşırı kâr ya da rant gelirini engellemek, böylece gelir dağılımında eşitliği gerçekleştirmek ve korumaktır.

Çalışma içerisinde soyut biçimde işlenen kredi kullanımının fiyat ve kiralara etkisi, ABD konut piyasasında yapılan analiz ile ekonometrik olarak ölçülmüştür. Sonuçlar beklenilen yönde ve anlamlıdır. Tahmin sonucu 2005Ç1-2009Ç1 ve 2011Ç4-2020Ç1 arası dönem için ABD'de %1'lik mortgage faiz oranının artması kira/fiyat oranını %0,16 oranında azalmaktadır. Yapısal kırılmanın geçerli olduğu 2009Ç2-2011Ç3 dönemi için ise mortgage faiz oranındaki %1'lik artış, kira/fiyat oranını %0,06 oranında arttırmaktadır. Kriz sonrası kira/fiyat oranının faiz oranları ile ilişkisinin bu yönlü değişmesi dikkat çekicidir. Çalışma bu sonuçlar doğrultusunda politika yapıcıya ışık olmalıdır.

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THE DETERMINING FACTORS OF FINANCIAL INCLUSION IN TURKEY

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ABSTRACT

Purpose- The purpose of this study is to investigate the impacts of GDP per capita, unemployment rate, cost of living index, gini coefficient, median age, urbanization rate, total length of railways and roads, number of road motor vehicles, number of mobile phone subscribers, number of broadband internet subscribers, literacy rate and mean years of schooling on financial inclusion in Turkey..

Methodology- The models were estimated using the Johansen Cointegration method, and the causality relationships between the variables were tested with the Granger and Toda-Yamamoto approaches.

Findings- The Johansen approach findings reveal a significantly positive long–run co–movement between financial inclusion and GDP per capita, urbanization and a significantly negative long–run co–movement between unemployment, cost of living and financial inclusion. However, according to the results of the Granger method, there has been no causality relationship between the variables. The results of the Toda–Yamamoto causality test are consistent with the results of the Granger causality test, except fort the urbanization variable which has been found to have a short term casual effect on financial inclusion in the Toda–Yamamoto test.

Conclusion- The significant relationship between the level of financial inclusion and the rate of urbanization in the short and long run reveals that the increase in the level of urbanization causes individuals to access financial institutions more easly and be able to use more financial products in Turkey.

Keywords: Financial inclusion, time series, cointegration, causality, Turkey.
JEL Codes: C32, D14, G20

1. INTRODUCTION

Although financial inclusion is a widely discussed issue in finance literature, it does not have a common definition due to its multidimensional nature and various different approaches. However, it refers to the situation in where individuals can effectively access financial services and use financial products. Broadly, financial inclusion can be defined as the existence of a financial system that enables weaker and disadvantaged individuals of the society to have access to and be able to use financial products. While financial inclusion is to make financial services accessible and usable by the majority of the society, financial exclusion emphasizes the situation that prevents low income and disadvantaged individuals of society from having access and being able to use these financial services.

The factors affecting the level of financial inclusion may arise from supply and demand. Socio-economic factors and individuals' perceptions and attitudes on financial issues are supply-side factors. Lack of financial services, in other words financial exclusion, may occur voluntarily or involuntarily. Voluntary financial exclusion may be due to cultural or religious factors, or due to the indifference individuals may have towards financial services. Involuntarily exclusion includes obstacles such as not having trust in financial institutions, inappropriate prices, maturity of the product, product design that does not meet the needs, and failure to meet other eligibility criteria. The demand-side factors include socio-economic and technological factors such as income, education level, age, gender, transportation and telecommunication facilities (Abel, Mutandwa and Le Roux, 2018; Demirgüc–Kunt, Klapper, Singer and Van Oudheusden, 2015; Dittus and Klein, 2011; European Commission, 2008).

Economic factors are considered as one of the major determinants of financial inclusion. Many studies reveal that financial inclusion is positively related to economic development and the factors such as unemployment, poverty, and income

inequality negatively impact the access to and use of financial services (Bittencourt 2012; Jeanneney and Kpodar 2011; Pal and Vaidya 2011; Clarke, Xu and Zou 2006). Socio-demographic factors can play an important role in strengthening financial inclusion. In societies where socio-demographic factors do not support financial inclusion, individuals are more likely to avoid using financial services, fewer people have bank accounts, and cash transactions widespread. These situations impact the demand side of financial inclusion (Cull, Ehrbeck and Holle, 2014; Dev, 2006). Another factor that influences financial inclusion is technology. The financial services industry is one of the sectors that supports technological innovation and also puts them into practice. Innovative financial service companies create and develop digital platforms to make their customers' daily transactions more cost-effective, faster and easier. Technological developments reduce the need to travel long distances, and ensure the efficient distribution of financial products and services. Electronic payment systems, mobile banking, and other fintech applications are becoming more widespread, so financial inclusion is able to improve with a new and wide-ranging stakeholder group from the digital world (Global Partnership for Financial Inclusion 2014; De Koker and Jentzsch 2013; Duncombe and Boateng 2009).

Due to the belief of its positive impacts on financial systems and the economy, financial inclusion issues have recently been gaining more attention among researchers, policy makers and practitioners. In many countries, studies have been carried out by financial institutions, governments and non-governmental organizations to develop strategies that may enable low-income and disadvantaged groups to be better included in the financial system. These efforts have also been supported by international financial and economic institutions such as the International Monetary Fund and the World Bank (Demirgüc-Kunt, Beck and Honohan, 2008; Kempson, Atkinson and Pilley, 2004; Leyshon and Thrift, 1995). In Turkey, ''Financial Access, Financial Education, Consumer Financial Protection Strategy and Action Plans'' were put into practice in 2014 aiming to strengthen the demand side of financial inclusion by considering the indicators of financial access and the financial infrastructure (Prime Ministry of Turkey, 2014). Within this scope, a total of 55 action plans have been determined in the fields of financial education and financial consumer protection. In addition, many public institutions, autonomous institutions and non-governmental organizations have been identified for collaboration. Understanding the linkage between financial inclusion and economic, social, demographic and other issues will be beneficial to policy makers and practitioners in their efforts to strengthen financial inclusion in the country. However, there have been few academic studies conducted on financial inclusion within Turkey. To fill this gap, this study aims to contribute to the understanding of the economic, technological, social and demographic drivers of financial inclusion in Turkey. In this context, the study has researched the impacts of some selected variables in the fields of economy, population, demography, transportation, information society and education on financial inclusion in Turkey.

The study has been structured as follows; the review of the literature on financial inclusion has been presented in the second part following the introduction, part three gives the details of the data used in the research and methodology, the results of the econometric models applied in the research have been presented in the fourth section, and part five presents the conclusion.

2. LITERATURE REVIEW

The issue of financial inclusion, which was first discussed in England in 1997 with the view that development should be spread to different areas, has been the interest of various international and national institutions, researchers and practitioners. Early studies focus more on the definition and nature of financial inclusion (Dev, 2006). Later, the studies on developing financial inclusion measurement methods and measuring, monitoring, and analysing financial inclusion in different countries has become frequent (Demirgüc-Kunt, Klapper, Singer and Van Oudheusden, 2015; Gündüz and Özyıldırım, 2019; Bayero, 2015; Fungáčová and Weill, 2015; Cámara and Tuesta, 2014; Yorulmaz 2013; Chakravarty and Pal, 2013; World Bank, 2013; Gupte, Venkataramani and Gupta, 2012; Sarma, 2008; Kempson, Atkinson and Pilley, 2004). In this continuous process, the literature has expanded with studies examining the relationship between financial inclusion and economic, social, demographic, geographical, technological and other variables.

Whether development and economic growth causes any increase in financial inclusion levels is one of the issues discussed extensively in the literature. Raza, Tang, Rubab and Wen (2019) have conducted a meta-analysis study in Pakistan. A significant and positive relationship between financial inclusion and economic development has been found by the authors which reveals that an increase in the level of financial inclusion may improve economic development. Van, Vo, Nguyen and Vo (2019) have applied a panel econometric model to estimate if financial inclusion impacts economic growth or not. The findings support a positive relationship between economic growth and financial inclusion consistent with many previous studies. In addition, it has been determined that the relationship is stronger in the countries where the income and financial inclusion levels are lower. The results of the panel data study conducted by Kim, Yu and Hassan (2018), using the data of the Organization of Islamic Cooperation's 55-member countries, also reveal that financial inclusion has a positive impact on economic growth. The linear cointegration test results of Sethi and Sethy (2018) together with the data of India for the period from 1975 to 2014 show that there has been a long-run relationship between economic growth and financial inclusion. Both

demand and supply side improvements in financial inclusion positively impacts economic growth. Shailesh and Ragabiruntha (2018) have collected data through a structured questionnaire and have established a model to determine which factors led economic development through financial inclusion in Tamil Nadu. According to the major findings of their study; financial literature, online banking and understanding banking services are the drivers of financial inclusion and economic development can be led by financial inclusion. Another study which reveals a positive long-run relationship between economic growth and financial inclusion has been conducted by Sethi and Acharya (2018) with data from 31 countries spanning the period 2004-2011.

Some of the studies conducted on the issues of financial inclusion have explored the relationship between financial inclusion and economic welfare indicators - two which are widely used are GDP per capita and income inequality. The findings of the research of Sha'bana, Girardone and Sarkisyan (2020) indicate that there has been a significant positive relationship between GDP per capita and financial inclusion. Jung and Cha (2020) who explored the long-run relationship between financial income inequality and development have found that at the provincial level in China, financial deepening makes inequality worse. According to Ginevicius, Dudzeviciute, Schieg and Peleckis (2019) the highest level of financial development has been demonstrated by the countries which have middle GDP per capita indicators. According to Nanda (2017) the level of financial inclusion seems to reflect a movement in tandem with the extent of per capita income and the extent of socio-economic development. The empirical analysis of Sarma and Pais (2011) reveals that per capita gross domestic product, urbanisation, adult literacy and income inequality are important factors in explaining the level of financial inclusion in a country. In addition to these, the other factors which have a positive impact in increasing financial level are electronic and physical connectivity and information availability, indicated by road networks, telephone and internet usage.

Saifullahi, Özdeşer and Çavuşoğlu (2019) have examined the finance-welfare linkage of Nigerian households in rural areas. The findings have shown financial inclusion has a strong positive impact on the welfare of households. However, the decomposition analysis results have shown that middle-income and high-income households benefit more from the increased level of financial inclusion compared to low-income ones. Zhang and Posso (2019) have researched the impact of financial inclusion on the income of households by using data covering more than 6,200 Chinese households and have found a strong and positive impact of financial inclusion on household income. In contrast with the studies of Sani Ibrahim, Ozdeser and Cavusoglu conducted in Nigeria, the Chinese study by Zhang and Pooso has shown that low-income households benefit more from financial inclusion than high-level and mid-level income households. Anwar and Amrullah (2017) have found in their research that financial inclusion can reduce poverty by affecting the overall economy, but it can increase inequality at the same time. The results of Kim's research (2016), which uses data on the 40 countries in the European Union and OECD between 2004 and 2011, reveal that financial inclusion causes an improvement on the relationship between economic growth and income inequality. Income inequality reduction by means of financial inclusion transforms the negative relationship to a positive relationship between income inequality and economic growth. This transformation trend is stronger in high-fragile countries than in low-fragile countries.

It is widely accepted in the literature that the developments in information and communication technologies are important factors in enlarging financial inclusion. According to Chatterjee (2020), financial inclusion can improve the per capita growth both individually or collectively with information and communication technologies. Musabegovic, Ozer, Djukovic and Jovanovic (2019) have investigated the relationship between the usage of new technologies and GDP per capita. The results of their study reveal a significantly positive relationship between GPD per capita and the usage of smartphones in financial transactions and payment processes. Patwardhan, Singleton and Schmitz (2018) have indicated that taking advantage of the convenience provided by electronic transactions, integrating mobile phones into the payments system, and using technology for turning high-cost operations into self-service or automated processes significantly caused reductions in the cost and expanded access to financial services.

Some studies in the literature investigating the determinants of financial inclusion based on different factors apart from those mentioned above.

Susilowati and Leonnard (2019) have investigated the factors using the microdata from global findex 2014. The findings of their binary logistic regression have indicated that there are significant and positive relationships between financial inclusion and the constraints to financial services, motivation to use financial services and sources of loans. By using the World Bank's 2017 Global Findex Database, Özşuca (2019) analysed the factors which might cause gender differences in using financial products and services. Outputs of the study indicate that disparity in financial inclusion is significantly related to employment. Age and higher education have also been found to be contributing factors to the financial inclusion gap. Alhassan, Li, Reddy and Duppati's (2019) findings indicate that the level of financial inclusion is positively related to higher education and higher incomes, and has been negatively affected by religious tensions and unemployment. Szopinski (2019) has investigated the reasons for individuals who chose to be unbanked in Poland and has found the major factors for being unbanked are lower income, lower levels of education, younger age, lack of trust in commercial banks and living in small towns or cities. Using the

World Bank's 2017 Global Financial Inclusion database Chu (2019) has applied probit estimation for different measures of financial inclusion. Outputs of the study reveal that being a man, more educated, richer, employed, and older than a certain age increases the likelihood of access to formal financial services. Bozkurt, Karakuş and Yıldız (2018) have examined the possible factors which might generate changes in financial inclusion levels by using 2011 - 2014 period data of 120 countries. The results of their study have revealed that the major factors in the change in financial inclusion are social, banking and political issues. Evans and Osi (2017) have applied a Bayesian VAR model with the World Bank Development Indicators datasets covering the 2005 - 2014 period of 15 African countries. The results have shown that the effects of credit supply, literacy, internet users and servers, and broad money on financial inclusion are positive and significant. In their research in which they used the data of thirty OECD countries, Van der Werff, Hogarth and Peach (2013) have determined that high trust in financial institutions and government causes an increase in the level of financial inclusion.

3. DATA AND VARIABLE DESCRIPTION

The widely used indicators in measuring financial inclusion are access to and use of financial services and products, and quality measures. Access indicators reflect how deep financial access is. Usage indicators measure how adults use financial services. Quality measures specify the compliance level of financial products and services to the needs of customers, the range of options available to customers, and the awareness level and understanding of adults regarding financial services and products (World Bank, 2013). According to Kempson, Atkinson and Pilley (2004), a good financial inclusion measure should be simple, practical, as multidimensional as possible, and should include comparable indicators.

In this study, four access and four usage indicators are used to calculate financial inclusion, taking into account the accessibility of data. Financial access indicators reveal the geographical and demographic penetration of service points. Financial usage indicators show how widespread its use is and how affordable it is (Table 1). Financial inclusion data is obtained from The Central Bank of the Republic of Turkey (TCMB), Banking Regulation and Supervision Agency of Turkey (BDDK), The Banks Association of Turkey (TBB), Participation Banks Association of Turkey (TKBB), The Interbank Card Centre (BKM), and Turkish Statistical Institute (TurkStat).

Table 1: Financial Inclusion Indicators

	Code	Indicator	Definition
Access	*BRPG*	Branch penetration (geographical)	Branch number per 1,000 km²
	BRPD	Branch penetration (demographic)	Branch number per 100,000 population (+15 years age)
	ATMG	ATM penetration (geographical)	ATM number per 1,000 km²
	ATMD	ATM penetration (demographic)	ATM number per 100,000 population (+15 years age)
Usage	*LAPP*	Loan account penetration (prevalence)	Loan account number s per 1,000 population (+15 years age)
	LIRA	Loan / income ratio (affordability)	The ratio of average loan amount to GDP per capita
	DAPP	Deposit account penetration (prevalence)	Deposit account number per 1,000 population (+15 years age)
	DIRA	Deposit / Income Rate (affordability)	The ratio of the average deposit account amount to GDP per capita

ATM: Automated teller machine

Higher geographical measurements reveal that the distance is shorter and easier to access to financial services. Per capita branch and ATM distributions show the demographic spread of financial services and measure how many customers a bank and ATM serve. Higher values mean fewer people per branch or ATM and easier access. Deposit and loan account numbers per 100,000 +15 age population indicate the prevalence of the use of financial services. The ratio of average loan and deposit amount to GDP shows the affordability of financial services by individuals. Higher rates indicate that financial services are mostly available to upper income groups (Işık, 2011). Descriptive statistics of financial inclusion indicators used in the study are presented in Table 2.

Table 2: Descriptive Statistics of Financial Inclusion Indicators

	n	Mean	SD	Min.	Max.
BRPG	22	11.43	2.82	7.85	15.48
BRPD	22	12.47	2.06	9.33	15.61
ATMG	22	32.83	20.02	8.6	66.29
ATMD	22	34.62	18.38	11.16	63.34
LAPP	22	120.88	85.49	15.48	254.78
LIRA	22	0.53	0.14	0.31	0.74
DAPP	22	1,593.23	579.03	775.95	2,727.65
DIRA	22	0.24	0.11	0.13	0.54

Individual interpretation of the indicators may lead to misleading results. Therefore, the Financial Inclusion Index (*FIITR*) has been created in order to provide information about the indicators of financial inclusion as a single value and to measure its relationship to numerous variables.

In order to be easily calculable and to produce comparable information, an index has been created for each dimension by accepting 1997 as the base year, and then the Financial Inclusion Index (*FIITR*) was calculated by taking the arithmetic mean of the two.

$$FIITR = \frac{\sum \frac{d_t}{d_0} x\ 100}{N} \quad (1)$$

(d_t: value of financial inclusion dimension in the relevant year, d_t: value of financial inclusion dimension in base year, *N*: number of observed dimensions)

The variables whose impacts on financial inclusion have been investigated include the fields of economy, population, demography, transportation, information society and education. Table 3 gives definitions and Table 4 presents the descriptive statistics of variables.

Table 3: Independent Variables

Field	Code	Time Period	Source	Definitions
Economy	*GDPPC*	1997 – 2018	TurkStat	Per capita gross domestic product in purchasers' value.
	UNEMP	1997 – 2018	TurkStat	Unemployment rate among non–institutional population by labour force status (15 – 65 years of age).
	COLIN	1997 – 2018	TCMB, ITO	Cost of living index (foodstuffs, heating and lighting articles, clothing and house furniture, house rent and maintenance and miscellaneous).
	GINIC	1997 – 2018	TurkStat	Gini coefficient by equalized household disposable income.
Population, Demography and Transportation	*MEDAG*	1997 – 2018	TurkStat	Median age obtained from population censuses and address based population registration system..
	URBAN	1997 – 2018	TurkStat	The share of population living in province and district centres.
	RWROD	1997 – 2018	TurkStat	Length of railways and roads.
	VHCLE	1997 – 2018	TurkStat	Number of road motor vehicles excluding road construction machineries, work machineries and tractors.
Information Society and Education	*MOBPH*	1997 – 2018	TurkStat, BTK	Number of mobile phone subscribers.
	INTRN	1997 – 2018	TurkStat, BTK	Number of broadband internet subscribers.
	LITER	1997 – 2018	TurkStat	Literacy rate (6 years of age and over).
	SCHOL	1997 – 2018	TurkStat	Mean years of schooling.

* ITO: Istanbul Chamber of Commerce, BTK: Information and Communication Technologies Authority of Turkey

Table 5: Descriptive Statistics of Variables

Variable	Mean	SD.	Min.	Max.
FIITR	2.68	1.33	1.00	4.69
GDPPC	8,092.69	3,323.37	3,084.39	12,480.37
UNEMP	9.77	1.66	6.40	12.90
COLIN	4,179.84	1,388.66	5,960.34	2,007.77
GINIC	0.42	0.03	0.38	0.52
MEDAG	28.39	2.29	24.70	32.02
URBAN	75.37	11.46	60.77	92.50
RWROD	138,181.36	4,100.88	133,229.00	146,347.00
VHCLE	13,739,364.64	5,171,641.28	6,863,462.00	22,865,921.00
MOBPH	48,300,537.59	26,618,589.16	1,483,149.00	80,117,999.00
INTRN	19,328,421.59	24,609,698.04	75,000.00	74,500,089.00
LITER	89.47	5.37	82.00	96.42
SCHOL	6.59	0.98	5.10	8.00

3.1. Unit Root Tests

Augmented Dicky Fuller (ADF), Phillips–Perron (PP), and Kwiatkowski–Phillips–Schmidt–Shin (KPSS) unit root tests are used to analyse stationarity properties of variables.

Augmented Dicky Fuller (ADF), Phillips–Perron (PP), and Kwiatkowski–Phillips–Schmidt–Shin (KPSS) unit root tests are used to analyse stationarity properties of variables.

ADF test is an extended application version of the DF (Dickey and Fuller, 1981). DF tests whether γ = 0 in the data of model.

$$y_t = \alpha + \beta t + \gamma y_{t-1} + \varepsilon_t \quad (2)$$

where y_t represents the interest variable, *t* represents the time index, γ represents a coefficient, and *ε* is the error term. The regression equation is written as

$$\Delta y_t = y_t - y_{t-1} = \alpha + \beta t + \gamma y_{t-1} + \varepsilon_t \quad (3)$$

where Δ represents the first difference operator. By writing in this way, a linear regression Δy_t against *t* and y_{t-1} can be applied and it can be tested whether *γ* has any difference from 0. *γ* = 0 indicates a random walk process. If not and −1 < 1 + γ < 1, the process is accepted as stationary.

The major problem with this method is that the Dickey–Fuller method is not effective if *ε* in an autoregressive model is auto correlated (Maddala and Kim 1999). To solve this problem, ADF unit root test has been proposed. By adding Δy_{t-p} to the equation, the ADF approach enables high order autoregressive processes. But still the *γ* = 0 equation is tested.

$$\Delta y_t = \alpha + \beta t + \gamma y_{t-1} + \delta_1 \Delta y_{t-1} + \delta_2 \Delta y_{t-2} \ldots + \varepsilon_t \quad (4)$$

The PP test (Phillips and Perron, 1988) is a non–parametric approach in which the selection of serial correlation level is not required. Unlike the ADF method, it rather takes the prediction scheme similar with DF method, but in this model the statistic is corrected for autocorrelations and heteroscedasticity. The last unit root test, which will be applied to the time series used in our study to improve the finite sample properties of the ADF and PP tests is the KPSS test in which the null hypothesis is examined under the assumption that an observable time series is stationary around a deterministic trend. For the KPSS approach, the null hypothesis is that the series is stationary.

3.2. Cointegration

In the research, Johansen approach is used for testing cointegration (Johansen and Juselius, 1990; Johansen, 1988). Vector error correction (VEC) representation is as follows in Johansen cointegration approach.

$$\Delta x_t = \sum_{i-1}^{k-1} \delta_i \Delta x_{t-1} + \Pi x_{t-1} + \mu + \varepsilon_t \quad (5)$$

where Δx_tpt comprise a null vector I(0) of *n x* series. The parameter *μ* is the deterministic component composed of the constant, trend, structural break, and seasonality; δ_i represents the short run parameter. The long–run relationship is captured by the matrix, defined as, where *x* is stationary if a cointegration relationship exists and the matrix Π has a reduced rank of (r): 0 < *r* < *n* (Thong, Ankamah–Yeboah, Julia Bronnmann, Nielsen, Roth and Schulze–Ehlers, 2020).

In Johansen Method, the maximum likelihood of the matrix is estimated assuming that the error variables are distributed normally. The Johansen tests are also known as maximum eigenvalue and trace tests.

$$LR(r_0, r_0 + 1) = -T\mathrm{In}(1 - \lambda_{ro+1}) \quad (6)$$

The trace approach examines whether the rank of the matrix Π is r_0. The alternative hypothesis is that r_0 < rank (Π) ≤ *n*, where *n* represents the possible cointegrating vectors' maximum number.

$$LR(r_{0,n}) = -T \sum_{i=r_{0+1}}^{n} \mathrm{In}(1 - \lambda_i) \quad (7)$$

where $LR(r_{0,n})$represents the statistic of a likelihood test if ratio statistic rank is (Π) = *r* or (Π) ≤ *n*.

3.3. Causality Tests

Finally, causality relationships between the variables will be tested by using the Granger and Toda–Yamamoto methods. Granger causality is a widely used approach in times series to examine the causality relationship between two variables by following a "bottom up" procedure.

$$Y = \sum_{i=1}^{t} \alpha_i X_{t-i} + \sum_{i=1}^{t} \beta_i Y_{t-1} + \mu \quad (8)$$

$$X = \sum_{i=1}^{t} \lambda_i X_{t-1} + \sum_{i=1}^{t} \lambda Y_{t-1} + v \quad (9)$$

where, *X* does not, Granger causes *Y* in the Eq. (8) and *Y* does not, Granger causes *X* in the Eq. (9) are null hypothesis' (h_0). The rejection of null hypothesis (h_1) reveals Granger-cause where μ and *v* are correlated.

Toda–Yamamoto, the second method used to reveal the causality relationships between the variables in the research, is not sensitive to cointegration properties and is feasible for stationary or non–stationary VAR models. In this method, preliminary information such as whether the variables contain unit root or the number of cointegration vectors is not needed. In Toda–Yamamoto method, constraint tests such as Wald likelihood ratio and LaGrange multiplier are investigated with a valid Wald statistic (an asymptotic x^2distribution), regardless of the order of integration of the variable (Toda and Yamamoto 1995).

$$Y_t = \alpha_i + \sum_{i=1}^{k+d} \gamma_{1i} Y_{t-i} + \sum_{i=1}^{k+d} \gamma_{2i} Y_{t-1} + \varepsilon_{yt} \quad (10)$$

$$X_t = \alpha_2 + \sum_{i=1}^{k+d} \delta_{1i} Y_{t-i} + \sum_{i=1}^{k+d} \delta_{2i} Y_{t-1} + \varepsilon_{xt} \quad (11)$$

where *k* represents the optimal lag order, *d* represents the maximum order of integration of the series, and ε_{yt} and ε_{xt} represent error terms.

4. RESULTS

In this study, the impacts of the variables regarding economy, population, demography, transportation, information society and education issues on financial inclusion is examined using annual data from Turkey over the 1997 - 2018 period. To explain these impacts, the following vector auto regression (VAR) models have been formulated.

$$FIITR_t = \alpha_0 + \alpha_1 GDPPC_t + \alpha_2 UNEMP_t + \alpha_3 COLIN_t + \alpha_4 GINIC_t + \varepsilon_t \quad (12)$$

where*; FIIT* is the dependent variable representing Financial Inclusion Index. *GDPPC* is the gross domestic product per capita, *UNEMP* is the unemployment rate, *COLIN* represents the cost of living index, *GINIC* represents the Gini coefficient, α_0 represents the constant term, α_1, α_2, α_3, α_4 represents the coefficients of the exogenous variables, *t* represents time and ε is the stochastic term.

$$FIITR_t = \alpha_0 + \alpha_1 MEDAG_t + \alpha_2 URBAN_t + \alpha_3 RWROD_t + \alpha_4 VHCLE_t + \varepsilon_t \quad (13)$$

where; *MEDAG* is the median age, *URBAN* is the urbanization rate, *RWROD* is the sum of the length of railways and roads, *VHCLE* is the number of road motor vehicles.

$$FIITR_t = \alpha_0 + \alpha_1 MOBPH_t + \alpha_2 INTRN_t + \alpha_3 LITER_t + \alpha_4 SCHOL_t + \varepsilon_t \quad (14)$$

where; *MOBPH* represents the number of mobile phone subscribers, *INTRN* represents the number of broadband internet subscribers*, LITER* represents the literacy rate, *SCHOL* represents mean years of schooling.

In the first stage of the research, the stationarity of the series was examined at 0.05 significance level by applying unit root tests.

Table 6: Unit Root Test Results

		ADF		PP		KPSS	
Series		Level	1st difference	Level	1st Difference	Level	1st Difference
FIITR	Test	-0.070	-3.100	0.199	-3.065	0.635	0.190
	Cv	-3.021	-3.021	-3.012	-3.021	0.463	0.463
GDPPC	Test	-1.469	-4.016	-1.466	-4.026	0.564	0.279
	Cv	-3.012	-3.021	-3.012	-3.021	0.463	0.463
UNEMP	Test	-2.252	-3.855	-2.252	-4.402	0.393	0.092
	Cv	-3.012	-3.040	-3.012	-3.021	0.463	0.463
COLIN	Test	-1.981	-3.262	-1.376	-3.307	0.447	0.381
	Cv	-3.040	-3.021	-3.012	-3.021	0.463	0.463
GINIC	Test	-1.616	-4.057	-2.082	-7.094	0.442	0.114

	Cv	-3.021	-3.066	-3.012	-3.021	0.463	0.463
MEDAG	Test	-1.004	-4.287	-0.659	-3.490	0.662	0.135
	Cv	-3.021	-3.030	-3.012	-3.021	0.463	0.463
URBAN	Test	-0.343	-4.619	-0.268	-4.633	0.621	0.112
	CV	-3.012	-3.021	-3.012	-3.021	0.463	0.463
RWOD	Test	2.809	-2.432	2.487	-2.402	0.654	0.441
	Cv	-3.012	-3.021	-3.012	-3.021	0.463	0.463
VHCLE	Test	3.591	-2.348	3.930	-2.262	0.637	0.576
	Cv	-3.012	-3.021	-3.012	-3.021	0.463	0.463
MOBPH	Test	-2.098	-2.774	-1.784	-1.167	0.625	0.290
	Cv	-3.030	-3.030	-3.012	-3.021	0.463	0.463
INTRN	Test	5.018	-1.638	4.382	-1.491	0.569	0.541
	Cv	-3.012	-3.021	-3.012	-3.021	0.463	0.463
LITER	Test	-1.611	-1.508	-0.535	-2.842	0.638	0.146
	Cv	-3.030	-3.030	-3.012	-3.021	0.463	0.463
SCHOL	Test	-1.109	-3.775	-1.094	-3.775	0.629	0.184
	Cv	-3.012	-3.021	-3.012	-3.021	0.463	0.463

where Cv is critical value.

In ADF and PP tests, the basic hypothesis is "there is a unit root in the series", and in the KPSS test, "there is no unit root in the series". It is seen that *FIITR*, *GDPPC*, *UNEMP*, *COLIN*, *GINIC*, *MEDAG*, *URBAN*, *LITER* and *SCHOL* series appear to be first difference stationary while *VHCLE* and *INTRN* series are non-stationary in all tests. *RWOD* and *MOBPH* series are first difference stationary in KPSS test, but non-stationary in ADF and PP tests (Table 6). After excluding the non-stationary series from the scope of the research, the Eq. (13) and Eq. (14) are combined and the VAR models to be used in the research are formulated as follows.

$$FIITR_t = \alpha_0 + \alpha_1 GDPPC_t + \alpha_2 UNEMP_t + \alpha_3 COLIN_t + \alpha_4 GINIC_t + \varepsilon_t \quad (15)$$

$$FIITR_t = \alpha_0 + \alpha_1 MEDAG_t + \alpha_2 URBAN_t + \alpha_3 LITER_t + \alpha_4 SCHOL_t + \varepsilon_t \quad (16)$$

In the next stage, long-term relationships between the variables are tested with the Johansen Cointegration framework. Akaike Information Criterion (AIC) is used to determine optimal lag length.

Table 7: Lag Length Selection

	Lag	LogL	LR	FPE	AIC	SC	HQ
Eq (15)	0	-262.789	-	1201902.	28.18831	28.43685	28.23038
	1	-244.704	24.74786	2781676.	28.91621	30.40743	29.16859
	2	-170.2	62.74054*	30796.12*	23.70522*	26.43913*	24.16791*
Eq (16)	0	-15.2905	-	5.8306*	2.135843	2.384380*	2.177906
	1	-1.63421	18.68757	2.15e-05	3.329917	4.821136	3.582290
	2	40.22946	35.25362	7.39e-06	1.554794*	4.288696	2.017478*

* indicates the optimal lag length at 0,05 level.
LR: Sequential modified LR test statistic, FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion.

Johansen Cointegration test results reveal that there are three cointegration equations for the Eq. (15) and one cointegration equation for the Eq. (16). The findings of the trace and maximum eigenvalue tests are consistent with each other. In order to predict the models by the Johansen method, the number of delays was determined as two according to the AIC (Table 7).

Table 8: Johansen Cointegration Test Results

	Hypotesized no of cointegrating equation(s)	λ_{max}	λ_{trace}	Critical Value	Probability**
Eq. (15)	None*	0.993319	164.1922	69.81889	0.0000
	At most 1*	0.817202	69.03100	47.85613	0.0002
	At most 2*	0.714999	36.74285	29.79707	0.0067
	At most 3	0.361508	12.89287	15.49471	0.1188
Eq. (16)	None*	0.965375	116.3989	69.81889	0.0000
	At most 1	0.793487	52.49834	47.85613	0.0172

At most 2	0.481698	22.52793	29.79707	0.2700
At most 3	0.348576	10.04117	15.49471	0.2776

* the hypothesis is rejected at the level of 0.05 significance
** MacKinnon-Haug-Michelis (1999) *p* values.
λ_{max}: Maximum Eigen statistic, λ_{trace}: Trace statistic,

The long–term equilibrium models estimated using the Johansen method are as follows.

$$FIITR_t = \underset{(0.023)}{6.109} + \underset{(0.000)}{0.001}GDPPC_t + \underset{(0.047)}{-45.769}UNEMP_t + \underset{(0.000)}{-7.406}COLIN_t + \underset{(2.705)}{1.607}GINIC_t \quad (17)$$

$$FIITR_t = \underset{(0.846)}{6.841} + \underset{(0.664)}{-6.191}MEDAG_t + \underset{(0.001)}{0.174}URBAN_t + \underset{(0.129)}{-1.736}LITER_t + \underset{(0.472)}{7.11}SCHOL_t \quad (18)$$

It is seen that the *t* values of the *GDPPC, UNEMP, COLIN* variables in Eq. (15) and *URBAN* variable in Eq. (16) are statistically significant at 0.05 level. The results of Johansen's cointegration test suggests significant and positive long-run co-movement between financial inclusion and GDP per capita, urbanization and a significantly negative long-run co-movement between financial inclusion, unemployment, and cost of living.

In the next stage, The Granger causality test has been performed to examine the causal relationship between variables. The optimal lag length determined by VAR for both models (Eq. 15 and Eq. 16) is two. The results of the Granger tests reveal no short-term causal relationships between variables (Table 9).

Table 9: Granger Causality Test Results

Direction of Causality	*F* statistic	probability**	Decision
GDPPC → FIITR	1.3344	0.2948	h_0
FIITR → GDPPC	0.9065	0.4264	h_0
UNEMP → FIITR	0.4731	0.6327	h_0
FIITR → UNEMP	1.0332	0.3815	h_0
COLIN → FIITR	1.6679	0.2241	h_0
FIITR → COLIN	2.2697	0.1400	h_0
URBAN → FIITR	0.6338	0.5451	h_0
FIITR → URBAN	0.3582	0.7052	h_0

where h_0: no causal effect of *X* on *Y,* h_1: causal effect of *X* on *Y*
Arrows point the direction of causality

Short–term causality relationships were also tested using the Toda–Yamamoto method with the length of 2 + 1 = 3 (*P* + d_{max}). The findings of the Toda–Yamamoto test are consistent with the results of Granger causality test apart from *URBAN → FIITR* hypothesis which indicates that there is a one-way causal relationship running from urbanization level to financial inclusion (Table 10).

Table 10: Toda–Yamamoto Causality Test Results

Direction of Causality	Test statistic	*p* value	Decision
GDPPC → FIITR	1.7922	0.4082	h_0
FIITR → GDPPC	1.4678	0.4800	h_0
UNEMP → FIITR	3.1729	0.2046	h_0
FIITR → UNEMP	1.9542	0.3764	h_0
COLIN → FIITR	4.5629	0.1021	h_0
FIITR → COLIN	2.6839	0.2613	h_0
URBAN → FIITR	6.0656	0.0482	h_1
FIITR → URBAN	0.5549	0.7577	h_0

where h_0: no causal effect of *X* on *Y,* h_1: causal effect of *X* on *Y*
Arrows point the direction of causality

5. CONCLUSION

In this study, the factors which might have an impact on financial inclusion in Turkey during the period of 1997 - 2018 were examined. In this context, firstly, the financial inclusion index, which consists of four access and four usage dimensions, was created. The variables whose effect on financial inclusion would be investigated were determined through the fields of

economy, population, demography, transportation, information society and education, and three regression models were created. GDP per capita, unemployment rate, cost of living index, Gini coefficient, median age, urbanization rate, total length of railways and roads, number of road motor vehicles, number of mobile phone subscribers, number of broadband internet subscribers, literacy rate and mean years of schooling as the independent variables.

The series was first difference stationary except from total length of railways and roads, number of road motor vehicles, number of mobile phone subscribers and number of broadband internet subscribers' series which were all non-stationary. Non-stationary variables were excluded from analysis and models were combined. For the estimation of the models, the Johansen Cointegration method was applied and causality relationships between the variables were tested with Granger and Toda–Yamamoto approaches.

Consistent with many studies demonstrating financial inclusion is positively and significantly related to GDP per capita, it was expected to find that GDP per capita has a positive impact on financial inclusion since increases in income may cause people to demand more financial services. Findings obtained by the Johansen approach suggests a significantly positive long-run co-movement between financial inclusion and GDP per capita. However, outputs of Granger and Toda–Yamamoto causality tests reveal there is no causality relationship in short-run between GDP per capita and financial inclusion in Turkey.

Unlike GDP per capita, it was expected that financial inclusion levels would decrease as national unemployment levels increase and therefore a negative relationship between unemployment and financial inclusion may appear. On the examination of cointegration test results it is seen that there is a significantly negative long-run co-movement between financial inclusion and unemployment in Turkey. Similar to the GDP per capita, the results of Granger and Toda–Yamamoto causality tests reveal that there is no significant causal relationship between unemployment and financial inclusion in Turkey in the short-run.

Increases in the cost of living were expected to impact savings rates negatively and thus financial inclusion. However, financial inclusion also has access to and use of loan dimensions. Increases in living costs may also cause an increase in the demand for consumer loans. Findings obtained by the Johansen approach suggests a significantly positive long-run co-movement between financial inclusion and cost of living. However, no significant short-term causality effect is determined between two variables.

Financial inclusion is a key enabler in reducing poverty and boosting prosperity (World Bank, 2018). Although decreases in the level of inequality were expected to cause an increase in financial inclusion, no significant long-run cointegration and no short-run causality effect has been determined between the Gini coefficient and the financial inclusion in Turkey.

It is widely accepted that the aging of a population has considerable impacts on financial markets because of the increase in savings rates and the demand for investment funds (Bosworth, Bryant and Burtless, 2004). On the other hand, unbanked adults may be of a younger age. The increases in the median age was expected to cause increases in financial inclusion. However, the outputs of the research show that there is no significant relationship between median age and financial inclusion in Turkey in the short and long run.

It is generally stated that the urbanization process leads to the growth of various infrastructural facilities as well as helps in promoting entrepreneurship and industrial growth. Therefore, high rate of urbanization was expected to give a boost to the financial sector resulting in a higher level of financial inclusion. The outputs of Johansen's cointegration test reveal significant and positive long-run co-movement between urbanization rate and financial inclusion. In addition, urbanization rate variable is found to have a short-run causal effect on financial inclusion in the Toda–Yamamoto test. The significant relationship between the level of financial inclusion and urbanization rate in the short and long run reveals that the increase in the level of urbanization causes individuals to access financial institutions more easily and use more financial products in Turkey.

Although a higher literacy rate and mean years of schooling were expected to cause higher financial inclusion levels by providing more information and awareness about financial products, the results obtained from the research do not reveal significant relationship in the short and long-run between two variables.

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TESTING THE WEAK FORM MARKET EFFICIENCY OF BORSA ISTANBUL: AN EMPIRICAL EVIDENCE FROM TURKISH BANKING SECTOR STOCKS

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ABSTRACT

Purpose- The purpose of this study is to assess the weak form efficiency of Borsa Istanbul banking sector stocks using bank stocks listed in BIST 30. In addition to individual banking sector stocks, BIST 100 and BIST BANKS indexes are also investigated.
Methodology- For this purpose, weekly adjusted closing prices of selected stocks and indexes are collected from finance.yahoo.com and investing.com. The study period covers from January 4, 2010, to December 20, 2019. Therefore, a total of 520 observations for each stock and index are analyzed using autocorrelation, run test and unit root tests such as Augmented Dickey-Fuller (ADF), Phillips-Perron test (PP) and Kwiatkowski-Phillips Schmidt-Shin (KPSS).
Findings- The autocorrelation test results indicated that only VAKBAN and YAKBNK are efficient at the weak form of efficiency during the study period. On the other hand, the runs test result showed that only AKBANK and GARAN do not follow the random walk hypothesis and the other six samples are efficient at the weak form of efficiency. Finally, the unit root tests such as ADF, PP and KPSS results indicated that all samples do not follow the random walk hypothesis and they are not efficient at the weak form of market efficiency. BIST 100 and BIST BANKS indexes are inefficient according to all methods except in run test analysis.
Conclusion- Consequently, the three types of tests employed in this study exhibited a controversial result and it is difficult to give a general conclusion regarding the efficiency of the BIST Banking sector in the weak form. This indicated the probability of making an abnormal return by examining the Borsa Istanbul banking sector stocks' historical prices.

Keywords: Autocorrelation, banking sector, Borsa Istanbul, efficiency, run test, unit root tests
JEL Codes: G10, G11, G14

1. INTRODUCTION

The relationship between capital markets and economic growth is one of the fields that catch the attention of economics and finance researchers. Several studies identified that there is an association between capital market development and economic growth. Carp (2012) states that stock markets have a vital role in the global economy, and their impacts on economic growth can be transferred to the real sector via their inevitable ways such as creating liquidity, market capitalization, risk distribution and allocation. Stock markets are also having an important function for the economy by providing liquidity to the market, creating fund sources through encouraging saving, expanding the ownership structure of capital for broadening society and playing as an economic indicator. The above-mentioned roles will effective when the stock market is efficient. The efficiency of the stock market is depending on the fairly and effectively change of securities' price in the market, fast and uninterrupted flow of information through the market, the low transaction cost in the market and the act of investors in the market rationally (Aydin, Başar & Coşkun, 2015).

There are three forms of market efficiency such as allocational market efficiency, operational market efficiency and informational market efficiency (Bauer, 2004). Allocational market efficiency is concerned with how scarce resources are distributed fairly through capital market instruments. On the other hand, operational market efficiency implied that if a

market is operationally efficient, market participants can perform their financial transaction at a possible minimum cost. According to the concept of informational market efficiency, if a market is informationally efficient, the market prices of financial instruments are reflected all available information (Pilbeam, 2018). This study concerned with only informational market efficiency and the phrase market efficiency is used as a proxy informationally efficiency through this paper.

The concept of the Efficient Market Hypothesis (EMH) depends on the random walk theory. In 1953, Maurice Kendall, a professor of statistics at the London School of Economics published an article named "The Analysis of Economic Time Series" in Journal of the Royal Statistical Society. He examined the weekly and monthly data for 22 economic series; 19 stock groups for the period from 1928 to 1938, monthly average price of wheat in the Chicago commodity markets from 1883 to 1934, monthly average price of wheat from 1983 to 1934 (excluding 1915 to 1920) and monthly spot cotton at New York commodity markets from1816 to 1951 (excluding 1861-1866 and 1914-1920). The result of Kendall's study confirmed that the series' prices are following random changes from one term to the next (Kendall, 1953). Kendall's empirical examinations commonly named the "random walk theory" (Dimson & Mussavian, 1998).

The EMH commenced in the 1960s by the works of Fama (1965) and Samuelson (1965). Fama (1965) indicates that the prices of stock markets follow a random walk and he defined efficient market as "a market where there are large numbers of rational, profit-maximizers actively competing, with each trying to predict future market values of individual securities, and where important current information is almost freely available to all participants." Samuelson (1965) states that in the reasonable market, price "perform a random walk with no predictable bias." According to Kendall (1953), the prices of stocks are shows unpredictable movement and there is no relationship between historical prices and future prices.

Initially, the stock market efficiency divided into a weak and strong form of efficiency by Harry Roberts and then Fama (1970) categorized it into three forms such as the weak, semi-strong and strong form of market efficiency. Fama identified three forms of information sets i.e. historical price information, publicly available information and unpublic information or insiders' information. The historical price information is used to test the efficiency of the stock market in its weak form. Firm-specific publicly available information (dividend announcement, merger and acquisition, earning announcement, new security issue and stock split) and general macro publicly available information (interest rate, exchange rate, GDP, commodity prices, inflation and money supply) are used to test the efficiency of stock market at the semi-strong form and insiders' information is used to test the strong form of efficiency.

Since in the 1970s several pieces of research conducted to identify the efficiency level of stock markets around the world. Identifying the efficiency levels of the stock markets has a vital role for policymakers and investors (Cooray & Wickremasinghe, 2007). The efficiency of the stock markets can be tested at a micro-level using single stock prices or macro-level using stock indexes. Researchers in economics and finance almost agreed on the efficiency of stock markets in developed countries at the weak form of efficiency. On the contrary, there is no agreement on the efficiency of developing countries stock market at the weak form of efficiency (Malkiel, 1989). Therefore, there is a need to test developing countries' stock markets in the weak form. In this regard, this paper aims to test the weak form efficiency of Borsa Istanbul using baking sector stocks.

2. THE GENESIS OF CAPITAL MARKET IN TURKEY

The origins of the structured capital market in Turkey dates back to the second half of the 19th century. During the Ottoman Empire, the first capital market is known as" Dersaadet Securities Exchange" was established in 1866. After the foundation of the Turkish Republic, a new law was issued to rearrange capital markets "İstanbul Securities and Foreign Exchange Bourse" was established in 1929 (Batten, Fetherston & Szilagyi, 2004).

In 1982, the "Capital Market Board" was established to form, amend and administer the Turkish security markets. The board was responsible for providing reliable information to the public, creating a suitable environment for the operation of the market, taking necessary action to expand the share market, doing audits and examinations. Consequently, the Board started to prepare a suitable legal and institutional framework for Turkey's capital market and on October 19, 1984, a new "Capital Market Law" regarding the establishment capital market was decreed. The new stock market regulations enacted on December 18, 1985 consists of the rules and regulations of the stock exchange. On December 26, 1985, Turkey's new stock exchange officially inaugurated with the new name of "Istanbul Stock Exchange" (Chambers, 2006).

Until 2013, the Istanbul Stock Exchange sustained its operations in the capital market as a state-owned entity and showed a progressive in corresponding with the Turkish economy growth. In 2013, depending on the new "Capital Market Law" enacted, the three separate exchanges such as Istanbul Stock Exchange (IMKB), Istanbul Gold Exchange (IGE) and Turkish Derivatives Exchange (TurkDEx) merged as one entity known as Borsa İstanbul (BIST). BIST became a profit-based joint-stock company since in 2013 (Canbaş & Doğukanlı, 2017).

Currently, BIST encompasses four different markets such as equity market (publicly traded corporations' stocks from different sectors are traded), debt securities market (organized market for both fixed income securities and repo-reverse repo dealings are traded), derivatives market (single stock futures and options, index futures and options, currency futures and options, precious metals, commodity and energy futures are traded) and precious metals and diamond Markets. (Borsa İstanbul, 2019). BIST calculates several market indexes for investors based on capitalization, sustainability, liquidity, established cities, technology, sector, corporate governance, dividend, initial public offering, etc. 354 stock indexes are calculating in BIST and 59 indexes out of 354 are calculated in real-time and the rest 259 are calculated once a session (Borsa İstanbul, 2019). According to the Public Disclosure Platform (PDP), there are 490companies listed in BIST.

Even several studies conducted to test the weak form efficiency of Borsa Istanbul; there is no consensus between researchers on its efficiency at the weak form. Most of the studies tested BIST efficiency using stock indexes. This study is trying to assess the efficiency of Borsa Istanbul using both indexes such as BIST 100 and BIST BANKS, and 6 banking sector individual stocks included in the BIST 30 index. The finance sector is playing a significant role in Turkish economy development. This sector is mainly dominated by the banking business. As stated by the Investment office of Turkey (2019), the banking business has a 70% share from the overall finance sector services. Furthermore, the banking sector also plays a substantial contribution to the development of Borsa Istanbul and it has a significant share in terms of market value and trading volume. Due to the above-mentioned reasons, the banking sector is selected to investigate the efficiency of Borsa Istanbul.

The rest of the paper is set out as follows: In the next section, we analyzed related literatures on the efficiency of Turkish Stock market. In Section 4, we describe the method applied and the data used to test the efficiency of the Turkish stock market. The empirical results are presented in Section 5. The summary and conclusions are presented in section 6.

3. LITERATURE REVIEW

Studies like Stengos& Panas (1992) and Khandoker, Siddik & Azam (2011), assessed the efficiency of banking sector stocks for Athens Stock Exchange and Dhaka Stock Exchange respectively. This section devoted to reviewing empirical studies conducted to assess the efficiency of Istanbul security exchange (Borsa Istanbul). Several studies were done to test the efficiency of Borsa Istanbul using different methods which covered various study periods. These empirical studies reviewed by chronological order as follows.

Alparslan (1989) tested the efficiency of the Istanbul Stock Exchange (ISE) using the weekly prices of 11 selected individual stocks for the period covering from January 10, 1986 - October 28, 1988. To investigate the weak form of efficiency, he used autocorrelation, runs test and filter test. The outcome of autocorrelation and runs tests indicated that ISE was efficient at the weak form and based on filter tests result, ISE was not efficient at the weak form. Balaban (1995) investigated the efficiency of Istanbul Security Exchange (ISE) at the weak and semi-strong form of efficiency using autoregression and autocorrelation for a total 1,646 closing prices of İstanbul Securities Exchange Composite Index (ISECI) covering a period from January 4, 1988, to August 5, 1994. The finding indicates that the ISE was not efficient neither at the weak-form nor the semi-strong form efficiency.

To test whether Istanbul Stock Exchange (ISE) is following the random walk hypothesis or not, Buguk & Brorsen (2003) did research using 396 observations enclosed from 1992 to 1999 for ISE industrial, composite and financial indexes weekly closing prices. They applied unit root testes (Augmented Dickey-Fuller test), GPH fractional integration test and variance ratio testes (LOMAC single variance ratio test and Rank- and sign-based variance ratio tests). According to ADF unit root, LOMAC variance ratio, and GPH fractional integration tests, the three indexes are following the random walk hypothesis and on the other hand the rank- and sign-based variance ratio tests indicated that the selected indexes are not following the random walk hypothesis.

Muslumov, Aras & Kurtulus (2003) studied the weak form of efficient market hypothesis in ISE using the widest study period which covered from 1990 to 2002. They collected the weekly prices of ISE-100 index and individual stocks that included in ISE-100 index. Generalized Auto-regressive Conditional Heteroscedastic (GARCH) method is employed to test efficiency. The finding indicated that ISE-100 national index follows the weak form of efficient market hypothesis and 65% of the individual stocks studied do not show the weak form of efficient market hypothesis while the remaining 35% does.

Kiliç (2005) assessed the weak form of efficient market hypothesis for ISE National 100 index using Markov chain methodology for the period covering from September 23, 1987, to October 2, 2004. His finding indicates that ISE does hold the weak form of an efficient market hypothesis. Aga & Kocaman (2008) investigated the efficiency levels of ISE by calculating their own index named "return index-20". They select the big 20 companies traded in ISE and calculated monthly return for the period covered from January 1986-November 2005. They analyze the collected data using time series regression method. Their finding indicated that ISE was efficient at the weak form of efficiency.

Al-Jafari (2013) tested the randomness behaviour of ISE using XU 030 index daily prices from January 1997 to December 2011. He employed unit root tests, runs tests and variance ratio test to assess the efficiency form of ISE. His finding indicated that ISE does not efficient at the weak form of efficiency, means ISE does not follow the random walk hypothesis. Saymeh (2013) empirically investigated the weak form of efficiency for Amman Stock Exchange, (ASE) and Istanbul Security exchange (ISE). He collected historical price information for the period 2000-2011 and analyzed using Ljung Box Autocorrelation test, Runs test, Dickey-Fuller Unit Root test, and Individual Variance Ratio test. The result from run and Autocorrelation tests indicated that ISE does not follow the random walk hypothesis while Dickey-Fuller tests and Individual Variance Ratio tests show that it follows the random walk hypothesis.

Kapusuzoglu (2013) did research to assess the efficiency of ISE using 3943 daily price observations of ISE National 100 index for the period from 1996 t0 2012. He implemented unit root tests such as Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests to investigate the efficiency of ISE. The finding shows that the ISE National 100 index did not follow the weak form of an efficient market hypothesis. Daver, Karacaer & Hülya (2013) examined the efficiency of Turkish Derivatives Exchange (TurkDEX 100) and Borsa Istanbul (BIST 100 Index) daily return for the period from December 2, 2007, to August 2, 2013, using serial correlation test, the runs test, and the variance ratio test. They conclude that ISE is efficient at the weak form of efficiency.

Gozbasi, Kucukkaplan & Nazlioglu (2014) assessed the efficiency of Borsa Istanbul using the daily data for the Borsa Istanbul composite index (BIST 100), industry index, financial index and services index for the period from July 1, 2002, to July 7, 2012. The employed linearity test developed by Harvey et al. (2008 and the nonlinear Exponential Smooth Transition Autoregressive (ESTAR) unit root test developed by Kruse (2011). They conclude that Turkey's stock market is following the weak form of an efficient market hypothesis. Yücel, (2016) studied the efficiency of Borsa Istanbul by collecting the returns of 22 indexes for the period from 2000 to 2015. The analyze is conducted using unit root tests such as Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP). The finding indicated that all 22 indexes examined in this study are efficient at the weak form of efficiency. Bulut (2016) tested the weak form of the efficient market hypothesis for BIST 100 index by using the monthly observations from January 2003 to September 2015. He employed Lee and Strazicich (2003) and Carrion-i-Silvestre et al. (2009) unit root tests. The finding shows that BIS 100 index is efficient at the weak form in this study period.

Akgün & Şahin (2017) investigated the weak-form of efficiency for BIST indexes such as BIST 100, BIST Industry, BIST Service and BIST Financial index. They collected the daily closing prices of such indexes for the period between January 4, 2010-November 2, 2017 and analyzed using unit root tests (Augmented Dickey-Fuller (ADF), Phillips-Perron (PP) and Kwiatkowski-Phillips Schmidt-Shin (KPSS)) and structural broken unit root tests. The finding indicated that BIST is inefficient at the weak form of efficiency. Tas & Atac (2019) investigated the randomness of Borsa Istanbul using Dickey-Fuller and Runs test for separate two study periods. BIST30 index and companies included in BIST 30 index daily prices collected for a five-year period from 2013 to 2018. And also, daily prices for indexes such as BIST30, BIST100 and BISTTUM are analyzed for the period from 2000 to 2018. The finding implies that the analyzed indexes are efficient at the weak form according to the Dickey-Fuller test while they are not efficient according to the run test.

Aliyev (2019) tested the weak form efficiency of Borsa Istanbul using BIST 100 indexes weekly price covering the period from 2000 to 2014. To analyze the efficiency, Smooth transition autoregressive (STAR) type nonlinear model is employed. According to Aliyev's nonlinear analysis, BIST is inefficient at the weak form of efficiency.

To sum up, 16 studies conducted to test the weak form of efficient market hypothesis in Borsa Istanbul are reviewed. These studies employed different analyzing methods, study periods and data. Some papers analyzed the efficiency based on individual companies' stock and some of the analyzed using stock indexes. About half of the papers reviewed concluded that Borsa Istanbul is efficient at the weak form and the rest half concluded that BIST is not efficient at the weak form of efficiency. There are also some different results in the same study used different models. Some models support the efficiency and some do not support. The inferences we can take from the previous studies are there is not a common agreement on the efficiency of BIST at the weak form and there is a need for more studies regarding the efficiency of BIST. In this regard, this study aims to investigate the sectoral efficiency of BIST using the banking sector index and banking sector individual stocks.

4. DATA AND METHODOLOGY

As clearly illustrated in the introduction part of this paper, Fama (1970) identified three types of information sets to test the efficiency of stock markets. Among these information sets, historical price information is used to test the market efficiency at its weak form. Therefore, it is possible to test the weak form of efficiency using daily, weekly and monthly historical price observations of the stock. According to the weak form of an efficient market hypothesis, if a market is efficient at the weak form it is impossible to predict the future prices of securities. There should be no relationship between past prices and future prices. Therefore, prices should be changed randomly. In other word, prices should follow the random walk hypothesis.

There are different statistical methods to test the randomness of time series variables. These methods are classified into parameter and none parameter tests. In most of the literature, parameter testes like unit root tests including Augmented Dickey-Fuller (ADF), Phillips-Perron test (PP) and Kwiatkowski-Phillips Schmidt-Shin (KPSS) have been extensively employed (Palachy,2019). On the other hand, nonparametric testes such as autocorrelation, run test and Markov chains test have been used to test randomness (Dufour, Lepage, & Zeidan, 1982).

After reviewing studies conducted in the similar area of this study, autocorrelation, run test and unit root tests such as Augmented Dickey-Fuller (ADF), Phillips-Perron test (PP) and Kwiatkowski-Phillips Schmidt-Shin (KPSS) selected to analyze the randomness of Borsa Istanbul using 2 indexes and 6 banking sector individual stocks.

4.1. Autocorrelation

According to BusinessDictionary.com, Autocorrelation defined as "a situation in which a time series data is influenced by its own historical values". Tintner (1965) describes autocorrelation as "lag correlation of a given series with itself, lagged by a number of time units", where he used the term serial correlation to "lag correlation between two different series.

The autocorrelation of a series x at lag k is calculated as:

$$AC_K = \frac{\sum_{t=k+1}^{T}(x_t-\bar{x})(x_{t-k}-\bar{x})}{\sum_{t=1}^{T}(x_t-\bar{x})^2} \quad (1)$$

Where: AC_K is the autocorrelation coefficient of series at lag k and $\bar{x}$ is the sample mean of x. If AC_1 is nonzero, it indicated that the sequences are serially correlated at first order. If an autocorrelation coefficient is outside the border calculated as the approximate of two standard error, it is significantly different from zero at and it also significant at the 5% significance level (Eviews.com, 2019).

4.2. The Runs Test

The runs test, it is also known as a Wald–Wolfowitz runs test is one of the popular nonparametric tests employed to detect a nonrandom pattern in a time series data. For instance, in a time series that have two or more types of signs, a run is described as a sequence of one or more similar signs which are followed and headed by separate signs. The run test depends on the extent of similar runs (Wang, 2003). For significant samples, we should to calculate a *z-score* and using the normal distribution table it is possible to find the critical value of *z-scores*. To calculate the Z-score of the run test for sizable samples, we can use the following formulas:

$$\bar{x}R = \frac{2n_1n_2}{n_1+n_2} + 1 \quad (2)$$

Where $\bar{x}R$the mean value of runs is, n_1 is the number of records the first occasion happened, and n_2 is the amount of records the second occasion happened;

Where S_R is the standard deviation of runs;

$$Z^* = \frac{R+h-\bar{x}R}{S_R} \quad (3)$$

Where *z** is the z-score for a normal estimate of the data, *R* is the quantity of runs, and *h* is the correction for continuity, ±0.5,

Where;

$$h = +0.5 \; if \; R < \; (2n_1n_2/(n_1+n_2-1)+1 \quad (4)$$

$$h = -0.5 \; if \; R > (2n_1n_2/(n_1+n_2-1)+1 \quad (5)$$

To test the randomness of the sample stock price series, we can construct the hypothesis as follows:

H_0: The series of stock prices are changed randomly.

H_1: The series of stock prices are not changed randomly.

Therefore, the decision rule is not rejecting the null hypothesis when the *z-score (Z^*)* value is between ***-1.96*** and ***+1.96*** at ***5%*** level of significance level (Corder, & Foreman, 2014).

4.3. Unit Root Tests

In a unit root test, the null hypothesis can be stated as "a time series contains a unit root" whereas the alternative hypothesis can be expressed as "a time series is stationary" (Harvey, 2005). The existence of a unit root in a time series indicates that a series is non-stationery. One of the ordinary examples of none stationary is the random walk hypothesis (Nkoro & Uko, 2016). Consequently, we can test the randomness of historical stock prices through unit root tests.

Unit root test is a common type of parametric tests used to test the stationarity or non-stationarity of a time series. Augmented Dickey-Fuller (ADF), Phillips-Perron (PP) and Kwiatkowski-Phillips Schmidt-Shin (KPSS) tests are the most frequently applied unit root tests (Arltová &Fedorová,2016).

The basic test for unit root is Augmented Dickey-Fuller (ADF). According to ADF, the null hypothesis is stated as a time series are following the random walk. The ADF model can be statistically defined as follows (Sjö, 2008).

$$\Delta x_t = \alpha_0 + \beta_t + \pi x_{t-1} + \sum_{i=}^{k} \alpha_i \Delta x_{t-i} + \varepsilon_t \quad (6)$$

Where; Δ represents first differences, ε_t is the random error term which is normally distributed with a mean of zero and x_i is the log of the price, π is the autoregression parameter and *k* is the lagged values of Δx. Determining the number of lag is very important. In this study, Akaike Information Criterion (AIC) is used to decide the number of lags. If H_0: π = 0, the series holds a unit root and hence it is non-stationary. We can say also the series is integrated at the first order I (1). If H_1: π<0, the series does not have a unit root and it is called stationary. In this case, the series is integrated at I (0) (Arltová &Fedorová, 2016).

Phillips-Perron (PP) unit root test is a non-parametric adjustment to the basic Dickey-Fuller test. In the non-stationary test of time series data produced through the serial correlated and heteroscedastic unsystematic element, it is repeatedly a problem regarding the choice of lag k in the model. Phillips and Perron (1988) solved this problem by modifying the basic Dickey-Fuller test as a non-parametric test without the addition of lagged variation terms (Virmani, 2004; Gujarati, 2009).

In contrary with ADF and PP tests, the complementary unit root model launched in 1992 by Kwiatkowski, Phillips, Schmidt and Shin, and known as KPSS test. It assumes that the null hypothesis is the stationarity of the series and the alternative hypothesis is the non-stationarity or the presence of unit root in the series (Syczewska, 2010).

4.4. The Sample and Data

To test the efficiency of BIST in banking sector, six bank stocks listed in BIST such as Ak Bank (AKBNK.IS), Turkey Garanti Bank (GARAN.IS), Turkey Halk Bank (HALKB.IS), Turkey Is Bank (ISCTR.IS), Turkey Vakiflar Bank (VAKBN.IS) and Yapi & Kredi Bank (YKBNK.IS) are selected. The main criterion to select individual banks is to be included in the BIST 30 index. The aforementioned six banks are included in the BIST 30 index. In addition to individual banking sector stocks, BIST 100 and BIST BANKS indexes are also selected.

After identifying the sample individual stocks and indexes, the next decision is regarding data source and study period. In this regard, the weekly adjusted closing prices of selected stocks and indexes are collected from finance.yahoo.com and investing.com. The study period covers from January 4,210 to December 20, 2019. Therefore, a total of 520 observations for each stock and index is analyzed. The weekly observation for ISCTR is found starting from February 15, 2010, and a total of 514 weekly observations analyzed. Graphical description of the data series which selected to test the efficiency of BIST banking sector efficiency is presented in figure1 and figure 2 below.

Following studies such as Fama (1965); Solnik (1973); Praetz (1980); Cooper (1982); Parkinson (1984a) and Dickinson & Muragu (1994), the collected weekly prices are converted into a natural logarithm. And then the difference between consecutive log prices are calculated as follows:

$$D_T = LogP_t - LogP_{T-1} \quad (7)$$

Where; D_t is the difference in log prices from time $t-1$ to time t and P_t is an adjusted weekly closing prices of selected stocks for the study. In place of using price changes, logarithm price changes are more appropriate to detect the randomness of series. Normal price changes for a particular share is a function of an increasing trend of the share while using logs is more neutralize from this effect. In the case of run test, there is no difference between the simple and log price changes due to run test concerned with only to the sign of the change, not the amount (Panas, 1990).

Figure 1: BIST 100 and BIST BANKS Indexes Historical Prices in Turkish Lira (TL)

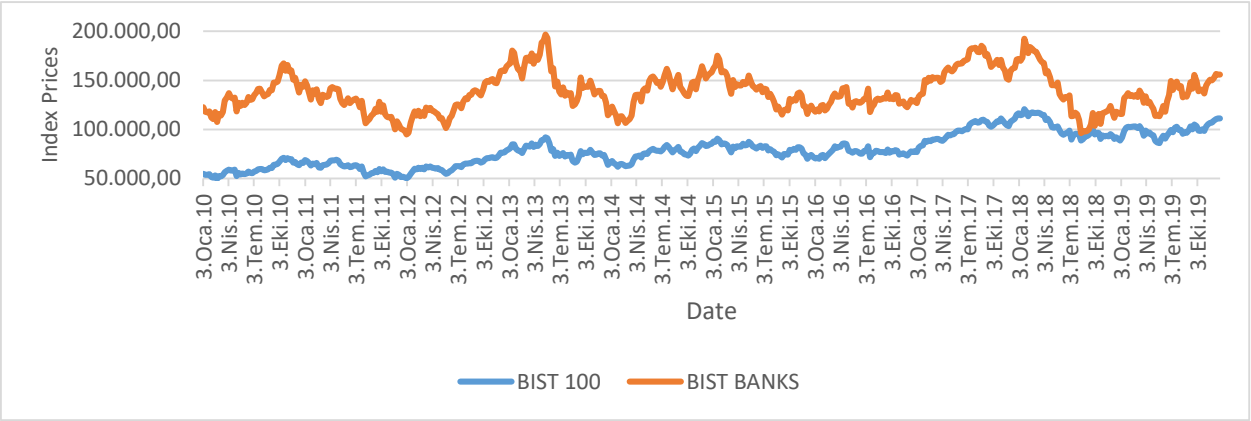
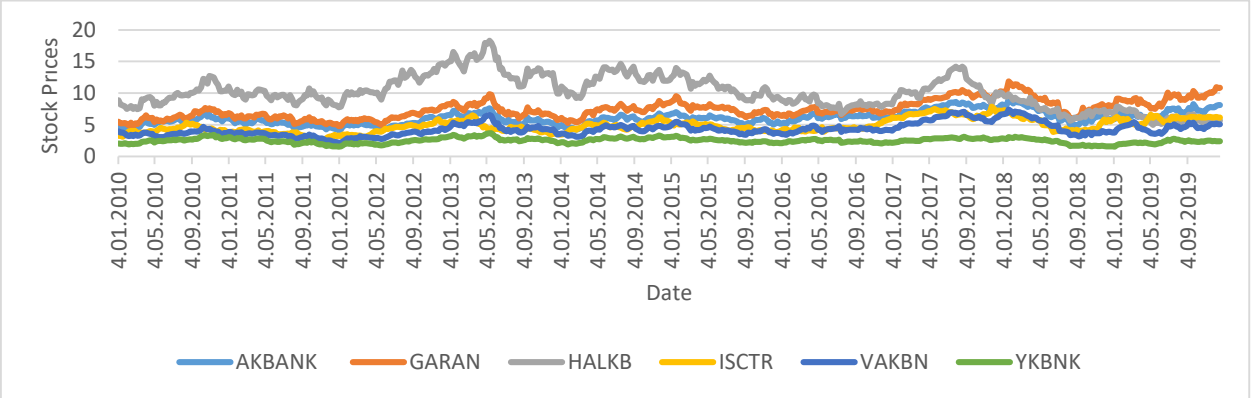


Figure 2: Selected Banks Historical Stock Prices in Turkish Lira (TL)



5. EMPIRICAL RESULTS

In this section the descriptive properties of the series and selected analyzing methods such as autocorrelation, run test and unit root test results are summarized.

5.1. Descriptive Statistics

One of the basic assumptions of the efficient market hypothesis is the randomness of the series, meaning that the series should follow the random walk hypothesis. If a series is following a random walk, it should be normally distributed. The descriptive statistics which shows the normality of the selected series is presented in table 1. The descriptive statistics which summarized in table 1 indicated that the samples' data are not normally distributed. The p values of all series are less than 5%. This means the normal distribution of the null hypothesis is not accepted. If the series is exactly normally distributed, the skewness and Kurtosis coefficient will be zero. In the case of this study, all 8 stock and index price change series' skewness and Kurtosis coefficients are different from zero. All series are negatively skewed. Normally distribution is one of the criteria for the randomness of a series. From the perspective of these descriptive statistics, all series are inefficient.

Table 1: Descriptive Statistics of Weekly Log Index and Stock Price Changes

	BIST_100	BIST_BANK	AKBANK	HALKB	ISCTR	VKBAN	YKBNK	GARAN
Mean	0.0014	0.0005	0.0010	-0.0009	0.0012	0.0005	0.0003	0.0013
Median	0.0030	0.0037	0.0023	0.0000	0.0033	0.0023	0.0029	0.0030
Maximum	0.0834	0.1326	0.1263	0.1686	0.1804	0.1548	0.1551	0.1611

Minimum	-0.1437	-0.1845	-0.1814	-0.2197	-0.1618	-0.2098	-0.2225	-0.2147
Std. Dev.	0.0310	0.0433	0.0463	0.0529	0.0442	0.0511	0.0475	0.0474
Skewness	-0.6142	-0.3230	-0.2936	-0.1330	-0.1969	-0.2851	-0.4481	-0.2605
Kurtosis	4.2852	4.1361	3.8705	3.7748	3.8363	4.2491	4.4483	4.4124
Probability	0.000	0.0000	0.0000	0.0007	0.0003	0.0000	0.0000	0.0000
Observations	520	520	520	520	514	520	520	520

5.2. Correlation between Selected Samples

The correlation coefficient between series shows whether the log price changes of selected stocks and indexes are move together or not. In this context, the correlation coefficients between them are presented in Table 2. All individual bank stocks are highly correlated with the BIST 100 and BIST BANKS indexes. All single bank stocks are also highly correlated with each other. The minimum correlation coefficient of 0.742. Therefore, it is not recommended diversifying investment only in banking sectors stocks. It also indicates most of the banks are affected similarly by the event happened in the markets.

Table 2: Correlation Matrix between the Sample Bank Stocks, BIST 100 and BIST 100 Indexes

	BIST 100	**BIST BANK**	**AKBANK**	**GARAN**	**HALKB**	**ISCTR**	**VKBAN**	**YKBNK**
BIST 100	1.000							
BIST BANK	0.937	1.000						
AKBANK	0.854	0.932	1.000					
GARAN	0.870	0.953	0.860	1.000				
HALKB	0.830	0.859	0.763	0.774	1.000			
ISCTR	0.833	0.884	0.788	0.821	0.742	1.000		
VKBAN	0.860	0.900	0.803	0.833	0.812	0.811	1.000	
YKBNK	0.851	0.883	0.783	0.826	0.752	0.818	0.831	1.000

5. 3. Autocorrelation Analysis

In this study, autocorrelation analysis used to identify the randomness of log price changes of selected indexes and stock prices. For all samples, serial correlation is employed for lag 1 to 30. The autocorrelation coefficients for all samples with 30 lags are presented in table 3. The results also presented graphically for each sample from chart 1 to chart 8. The null hypothesis of serial correlation states that there is no serial correlation between series.

The estimated two standard error boundaries calculated as ±0.0439. As the observation of ISCTR is less than other samples, the estimated standard error is estimated as ±0.0441 if the autocorrelation coefficient is larger than two standard error sums, the series is significantly non-zero and indicated the existence of serial correlation. The autocorrelation coefficient which greater than two standard error are bolded in the table and colored red in the autocorrelation chart.

Out of 2 indexes and 6 individual stocks analyzed in this study, 2 indexes and 4 stocks have at least one significant autocorrelation. In the case of BIST 100, lag 14 and lag 29 are significantly autocorrelated. BIST BANKS index has significant autocorrelations at lag 1, 14 and 19. In the case of individual bank stocks such as AKBAK, GARAN, HALKB and ISCTR have at least one autocorrelation. AKBAK and GARAN are significantly autocorrelated at lag 1 and lag 19. On the other hand, ISCTR log first difference is autocorrelated at lag 14. In contrary, VAKBAN and YAKBNK do not have any significant serial correlations. Depending on autocorrelation analysis, BIST banking sector is not efficient at the weak form of efficient level.

Table 3: Results of Autocorrelation Test

Lag	BIST 100	BIST BANK	AKBANK	GARAN	HALKBN	ISCTR	VKBAN	YKBANK
1	-0.077	**-0.112**	**-0.126**	**-0.176**	-0.051	-0.038	-0.048	-0.085
2	0.052	0.042	-0.011	0.055	-0.049	0.070	0.077	0.046
3	-0.030	-0.012	0.012	-0.009	-0.003	-0.061	0.024	-0.008
4	-0.033	-0.018	-0.060	-0.038	-0.009	0.042	-0.017	0.048
5	0.022	0.041	0.034	0.054	-0.015	0.053	0.025	-0.026
6	-0.043	-0.060	-0.065	-0.078	0.012	-0.021	-0.012	-0.054
7	0.022	0.049	0.082	0.027	-0.010	0.037	0.016	0.011
8	-0.046	-0.042	-0.085	0.000	-0.046	-0.003	-0.041	0.004
9	-0.050	-0.033	-0.008	-0.040	-0.023	-0.050	-0.031	-0.055
10	-0.031	-0.039	-0.032	-0.041	-0.006	-0.085	-0.064	-0.039
11	0.030	0.033	0.035	0.031	0.021	0.061	-0.007	0.063
12	0.040	0.038	0.023	0.028	0.059	0.019	0.052	0.013
13	-0.014	-0.033	-0.017	-0.043	-0.025	0.013	-0.041	-0.007
14	**-0.113**	**-0.092**	-0.064	-0.063	**-0.135**	**-0.100**	-0.074	-0.062
15	-0.047	-0.049	-0.047	-0.058	-0.030	-0.043	-0.056	-0.017
16	-0.029	0.017	0.038	0.035	-0.010	0.059	-0.056	-0.047
17	0.025	0.025	0.007	0.014	0.012	-0.004	0.024	0.050
18	0.040	0.063	0.054	0.049	0.060	0.025	0.039	0.041
19	-0.048	**-0.093**	**-0.115**	**-0.090**	-0.040	-0.087	-0.032	0.037
20	0.007	0.017	0.002	0.052	-0.046	0.060	-0.005	0.006
21	0.046	0.017	0.006	-0.007	0.021	0.003	0.004	0.032
22	0.064	0.077	0.061	0.052	**0.089**	0.066	0.072	0.071
23	0.050	0.035	0.022	0.032	0.016	0.002	0.032	-0.009
24	0.005	-0.035	-0.049	-0.039	-0.003	0.009	-0.007	0.021
25	0.017	0.015	0.049	-0.009	0.004	-0.031	-0.018	-0.047
26	0.022	-0.001	-0.006	-0.002	0.069	0.032	-0.007	0.054
27	0.024	0.028	0.034	0.027	0.003	0.026	0.029	-0.021
28	0.054	0.019	0.002	0.035	0.006	0.006	0.013	-0.009
29	**0.089**	0.063	0.057	0.050	0.055	0.046	0.045	0.069
30	-0.042	-0.034	-0.028	-0.029	-0.035	-0.054	-0.027	0.001

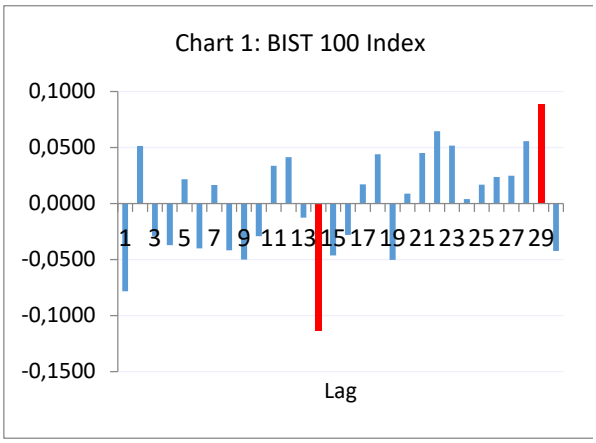


Chart 1: BIST 100 Index
0,1000
0,0500
0,0000
-0,0500
-0,1000
-0,1500
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29
Lag

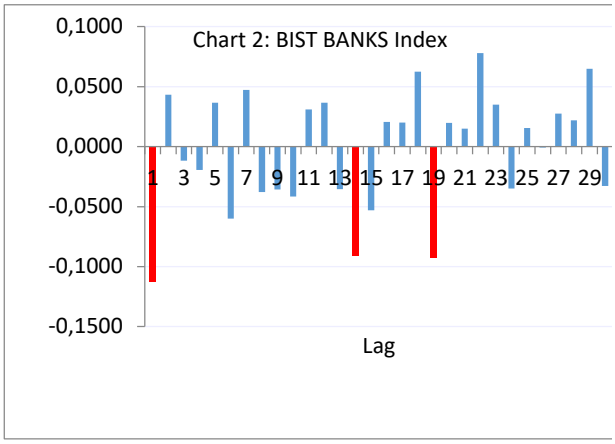


Chart 2: BIST BANKS Index
0,1000
0,0500
0,0000
-0,0500
-0,1000
-0,1500
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29
Lag

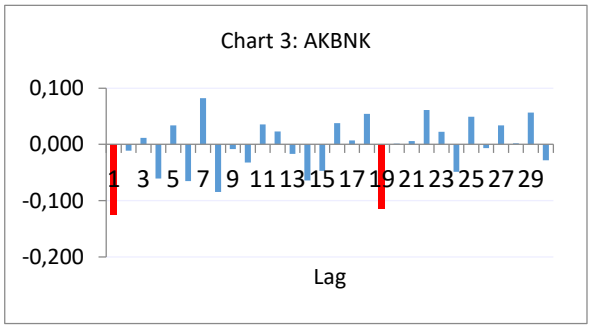


Chart 3: AKBNK
0,100
0,000
-0,100
-0,200
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29
Lag

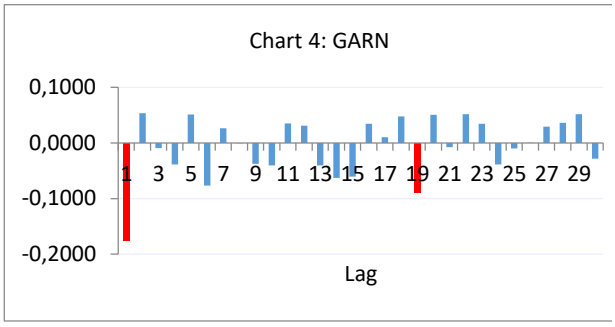


Chart 4: GARN
0,1000
0,0000
-0,1000
-0,2000
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29
Lag

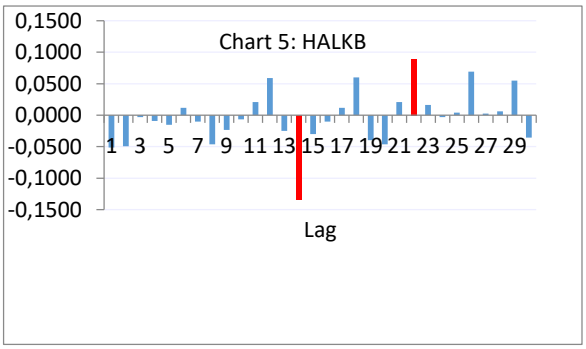


Chart 5: HALKB
0,1500
0,1000
0,0500
0,0000
-0,0500
-0,1000
-0,1500
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29
Lag

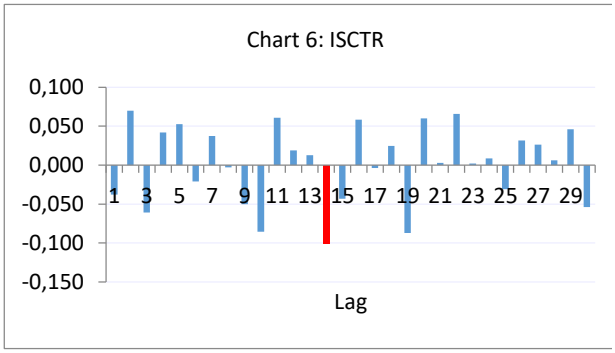


Chart 6: ISCTR
0,100
0,050
0,000
-0,050
-0,100
-0,150
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29
Lag

5.4. Analysis of Runs Tests

The run-tests are conducted for selected 8 series and, the result is presented in Table 4. To decide whether the samples' series are following a random walk or not z-value and p-value is important. As stated previously in the methodology part, if the z-value is between -1.96 and +1.96, the randomness of the null hypothesis is accepted at a 5% level of the significance level. In this regard, only AKBANK and GARAN stocks log return series has a z-values more than the stated boundaries and they are not following the random walk. According to this test, the rest 6 series does follow the random walk hypothesis.

On the other hand, p-value also used to decide the randomness of the series. If the p-value is less than 5% (P-value ≤ α), we can reject the null hypothesis of randomness. In this concern, the p-values of all series except AKBANK and GARAN are too high and more than 5%. Depending on p-value coefficients, only AKBANK and GARAN does not follow the random walk hypothesis.

In general, the run test results such as z- value and p-vale indicated that only two series out of eight does not follow the random walk hypothesis. Depending on run tests, the sample series selected for this study representing the banking sector of BIST does follow the random walk hypothesis except AKBANK and GARAN. Therefore, in light of the runs test, BIST banking sector stock is efficient at the weak form of efficiency.

Table 4: Run Test Results for Weekly Log Returns of Sample Indexes and Stocks

	BIST 100	**BIST BANKS**	**AKBANK**	**GARAN**	**HALKB**	**ISCTR**	**VAKBN**	**YKBNK**
# of non-missing obs	520	520	520	520	520	514	520	520
# below mean	246	241	252	250	257	248	254	253
# on or above mean	274	279	268	270	263	266	266	267
# of runs	271	271	287	286	262	262	260	270
E(R)	260.246	259.612	260.754	260.615	260.965	257.685	260.862	260.812
Stdev(R)	11.358	11.330	11.380	11.374	11.389	11.311	11.385	11.382
z-value	0.947	1.005	**2.306**	**2.232**	0.091	0.382	-0.076	0.807
p-value (2-tailed)	0.344	0.315	**0.021**	**0.026**	0.928	0.703	0.940	0.420

5.5. The Unit Root Tests

Three types of unit root tests such as ADF, PP and KPSS tests are employed to assess the randomness of selected series. The test equation that include the constant applied for all testes. The test conducted for all samples at the level I (0) and 1st difference I (1). The three types of unit root test results are summarized in Table 5 below.

Table 5: Unit Root Tests Results

Samples	**ADF**		**PP**		**KPSS**	
	I (0)	I (1)	I (0)	I (1)	I (0)	I (1)
BIST 100	-1.68	-24.58*	-1.68	-24.58*	2.45*	0.02
BIST BANKS	-3.15**	-25.47*	-3.41**	-25.54*	0.18	0.03
AKBANK	-2.71	-25.81*	-2.81	-25.96*	1.50*	0.03
GARAN	-2.28	-27.18*	-2.44	-27.13*	1.81*	0.03
HALKB	-1.83	-23.98*	-1.68	-24.09*	1.13*	0.13
ISCTR	-2.46	-15.17*	-2.57	-23.48*	1.32*	0.03
VAKBNK	-2.61	-15.26*	-2.65	-23.66*	1.16*	0.03
YKBNK	-3.23**	-24.76*	-3.26**	-24.72*	0.16	0.04

Notes: Test equations that include a constant is employed in all cases.

- Decision criteria of critical value for the ADF and PP tests in case of constant test equation are: -3.44 (1%); -2.87 (5%) and -2.57 (10%).
- Decision criteria of critical value for the KPSS tests in case of constant test equation are: 0.74 (1%); 0.46 (5%) and 0.35 (10%).
- *, **, represent significant at 1%, and 5%, respectively.

At level, ADF and PP test statistics for BIST BANKS and YKBNK have rejected the null hypothesis of a unit root (non-stationary) at 5% significance level and accepted the null hypothesis for the other six samples. Therefore, except BIST BANKS and YKBNK,

all samples have a unit root, meaning that they are non-stationery. Non-stationarity is one of the characteristics of the random walk. Accordingly, it can be concluded that BIST 100, AKBNK, GARAN, HALKB, ISCTR and VAKBNK are efficient at the weak form of efficiency at the level. This conclusion also supported by KPSS results.

At weekly difference, ADF and PP unit root test results rejected the null hypothesis of a unit root (non-stationary) at 1% significance level. Therefore, there is no evidence for the efficiency of the 8 samples analyzed in this study. The inefficiency of the series investigated by ADF and PP also supported by KPSS test results. In general, according to unit test results, BIST 100, BIST BANKS indexes and 6 individual bank stocks analyzed in this study are not efficient at the weak form of market efficiency. The finding of this study is strength the conclusion of the latest study conducted by Tas & Atac (2019).

6. SUMMARY AND CONCLUSION

The aim of this study is assessing the efficiency of Borsa Istanbul banking sector stocks. To test the efficiency of BIST in banking sector, six bank stocks listed in BIST such as Ak Bank (AKBNK.IS), Turkey Garanti Bank (GARAN.IS), Turkey Halk Bank (HALKB.IS), Turkey Is Bank (ISCTR.IS), Turkey Vakiflar Bank (VAKBN.IS) and Yapi & Kredi Bank (YKBNK.IS) are selected. The main criteria to select individual banks is to be included in the BIST 30 index. In addition to individual banking sector stocks, BIST 100 and BIST BANKS indexes are also included.

To assess the weak form of BIST banking sector efficiency, the weekly adjusted closing prices of selected stocks and indexes are collected from finance.yahoo.com and investing.com. The study period covers from January 4,210 to December 20, 2019. Therefore, a total of 520 observations for each stock and index is analyzed. The weekly observation for ISCTR is found starting from February 15, 2010, and a total of 514 weekly observations analyzed. The collected data is analyzed using autocorrelation, run test and unit root tests such as Augmented Dickey-Fuller (ADF), Phillips-Perron test (PP) and Kwiatkowski-Phillips Schmidt-Shin (KPSS).

The autocorrelation test results indicated that only VAKBAN and YAKBNK do not have any autocorrelation. Therefore, depending on autocorrelation, they are efficient at the weak form of efficiency during the study period. On the other hand, the runs test result showed that only AKBANK and GARAN does not follow the random walk hypothesis and the other six samples are efficient at the weak form of efficiency. Finally, the unit root tests such as ADF, PP and KPSS results indicated that all samples do not follow the random walk hypothesis and they are not efficient at the weak form of market efficiency. BISTt 100 and BIST BANKS indexes are not efficient according to autocorrelation and unit root test results. Therefore, the three types of tests employed in this study showed a distinctive result and it is difficult to give a general conclusion regarding the efficiency of BIST Banking sector in the weak form. In light of these finding, technical analysts can beat the market by analyzing the BIST banking sector stocks' historical prices.

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EMPIRICAL ANALYSIS OF ENERGY CONSUMPTION AND ECONOMIC GROWTH IN TANZANIA: BASED ON ENGEL AND GRANGER TEST

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ABSTRACT

Purpose - This article aims to investigate the effect of energy consumption on economic growth in Tanzania. It is a quantitative investigation that is structured by the time series data from the World Bank (WB) database which started from 1990 to 2019. The article uses variables of Energy consumption (EC) and Economic growth (GDP). The variables are measured in GDP (Constant US$) and EC (MTOE).

Methodology – To obtain the significant estimated results, this study uses econometric tools for both theoretical and empirical analysis such Augmented Dickey-Fuller (ADF) test for identifying stationary and nonstationary time series data, Engel and Granger test for determination of the existence or absence of cointegration relationship, Vector Error Correction Model (VECM) for determining the speed of adjustment (ECT) and Classical Granger-causality test for a causal relationship between economic growth and consumption.

Findings- The core findings from the study are; the cointegration relationship between Energy consumption (EC) and Economic growth (GDP), a bidirectional causal relationship between energy consumption (EC) and Economic growth (GDP) in Tanzania. Therefore, the study accepts the energy feedback hypothesis that revealed to exist both a long-run effect and short-run effect between the energy consumption and economic growth in Tanzania.

Conclusion- The estimated results of this study provide the information to Tanzanian policymakers with a new dimensional approach to Tanzanian economic growth through an increase in energy consumption use. Although Tanzanian government has a huge and long term sustainable project of increasing energy power by adding 2115megawatts to Tanzanian national grid using the Stigler gorge or Julius Nyerere Hydroelectric power at Rufiji River but also Tanzania should invest to the short energy projects consumptions that can facilitate and improve the economic development of domestic hoods.

Keywords: Tanzania, GDP, EC, Engel and Granger test, Granger Causality test.
JEL Codes: B23, Q43, O55

1. INTRODUCTION

Energy sources are key elements or an engine of the country's GDP. When efficiency energy sources are implemented well and established within the country, it often contributes by improving the GDP of the country. EC and GDP have a direct correlation. Sorely, increasing the rate of EC in the economic sectors like an agricultural sector in the case of cultivating cash products using machines, transportations and the communication sector, investment, and trade sector contributes a significant performance on the country's GDP. The country which has better economic performance is associated with advanced in science and technology which is related to effective investments in terms of public and private sectors. The demand of energy consumptions within the state is almost high. More energy will be demanded to facilitate economic activities. It is different from countries that perceive or consume less amount of energy per year definitely, they cannot produce standard and good quality services from the industries that compete or meet international world market requirements. Less distribution of energy consumption affects the housing hood, firms, and industries economically by consuming a small amount of energy on economic activities. It makes it difficult for the domestic hood to achieve a good and standard of their livelihood. Therefore EC has a direct significant contribution to the GDP of the country. Sorely energy

consumption often depends on the availability of energy sources. Therefore, Tanzania has abundant energy sources that are significant to the GDP of the country. The energy sources which are found in Tanzania are natural gas, biomass, geothermal, brown coal, hydroelectric power, nuclear materials, and solar power energy through which its domestic consumptions are very low (Napendael, 2004). Other energy sources are agriculture residual, solid factories waste, animal dang, and landfill biogas. Natural gas reserves in the offshore of Songo-Songo are estimated to be at 783BCF (Besta, 2013), Mnazi Bay, the natural gas has been discovered (Boma, 2013.15-19). Msimbati area has reserved of natural gas that it makes about 46TCF to 55TCF. Natural gas has discovered in the year of 2009 and 2013. The area of natural gas is found in the southern part of Tanzania in the region of Mtwara which has got a massive deposit of natural gas. Therefore it makes Tanzania to be accounted among the country that has enough reservation of the natural gas in the world (Kamat, 2017.304-306). The other areas that contain natural gas like Mkuranga, Kilwa North, and Nanyuki, generally the amount of natural gas that deposited in Tanzania is about 27trillion (Kusekwa and M.A, 2013. 241). Table 1 indicates energy sources that are found in Tanzania concerning to their regions and districts.

Table 1: Energy Sources in Tanzania

Energy Source	**Amount of Deposition**	**Region**	**District**
Natural gas	30bcf [IEA,2013]	Lindi	Songwe-Songwe Island
	817bscf [RPS, Energy Canada]	Mtwara	Mnazi Bay
Natural gas	30bcf [IEA,2013]	Lindi	Songo- Songo Island
	817bscf [RPS, Energy Canada]	Mtwara Pwani Lindi Ruvuma	Mnazi Bay Mkuranga (Madimba) North Kilwa Ntorya
	46Tcf to 55Tcf [TPDC]	Mtwara	Msimbati
Coal	9.1bt extra per capital year [TMAA]	Mbeya	Kiwira
		Ruvuma	Ngaka
Geothermal		Arusha	Lake Natron
			Lake Manyara
		Kilimanjaro	Lake Natron
			Lake Manyara
			Meru province
			Rungwe
		Rukwa , Morogoro,Dododma, Singida, Rufiji and Shinyanga	
Uranium		The northern part of Tanzania	Tarosero volcano-sedimentary rocks of Chimala
		The Central part of Tanzania	Manyoni, Bahi, Mbuga, Makotopola and Lake Hombolo
		The southern part of Tanzania	Namtumbu {Mtakuja and Madaba}
IEA	International Energy Agency		
TPDC	Tanzania Petroleum Development Cooperation		
TMAA	Tanzania Minerals Audit Agent		
tcf	Trillion cubic feet		
bcf	Billion cubic feet		
RPS, Canada	Rural Planning Services energy company in Canada		

The main focuses of this study to explore the relationship between EC and the GDP of Tanzania. Therefore the study intends to address the following questions; the presence of the cointegration effect between EC and GDP in Tanzania, what kind of causal relationship is found between the EC and GDP, does it, a unidirectional or bidirectional relationship between EC and GDP. To support these equations this study cements the following hypothesis; EC depends on GDP energy in Tanzania (conversation hypothesis), EC affects GDP in Tanzania (economic growth), GDP and EC depend on each other (feedback relationship, and the last assumption. There is a neutral relationship between GDP and EC in Tanzania (Neutral relationship) (Ocal and Aslan,2013.495). The study contributes by adding knowledge about issues the EC and GDP in the academic world.

The study uses quantitative methods to examine a specific case study and made use of empirical research methods. More emphasis has been laid on secondary sources of data from the World Bank database. The study applies the ADF test, Engel-Granger test, VECM, Granger Causality test, and Post estimations test for data analysis. The policymakers will develop energy and economic policies that will contribute a significant effect on the GDP of Tanzania. Furthermore, it adds a new dimension in the literature review especially in the field of EC and GDP in Tanzania. The study spans from 1990 to 2019. Therefore the justifications of the topic have drawn great attention from many thoughts of scholars in the economic field, especially in EC and GDP, the pioneer Kraft was the emphasis the investigation of EC and GDP economic (Kraft, 1978). The organization of the study is constructed as follows; the next sections are reviews of the literature, analysis of data, methodology, estimated results, literature, and conclusion.

2. LITERATURE REVIEW

Different Thoughts of schools discuss the effect of EC and GDP, how the causal relationship among the variables behave. They come with the conclusion that the causal relationship among the variables is not constant. The relationship between EC and GDP depends on the different factors that include economic factors, technological factors, demographic factors, and empirical methodological factors. Thus to determine the connection between EC and GDP is found to be non-consensus. The Kraft contributed a lot to EC and GDP (Kraft, 1987). Kraft found unidirectional moves from the GDP to EC. In the U.S uses the bivariate model through the study of Kraft no causal relationship between EC and GDP (Kraft, 1987). The Kraft contributed a lot to the determination of the causal relationship between EC and GDP. Kraft found unidirectional moves from the GDP to EC (Kraft, 1987). Also, Kraft investigated the causal relationship between EC and GDP in the U.S. He investigated by applying the bivariate model through the study of Kraft, and he found no causal relationship between EC and GDP (Kraft, 1987). Liu (2017) on his study, related energy consumption, and economic growth argued that higher an increase of EC leads to a higher GDP (Liu and Zhang. 2015, p.401).

The research revealed a bidirectional relationship between EC and GDP. Odhiambo (2008) conducted his research related to EC and GDP in Tanzania. He used three variables identified as EC, GDP. and Electricity. The study applied an ARDL bound test for finding the cointegration. The empirical analysis from this study found that there is cointegration effect between EC and GDP. The results show that there is a unidirectional causal relationship that moves from EC to GDP. Seemingly there is a causal connection that flows from Electricity to GDP (Odhiambo, 2009). Nyoni (2013) investigates the relationship between EC and GDP in Tanzania. He applied the cobb-Douglass production function that includes EC, capital investment, and labor. The study finds the unidirectional causal relationship which is running from the GDP to EC (Nyoni, 2013). Vinay (2017) conducted his research identified as the powering of the nation. From his study included natural gas and GDP. Vinay argued Tanzania can use natural gas protection to employ Tanzanian. Sorely the GDP of the country will be improved by reducing the unemployment rate and to increase the employment gap to the communities (Kamat.2017). Another study was conducted by Campo and Sarmiento (2013) in Latin America. The study examines the relationship between EC and GDP of 10 Latin American states. The study applied Pedroni's test for cointegration and the outcomes from the study show the bidirectional causal relationship between EC and GDP, and long-relationship between EC and GDP was found (Campo and Sarmiento, 2013).

Not all the studies show the positive correlation between EC and GDP, there some studies that show a negative relationship between EC and GDP. For instance, the study conducted by Aqeel and Mohammed (2001) related to EC and GDP in Pakistan. The study applied technic of cointegration and Hsiao version of the Granger causality test. In this study, the findings show that EC leads to petroleum consumption and no causal relationship between Petroleum consumption towards GDP (Aqeel and Mohammed, 2001). Makala (2019) investigates the impact of natural gas on GDP in Tanzania. He applied the ARDL test and Granger causality test to examine the causal relationship between natural gas and GDP. Makala argued that there is no cointegration effect between natural gas and GDP in Tanzania. The analysis revealed that there is no long-run relationship between natural gas and GDP in Tanzania (Makala and Zongmin, 2019).

According to Sankaran (2019) investigates the effect of electricity consumption for industrial countries. Sankaran used ARDL bound test and Toda-Yamamoto. The study revealed that electricity consumption has a significant contribution to industrial countries. Therefore electricity distribution to the industries leads to the enhancement of technological productions in the

industries (Sankaran and Das, 2019). The following table represents different studies with different results as the literature reviews that demonstrate the study of EC and GDP are non-consensus.

Table 2: Energy Consumption and Economic Growth Studies

Single country of Non-SSA research for EC and GDP					
Authors	**Countries**	**Methodologies**	**Limitation**	**Results**	**Hypothesis**
Lee (2008)	Taiwan	Tar	{1955,2003}	EC leads to GDP	Growth
Warr (2000)	U.S.A	Engel – Granger	{1946, 2000}	EC leads to GDP	Growth
Lotfalimpour (2007)	Iran	Today Yaamoto	{1967,2007}	GDP leads to Petrol	conservation
Pao and Tsai (2011)	Russia	Engel-Granger	{1990,2007}	GDP leads to EC	feedback
Fallahi (2011)	U.S.A	Markov- Var	{1960-2005}	GDP ↔ EC	feedback
Zhang (2011)	China	OLS	{1985 – 2007}	EC ↔GDP	feedback
Lai (2011)	Macao saar	Engel Granger	{1999,2008}	GDP leads Electric	conservation
Behi (2008)	Portugal	Johansen Cointegration	{1980,2008]	GDP lead to Oil	feedback
Sub-Saharan Africa researches for energy and economic growth					
Jumbe (1999)	Malawi	Engle Granger	{1970,1990}	GDP ↔ Electric	feedback
Akinlo (2009)	Nigeria	Johansen-Juselin	{1980,2006}	Elecricity → GDP	Growth
Odhimbo (2009)	Tanzania	ARDL bounds test	{1971,2006}	Electricity → GDP	Growth
Odhimba (2006)	S.Africa	Johansen-Juseli	1971 - 2006	GDP ↔ Electricity	Feedback
Ouedraogo (2013)	Bukin-Faso	ARDL bounds test	1968 - 2003	GDP ↔ Electricity	Feedback
Multiple countries study Non-Sub					
Jinke (2005)	China	Engel Granger	{1980,2005}	GDP leads to coal	conservation
	India			GDP ≠ coal	Neutral
	Japan			GDP → Coal	conservation
	S. Korea			GDP ≠ coal	Neutral
	S.Africa			GDP ≠ coal	Neutral
Sub-Saharan African studies					
Ebohon (1981)	Tanzania	Granger causality	1960 - 1984	GDP ↔EC	Feedback
Murray (1990)	Kenya	Granger causality	1970 - 1990	GDP→ Electricity	Conservation

Chontanaw (2000)	Congo Rep	Johansen-Juselius	1971- 2000	EC → GDP	Growth
Odhiambo (2006)	S. Africa	ARDL bounds te	1972 - 2006	EC → GDP	Growth
Sub Saharan Africa studies					
Ozturk (2005)	LMI	Pedroni and VECM	1971 - 2005	GDP →EC	Conservation
	LMI	Pedroni and VECM	1971 - 2005	GDP↔ EC	Feedback
Eggoh (2011)	21 African countries	Pedroni and PMG	1970 - 2006	GDP ↔ EC	Feedback
Al-mulali (2009)	30 SSA	Pedroni and VECM	1980 - 2008	GDP ↔ EC	Feedback

Note Vector Error Correction Model (VECM), Auto-Regressive Model (VAR), Auto-Regressive Distributed Lag (ARDL), Environment Kuznets curve (EKE), Energy Consumption(EC), Economic growth (GDP), Emission of carbon dioxide gas (CO_2).

The thoughts of scholars demonstrate that the relation between EC and GDP in not constant. Mostly the relationship depends on the demographic conditions, technological invention, kind of methodology that has been applied during the econometrical analyzing the results. On top of that, the level of the country's income is determining the fact of the relationship between the GDP and EC in the country. For instance, the industrial countries the rate of its EC is different in terms of its consumption compared to the nonindustrial countries.

3. DATA AND METHODOLOGY

Annual data of Energy consumption (EC) measured in Millions Tone equivalent (MTOE) and Economic growth (GDP) measured in 2010 US$ are obtained from WDI and UNCTD from the year 1990 to 2019. This study is based on a quantitative methodology in which all statistical calculations and estimations are presented. Consequently, this section focuses on theoretical and empirical analysis. It is started with theoretical analysis and ends with empirical analysis. This study uses an econometric model to analyze the estimated results. The econometric tools which are used in this study are ADF, Engel-Granger test, VECM, and Granger causality. The econometric tools have been used to specify, contrast, and compare the indicated results from the hypothesis theories, after being tested.

Unit root test; if the variable is discovered to be nonstationary, then it should be converted from nonstationary to stationary by taking the differentiation. The process of differentiation converts the variable from Nonstationary series to Stationary is called the order of integration and is presented by I (d) (Charemza and Deadman, 1997).

Augmented Dicky and Fuller test is a statistical test that has been proposed by Sargan and Bhargava 1983 (Harris, 1992.p.401-402). The ADF has been used to identify stationary or nonstationary of GDP and EC variables (Giovannetti, 1987.p.494). By using the ADF test all variables must integrate at the same order (Saboori, 2013.p.402). Therefore, the variables should be integrated at the same order, the process can be continued up to seconder order I(2) if and only the stationary conditions are not found to be at the first level (Giovannetti,1987.p.494). Mathematically the ADF can be represented as follows:-

$$\Delta X_t = \beta X_{t-1} + \sum_t^p \Theta_i X_{ti} + \varepsilon_t \quad (1)$$

Where p represents the maximum value of the lag length, and ε_t stands for the error term. There are different types of lag length. However, in this research, the selected lags are AIC and SBC lags. The criteria of choosing these lag lengths are based on their properties of accepting the small number of data size, and in most cases, the lags are used by OLS and ECM (Ibrahim, 1999.p.220 - p.222). Ibrahim, M. (1999). The chosen lag AIC and SBC have developed a model selection criterion, especially for likelihood estimation and maximization techniques. It minimizes the natural logarithmic of residual of adjusted squares for sample size " n " and "k" represents parameters (Maysami and Koh,2000.p.84). Akaike Information Criterion lags can be represented as follows

AIC = nln (sum of the residual square) + 2k

where "n" represents sample size and "k" represent parameters and SBC lag, it minimizes the natural

SBC = nln (Residual sum of squares) + kln (n)

The AIC and SBC are models that are created just for maximization likelihood estimation techniques.

The ECM is built to represent the information lost in the difference. It is used to determine cointegration. In this analysis, two variables have been imported, which are GDP and EC, mathematically will be presented as follows;-

$$\Delta GDP_t = \alpha_1 + \alpha_{11}\, ECT_{t-1} + \sum \alpha_{j=1}^{p-1} \phi_{1j}\, \Delta GDP_{t-j} + \sum_{j=1}^{p-1} \Theta_{1j} \Delta EC_{t-j} + \varepsilon_{1t} \quad (2)$$

$$\Delta EC_t = \alpha_2 + \alpha_{21} ECT_{t-1} + \sum_{j=1}^{p-1} \phi_{2j}\, \Delta GDP_{t-j} + \sum_{j=1}^{p-1} \Theta_{2j} \Delta EC_{t-j} + \varepsilon_{2t} \quad (3)$$

Equations 2 and 2 represent the ECM with ECT. The equations are used to determine the cointegration. The ECT at the equations is used to measure cointegration and coefficients parameters indicate the short-run. The probability of ECT for both EC and GDP should be significant and lower than 5%. Negative Signe represents a convergence of economic trends. The negative sign (-) indicates the presence of the cointegration. Generally, ECT intends to measure the speed of EC to return to the normal equilibrium after diverging from the normal trend.

The ECT can be represented as follow;

$$ECT_{t-1} = GDP_{t-1} + (\alpha_{21}/\alpha_{11}) EC_{t-1}\ ) \quad (4)$$

$$ECT_{t-1} = EC_{t-1} + (\alpha_{11}/\alpha_{21}) GDP_{t-1}\ ) \quad (5)$$

The ECT is also representing the Error of correction or speed of adjustment of research (Ang, 2007, p.475).

The ECM is an efficiency to minimize or to prevent carrying some errors from one step to another during the analysis phase. The ECM estimates the long-term effects and analyzes the short-term adjustment process within the same model (Maysami, 2000,p.83; Bhashkara, 2007, p.17). The ECM occupies two or more variables; since the economic model of this research contains two variables, therefore, ECM is justified to be suitable for this study. The most advantage of ECM has a smooth and straightforward interpretation for determining the long-run term and short return term equations.

Error Correction Model is built up if and only if the GDP and EC are cointegrated. The cointegration between the GDP and EC indicates the long-run effect. ECM contains lag length, represented by letter p. Thus the lag lengths in the equation model are composed by (p-1) for GDP and EC where p stands for lags in ECM. The theoretical approach is based on testing EC and GDP using the Granger causality test (Granger, 1969, p.200). In addition to that, Engel Granger (1987) makes a significant contribution to the co-integration technique towards testing of EC and GDP. The presence of the cointegration process leads to the finding of error correction technic (ECT), which is based on the adjustment of disequilibrium of the speed of the long-run effect between GDP and EC. General equations of ECM together ECT and their lags are represented as follows;

$$\Delta Y_t = \sum_{l=1}^{k} \theta_{1i} \Delta Y_{t-i} + \sum_{l=1}^{n} \beta_{1i} \Delta X_{t-i} + \sum_{l=1}^{r} \delta_{1i} ECT_{r,t-1} + U_{1t} \quad (6)$$

$$\Delta X_t = \sum_{i=1}^{k} \theta_{2i} \Delta Y_{t-i} + \sum_{i=1}^{n} \beta_{2i} \Delta X_{t-i} + \sum_{i=1}^{r} \delta_{2i} ECT_{r,t-1} + U_{2t} \quad (7)$$

From the two equations coefficients of β and δ stands for explanatory of ΔY, ΔX, and ECT respectively, letter k, n represents the maximum numbers of the explanatory variables, and 'r' represents the number of co-integration equation. For determination of the causal relationship between the dependent variables of ΔY and ΔX, the parameters of β_{1i} for $\Delta X_{t=1}$, ΔY_t and parameters of θ_{2i} for ΔY_{t-1} both respectively cannot be equal to zero. When the coefficients become equal to zero, means the related independent variable also becomes equal to zero. Therefore the causal relationship between the two variables cannot be found. This is the reason why these coefficients are not equal to zero.

Equation 6 and 7 represent the change of the dependant variables which is equal to $\sum \Delta X_t$ and $\sum \Delta Y_t$ represent the change of the sum of the explanatory variables, coefficients, ECT, white noises, and with their respective number of lags (Kar and Pentecost, 2000, p.9). The equations above are VECM which is acting as the source of the causation between GDP and EC. The test of the joint aggregate sum of the number of lags of every regress using Wald test, the second test is associated with lagged ECT statistic and the third, the test of joint used to sum of the regress variable and ECT's lagged statistic, this test is recognized as the strong propensity test (Charemenza and Deadman, 1997). For more clarification of this test, we can have an example if the null hypothesis of EC which states that GDP does not cause granger relation is ignored if β_{1i} is significantly different from zero, the same analysis if the null hypothesis is not obeyed if δ_{1i} is significant or β_{1i} and δ_{1i} are jointly significant apart of zero (Kar and Pentecost, 2000. p.10).

4. ESTIMATED RESULTS

This section represents an empirical analysis that represents the findings obtained through the econometric technique, as highlighted from the methodology section. It started by checking the ADF test then followed other econometric tools. The

estimations are determined once the causal co-integration is found. After determining the co-integration, the stability test using the CUSUM and CUSUMSQ, correlogram Q test, correlogram, and AR test are used to determine the stability of parameters. To archive the best efficiency of the analysis, the stationary test should be included to monitor the stationarity of the data. Therefore the following part describes the stationarity of the time-series data.

Estimated results; ADF test defines the existence of stationary data from the time series. The stationarity of the data is related to the order of integration, therefore ADF indicates the order of integration during the empirical analysis. The essence of stationary data is to help the analysis phase to be free from the problem of spurious regression. The problem of spurious might happen if the dependent variable shows uncorrelated series with independent variables and the relationship between them is significant but the two variables are not correlated. The research uses a standard ADF test for stationary (Liew, 2004,p.314). The table below is the ADF table that computed using the time series data from 1990 to 2019, which contain variables of the model obtained at the level and I(1).

Table 3: Augmented Dicky–Fuller (Constant and Trend)

Var	At level I (0)		First difference (1)	
	t-stat	Prob**	t-stat	Prob**
GDP	-1.766273	0.6938	-3.747286	(0.0361)*
EC	-2.038669	0.5558	-4.741599	(0.0042)***

Note, that *, **, *** represent the 10%, 5%, 1% level respectively

From the ADF indicates that the Critical value at 5 percent and 1 percent are 0.036, and 0.0042 respectively. The ADF indicates that the GDP and EC are integrating at I(1). Then, the analysis can proceed with estimating an OLS regression of GDP and EC by subjecting the residuals to a stationary test, and if the residuals are stationary, then EC and GDP integrating. Below are OLS estimation results.

Table 4: Residuals of GDP

Independent var	coefficient	Std error	t-statistic	Prob
C	542.8538	936.3458	0.579758	0.5669
EC (MTOE)	8.064446	0.275644	29.25671	0.0000

Table 5: Residuals of EC

Variable	coefficient	Std error	t-statistic	Prob
C	21.09089	114.9566	0.183468	0.8558
GDP(constant 2010 US$)	0.120209	0.004109	29.25671	0.0000

Tables 4 and 5 both indicate the simple regression models in which GDP stands for the dependent variable for 4 EC is an independent variable, while 5 EC is dependent and GDP is independent variables. The letter C for both tables stands for the constant of the regression equations. The regression equations show that there are positive correlations between variables. The coefficients of EC and GDP are significant because their probabilities are less than 5%. Therefore, both coefficients have a positive correlation to their dependent variables. In table 4, the coefficient estimate of EC is 8.06, meaning that the one-unit increase in EC leads to an 8.06 change of economic growth. Also, in table 5, the coefficient estimate of GDP is 0.12, meaning that the one-unit increase in GDP leads to 0.12 changes in EC. The aim of estimating regression equations is to obtain the rapport of EC and GDP simultaneously finding residual equations which are used in finding the co-integration between the GDP and EC. The next step is to find the ADF test for the residual values.

Table 6: Augmented Dickey-Fuller (ADF) Residuals at I (0)

GDP is the dependant variable			
Null hypothesis: U is nonstationary		t-statistic	Prob*
ADF statistic		-3.6	0.053
Critical t-stat values :	1%	-4.34	
	5%	-3.79	
	10%	-3.23	
R-squared	0.708615		
Durbin-Watson stat	1.833156		

Table 7: Augmented Dickey-Fuller (ADF) Residual I (0)

EC is the dependant variable			
Null hypothesis: U nonstationary		**t-statistic**	**Prob***
ADF-stat		-3.517359	0.0525
Test for t-critical:	1%	-4.33	
	5%	-3.59	
	10%	-3.22	
R-sqr	0.709		
D.Watson stat	1.833		

Tables 6 and 7 both indicate ADF t-stat values, which 3.558900 and 3.517359 respectively, are greater than the Engel and Granger, which is 3.28 ADF of critical test statistics at 5% which are significant for both levels respectively. This suggests the hypothesis of no cointegration is ignored, and analysis indicates that the presence of cointegration for both table 6 and table 7. It concludes that GDP and EC, EC and GDP are cointegrating and long-run is present Furthermore, when Durbin-Watson and R-square are compared, the Durbin-Watson statistic is greater than R-square indicates that the system model of the data is free from the sporous problem.

Table 8: Error Correction Technique (ECT) of ΔGDP

Independent variables	**Coefficient**	**Std error**	**t-statistic**	**Prob**
C	1136.101	361.0291	3.146840	0.0042
Δ(EC)	2.345391	1.000718	2.343709	0.0273
ECT	-0.360502	0.120008	-3.003977	0.0060

Note: ECT represents the Error Correction technique/speed of adjustment, ΔEC represents the first difference of energy consumption variable, C represents a constant value

Table 9: Error Correction Technique (ECT) of Δ EC

Independent variables	**Coefficient**	**Std error**	**t-statistic**	**Prob**
C	48.93487	77.70457	0.629755	0.5346
Δ(GDP)	0.080674	0.0333744	2.390780	0.0247
ECT	-0.444319	0.191948	2.314791	0.0291

Note: ECT represents Error Correction Technique/ speed of adjustment, ΔGDP represents the first difference of economic growth variable and C represent the constant value

Tables 8 and 9 both report the estimated ECM results of both ΔGDP and ΔEC models. From empirical analysis shows that the ECT is negative and significant, this indicates that the GDP and EC convergent to equilibrium. For instance, Table 8 demonstrates ECT is -0.360502, suggesting that the ΔGDP model adjusts itself to equilibrium by 36.05% annually. The ECT is significant at a 1% level, while table 9 shows that ECT is -0.444319 suggesting that the ΔEC model adjusts itself to equilibrium by 44.43% annually. Again, the negative of ECT indicate the cointegration of GDP and EC in this model. The coefficient of ΔGDP as 0.080674 represents the short-run effect is significant at 5% because its probability value is 0.024, which is less than 5% at a significant level. The coefficients of the short-run have the following meaning economically; first, the EC attained in Tanzania is the most significant short-run determinant value in the GDP of Tanzania. The significant effect of EC on GDP indicates that the appropriate EC was being used in the growth of Tanzanian's economy. Second, the GDP attained in Tanzania is the most significant short-run determinant value in the EC of Tanzania. Third, the significant positive effect of EC on GDP indicates that the appropriate EC was being used in the growth of the Tanzanian economy to the same case to the significance of GDP on EC indicates that the appropriate GDP was being applied to the EC of Tanzanian. The analysis shows that EC and GDP are depending on each other. Therefore However Tanzania government is engorging to the massive long-run projects for energy productions like Stigler's Gorge Hydropower Project. Natural gas also should have short plan strategies for energy productions. It seems that there are significant contributions to the short-run effects of EC on the GDP of Tanzania.

Table 10: Cointegration Equation

Independent Variables	Coefficient	Std error	t-stat
EC	7.937856	0.50707	15.6544
C	12.528		

The table above indicates the cointegration equation, which indicates a significant correlation between EC and GDP in Tanzania.

Table 11: Vector Error Correction Model (VECM)

ECT	Coefficient	Std error	t-stat	Prob
ECT of GDP	-0.343417	0.17987	-1.91429	0.0060

The two tables show VECM and ECT as the adjustment speed of GDP per year. The analysis indicates that the ECT of GDP is 34.34. The negative sign has a significant meaning. It represents the cointegration, sorely long run has been shown among the EC and GDP.

Table 12: Causal Relationship between GDP and EC (using Wald test)

Dep Var	Wald-test		t-stat
	$\sum\Delta\mathrm{GDP}$	$\sum\Delta\mathrm{EC}$	ECM_{-1}
$\Delta\mathrm{GDP}$		$X^2(1)$ =7.614 (0.0058)***	-4.628905 (0.001)***
$\Delta\mathrm{EC}$	$X^2(1)$= 4.538443 (0.0331)**		-0.776405 (0.0462)**

Table 13: Joint Sources of Causation Using Wald test

Wald Test	
$(\sum\Delta\mathrm{EC}, \mathrm{ECM}_{-1})$	$X^2(2)$= 25.39298 (0.0)*
$(\sum\Delta\mathrm{GDP}, \mathrm{ECM}_{-1})$	$X^2(2)$= 5.184489 (0.0749)**
	1. EC represents Energy consumption 2. GDP represents Economic growth 3. ECM represents Error Correction Model 4. (-1) represents the number of lag 5. Δ represents the first difference 6. ∑ sum of coefficients with respective lags 7. *, **, *** represent significant level 0.1, 0.05, 0.01 respectively 8. () p-value

The sources of causation from the table 12 with three estimations can be explained as follows;- the first case is a test of the joint which is aggregated together with a lag of independent variable, in turn, using a Waldγ^2. It is observed that in table 12, the $\Delta\mathrm{GDP}$ dependant variable and $\sum\Delta\mathrm{EC}$ independent factor. Independent $\sum\Delta\mathrm{EC}$ concerning its lag is tested and shows that the $\sum\Delta\mathrm{EC}$ is significant at 5%.In the same case, when the $\Delta\mathrm{E}$ dependent variable and $\sum\Delta\mathrm{GDP}$ independent variable, concerning its lag, is tested, it shows that the $\sum\Delta\mathrm{GDP}$ is significant at 5%. The second case is the t-statistic test on the lagged ECM and the value of $\Delta\mathrm{GDP}$ as the dependent. Shows the $\Delta\mathrm{GDP}$ is significant, and the ECM of $\Delta\mathrm{EC}$ is significant at 5%. The last in table 8.1 is about the joint test between the sum of the variables with their lags with ECM shows that the $(\sum\Delta\mathrm{EC}, \mathrm{ECM}_{-1})$ and $(\sum\Delta\mathrm{GDP}, \mathrm{ECM}_{-1})$ both are significant. Table 12 indicates the causation source from the analysis is ECT of tour cases (between ΔGDP and ΔGDP, ΔEC, and ΔGDP) and shows the ECT is significant at a different level of 5% and 10%. Not only ECT is acting as the source of the causation, but there some other sources of causation such as the statistical significance of the explanatory variables. Table 13 indicates the causal relationship between GDP and EC by corresponding to the ECT. Empirical analysis shows connections that move from EC to GDP, meaning that the EC depends on GDP to the same case the causality states run from GDP to EC. The analysis shows the bidirectional causal relationship between EC and GDP in Tanzania.

Table 14: Summary of the Sausal Relationship between EC and GDP

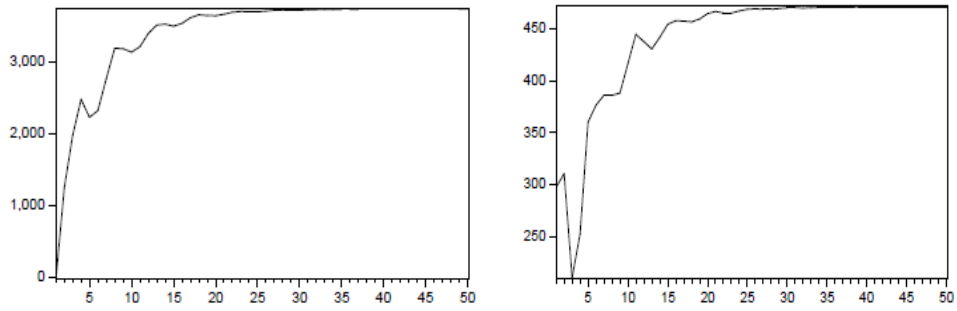
ΔEC to ΔGDP	Energy consumption leads to Economic growth	
ΔGDP to ΔEC		Economic growth leads to energy consumption

Note: EC represents Energy consumption and GDP represents Economic growth.

Table 14 indicates the bidirectional relationship between the variables.

Figure 1: Impulse Response of GDP and EC

GDP to EC **EC to EC**



Overall, the impulse responses summarized in Figures 1 for GDP to England EC to GDP as follows. The two graphs appear to be generally growing with expected positive trends. Expect in the case of the EC graph declines from a period of one to two, and then it starts to grow positively.

4.1. Post Estimation Results

The post-estimation test of this research focused on the efficiency, significance, and desirability of the model. The test includes - Heteroscedasticity test, serial correlation test, Normal distribution test, and stability of the model. The Heteroscedasticity is being the first to be analyzed.

Table 15: The Heteroscedasticity Test

Null hypothesis: Model has heteroscedasticity			
F-stat	0.806809	Prob**	0.54
Ob*Rsqr	2.6	Prob* Chisqr	0.52

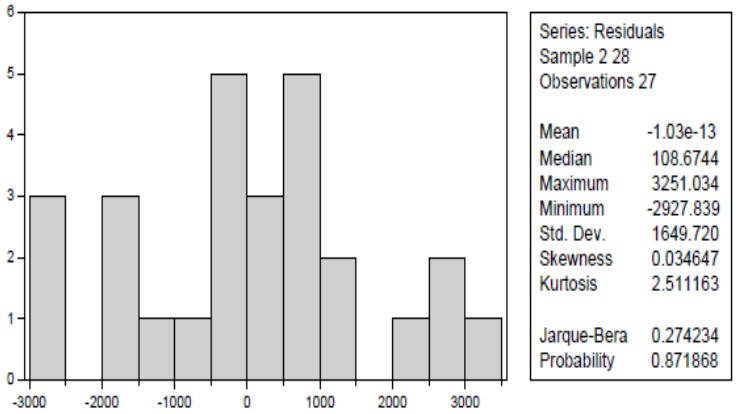
The analysis above using the Breusch-Pagan-Godfrey testing type, for Heteroscedasticity indicate that the Prob. Chi-Square (3) is 64.76, which greater than 5%, indicates that we can ignore the Null hypothesis and results show that the system model does not suffer from the heteroscedasticity problem. Therefore the system is desirable for giving the estimation.

Table 16: The Serial Correlation

Null hypothesis: Model has the serial correlation			
F-stat	0.545017	Prob**	0.66
Obs*R-sqr	2.081800	Prob** Chi sqr	0.56

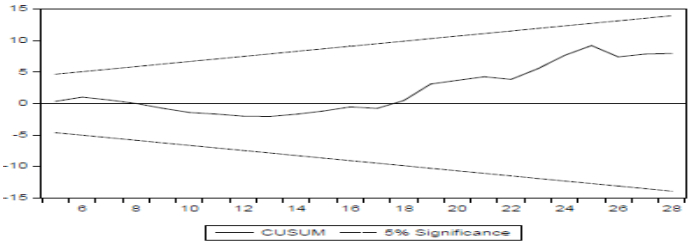
Analysis from Serial correlation indicating that Prob. Chi-Square (3) is 55.56, which is more than 5% indicates we cannot ignore the Null hypothesis. Therefore, the system of data analysis cannot be affected by the serial correlation problem. Therefore, the data can be used for estimation.

Figure 2: Histogram of Normality Test



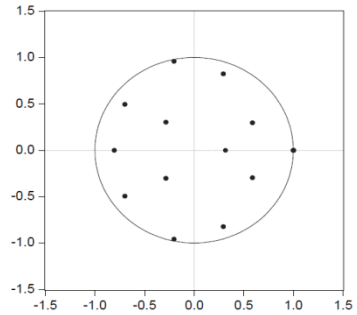
The analysis from the Histogram Normal distribution above indicates that the Jarque-Beara is 27.42349% which is greater than 5%. The analyses represent the normal distribution of the system data.

Figure 3: System Stability



Looking at the graph above, we can deduce that the graph of the CUSUM lies within the interval of a 5% significance level indicate the model is stable. If a trend is found within the boundaries, meaning that does not cross the boundaries indicates that the system model is stable. There is no effect of break structure effects within the data system.

Figure 4: The AR Unit Root Test



The AR unit root contains the dotted particles which are deposited inside the cycle. The definition of this analysis is that the system model significant. If and only if these particles are found outside the cycle means that the analysis is not significant.

5. CONCLUSION

The article investigates the impact of energy consumption on economic growth in Tanzania. The article applies two variables which are identified as Economic growth and Energy consumption from the WB database which spans from the year of 1990

to 2019. To obtain the estimated results the study employs ADF, PP, Engle and Granger, VECM, and Granger causality test. The study finds that Economic growth and Energy consumption are integrated at the same order which is I (1). The study finds the cointegration between Economic growth and Energy consumption. The existence of cointegration meaning that there is the long-run and short-run relationship between Energy consumption and Economic growth in Tanzania. The study revealed the bidirectional causal relationship which runs from the Economic growth to Energy consumption and from Energy consumption to Economic growth. Therefore, the study justifies the feedback hypothesis relationship. The study revealed that Energy consumption has a significant contribution to the Economic growth of Tanzania and the Economic growth of Tanzania depends on Energy consumption. Therefore although Tanzania has a different long project for energy investment, it should focus on short runs projects. Because the empirical analysis shows that there are effects of energy consumption for both the short-run and long-run effects.

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POLITICAL STABILITY AND ECONOMIC GROWTH RELATION: THE CASE OF TURKEY AND TURKIC REPUBLICS

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ABSTRACT

Purpose – The purpose of this study is to investigate the possible relation between political stability and economic growth in Turkey and Central Asian Turkic Republics namely, Azerbaijan, Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan and Turkmenistan. By doing so, we will be able to conclude the effect of political stability on transition economies such as Turkic countries.

Methodology – We employ panel data analysis methods which take cross section dependency into account. In this regard, we employ cross section dependency test and unit root tests. In the second step, we use panel unit root co-integration test. At the end we employ panel VAR causality and Köse and Emirmahmutoğlu Panel causality tests.

Findings- Results imply that there is a uni-directional causality running from gross domestic product per capita to political stability. In country based analysis, it is seen that the causation linkage running from political stability to economic growth occurs in only Azerbaijan. In other countries, there is no relationship between variables.

Conclusion- According to results, it is possible to conclude that political stability is not a pre-condition of economic growth in Turkic economies, except Azerbaijan. On the other hand, political stability might be a pre-condition of another macroeconomic indicator such as inflation, trade opennes and etc.

Keywords: Central Asia, political stability, economic growth, panel data, causality.
JEL Codes: E00, C23, P48

1. INTRODUCTION

Expressing the interaction between politics and economy, political stability is a concept that develops around the new institutional economics approach and is intertwined with both politics and economy. This concept, which has gained increasing importance with the increase of international integration, has attracted the attention of many researchers and the relationship between political stability and economic indicators has become one of the frequently encountered issues in the literature.

Determining the relationship between political stability and macroeconomic indicators is very important for decision makers to guide their policies. In order to establish a stable political structure, there is a need for legitimate governance that is far from arbitrary practices, bound by rules and laws, and highly accountable. In addition, decision makers should not ignore that the political decisions they make and the policies they set would affect the economy. Predictability is very important for investors. The more positive expectations economic actors have about the future, they invest more. The atmosphere of confidence created by a stable political order contributes to the increase of positive expectations about future by eliminating uncertainty. While this situation makes the existing investments permanent, it also serves as an incentive for new investors. Otherwise, the uncertainty caused by an unstable structure will increase the level of risk, negatively affect the economic indicators, and will especially push foreign investors to seek safe havens. In addition, the chaos environment created by political instability will put pressure on government and cause loss of reputation both in domestic politics and in the international political arena.

The political stability is a very important concept in terms of emerging economies those begun to integrate with international markets. A politically stable structure is both an international reputation and an important reference source for foreign investors.

The aim of this study is to investigate possible relation between political stability and economic growth in Turkey and Central Asian Turkic Republics. While Turkey is an emerging market economy, Central Asian Turkic Republics have entered the process of integration with international markets by switching from the centrally planned system to the market economy. The contribution of the study to existing literature is that although there are numerous studies examining the relation for emerging and developed economies, there are insufficient studies examining transition economies such as Central Asian Turkic countries. To my knowledge, this is one of the initial study investigating Central Asian Turkic economies.

The first section of the study includes theoretical framework on political stability, literature survey and graphs of development of variables investigated. In the second section, analysis method employed and results of empirical analysis are presented. In conclusion section, evolutions are made for the results of empirical analysis.

2. THEORETICAL BACKGROUND OF POLITICAL STABILITY/INSTABILITY NOTION AND LITERATURE REVIEW

Political stability is an essential notion to be able to manage process in both private and public sector and it means lack of change and movement. In the case of absence of political stability, it is very possible beginning of uncertainty and loss of welfare. The basic component of political stability is predictability. Presence of opponents is the key of the political stability. Political stability expresses a set of rules which is established at the beginning and ensures the predictability where opponents are institutionally recognized.

Political stability is a notion appeared first in 1960s. Confusion about the explanation of this concept has continued until today. In studies examining the effect of political instability on growth, this state of uncertainty shows its effect. In researches related to political stability notion it is seen that frequent government changes, increase in anti-government demonstrations and actions and coups cause a politically unstable structure (Curvale, 2010: 1-12).

Huritz synthesizes different articles and collates conditions necessary for the existence of political stability in a system as follows:

- Persistence: The ability of the political system to continue
- Legitimacy: The existence of a legitimate political system
- Effectiveness: The ability to make effective decisions by the political system

For a politically stable structure, "persistence", that is, the absence of frequent government changes, is an important condition. Since there is an uncertainty about the descriptive use of these three conditions that Huritz envisages, it is discussed in the literature that in order to build stronger political stability, “legitimacy” and “efficiency” for “persistence” or “persistence” for “legitimacy” and “effectiveness”? (Park, 1982: 12).

Interaction between political decisions and economic indicators constitutes main subject of political economics and constitutes policymakers’ performances on solution of economic problems. In other words, the most important results of political decisions are seen on the field of economics. In this regard, political stability defined as stability in political decisions and political order is effective on economic order, development and stability (Çalışkan, 2019: 72).

In order to build politically stable environment, institutional factors are too undeniable. Also, it is a view in the economic literature that the increase in institutional quality positively affects economic performance. Institutions have an impact on the economic performance of the countries by reducing the uncertainty and affecting transaction costs, directing economic activities to productive areas, and enhancing cooperation and trust (Gökalp and Baldemir, 2006: 212).

Democratic framework and institutional stability are crucial for political stability. Lack of them in a system can ruin the best policies and growth initiatives. Increasing uncertainty about the future and increasing the level of risk may cause political instability and cause the funds of domestic and foreign capital owners to shift to new investment projects. In addition, regime and frequent government changes make rational expectations impossible.

In an unstable environment, investors will seek a more stable environment for reasons such as credit default risk, weakening the principle of private property and less trust in the judiciary, and will choose to shift their investments to foreign countries. Decreasing investments because of outflowing investments due to unstable structure induces economic problems such as decreasing labor demand and increasing unemployment. The persistence of instability will further undermine the political structure, leading to the skilled labor migration required for efficient production. Thus, less capital and labor will reduce total

production and lower labor quality will slow down economic growth by affecting productivity negatively (Comeau, 1998: 55-57).

In the economic literature, there are numerous many studies examining the effects of political stability / instability on countries' economic performance. The uncertainty created by instability in an economy confronts as an undesirable situation for policy makers and economic actors. When the related literature is reviewed, it is possible to conclude that a politically stable structure has a positive effect on macroeconomic indicators, political instability affects these indicators negatively. Negative effect will increase when instability increases.

Asghar et al. (2015) analyzes relation between institutional quality and economic growth in thirteen Asian economies. In the study authors employ panel data method to examine period between years 1990 and 2013. According to findings, there is a uni-directional causality running from institutional quality to economic growth and institutional quality affects economic growth positively.

Sekrafi and Sghaier (2018) investigate effects of energy consumption, corruption, quality of environment and political stability on economic growth in thirteen Middle Eastern and North African (MENA) countries. The study analyzes 1984 – 2012 period via static and dynamic panel data methods. According to analysis results, increasing corruption is effective on economic growth, environmental quality and energy consumption directly. Also economic growth affects environmental deterioration and political instability negatively.

Çetin (2019 investigates the effect of economic and political institutions on economic growth in twenty six countries. The data belonging to variables cover 2002 – 2016 period. The author analyzes the countries into two groups namely, developed and emerging market economies. According to analysis results obtained from generalized OLS (FGLS, hereafter), there is positive and statistically significant relation between economic growth and indicators those are employed to build World Governance Index that is substituted to measure economic and political institutions.

Çalışkan (2019) examines the relation between political stability and financial development in the Turkish economy. In the study, Çalışkan employs Granger causality test to analyze 1970 – 2017 period. According to empirical analysis results, there is a long run relation between financial development and political stability and also causation linkage between political stability and financial development.

Karakuzu and Limon (2019) analyze the Tunusian economy in the context of effect of political stability on political and social life. The authors employed human development index, Failed / Fragile State Index, Global Peace and Terror Indices. They analyze 2010 – 2018 period. According to results obtained, unless governments answer needs of democracy, they would face with riots and revolts. Also, economic crises and inequality in income distribution trigger political instability.

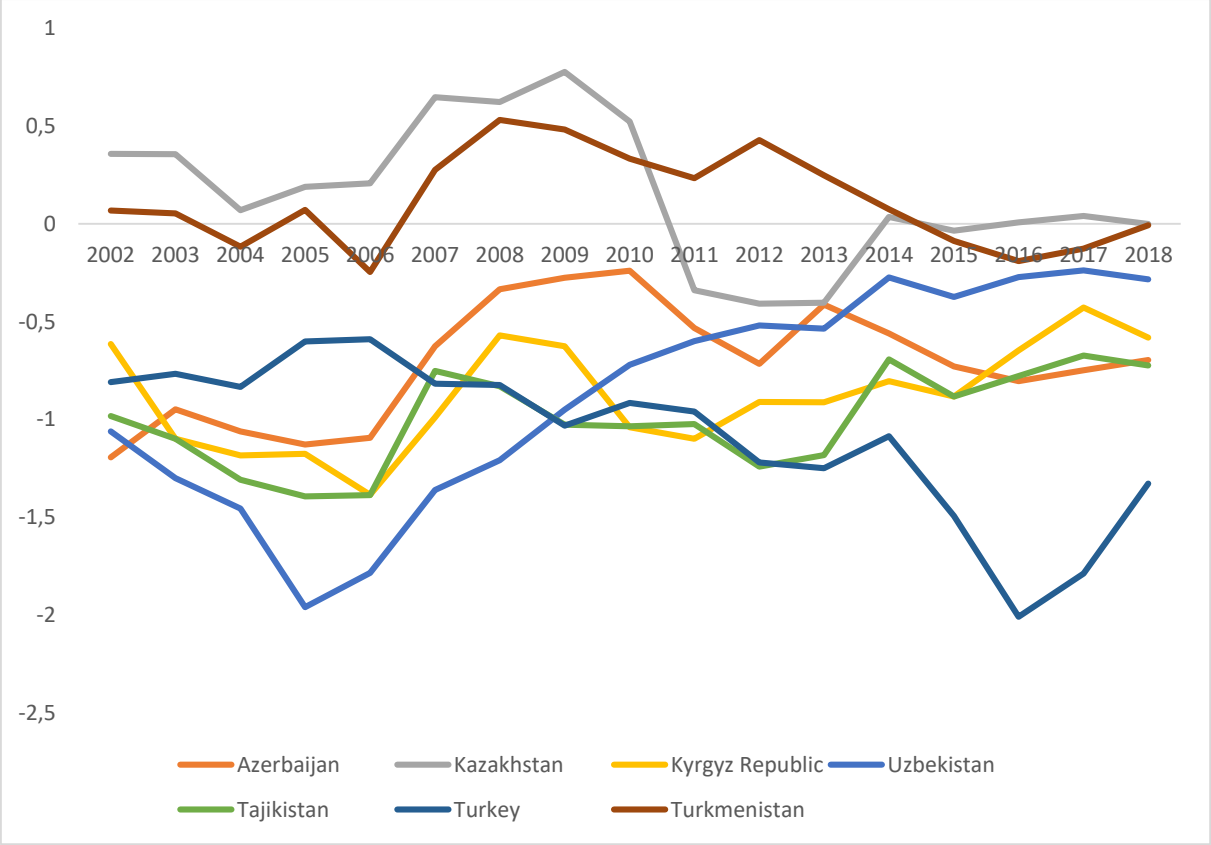
Demez et al. (2019) investigate relation between economic growth and political stability in NIC countries. Authors employ bootstrap panel causality test developed by Konya (2006) in order to find possible causation linkage between variables between years 2002 and 2017. As a result, there is a uni-directional causality running from economic growth to political stability in only Indonesia and Turkey.

Kamacı (2019) investigates the relation for twenty OECD countries in between 2003 – 2017 years. Panel data analysis method results show that a 1 % percent increase in political instability decreases real GDP 1,784 % in the long run, while it increases economic growth 5,244 % in the short run.

Yılmaz (2019) analyzes the interaction between political instability and economic indicators for nine countries between years 2010 and 2017 via panel data analysis method. According to results obtained, there is no relation between economic growth and political instability. On the other hand, results imply a negative weak correlation between political instability and foreign direct investment inflow and outflow, inflation rate and exchange rate.

In Graph 1, it can be seen that development of political stability level of selected economies during years between 2002 and 2018. There is no considerable volatility in Azerbaijan, Kyrgyzstan and Tajikistan during the years and level of stability is close to each other. When other economies in the graph investigated, it is possible to say that level of political stability index decreased between years 2002 and 2005 in Uzbekistan. After this period, it has been started to increase in 2005 till 2018. Break point of political stability level of Uzbekistan is year of 2005. When we look closer, it is possible to conclude that there are some important changes in economic management. In this period, Uzbekistan was in a situation such as closed economy. In 2005, “Foreign Investments Law” which was accepted in 1998, was changed and by the change, foreign direct investment inflow into country is stimulated and foreign investors are privileged via tax and customs duty exemptions.

Graph 1: Political Stability Index During 2002 – 2018 Years



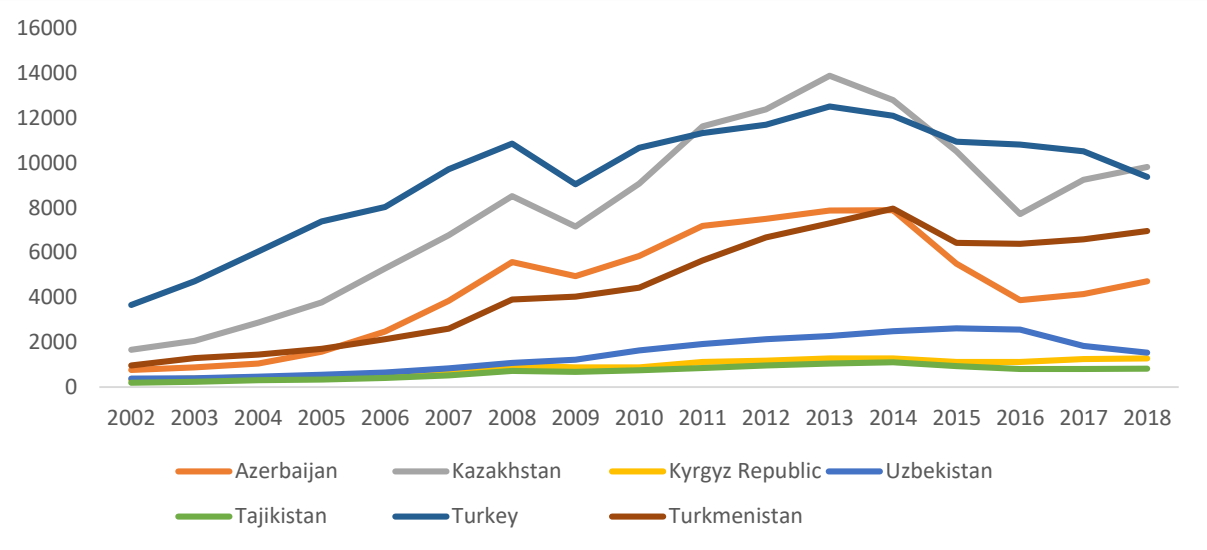
Source: World Bank, 2019.

The trend between years 2007 and 2015 is positive in Turkmenistan and the lowest level was seen in 2006. After the death of former Turkmenistan head of state Niyazov, Berdimuhammedov was selected of new head of state in 2007. Contrariwise of Niyazov's closed economy policy, Berdimuhammedov has given international relations and implemented policies in order to increase foreign trade capacity, especially for energy sources that the country has. It is seen that the policies pursued to develop the relations and to open out also reflected to the level of political stability.

Kazakhstan is the country with the highest level of political stability among the analyzed economies. On the other hand, the level of political stability in Kazakhstan showed a downward trend between 2009 and 2013, while the average course continued in other years. Kazakhstan suspended membership negotiations with the World Trade Organization, which has been going on for many years in 2009, and was included in the Customs Union Agreement between Russia and Belarus as of 2010. However, Kazakhstan could not achieve the desired result from this agreement. According to analysis for 2010-2015 period, made by Barak and Abutalipov (2016), the Customs Union Agreement between Kazakhstan, Russia and Belarus does not have any positive effect on foreign trade volume of Kazakhstan. The country officially became a member of World Trade Organization in 2015.

In Turkey, political stability index has an average cruise during whole period, but trend of index presents a negative trend between years 2014 and 2016. It is possible to conclude that coup attempt occurred in 15th of July 2016 was effective on the negative trend which is is accepted as a major indicator of political instability. But the Turkish economy was not influenced in a long time period and entered into a rapid recovery period. Recovery process also influenced the level of political stability. As of the end of 2016, it gained momentum and increased.

Graphic 2: Development of GDP Per Capita in 2002 – 2018 Period



Source: World Bank, 2019.

In Graph 2, change in gross domestic per capita of each countries examined are presented for 2002 – 2018 period. It is interesting that the lowest political stability value belongs to Turkey as indicated in graph 1, the highest gross domestic product per capita value belongs to Turkey too. Among Central Asian Turkic countries, Kazakhstan, which is the most developed economy, stands out with its high gross domestic product per capita. The economic development of Turkmenistan, Azerbaijan and Uzbekistan economies have followed similar pathways. Gross domestic product per capita of Kyrgyzstan and Tajikistan have increased in the same ratio.

3. EMPIRICAL FINDINGS

In this study, relation between political stability and economic growth is investigated in Azerbaijan, Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan, Turkish and Turkmenistan economies. Annual data belonging to 2002 – 2018 period is employed. Political stability[1] (PS, hereafter) and gross domestic product per capita (GDPPC, hereafter) are used as variables denoting political stability and economic growth, respectively. Data belonging to variables PS and GDPPC are obtained from World Bank database. Cross section dependency, unit root and causality tests are employed. In order to test cross section dependency test, Lagrange Multiplier test developed by Breusch and Pagan (1980) are used. Panel data model where size of cross section is i=1,2,…,N, time size is t=1,2,…,T, α_i and β_i are constant term and slope coefficients, respectively, x_{it} is descriptive variables vector and its size is kx1;

$$y_{it} = \alpha_i + \beta_i' x_{it} + \varepsilon_{it} \quad (1)$$

In the model, LM test statistic is [$H_0 : Cov(\varepsilon_{it}, \varepsilon_{jt}) = 0$];

$$LM = T\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{\rho}_{ij}^2 \square \chi^2_{N(N-1)/2} \quad (2)$$

[1] World Bank definations of political stability: "Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5" (World Bank Database, 2020)

$\hat{\rho}_{ij}^2$ denotes sectional correlation obtained from individually employed ordinary least squares method. Pesaran (2004) finds a new LM test statistics in order to prevent size distortion. LM statistics which is modified as time size is T→∞ and sectional size is N→∞ is as follows;[2]

$$CD = \sqrt{\left(\frac{2T}{N(N-1)}\right)}\left(\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{\rho}_{ij}\right) \square\ N(0,1) \tag{3}$$

If there is no cross sectional dependency, first generation unit root tests are employed. If there is a cross sectional dependency, second generation unit root tests are employed. In order to test validity of cross section dependency in the panel data analysis, CD_{LM} test developed by Pesaran (2004), CD_{LM1} test developed by Breusch – Pagan (1980) and CD_{LM2} test developed by Pesaran (2007) are employed. If time size is bigger than cross sectional size (T>N), CD_{LM1} and CD_{LM2} tests are employed. If cross sectional size is bigger than time size (N>T), CD_{LM} test is employed.

The null hypothesis in cross sectional dependency tests is "there is no cross section dependency and alternative hypothesis denotes validity of cross section dependency.

Table 1: Cross Section Dependency Tests Results

Model with Constant	PS	GDPPC
CD_{lm}	28.552 (0.125)	33.54 (0.041)**
CD_{lm}	1.165 (0.122)	1.935 (0.026)**
CD	-2.655 (0.00)***	-1.519 (0.064)*
LM_{adj}	3.766 (0.00)***	-0.907 (0.818)

Notes: In the following model $\Delta y_{i,t} = d_i + \delta_i y_{i,t-1} + \sum_{j=1}^{p_i} \lambda_{i,j}\Delta y_{i,t-j} + u_{i,t}$, lag length ($p_i$) is acceptes as 1. ***, ** and * denote that alternative hypothesis is accepted in 1%, 5% and 10% significance levels, respectively.

According to probability values, alternative hypothesis which claims validity of cross section dependency is accepted. Second generation unit root tests are capable to test whether variables are stationary for each country and it is valid in the case of T>N. Seemingly Unrelated Regression Augmented Dickey Fuller test (SURADF, hereafter) developed by Breuer et al. (2002) is panel data analysis version of conventional generalized Dickey – Fuller unit root test for time series. In SURADF test is calculated as follows where N denotes the number of countries;

$$\Delta y_{1t} = \alpha_1 + \beta_1 y_{1t-1} + \delta_{1t} + \sum_{j=1}^{p1}\varphi_{1j}\Delta y_{1t-j} + \varepsilon_{1t} \tag{4}$$

$$\Delta y_{2t} = \alpha_2 + \beta_2 y_{2t-1} + \delta_{2t} + \sum_{j=1}^{p1}\varphi_{2j}\Delta y_{2t-j} + \varepsilon_{2t} \tag{5}$$

$$\Delta y_{Nt} = \alpha_N + \beta_N y_{Nt-1} + \delta_{Nt} + \sum_{j=1}^{p1}\varphi_{Nj}\Delta y_{Nt-j} + \varepsilon_{Nt} \tag{6}$$

In this case, N null and alternative hypotheses are established for each country in the panel. In SURADF test, the null hypothesis claims the existence of unit root in the serie and alternative hypothesis claims that there is no unit root in the related serie. If the test statistic of SURADF is smaller than critical value, it is possible to imply that variable belonging to related country is stationary. If the test statistics of SURADF is bigger than critical value, it means that null hypothesis claiming the existence of unit root is accepted.

[2] Since pair-wise correlations are not distributed with zero mean, Pesaran et al. (2008) can be examined for bias-adjusted LM test statistics for large panels.

Table 2: SURADF Unit Root Test Results

	Model with Constant Term			Model with Constant Term and Trend		
	Lags	**SURADF t-stat**	**10%**	**Lags**	**SURADF t-stat**	**10%**
PS						
Azerbaijan	1	-6.5419	-3.4765	3	-6.1779	-6.0180
Kazakhstan	1	-2.3140*	-4.3891	4	-4.8419	1.6461
Kyrgyzstan	4	-3.6838*	-5.0770	3	-4.4984*	-5.3820
Uzbekistan	4	-9.9730	-6.0475	4	-1.7847*	-6.1989
Tajikistan	4	-2.8973*	-5.3498	2	-3.8697*	-5.1964
Turkey	1	-3.4473*	-4.2565	1	-7.2618*	-7.3078
Turkmenistan	4	-4.1293	0.3758	4	-5.5450*	-8.4657
GDPPC						
Azerbaijan	1	-6.4393	-4.9484	2	-4.3726*	-6.7894
Kazakhstan	1	-3.5484*	-4.0959	1	-3.7053*	-7.7408
Kyrgyzstan	2	-4.7373*	-5.1622	1	-5.6562*	-8.9847
Uzbekistan	4	0.3612	-5.5938	4	-4.9348	-0.1073
Tajikistan	2	-5.0235	-4.4443	2	-4.7418*	-6.2939
Turkey	1	-3.7164*	-5.0767	1	-2.5691*	-8.5840
Turkmenistan	2	-3.5044*	-5.7954	2	-4.7120*	-5.3168

Notes: Maximum lag length is determined as four and optimal lag length are determined according to Schwarz information criterion. Critical values are obtained from 1.000 bootstrap simulation. ***, ** and * denote acceptance of alternative hypothesis in significance levels 1 %, 5 % and 10 %, respectively.

According to SURADF unit root test results presented in table 2, series of Kazakhstan, Tajikistan, Kyrgyzstan and Turkey belonging to political stability index are stationary in model with constant and series of Kyrgyzstan, Uzbekistan, Tajikistan, Turkey and Turkmenistan belonging to political stability are stationary in model with constant and trend. Test results also imply that in Kazakhstan, Kyrgyzstan and Turkey, GDPPC series are stationary in model with constant and in all countries except Uzbekistan; GDPPC series are stationary in model with constant and trend. But it is assumed that both series have long run memory features and first difference of series will be employed in empirical analyzes.

Pesaran and Yamagata (2008) developed $\tilde{\Delta}$ delta test in order to test homogeneity of slope coefficient. Null hypothesis of test is homogeneity of slope coefficient [$H_0 : \beta_i = \beta$] for each i[3].

Table 3: Cross Section Dependency and Homogeneity Tests Results

Regression: $GDPPC_{it} = \alpha_i + \beta_{1i} PS_{it} + \varepsilon_{it}$	Test Stat	Prob Value
Cross Section Dependency Test:		
LM	150.294	0.00***
CD_{lm}	19.950	0.00***
CD	11.731	0.00***
LM_{adj}	20.689	0.00***
Homogeneity Test:		
$\tilde{\Delta}$	3.739	0.00***
$\tilde{\Delta}_{adj}$	4.096	0.00***

Note: ***, ** and * denote acceptance of alternative hypothesis in significance levels 1 %, 5 % and 10 %, respectively.

[3] For test stats, please see Pesaran and Yamagata (2008).

Results imply that co-integration methods based on heterogonous estimation and taking cross section dependency into account have to be employed.

Table 4: Results of No Structural Break Co-integration Tests Taking Cross Section Dependency

	Model with Constant Term			Model with Constant Term and Trend		
	Test Stat	Asymptotic Prob Value	Bootstrap Prob Value	Test Stat	Asymptotic Prob Value	Bootstrap Prob Value
Error Correction Model						
Group_tau	-0.091	0.464	0.636	-0.543	0.294	0.578
Group_alpha	-0.593	0.723	0.667	-1.546	0.061	0.326
Panel_tau	-1.101	0.136	0.490	-0.625	0.266	0.336
Panel_alfa	-0.307	0.379	0.626	-2.156	0.016	0.300

Notes: Null hypothesis of test claims that there is no co-integration. In error correction test, lag and antecedent are accepted as one. Bootstrap probability value are obtained from 1.000 bootstrap simulation. Asymptotic prob values are obtained from standard normal distribution. ***, ** and * denote acceptance of alternative hypothesis in significance levels 1 %, 5 % and 10 %, respectively.

In error correction test, when both asymptotic and bootstrap probability values are taken into account, it is possible to conclude that there is no relationship between political stability and gross domestic product per capita in the long run. Panel vector auto-correlation models (PVAR, hereafter) are as follows;

$$\Delta GDPPC = \delta_{1i} + \sum_{p=1}^{k} \delta_{11ip} \Delta GDPPC_{it-p} + \sum_{p=1}^{k} \delta_{12ip} \Delta PS_{it-p} + \nu_{1it} \quad (7)$$

$$\Delta PS = \delta_{2i} + \sum_{p=1}^{k} \delta_{21ip} \Delta PS_{it-p} + \sum_{p=1}^{k} \delta_{22ip} \Delta GDPPC_{it-p} + \nu_{2it} \quad (8)$$

In equation seven where first panel VAR model presented, null hypothesis is $\sum_{p=1}^{k} \delta_{12ip} \Delta PS_{it-p} = 0$ and it claims that there is no causation linkage running from political stability to gross domestic product per capita. Alternative hypothesis is $\sum_{p=1}^{k} \delta_{12ip} \Delta PS_{it-p} \neq 0$ and claims there is a uni-directional causality running from political stability to gross domestic product per capita.

In equation eight where second panel VAR model presented, null hypothesis is $\sum_{p=1}^{k} \delta_{22ip} \Delta GDPPC_{it-p} = 0$ and it claims that there is no causation linkage running from gross domestic product per capita to political stability. Alternative hypothesis is $\sum_{p=1}^{k} \delta_{22ip} \Delta GDPPC_{it-p} \neq 0$ and claims there is a uni-directional causality running from gross domestic product per capita to political stability.

Table 5: Panel VAR Causality Test Results

	Δ (PS)	Δ (GDPPC)
Δ (PS)	-	0.512 (0.474)
Δ (GDPPC)	3.157 (0.076)*	-

Note: ***, ** and * denote acceptance of alternative hypothesis in significance levels 1 %, 5 % and 10 %, respectively.

According to table 5, there is a uni-directional causality running from GDPPC to PS. But there is no Granger causality running from PS to GDPPC. This result shows that political stability is not a pre-condition of economic growth. So, even if there is an unstable political environment, economic growth can continue. Central Asian Turkic economies are typical transition economies even they are independent since 1990s and transition in democracy may still continue. That is why political

instability do not affect decisions of households and firms. On the other hand, when governments are successful in economic management, confidence of households and firms to government would increase and that would increase continuity of government. That is one of the measurements of political stability. As a result political stability would increase.

Emirmahmutoğlu and Köse (2011) employ causality test for each cross section by implementing bootstrap method to Fisher test statistics. Before causality test, stationary level ($dmax_i$) and optimal lag length (p_j) in panel VAR model are determined by employing unit root test. Then, both coefficients are collected. For each cross section, error correction terms are obtained for regressions below;

$$GDPPC_{i,t} = \alpha_{i,t} + \sum_{j=1}^{p_i + d\max_i} \beta_{ij} GDPPC_{i,t-j} + \sum_{j=1}^{p_i + d\max_i} \gamma_{ij} PS_{i,t-j} + \varepsilon_{it} \quad (9)$$

$$PS_{i,t} = \alpha_{i,t} + \sum_{j=1}^{p_i + d\max_i} \beta_{ij} PS_{i,t-j} + \sum_{j=1}^{p_i + d\max_i} \gamma_{ij} GDPPC_{i,t-j} + \varepsilon_{it} \quad (10)$$

Null hypothesis of Emirmahmutoğlu and Köse (2011) causality test is [$H_0 : \beta_{i1} = \beta_{i2} = ... = \beta_{ik_i} = 0$]. Alternative hypothesis claims there is no Granger causality and as follows [$H_0 : \beta_{i1} = \beta_{i2} = ... = \beta_{ik_i} \neq 0$].[4]

Table 6: Emirmahmutoğlu and Köse Panel Causality Test Results

	Lag	PS≠>GDPPC		GDPPC≠>PS	
		Wald	**Prob Value**	**Wald**	**Prob Value**
Azerbaijan	3	27.285	0.00***	2.735	0.434
Kazakhstan	3	4.764	0.189	2.010	0.570
Kyrgyzstan	1	0.538	0.463	0.277	0.598
Uzbekistan	2	1.951	0.376	2.059	0.357
Tajikistan	1	0.125	0.723	0.978	0.322
Turkey	3	4.150	0.245	1.528	0.675
Turkmenistan	1	1.058	0.303	1.250	0.263
Fisher		**37.013**	**0.00*** **	**11.594**	**0.638**

Note: ***, ** and * denote acceptance of alternative hypothesis in significance levels 1 %, 5 % and 10 %, respectively.

According to Emirmahmutoğlu and Köse (2011) causality test results, in only Azerbaijan, there is uni-directional causality running from political stability to gross domestic product per capita in significance level 1%.

The result obtained from Emirmahmutoğlu and Köse (2011) test is important to conclude. Because the members of the CIS (Commonwealth of Independent States), who switched from the central planned system to the market economy, tried to rebuild their countries politically and economically and aimed to be accepted in the international arena. Among them, Azerbaijan has some extra features than others.

According to Dikkaya and Demirci (2013), Heydar Aliyev, who served as the head of state in 1993-2003, has a great contribution in the economic and political shaping of Azerbaijan. The basis of the balance strategy of the country's foreign policy was shaped in this period, which also contributed to the shaping of the economy. While in the beginning of 2000s, the political stability provided by Heydar Aliyev was built on an energy-centered political line, bringing along economic stability. Ilham Aliyev, who was elected president in 2003 after the death of Heydar Aliyev, continued the policies of Haydar Aliyev during his rule and managed to achieve a stable performance in economic growth.

4. CONCLUSION

The interaction between political and economic policies is reflected on the political and economic stability levels of the countries and has an impact on their economic indicators. Especially in developing countries, foreign investors have an important role in ensuring sustainable economic stability. Political stability is needed to ensure sustainable economic stability. A politically unstable structure negatively affects economic performance, resulting in uncertainty in the economy. Persistence

[4] Please see Emirmahmutoğlu and Köse (2011) for bootstrap test statistics.

of uncertainty causes foreign investors to be annoyed, resulting in a capital outflow from the country. Unlike these negativities, which may be caused by political instability, political stability is essential for governments, because it reduces risk via eliminates uncertainty, improves economic performance and makes investments permanent. Studies that examine the effects of political stability / instability concepts, which are very difficult to measure, on the macroeconomic indicators of countries, have recently come across widely in the literature of economics. In this study, relation between political stability and economic growth in Turkey, Azerbaijan, Kazakhstan, Uzbekistan, Kyrgyzstan, Tajikistan and Turkmenistan is examined for period between years 2002 and 2018. The cross section dependence, panel unit root and panel causality tests are made and annual data belonging to related period is used. In the panel where there is a cross-section dependency, both variables contain unit root in level. According to the panel vector auto-regression model, there is a Granger causality at a 10% significance level from gross domestic product per capita to political stability. However, there is no causality running from political stability to gross domestic product per capita. According to Emirmahmutoğlu and Köse (2011) causality test results, there is a causation linkage running from political stability to gross domestic product per capita only in Azerbaijan. Determining the relationship between political stability and economic indicators will be a decisive factor in policy makers' political and economic decisions. In this study, the relationship between political stability and economic growth is examined. Political stability is likely to have an impact on other macroeconomic indicators, such as trade openness, exchange rate, inflation and unemployment rates. Examining the relationship between political stability and other macroeconomic indicators for different countries or country groups in future studies will contribute to the literature.

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PROACTIVE RISK MANAGEMENT APPROACH IN REDUCING THE AGRICULTURAL SUPPLY CHAIN RISKS

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ABSTRACT
Purpose- The purpose of this study is to provide a model that analyzes the risk factors encountered by the agriculture industry, which is an essential part of the global economy, during supply chain activities.
Methodology – In this study, a systematic risk management model (Australia and New Zealand Standard AS / NZS 4360: 2004) is proposed to manage the risks that may arise in the agricultural supply chain. The proposed model was applied in a multinational company operating in the agricultural sector and road map has been developed which allows them to monitor and manage the supply chain risks of the company systematically. Within this scope; the risks in an organization, which may lead to business interruption and losses for agriculture companies, risk matrix method has been used in order to examine their probability and effects of their consequences.
Findings- Within the scope of the study, identified risks were analyzed under six categories; namely environmental risk, supply risk, operational risk, political risk, organizational risk and financial risk. Based on the findings of the study, it is determined that eight risks most important, seven risks moderately important and six risks less important than other risks.
Conclusion- At the end of the analysis, it was concluded that, product quality, storage conditions, supply, climatic instability and commercial restrictions that limit or cause inhibition of competition in the foreign markets had critical importance in agricultural supply chain management.

Keywords: Australia/New Zealand Standards, risk management, agricultural supply chain, agricultural supply chain risk management, risk matrix.
JEL Codes: Q10, M10, M20

TARIM TEDARİK ZİNCİRİ RİSKLERİNİN AZALTILMASINDA PROAKTİF RİSK YÖNETİMİ YAKLAŞIMI

ÖZET
Amaç- Çalışmanın amacı; dünya ekonomisinin temel bir parçası olan tarım sektörünün, tedarik zinciri faaliyetleri sırasında karşı karşıya kaldığı risk faktörlerini analiz eden bir model sunmaktır.
Yöntem- Bu çalışmada, tarım tedarik zincirinde ortaya çıkabilecek risklerin yönetilmesi için sistematik bir risk yönetim modeli (Avustralya ve Yeni Zelanda Standardı AS / NZS4360:2004) önerilmiştir. Önerilen model, tarım sektöründe faaliyet gösteren, çokuluslu bir firmada uygulanarak, firmanın tedarik zinciri risklerinin sistematik bir şekilde izlenmesine ve yönetilmesine imkân veren bir yol haritası geliştirilmiştir. Bu kapsamda; bir organizasyon içinde tarım şirketleri için iş kesintisi ve kayba neden olabilecek risklerin, olasılığını ve sonuçlarının etkisini incelemek amacıyla risk matrisi yöntemi kullanılmıştır.
Bulgular- Çalışma kapsamında, tespit edilen riskler; çevresel risk, tedarik riski, operasyonel risk, politik risk, örgütsel risk ve finansal risk olmak üzere 6 kategori altında incelenmiştir. Araştırmanın bulgularına dayanarak, sekiz risk en önemli, yedi risk orta derece önemli ve altı risk ise diğer risklere göre önemi daha az bulunmuştur.
Sonuç- Yapılan analizin sonucunda ürün kalitesi, depolama koşulları, tedarik, iklim ile ilgili değişkenlik ve dış pazarda rekabet etmeyi sınırlandıran ya da engellemeye neden olan ticari kısıtlamaların tarım tedarik zinciri yönetiminde kritik önem taşıdığı sonucuna varılmıştır.

Anahtar Kelimeler: Avustralya/Yeni Zelanda Standardı, risk yönetimi, tarımsal tedarik zinciri, tarımsal tedarik zinciri risk yönetimi, risk matrisi
JEL Kodları: Q10, M10, M20

1. GİRİŞ

Günümüz iş dünyasında, modern tarım tedarik zinciri ağları, daha karmaşık, dinamik ve birbirine bağımlı hale gelmiştir. Tarımsal tedarik zinciri, dinamik bir çevrede, nihai tüketicilerin taleplerini yerine getirmek için karmaşık yapıya sahip faaliyetleri yönetmeye odaklanır. Tüketici odaklı bir yaklaşım olan tarım tedarik zinciri, tüketici gereksinimlerine etkili ve hızlı cevap verebilmek için tarımsal gıda üretiminde yer alan tüm faaliyetleri, organizasyonları, ara aktörleri, teknolojiyi, bilgiyi, kaynakları ve hizmetleri kapsayan tüm sistemi ifade eder.

Yakın zamanda, tarımsal ürünlerin tedarik zinciri, dünyadaki en kritik konulardan biri haline gelmiştir. Çünkü tarımsal riskler, aynı zamanda gıda güvensizliğinin başlıca sebebi olarak görülmektedir. 2020 verilerine göre; dünya üzerinde 7,7 milyardan fazla insan yaşamaktadır. Birleşmiş Milletler Gıda ve Tarım Örgütü'nün (FAO, 2017) Roma konferansına ait raporunda 2050 yılına gelindiğinde, dünya nüfusunun yaklaşık 10 milyar olacağı tahmin edilmektedir. Dünyada nüfusun artış hızı yükselirken, gıda ihtiyacını karşılayacak tarım topraklarının ve doğal kaynakların yetersiz kalacağı ciddi bir tehdit olarak öngörülmektedir. Dünyada giderek artan gıda talebini karşılamak için tarımsal verimliliğin ve üretim artışının sağlanmasının önemine işaret edilerek tarımda risk etmenlerinin azaltılmasının gerekliliğine de dikkat çekilmektedir.

Tarım sektörü, özellikle sektördeki aktörlerin ve paydaşların kontrolü altında olan ve kontrolünün ötesinde birçok risk ve belirsizlik ile karşı karşıyadır. Bu riskler, faaliyetler sırasında ortaya çıkabileceği gibi dış çevre koşullarından da yakından etkilenmektedir. Tarımsal üretimin doğa koşullarına bağlı olması ve doğrudan hava koşullarındaki değişikliklerden etkilenmesi nedeniyle her zaman çeşitli risk ve belirsizliklere maruz kalmaktadır. Diğer bir taraftan; gittikçe küreselleşen iş ortamının bir sonucu olarak tarım sektöründeki şirketler için yeni riskler ortaya çıkmaya devam etmektedir. Tarım, özellikle üreticilerin kontrolü dışında olan doğal faktörlerden yakından etkilendiği için diğer sektörlere kıyasla daha riskli bir sektör olarak kabul edilir. Tarım sektörünün kendine özgü dinamiklerinin olması tedarik zincirlerini daha kırılgan hale getirerek aksamalar yaşanma riskini arttırmaktadır. Tarımsal tedarik zincirinde yaşanan aksaklıklar, tüm zincirinin işleyişini ve hedefleri olumsuz yönde etkileme potansiyeline sahiptir.

Tarımsal tedarik zinciri riskleri, coğrafi unsur olarak doğal afetlerden, iklim ve hava koşullarından kaynaklanan olaylardan, lojistik hizmet sağlayıcılarının kalite problemlerine kadar çok sayıda ve çeşitlilik gösterir. Bununla birlikte; tarım emtia fiyatlarındaki değişkenlikler, gübre ve diğer girdilerin kullanım zamanları ve miktarları, finansal belirsizlikler ile politika ve düzenleyici risklere kadar uzanmaktadır. Tedarik zincirinde meydana gelen bu riskler, operasyon kesintiler, finansal kayıplar, itibar kaybı, insan sağlığı ve güvenliği zararları gibi nitel ve nicel sonuçlara yol açarak kendini gösterir. Diğer bir yandan, tarım tedarik zinciri riskleri, potansiyel olarak, firmaların hedeflerine ulaşması ve tedarik zincirinin performansı ile sürdürülebilirliği üzerinde önemli bir etkiye sahiptir.

Tarım tedarik zincirinde risk yönetimi, tedarik zincirinin düzgün bir biçimde akışına engel olan muhtemel riskleri öngörerek, ortaya çıkma zamanı, sıklığı ve etkisine karşı hazırlıklı olunmasını sağlayan sistematik yani planlanmış bir yönetim sürecidir. Bu çalışmada, anlaşılması ve benimsenmesi kolay, hızlı bir şekilde uygulanabilen, Avustralya ve Yeni Zelanda risk yönetim modeli önerilmiştir. Önerilen model, tarım sektöründe faaliyet gösteren çok uluslu bir firmada uygulanarak, firmanın tedarik zinciri risklerini, sistematik bir şekilde yönetilmesine imkân veren bir yol haritası geliştirilmiştir.

Çalışma beş bölümden oluşmaktadır. Giriş bölümünden sonra ilk olarak, tarımsal tedarik zinciri kavramı tanımlanmıştır. Bu bölümde, literatüre dayalı olarak tarım endüstrisinde tedarik zinciri yönetimi, gelişimi ve bütünleşik bir yapı içerisinde iş süreçleri incelenmiştir. Üçüncü bölümde, tarım tedarik zinciri risklerini en aza indirgemeye dayanan Avustralya ve Yeni Zelanda risk yönetim standardı açıklanmıştır. Çalışmanın dördüncü bölümünde ise araştırmanın bulguları, analizi ve değerlendirilmesi yer almaktadır. Çalışmanın yöntemsel çerçevesinde, tarımsal tedarik zincirini etkileyen risklerin gerçekliğini ortaya çıkarmak için bir vaka analizi araştırma metodolojisi benimsenmiştir. Uygulamadan elde edilen analiz sonuçları incelendiğinde; sekiz risk en önemli, yedi risk orta derece önemli ve altı risk ise diğer risklere göre önemi daha az olarak bulunmuştur. Analizden elde edilen bilgiler ışığında; ürün kalitesi, depolama koşulları, tedarik, iklim ile ilgili değişkenlik ve dış pazarda rekabet etmeyi sınırlandıran yada engellemeye neden olan ticari kısıtlamaların tarım tedarik zinciri yönetiminde kritik önem taşıdığı sonucuna varılmıştır. Son bölümde ise sonuç ve önerilere yer verilmiştir.

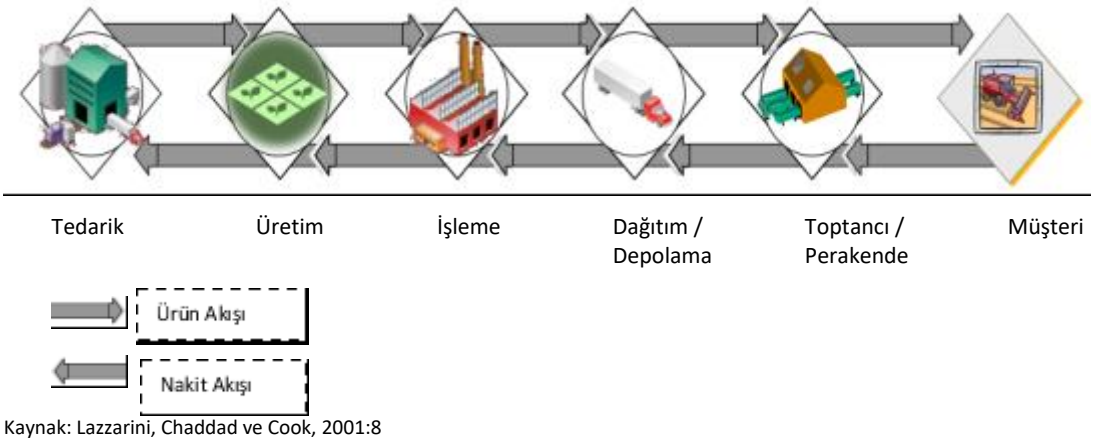
Çalışma kapsamında, tarım endüstrisinin karşı karşıya olduğu risk kaynakları araştırılmış olup her bir riskin tarım tedarik zinciri üzerindeki olası negatif etkileri ön plana çıkarılarak yönetim düzeni içerisinde üst yönetimin karar vermesinde destekleyici bilgiler sunulmuştur. Araştırmanın bulgularına dayanarak, rekabetin ve sürekli değişimin olduğu dinamik bir yapıda devamlılığın sağlanması ve çeşitli sebeplerden oluşabilecek, zararların/risklerin en aza indirilmesi gerekliliği ile "risk analizi" yöntemi tarım endüstrisindeki risklerin olasılığını ve ciddiyetini öngörmek için bir planlama aracı olarak kullanılabilir. Böylece, tarımsal faaliyetleri etkileyen risklerin muhtemel etkisine karşı gerekli önlemleri zamanında almaya yönelik imkân sağlanır.

2. TARIMSAL TEDARİK ZİNCİRİ VE YÖNETİMİ

Tarımsal tedarik zinciri, üretim için gereksinim duyulan hammadde ve diğer girdilerin tedarik edilmesi de dahil olmak üzere, üretimin farklı safhaları boyunca ara mal, yarı mamul ve nihai ürün elde edilmesinde gereken katma değerli faaliyetlerin tümünü kapsayarak, ürünün tüketiciye akışının sağlandığı süreci ifade etmektedir (Vorst, Silva ve Trienekens, 2007:7-13).

Tarımsal tedarik zincirlerinin temel iş süreçleri Şekil 1 üzerinde gösterilmiştir. En sade biçimiyle, girdi kaynağı tedariği (çoğaltım materyalleri, gübre, enerji), üretim, hasat sonrası işleme, depolama, pazarlama ve dağıtım yoluyla ürünün nihai müşteriye ulaşması için tüm işlevlerin birbirine sistematik olarak bağlanmasıdır.

Şekil 1: Tarımsal Tedarik Zinciri Süreçleri



Kaynak: Lazzarini, Chaddad ve Cook, 2001:8

Tarım tedarik zincirinde, ürünler, üretim, işleme, dağıtım ve perakende yoluyla üreticiden tüketiciye doğru akış sağlar; böylece, ürünler, tarladan tüketiciye doğru domino taşı gibi birbiri ardına hareket eder. Aynı zamanda, tüketicilerin satın aldığı ürünlere karşılık ödediği bedel müşteriden üreticiye doğru ters süreçte de domino etkisine sahiptir.

2.1. Kuramsal Çerçevede Tarımsal Tedarik Zinciri Yönetimi

Tarımsal tedarik zinciri yönetimi, tarım ticareti literatüründe nispeten yeni bir kavram olsa da ilk olarak 1980'li yıllarda lojistik literatüründe hammaddenin tedarik edilmesinin önemi vurgulanarak bir "Envanter Yönetimi" yaklaşımı olarak ortaya çıkmıştır. Endüstrideki hızlı değişimler ve iş çevrelerindeki rekabetçi ortamın bir sonucu olarak tedarik zinciri akımı, tarım sektörü de dahil olmak üzere endüstrideki diğer sanayi kollarına yayılmıştır (Vorst, Silva ve Trienekens, 2007:13).

1990'lı yıllara gelindiğinde akademik çevrede "tedarik zinciri yönetimi" kavramı geleneksel yaklaşım olan "malzeme ve bilgi akışını yönetmek" tanımından farklı olarak kuramsal bir bakış açısıyla değerlendirilmiştir. Özellikle de 1990'lı yıllardan sonra tedarik zinciri yönetimi kavramı gerek iş dünyasında gerekse akademik alanda üzerinde önemle durulan bir konu haline gelmiştir (Christopher, 1998:5).

Kuramsal çerçevede, tarımsal tedarik zinciri yönetimi, etkileşim halinde birlikte çalışan bir dizi bağımlı şirketin, zincir boyunca katma değer yaratarak her aşamada ürünlerin ve bilgilerin değiştirilmesi üzerine kurulu bir sistemin yönetimini ifade etmektedir (Handayati, Simatupang ve Perdana:2015:2)

Tarımsal tedarik zinciri yönetimi, kapsamlı ve uzun dönemli bir sistem içerisinde, ürünlerin tüketiciye sorunsuz bir şekilde ulaştırılması görevini üstlenir. Yıl boyunca devamlı üretilen tüketim malları ve sanayi mallarının aksine tarımsal ürünler, sadece yılda belirli bir süre üretilebildiği için sürekli üretim olanaksızdır. Bu özeliğinden dolayı, yeni ve ilave ürünler üretmek zaman almaktadır. Bu hususlar dikkate alınarak, tarım tedarik zincirlerinin küresel pazarda, bilhassa uzun mesafelerde, tüketici taleplerini karşılayabilme gereksinimlerine uygun şekilde yapılandırılmış olması gerekir (Norina, 2004:9).

Chopra ve Meindl (2009:3) çalışmasında, tedarik zinciri yönetimini; "hem üreticiden son tüketiciye hem de son tüketiciden üreticiye doğru, başka bir deyişle, ileriye ve geriye doğru akışın planlanması, uygulanması ve kontrol edilme süreçlerinin yönetilmesi" şeklinde tanımlamıştır.

Woods (2004:18-25) ise tedarik zinciri yönetimini şu şekilde ifade etmiştir; "Tedarik zinciri yönetimi, tarımsal ürünlerin verimli bir şekilde üretilmesi sürecinde, sorumlu işletmeler arasındaki ilişkilerin yönetimini ve miktar, kalite ve fiyat bakımından tüketicilerin gereksinimlerinin güvenilir bir şekilde karşılanması görevini üstlenir."

Tarım tedarik zincirinde, gıda güvenliğinin sağlanması, yüksek kaliteli ürünler ve hizmetler tüm tedarik zincirinin sorumluluğundadır. Tedarik zincirinin etkinliği, teslim edilen ürünün tüketici tarafından kabul edilmesi yoluyla ölçülebilir. Bu kabul; fiyat, kalite ve gıda güvenliği kombinasyonuna bağlıdır (Trienekens, Vorst, Verdouw,214:500)

Literatürde, tarımsal tedarik zinciri yönetiminin kritik ilkeleri, gıda güvenliği ve hijyen, kalite ile izlenebilirlik olmak üzere üç bütünleşik prensipten oluşmaktadır (Aung ve Chang, 2014:172-184).

Gıda Güvenliği ve Hijyen: Tarım tedarik zincirinde, gıda güvenliğinin ve hijyenik şartların sağlanması birincil ve çok geniş bir hedeftir. Ürünlerin depolanması, işlenmesi, ambalajlanması ve taşınması ile ilgili faaliyetler sırasında ürünlerin tüketicilere ve çevreye biyolojik, fiziksel ve kimyasal açıdan zarar vermemesi için gerekli önlemlerin alınmasıdır.

Kalite: Etkin bir tarımsal tedarik zinciri yönetiminin önemli bir unsuru olan "kalite" tarımsal gıda ürünlerinin dayanıksız olmaları nedeniyle ürünün değerini ve özelliklerini korumak için etkili bir lojistik faaliyet süreci ile ilişkilendirilmektedir.

İzlenebilirlik: Tarım endüstrisinde "izlenebilirlik" gıda güvenliğini garanti etmek için vazgeçilmez bir araç olarak kullanılır. İzlenebilirlik, tarım tedarik zincirinde yer alan üretim, işleme ve dağıtımın tüm aşamalarında izleme yeteneğini ifade eder. Yetiştiriciden nihai tüketiciye kadar olan ve sonraki üretim işlemleri ile birlikte gıda üretiminin tarihini açıklayan gerekli bilgileri içerir.

3. TARIM TEDARİK ZİNCİRİNDE RİSK YÖNETİM MODELİ VE SÜREÇLERİ

Son yıllarda, tarım tedarik zinciri ile ilgili araştırmalarda risk yönetimi, geniş ve hızla gelişen bir alan olmuştur. Bu bölümde, çalışma kapsamında önerilen Avustralya ve Yeni Zelanda risk yönetim modeline ilişkin literatüre dayalı bilgiler açıklanmıştır.

3.1. Risk Kavramı

Risk; istenmeyen bir olayın meydana gelme olasılığı olarak tanımlanır. Risk, gelecekle ilgili belirsizliği, hedeflerin gerçekleştirilmesinde ortaya çıkabilecek zarar ve kayıp ihtimalini ifade eder (Lay ve Strasser, 1987:181). SRA (The Society for Risk Analysis) 2018 yılında, riskle ilgili terminoloji sözlüğünde, riski; "bir olayın istenmeyen ve olumsuz sonuçlarının gerçekleşme potansiyeli" olarak tanımlamıştır. Bir başka risk tanımı ise Paulson (2005:2) tarafından yapılmış, riski "olumsuz ekonomik sonuçlar doğuran herhangi bir olay" olarak ifade etmiştir.

Tanım ve anlam olarak "risk ve belirsizlik" kavramları farklı olmakla beraber birbiri yerine kullanıldığına da rastlanmaktadır. Amerikalı Ekonomist Frank Knight (1921:215) "*Risk, Uncertainty and Profit*" adlı eserinde birbirinin yerine kullanılan "risk" ve "belirsizlik" kavramları arasında kesin bir ayrım yaparak tanımlamıştır. Knight'ın teorisine göre; risk, karşılaşılan rastlantının matematiksel olasılığının belirlenmesidir. Riskte ihtimallerinin kesinliği vardır fakat sonuçların kesinliği yoktur. Belirsizlik ise karşılaşılan rastlantının matematiksel olasılığının olmadığı durumu ifade eder ve dolayısıyla ihtimal ve sonuçların tahmin edilemeyeceğini savunmuştur (Knight, 1921:215).

Bir eylem veya kararın neticesinde birden fazla olası sonucunun olduğu kabul edilen riskin en belirgin özelliği; ölçülebilir ve yönetilebilir bir olgu olmasıdır.

Risk matematiksel terimlerle de ifade edilir ve başlıca iki faktöre dayanır; (1) riskli olayın meydana gelme ihtimali ile (2) olay meydana geldiğindeki şiddetin bileşkesinden oluşmaktadır (Cormican,2014:404).

Bu formül, kalitatif risk analizinin temel formülüdür;

$$\text{Risk} = f\,(\text{Olasılık} \times \text{Etki})$$

Risk; bir faaliyet sürecinde veya sonucunda olumsuz bir olayın meydana gelme olasılığı ile bu olayın sonuçlarının ortaya çıkardığı zararın etkisinin çarpımı ile formüle edilir (Kristina ve Wijaya, 2017).

3.2. Risk Yönetimi ve Süreçleri

Risk yönetimi, riskleri etkili bir şekilde öngörmek ve olumsuz etkilerini azaltmak ya da önlemek amacıyla sürekli ve ileriye yönelik yapılan sistematik bir metodu ifade etmektedir. Dickson, (1989:1) çalışmasında, risk yönetimini "bir işletmenin varlıklarını veya kazanma gücünü tehdit eden risklerin tanımlanması, analizi ve kontrolü" olarak tanımlamıştır.

Risk yönetimi, yasal gerekliliklere uygun bir şekilde kararlar vermeyi ve kurumsal hedeflerle tutarlı bir şekilde hareket etmeyi içerir. Bir başka deyişle; risk yönetimi karar vermede hesap verebilirliği gerektirir. Bununla birlikte; risk yönetiminde, faaliyetlerin doğru bir şekilde uygulanmasını sağlamak için etkin bir iletişim sisteminin kurulmasına gereksinim vardır (Chen, 2018:4136).

Risk yönetim süreci ise bir organizasyonun amaç ve hedeflerinin gerçekleştirilmesi üzerinde etkisi olan risklerin tanımlanması, analizi, değerlendirilmesi ve olumsuz etkilerini önlemek veya azaltmak için kontrol faaliyetlerinin tümünü içerir. Risk yönetimi sürecinde, riskler, organizasyonun içinden ve dışından kaynaklanan faktörlere göre iki kısımda değerlendirilir. Bu riskler;

- İç riskler,
- Dış riskler

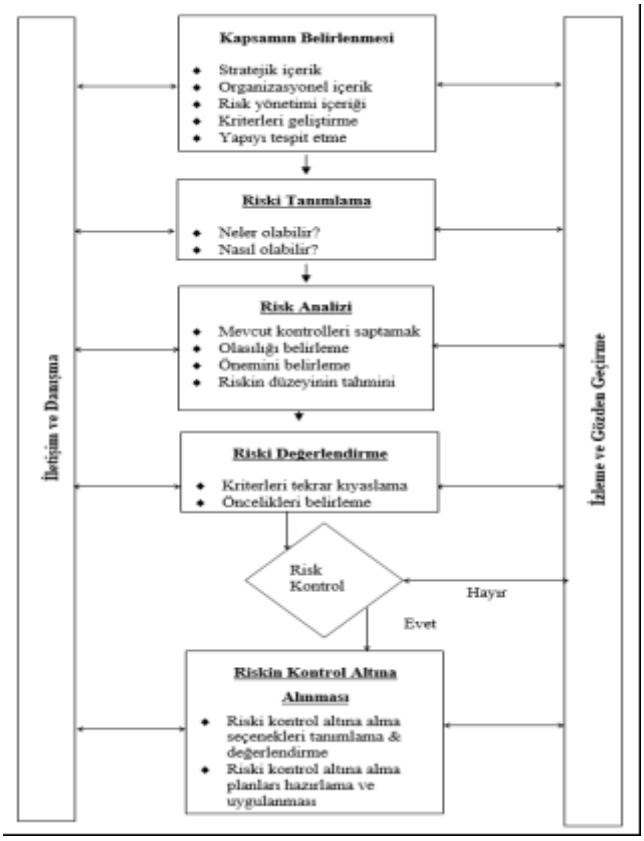
olarak gruplandırılır (A Risk Management Standard, 2002:4).

İç riskler; organizasyon içinde meydana gelen olaylardan kaynaklanan, yönetilebilir risklerdir. Dış riskler ise organizasyonun dışında gerçekleşen olaylardan kaynaklanan, iç riskler kadar yönetilebilir olmayan beklenmedik ve tahmin edilemeyen olayların neticesinde ortaya çıkan risklerdir.

Dünya çapında, ilk resmi standart olan Avustralya ve Yeni Zelanda risk yönetim standardı ilk defa 1995 yılında ortaya çıkmıştır. 2004 yılında yeniden yapılandırılan bu standart, Avustralya ve Yeni Zelanda Standardı AS / NZS4360:2004 olarak bilinmektedir. İlke, esas, yapı ve süreçleri bakımından çok güçlü bir uygulama modeline sahiptir. Bu çalışmada önerilen risk yönetim standardı, her çeşit organizasyonda, uygulamacılar tarafından anlaşılması ve benimsenmesi kolay, hızlı bir şekilde uygulanabilen esnek özelliğe sahip bir model olduğu için tercih edilmiştir. Bununla birlikte; bu risk yönetim modelinin, Sarbanes-Oxley yasası ile uyumu gerektiren organizasyonlarda daha iyi çalıştığı ileri sürülmektedir.

Avustralya ve Yeni Zelanda Standardı AS / NZS4360:2004'e göre risk yönetim süreci, birbirine bağlı beş adımdan oluşmaktadır. AS / NZS4360:2004 risk yönetim standartları uygulama süreci Şekil 2'de gösterildiği gibi; iletişim ve dayanışma, kapsam oluşturma, risk belirleme, risk ölçümü, risklerin kontrol edilmesi ve yönetimi ile izleme faaliyetlerinden oluşmaktadır.

Şekil 2: AS / NZS4360:2004 Risk Yönetimi Sürecinin Akış Diyagramı



Kaynak: Risk Management Guidelines Companion to AS/NZS 4360:2004:17

Kapsamın Belirlenmesi- Öncelikle, risk yönetim sürecinin ilk adımı olan kapsamın belirlenmesi, organizasyonun hedefleri, stratejileri ve faaliyet alanı ile uyumluluğu ifade eder. Bu kapsam, yasal ve düzenleyici çevre, politik hususlar, ekonomik koşullar gibi dış faktörleri ayrıca organizasyon yapısını, iş süreçlerini ve teknoloji gibi iç faktörleri de içermelidir.

Riski Tanımlama- Risk tanımlama süreci, organizasyon hedeflerinin başarılması üzerinde etkili olabilecek risklerin ve olayların kapsamlı bir listesinin oluşturulduğu bir süreçtir. Bu aşamada yapılan teşhis, organizasyonun kontrolü altında olan ve olmayan tüm riskleri içermelidir.

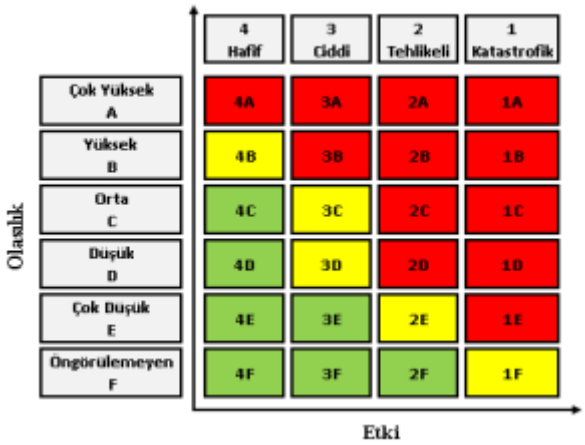
Risk Analizi- Risk analizi, bir firmanın maruz kalabileceği risklerin olasılığını ve sonuçlarını tahmin eden ve bu sonuçlara göre, nihai muamele için öncelik veren bir süreci ifade etmektedir (Dumbrava ve lacob,2013:85).

Risk iki temel özellik ile karakterize edilir:

- Olasılık (her sonucun ortaya çıkma ihtimali)
- Etki (olası olumsuz sonuçların şiddeti)

Risk analizinde kullanılan yöntemlerden biri olan risk matrisi, iki risk değişkenini, istenmeyen olayın ortaya çıkma ihtimali (olasılık) ve istenmeyen olayın ciddiyeti (etki) kullanılarak geliştirilir. Şekil 3 üzerinde gösterilen risk matrisinde, olasılık dikey olarak yer alırken, etki (potansiyel sonuçlar) yatay düzlemde gösterilmiştir. Risk matrisindeki her hücre, riske maruz kalma düzeyine göre numaralandırılmıştır.

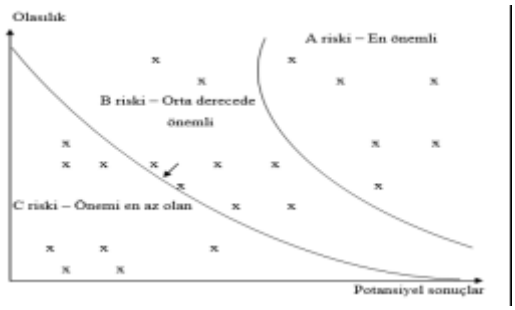
Şekil 3: Risk Matrisi



Kaynak: Waters, 2007:140'den geliştirilmiştir.

Risk Değerlendirme- Risk değerlendirme süreci, risk analizinin sonuçlarına dayalı olarak hangi risklerin kontrol altına alınması gerektiği ve önceliklerin belirlenmesi konusunda kararın verildiği aşamadır. Bu değerlendirmenin sonucunda, her bir riskin ciddiyeti saptanır. Riskler risk matrisinin sağ köşesine doğru ilerledikçe daha olası hale gelir ve gerçekleşmesi durumunda daha ciddi bir etki yaratır. Bu nedenle, risk daha fazla önem kazandığı için derhal ve etkili risk kontrol tedbirleri alınmalıdır (Hopkin, 2017:22).

Şekil 4: Risk Haritası



Kaynak: Waters, 2007:138

Şekil 4 üzerinde gösterilen "x" terimi riskleri ifade etmek için kullanılmıştır. Risk haritasında, en önemli olarak nitelendirilen A türü riskler, sonuçlarının etkisi yüksek olan kritik öneme sahip risklerdir. Faaliyetleri yıkıcı derecede ihlal eden ve zarar veren riskleri temsil eder. Bu tür risklere öncelik verilerek acil önlem stratejilerinin derhal alınmasına ihtiyaç vardır. Gerekli görüldüğü takdirde, yönetim, risk kabul edilebilir seviyeye düşürülünceye kadar faaliyetleri durdurmalıdır. Orta kategoride bulunan B riski ise ciddi riskleri temsil etmektedir. Bu risklerin ortaya çıkma olasılığını azaltmak ve etkisiyle başa çıkabilmek için ihtiyati tedbirler alınması gerekir. Diğer bir ifadeyle, ilave önlemin var olması gerektiği anlamına gelir. Önemi az olan, C seviyesinde bulunan riskler, genelde kabul edilebilir nitelikte risklerdir. Bir olayın olma ihtimalinin düşük olduğunu ve/veya etkisinin ihmal edilebilir düzeyde olumsuz olması beklenir. Ancak, risk düzeyini arttırabilecek değişiklikleri fark etmek için tehditler sürekli gözlemlenmelidir (Waters, 2007:139).

Riskin Kontrol Altına Alınması- Risklerin kontrol altına alınmasının amacı, riski kabul edilebilir bir seviyeye indirgemektir. Risk kontrolü, alınan önlem planlarıdır. Yönetici, riskin kontrol altına alınması sürecinde şu sorular üzerinde yoğunlaşmalıdır (Aksu vd., 2016:141).

- Risk kabul edilebilir bir seviyenin üstünde mi?
- Riskleri ortadan kaldırmak veya etkisini azaltmak için ne yapılabilir?
- Avantajlar, riskler ve kaynaklar arasında uygun denge nedir?
- Tanımlanan risklerin kontrol edilmesi sonucunda ortaya çıkan yeni riskler var mı?

Riski Azaltma / Önleme- Bu aşamada, bir risk kabul edilebilir seviyeyi aştığında, riskin azaltılması veya önlenmesi süreçlerine odaklanılır. Risk azaltma/önleme süreci, zararın şiddetini ve olasılığını azaltmak için alınan önlem planlarını içerir. Risk azaltma

önlemlerinin uygulanması, sistemde yeni riskler meydana getirebileceği gibi mevcut diğer risklerin önemini de arttırabilir. Dolayısıyla, risk azaltma sürecini uyguladıktan sonra olası herhangi bir değişikliği belirlemek ve değerlendirmek için risk değerlendirmesini tekrar gözden geçirmek gereklidir (Sikdar, 2017:138).

Riskin Kabulü- Risk kabulü, belirli bir riskin olasılığını ve sonuçlarının etkisini kabul etmek için bilinçli bir karar verme sürecidir. Risk kabul kriterleri, organizasyona dahil olan tarafların politikaları, hedefleri ve çıkarlarına bağlıdır. Bu yaklaşım, riski azaltan önlemlerin uygulama maliyetinin, faydaları aştığı durumlarda veya iş geliştirme çalışmaları için risk seviyesinin gerekli olduğu durumlarda geçerli olabilmektedir (Katsikas,2013:510).

4. VERİ VE METODOLOJİ

Çalışmada nitel bir araştırma yöntemi olan vaka analizi yöntemi kullanılmıştır. Vaka analizi yöntemi kullanılmasının nedeni, bir organizasyon içinde Avustralya ve Yeni Zelanda Standardı AS / NZS4360:2004 risk yönetim modelinin uygulanabilirliğini araştırmaktır. Bir diğer neden ise tarımsal tedarik zinciri yönetiminin doğası, kapsamı ilke ve kavramları ile birlikte bir organizasyon içinde riskleri görünür ve ölçülebilir hale getirmek yani sübjektifliğini azaltma gereğidir. Bu süreçte, öncelikle firmanın tedarik zinciri faaliyetlerini birbirinden ayrı olarak incelemek için mevcut durumun değer akış haritası çizilmiştir. Değer akış haritası, üretimden başlayan ve nihai müşteriye kadar katma değeri olan ve olmayan tüm faaliyetleri içine alan geniş bir süreci yansıtmıştır.

İlk aşamada, araştırmanın kavramsal çerçevesini oluşturmak amacıyla olası tedarik zinciri riskleri incelenerek, firmanın tedarik zinciri faaliyetleri sırasında, zincirin kırılmasına neden olabilecek riskler tespit edilmiştir. Firma yetkilileriyle yapılan çalışma sonucunda tespit edilen bu riskler, faaliyet alanlarına göre sınıflandırılarak; çevresel risk (ÇEV_R), tedarik riski (TED_ R), operasyonel risk (OPR_ R), politik risk (POL_R), örgütsel risk (ÖRG_R) ve finansal risk (FİN_R) olarak 6 başlık altında ele alınmıştır. Risklerin sıklık derecelerinin (olasılık) ve etki düzeylerinin belirlenmesi aşamalarında, şirketin geçmiş yıllara ait risklerin kaydedildiği istatistiksel yazılım programından (ERP) faydalanılmıştır. Firmanın tedarik zincirinden elde edilen veriler doğrultusunda, risklerin gerçekleşme olasılıkları ve etki seviyelerinin sayısallaştırılması için birer ölçek geliştirilmiştir (Tablo1 ve Tablo2).

4.1. Firma Profili

Merkezi Avrupa'da olan şirketin, dünya çapında 95'i aşkın ülkede yaklaşık 30.000 çalışanı bulunmaktadır. Şirket, sürekli gelişerek tarımda değer yaratmayı, dünya çapında üreticilere ve gıda zincirine zamanında ve kaliteli tarım ürünü tedarik ederken insana ve çevreye duyarlılığı amaç edinmiştir. Aynı zamanda, piyasa talebinin önemli bir kısmını karşılarken rekabetçi bir kâr elde etmeye çalışmaktadır.

Türkiye, şirketin dünya genelinde, tarım üretimini en fazla gerçekleştirdiği ülke olarak ön plana çıkmaktadır. Üretim yapılan bölgeler, en fazla üretim alanına göre sıralandığında, ilk sırada İç Anadolu Bölgesi yer alırken ikinci sırayı Ege Bölgesi takip etmektedir. Şirketin, 2019 üretim yılı için ekim alanları bölge bazında şu şekilde gerçekleşmiştir; İç Anadolu Bölgesinde, 3 bin 900 hektar (ha), Ege Bölgesinde; 2 bin 450 ha olmak üzere toplam 6 bin 350 (ha)'lık ekim alanında mısır ve ayçiçeği bitkileri yetiştirilmiştir.

Türkiye'de üretilen ürünlerin %75'i ihraç amaçlı olarak küresel pazarın talebini karşılamaya yönelik olup %25'lik kısmı ise yurt içi pazar için elde tutulmaktadır. Firmanın ihracat yaptığı ülkelerin başında Rusya, Ukrayna, Kazakistan, İtalya, İran, Irak ve Fas gelmektedir.

4.2. Veri

Araştırma kapsamında, 3'ü çevresel risk, 4'ü tedarik riski, 5'i operasyonel risk, 3'ü politik risk, 3'ü örgütsel risk ve 3'ü finansal risk olmak üzere toplam 21 risk tespit edilmiştir.

Çevresel riskler; iklim ve salgın hastalık gibi dış çevre kaynaklı tehditlere karşı geliştirilmiştir. Bu başlık altında 3 risk incelenmiştir.

ÇEV_R1: Mısır bitkisi üretiminin, çiçeklenme periyodunda aşırı sıcakların tozlaşma ve dane tutma oranını olumsuz etkilemesi.

ÇEV_R2: Yoğun yağışlar nedeniyle ilkbahar ekim periyodunda ekimlerin gecikmesi ve buna bağlı olarak sonbahar hasat döneminde hasat faaliyetlerinin gecikmesi.

ÇEV_R3: H1N1, Covid-19 gibi salgın hastalıkların tedarik zincirinin işleyişini ve faaliyetleri olumsuz etkilemesi.

Tedarik riskleri; mevcut tedarikçilerin şirkete olan taahhütlerini zamanında ve istenilen şekilde yerine getirememesi üzerine geliştirilmiştir. Bu başlık altında 4 risk incelenmiştir.

TED_ R 1: Üretim girdisi olarak kullanılan çoğaltım materyallerinin (orjinal tohum) eksik ya da geç tedarik edilmesi.

TED_ R 2: Nakliye hizmet kalitesinin düşük olması nedeniyle ürünün müşteriye zamanında teslim edilememesi ya da eksik teslim edilmesi.

TED_ R3: Satılmayan ürünlerin kalite değerlerinin düşmesi ve paketlerin fiziki görünümlerinde deformasyonlar meydana gelmesi.

TED_ R4: Dış kaynak kullanımında teknik risk; ürünlerin kalitesi, spesifikasyonları ve işlevselliğinin istenilen standardı karşılamaması. Performans riski; tedarikçinin genel olarak satın alma döngüsünü yürütme ve teslim etme performansının düşüklüğü. Sözleşme riski; sözleşmede tanımlanan performans göstergelerinin tedarikçinin gerçekleştirmesi gereken hedefleri yeterince kapmaması.

Operasyon riskleri; mal ve hizmet üretimi ile ilgili süreçlerde, dahili kontrol mekanizmasının eksikliği, personel/çalışan hataları ve iç sistemin zayıflığı ile ilişkilendirilmiştir. Bu başlık altında 4 risk incelenmiştir.

OPR_ R1: Ürün kalitesinde uygunsuzluk meydana gelmesi. Önceki proses sürecinden kalan, teknik zorluklar nedeniyle yeterli temizlenememesinden kaynaklanan kimyasal ilaç kalıntılarının ürüne bulaşması.

OPR_ R2: Elektrik ve diğer enerji kaynaklarının kesintiye uğraması nedeniyle ortalama %35 nem ile hasat edilen mısır bitkisinin kurutma işleminin gecikmesi.

OPR_ R3: Depolama ortamında ısının ve nemin yüksek olması nedeniyle tahıl zararlılarının popülasyonunu arttırması.

OPR_ R4: Hareketli parçaların bulunduğu makinelerin bakımı ve temizliği sırasında iş kazası meydana gelmesi.

OPR_ R5: Üretim alanlarında hayvan (arı, yılan, domuz, kurt) saldırılarına bağlı yaralanmalar olması.

Politik riskler; ticari faaliyetleri olumsuz etkileme potansiyeli olan, ani ve hızlı bir şekilde meydana gelen, önceden tahmin edilmesi zor herhangi bir siyasi olay ya da karara karşı geliştirilmiştir. Bu başlık altında 3 risk incelenmiştir.

POL_R1: Ambargo- İhracatta önemli bir pazar payına sahip ülkeler ile ticaret engeli olması.

POL_R2: Hükümet tarafından ithalatı kısıtlayan, beklenmeyen düzenlemeler gerçekleşmesi.

POL_R3: Tarımsal Destekleme Politikaları – Devlet tarafından alternatif ürün destekleme politikaları uygulanması.

Örgütsel riskler; organizasyonun uzun vadede stratejik amaç ve hedeflerine bağlı olarak geliştirilen, insan kaynakları ile ilişkili risklerdir. Bu başlık altında 3 risk incelenmiştir.

ÖRG_R1: Tedarik zinciri organizasyonunda kaza, hastalık, emeklilik, kariyer fırsatı gibi nedenlerle kilit personel kaybı yaşanması.

ÖRG_R2: Yoğun sezonda, nitelikli teknik uzman personel eksikliği meydana gelmesi.

ÖRG_R3: Örgüt kültürü ile organizasyon yapısında uyumsuzluk olması.

Finansal riskler; şirketin finansal pozisyonundaki değişiklikler ile tercihlerinin sonucundaki başarısızlıklar ve mevcut yasal düzenlemelere uygun davranılmaması neticesinde ortaya çıkabilecek tehditlere karşı geliştirilmiştir.

FİN_R1: Finansal Raporlama Standartlarında önemli değişiklikler sonucu, FVÖK (faiz ve vergi öncesi kâr) ve diğer kilit rakamlar üzerinde ciddi etkilerin meydana gelmesi.

FİN_R2: Teminatsız borçları olan kilit müşterilerin temerrüde düşmesi neticesinde ödemesi gereken borcunu ödeyememesi.

FİN_R3: Doğrudan veya üçüncü kişiler vasıtasıyla herhangi bir kamu görevlisine, tedarikçiye veya müşteriye rüşvet ya da değerli bir hediye vb. yasadışı işlemler ile ödeme yapılması neticesinde cezalar ve itibar kaybı yaşanması.

4.3. Metodoloji

Tablo 1'de yer alan olasılık göstergeleri,tedarik zincirinin işleyişini ve faaliyetleri önemli ölçüde etkileyebilecek her olası riskin bir zaman dilimi içerisinde gerçekleşme durumunu ifade etmek için 6 kategoride oluşturulmuştur. Sıklık derecesi tanımlamalarında, "A" gerçekleşme olasılığı çok yüksek riskleri, "B" üç yılda bir meydana gelen, gerçekleşme olasılığı yüksek riskleri, "C" dört, beş yılda bir meydana gelen, gerçekleşme olasılığı orta seviyede olan riskleri, "D" altı ile dokuz yıl arasında meydana gelen, gerçekleşme olasılığı düşük riskleri, "E" sektörde on yılda bir karşılaşılan, gerçekleşme olasılığı çok düşük riskleri, "F" ise ihtimal verilmeyen yani öngörülemeyen riskleri ifade etmek için kullanılmıştır.Riskler gerçekleşme olasılığına ilşkin olarak firmanın tedarik zinciri faaliyetlerinin niteliğine, risk türlerine ve organizasyonun hedeflerine bağlı olarak belirlenmiştir. Bu aşamada, kayıtlara dayalı tahminler, akış çizelgeleri, beyin fırtınası, sistem analizi ve senoryo gibi teknikler kullanılarak geliştirilmiştir.

Tablo 1: Olasılık Göstergeleri

Sıklık Derecesi	Tanım	Gösterge Sıklığı	Açıklama
A	Çok Yüksek	≤ 1-2 yıl	Tesis veya organizasyon genelinde her yıl ile iki yılda bir meydana gelen olay
B	Yüksek	3 yıl	Organizasyon genelinde her üç yılda bir meydana gelen bir olay
C	Orta	4-5 yıl	Muhtemelen organizasyon genelinde dört ile beş yılda bir meydana gelen bir olay
D	Düşük	6-9 yıl	Organizayonda altı ile dokuz yıl arasında meydana gelen olay
E	Çok Düşük	10 yıl	Sektörde sıklıkla karşılaşılan bir olay
F	Öngörülemeyen	>10-100 yıl	Beklenmedik bir olayın gerçekleşmesi

Etki değerlendirme ölçeği ise organizasyonun ve diğer paydaşların endişe duyduğu temel hususlara ve hedeflere bağlı olarak belirlenmiştir. Örgüt ya da faaliyet bir bütün olarak değerlendirilmeye teşebbüs edilirse, risk tanımla verimsiz olacaktır. Bu nedenle, faaliyetleri bölümlere ve kilit unsurlara ayırmak her zaman daha etkilidir. Tablo 2'de gösterildiği gibi tarımsal tedarik zincirinde, risk değerlendirmesini yapılandırmak için "Etki Değerlendirme Ölçeği" altı unsur olarak tanımlanmıştır. Tablo 2, sağlık ve güvenlik, maddi duran varlıklar, ürün güvenliği-çevre ve mali başarı ile ilgili kriterlere sahip bir kuruluş tarafından kullanılabilecek niteliksel sonuç tablosunu göstermektedir. Ayrıca, risklerin finansal etkilerini de dikkate alır. Etki değerlendirme ölçeğinde yer alan finansal gösterge aralıkları şirketin brüt kârı baz alınarak belirlenmiştir. Belirlenen aralıklar, şirketin bir yılda elde ettiği satış gelirini korumak üzere tasarlanmıştır. Hafif etkiye sahip risklerin finansal değeri, 1 milyon dolara eşit ve daha az olan riskleri, ciddi etkiye sahip risklerin finansal değeri, 1 milyon dolardan daha büyük ve 3 milyon dolara eşit riskleri, tehlikeli etkiye sahip risklerin finansal değeri, 3 milyon dolardan daha büyük ve 5 milyon dolara eşit riskleri, katastrofik etkiye sahip risklerin finansal değeri ise 5 milyon dolardan daha büyük riskleri ifade etmek için tanımlanmıştır.

Tablo 2: Etki Değerlendirme Ölçeği

	Hafif	Ciddi	Tehlikeli	Katastrofik
Finansal	≤ $ 1 milyon	> $ 1 milyon ≤ $ 3 milyon	> $ 3 milyon ≤ $ 5 milyon	> $ 5 milyon
Sağlık ve Güvenlik	*İlk yardım tipi yaralanmalar *Geri döndürülebilir meslek hastalıkları	*Birkaç kişiyi etkileyen kısa süreli iş günü kayıplı kazalar	*Ciddi yaralanma, sürekli iş görmezlik *Geri dönüşü mümkün olmayan meslek hastalıkları	*Bir veya daha fazla ölümlü kaza ya da toplu kalıcı sakatlık
Maddi Duran Varlıklar	*1-2 aylık kesinti	*Yaklaşık 3 aylık kesinti ile kısmi tahribat	*Yaklaşık 6 aylık kesinti ile büyük zarar	*12 aylık kesinti süresi ile yıkım
Tedarik	*Satış kaybı ile neticelenmeyen aksama	*Zincirde satış kaybına neden olabilecek büyüklükte bozulma	*Kesin satış kaybı ile sonuçlanan aksama	*Tüm sezon satışının kaybedilmesi ile sonuçlanan uzun dönem pazar kaybı
Ürün Güvenliği ve Çevre	*Çevreye salınım etkisi işletme sınırları içinde	*Çevrede minumum düzeyde geçici hasar meydana gelmesi	*Çevreye belirgin ancak kısa dönemli etki, potansiyel hukuki yaptırımı olan olay	*Çevrede kalıcı, geri dönüşümü olmayan hasar ve sorumluluk potansiyeline sahip büyük etki
İtibar	*Yerel olarak bildirilen daha fazla ilgi çekmesi mümkün olmayan bir olay	*Yerel toplulukta rapor edilen ancak daha geniş bir kampanyanın parçası olarak kuruluşa karşı kullanılabilecek bir olay	*Ulusal medyada yer alan ve iş dünyası tarafından rapor edilmesi muhtemel bir olay	*Uluslararası medyanın ilgisini çekebilecek ve muhtemelen hisse fiyatını olumsuz yönde etkieyecek bir olay

4.4. Araştırmanın Bulguları, Analizi ve Değerlendirmesi

Şirketin tarımsal tedarik zincirinin kesintisiz bir biçimde işlemesini engelleyen risklerin gerçekliğini ortaya çıkarmak amacıyla risk matrisi (L tipi – 6x4) kullanılmıştır. Şekil 5 üzerinde gösterilen L tipi – 6x4 risk matrisinde olasılık, A – F olarak 6 değere sahiptir. Etki ise hafif, ciddi, tehlikeli ve katastrofik olarak 4 kısımda değerlendirilmiştir. Analiz değeri olan risk seviyesi, bu iki boyutlu matriste, olasılık derecesi ve etki düzeyi değerlerinin çarpımından ƒ = (Olasılık x Etki) elde edilmiştir.

Şekil 5 üzerinde gösterilen, risk matrisine yerleştirilen riskler, önem derecelerine göre; "en önemli", "orta derecede önemli" ve "önemi en az olan" riskler olmak üzere üç kategoride sınıflandırılmıştır. Burada, "en önemli" olarak nitelendirilen, kırmızı alanda yer alan risklerdir (OPR_R2, TED_R 1, TED_R 3, ÇEV_ R1, OPR_R1, ÇEV_R2, OPR_R3 ve POL_R1). Bu risklerin en belirgin özelliği; gerçekleşme olasılıklarının ve etki düzeylerinin yüksek olmasıdır. Diğer kategoride olan önemi "orta derece olan riskler" ise sarı alanda yer almaktadır (ÖRG_R3, POL_R2, POL_R3, ÖRG_R2, FİN_R1, ÇEV_R3, FİN_R3). Bu kategoride yer alan risklerin, kabul edilebilir olması için iyi bir kontrole bağlı olması gerekir. Bu risklerin, ortaya çıkma olasılığını azaltmak ve etkisinin düzeyini düşürmek için ilave tedbirler alınmalıdır. Aynı zamanda, bu riskler belirlendiğinde, tedbir almadan önce yönetim tarafından fayda/maliyet analizi yapılmalıdır. "Önemi en az olan riskler" ise yeşil alanda yer alan kabul edilebilir risklerdir (OPR_R4, FİN_R2, TED_R2, TED_R4, OPR_R5 ve ÖRG_R1). Bu risklerin gerçekleşme ihtimalinin düşük olmasının yanında, etkisinin de ihmal edilebilir düzeyde olduğu söylenebilir. Kırmızı ve sarı renkte yer alan risklere göre, olasılığının ve etkisinin daha düşük olduğu açıkça görülmektedir.

Şekil 5: Analiz Edilen Risklerin Risk Matrisindeki Konumu

Olasılık \ Etki		4 Hafif ≤$1 milyon	3 Ciddi >$1milyon ≤$3 milyon	2 Tehlikeli >$3 milyon ≤$5 milyon	1 Katastrofik >$5 milyon
A	Çok Yüksek	OPR_R2	TED_R 1 TED_R 3		
B	Yüksek	ÖRG_R3	ÇEV_ R1	OPR_R1	
C	Orta	OPR_R4 FİN_R2	POL_R2 POL_R3	ÇEV_R2 OPR_R3	
D	Düşük	TED_R2	ÖRG_R2 FİN_R1	POL_R1	
E	Çok Düşük	TED_R4	OPR_R5 ÖRG_R1	ÇEV_R3 FİN_R3	
F	İhtimal Dışı Olanaksız				

En önemli riskler incelediğinde; tarımsal tedarik zincirinin işleyişini ve hedefleri olumsuz yönde etkileme potansiyeline sahip olduğu gözlenmiştir. Bu gruba giren risklerden çevresel riskler, ilkbahar ekim periyodunda yoğun yağışlar nedeniyle ekimlerin gecikmesi ve çiçeklenme döneminde mısır bitkisinin aşırı sıcaklardan etkilenmesidir. Tarım sektörü, yapısı itibariyle, aşırı yağış, sel, aşırı sıcak, kuraklık gibi iklimsel tehlikeye eğilimlidir. Tedarik risklerinde ise tarımsal tedarik zincirinin başlangıç noktasında yer alan üretim girdisi olarak kullanılan çoğaltım materyallerinin eksik ya da geç tedarik edilmesidir. Bu risk gerçekleştiğinde, ekim periyodunun kaçırılması, pazara eksik ya da geç tohum temini dolayısıyla satış kaybı ile sonuçlanacaktır. Bu kategoride yer alan diğer riskler incelendiğinde; satılmayan ürünlerin kalite değerlerinin, niteliklerinin düşmesi ve paketlerin fiziki görünümlerinde deformasyonlar meydana gelmesidir. Bu risk meydana geldiğinde, hasar görmüş ürünlerin yeniden işlemden geçmesi, kalite testlerinin ve sertifikalarının yenilenmesi, kalite kriterlerine uygun olmayan ürünlerin imha edilmesi gerekecektir. Buna bağlı olarak, ekonomik kayıp söz konusu olacaktır. Operasyon riskleri incelendiğinde, en önemli riskin ürünün kalitesinde uygunsuzluk olduğu tespit edilmiştir. Firma, üretilen tarım ürünlerini, hastalık ve zararlılara karşı korumak için çeşitli bitki koruma ilaçları (insektisit, fungusit, herbisit) kullanmaktadır. Birçok böcek türüne karşı bir çeşit pestisit olan "Tiametoksam" etken maddeli ilaç, neonikotinoidler sınıfında bir insektisittir. Bu etken madde kullanılarak üretilen ürünlerin, arılara karşı zehirli olduğu ve bunun neticesinde koloni halinde ölümlere sebebiyet verdiği gerekçesi ile Avrupa ülkelerine girişi yasaklanmıştır. Önceki proses sürecinde, paketleme hattında, teknik zorluklar nedeni ile yeterli şekilde temizlenememesinden kaynaklanan Tiametoksam etken maddeli ilaç kalıntılarının, Avrupa Birliği ülkelerinin siparişi için üretilen ürünler ile temasının oluşması durumunda, ürünün pazardan geri çekilmesi, itibar ve pazar kaybı ile sonuçlanacağı açıktır. Diğer önemli operasyon

riski ise ürünlerin depolama koşulları ile ilgilidir. Depolama koşulları, tarım ürünlerinin canlılığını ve gücünü etkileyen en önemli kalite kriterlerinden biridir. Depolama ortamında, ısının ve nemin yüksek olması, tahıl zararlılarının (kemirgen, böcek) popülasyonunu arttırarak, ürünün kalitesinde ve miktarında kayıplar meydana getirecektir. Bu kategoride yer alan diğer önemli risk ise elektrik ve diğer enerji kaynaklarının kesintiye uğramasıdır. Ortalama %35 nem ile hasat edilen mısır bitkisinin kurutma işleminin gecikmesi neticesinde, üründe kızışma meydana gelerek, canlılığını kaybetmesine neden olacaktır. En önemli riskler içinde yer alan Politik risklerden en kritik olanı ise ihracatta önemli pazar payına sahip ülkeler ile ticaret engelidir. Bu riskin gerçekleşmesi durumunda, satış hedefleri büyük ölçüde etkilenerek pazar kaybedilmesi ile sonuçlanacaktır.

Orta derecede önemli olarak nitelenen risklerin kontrol altında tutulması için ilave önlemler alınması kritik bir gereklilik olarak görülmektedir. Bu kategoride yer alan çevresel risklerin içinde tanımlanan salgın hastalıkların (H1N1, Covid-19), tedarik zincirinin işleyişini ve faaliyetleri olumsuz etkileme potansiyeli vardır. Bu riskin gerçekleşmesi durumunda, muhtemel sonuçları şu şekilde özetlenebilir; sınırların kapatılması, seyahatlerin kısıtlanması, coğrafi bölgelerin karantina altına alınması, belirli bir süre için üretimin durdurulması, şirketlerde personel alımında azalma olması ve mevcut personelin bu dönemde çalışmaktan çekinmesi en belirgin etkileridir. Örgütsel riskler incelendiğinde; nitelikli, eğitimli, teknik iş gücü eksikliği riski, iç ve dış başarısızlık maliyetlerinin artmasına neden olacaktır. Örgütsel risklerden diğer bir risk, örgüt kültürü ile organizasyon yapının uyumsuz olmasıdır. Örgüt kültürü, organizasyonun uzun vadeli hedefleri, stratejileri ve politikalarının gerçekleştirilmesinde önemli bir rol oynamaktadır. Organizasyon farklı kültüre sahip çalışanlardan oluşmaktadır. Örgütün sahip olduğu kültür ile benzer özellik taşıyan çalışanların bir arada olması son derece önemli ve gereklidir. Dolayısıyla, bu risk, tedarik zincirinin tam verimlilikle çalışmasına engel niteliktedir. Bu grupta yer alan politik riskler incelendiğinde; tarımsal arzın belirlenmesi üzerinde etkin bir role sahip olan devlet, dış ticarete yönelik müdahale olarak ithalatı kısıtlama yetkisine sahiptir. Bunun dışında, devlet fiyata yönelik müdahale yaparak, şirketin ürettiği tarım ürünü dışında alternatif bir ürünü destekleme politikası uygulayabilir. Alternatif ürün fiyatlarının yükselmesi neticesinde şirketin üretim maliyetleri artacaktır. Finansal riskler incelendiğinde; Finansal Raporlama Standartlarında, önemli değişiklikler sonucu FVÖK ve diğer kilit rakamlar üzerinde ciddi etkilerin meydana gelmesidir. Finansal Raporlama Standartlarında ve yasal mevzuattaki değişimler, mali durumu olumsuz yönde etkileyebilir. 01.01.2019 tarihinde yürürlüğe giren IFRS 16 Kiralamalar Standardı, faaliyet kiralaması yapan şirketin finansal tabloları üzerinde önemli bir etkisi olduğunu göstermektedir. IFRS 16 yeni standarda göre rapor edildiğinde, şirketin bilançosunda, varlık ve yükümlülüklerde artış, özkaynaklar da ise düşme olduğu tespit edilmiştir. Finansal riskler içinde yer alan diğer bir risk ise kamu görevlileri dahil, diğer üçüncü taraflar (tedarikçi, müşteri) ile olan işlerin usulsüz bir şekilde yerine getirilmesidir. Doğrudan ya da dolaylı olarak, yasa dışı bir ödeme, rüşvet ya da değerli bir hediye şirketin itibarını kötü yönde etkileyecektir. Bu riskin gerçekleşmesi durumunda, şirket hakkında yasal işlem yapılacaktır. Bunun yanı sıra, mali kayıplar ve müşteri sayısının düşmesi ile sonuçlanacaktır.

Önemi en az olarak nitelendirilen, kabul edilebilir özellikteki risklerin, risk düzeyini arttırabilecek tehditler sürekli gözlenmelidir. Bu kategoride yer alan örgütsel risklerden; tedarik zinciri organizasyonunda, kaza, hastalık, emeklilik veya kariyer fırsatı gibi nedenlerden dolayı kilit personel kaybı yaşanması, belirsizlik ve stres artışına sebep olacaktır. Bu durumda verimliliğin düşmesi ile sonuçlanacaktır. Bu kategoriye giren tedarik risklerinden, nakliye hizmet kalitesinin düşük olması nedeniyle ürünün müşteriye zamanında teslim edilememesi veya eksik teslim edilmesi riskinin en belirgin etkisi müşteri memnuniyetsizliği ile neticelenecek olmasıdır. Sevkiyat esnasında yüksek sıcaklıklar veya kaza gibi nedenlerle ürünlerin zarar/hasar görmesi riski satış kaybı ile sonuçlanarak, maliyetlerin artmasına neden olacaktır. Tedarik riskleri içinde değerlendirilen diğer bir risk ise dış kaynak kullanımında karşılaşılan riskler ile ilgilidir. Şirket, hedeflenen üretimi, karşılayabilecek yetkinlikte (kapasite) olmadığı zamanlarda dış kaynak kullanımını tercih etmektedir. Dış kaynak kullanımı, tedarik zinciri yönetiminin en önemli tamamlayıcı öğelerinden birini temsil eder. Dış kaynak kullanımına bağlı gerçekleştirilen üretimin, tedarik zincirini teslimat güvenirliliği, teslimat süresi ve ürün kalitesi yönünden olumsuz etkileme potansiyeli vardır. Buna ek olarak, bu üçüncü parti sağlayıcılarının performans sorunları, öngörülemeyen operasyonel sorunlar ve ilave maliyetler ile sonuçlanabilir. Dış kaynak kullanımında, bir diğer önemli konu, gizli bilgiler ve ticari sırların yanlışlıkla veya kasıtlı ifşa edilmesidir. Dolayısıyla dış kaynak kullanımında olası riskler yönetilmediği takdirde, şirketin itibarına zarar verebilecek nitelikte etkileri meydana getirir. Finansal riskler incelendiğinde, teminatsız borçları olan kilit müşterilerin temerrüde düşmesi neticesinde ödemesi gereken borcunu ödeyememesi riski her zaman bulunmaktadır. Bu riskin en olumsuz etkisi, firmanın nakit akışını direkt olarak etkileyerek, net kârı azaltmasıdır. Firmanın müşteri segmentasyonu incelendiğinde, teminatsız borçları olan müşterilerin borç bakiyeleri tehdit oluşturmayacak düzeyde bulunmuştur. Bu kategori altında değerlendirilen operasyon risklerinden, haraketli parçaların bulunduğu makinelerin bakımı ve temizliği sırasında iş kazası meydana gelmesi riskinin, risk düzeyi kabul edilebilir seviyede bulunmuştur. Bunun nedeni, firma, bakım ve onarım çalışmalarını gerçekleştirme esnasında, etiketleme/kilitleme yöntemini kullanarak enerjinin tamamen kesilmesini sağlamaktadır. Ayrıca makinelerin hareketli parçaları ile fiziksel temas önlenmiştir. Operasyon riskleri içinde değerlendirilen, üretim alanlarında hayvan (arı, yılan, domuz, kurt) saldırılarına bağlı yaralanma riski de sağlık ve güvenlik risklerindedir. Hayvan saldırılarına maruz kalma riski ciddi yaralanmalarla ve ölümle sonuçlanabilir. Bu riskin olasılığını ve etkisini azaltmak için halihazırda uygulanmakta olan güvenlik önlemleri şu şekildedir; yılan sokması riskinin etkisini azaltmak için diz boyu botlar giyilmesi, arı sokmasını engellemek için kovucu sprey veya losyon kullanılması, yalnız çalışmaktan kaçınma ve kişisel koruyucu ekipmanların kullanımı konusunda ekip liderinin vasıtasıyla disiplinin oluşturulması ve etkili denetimin sağlanmasıdır.

5. SONUÇ

Tarımsal işletmeler, faaliyetlerini riske çok açık bir ortamda sürdürmektedir. Bu nedenle, tedarik zinciri yöneticilerinin başlıca endişelerinden biri, zincirin herhangi bir halkasında aksaklık meydana gelmesidir. Çünkü üretim veya teslimat süreçlerinde gerçekleşen bir kırılma, satış kayıpları, gelirlerin azalması, kâr kaybı ve belki de en önemlisi firmanın itibarının zedelenmesine neden olacaktır.

Uygulamadan elde edilen analiz sonuçları incelendiğinde, sekiz risk en önemli, yedi risk orta derece önemli ve altı risk ise diğer risklere göre önemi daha az olarak bulunmuştur. Öncelikle firmanın acil önlem alması gereken en kritik riskin ürün kalitesinde uygunsuzluk (OPR_ R1) riski olduğu görülmektedir. Yapılan değerlendirmelerde, söz konusu riskin ortaya çıkma olasılığının üç yılda bir olduğu ve gerçekleştiğinde firmaya olan etkisinin cezai yaptırım dahil, pazar ve itibar kaybı ile sonuçlanacağı belirtilmiştir. Operasyon süreçlerinde, depolama koşulları (OPR_ R3) riski, en önemli riskler içinde değerlendirilmektedir. Bu riskin ortaya çıkma olasılığının dört yılda bir ve etkisinin sonucu ürün kalitesinde ve miktarında kayıplar yaşanmasıdır. Çevresel risklerden, üretim faaliyetini etkileyen en kritik risk ise iklim ile ilgilidir. Üretim yapılan bölgelerde, aşırı yağışlar (ÇEV_R2) ile ilgili riskin ortaya çıkma sıklığı beş yılda bir ve etkisinin verim kayıpları haricinde, ekili bitkinin arazide kalma süresinin uzaması ile birlikte, tarlaların bozulması ile sonuçlanacaktır. Tespit edilen diğer bir kritik öneme sahip risk ise diğer ülkeler ile olan siyasi anlaşmazlıklar nedeniyle ticaretin engellenmesi (POL_R1) riskidir. Bu riskin ortaya çıkma sıklığı dokuz yılda bir ve gerçekleşmesi halinde sonucunun etkisinin pazar kaybına neden olması beklenmektedir. Tedarik risklerinden (TED_ R1) riski de önlem alınması gereken riskler içinde değerlendirilmiştir. En temel üretim bileşenlerinden biri olan çoğaltım materyallerinin ithalatında yaşanan gecikme ya da eksik tedarik edilmesi riskine şirket her yıl maruz kalmaktadır. Bu riskin etkileri değerlendirildiğinde, ekim periyodunun kaçırılmasıyla pazara eksik ya da geç ürün temini söz konusu olacaktır. Dolayısıyla, satış kaybı ile sonuçlanacaktır. Önlem alınması gereken diğer bir tedarik riski ise satılmayan ürünler (TED_ R3) ile ilgili olan risktir. Bu riskin ortaya çıkma olasılığı her yıl olarak belirlenmiştir. Satılmayan tarım ürünleri, yalnızca bir sonraki satış sezonu için stokta tutma maliyetine (elde bulundurma maliyeti) katlanılmasına neden olmaz. Bunun yanı sıra, ürün kalite değerlerine bağlı olarak "satılamaz" hale gelir ve bertaraf etmek için ilave maliyetler gerektirir. Çevresel risklerden, mısır bitkisi üretiminin çiçeklenme periyodunda maksimum sıcaklığın 35 °C derecenin üzerinde seyretmesi (ÇEV_R1) riski de önlem alınması gereken riskler arasındadır. Firma, üretim yaptığı bölgelerde, üç yılda bir bu risk ile karşı karşıya kalmaktadır. Bu risk gerçekleştiğinde, üründe kalite ve verim kayıpları meydana getirmektedir. Çünkü bitkide yaşanan su stresleri verimi önemli ölçüde etkilemektedir. Çiçeklenme periyodunda aşırı sıcaktan kaçınmak için geçmiş yıllara ait iklim verileri analiz edilerek, ekim döneminin erkene alınması riskin etkisini hafifletecek önlemlerden biridir. Her yıl maruz kalınan diğer bir operasyon riski ise elektrik ve enerji kaynaklarında yaşanan kesinti (OPR_ R2) riskidir. Ortalama %35 nem ile hasat edilen mısır bitkisinin kurutma işleminin gecikmesi nem içeriğinin ve sıcaklığının artmasına neden olacaktır. Bu durumun sonucu olarak ürün canlılığını kaybedecektir. Firma kurutma sisteminde, doğalgaz enerjisi kullanmaktadır. Doğalgaz enerjisine alternatif olacak enerji kaynağının temin edilmesi bu riskin önemini azaltacaktır.

Çalışma kapsamında önerilen Avustralya ve Yeni Zelanda risk yönetim modeli, tarım şirketlerinin maruz kaldığı risklerin tanımlanması ve yönetilmesine yönelik olarak geliştirilmiştir. Buna bağlı olarak; olasılık göstergeleri ve etki değerlendirme ölçeği, uygulama yapılan firmanın organizasyon yapısı, tedarik zinciri birimlerinde yürütülen görev ve sorumlulukları, kilit tedarikçileri, üretim kapasitesi, insan kaynağı ve müşterileri gibi unsurlar dikkate alınarak oluşturulmuştur. Risk analizi aşamasında, risk skoru belirlenirken firmanın mevcut durum tedbirleri göz önünde bulundurulmuştur.

Son yıllarda, tedarik zinciri bozulmalarında gözlenen artış ile birlikte, risk yönetimi, tedarik zinciri yönetiminin ayrılmaz bir parçası olma yolunda gelişim göstermektedir. Günümüz yöneticileri, tedarik zincirlerini, ciddi ve masraflı aksamalara karşı korumak, müşteri ve ortaklarıyla kalıcı ilişkiler kurabilmek için tüm süreç boyunca uygulanabilen risk yönetim tekniklerine ihtiyaç duymaktadır.

Yoğun rekabet ortamında, tedarik zincirinde yaşanan bozulmalara tepki verebilmek veya bu bozulmalara karşı hazır olmak için her şirket mevcut bilgi sistemlerine risk yönetim modelini entegre etmelidir. Sonuç olarak, tedarik zincirinde risk yönetimi, tarım sektörünün istikrarlı bir şekilde büyümesinde önemli bir rol oynamakla birlikte daha üretken, güvenilir ve yeterli düzeyde gıda arzı sağlamaya yardımcı olacaktır.

Çalışmanın kapsam ve sınırlamaları neticesinde ileride yapılacak olan araştırmalarda, tespit edilen her risk için azaltma/önleme stratejileri geliştirilebilir. Ayrıca, önleyici faaliyetlerin fayda/maliyet analizleri de dikkate alınarak çalışmanın kapsamı genişletilebilir.

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EMPIRICAL STUDY ON ORGANIZATIONAL PERFORMANCE: THE MODERATING EFFECT OF ORGANIZATIONAL CULTURE

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ABSTRACT

Purpose- This study is based on IHPS BPK RI 2017 in the second semester. There are problems in terms of the performance of local governments in Lampung Province. The purpose of this study is to analyze the effect of 4 successful factors of AIS consisting: service quality, information quality, data quality, and system quality on organizational performance moderated by organizational culture.
Methodology- The population of this study is 29 Regional Apparatus Organizations (RAO) in South Lampung Regency using a saturated sample. Contingency theory is the basis of this study in order to form a mindset connecting four successful factors of AIS supported by the organizational culture of the leadership of the RAO on organizational performance. The analysis technique uses Structural Equation Model (SEM) through the SMART PLS version 3.0 application.
Findings- The results of this study indicate that there is a significant positive impact on organizational performance which has been presented by service quality. On the other hand, organizational performance is not influenced by information quality, data quality, and system quality. Whereas, the organizational culture does not constrain the relationship of service quality, information quality, data quality, and system quality on organizational performance.
Conclusion- This study concluded that service quality is positve significantly on the organizational performance. Whereas, the information quality, data quality, and system quality insignificant relationship with the organizational performance in regional apparatus organizations. Therefore, further studies could be conducted to include other variables such as employee motivation, employee performance, self-efficacy, in indonesian local government.

Keywords: Service quality, information quality, data quality, system quality, organizational performance, organizational culture.
JEL Codes: H11, M41, M48

1. INTRODUCTION

The state as a public organizer obligates to meet the basic needs of the citizens. The basic needs consist of goods, services as well as administrative services. The public services provided by public service providers show the government system whether it is good or bad. The government organizes public services which represent the quality of the public bureaucracy. Therefore, the government ought to reform the quality of public services to get people's satisfaction. In this case, the government has a policy related to public services stated by the Decree of the Minister of Empowerment of State Apparatus (KEP/25/M.PAN/2/2004). It explains the general guidelines for preparation of Public Satisfaction Index in the government institution service unit. To improve the quality of public services, the government has formulated guidelines to improve the quality of public services involving the public stated in Law Number 25 of 2009 mentioning that everyone has the right to use the best public services. In accordance with Permendagri No. 13 of 2006, performance is defined as the output / results of various activities / programs to use a measured quantity and quality budget as the target.

Problems with public sector organizations, especially in Indonesia, still occur today. The results of audits of the Supreme Audit Agency (BPK) in 2015 - 2017 have shown that the public service administration of Population Administration and the Office of Investment and Integrated Services remains very low. Sunarto (Head of the Lampung Representative Financial Auditing Agency) states that the poor performance quality of local governments is found in North Lampung, Central Lampung, South Lampung and Tulang Bawang.

One of the critical success factors of organizational performance is service quality. To achieve the success of an organization, there is one factor that is providing quality of service (Rahaman et al. 2011). According to Gowan, Seymour and Ibarreche (2001), to provide public sector services is sophisticated. It deals with meeting and finding out the needs, setting priorities, and allocating public resources. Public sector organizations are always pressured to provide service quality and improve efficiency (Robbbin & Coulter, 2005). Service quality on organizational performance has a positive relationship (Ali et al. 2016; Duncan & Elliot, 2002; Nazeer et al. 2014; Yasin et al. 2004).

Emery (1971) states that the information quality becomes the cause of a decrease in operating costs outside the information processing system. Hamilton and Chervany (1981) state that improving computer-based information systems can be done through corporate revenue. Bender (1986) examines the effect investigating financial information processes. It can be found that the quality of information has a positive-significant positive impact on organizational performance. The review shows that the quality of information and the performance of ERP system users have a significant relationship (Kositanurit et al. 2006). In line with this, a close relationship is found in the information quality and performance quality occurring in the public sector organizations (Ali et al. 2016).

Peltier et al. (2013) state two main ideas. First, high-quality customer data has impacted the customer and business performance. Second, the executive suite becomes the most important control of customer data quality. The quality of inputs, processes and outputs determines the result of effectiveness. This shows the essence of data quality for the success of AIS (Hubley, 2011; Wongsim & Gao, 2010). The importance of data quality is the top priority in organizations. It also influences not only the organizational performance but also the adoption of accounting information systems (Ahmad et al. 2013; Emeka-Nwokeji, 2012). The study is not in accordance with Ali et al. (2016) which finds there is not any impact on organizational performance delivered by data quality.

The quality of the system is an information characteristic about the system. The quality of which the system refers to how well information about the user needs are provided by the hardware, software, and policy policies of the information system as stated by Delone and McLean (1992). The company is benefited with compatible high-quality software (Slaughter et al. 1998). Data warehousing situations with a system quality related to good benefits have been noticed from the productivity of individuals which ease the decision determination (Wixom & Watson, 2001). The system quality is related to the organizational performance in the company at the operational level in a positive way (Bradley et al. 2006). Seddon and Kiew (1996) describe the system quality related to the perceived benefits becomes significant. Generally, the existing relationships between the system quality and the benefits have been summarized in part by the literature. The related relationship between ease of use (even though it is perceived as a benchmark for the quality of the system) and the perceived benefits are mixed. Some studies found that the system quality performs a positive relationship with the benefits of an organization (Hsieh & Wang, 2007). In line with the public sector, the system quality influences organizational performance (Ali et al. 2016; Bharati & Chaudhury, 2015). However, there are also those which deliver no effect (Shagari at al. 2017).

This study applies organizational culture as a moderating variable. It is because the organizational culture and the organizational performance deliver effect on one another. There is a positive relationship between organizational culture which leads to results related to the performance (Verbeeten & Spekle, 2015). Performance management triggers the emergence of unique cultures in public sector organizations. It ripples significant effects developing the performance of public sector organizations (Parker & Bradley, 2000). Henri (2006) claims that organizational culture is a strongly built performance management practice. It also serves as a major determinant of the performance of public sector organizations. An effective organizational culture is a well-known and familiar construction. It plays an important role to promote good institutional practices and achieve efficient results (Ramachandran, Chong, & Ismail, 2011). In the same order, Kanji and Moura (2007) argue that institutional culture influences functional patterns and organizational performance. Melkers and Willoughby (2005) specifically postulate that flexibility in cultural norms and good cultural tendencies enhance the performance of public sector organizations. Wong et al. (2012) suggest that organizational or institutional culture determines the success or the failure in corporate governance. Institutional culture shows the goals of an organization. It directs the organization and institutional culture and the organization performance responses (Pandey, 2014). Parker and Bradley (2000) determine an essential relationship between institutional culture and organizational performance. Even so, Ramachandran et al. (2011)

suggest that institutional culture gradually becomes a trend in public sector organizations. It is the malfunction or absence which becomes a serious concern.

The main purpose of this study is to obtain the organizational performance through success factors namely information quality, service quality, data quality, and system quality focusing on the organizational culture. Specifically, this study aims to analyze the effect of AIS successful factors on organizational performance. It also aims to analyze the influence of organizational culture and organizational performance in RAO, South Lampung Regency.

Focus on the organizational performance in Indonesia local goverernment context, the next section is highlight literature review related to the organizational performance, contingency theory, hypothesis development of each variables in this study.

2. LITERATURE REVIEW

2.1. Contingency Theory

Contingency theory is a theory which requires a leader to make appropriate adjustments related to his own leadership in any circumstances. This theory is put forward by Fiedler (1964). It is mentioned that a leader's performance is determined and seen from his understanding of the conditions he leads. This contingency theory focuses on the form of leadership as well as the understanding of the appropriate circumstance situations for a leader. The form of leadership can be elaborated with the enthusiasm of work as a motivational relationship. Work motivation focuses on achieving an objective, emphasizing the development and the close relationships of individuals. Then, the form of leadership can be adjusted to the happening situation and conditions. Contingency theory states that there are three factors influencing the occurrence of a situation faced by a leader. Those three are subordinate leader relations, performance structure, and position strength. The subordinate leadership relationship is linked to the group's atmosphere and self-confidence, loyalty, and interaction. Performance structure is more related to performance optimization. Study related to organizational performance using contingency theory has been conducted by several studies namely Saha et al. (2012) and Shagari et al. (2017). Then, this study also uses contingency theory to support the relationship among several independent variables (service quality, information quality, data quality, and system quality on the dependent variable (organization performance) and the moderation relationship for the independent relationship to the dependent.

2.5. Hypothesis Development

The development of hypotheses in this study is based on the success factors of AIS. The factors are believed to influence organizational performance. It is formulated as:

Service Quality and Organizational Performance

Gardin and Greve (2008) state that the basic meaning of contingency theory is that organizations should be adaptive. They should adapt to their contingency structures, such as the environment, organizational size, and business strategy. It aims that the organization is able to run well. Duncan and Elliott (2002) suggest that there is a beneficial relation between service quality and financial performance in a financial services organization. Kesuma et al. (2013) and Nazeer et al. (2014) identify a mutual relationship between service quality and business performance. They suggest the profit-seeking activities by providing services to possibly provide a greater strategic role for service quality. It is coupled with making a constant change toward better and premium prices, better customer value, and customer orientation as the benefits from the implementation of information technology. Also, others report some findings related to service quality on organizational performance with positive and significantly strong relationship using individual measurements (Weerakoon & Wijavanayake, 2013; Khan & Fasih, 2014; Ali et al. 2016). They examine the organizational performance as customer loyalty. They report a beneficial relationship is found according to service quality.

H_1: Service quality has a positive effect on organizational performance

Information Quality and Organizational Performance

In the previous information system study, Emery (1971) states that intrinsic value is not held by information but its value is only related to the effect on physical events. However, this has become a trigger (Lucas Jr. & Nielsen, 1980). In terms of performance improvement, this study applies learning as the dependent variable to make an understanding of inventory using the system. It is because an Information Quality (IQ) problem delivers significant changes for companies which project superior performance, gain competitive advantage, or survive in the survival of the environment in contemporary business.

Several previous and modern research studies have been conducted on the effects of information systems and using the size of an organization's performance and their dependent variables (Chang & King, 2005; Bernroider, 2008; Gorla et al. 2010). At the organizational level, previous study conducted reveals that IQ affects organizational performance (Ali et al. 2016; Soudani, 2012).

H_2: Information quality has a positive effect on organizational performance.

Data Quality and Organizational Performance

Contingency theory suggests an organizational structure containing several factors including environmental conditions, business strategies, hierarchy in organizations, technology production, and forms of management (Ismail & King, 2004). The quality and effectiveness of accounting information systems depend on the quality of inputs, outputs and processes. It shows the urge of data quality for the accounting information system successes as stated by Hubley (2011) and Wongsim and Gao (2010). A study by Rahayu et al. (2012) mentions that achieving effective works, data quality is required for an accounting information system. Thus, an accounting information system adoption needs to be considered. Both system quality and data quality are used for the decision-making activities in organizations (Wongsim & Gao, 2010). In the study of Ahmad et al. (2013), it reveals the priority of data quality in any AIS. It indicates that the organizations should apply it as the main reference. Emeka-Nwokeji (2012) states that the quality of data in accounting information systems should refer to the size of the data quality in organizations and contribute to the effectiveness of accounting information systems. Saleh (2013) finds a strong relationship between data quality and auditor internal perceptions. Previous study related to data quality as a success factor in organizational performance is noticed to have a positive effect (Ahmad et al. 2013; Emeka-Nwokeji, 2012).

H_3: Data quality has a positive effect on organizational performance.

System Quality and Organizational Performance

Contingency theory is to assess company performance which depends on the suitability between contextual factors as an organization (Cadez & Guilding, 2008). The system quality contributes to the usage, user convenience and individual performance. It consequently affects performance in the organization (DeLone & McLean, 1992). There is an important prerequisite to benefit from the organization. It is a well-developed and implemented system. Gorla et al., (2010) and Hsieh and Wang, (2007) report that system quality has a positive effect for the organizations. Kositanurit et al. (2006) finds a significant relationship between the perceived ease of use and performance. However, reliability and performance for individual ERP system users have not affected each other. Bharati and Chaudhury (2015) find mutual relationships among system quality, measurement using reliability, flexibility, ease of use, and the convenience of access for satisfaction in decision making. This is in line with Ali et al. (2016) who delivers findings related to the effect of system quality on organizational performance. It suggests that the system quality is strongly associated with net benefits at the organizational level.

H_4: The quality of the system has a positive effect on organizational performance.

Organizational Culture as Moderator

Organizational culture is a condition in which a strong look is made to make progress-engineered mechanisms to carry out several considerations in the organization (Akinnusi, 1991). Ramachandra et al. (2010) mention that the organizational culture (OC) significantly influences the success of promoting organizational change. The leadership models desire the behaviors. In fact, the implementation of the first change should be from the lead organizations to the general workforce to strengthen their commitment of work. It purposes that there will be no negative impact on the change. The study conducted by Ali et al. (2016) confirms the findings that the culture of organizations helps increase the performance of the organizations by relating information quality, data quality and system quality; and weakening service quality.

Organizational activities and steps to obtain a decision formulation are directed from the culture of the organization. Thus, it supports the welfare of the organization. Organizational culture is considered as the creation of human resource management practices, or managerial practices affecting the company boards, shareholders, or other stakeholder preferences. The performance of the system has the effect on the relationship between organizational commitment and work performance (Babulak, 2006; Buller & McEvoy, 2012; Özçelik & Aydinli, 2012). The findings of this invention have been adjusted to several findings in the past which have an effect on the system quality, as previously reported. According to Babulak (2006) performance can be made by employees or individuals at work sites. Personal factors can also exert influence in a performance are knowledge, abilities, skills, motivation and attitudes. Shift rules to provide better performance output in the workplace are a system of performance management dealing with colleagues and superiors, performance goals, company

encouragement, and action or award to recognize outstanding performance. These factors include: the application of organizational culture, and the determining factor is individual organizations in accordance with organizational goals.

$H_{5:}$ Organizational culture moderates the relationship between service quality and organizational performance.
$H_{6:}$ Organizational culture moderates the relationship between information quality and organizational performance.
$H_{7:}$ Organizational culture moderates the relationship between data quality and organizational performance.
$H_{8:}$ Organizational culture moderates the relationship between system quality and organizational performance.

3. DATA AND METHODOLOGY

This study aims to analyze the influence of the success factors of AIS (service quality, information quality, data quality, and system quality) and the influence of organizational culture in the organizational performance. The population in this study is 29 RAO in South Lampung Regency. The samples of this study taken from three divisions. The sample taken from the Regional Secretariat is the Regional Secretary, Section Assistant and Section Chief. The sample taken from the DPRD Secretariat is the DPRD Secretary and the Head of the Department. The sample taken from the Office and Agency is the Head of Service or Head of Agency and the Office Secretary or Agency Secretary. In this study, the sampling method applies saturated samples with a quantitative approach. A total of 77 questionnaires were distributed, as many as 67 questionnaires were used with complete conditions, and 10 questionnaires were not returned.

The collected data was then analyzed using Structural Equation Modeling (SEM) and computer software supported by the application of Partial Least Square (PLS) version 3.0. The dependent variable is the organizational performance measured by the indicators adopted from Ali et al. (2016).

The independent variable in this study is the quality of service measured by indicators adopted from Kheng (2010), information quality measured by indicators adopted from Ali et al. (2016), data quality measured by indicators adopted from Ali et al. (2016), and the quality of the system as measured by indicators adopted from the Shagari et al. (2017). The moderating variable is the organizational culture measured by indicators adopted from Aswar and Saidin (2018). A Likert scale with 5 levels (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree) was applied in this study.

4. FINDINGS AND DISCUSSIONS

Before testing the hypothesis, validity and reliability tests are done first. The validity testing is done by observing the average variance extracted (AVE) with recommended value above 0.5. The reliability test is done by observing the value of Composite Reliability and Cronbach Alpha. The Composite Reliability value for all constructions is above 0.7. It means that all constructs in this study are estimated to meet the criteria and the suggested values in Cronbach's Alpha above 0.6 is for all constructions (Ghozali, 2014). Furthermore, to assess the model with PLS is by checking the R-Square (R2) for each latent dependent variable (Ghozali, 2014). The results of validity and reliability tests can be seen in the following table.

Table 1: The Results of Validity and Reliability Test

R^2 = 0,336			
Variable	**AVE**	***Composite Reliability***	***Cronbach's Alpha***
OC	0,517	0,863	0,816
DQ	0,577	0,890	0,854
IQ	0,733	0,943	0,927
OP	0,600	0,881	0,830
SQ	0,510	0,892	0,865
QS	0,545	0,892	0,856

The lowest value of AVE is 0.510 in the independent variable that is service quality and all variables are valid. The lowest value of Composite Reliability in this research model is 0.863 for organizational culture variables so that all variables have good reliability from each construct. The lowest value of Cronbach's Alpha is 0.816 in organizational culture so that all variables show good reliability of each construct as well.

R-Square (R2) seen from Adjusted R-Square organizational performance is equal to 0.336. It indicates the independent latent variables of service, information, data, and system qualities. The moderation variables namely organizational culture explains the dependent latent variables namely organizational performance by 33.6%. The remaining 66.4% is explained by other factors out of this study which has not been considered.

Table 2: The Results of Hypotheses Test - Bootstrapping Algorithm

Hypotheses	Variables	*Path Coeficients*	*T Statistics*	*P Value*
H1	SQ-> OP	0,365	2,564	0,011
H2	IQ -> OP	0,073	0,428	0,669
H3	DQ -> OP	0,155	0,907	0,365
H4	QS -> OP	0,071	0,386	0,699
H5	OC.SQ -> OP	-0,121	0,641	0,522
H6	OC.IQ -> OP	-0,111	0,458	0,647
H7	OC.DQ -> OP	0,155	0,745	0,457
H8	OC.QS -> OP	0,342	1,549	0,122

The results of testing the hypothesis are by applying Structural Equation Modeling (SEM) and by using computer software supported by the Partial Least Square (PLS) version 3.0 application. Table 2 shows that service quality (SQ, t = 2.564 and p-value = 0.011), information quality (IQ, t = 0.428 and p-value = 0.669), data quality (DQ, t = 0.907 and p-value = 0.365), the quality of the system (QS, t = 0.386 and p-value = 0.699). It means that H1 is accepted and H2, H3, and H4 are rejected. Organizational culture in moderating service quality (OC.SQ, t = 0.641 and p-value = 0.522) does not affect organizational performance which means that H5 is rejected. Organizational culture in moderating information quality (OQ.IQ, t = 0.458 and p-value = 0.647) does not affect organizational performance which means that H6 is rejected. Organizational culture in moderating data quality (OC.DQ, t = 0.745 and p-value = 0.457) does not affect organizational performance which means that H7 is rejected. Organizational culture in moderating the quality of the system (OC.QS, t = 1.549 and p-value = 0.122) does not affect organizational performance which means that H8 is rejected.

Service quality has a positive influence on organizational performance. It shows that better service quality increases the organizational performance supported by Weerakoon and Wijavanayake (2013), Khan and Fasih (2014), and Ali et al. (2016). The results of this study indicate the good quality of services including reliability, assurance, direct evidence, friendly attitude of officers, empathy, and responsiveness related to the state of existing human resources, infrastructure and work facilities producing good organizational performance. Then, it is in accordance with the contingency theory focusing on the form of leadership and understanding of the situation with the appropriate circumstances by a leader. The form of leadership is explained as a work impulse or as a relationship boost. Work motivation focuses more on achieving goals, improvement and personal relationships.

The quality of information has no effect on organizational performance. It shows that the quality of information has not been maximized yet. Thus, organizational performance declines. The results of this study are not supported by studies which reveal information quality influencing organizational performance such as Bharati and Chaudhury (2015), Ali et al. (2016), Soudani (2012). Then, there is the lack of implementing good information quality including accuracy, timeliness, and format to facilitate human resources at work and produce unfavorable outputs. It is not in accordance with the contingency theory which serves as the basis for developing hypotheses. The results of the study refer to the internal dependence to meet the need of sharing information across national organizational functions, organizational formalization, and interdependence of organizations in terms of resource interests and accessibility, significant effects on requirements for organizational coordination and national system control.

Data quality presents no effects on organizational performance. This proves that data quality has not been maximized. As a result, organizational performance declines. The results of this study are supported by Ali et al. (2016) revealing that there are no relations between data quality and organizational performance. However, the results of this study are not supported by studies reporting that data quality affects organizational performance (Ahmad et al. 2013; Emeka-Nwokeji, 2012). It is caused by the lack of implementation to produce high quality data such as: accuracy, completeness, renewal, consistency, relevant human resources facilities at work and unfavorable output productions. Then, it is not in accordance with the contingency theory suggesting the existence of an organizational structure. There are several contextual factors namely environmental conditions, the existence of a business plan, organizational mechanisms, production for technology, and forms of management (Ismail & King, 2004).

The system quality performs no effect on the performance of the organization. It shows unmaximized quality of the data which decreases the organizational performance. The results of this study are supported by Shagari et al. (2017) revealing the quality of the system with no impact on organizational performance. However, it is not supported by research revealing that the quality of the system influences organizational performance such as Bharati and Chaudhury (2015) and Ali et al.

(2016). It causes the system not to integrate, and the bias data. It is concluded that there is a poor implementation of the system to support the processing of inputs and outputs such as: security, ease of use, efficiency used by human resources while working and producing unfavorable outputs. Thus, it is not in accordance with the contingency theory explaining that the accounting information system needs to adapt to the specific desires. It considers the environment and organizational structure in an organization (Dandago & Rufai, 2014). Contingency theory is to assess company performance depending on the suitability between contextual factors as an organization (Cadez & Guilding, 2008).

Organizational culture does not balance the service quality and organizational performance. It indicates that organizational leaders do not apply good organizational culture. The results of this study are in line with Ali et al. (2016) explaining that the organizational culture becomes a moderating variable to weaken the organizational performance by interacting with service quality. This is not according to Katou and Budhwar (2010) examining a causal relationship of HRM performance into Greek utilizing contingency theory, resource-based views as well as ability, motivation and opportunity. Leaders lack a good organizational culture which includes innovation and risk developments, attention to detail, output orientation, people and team orientations, aggressiveness, stability, and influencing employees to provide public information to the public.

The results of this study are not in line with Ali et al. (2016). It mentions organizational culture as a moderating variable which strengthens organizational performance by interacting with information quality. However, this is not in line with contingency theory which urges an organization to take several considerations for workers, the managerial department influencing company boards, shareholders, or other stakeholders' preferences. The leaders lack to implement good organizational culture.

This study is also not in accordance with contingency theory. It is a theory which explains that adaptation to the specific desired decisions is required for accounting information systems. The decisions are made by considering the environment and organizational structure (Dandago & Rufai, 2014). Thus, it is related to the quality of the data processed needed for the process of accounting information systems to support the organizational performance achievement. Özçelik and Aydinli (2006) explain that the performance of a system has an influence on organizational agreements and performance in the work environment. This is not in line with contingency theory according to Gordon and Miller (1976). It lays the basic framework to consider the accounting information systems from a contingency perspective. Accounting information systems need to be adaptive to the specific decisions. Then, leaders are assumed not to apply good organizational culture related to innovation and risk development; attention to detail; orientation of output, public, team; aggressiveness; stability, and their influencing employees to provide data reliability to the user interests.

5. CONCLUSION

The study is to discover the impacts of service quality, information quality, data quality, system quality of public sector organization and organizational culture performances as a moderating variable. Based on the results of the analysis done with a series of hypothesis testing, it summarizes the quality of service has affected the performance of public sector organizations positively. This shows that the better system quality improves the performance of public sector organizations in each each RAO at the Regional Secretariat (Regional Secretary, Section Assistant and Section Chief), at the DPRD Secretariat (DPRD Secretary and Section Head), at Office and Agency (the Office Head or Agency Head and the Office Secretary or Agency Secretary)

The quality of information, data, and system do not affect the performance of public sector organizations positively. This shows that if the public sector organization gives low information to the public, processes data and uses facilities integrated with the agency system, the performance of public sector organizations in each RAO will decline.

Organizational culture does not moderate the relationship between SQ, IQ, DQ, QS and OC of public sector organizations. This shows that the organizational culture adopted and disseminated weakens the relationship between service quality, information quality, data quality, system quality on the performance of public sector organizations as the sample in this study lacks understanding of organizational culture well. Thus, organizational culture weakens the relationship between SQ, IQ, DQ, QS and OC of public sector organizations.

The limitations of this study include: RAO objects are only in the South Lampung Regency Government; the time for respondents to explore more information related to the occupation and occupation is limited; sample taken in Regional Secretariat is only from the Regional Secretary, Section Assistant and Section Chief; sample taken in the DPRD Secretariat is only from the DPRD Secretary and the Section Head, sample taken at the Office and Agency is only from the Head of Service or Agency Head and the Office Secretary and Secretary or Agency Secretary in the South Lampung Regency. In addition to the

dissemination process, Direct questionnaires to the location of each RAO in the Regional Government of South Lampung Regency was conducted during the Covid-19 virus pandemic. The respondents did not work every day. The sample majority is the respondents owning post-graduate education (S2) continued with bachelor (S1) or doctorate (S3) - only 1 person.

Suggestions for the Regional Government of South Lampung Regency are expected to be more active to provide services, information, data processing, using integrated systems to the community. Each RAO and RAO leaders and staff who hold positions to provide good leadership to subordinates need to be aware of the organizational culture to improve organizational performance. Then, the next study is expected to be able to examine organizational performance materially and add other independent variables such as employee motivation, employee performance, self-efficacy, and to use empowerment moderation variables. In addition, researchers are able to replace the object of research into RAO or private organizations in other regions in Indonesia.

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APPENDIX 1: Survey Questionnaire

Variable	**Item measure**
Performance Measurement	1. Carry out part of the duties or service authority in my field. 2. Formulate technical policies according to my field of work. 3. Compile data about work in my field of work. 4. Leading, developing and mentoring my subordinates. 5. Planning and implementing programs in my field of work. 6. Provide direction and training to my subordinates. 7. Assess and measure the performance of my subordinates.
Service quality	1. Adequate physical equipment. 2. Officer appearance. 3. Management procedure is clear. 4. Officers master the problem. 5. The seriousness and patience of the officer. 6. Officer response speed. 7. Officer alacrity. 8. Telephone service. 9. Certainty of time.

	10. Clerk solve problem on time. 11. Officer credibility. 12. Hear every complaint well. 13. Friendly and polite attitude of officers. 14. Understanding of user problems.
Information Quality	1. precise and accurate data 2. data according to activities 3. Timely delivery of data 4. The data submitted is up to date 5. The information presented is easy to read 6. There is a manual book
Data Quality	1. The data presented is in accordance with reality 2. The data presented are not biased 3. The number of publications is quite a lot 4. Publication types/ titles are quite diverse 5. The data presented is as needed 6. Complete data series 7. Data display is easy to understand 8. The data presented is consistent
System Quality	1. User login is required to access agency facilities online 2. Automatic logout is activated after a period of inactivity 3. Anti firus software does not prevent the system from catching viruses 4. Our AIS is not regularly checked and managed by IT unit staff 5. The user interface of our agency information system is easy to use 6. The tutorials or instructions given by our AIS help to use the system easily 7. User interface design by our AIS is user friendly 8. I understand every AIS function 9. I'm not familiar with our AIS interface 10. Our AIS user interface items are easy to understand 11. Our AIS really helps my work efficiency 12. AIS processing speed helps me to get my work done very fast
Organizational Culture	1. At work I am required to think innovatively 2. I was always required to be brave 3. Every time I do my job, I always prioritize accuracy, analysis and attention to detail 4. So far, I feel that management in the agency is prioritizing results and outputs 5. so far, I feel that decisions taken by management consider the impact of outputs on employees 6. The work that I do tends to prioritize tiem performance 7. Everyone who works is more aggressive and competitive than casual 8. The existing job always emphasizes stability rather than growth