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EFFICIENCY MEASUREMENT OF REAL ESTATE INVESTMENT TRUSTS TRADED IN BIST WITH DATA ENVELOPMENT ANALYSIS AND MALMQUIST TOTAL FACTOR PRODUCTIVITY INDEX

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ABSTRACT

Purpose- The aim of the study is to measure the efficiency of real estate investment trusts traded on BIST with data envelopment analysis and the Malmquist total factor productivity index. Efficiency and productivity were measured using the Malmquist total productivity analysis and the Data Envelopment Analysis approach, both of whose application fields have grown recently**.**

Methodology- The Malmquist total factor productivity index is used to analyze changes in total factor productivity of 20 real estate investment trusts operating in 2019–2020–2021, as well as the reasons for these changes, on the axis of variables such as current ratio, leverage ratio, long-term debt-to-asset ratio, short-term debt-to-asset ratio, equity-to-asset ratio, return on assets, net profit margin, and gross profit margin.

Findings- The results of the analysis show that 8 companies that are relatively efficient according to their CCR technical efficiency values have been identified; these are ALGYO, AVGYO, HLGYO, MRGYO, MSGYO, PAGYO, RYGYO, and SNGYO. It has been observed that these companies have been effective in an output-oriented way over the past three years.

Conclusion- The firms that are below the efficiency limit need to take a few things into account, according to the results. They need to alter a few input variables to reach a higher level of efficiency. It is anticipated that all these findings will support the decision-making of the companies and the investors who are considering investing in these companies.

Keywords: Real estate investment trusts**,** data envelopment analysis, Malmquist total factor productivity index, efficiency measurement.
JEL Codes: C67, L25, G29.

1. INTRODUCTION

Companies that need to compare their own circumstances to those of their competitors and investors who plan to participate in these businesses should take several aspects into account in today's continuously evolving and competitive world. There is a need for approaches that can develop a simultaneous decision-making mechanism by combining all these aspects into a single model in order for them to be employed in a decision-making process in a healthy manner. Decision makers find Data Envelopment Analysis to be a very helpful tool in all these decision-making situations. Data Envelope Analysis, according to the study, concurrently establishes the relative differences under the efficiency criterion and presents them to the decision-maker in the choice of the most suitable unit that can vary from one another under common conditions.

Data envelope analysis, on the other hand, is a static analysis because it performs a cross-sectional analysis on the decision unit data over a specific period. A decision unit whose effectiveness has been determined by Data Envelopment Analysis may lose its effectiveness and its ability to be a reference when examined in later periods. However, in the process of evaluating the activities, it is very important to reveal how the activity has developed over time. For this reason, the "Malmquist Total Factor Productivity Index," which includes the time dimension, has been developed. With the use of the Total Factor Efficiency Index, this missing aspect of Data Envelopment Analysis is eliminated, and it turns into a much more beneficial tool in the decision-making process (Dinçer, 2008).

Efficiency measures how well predefined plans and programs for production factors and/or an enterprise's production are carried out. In other words, it demonstrates efficacy by highlighting how closely the actual performance matches the previously projected and planned performance. When the literature is evaluated, it becomes clear that a performance that is regarded as effective requires an efficiency ratio of 1. In this context, a ratio greater than 1 is read as an efficiency level above the norm, and a ratio less than 1 is interpreted as an activity that is not proceeding as intended (Savaş, 2009).

Efficiency measures enable businesses to identify their location. When assessing their performance in this regard, organizations commonly employ efficiency analysis. Because efficiency assessments allow companies to assess where they stand in the economies they operate in and provide guidance on how to get the greatest results from the resources they already have at their disposal (Yolalan, 1993). Businesses should decide in advance which inputs and outputs will be most effective in achieving the objective. Businesses can then compare their efficiency levels by exposing how close they are to the degree of effectiveness needed to be effective in their production (Özgür and Eleren, 2006). In other words, through efficiency measurements, organizations may determine whether the production process is operating properly.

The Malmquist total productivity analysis and Data Envelopment Analysis (DEA) methods, which have recently become popular in measuring efficiency and productivity, were applied in this work. The Malmquist total factor productivity index is used to analyze changes in total factor productivity of 20 real estate investment trusts (REITs) operating in 2019-2020-2021, as well as the reasons for these changes, on the axis of variables such as current ratio, leverage ratio, long-term debt-to-asset ratio, short-term debt-to-asset ratio, equity-to-asset ratio, return on assets, net profit margin, and gross profit margin.

2. LITERATURE REVIEW

Although there is much research in the literature that uses the DEA approach to estimate enterprise efficiency, the number of studies that use the Malmquist Productivity Index to quantify efficiency is still far fewer. The fact that there isn't much research on real estate investment trusts, the topic of this study, and the use of these analysis tools show the study's importance and contribution to the literature.

By Kaya and Coşkun (2016), the 2009–2013 data of 17 companies trading in the BIST Food, Beverage, and Tobacco sector were examined using the output-oriented CCR DEA approach. KRVTS and KNFRT firms were found to be productive during the analysis period based on the study's empirical analysis.

Data from 22 firms in the textile, apparel, and leather sectors, whose stocks are traded on the BIST, were evaluated by DEA and ordinal logistic regression methods based on eight chosen variables in the study by Abacıoğlu and Ünal (2017). The study covered the years 2013-2016 and the companies were from the woven, clothing and leather sectors. According to empirical data, businesses are divided into four classes based on their efficiency scores. However, it was discovered that seven out of the eight variables utilized in the DEA application had a statistically significant impact on the enterprises' productivity. On the other hand, Çelik and Ayan (2017) used the input-oriented CCR DEA approach to evaluate the 2010–2014 period data of businesses operating in the BIST manufacturing sub-sectors. The manufacturing industry sector was found to have efficiency average values of 90% for 2010, 91% for 2011, 91% for 2012, 92% for 2013, and 94% for 2014. However, the manufacturing sector did not attain average efficiency values of 100% for any of the five sub-sectors in the study.

In their study, Özcan and Anıl (2017) used both the DEA and the Malmquist total factor productivity index, which is based on the DEA, to examine the productivity of 13 iron and steel companies that are among the largest 500 enterprises in Turkey for the years 2013, 2014, and 2015. The analysis led to its acquisition using the DEA approach, in which a single company demonstrated efficient work over the course of three years. Eleven companies improved, as assessed by the Malmquist total factor productivity index data. According to Münyas (2018), the DEA approach was used to examine the data for 27 REITs throughout the period of 2011–2017, whose stocks are traded on the BIST. Five input variables and three output variables were employed in the study's DEA analysis. The effectiveness of 13 REITs in 2011, 13 REITs in 2012, 12 REITs in 2013, 10 REITs in 2014, 17 REITs in 2015, 16 REITs in 2016, and 11 REITs in 2017 has been evaluated through empirical investigation.

Using the Malmquist-TFP index approach based on the DEA output-oriented CCR model, Gelmez et al. (2018) studied the changes in the productivity of the businesses operating in the textile sector and the sources of the change. Each enterprise's total factor productivity for the years 2014-2016 was assessed separately in the study, and the causes of change based on time periods were attempted to be identified. Following the analysis, it was discovered that the companies' Total Factor Productivity had decreased. The evaluation of the results led to the conclusion that, despite the positive situation in the technical efficiency of the companies, the decrease in the total factor productivity could not be prevented. The decrease in the TFPs of the companies was attributed to their inability to implement the technological changes on time.

Data from 2005 to 2019 were analyzed using the DEA approach by Şahin and Özdemir (2020) to assess the efficiency levels of 23 banks. Interest income and non-interest income are preferred as the study's output variables; the number of branches, number of employees, interest expenses, and non-interest expenses are used as input factors. According to the empirical investigation, Citibank had the highest efficiency value. Additionally, studies have shown that foreign banks perform better than domestic banks. The objective of the study conducted by Kıllı and Uludağ (2020) was to assess the cost performance of 19 companies in the woven, clothing and leather industries whose stocks are traded on the BIST. According to the study, five companies operated on the fixed scale and nine under the variable scale as of 2017. Five companies operated under the fixed scale in 2018 whereas ten businesses operated under the variable scale. On the other hand, it has been established that 7 companies are effective for 2019 under the fixed scale and 10 companies are effective under the variable scale. Furthermore, it was discovered that 25 other companies had cited BLCYT.

3.DATA ENVELOPMENT ANALYSIS (DEA)

The Data Envelopment Analysis method is a "parameterless" efficiency measurement that was first developed by Charnes, Cooper, and Rhodes (1978) to measure the "relative" efficiency of similar economic decision units in terms of the goods or services they produce (Yolalan, 1993). The method is used to compare the success of production processes with multiple inputs and multiple outputs, where classical regression analysis cannot be applied directly (Baysal et al., 2004).

The foundations of the DEA method were put forward by Farrell in 1957. Later, the current DEA method was developed by Charnes, Cooper and Rhodes (1978) to measure the relative efficiency of decision-making units (DMUs) with multiple inputs and multiple outputs. The DEA method is a linear programming-based efficiency measurement method that aims to measure the relative effectiveness of DMUs with similar structures. Formally, the basis of the Data Envelopment Analysis consists of boundary approaches rather than measures of central tendency. When compared to other analysis methods, DEA is a successful measure for determining effectiveness. For example, if a person wants to express efficiency, or more generally, show that a decision unit is more efficient than other decision units, he or she can easily do so with the DEA method without the rational expectations of various linear and non-linear regression models. (Cook and Zhu, 2005).

The DEA method does not have to assume a specific method for the production- and cost-bound approach. It provides production and cost boundary measurement with the convex boundary method by using the observed input and output data. The linear programming model is generally used for the estimation of the boundary approach. Linear programming is an analytical method developed long before Data Envelopment Analysis to assist decision-making units. The general purpose of the linear programming model is to select decision-making units that aim to achieve maximum profit or minimum loss. DEA uses linear programming as a tool for efficiency measurement. The DEA technique ranks decision-making units based on their efficiency ratings. First place goes to the decision-making unit with the highest efficiency score, and last place goes to the decision-making unit with the lowest efficiency score. The effective decision-making units, however, are given the value "1.000," and it is not possible to rank the effective decision-making units within one another. Inefficient decision-making groups are ranked among themselves (Thanassoulis, 2001). Although Farrell used more than one input and one output in the DEA method, the linear equation system he established for the measurement of efficiency formed the basis for the calculation of efficiency for multiple outputs (Farrell, 1957). Based on Farrell's work in 1957, Charnes, Cooper, and Rhodes (1978) proposed a non-parametric model based on linear programming, known as the CCR model. Later, in 1984, Banker, Charnes and Cooper developed the BCC model, which is another basic model of DEA (Banker et al., 1984).

The industries where data envelopment analysis can be performed are the production, service, and financial sectors. Contrary to conventional analysis techniques, it is possible to measure a company's efficiency by combining various variables. DEA is widely used to assess the productivity level of many profit-oriented organizations after initially measuring the comparative efficiency of non-profit public institutions (Gülcü et al., 2004).

In studies using the DEA method in the literature, it is seen that different scientists consider one of two constraints when determining the number of decision-making units. In this study, the number of decision-making units was determined by considering the second constraint.

1. Constraint: When the number of inputs is m and the number of outputs is n, the number of decision-making units must be at least "$m + n + 1$" (Babacan et al., 2009).

   Number of decision-making units $\geq\ m + n + 1$

2. Constraint: If the number of inputs is m and the number of outputs is n, at least (m+n)*2 decision making units are needed (Eleren and Özgür, 2006).

Number of decision-making units = $(m + n) * 2$

The most important advantage of DEA over parametric methods is that it can measure efficiency in studies where multiple input and output variables are used without the need to predict the existence of a predetermined analytical production function, as in parametric methods. However, the input and output variables are also independent of the units. This allows for the simultaneous testing of multiple dimensions of companies or decision-making units (Karsak and İşcan, 2000). Another important advantage of the DEA method is that there is no need for an analytical production function to be determined before the analysis in cases where the multi-criteria decision-making process needs to be run. However, input and output variables and units of measurement are independent of each other. With this feature, DEA provides the opportunity to measure different dimensions of companies in the same process. (Karsak and İşcan, 2000).

3.1. Data Envelopment Analysis Models

Different models are applied in DEA. These models can be broadly classified into two groups. One is based on constant returns to scale and is called CCR (Charnes-Cooper-Rhodes), while the other is based on variable returns to scale and is called BCC (Banker-Charnes-Cooper). Additionally, it can be noted that the studies also use additional models. The model to be utilized is determined by the scope of the research and the assumptions to be made.

3.1.1. Charnes-Cooper-Rhodes (CRR) Model

The input-oriented CCR model is a model that aims to reduce the level of inputs to meet the current output level (Kıran, 2008). In this model, which is made by weighting the input variables, it is determined how much reduction in the input values should be made without changing the output values in order for the inactive DMUs to be effective. The input-oriented CCR model developed by Charnes, Cooper, and Rhodes (1978) maximizes the ratio of weighted output to weighted input to determine the efficiency value of each decision unit.

Suppose that n DMUs are considered in a DEA model, and there are m inputs and s outputs for each of these DMUs. In this case, the fractional CCR model for the input will be as follows: where the i-th input amount of the j-th DMU is $X_{ij} \geq 0$ and the r-th output amount produced by the j-th DMU is $Y_{rj} \geq 0$ (Cooper et al., 2004).

$$Max \frac{\sum_{r=1}^{s} u_r y_{ro}}{\sum_{i=1}^{m} v_i x_{i0}} \text{ , } Max \frac{\sum_{r=1}^{s} u_r y_{rj}}{\sum_{i=1}^{m} v_i x_{ij}} \leq 0 \qquad j = 0,1, \dots, n \qquad u_r, v_i \geq 0 \tag{1}$$

$Max =$ Maximal,

u_r= weight given to the r-th output of the k-th DMU,

v_i= weight given to the r-th input of the k-th DMU

y_{rj}= r-th output of the j-th DMU

x_{ij}= j i-th input of the j-th DMU

The number of models to be created in DEA is as large as the number of DMUs to be analyzed. For example, if the number of DMUs to be analyzed is n, then the number of models to be created will be n. In order to calculate the efficiency of DMUs, these n models must be analyzed separately. The linear programming (primal) model of the fractional model above is formed as follows (Cooper et al., 2004):

$$Maxz = \sum_{r=1}^{s} \mu_r \, y_{ro}, \quad \sum_{r=1}^{s} \mu_r \, y_{rj} - \sum_{r=1}^{s} v_i \, x_{ij} \leq 0 \;\; , \;\; \sum_{r=1}^{s} v_i \, x_{i0} = 0 \, , \;\; \mu_r, v_i \geq 0 \tag{2}$$

This model, like all linear programming models, also has dual. The dual of the above model is as follows:

$$Min\theta, \qquad \sum_{j=1}^{n} x_{ij} \, \lambda_j \leq \theta x_{i0} \, , \qquad \sum_{j=1}^{n} y_{rj} \, \lambda_j \geq y_{r0} \, , \qquad \lambda_j \geq 0 \tag{3}$$

$$i = 1, \dots, m \, ; r = 1, .., s \, ; \;\; j = 1, \dots, n$$

The relative efficiency of any DMU means that the objective function in the primal model is equal to 1. For any DMU to be effective in the dual model,

$$\theta = 1, \qquad s_i^- = 0, \qquad s_i^+ = 0$$

conditions must be met together.

In order to convert inequalities in linear programming models into equality, s_i^- denotes slack variables related to overused inputs, and s_r^+ denotes slack variables related to underproduced outputs (Erpolat, 2011).

Output Oriented CCR Model:

This is a model that aims to maximize outputs so that no more than the current inputs are needed (Kıran, 2008). The difference between the output-oriented CCR model and the input-oriented CCR model is that the result of a weighted input and weighted output ratio is minimized. (Erpolat, 2011:77).

The fractional CCR model for the output consists as follows (Cooper et al., 2004):

$$Min \frac{\sum_{i=1}^{m} v_i x_{i0}}{\sum_{i=1}^{m} u_r y_{r0}} \geq 1, \quad \frac{\sum_{i=1}^{m} v_i X_{ij}}{\sum_{i=1}^{m} u_r Y_{rj}} \geq 1, \quad u_r \geq 0, \quad v_i \geq 0,$$

$$r = 1, .., s, \; i = 1, .., m, \; j = 1, \dots, n, \quad Min: Minimal \tag{4}$$

The expression of the output-oriented primal CCR model as a linear programming model is as follows:

$$\sum_{i=1}^{m} v_i x_{i0}, \quad \sum_{i=1}^{m} v_i X_{ij} - \sum_{i=1}^{m} \mu_r Y_{rj} \geq 0, \; \sum_{i=1}^{s} \mu_r Y_{r0} = 1, \; u_r \geq 0, \quad v_i \geq 0, \quad \mu_r \geq 0 \tag{5}$$

The dual model of the CCR model for the primal output above consists as follows:

$$Max \sum_{i=1}^{m} s_i^- + \sum_{r=1}^{s} s_r^+, \qquad \sum_{j=1}^{n} x_{ij} \, \lambda_j + s_i^- = x_{i0}, \qquad \sum_{j=1}^{n} y_{rj} \, \lambda_j + s_r^+ = \phi y_{i0}, \; \lambda_j \geq 0, \; \phi > 0, \quad r = 1, .., s, \; i = 1, .., m, \; j = 1, \dots, n \tag{6}$$

3.1.2. Banker-Charnes-Cooper (BCC) Model

The BCC Model is interpreted in two different ways, just like the CCR Model, for input and output. The input-oriented BCC model aims for the maximum movement along the frontier line along with the proportional decrease of the inputs, while the

output-oriented BCC model aims for the maximum movement along the frontier line with the proportional increase of the outputs.

The following constraint, known as the convexity constraint, is added to the dual of the CCR models, allowing the efficiency limit to demonstrate the variable returns to scale property. This is the only difference between the CCR and BCC models. (Ramathan, 2003; Cooper, Seiford and Tone, 2000; Cooper, et al., 2004).

$$\sum_{j=1}^{n} \lambda_{jk} = 1 \quad (7)$$

With this constraint, it is also possible to determine the return types of DMUs according to scale. If the sum of the λ_{js} calculated for the DMU is more than 1, the DMU is operating with decreasing returns to scale, if it is less than 1, it is operating with increasing returns, and if it is 1, it is operating with constant returns (Erpolat, 2011).

Input-Oriented BCC Model:

Under the premise of variable returns to scale, this model is the one that determines how much the input variables should be reduced in order to achieve this output level in the most effective way, without affecting the outputs (Erpolat, 2011).

Fractional, primal linear programming and dual linear programming formulations of the input-oriented BCC model are as follows (Cooper et al., 2000):

Fractional model,

$$Max \frac{uy_0 - u_0}{vx_0} \ , \quad Max \frac{uy_j - u_0}{vx_j} \leq 1, \quad (j = 1, .., n), \ v \geq 0, \ u \geq 0, \ u_0 : unrestricted \quad (8)$$

Primal linear programming model:

$$Min \ \theta_b, \ \theta_b X_0 - X\lambda \geq 0, \ Y\lambda \geq y_0 \ , \ e\lambda = 1, \ \lambda \geq 0 \quad (9)$$

Dual model:

$$Max \ z = uy_0 - u_0, \quad vx_0 = 1, -vX + uY - u_0 e \leq 0, \quad v, u \geq 0, \ u_0 : unrestricted \quad (10)$$

Efficiency solutions in this model are carried out in two steps, like those in the CCR model. The first step is to minimize θ_B and to maximize input surpluses and output deficits. For any DMU to be effective in the model, the objective function must be equal to 1 (Cooper et al. 2000).

Output-Oriented BCC Model:

It is a model that determines how much the outputs should be increased in order to reach the maximum output level that can be obtained from these inputs without making any reductions in the inputs of the variables. (Erpolat, 2011).

Fractional, primal linear programming and dual linear programming formulations of this model are as follows (Cooper et al., 2000).

Fractional model:

$$Min \frac{ux_0 - v_0}{vy_0}, \quad Max \frac{ux_j - u_0}{vy_j} \geq 1, \quad (j = 1, .., n), \ v \geq 0, \ u \geq 0, \ v_0 : unrestricted \quad (11)$$

Primal model:

$$Max \eta_B, \quad X\lambda \leq x_0, \ \eta_B y_0 - Y\lambda \leq 0, \quad e\lambda = 1, \ \lambda > 0 \quad (12)$$

Dual model.

$$Min \ z = vx_0 - u_0, \ u_y = 1, \ uX - uY - v_0 e \geq 0, \ v, u \geq 0, \ v_0 : unrestricted \quad (13)$$

If the BCC and CCR values are both 1, the DMUs are fully active. In this case, DMUs have an optimal scale size. That is, they operate at an optimal scale. If the CCR value is 1 and the BCC value is less than 1, the DMU is total effective according to the scale size, but the technique is not efficient. (Kutlar and Babacan, 2008).

3.2. Malmquist Total Factor Productivity Index

DEA's structure is static, and it only uses data from decision units for the designated time period to do cross-sectional analysis. An effective decision unit determined through DEA analysis may lose its effectiveness in the future and cease to be a reference unit. The Malmquist Total Factor Efficiency Index was created in order to study how efficiency changes over time. The first advantage of the Malmquist index over the Tornqvist and Fisher Ideal Indices is that it does not calculate total factor productivity by making the same assumptions as the Tornqvist Index and Fisher Ideal Index do, namely, cost reduction or revenue maximization. Second, there is no requirement to set a price, unlike these two indices. since it's not always possible to receive accurate price information. Finally, it allows calculation using panel data. Despite the benefits described, the Malmquist TFP index has the drawback of not being stochastic, which prevents statistical inferences (Kılıçkaplan et al., 2004).

The Malmquist total factor productivity index is a method that measures the change in total factor productivity of two observations as the ratio of the distances to a common technology. The "distance function" is used for this measurement. This index, developed by Caves et al. (1982), was named Malmquist because the idea of establishing an index with the help of distance functions was first introduced by Sten Malmquist (Malmquist, 1953). With the distance function, it is used when there are inputs and outputs, and when there are targets, such as cost minimization or profit maximization.

According to the output, the distance function is defined as:

$$d(x, y) = min\{\delta: (y/\delta) \in S\}$$

and the values that the distance function d(x, y) will take are,

- If the vector y is on the boundary of S (production frontier) =1
- If vector y describes a technically inefficient point in S >1
- If vector y describes an impossible point other than S <1.

The Malmquist Total Factor Productivity Index of Change is derived using the formula

$$m(Y_s, X_s, Y_t, X_t) = \sqrt{\frac{d^s(Y_t,X_t)}{d^s(Y_s,X_s)} \times \frac{d^t(Y_t,X_t)}{d^t(Y_s,X_s)}} \quad (14)$$

on the "distance function" axis based on the output between the s period used as the basis and the following t period. In this notation, $d^s(Y_t, X_t)$ represents the distance of the observation of period t from the technology of period $s(t = s + 1)$. Here, the value of the function $m(Y_s, X_s, Y_t, X_t)$) greater than 1 indicates that there is an increase in total factor productivity from the s period to the t period, and if it is less than 1, when the same periods are taken into account, there is a decrease in the total factor productivity (Cingi and Tarım, 2000).

3. DATA AND METHODOLOGY

Efficiency and productivity were analyzed in the study using the Data Envelopment Analysis method and the Malmquist total productivity analysis, whose application area has grown recently. On the axis of variables such as current ratio, leverage ratio, long-term debt-to-asset ratio, short-term debt-to-asset ratio, equity-to-asset ratio, return on assets, net profit margin, and gross profit margin, the Malmquist total factor productivity index is used to analyze changes in total factor productivity of 20 real estate investment trusts (REITs) operating in 2019-2020-2021, as well as the reasons for these changes. Total factor productivity changes and their causes were examined using the Malmquist total productivity index. Determinative outcomes have been attained in the development of the sector's future strategies by computing the "technological change, technical efficiency, and scale efficiency change values" required for the creation of the index, determining whether the companies operate at a scale suitable to them, the direction of the change in the amount of output produced with the same input, and managerial activities. In the analysis, the efficiency values and productivity of 20 companies in the years 2019-2020-2021 were measured with the Win4DEAP2-Window for Deap package program. Firms with a value of 1 are considered efficient firms, and firms with a value below 1 are considered inefficient firms. In the Data Envelopment analysis, the selection of 'orientation', 'enveloping surface' and 'model' was decided by using the following steps.:

Orientation; ‘DEA Output Oriented Approach',

- Returns to Scale; ‘CCR Variable Model’,
- Returns to Scale; ‘BCC Variable Model’,
- Calculate; ‘DEA multi-stage’.

3.1. Purpose of the Study and Data

The purpose of the study is to assess the effectiveness of the companies included in its scope, as well as the financial ratios and their corresponding weights in assessing effectiveness. For this aim, the end-of-period financial statements of the 38 companies participating in the BIST Real Estate Investment Trust index for the years 2019-2020-2021 were used to create 8 different financial ratios for each year. The Data Envelopment analysis excluded a total of 18 companies, including 12 companies with negative values and 6 companies with non-continuous data. The financial statements of the companies were obtained by using the Public Disclosure Platform (KAP-Kamuyu Aydınlatma Platformu) website (www.kap.org.tr). In order to measure the efficiency of the companies, the data obtained from the 3-year balance sheet and income statements for the period 2019-2020-2021 was used. The list of companies included in the study is given in Table 1.

Table 1: Companies Included in the Study

No	Code	Company Title
1	AKMGYO	AKMERKEZ GAYRİMENKUL YATIRIM ORTAKLIĞI A.Ş.
2	ALGYO	ALARKO GAYRİMENKUL YATIRIM ORTAKLIĞI A.Ş.
3	AGYO	ATAKULE GAYRİMENKUL YATIRIM ORTAKLIĞI A.Ş.
4	AVGYO	AVRASYA GAYRİMENKUL YATIRIM ORTAKLIĞI A.Ş.
5	DZGYO	DENİZ GAYRİMENKUL YATIRIM ORTAKLIĞI A.Ş.
6	EKGYO	EMLAK KONUT GAYRİMENKUL YATIRIM ORTAKLIĞI A.Ş.
7	HLGYO	HALK GAYRİMENKUL YATIRIM ORTAKLIĞI A.Ş.
8	ISGYO	İŞ GAYRİMENKUL YATIRIM ORTAKLIĞI A.Ş.
9	KGYO	KORAY GAYRİMENKUL YATIRIM ORTAKLIĞI A.Ş.
10	KRGYO	KÖRFEZ GAYRİMENKUL YATIRIM ORTAKLIĞI A.Ş.
11	MRGYO	MARTI GAYRİMENKUL YATIRIM ORTAKLIĞI A.Ş.
12	MSGYO	MİSTRAL GAYRİMENKUL YATIRIM ORTAKLIĞI A.Ş.
13	OZKGYO	ÖZAK GAYRİMENKUL YATIRIM ORTAKLIĞI A.Ş.
14	PAGYO	PANORA GAYRİMENKUL YATIRIM ORTAKLIĞI A.Ş.
15	RYGYO	REYSAŞ GAYRİMENKUL YATIRIM ORTAKLIĞI A.Ş.
16	SRVGYO	SERVET GAYRİMENKUL YATIRIM ORTAKLIĞI A.Ş.
17	SNGYO	SİNPAŞ GAYRİMENKUL YATIRIM ORTAKLIĞI A.Ş.
18	TRGYO	TORUNLAR GAYRİMENKUL YATIRIM ORTAKLIĞI A.Ş.
19	VKGYO	VAKIF GAYRİMENKUL YATIRIM ORTAKLIĞI A.Ş.
20	YGGYO	YENİ GİMAT GAYRİMENKUL YATIRIM ORTAKLIĞI A.Ş.

Studies in the literature were reviewed to identify the input and output variables used in the study. The input and output variables are listed in Table 2.

Table 2: Input and Output Variables

Input/Output	Ratios	Definitions
Input	Current rate	Current Assets / Current Liability
	Leverage Ratio	(Short Term Liabilities + Long Term Liabilities) / Total Resource
	Long Term Debt-Asset Ratio	Long Term Load. / Total Assets
	Short Term Debt-Asset Ratio	Short Term Load. / Total Assets
	Equity-Asset Ratio	Total Equity / Total Assets
Output	Assets Profitability Ratio	Net Profit (Loss) for the Period / Total Assets
	Net Profit Margin	Net Profit / Net Sales
	Gross Margin	(Sales - Cost of Sales) / Sales Revenues

The data obtained by examining the balance sheets and income statements of 20 companies within the scope of the analysis for the years 2019–2020–2021 were included in the analysis. In DEA, the number of decision units should be one more than the sum of the number of inputs and the number of outputs, and twice the sum of the number of inputs and outputs (Boussofiane, Dyson, and Thanassoulis, 1991: 1–15, as cited in Kayalıdere and Kargın 2004: 205). These two constraints are provided for the reliability of DEA.

4. APPLICATION

Table 3 lists the financial ratios that were determined through calculations based on the years using the input and output variables.

Table 3: Financial Ratios of Companies by Years

Order	Code	Output Variables									Input Variables														
		Return on Assets			Net Profit Margin			Gross Profit Margin			Current Ratio			Leverage Ratio			Long-Term Asset Ratio			Debt-Asset Ratio			Short-Term Debt-Equity Ratio		
		2019	2020	2021	2019	2020	2021	2019	2020	2021	2019	2020	2021	2019	2020	2021	2019	2020	2021	2019	2020	2021	2019	2020	2021
1	AKMGYO	0.32	0.21	0.36	0.69	0.65	0.79	0.69	0.64	0.72	9.09	3.62	18.58	0.04	0.10	0.03	0.01	0.01	0.01	0.03	0.09	0.02	0.96	0.90	0.97
2	ALGYO	0.25	0.18	0.41	10.76	12.31	10.34	0.95	0.93	0.99	58.21	59.72	22.21	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.99	0.99	0.99
3	AGYO	0.06	0.00	0.13	1.00	0.05	2.32	0.42	0.44	0.51	0.89	0.31	5.81	0.07	0.07	0.01	0.04	0.01	0.01	0.02	0.06	0.01	0.93	0.93	0.99
4	AVGYO	0.16	0.20	0.08	3.42	5.11	3.07	0.94	0.96	0.97	36.42	39.60	2.70	0.01	0.00	0.04	0.00	0.00	0.00	0.01	0.00	0.04	0.99	1.00	0.96
5	DZGYO	0.02	0.01	0.10	0.88	0.02	0.21	0.71	0.19	0.28	0.18	1.08	2.18	0.69	0.65	0.28	0.30	0.09	0.00	0.38	0.55	0.28	0.31	0.35	0.72
6	EKGYO	0.03	0.03	0.04	0.14	0.18	0.20	0.27	0.24	0.33	2.34	2.17	2.03	0.43	0.49	0.49	0.07	0.11	0.07	0.36	0.39	0.42	0.57	0.51	0.51
7	HLGYO	0.11	0.10	0.08	2.47	2.32	3.62	0.68	0.57	0.68	0.43	0.21	0.26	0.15	0.17	0.28	0.00	0.02	0.04	0.15	0.14	0.24	0.85	0.83	0.72
8	ISGYO	0.05	0.05	0.20	0.25	0.48	2.72	0.21	0.36	0.59	1.01	0.48	0.49	0.32	0.21	0.18	0.11	0.03	0.03	0.22	0.18	0.15	0.68	0.79	0.82
9	KGYO	0.05	0.02	0.20	0.09	0.04	0.41	0.22	0.21	0.21	4.59	4.61	4.33	0.16	0.14	0.12	0.07	0.06	0.05	0.08	0.08	0.08	0.84	0.86	0.88
10	KRGYO	0.11	0.04	0.13	1.16	0.29	0.87	0.83	0.58	0.68	14.14	5.20	4.75	0.08	0.28	0.22	0.02	0.16	0.10	0.06	0.11	0.12	0.92	0.72	0.78
11	MRGYO	0.03	0.01	0.11	0.79	0.34	16.20	0.92	0.91	0.79	0.34	1.28	1.63	0.52	0.51	0.24	0.00	0.38	0.19	0.52	0.12	0.05	0.48	0.49	0.76
12	MSGYO	0.14	0.05	0.44	2.44	1.06	5.39	0.76	0.85	0.83	7.95	9.32	4.84	0.03	0.03	0.05	0.00	0.00	0.00	0.03	0.03	0.04	0.97	0.97	0.95
13	OZKGYO	0.07	0.11	0.28	0.59	0.52	1.71	0.43	0.33	0.47	1.80	3.28	2.30	0.49	0.41	0.26	0.26	0.29	0.12	0.22	0.12	0.14	0.51	0.59	0.74
14	PAGYO	0.06	0.03	0.21	0.71	0.56	3.32	0.74	0.65	0.69	5.70	1.23	5.07	0.01	0.03	0.01	0.00	0.00	0.00	0.01	0.02	0.01	0.99	0.97	0.99
15	RYGYO	0.20	0.12	0.27	2.55	1.55	4.76	0.87	0.87	0.84	0.15	0.42	0.66	0.39	0.40	0.30	0.23	0.22	0.15	0.17	0.18	0.15	0.61	0.60	0.70
16	SRVGYO	0.05	0.37	0.13	0.55	0.74	1.66	0.63	0.85	0.44	0.57	3.10	0.62	0.50	0.36	0.43	0.36	0.18	0.21	0.15	0.18	0.22	0.50	0.64	0.57
17	SNGYO	0.04	0.03	0.28	0.13	0.08	1.49	0.32	0.39	0.48	1.43	1.10	3.25	0.89	0.88	0.57	0.53	0.48	0.47	0.36	0.40	0.10	0.11	0.12	0.43
18	TRGYO	0.06	0.02	0.27	0.87	0.26	3.58	0.69	0.61	0.79	0.90	0.49	0.48	0.38	0.36	0.27	0.22	0.18	0.13	0.16	0.18	0.14	0.62	0.64	0.73
19	VKGYO	0.05	0.04	0.10	4.38	1.53	1.91	0.34	0.31	0.76	0.37	1.17	1.22	0.40	0.51	0.47	0.26	0.16	0.11	0.14	0.35	0.36	0.60	0.49	0.53
20	YGGYO	0.15	0.05	0.25	1.47	0.66	2.52	0.78	0.71	0.75	13.22	15.02	9.55	0.01	0.01	0.02	0.00	0.00	0.00	0.01	0.01	0.02	0.99	0.99	0.98

In the analysis, the input- and output-oriented CCR and BCC models of DEA are used to maximize the outputs. Table 4 provides descriptive statistics for the three-year financial ratios of the companies included in the analysis for the years 2019–2020–2021.

Table 4: Descriptive Statistics

N=20	Year	Mean	Median	Stand. D.	Min	Max
Asset Profitability	2019	0.10	0.06	0.08	0.02	0.32
	2020	0.08	0.05	0.09	0.00	0.37
	2021	0.20	0.20	0.11	0.04	0.44
	Total	0.13	0.10	0.11	0.00	0.44
Net Profit Margin	2019	1.77	0.88	2.42	0.09	10.76
	2020	1.44	0.54	2.81	0.02	12.31
	2021	3.35	2.42	3.80	0.20	16.20
	Total	2.19	0.94	3.13	0.02	16.20
Gross Margin	2019	0.62	0.69	0.25	0.21	0.95
	2020	0.58	0.60	0.26	0.19	0.96
	2021	0.64	0.69	0.22	0.21	0.99
	Total	0.61	0.68	0.24	0.19	0.99
Current Ratio	2019	7.99	1.62	14.56	0.15	58.21
	2020	7.67	1.73	15.16	0.21	59.72
	2021	4.65	2.50	5.89	0.26	22.21
	Total	6.77	2.18	12.48	0.15	59.72
Leverage Ratio	2019	0.28	0.24	0.26	0.01	0.89
	2020	0.28	0.25	0.25	0.00	0.88
	2021	0.21	0.23	0.18	0.01	0.57
	Total	0.26	0.23	0.23	0.00	0.89
Long-Term Liabilities/Assets Ratio	2019	0.12	0.06	0.15	0.00	0.53
	2020	0.12	0.08	0.14	0.00	0.48
	2021	0.08	0.05	0.11	0.00	0.47
	Total	0.11	0.06	0.14	0.00	0.53
Short Term Liabilities/Assets Ratio	2019	0.15	0.15	0.15	0.01	0.52
	2020	0.16	0.12	0.15	0.00	0.55
	2021	0.13	0.11	0.12	0.01	0.42
	Total	0.15	0.12	0.14	0.00	0.55
Equity/Asset Ratio	2019	0.72	0.76	0.26	0.11	0.99
	2020	0.72	0.76	0.25	0.12	1.00
	2021	0.79	0.77	0.18	0.43	0.99
	Total	0.74	0.77	0.23	0.11	1.00

According to the 3-year data of real estate investment trusts, it has been determined that the return on assets is 13%, the net profit margin is 219%, and the gross profit margin is 61%. Additionally, it has been determined that the average leverage ratio for real estate investment trusts is 0.26, the average long-term debt-to-asset ratio is 0.11, and the average short-term debt-to-asset ratio is 0.15, all of which are above the optimal value (current ratio > 1) of 1 and equity financing accounts for 74% of its average assets.

Table 5 contains the coefficients of the findings of the Pearson correlation analysis between the input and output variables used for the DEA study.

Table 5: Correlation Analysis Between Variables

	Year	Asset Profitability	Net Profit Margin	Gross Margin
Current Ratio	2019	0.58**	0.81**	0.50*
	2020	0.37	0.93**	0.51*
	2021	0.59**	0.17	0.33
Leverage Ratio	2019	-0.74**	-0.47*	-0.42
	2020	-0.36	-0.46*	-0.51*
	2021	-0.33	-0.31	-0.34
Long-Term Liabilities/Assets Ratio	2019	-0.51*	-0.42	-0.56**
	2020	-0.21	-0.36	-0.27
	2021	-0.05	-0.10	-0.21
Short Term Liabilities/Assets Ratio	2019	-0.70**	-0.47*	-0.38
	2020	-0.26	-0.40	-0.58**
	2021	-0.51*	-0.35	-0.40
Equity/Asset Ratio	2019	0.74**	0.47*	0.42
	2020	0.36	0.45*	0.51*
	2021	0.33	0.31	0.34

Indicates significance at the *5% level, ** at the 1% level.

According to the correlation values of 2019; It was observed that there is a positive and significant relationship between current ratio and return on assets (r=0.58, p<0.01), net profit margin (r=0.81, p<0.01) and gross profit margin (r=0.50, p<0.05). It was observed that there was no significant relationship between leverage ratio and gross profit margin (r=-0.42, p>0.05) and there is a significant negative correlation between return on assets (r=-0.74, p<0.01) and net profit margin (r=-0.47, p<0.05). There is no significant relationship between long-term debt-to-asset ratio and net profit margin (r = -0.42, p > 0.05). In addition, it was observed that there is a negative significant relationship between return on assets (r = -0.51, p 0.05) and gross profit margin (r = -0.56, p 0.01). There is no significant relationship between short-term debt-to-asset ratio and gross profit margin (r = -0.38, p > 0.05). In addition, it was observed that there was a significant negative correlation between return on assets (r = -0.70, p 0.01) and net profit margin (r = -0.47, p 0.05). There is no significant relationship between equity-asset ratio and gross profit margin (r = 0.42, p > 0.05). In addition, it was observed that there was a significant positive correlation between return on assets (r = 0.74, p 0.01) and net profit margin (r = 0.47, p 0.05).

According to the correlation values of 2020; There is no significant relationship between current ratio and return on assets (r=0.37, p>0.05). In addition, it was observed that there was a significant positive correlation between net profit margin (r=0.93, p<0.01) and gross profit margin (r=0.51, p<0.05). There is no significant relationship between leverage ratio and return on assets (r=-0.36, p>0.05). However, it was observed that there was a significant negative correlation between net profit margin (r=-0.46, p<0.05) and gross profit margin (r=-0.51, p<0.05). There is a significant difference between the long-term debt-to-asset ratio and return on assets (r = -0.21, p > 0.05), the net profit margin (r = -0.36, p > 0.05), and the gross profit margin (r = -0.27, p > 0.05). No relationship was observed. There is no significant relationship between short-term debt-to-asset ratio and return on assets (r = -0.26, p > 0.05) or net profit margin (r = -0.40, p > 0.05). On the other hand, it was observed that there was a significant negative correlation between short-term debt-asset ratio and gross profit margin (r = -0.58, p 0.01). There is no significant relationship between the equity-asset ratio and return on assets (r = 0.36, p > 0.05). It was observed that there is a significant positive correlation between net profit margin (r = 0.45, p 0.05) and gross profit margin (r = 0.51, p 0.05).

According to the correlation values of 2021; There is no significant relationship between current ratio and net profit margin (r=0.17, p>0.05) and gross profit margin (r=0.33, p>0.05). It was observed that there is a significant positive correlation between return on assets (r=0.59, p<0.01). It was observed that there was no significant relationship between leverage ratio and return on assets (r=-0.33, p>0.05), net profit margin (r=-0.31, p>0.05), gross profit margin (r=-0.34, p>0.05). There is no significant relationship between long-term debt-to-asset ratio and return on assets (r=-0.05, p>0.05), net profit margin (r=-0.10, p>0.05), gross profit margin (r=-0.21, p>0.05). There is no significant relationship between short-term debt-asset ratio and net profit margin (r=-0.35, p>0.05) and gross profit margin (r=-0.40, p>0.05). It was observed that there is a negative significant relationship between short-term debt-asset ratio and return on assets (r=-0.51, p<0.05). It was observed that there was no significant relationship between equity-asset ratio and return on assets (r=0.33, p>0.05), net profit margin (r=0.31, p>0.05), gross profit margin (r=0.34, p>0.05).

4.1. Data Envelopment Analysis Efficiency Results

The CCR model output-oriented scale efficiency results of 20 companies in the real estate investment partnership index are given in Table 6.

Tablo 6: CCR Technical Efficiency Changes

Company	CCR Technical Efficiency		
	2019	**2020**	**2021**
AKMGYO	1.000	1.000	0.863
ALGYO	1.000	1.000	1.000
AGYO	1.000	1.000	0.726
AVGYO	1.000	1.000	1.000
DZGYO	1.000	0.427	0.569
EKGYO	0.303	0.389	0.502
HLGYO	1.000	1.000	1.000
ISGYO	0.308	0.625	1.000
KGYO	0.290	0.265	0.488
KRGYO	1.000	0.670	0.772
MRGYO	1.000	1.000	1.000
MSGYO	1.000	1.000	1.000
OZKGYO	0.539	0.503	0.874
PAGYO	1.000	1.000	1.000
RYGYO	1.000	1.000	1.000
SRVGYO	0.872	1.000	0.630
SNGYO	1.000	1.000	1.000
TRGYO	0.807	0.753	1.000
VKGYO	1.000	0.995	1.000
YGGYO	1.000	1.000	0.897
Mean	0.856	0.831	0.866
Number of Effective Decision Units	14	12	11
Efficiency Percentage	70%	60%	55%

Eight companies that were relatively active in2019,2020, and 2021 were identified using the CCR technical efficiency values. It has been observed that these companies ALGYO, AVGYO, HLGYO, MRGYO, MSGYO, PAGYO, RYGYO, SNGYO have become output-oriented in 3 years. According to the output-oriented CCR technical efficiency values, 55% of the 20 companies in 2021, 60% of the 20 companies in 2020, and 70% of the 20 companies in 2019 are all operating in a reasonably efficient way.

Real estate investment trusts performed better in 2021 than they did in 2019 and 2020, according to average efficiency values.

Figure 1: Output Oriented CCR Technical Efficiency Changes by Years

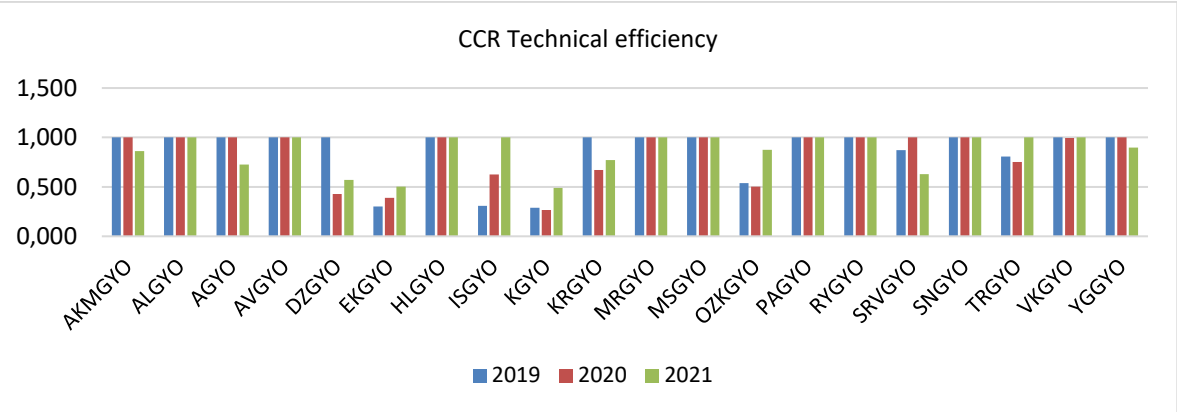


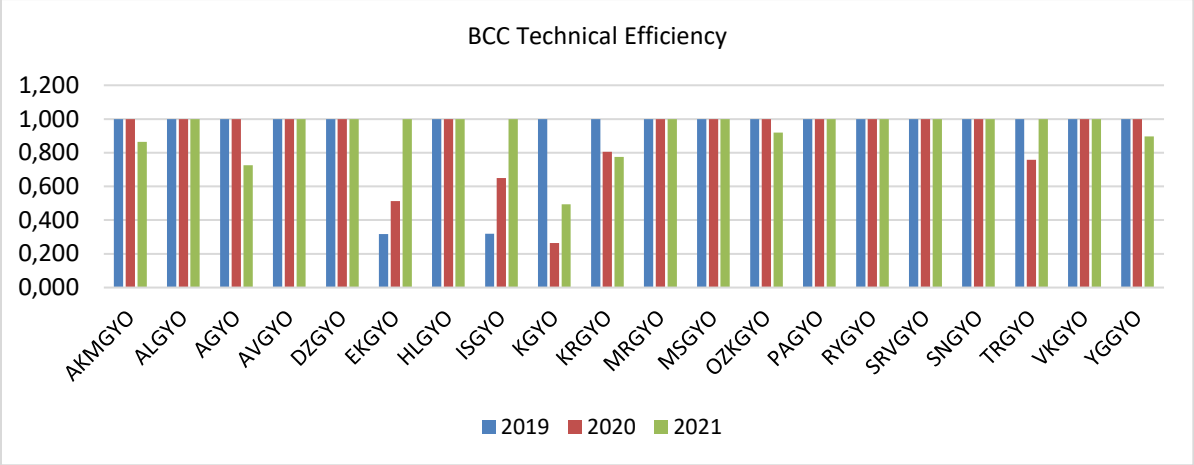
Table 7 displays the output-oriented scale efficiency statistics for 20 enterprises that are members of the real estate investment partnership index.

Table 7: BCC Technical Efficiency Changes

Company	BCC Technical Efficiency		
	2019	2020	2021
AKMGYO	1.000	1.000	0.864
ALGYO	1.000	1.000	1.000
AGYO	1.000	1.000	0.726
AVGYO	1.000	1.000	1.000
DZGYO	1.000	1.000	1.000
EKGYO	0.318	0.513	1.000
HLGYO	1.000	1.000	1.000
ISGYO	0.320	0.650	1.000
KGYO	1.000	0.265	0.494
KRGYO	1.000	0.805	0.775
MRGYO	1.000	1.000	1.000
MSGYO	1.000	1.000	1.000
OZKGYO	1.000	1.000	0.919
PAGYO	1.000	1.000	1.000
RYGYO	1.000	1.000	1.000
SRVGYO	1.000	1.000	1.000
SNGYO	1.000	1.000	1.000
TRGYO	1.000	0.758	1.000
VKGYO	1.000	1.000	1.000
YGGYO	1.000	1.000	0.897
Mean	0.932	0.900	0.934
Number of Effective Decision Units	18	15	14
Efficiency Percentage	90%	75%	70%

According to BCC technical efficiency values, relatively active 11 companies have been identified in 2019, 2020 and 2021. It has been observed that these companies ALGYO, AVGYO, DZGYO, HLGYO, MRGYO, MSGYO, PAGYO, RYGYO, SRVGYO, SNGYO, VKGYO have been effective in 3 years with a focus on output. Looking at the output-oriented BCC technical efficiency values, 90% of 20 companies in 2019, 75% in 2020, and 70% in 2021 are operating relatively effective. Looking at the average efficiency values, it can be said that real estate investment trusts operated more effectively in 2021 compared to 2019 and 2020.

Figure 2: Output Oriented BCC Technical Efficiency Changes by Years



The CCR/BCC model output-oriented scale efficiency results of 20 companies included in the real estate investment partnership index are given in Table 8.

Table 8: CCR/BCC Scale Activity Changes

Company	CCR/BCC Scale Efficiency		
	2019	2020	2021
AKMGYO	1.000	1.000	0.998
ALGYO	1.000	1.000	1.000
AGYO	1.000	1.000	1.000
AVGYO	1.000	1.000	1.000
DZGYO	1.000	0.427	0.569
EKGYO	0.953	0.758	0.502
HLGYO	1.000	1.000	1.000
ISGYO	0.963	0.962	1.000
KGYO	0.290	1.000	0.989
KRGYO	1.000	0.832	0.996
MRGYO	1.000	1.000	1.000
MSGYO	1.000	1.000	1.000
OZKGYO	0.539	0.503	0.951
PAGYO	1.000	1.000	1.000
RYGYO	1.000	1.000	1.000
SRVGYO	0.872	1.000	0.630
SNGYO	1.000	1.000	1.000
TRGYO	0.807	0.993	1.000

VKGYO	1.000	0.995	1.000
YGGYO	1.000	1.000	1.000
Mean	0.921	0.923	0.932
Number of Effective Decision Units	14	13	13
Activity Percentage	70%	65%	65%

Ten businesses that were relatively active in 2019, 2020, and 2021 were identified using the CCR/BCC scale efficiency ratings. With an emphasis on output, it has been noted that the following companies—ALGYO, AGYO, AVGYO, HLGYO, MRGYO, MSGYO, PAGYO, RYGYO, SNGYO, and YGGYO—have been successful in the past three years.

Figure 3: Output Oriented CCR/BCC Scale Efficiency Changes by Years

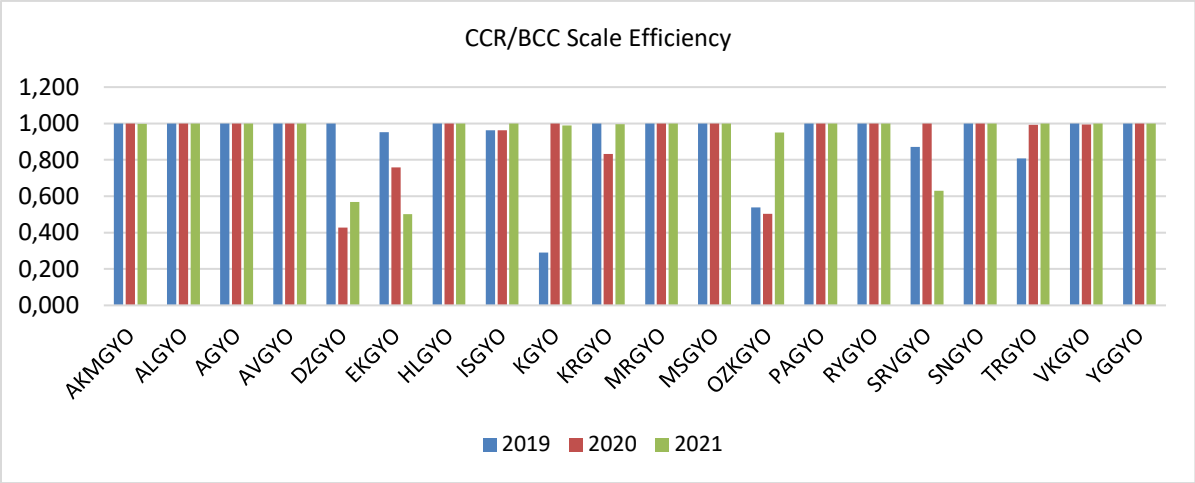
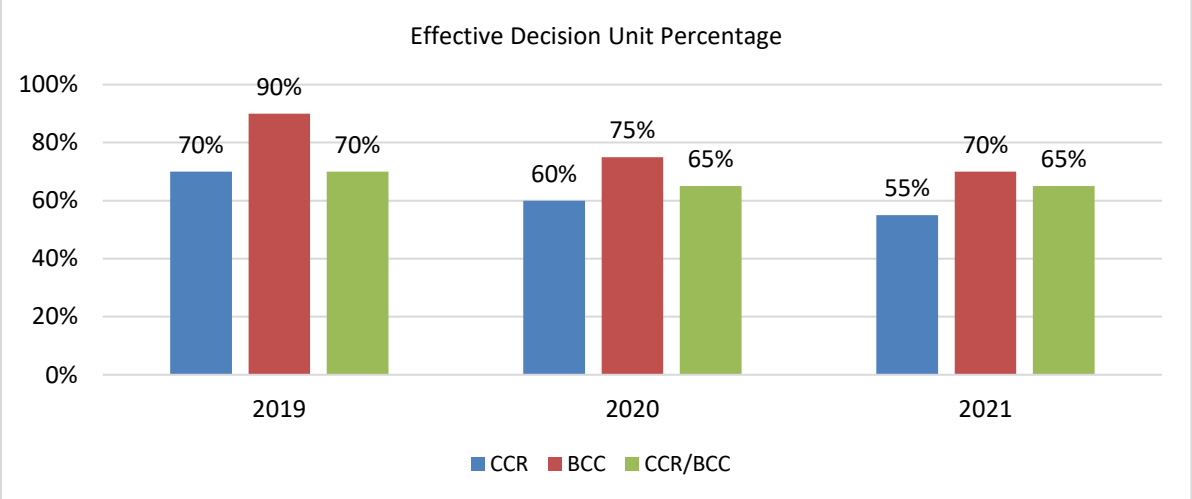


Figure 4: Effective Decision Unit Percentage



4.2. Malmquist Productivity Analysis Results

For the 20 real estate investment partnership firms included in the analysis (2019–2020–2021), 3-year period efficiency change (effch), technological change (techch), pure efficiency (pech), scale efficiency change (sech), and total factor productivity change (tfpch) values were calculated. The average Malmquist indices for each year are provided in the tables below.

Table 9: 2019-2020 Malmquist Index Summary

Company	Malmquist Index Summary 2019-2020				
	Efficiency change	Technological change	Pure Efficiency change	Scale Efficiency change	Total Factor Productivity Change
AKMGYO	1.00	0.63	1.00	1.00	0.63
ALGYO	1.00	1.07	1.00	1.00	1.07
AGYO	1.00	0.79	1.00	1.00	0.79
AVGYO	1.00	0.67	1.00	1.00	0.67
DZGYO	0.43	0.60	1.00	0.43	0.26
EKGYO	1.29	0.68	1.60	0.80	0.88
HLGYO	1.00	0.54	1.00	1.00	0.54
ISGYO	2.03	0.90	2.02	1.00	1.82
KGYO	0.92	0.99	0.27	3.44	0.91
KRGYO	0.67	1.04	1.00	0.67	0.70
MRGYO	1.00	0.52	1.00	1.00	0.52
MSGYO	1.00	0.66	1.00	1.00	0.66
OZKGYO	0.93	1.05	1.00	0.93	0.98
PAGYO	1.00	1.14	1.00	1.00	1.14
RYGYO	1.00	0.60	1.00	1.00	0.60
SRVGYO	1.15	0.14	1.00	1.15	1.57
SNGYO	1.00	1.05	1.00	1.00	1.05
TRGYO	0.93	0.99	0.76	1.23	0.92
VKGYO	0.99	0.48	1.00	0.99	0.47
YGGYO	1.00	0.69	1.00	1.00	0.69
Ort.	0.98	0.79	0.98	1.00	0.77

When the Malmquist Index (2019-2020) table is examined, it is seen that there is an increase in Malmquist total factor productivity in 2020 compared to 2019 for ALGYO, ISGYO, PAGYO, SRVGYO, SNGYO companies for 2019-2020. On the other hand, it has been determined that the companies AKMGYO, AGYO, AVGYO, DZGYO, EKGYO, HLGYO, KGYO, KRGYO, MRGYO, MSGYO, OZKGYO, RYGYO, TRGYO, VKGYO, YGGYO have decreased in Malmquist total factor productivity in 2020 compared to 2019. If we look at the change in technical efficiency for 2019-2020, since the technical efficiency change of AKMGYO, ALGYO, AGYO, AVGYO, EKGYO, HLGYO, ISGYO, MRGYO, MSGYO, PAGYO, RYGYO, SRVGYO, SNGYO, YGGYO is 1 and above, it can be said that these companies have reached the production limit. The most technically efficient company is ISGYO. When it comes to technological efficiency change in 2019-2020, it can be said that ALGYO, KRGYO, OZKGYO, PAGYO, and SNGYO companies use it more effectively. The company that uses the technological efficiency change most effectively is PAGYO.

If we look at the scale efficiency change for the years 2019-2020, the company that reached the most effective production size was determined to be KGYO (3.44). It is followed by TRGYO (1.23) and SRVGYO (1.15).

Table 10: 2020-2021 Malmquist Index Summary

Company	Malmquist Index Summary 2020-2021				
	Efficiency change	Technological change	Pure Efficiency change	Scale Efficiency change	Total Factor Productivity Change
AKMGYO	0.86	2.04	0.86	1.00	1.76
ALGYO	1.00	1.69	1.00	1.00	1.69

AGYO	0.73	1.50	0.73	1.00	1.09
AVGYO	1.00	1.42	1.00	1.00	1.42
DZGYO	1.33	1.95	1.00	1.33	2.60
EKGYO	1.29	1.22	1.95	0.66	1.57
HLGYO	1.00	1.07	1.00	1.00	1.07
ISGYO	1.60	1.33	1.54	1.04	2.12
KGYO	1.83	1.577	1.85	0.99	2.89
KRGYO	1.15	1.01	0.78	1.49	1.16
MRGYO	1.00	3.04	1.00	1.00	3.04
MSGYO	1.00	3.06	1.00	1.00	3.06
OZKGYO	1.74	1.24	0.92	1.89	2.15
PAGYO	1.00	1.83	1.00	1.00	1.83
RYGYO	1.00	1.37	1.00	1.00	1.37
SRVGYO	0.63	1.19	1.00	0.63	0.75
SNGYO	1.00	0.81	1.00	1.00	0.81
TRGYO	1.33	1.42	1.32	1.01	1.88
VKGYO	1.005	1.66	1.00	1.005	1.67
YGGYO	0.90	2.00	0.90	1.00	1.80
Mean.	1.08	1.53	1.06	1.02	1.66

When the Malmquist Index (2020-2021) table is examined, it is seen that AKMGYO, ALGYO, AGYO, AVGYO, DZGYO, EKGYO, HLGYO, ISGYO, KGYO, KRGYO, MRGYO, MSGYO, OZKGYO, PAGYO, RYGYO, TRGYO, VKGYO, YGGYO companies have increased Malmquist total factor productivity in 2021 compared to 2020. On the other hand, it has been determined that SRVGYO, SNGYO companies have a decrease in Malmquist total factor productivity in 2021 compared to 2020.

If we look at the change in technical efficiency for the year 2020-2021, since the technical efficiency change of ALGYO, AVGYO, DZGYO, EKGYO, HLGYO, ISGYO, KGYO, KRGYO, MRGYO, MSGYO, OZKGYO, PAGYO, RYGYO, SNGYO, TRGYO, VKGYO is 1 and above. It can be said that these companies have reached the production limit. The most technically efficient company is KGYO.

If we look at the technological efficiency change for the year 2020-2021, it can be said that AKMGYO, ALGYO, AGYO, AVGYO, DZGYO, EKGYO, HLGYO, ISGYO, KGYO, KRGYO, MRGYO, MSGYO, OZKGYO, PAGYO, RYGYO, SRVGYO, TRGYO, VKGYO and YGGYO companies use technological efficiency change more effectively. The company that uses the technological efficiency change most effectively is MSGYO.

If we examine the scale efficiency change for the years 2020–2021, OZKGYO was found to have attained the most efficient production size (1.89). Next are KRGYO (1.49) and DZGYO (1.33).

Table 11: Malmquist Index Summary of Company Means

Company	Malmquist Index Summary of Company Means				
	Efficiency change	**Technological change**	**Pure Efficiency change**	**Scale Efficiency change**	**Total Factor Productivity Change**
AKMGYO	0.93	1.13	0.93	1.00	1.05
ALGYO	1.00	1.35	1.00	1.00	1.35
AGYO	0.85	1.09	0.85	1.00	0.93
AVGYO	1.00	0.97	1.00	1.00	0.97
DZGYO	0.75	1.08	1.00	0.75	0.82
EKGYO	1.29	0.91	1.77	0.73	1.18
HLGYO	1.00	0.76	1.00	1.00	0.76

ISGYO	1.80	1.09	1.76	1.02	1.96
KGYO	1.30	1.253	0.70	1.85	1.63
KRGYO	0.88	1.02	0.88	1.00	0.90
MRGYO	1.00	1.26	1.00	1.00	1.26
MSGYO	1.00	1.42	1.00	1.00	1.42
OZKGYO	1.27	1.14	0.96	1.33	1.45
PAGYO	1.00	1.45	1.00	1.00	1.45
RYGYO	1.00	0.91	1.00	1.00	0.91
SRVGYO	0.85	1.27	1.00	0.85	1.08
SNGYO	1.00	0.92	1.00	1.00	0.92
TRGYO	1.11	1.18	1.00	1.11	1.32
VKGYO	1.000	0.89	1.00	1.000	0.89
YGGYO	0.95	1.17	0.95	1.00	1.11
Mean.	1.03	1.10	1.02	1.01	1.13

When the 3-year Malmquist Index table of the company averages is analyzed, it is seen that the Malmquist total factor productivity of the AKMGYO, ALGYO, EKGYO, ISGYO, KGYO, MRGYO, MSGYO, OZKGYO, PAGYO, SRVGYO, TRGYO, and YGGYO companies has increased. On the other hand, it was determined that the Malmquist total factor productivity of AGYO, AVGYO, DZGYO, HLGYO, KRGYO, RYGYO, SNGYO, and VKGYO companies decreased.

If we look at the change in the 3-year technical efficiency of the company averages, it can be said that the companies ALGYO, AVGYO, EKGYO, HLGYO, ISGYO, KGYO, MRGYO, MSGYO, OZKGYO, PAGYO, RYGYO, SNGYO, TRGYO and VKGYO have reached the production limit since their technical efficiency change is 1 and above. The most technically efficient company is ISGYO.

If we look at the 3-year technological efficiency change of the company, it can be said that AKMGYO, ALGYO, AGYO, DZGYO, ISGYO, KGYO, KRGYO, MRGYO, MSGYO, OZKGYO, PAGYO, SRVGYO, TRGYO, and YGGYO companies use technological efficiency change more effectively. The company that uses the technological efficiency change most effectively is PAGYO. If we look at the 3-year scale efficiency change of the company, the company that reached the most effective production size was determined to be KGYO (1.85). Next are OZKGYO (1.33) and TRGYO (1.11).

Table 12: Malmquist Index Means Summary

Malmquist Index Means Summary					
	Efficiency change	**Technological change**	**Pure Efficiency change**	**Scale Efficiency change**	**Total Factor Productivity Change**
2019-2020	0.98	0.79	0.98	1.00	0.77
2020-2021	1.08	1.53	1.06	1.02	1.66
Mean	1.03	1.10	1.02	1.01	1.13

Analyzing the efficiency values of 20 real estate investment partnership firms in the 2019–2021 period on the axis of Malmquist Index averages, it is seen that the period with the highest technical efficiency, technological efficiency, pure efficiency, scale efficiency, and total factor productivity change is the 2020–2021 period. In addition, for the years 2019–2020–2021, the average sector improved by 3% in technical efficiency change, 10% in technological efficiency change, 1% in scale efficiency change, and 13% in total factor productivity change.

Tablo 13: Malmquist Total Factor Productivity Ranking

Company	Teknik Efficiency change		Technological Efficiency change		Total factor productivity change	
	Productivity	Ranking	Productivity	Ranking	Productivity	Ranking
AKMGYO	0.93	16	1.13	10	1.05	12
ALGYO	1.00	6	1.35	3	1.35	6
AGYO	0.85	18	1.09	12	0.93	14
AVGYO	1.00	6	0.97	15	0.97	13
DZGYO	0.75	20	1.08	13	0.82	19
EKGYO	1.29	3	0.91	17	1.18	9
HLGYO	1.00	6	0.76	20	0.76	20
ISGYO	1.80	1	1.09	11	1.96	1
KGYO	1.30	2	1.25	6	1.63	2
KRGYO	0.88	17	1.02	14	0.90	17
MRGYO	1.00	6	1.26	5	1.26	8
MSGYO	1.00	6	1.42	2	1.42	5
OZKGYO	1.27	4	1.14	9	1.45	3
PAGYO	1.00	6	1.45	1	1.45	4
RYGYO	1.00	6	0.91	18	0.91	16
SRVGYO	0.85	19	1.27	4	1.08	11
SNGYO	1.00	6	0.92	16	0.92	15
TRGYO	1.11	5	1.18	7	1.32	7
VKGYO	1.00	6	0.89	19	0.89	18
YGGYO	0.95	15	1.17	8	1.11	10

5.CONCLUSION AND IMPLICATIONS

In the study, the Malmquist total factor productivity index is used to measure the efficiency of the companies, to determine the financial ratios, such as current ratio, leverage ratio, long-term debt-to-asset ratio, short-term debt-to-asset ratio, equity-to-asset ratio, return on assets, net profit margin, and gross profit margin, and to determine the efficiency and the importance level of these ratios in total factor productivity of 20 real estate investment trusts operating in 2019-2020-2021.

The results of the analysis show that 8 companies that are relatively efficient according to their CCR technical efficiency values have been identified; these are ALGYO, AVGYO, HLGYO, MRGYO, MSGYO, PAGYO, RYGYO, and SNGYO. It has been observed that these companies have been effective in an output-oriented way over the past three years.

Another result is that 11 companies were relatively active according to their BCC technical efficiency values. It has been observed that these companies, ALGYO, AVGYO, DZGYO, HLGYO, MRGYO, MSGYO, PAGYO, RYGYO, SRVGYO, SNGYO, and VKGYO, have been effective as output-oriented in the years observed. According to the CCR/BCC scale efficiency values, there are 10 companies that are relatively efficient; these are ALGYO, AGYO, AVGYO, HLGYO, MRGYO, MSGYO, PAGYO, RYGYO, SNGYO, and YGGYO. It has been observed that these companies are effective as output-oriented.

Another result is that ALGYO, ISGYO, PAGYO, SRVGYO and SNGYO companies increased their Malmquist total factor productivity in 2020 compared to 2019. On the other hand, the Malmquist total factor productivity of AKMGYO, AGYO, AVGYO, DZGYO, EKGYO, HLGYO, KGYO, KRGYO, MRGYO, MSGYO, OZKGYO, RYGYO, TRGYO, VKGYO and YGGYO companies decreased in 2020 compared to 2019. Finally, considering the 3-year scale efficiency change, KGYO is the company that reaches the most effective production size. OZKGYO and TRGYO follow.

The firms that are below the efficiency limit need to take a few things into account, according to the results. They need to alter a few input variables to reach a higher level of efficiency. It is anticipated that all these findings will support the decision-making of the companies and the investors who are considering investing in these companies.

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NEW TOURISM FINANCIAL CONDITION INDEX: EXTENDED WITH TERRORIST ATTACKS*

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ABSTRACT

Purpose- In this study, a composite indicator that can be followed in the financial markets has been developed. The tourism financial conditions index has been developed in the literature for tourism based on MCI (Monetary Conditions Index) and FCI (Financial Conditions Index). The index is called the Tourism Financial Conditions Index in their studies. This study ensures that the calculation of the tourism index by adding the terror variable to the index can better reflect the expectations.

Methodology- While constructing the composite indicator Z-score is used for standardization. With this standardization terrorist attacks variable is added to the composite indicator. The relationship between New Tourism Financial Composite Indicator and Tourism Stock Market Index Return is analyzed with the Threshold VAR method. This method is used because of the nonlinearity of variables.

Findings: Monthly data for the period 2009:07 – 2017:12 were used in the study. The countries examined are Australia, Denmark, France, Italy, Spain, Türkiye and the UK. It is aimed to examine the relationship between the calculated NTFCI and the Tourism Stock Exchange data of each country. T-VAR results show the relationship between these variables.

Conclusion - In this study, the new version of the TFCI index with terrorist incidents is presented. Chang (2015) developed the TFCI index for the tourism sector. We think that the countries should also consider the effect of terrorism in their economic and financial research in tourism area. Based on this idea, the index was expanded by adding the terror variable to the previously developed TFCI composite indicator and its relationship with the tourism stock market index as a financial indicator was examined. The TVAR model is applied which shows the short-term dynamic relationship. Models for different countries were estimated and similar results were obtained for different countries.

Keywords: Tourism financial conditions index, tourism sector, monetary conditions index, financial conditions index
JEL Codes: E44, E47, G32

1. INTRODUCTION

The literature on studies reveals the importance of the tourism sector in terms of its contribution to economic growth. The tourism sector's unique structure, with high direct and indirect effects, requires the contribution to the economy to be analyzed from different perspectives. The tourism sector provides revenue, creates jobs, and supports the development of related industries, improving the balance of trade and having a positive impact on local economies. Additionally, the growth of the sector can positively affect liquidity and financial markets, leading to an increase in demand for financial products and services, a more attractive financial market, and boosting economic growth. As a matter of fact, when evaluating the contribution of the tourism sector to the economy, it should not only be evaluated in terms of its contribution to the current account deficit but also its importance in terms of financial markets should be emphasized. However, it's also worth noting that the tourism sector is often vulnerable to external factors such as global economic conditions and natural disasters, which can negatively impact financial markets. However, the sector is also vulnerable to external factors such as global economic conditions and natural disasters. Overall, it's clear that the tourism sector has a significant impact on the economy and should

*An earlier version of the article was presented on November 1, 2019, at the Istanbul Finance Congress. Title of this version is "A suggestion for financial condition index for the Turkish tourism sector", includes a technical discussion of the underlying standardization statistics for Turkiye.

be carefully evaluated and managed to ensure sustainable growth. Therefore, it's significant for the sector to monitor the stability/instability position to manage risks to the economy.

On the other hand, terrorist incidents can significantly negatively impact tourism, leading to a decrease in demand for travel to the affected region or country. This can result in a loss of revenue for the tourism industry, which can have broader economic implications for the affected area. The fear of future terrorist attacks can also discourage potential tourists from visiting a destination, even if they have not been directly impacted by an incident. As a result, the threat of terrorism can have a long-lasting impact on tourism demand. However, it is essential to note that the effects of terrorism on tourism are often short-term and localized (Bilgili et. al., 2021). Terrorism can cause a decline in the number of tourists, negatively affect the tourism industry's reputation, and lead to long-term economic damage (Korstanje, 2023). Thus terrorism can create significant vulnerability in the tourism sector, and any study related to tourism should not overlook the impact of terrorist attacks.

This study develops a composite indicator, the Tourism Financial Conditions Index, that can be followed in financial markets. Based on the Monetary Conditions Index and the Financial Conditions Index, the Tourism Financial Conditions Index was developed by Chang, Hsu, and McAleer (2014), and further refined in later studies (Chang, 2015; Chang, Hsu, and McAleer, 2017). This study argues that by adding the terror variable into the index calculation, the tourism index can better reflect expectations.

2. LITERATURE REVIEW

The literature has various methods to measure different aspects of tourism, such as efficiency, sustainability, financial conditions, climate risk, medical tourism attractiveness, and trust in tourism. For instance, Mieczkowski (1985) proposed a tourism climatic index calculation method as a combined measure of tourists' climatic well-being in order to determine the climate-tourism relationship. These proposed indices represent a quantitative assessment of the world's climate for international tourism purposes. De La VIina et al. (1994) used the principal component analysis method to calculate the Tourism Efficiency Index in their studies. They have formed an indicator for the tourism industry. As a result, an index based on factor analysis was created. It was shown that the sector performance was measured correctly. Fernández and Rivero (2009) proposed a method based on factor loadings and a global composite index to measure tourism sustainability. In the creation of this index, both World Travel & Tourism Council (WTTC)'s and Yale University's criteria were used to measure the sustainability of tourism. In the study, they stated that tourism sustainability is a multidimensional concept that depends on many factors. In this new index proposed with the name Sustainable Tourism Index (ST index), they argued that it is more appropriate to determine different factor loads for different factors rather than giving equal weight to all sustainability indicators when measuring.

Göktuğ Kaya, Onifade, and Akpinar, (2022) study also investigate the relation between terrorism and tourism. They applied empirical research with ARDL method for the consequences of terrorist attacks on tourism revenues in Turkey. Examining the existence of the effect of terrorism on tourism is not a new idea. There are many studies made especially for Turkey. however, this study is important in terms of its use in a tourism index.

Chang (2015) created a new daily tourism financial indicator for Taiwan regarding daily financial stock index returns, tourism stock market sub index returns, exchange rate returns, and interest rate differentials. In other words, he proposed the Tourism Financial Conditions Index (TFCI). This index was created by adapting and expanding the TFCI, the widely used Monetary Conditions Index (MCI), and the Financial Conditions Index (FCI) to tourism stock data. However, the method of calculating the daily TFCI differs from the existing methods of constructing the MCI and FCI in terms of calculating the weights. Unlike TFCI calculations in the literature, in this study, the method GARCH, GJR, and EGARCH conditional volatility models are discussed to capture the natural volatility in daily tourism stock index returns. As a result of the study, the findings showed that the new tourism financial conditions index can be estimated by using the conditional average of the tourism stock market index return. In addition, by emphasizing the simplicity of the use and interpretation of the new daily TFCI obtained, it was stated that it would be useful in predicting the current economic and financial environment for tourism stock index returns, especially since it is based on the calculation and interpretation of publicly available information.

Olya and Alipour (2015) propose a mathematical approach to climate risk using extreme precipitation probabilities. In the study, the probability of excessive precipitation was calculated, and the data was then added to the Tourism Climate Index formula for each station on the island. Then, geo-statistical techniques were used and a spatial risk model related to climate was created. Fetscherin and Stephano (2016) aimed to create a Medical Tourism Index, which is a country-based performance measure, to evaluate the attractiveness of a country in terms of health tourism. According to the findings obtained as a result of the study, it was stated that the Medical Tourism Index allows for the measurement of the significant differences between countries. Croce (2016) conducted a study to examine the relationship between trust and tourism. For this purpose, the UNWTO Tourism Confidence Index and the number of international tourists were used for the period 1999-2013, and the crisis and cyclical fluctuations were tried to be estimated with the help of ARIMA models. According to the empirical results of the study, it has been emphasized that the Tourism Confidence Index obtained by the questionnaires

collected by the UNWTO since the second quarter of 2003 is more successful in estimating the crisis and cyclical fluctuations. It is stated that the UNWTO Tourism Confidence Index captures the changes in tourism demand created by external shocks, as well as short-term systematic factors.

Chaivichayachat (2019) used Chang (2015) methodology for constructing an economic indicator "economic condition for tourism (ECT) index". He used this new indicator for Thailand tourism sector. The most important aspect of this study, which is similar to ours, is the use of crime rate in their index. Crime rate is one of the most important economic factors to determine the ECT index and for the forecasting the number of foreign tourists in Chaivichayachat (2019) study.

Again, based on the study of Chang (2015), Malkina, and Ovcharov (2021) examined the relationship between the Tourism Industry Stress Index (TSI) and the Financial Stress Index (FSI) indexes. The countries Finland, Italy, Germany and Spain between 1993 and 2020 is analyzed fort the relationship between TSI and FSI. Both indices are developed in their study and Granger causality is used. The causality relation between FSI-TSI showed that financial turmoil led to increased tourism market stress with an average lag of three months. The contribution of this study is Financial Stress Index and they put forward that FSI can be used as a predictor of the Tourism Industry Stress Index.

3. COMPOSITION OF NTFCI

Chang, Hsu and McAleer (2017) have created an alternative composite indicator for tourism based on the MCI (Monetary Conditions Index) and FCI (Financial Conditions Index) indexes in the TFCI index they developed in their 2014, 2015, 2017 studies. The method used in their study is briefly as follows. In this index, unlike MCI and FCI, the calculation of weights has been changed. When the basis of the index is examined, the FCI is derived from the MCI index. MCI index is short run interest rate and exchange rate linear combination,

$$MCI = Q_1(e_t - e_0) + Q_2(r_1 - r_0) \quad (1)$$

By adding house price and stock price to this linear combination, information about financial markets has become available.

$$FCI = Q_1(e_t - e_0) + Q_2(r_1 - r_0) + Q_3(a_1 - a_0) \quad (2)$$

TFCI is constructed far to summarize current economy and tourism conditions into a single statistical index.

The formation of MCI and FCI indices, the calculation of the parameters here and the literature on the parameters are given in the study of Chang (2015). The point we want to underline the attention to here is the possibility that the use of estimation-based calculations for Q1, Q2, Q3 may change from period to period and from country to country. However, the existing studies in the literature are quite successful in clearly demonstrating that the proxy variables used are important in terms of MCI and FCI.

The TFCI model explained in the studies of Chang (2015) and Chang et al (2017) was created as follows.

$$TFCI = c + Q_1 REE_t + Q_2 DIR_t + Q_3 RTCC_t + u_t \quad (3)$$

The variables used here are REE; real effective exchange, DIR; interest rate and RTCC; composite coincident stock index and i.i.d. error terms are defined as shocks that do not necessarily occur. Q_1, Q_2, Q_3 are coefficients (weights) obtained from OLS regression.

The TFCI index obtained from these calculations was modeled with the Tourism industry stock index (RTS).

$$RTS = TFCI_t + v_t \sim v_t \sim D(0, \sigma_v^2) \quad (4)$$

In equation 4 v_t do not need to be independent or i.i.d. distributed because;

$$RTS = c + Q_1 REE_t + Q_2 DIR_t + Q_3 RTCC_t + u_t + v_t \quad (5)$$

As given in 5th equation $(u_t + v_t)$ shocks construct the new error term as it is given in equation 6.

$$\varepsilon_t = u_t + v_t \sim D(0, \sigma_\varepsilon^2) \quad (6)$$

However, ε_t shocks shown in equation (6) are also i.i.d. It has been shown that the equation (5) can be used after estimation by OLS or ML method.

Chang et. all (2017) study transformed the stochastic structure of the model as follows.

$$RTS = TFCI_t + v_t \sim v_t \sim D(0, \sigma_v^2) \quad (7)$$

In the study, the structure between the related variables was examined by making a factor analysis. The idea in the study of Chang, Hsu, and McAleer (2017) is that the RTS variable is the observable version of the unobservable TFCI composite indicator. Based on this idea, the weights of the variables thought to be related were determined using factor analysis.

In this study, the hypothesis that the method used instead of the stochastic weight determination method is a more useful and accurate weighting method is based on the hypothesis. However, instead of using the analysis of the relationship of the created NTFCI (New TFCI) variable with RTS as an apriori information set, it is evaluated as an observation of a result relationship, that is, as an ex-post information set.

At this point, the study differs from Chang (2015) and the literature developed in 3 subjects. Although ARCH Family models are used in the study, it is thought that there are two limitations. The first is that the Q parameters need to be converted to weights components instead of estimation. Since the Q parameters to be used in the creation of composite indicators will vary according to the period and country in which they are applied, and they contain errors such as u_t, v_t , it is estimated that making linear combinations will give more unbiased results after the relevant variables are selected, making them not to cause scale problems with the necessary normalization method.

The second point is that the error terms are not i.i.d. errors. Using GARCH Family models or Newey-West Hac. standard error estimation is required.

The third issue is the contribution to the content of the index. The rapidly increasing terrorist incidents in the world have a significant impact on the economic relationship of countries based on tourism.

Based on these 3 issues, it was created by standardizing the index and we added the terrorism variable as a variable that should be included in the index.

The index composed from this point of view is given below.

$$TFCI_i = \delta_1 REE_i + \delta_2 CCI_i + \delta_3 CLI_i + \delta_4 CPI_i + +\delta_5 ARV_i + \delta_6 TRR_i \quad (8)$$

It is in the structure of a composite indicator, which is formed in the form of an index. Since the data used in equation 8 are different in structure and contain nominal variables, the effect on the indicator should be standardized while being brought together. The z-score method was used for standardization.

There are many types of data normalization in the literature. Data normalization is particularly useful for modeling practice where data are often at different scales. Although there are many different techniques such as Min-max, Z-score, and Median normalization in the literature, min-max and z-score methods are often preferred (Jain, Nandakumar & Ross, 2005; Jain & Bhandare, 2011; Nayak, Misra & Behera, 2014; Chiaramonte, Croci & Poli, 2015; Svirydzenka, 2016; Mare, Moreira & Rossi, 2017; Jain, Shukla & Wadhvani, 2018). For this reason, the z-score method, which is one of the most frequently used statistical normalization methods, was used in the normalization of the variables in the study.

The most commonly used score normalization technique is the z-score, which is calculated using the arithmetic mean and standard deviation of the given data. In the Z-score method, each observation data is divided by its standard deviation after subtracting from the observation mean in order to eliminate the difference in the measurement unit of the data.

$$z_i = \frac{X_i - \mu}{\sigma} \quad (9)$$

μ is arithmetic mean and σ is standard deviation. Z-score normalization determines a common numerical range for the normalized scores of different structures. In order to calculate TFCI, the different structure between the data was corrected by transforming the variables according to the z-score method. After the variables were normalized, the NTFCI index was calculated.

$$Z\ Skore: TFCI_i = zCCI_i + zCLI_i + zCPI_i + zREE_i + zARV_i + zTRR_i \quad (10)$$

3. DATA AND ECONOMETRIC METHODOLOGY

This section contains information about the data and analysis method.

3.1.Data

Monthly data for the period 2009:07 – 2017:12 was used in the study. The countries examined are Australia, Denmark, France, Italy, Spain, Turkiye and the UK. It is aimed to examine the relationship between the calculated NTFCI and the Tourism Stock Exchange data of each country. The sources of data used in the study are World Bank Database, Global Terrorism Database, and UNWTO Tourism Data.

The definitions of the variables used in this study are given below.

- ✓ CCI; Consumer confidence index (This consumer confidence indicator provides an indication of future developments of households' consumption and saving, based upon answers regarding their expected financial situation, their sentiment about the general economic situation, unemployment, and capability of savings).

- ✓ CLI; Composite leading indicator (The composite leading indicator (CLI) is designed to provide early signals of turning points in business cycles showing fluctuation of the economic activity around its long-term potential level. CLIs show short-term economic movements in qualitative rather than quantitative terms.).
- ✓ CPI: Consumer Price Index (Inflation measured by consumer price index (CPI) is defined as the change in the prices of a basket of goods and services that are typically purchased by specific groups of households).
- ✓ REE; Real Effective Exchange Rate (Real effective exchange rate, is obtained by purifying relative price effects in the nominal effective exchange rate.).
- ✓ ARV; Total Visitor Arrivals.
- ✓ TRR; Number of terrorist attacks in Global Terrorism Database.

3.2. Z Score Calculations

The standardization methods applied to the variables are reported below.

$Consumer\ confidence\ index$: $zCCI_i = \frac{CCI_i - \mu_{CCI}}{\sigma_{CCI}}$ (12)

Composite leading indicator: $zCLI_i = \frac{CLI_i - \mu_{CLI}}{\sigma_{CLI}}$ (13)

Consumer Price Index: $sCPI_i = \frac{CPI_i - \mu_{CPI}}{\sigma_{CPI}}$ (14)

Real Effective Exchange Rate: $sREE_i = \frac{REE_i - \mu_{REE}}{\sigma_{REE}}$ (15)

$Total\ Visitor\ Arrivals$: $sARV_i = \frac{ARV_i - \mu_{ARV}}{\sigma_{ARV}}$ (16)

Number of terrorist attacks: $sTRR_i = \frac{CCI_i - \mu_{CCI}}{\sigma_{CCI}}$ (17)

3.3. Econometric Methodology

For the composite indicator obtained as a result of standardization, firstly, seasonal adjustment was applied. In the second stage, unit root analysis was performed. The unit root tests applied are ADF, Phillips Perron and KPSS unit root tests. In the next step, the relationship between Return and NTFCI variables for each country was estimated using the threshold VAR method. In this section, econometric methodology explanations of the threshold VAR method are written, since ADF, Phillips Perron and KPSS tests are frequently used in the literature, no theoretical explanation is given in this section.

Threshold VAR Methodology - In this paper Balke (2000) TVAR approach is followed and Eviews 9 program is used. The composite indicator and return variables for selected countries are non-linear and with this method this non-linear dynamic relation can be taken into account. T-VAR also report the impulse response functions among these variables.

The TVAR model is introduced with the model given below.

$$Yt = A^1 Y_t + B^1(L)Y_{t-1} + (A^2 Yt + B^2(L)Y_{t-1})I\left[v_{t-d} > \gamma\right] + U_t \quad (18)$$

Y_t is a nx1 vector of endogenous variables and I[ ] is the indicator function which equals 1 when $v_{t-d} > \gamma$ and 0 if $v_{t-d} \leq \gamma$. $B^1(L),\ B^2(L)$ are lag polynomial matrices, U_t are structural disturbances, V_{t-d} is the threshold variable.

In this study nx1 vector of endogenous variables denoted as Z_t and Rt. The indicator function equals 1 when Return variable is higher than the threshold value. The lag value noted as "d". Number of lags selected for each country is different from each other and selected with using lag length criteria. The lag value for Australia, Denmark and Italy is six, for France seven, for Spain eight, for Turkey five and UK is four respectively.

In first step we estimated TVAR model and tested the difference of the regimes. This test procedure is known as Wald test procedure. Three main test types are revealed in Balke (2000) study which are named as; sup-Wald, avg-Wald and exp-Wald tests. Critical values are obtained as using the procedure of Hansen (1996). Nonlinear impulse-response functions estimation is also obtained and interpreted.

4. ECONOMETRIC FINDINGS

The unit root test and non-linearity tests applied in the study were also determinative in the country selection. Thus Australia, Denmark, France, Italy, Spain, Turkey, and the UK are selected for applying the long-run relationship. It has been determined that the tourism index and return data calculated for the above-mentioned countries are stationary.

As is seen in Table 1, the selected countries' Tourism index and Return variables are stationary according to ADF and PP tests. The KPSS test results sigs also stationarity for different significance levels accept Denmark's Return variable. When all test results were evaluated, the analyzes were continued with the assumption that this variable was stationary as well.

Table 1: Unit Root Test Results

Unit Root Test	**ADF**		**Philips-Perron**		**KPSS**	
Country	**Z-Score**	**Return**	**Z-Score**	**Return**	**Z-Score**	**Return**
AUSTURALIA	-3.919262	-12.11078	-3.867946	-12.33404	0.222333	0.125062
DENMARK	-5.235158	-10.67427	-5.215262	-10.64488	0.162476	0.606449**
FRANCE	-4.793902	-10.87698	-4.705331	-10.89989	0.338685	0.082959
ITALY	-3.935316	-10.49419	-3.938032	-10.49600	0.431459	0.166875
SPAIN	-3.912693	-11.41181	-3.327871	-11.57763	0.709181**	0.047779
TURKEY	-3.832844	-8.346489	-3.499046	-8.234617	0.311268	0.280124
UK	-2.927522	-10.93481	-3.209026	-10.93476	0.750358*	0.133773
	ADF Test Critical Values:		PP Test Critical Values:		KPSS Test Critical Values:	
	1% level	-3.493747	1% level	-3.492523	1% level	0.739000
	5% level	-2.889200	5% level	-2.888669	5% level	0.463000
	10% level	-2.581596	10% level	-2.581313	10% level	0.347000

Since all variables are stationary, it is envisaged to establish a VAR model. In order to decide whether the model to be built is linear or non-linear, the linearity test was carried out with the BDS test.

Table 2: BDS Test Results

0,5	**Z-score**	**Return**	**Dim**	
AUSTURALIA	0.04358	0.00039	3	0,05
DENMARK	0.06396	0.00012	3	0,9525
FRANCE	0.05835	0.00485	3	0,05
ITALY	0.03871	0.00440	3	0,05
SPAIN	0.08129	0.01591	2	0,05
TURKEY	0.08117	0.00698	3	0,05
UK	0.06266	0.00360	3	0,05

For %5 percent significance BDS results signs non-linearity accepting Denmark Return variable. For this result, the non-linearity is tested using the Caner Hansen Unit root test, and this test signs non-linearity and stationarity.

Table 3: Threshold VAR threshold and Wald test results

Country	**Estimated Threshold Value**	**Wald Statistics for Structural VAR**		
		Sup-	**Avg-**	**Exp-**
AUSTURALIA	0.0075	61.53	41.07	27.22
		(0.00)	(0.00)	(0.00)
DENMARK	1.3870	69.45	40.53	31.26
		(0.00)	(0.00)	(0.00)
FRANCE	0.0447	113.91	93.18	54.1
		(0.00)	(0.00)	(0.00)
ITALY	0.2343	59.51	39.45	26.62
		(0.00)	(0.00)	(0.00)
SPAIN	0.3800	64.73	48.71	29.92
		(0.00)	(0.00)	(0.00)
TURKEY	-0.1870	53.82	32.52	23.90
		(0.00)	(0.00)	(0.00)
UK	-1.6831	40.48	25.46	17.47
		(0.00)	(0.00)	(0.00)

In Table 3 brief threshold VAR test results are reported. The main equations and impulse-response results are given below.

The first TVAR results are belong to Australia. Z_t defines New Tourism Financial Composite Indicator (NTFCI) with terrorism effect and R_t is used for Australia's Tourism stock exchange market returns. NTFCI is chosen as threshold variable. This

selection helps to analyze the effect of NTFCI to Stock Market Tourism Index returns subject to the level of threshold variable. Estimated threshold value for Australia is 0.007. When the NTFCI is above this threshold value, the first regime realized and this regime is dominated at 64.4% of the period analyzed. If the NTFCI change is below the threshold level the second regime dominates and its realized at 35.6% of the period.

In first TVAR equation Tourism Stock Index Return (R_t) affected from NTFCI negative and positive for different lags but this positive and negative effects changes for different regimes. This implies the effect of threshold variable and value estimation is correct and NTFC has significant effects in different regimes. This effect is also valid for the second part of the T-VAR system. Another implication of second part is the relatively stronger relation between NTFC and R_t respectively.

$$R = 0.199 + 0.039R_{t-1} - 0.094R_{t-2} + 0.040R_{t-3} - 0.220R_{t-4} + 0.072R_{t-5} + 0.092R_{t-6} + 0.0007Z_{t-1} - 0.006Z_{t-2} + 0.02Z_{t-3} - 0.0009Z_{t-4} - 0.002Z_{t-5} + 0.001Z_{t-6} \quad 0.007534 \geq \tau$$
$$(0.008)\ (0.136)\ (0.129)\ (0.135)\ (0.132)\ (0.141)\ (0.136)\ (0.003)\ (0.004)\ (0.004)\ (0.004)\ (0.004)\ (0.003) \qquad (19)$$

$$R = 0.010 - 0.420R_{t-1} - 0.027R_{t-2} - 0.178R_{t-3} - 0.353R_{t-4} - 0.263R_{t-5} - 0.209R_{t-6} - 0.0005Z_{t-1} + 0.002Z_{t-2} - 0.007Z_{t-3} + 0.003Z_{t-4} + 0.003Z_{t-5} - 0.005Z_{t-6} \quad 0.007534 < \tau$$
$$(0.014)\ (0.206)\ (0.238)\ (0.205)\ (0.214)\ (0.211)\ (0.225)\ (0.004)\ (0.006)\ (0.006)\ (0.006)\ (0.006)\ (0.004)$$

$$Z = 0.173 - 2.112R_{t-1} - 9.369R_{t-2} + 8.628R_{t-3} - 3.855R_{t-4} - 2.55R_{t-5} - 2.336R_{t-6} + 0.583Z_{t-1} - 0.03Z_{t-2} + 0.393Z_{t-3} + 0.019Z_{t-4} + 0.063Z_{t-5} - 0.161Z_{t-6} \quad 0.007534 \geq \tau$$
$$(0.365)(6.022)\ (5.722)\ (5.964)\ (5.840)\ (6.251)\ (6.025)\ (0.152)\ (0.199)\ (0.189)\ (0.161)\ (0.166)\ (0.138) \qquad (20)$$

$$Z = -1.493 + 13.985R_{t-1} - 4.538R_{t-2} + 11.813R_{t-3} + 3.331R_{t-4} + 8.95R_{t-5} + 9.88R_{t-6} + 0.446Z_{t-1} - 0.446Z_{t-2} + 0.142Z_{t-3} - 0.079Z_{t-4} - 0.387Z_{t-5} + 0.451Z_{t-6} \quad 0.007534 < \tau$$
$$(0.495)\ (7.310)\ (8.448)\ (7.274)\ (7.590)\ (7.487)\ (7.988)\ (0.156)\ (0.203)\ (0.198)\ (0.196)\ (0.200)\ (0.152)$$

Figure 1: Response of Australia R_t to shock to Australia NTFCI

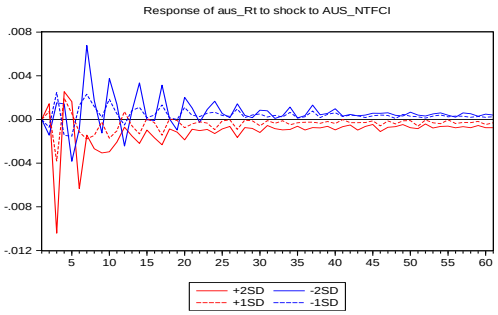

Figure 1 shows the response of the Tourism index return of Australia for positive and negative shocks to the variables in this system. A positive shock to NTFC leads to a temporary positive effect whereas a negative shock leads to a temporary negative effect on R_t. This effect disappears in the first term and is followed by a bigger opposite effect. Also, the opposite effect does not dissipate before the ninth period.

Denmark T-VAR model is given below. The estimated threshold value for Denmark is about 1.39. When the NTFCI is above this threshold value, the first regime is realized, and this regime is dominated at 28.7% of the period analyzed. If the NTFCI change is below the threshold level the second regime dominates and is realized at 71.3% of the period. The relation between those two variables is in the same direction, especially for the first lag. This positive relation changes generally after the third lag. The relatively small effect of terrorism is an expected issue for Denmark.

$$R = -0.048 - 0.026R_{t-1} - 0.239R_{t-2} + 0.565R_{t-3} - 0.032R_{t-4} + 0.256R_{t-5} - 0.16R_{t-6} + 0.007Z_{t-1} + 0.025Z_{t-2} - 0.029Z_{t-3} + 0.012Z_{t-4} - 0.007Z_{t-5} - 0.002Z_{t-6} \quad 1.387090 \geq \tau$$
$$(0.048)\ (0.262)\ (0.320)\ (0.339)\ (0.258)\ (0.208)\ (0.313)\ (0.015)\ (0.021)\ (0.024)\ (0.022)\ (0.008)\ (0.008) \qquad (21)$$

$$R = -0.0007 + 0.089R_{t-1} - 0.018R_{t-2} - 0.003R_{t-3} + 0.101R_{t-4} + 0.021R_{t-5} - 0.094R_{t-6} + 0.0002Z_{t-1} - 0.005Z_{t-2} + 7.918Z_{t-3} - 0.006Z_{t-4} + 0.003Z_{t-5} + 0.004Z_{t-6} \quad 1.387090 < \tau$$
$$(0.007)\ (0.129)\ (0.115)\ (0.114)\ (0.120)\ (0.132)\ (0.113)\ (0.004)\ (0.004)\ (0.004)\ (0.004)\ (0.005)\ (0.004)$$

$$Z = 1.802 - 3.577R_{t-1} - 6.936R_{t-2} + 12.783R_{t-3} + 7.341R_{t-4} - 1.224R_{t-5} + 2.102R_{t-6} + 1.370Z_{t-1} - 1.613Z_{t-2} + 1.013Z_{t-3} - 0.979Z_{t-4} - 0.106Z_{t-5} + 0.665Z_{t-6} \quad 1.387090 \geq \tau$$
$$(1.153)\ (6.285)\ (7.680)\ (8.127)\ (6.182)\ (4.998)\ (7.505)\ (0.370)\ (0.513)\ (0.583)\ (0.531)\ (0.192)\ (0.189) \qquad (22)$$

$$Z = -0.013 - 4.517R_{t-1} + 2.284R_{t-2} + 3.081R_{t-3} + 7.924R_{t-4} - 0.367R_{t-5} + 4.844R_{t-6} + 0.367Z_{t-1} + 0.191Z_{t-2} + 0.106Z_{t-3} + 0.001Z_{t-4} - 0.027Z_{t-5} - 0.121Z_{t-6} \quad 1.387090 < \tau$$
$$(0.204)\ (3.618)\ (3.220)\ (3.179)\ (3.360)\ (3.696)\ (3.162)\ (0.112)\ (0.113)\ (0.107)\ (0.105)\ (0.132)\ (0.124)$$

Figure 2: Response of Denmark R_t to Shock to Denmark NTFCI

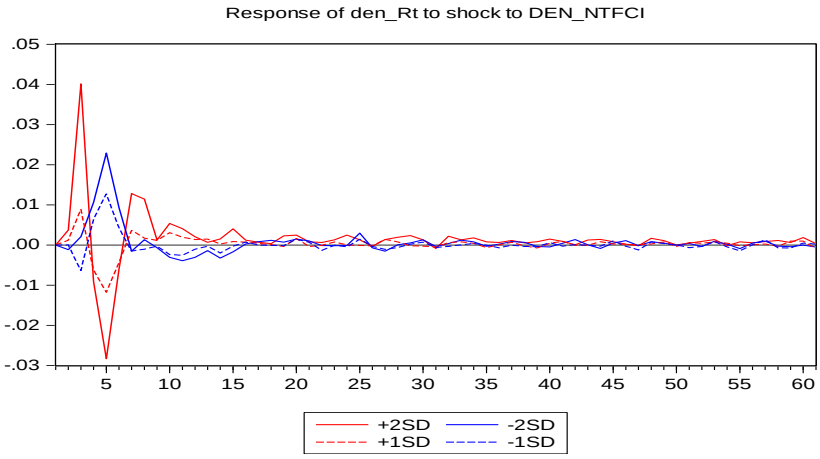

Figure 2 shows the response of the Tourism index return of Denmark for positive and negative shocks to the variables in this system. A positive shock to NTFC leads to a temporary positive effect whereas a negative shock leads to a temporary negative effect on R_t. The relatively high positive effect ends in the third term and fluctuates for several terms. The effect of this shock disappears in the eighteenth term. The negative shock effect also has the same direction effect but after the first term this effect turns into a positive effect and disappears in the fifteenth period.

The first TVAR results below belong to France. Zt defines New Tourism Financial Composite Indicator (NTFCI) with a terrorism effect and R_t is used for France Tourism stock exchange market returns. NTFCI is chosen as the threshold variable. The estimated threshold value for France is 0.0447. When the NTFCI is above this threshold value, the first regime is realized and this regime is dominated at 45.5% of the period analyzed. If the NTFCI change is below the threshold level the second regime dominates and is realized at 54.5% of the period.

$$R = \underset{(0.013)}{0.02} + \underset{(0.179)}{0.098}R_{t-1} - \underset{(0.191)}{0.084}R_{t-2} - \underset{(0.176)}{0.085}R_{t-3} + \underset{(0.177)}{0.049}R_{t-4} + \underset{(0.171)}{0.091}R_{t-5} - \underset{(0.180)}{0.019}R_{t-6} + \underset{(0.174)}{0.169}R_{t-7} - \underset{(0.006)}{0.016}Z_{t-1} + \underset{(0.008)}{0.01}Z_{t-2} - \underset{(0.009)}{0.002}Z_{t-3} - \underset{(0.012)}{0.003}Z_{t-4} + \underset{(0.012)}{0.0003}Z_{t-5} - \underset{(0.006)}{0.002}Z_{t-6} + \underset{(0.006)}{0.003}Z_{t-7} \quad 0.0447 \geq \tau$$

$$R = \underset{(0.009)}{0.02} - \underset{(0.238)}{0.356}R_{t-1} - \underset{(0.206)}{0.018}R_{t-2} + \underset{(0.205)}{0.061}R_{t-3} + \underset{(0.212)}{0.061}R_{t-4} - \underset{(0.208)}{0.071}R_{t-5} - \underset{(0.187)}{0.260}R_{t-6} - \underset{(0.188)}{0.11}R_{t-7} - \underset{(0.007)}{0.005}Z_{t-1} - \underset{(0.008)}{0.0046}Z_{t-2} + \underset{(0.012)}{0.0009}Z_{t-3} + \underset{(0.011)}{0.003}Z_{t-4} + \underset{(0.009)}{0.003}Z_{t-5} - \underset{(0.008)}{0.006}Z_{t-6} + \underset{(0.007)}{0.001}Z_{t-7} \quad 0.0447 < \tau \qquad (23)$$

$$Z = \underset{(0.384)}{-0.858} - \underset{(5.466)}{0.94}R_{t-1} + \underset{(5.839)}{14.771}R_{t-2} + \underset{(5.386)}{13.456}R_{t-3} + \underset{(5.409)}{4.297}R_{t-4} + \underset{(5.217)}{4.597}R_{t-5} + \underset{(5.485)}{5.388}R_{t-6} + \underset{(5.329)}{4.7903}R_{t-7} + \underset{(0.192)}{0.654}Z_{t-1} + \underset{(0.240)}{0.329}Z_{t-2} + \underset{(0.261)}{0.012}Z_{t-3} + \underset{(0.368)}{0.423}Z_{t-4} - \underset{(0.380)}{0.569}Z_{t-5} - \underset{(0.177)}{0.023}Z_{t-6} + \underset{(0.172)}{0.812}Z_{t-7} \quad 0.0447 \geq \tau$$

$$Z = \underset{(0.286)}{0.474} - \underset{(7.401)}{10.253}R_{t-1} - \underset{(6.404)}{14.848}R_{t-2} + \underset{(6.364)}{0.042}R_{t-3} + \underset{(6.581)}{1.18}R_{t-4} + \underset{(6.465)}{5.627}R_{t-5} + \underset{(5.822)}{8.978}R_{t-6} - \underset{(5.845)}{2.845}R_{t-7} + \underset{(0.210)}{0.186}Z_{t-1} + \underset{(0.241)}{0.031}Z_{t-2} - \underset{(0.362)}{0.08}Z_{t-3} + \underset{(0.348)}{0.291}Z_{t-4} + \underset{(0.279)}{0.193}Z_{t-5} + \underset{(0.254)}{0.011}Z_{t-6} - \underset{(0.207)}{0.112}Z_{t-7} \quad 0.0447 \geq \tau \qquad (24)$$

Figure 3: Response of France R_t to Shock to France NTFCI

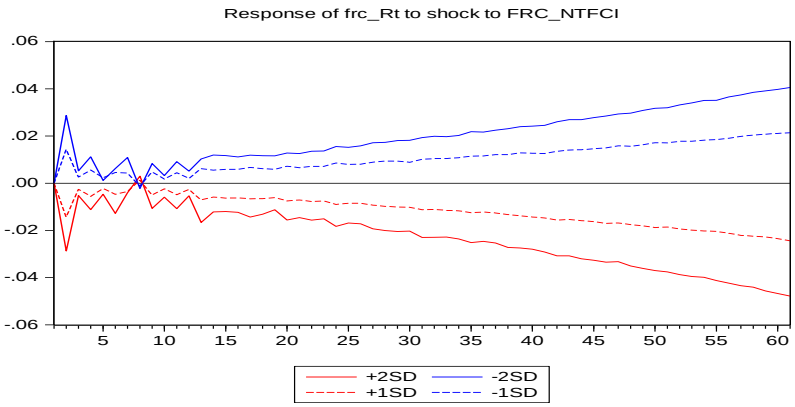

Figure 3 shows the response of the Tourism index return of France for positive and negative shocks to the variables in this system. A positive shock to NTFC leads to a negative effect whereas a negative shock leads positive effect on R_t. The positive

effect has its lowest value in the second period and disappears in the eighth period. This effect is also the same for the negative shock and the positive effect of negative shock also ends in the eighth period.

Italy T-VAR model is given below. The estimated threshold value for Italy is about 0.2343. When the NTFCI is above this threshold value, the first regime is realized, and this regime is dominated at 55.8% of the period analyzed. If the NTFCI change is below the threshold level the second regime dominates and is realized at 44.2% of the period. During the first regime when the NTFCI is above the threshold value return is affected negatively in the first, third, fourth, and fifth lags. This opposite relation turns to positive relation in the second regime except in the third period. A similar effect can be seen for the relation in the second part of the VAR system. The effect of return on NTFCI has a negative effect for various lags in the first regime but positive effects on NTFCI in the second regime.

$$R = \underset{(0.016)}{-0.002} \underset{(0.139)}{-0.074R_{t-1}} \underset{(0.148)}{-0.054R_{t-2}} \underset{(0.154)}{+0.185R_{t-3}} \underset{(0.141)}{+0.064R_{t-4}} \underset{(0.144)}{-0.033R_{t-5}} \underset{(0.159)}{+0.242R_{t-6}} \underset{(0.008)}{-0.015Z_{t-1}} \underset{(0.008)}{+0.018Z_{t-2}} \underset{(0.008)}{-0.001Z_{t-3}} \underset{(0.007)}{-0.002Z_{t-4}} \underset{(0.006)}{-0.007Z_{t-5}} \underset{(0.005)}{+0.004Z_{t-6}} \quad 0.2343 \geq \tau$$

$$R = \underset{(0.023)}{0.025} \underset{(0.260)}{+0.024R_{t-1}} \underset{(0.228)}{-0.318R_{t-2}} \underset{(0.234)}{+0.198R_{t-3}} \underset{(0.227)}{+0.084R_{t-4}} \underset{(0.213)}{+0.321R_{t-5}} \underset{(0.224)}{-0.113R_{t-6}} \underset{(0.006)}{+0.0004Z_{t-1}} \underset{(0.007)}{+0.008Z_{t-2}} \underset{(0.007)}{-0.009Z_{t-3}} \underset{(0.008)}{+0.0001Z_{t-4}} \underset{(0.010)}{+0.0001Z_{t-5}} \underset{(0.007)}{+0.003Z_{t-6}} \quad 0.2343 < \tau \qquad (25)$$

$$Z = \underset{(0.338)}{0.332} \underset{(2.882)}{-5.526R_{t-1}} \underset{(3.084)}{-6.023R_{t-2}} \underset{(3.195)}{-1.199R_{t-3}} \underset{(2.926)}{-2.809R_{t-4}} \underset{(2.988)}{+6.961R_{t-5}} \underset{(3.312)}{-0.167R_{t-6}} \underset{(0.159)}{+0.716Z_{t-1}} \underset{(0.174)}{+0.249Z_{t-2}} \underset{(0.158)}{-0.402Z_{t-3}} \underset{(0.151)}{-0.061Z_{t-4}} \underset{(0.124)}{+0.028Z_{t-5}} \underset{(0.109)}{-0.082Z_{t-6}} \quad 0.2343 \geq \tau$$

$$Z = \underset{(0.728)}{-1.153} \underset{(8.282)}{+13.562R_{t-1}} \underset{(7.285)}{+0.989R_{t-2}} \underset{(7.463)}{+2.428R_{t-3}} \underset{(7.239)}{+6.346R_{t-4}} \underset{(6.778)}{+8.181R_{t-5}} \underset{(7.147)}{+14.692R_{t-6}} \underset{(0.199)}{+0.530Z_{t-1}} \underset{(0.216)}{-0.032Z_{t-2}} \underset{(0.214)}{-0.104Z_{t-3}} \underset{(0.264)}{-0.028Z_{t-4}} \underset{(0.310)}{+0.299Z_{t-5}} \underset{(0.232)}{+0.010Z_{t-6}} \quad 0.2343 < \tau \qquad (26)$$

Figure 4: Response of Italy R_t to shock to Italy NTFCI

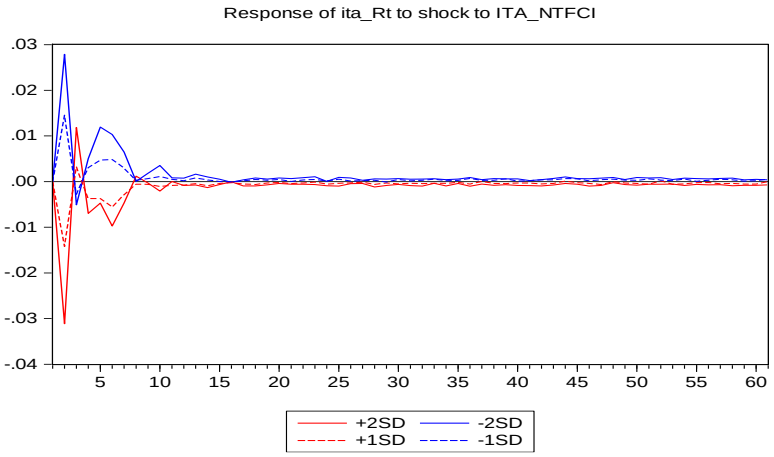

Figure 4 shows the response of the Tourism index return of Italy for positive and negative shocks to the variables in this system. A positive shock to NTFC leads to a negative effect whereas a negative shock leads positive effect on Rt. The positive effect has its lowest value in the second period and disappears in the eighth period. This effect is also the same for the negative shock and the positive effect of negative shock also reaches its end in the eighth period.

Spain T-VAR model is given below. The estimated threshold value for Italy is about 0.2343. When the NTFCI is above this threshold value, the first regime is realized, and this regime is dominated at 55.8% of the period analyzed. If the NTFCI change is below the threshold level the second regime dominates and is realized at 44.2% of the period. During the first regime when the NTFCI is above the threshold value return is affected negatively in the first, third, fourth, and fifth lags. This opposite relation turns to positive relation in the second regime except in the third period. A similar effect can be seen for the relation in the second part of the VAR system. The effect of return on NTFCI has a negative effect for various lags in the first regime but positive effects on NTFCI in the second regime.

$$R = \underset{(0.029)}{-0.004} \underset{(0.147)}{-0.091R_{t-1}} \underset{(0.148)}{+0.216R_{t-2}} \underset{(0.148)}{+0.013R_{t-3}} \underset{(0.138)}{-0.199R_{t-4}} \underset{(0.146)}{+0.221R_{t-5}} \underset{(0.150)}{+0.123R_{t-6}} \underset{(0.140)}{-0.026R_{t-7}} \underset{(0.141)}{-0.089R_{t-8}} \underset{(0.023)}{-0.021Z_{t-1}} \underset{(0.033)}{+0.023Z_{t-2}} \underset{(0.031)}{+0.017Z_{t-3}} \underset{(0.033)}{-0.004Z_{t-4}} \underset{(0.036)}{-0.052Z_{t-5}} \underset{(0.035)}{+0.035Z_{t-6}} \underset{(0.034)}{+0.020Z_{t-7}} \underset{(0.021)}{-0.016Z_{t-8}} \quad 0.3800 \geq \tau \qquad (27)$$

$$R = \underset{(0.035)}{0.069} \underset{(0.200)}{-0.182R_{t-1}} \underset{(0.190)}{-0.235R_{t-2}} \underset{(0.201)}{-0.138R_{t-3}} \underset{(0.207)}{-0.397R_{t-4}} \underset{(0.201)}{-0.260R_{t-5}} \underset{(0.208)}{-0.060R_{t-6}} \underset{(0.225)}{-0.112R_{t-7}} \underset{(0.216)}{+0.125R_{t-8}} \underset{(0.032)}{-0.012Z_{t-1}} \underset{(0.038)}{+0.049Z_{t-2}} \underset{(0.043)}{-0.017Z_{t-3}} \underset{(0.045)}{+0.001Z_{t-4}} \underset{(0.040)}{-0.050Z_{t-5}} \underset{(0.046)}{+0.035Z_{t-6}} \underset{(0.045)}{+0.024Z_{t-7}} \underset{(0.029)}{-0.002Z_{t-8}} \quad 0.3800 < \tau$$

$$Z = 0.437 + 0.063R_{t-1} - 0.516R_{t-2} - 0.216R_{t-3} + 0.512R_{t-4} + 1.484R_{t-5} - 0.510R_{t-6} + 0.598R_{t-7} + 2.385R_{t-8} + 1.107Z_{t-1} - 0.470Z_{t-2} + 0.362Z_{t-3} - 0.150Z_{t-4} - 0.242Z_{t-5} + 0.121Z_{t-6} - 0.289Z_{t-7} + 0.371Z_{t-8} \quad 0.3800 \geq \tau \quad (28)$$
$$(0.161)\ (0.807)\quad (0.811)\quad (0.811)\quad (0.756)\quad (0.800)\quad (0.824)\quad (0.772)\quad (0.774)\quad (0.124)\quad (0.181)\quad (0.172)\quad (0.183)\quad (0.199)\quad (0.194)\quad (0.186)\quad (0.114)$$

$$Z = 0.181 - 0.164R_{t-1} - 1.086R_{t-2} - 0.348R_{t-3} - 1.536R_{t-4} - 1.906R_{t-5} - 0.263R_{t-6} + 0.257R_{t-7} + 0.224R_{t-8} + 1.033Z_{t-1} + 0.357Z_{t-2} - 0.245Z_{t-3} - 0.340Z_{t-4} - 0.077Z_{t-5} - 0.013Z_{t-6} + 0.221Z_{t-7} + 0.018Z_{t-8} \quad 0.3800 < \tau$$
$$(0.244)\ (1.383)\quad (1.311)\quad (1.386)\quad (1.430)\quad (1.392)\quad (1.438)\quad (1.557)\quad (1.491)\quad (0.220)\quad (0.262)\quad (0.299)\quad (0.310)\quad (0.280)\quad (0.317)\quad (0.309)\quad (0.201)$$

Figure 5: Response of Spain R_t to Shock to Spain NTFCI

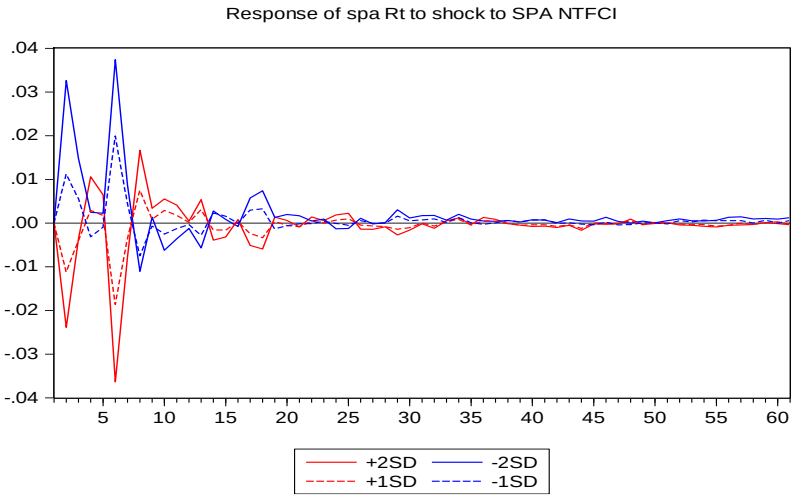

Figure 5 shows the response of the Tourism index return of Spain for positive and negative shocks to the variables in this system. A positive shock to NTFC leads to a negative effect whereas a negative shock leads positive effect on Rt. The positive effect has its lowest value in the sixth period and disappears in the twentieth period. This effect is also the same for the negative shock and the positive effect of negative shock also ends about the twentieth period.

The t-VAR model for Türkiye is given below. The estimated threshold value for the Türkiye model is -0,187. When the NTFCI is above the threshold value, the first regime is realized and the first regime is dominated at 60.8% of the period analyzed. Additionally, if the NTFCI is below the threshold level the second regime dominates and is realized at 39.2% of the period.

In the first TVAR equation R_t was affected by NTFCI negative and positive for different lags but these positive and negative effects changes for different regimes. This effect is also valid for the second part of the T-VAR system. Another implication of the second part is the relatively stronger relation between NTFC and R_t variables.

$$R = 0.010 - 0.001R_{t-1} - 0.266R_{t-2} - 0.080R_{t-3} - 0.059R_{t-4} + 0.270R_{t-5} - 0.009Z_{t-1} - 0.024Z_{t-2} + 0.033Z_{t-3} - 0.029Z_{t-4} + 0.016Z_{t-5} \quad -0.1870 \geq \tau \quad (29)$$
$$(0.017)\ (0.135)\quad (0.149)\quad (0.149)\quad (0.153)\quad (0.154)\quad (0.015)\quad (0.023)\quad (0.023)\quad (0.021)\quad (0.015)$$

$$R = 0.054 + 0.225R_{t-1} - 0.082R_{t-2} + 0.114R_{t-3} - 0.120R_{t-4} - 0.010R_{t-5} - 0.0001Z_{t-1} + 0.003Z_{t-2} - 0.001Z_{t-3} + 0.021Z_{t-4} - 0.008Z_{t-5} \quad -0.1870 < \tau$$
$$(0.023)\ (0.178)\quad (0.163)\quad (0.175)\quad (0.145)\quad (0.144)\quad (0.012)\quad (0.017)\quad (0.018)\quad (0.017)\quad (0.011)$$

$$Z = -0.013 + 0.160R_{t-1} - 3.091R_{t-2} + 3.483R_{t-3} + 0.319R_{t-4} + 1.341R_{t-5} + 1.404Z_{t-1} - 0.132Z_{t-2} - 0.574Z_{t-3} + 0.083Z_{t-4} + 0.163Z_{t-5} \quad -0.1870 \geq \tau \quad (30)$$
$$(0.197)\ (1.539)\quad (1.694)\quad (1.70)\quad (1.739)\quad (1.756)\quad (0.167)\quad (0.262)\quad (0.258)\quad (0.234)\quad (0.171)$$

$$Z = -0.073 + 1.353R_{t-1} + 1.360R_{t-2} + 3.073R_{t-3} + 2.483R_{t-4} - 0.474R_{t-5} + 0.834Z_{t-1} - 0.125Z_{t-2} + 0.105Z_{t-3} - 0.055Z_{t-4} + 0.116Z_{t-5} \quad -0.1870 < \tau$$
$$(0.232)\ (1.774)\quad (1.625)\quad (1.739)\quad (1.449)\quad (1.437)\quad (0.124)\quad (0.171)\quad (0.177)\quad (0.17)\quad (0.111)$$

Figure 6: Response of Türkiye R_t to Shock to Türkiye NTFCI

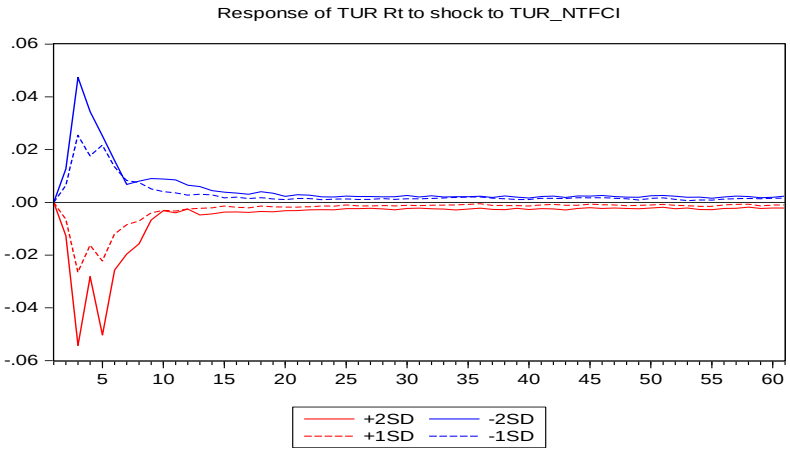

Figure 6 shows the response of the Tourism index return of Türkiye for positive and negative shocks to the variables in this system. A positive shock to NTFC leads to a negative effect whereas a negative shock leads positive effect on Rt. The positive effect has its lowest value in the third period and disappears about the twentieth period. This effect is also the same for the negative shock and the positive effect of negative shock also ends about the twentieth period.

The UK T-VAR model is given below. The estimated threshold value for Italy is about -1.68. When the NTFCI is above this threshold value, the first regime is realized, and this regime is dominated at 68.9% of the period analyzed. If the NTFCI change is below the threshold level the second regime dominates and is realized at 31.1% of the period. During the first regime when the NTFCI is above the threshold value Return variable is affected negatively in the first and second lags. This relation is also a negative relation in the second regime except in the first and fourth periods. In the second part of the VAR system, the effect of return on NTFCI has a negative effect for the first lag in the first regime but positive effects on NTFCI in the second regime except for the third lag.

$$\underset{(0.007)}{R = 0.015} \underset{(0.127)}{-0.223R_{t-1}} \underset{(0.125)}{+0.039R_{t-2}} \underset{(0.119)}{+0.038R_{t-3}} \underset{(0.120)}{-0.135R_{t-4}} \underset{(0.004)}{-0.0004Z_{t-1}} \underset{(0.005)}{-0.007Z_{t-2}} \underset{(0.005)}{+0.0004Z_{t-3}} \underset{(0.004)}{+0.005Z_{t-4}} \quad -1.6831 \geq \tau \tag{31}$$

$$\underset{(0.027)}{R = 0.024} \underset{(0.189)}{+0.049R_{t-1}} \underset{(0.185)}{-0.065R_{t-2}} \underset{(0.177)}{-0.234R_{t-3}} \underset{(0.176)}{+0.327R_{t-4}} \underset{(0.007)}{-0.004Z_{t-1}} \underset{(0.010)}{+0.002Z_{t-2}} \underset{(0.010)}{+0.017Z_{t-3}} \underset{(0.007)}{-0.013Z_{t-4}} \quad -1.6831 < \tau$$

$$\underset{(0.206)}{Z = 0.076} \underset{(3.635)}{-5.868R_{t-1}} \underset{(3.575)}{+2.244R_{t-2}} \underset{(3.402)}{+2.902R_{t-3}} \underset{(3.424)}{+1.646R_{t-4}} \underset{(0.121)}{+0.609Z_{t-1}} \underset{(0.142)}{+0.195Z_{t-2}} \underset{(0.141)}{-0.088Z_{t-3}} \underset{(0.112)}{+0.188Z_{t-4}} \quad -1.6831 \geq \tau \tag{32}$$

$$\underset{(0.683)}{Z = -1.423} \underset{(4.714)}{+0.690R_{t-1}} \underset{(4.626)}{+2.751R_{t-2}} \underset{(4.422)}{-4.669R_{t-3}} \underset{(4.402)}{+4.358R_{t-4}} \underset{(0.175)}{+0.695Z_{t-1}} \underset{(0.258)}{-0.180Z_{t-2}} \underset{(0.256)}{+0.460Z_{t-3}} \underset{(0.175)}{-0.561Z_{t-4}} \quad -1.6831 < \tau$$

Figure 7: Response of UK R_t to Shock to UK NTFCI

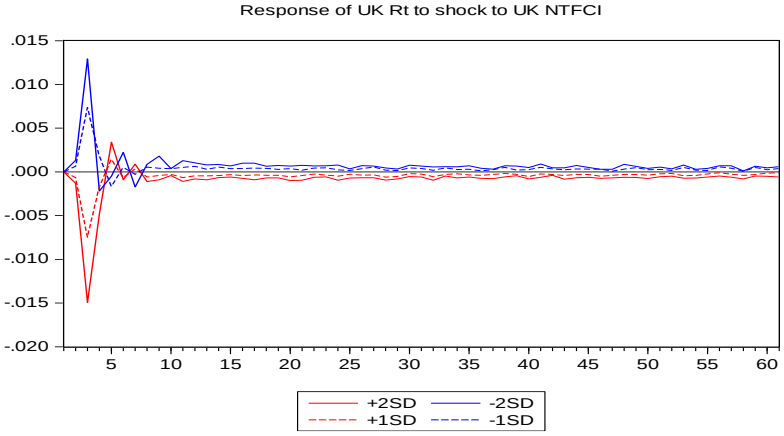

Figure 7 shows the response of the Tourism index return of the UK for positive and negative shocks to the variables in this system. A positive shock to NTFC leads to negative effect whereas a negative shock leads positive effect on Rt. The positive effect has its lowest value in the third period and ends about the seventh period. This effect is also the same for the negative shock and the positive effect of negative shock also disappears about the seventh period.

5. CONCLUSION

In this study, the new version of the TFCI index with terrorist incidents is presented. Chang (2015) developed the Monetary Conditions Index (MCI) and Financial Conditions Index (FCI) as a developed version of the TFCI index adapted to the tourism sector. Adhering to the index methodology developed by Chang (2015), it is thought that the impact of terrorist attacks will affect both the expectations and the economic value of the enterprises existing in the financial market in this field. Today, tourism has become an important economic field not only with the choice of leisure time, but also because it exists in many areas. However, the environment of expectation and trust creates a significant change in preferences. Therefore, countries should also consider the effect of terrorism in their economic and financial research in this area. Based on this idea, the index was expanded by adding the terror variable to the previously developed TFCI composite indicator and its relationship with the tourism stock market index as a financial indicator was examined. With the TVAR model, which shows the short-term dynamic relationship. Models for different countries were edtimated and similar results were obtained for different countries.

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DEVELOPMENT AND VERIFICATION OF THE SPENDING RULE FOR THE NATIONAL FUND OF KAZAKHSTAN

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ABSTRACT

Purpose- The article examines the key factors affecting the use of the National Fund of Kazakhstan (NFK) in 2005-2017, as well as the development of more effective methods and actions to improve its performance in the future.
Methodology- The study has developed a functional model of transfers from it to the state budget (spending rule), which helps to explain the observed dynamics of its use. The model was examined by using dynamic panel estimation techniques. As result it was found that transfers from oil fund to the state budget are dependent on economic activity, non-oil budget deficit and inflation in the country. An econometric test confirmed the correctness of the assumptions about the factors used in the model.
Findings- A multivariate forecast was also made for NFK's assets for the period until the end of 2022. Upon the favorable scenario, the value of the assets of the oil fund will reach 57.5 billion US dollars at the end of 2022. If world oil prices fall from 68 to 50 US dollars per barrel and remain at this level, the oil fund's assets will be exhausted in 6-7 years. If oil prices fall to 30 US dollars, then the fund's oil assets will last only 5 years.
Conclusion- The principles of the formation and use of the NFK should be revised in order to ensure the long-term preservation of the fund's assets for future generations as originally planned.

Keywords: Sovereign wealth funds, oil fund, asset management, Kazakhstan
JEL Codes: D25, D53, D58

1.INTRODUCTION

The establishment of the National Fund of Kazakhstan (NFK) in 2000 created conditions for sustainable economic growth, as it allowed the withdrawal of surplus income associated with the rapid development and use of the country's oil and gas resources to external foreign accounts (President's Decree, 2000) that sharply reduced the risks of Dutch disease.

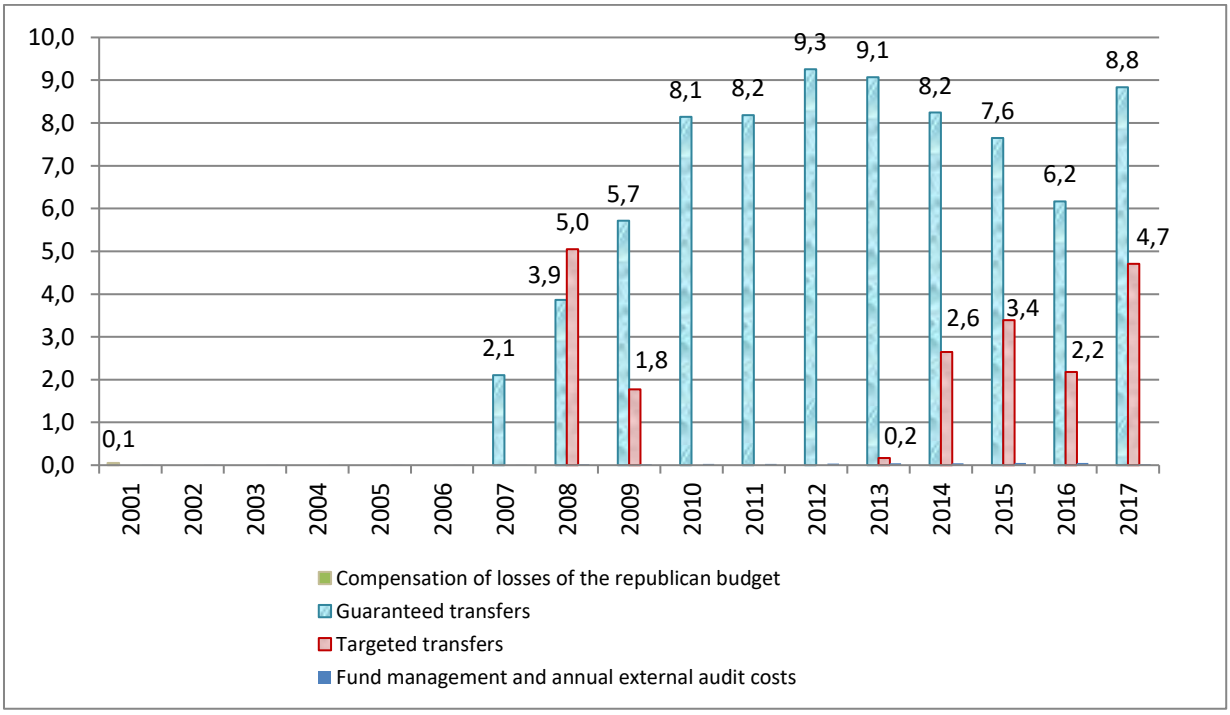
In 2005, the first concept for the accumulation and use of the NFK's assets for the medium term was adopted by the President's Decree (2005). It defined the basic principles and approaches for managing of the assets of the oil fund. As a result, the sterilization of excess foreign exchange inflows to the market was ensured due to the inflow of foreign exchange as a result of rising world oil prices and subsequent growth in oil production (Figure 2). This eased previous pressure on the tenge and ensured its stability during this time. In 2006, the government allowed NFK's assets to be invested in domestic bonds, as well as to transfer funds from it to the state budget in order to strengthen the stabilizing impact of the oil fund on the development of the economy (Government, 2004).

However, a sharp decline of world oil prices during the world crises in 2007-2008 and in 2014 led to a decrease in the value of NFK's assets in subsequent years. Due to the global economic crisis, transfers from the NFK also began to be used to conduct an active anti-crisis policy (Figure 1). However, these transfers continued to be actively used in subsequent years, after the global crisis had already passed.

As of the end of 2009, the oil fund's assets reached 30.2 billion US dollars, of which 5.0 billion US dollars was allocated to domestic assets (to buy bonds of JSC "Sovereign Wealth Fund Samruk-Kazyna", National Holdings "KazAgro" and "Baiterek") and 25.2 billion US dollars were placed in foreign assets. For this reason, in order to prevent depletion of the oil fund, the size of the guaranteed transfer to the state budget was limited to one third of its assets at the end of the year.

The concept of the accumulation and use of the NFK's assets, adopted in 2010, has become the main and effective tool of the countercyclical policy of the state, which allowed ensuring a stable development of the Kazakhstan's economy (President's Decree, 2010). This concept provided for fixing guaranteed transfers to the republican budget in the amount of 8 billion US dollars annually and the possibility of adjusting it up or down to 15 per cent, depending on the economic situation. The concept provided for the growth of the assets of the oil fund to 73.2 billion US dollars at the end of 2014, or 2.3 times, as well as the implementation of the State Anti-Crisis Program for 2014-2015.

Figure 1: Using of the NFK in 2001-2017 (bln. USD)



In 2014, there was a sharp drop in the value of black gold after the decision of OPEC member countries to maintain the quota for oil production at 30 million barrels per day. The fast-growing production of shale in the US also contributed to the decline in prices. Within a few months, Brent oil has almost halved in price - from about 110 to about 60 US dollars per barrel. This dramatically increased the likelihood of oil fund assets being depleted.

The state authorities were aware of the risk of a rapid depletion of the assets of the NFK in the context of low oil prices and tried to solve this problem by adopting a new concept for its accumulation and use on December 8, 2016. It was supposed to prevent further reduction of the assets of the oil fund in the medium term, resume its accumulation in the long term and reduce the dependence of the state budget on oil from 46 per cent to 20 per cent in 2017-2030 (President's Decree, 2016). However, this concept, despite its relevance, turned out to be ineffective because it did not provide a reliable way to achieve the desired results.

In this regard, the purpose of this article is to determine the key factors affecting the use of assets of the oil fund, as well as the development of more effective methods and actions to improve its performance in the future. To do this, we have developed a functional model of transfers from the NFK to the state budget (spending rule), which allows to explain the observed dynamics, as well as to understand its changes in the future. The most significant factors in this model were found to be economic activity in the country, the non-oil budget deficit and inflation.

The model was verified by using the econometric technique. The least squares method (LS) was used as the basic method. The problem of autocorrelation was eliminated by using the first order autoregressive model, AR(1). Robustness was tested using the Generalized Method of Moments (GMM) and Generalized Linear Model (GLM), which helped to overcome the problem of autocorrelation and heteroscedasticity. The ARCH method was also used to validate the models as the data fluctuated slightly around the mean, showing periodic spikes in values.

As a result of our research, we build a model of transfers from the oil fund to the state budget. Testing showed high results of the model. It explains the official transfers from the oil fund to the state budget by 96-98 per cent .

In addition, the hypothesis of the sufficiency of NFK's assets was also tested. The calculations confirmed that under the optimal scenario, the value of assets of the NFK by the end of 2022 will reach 57.5 billion US dollars. If world oil prices fall from 68 to 50 US dollars per barrel and remain at this level, the oil fund's assets will be depleted in 6-7 years. If oil prices fall to 30 US dollars, the fund's oil assets will only last for 5 years.

This paper proceeds as follows. Second part provides a review of the literature. Third part discusses the data and the research methodology. Forth part describes the data and builds econometric models of official transfers, discusses and tests them for adequacy and correctness. Finally, last section summarizes the findings and gives recomendations for the country's authorities.

2. LITERATURE REVIEW

Harold Hotelling (1931) was the first author, who considered the management of non-renewable resources and determined the maximum rent from the exploitation of non-renewable and non-renewable resources that the state could receive by depleting the resources. Hotelling's rule predicts that owners of non-renewable resources will only produce a supply of their basic commodity if it can yield more than available financial instruments.

The Fiscal Affairs Department of the IMF (2007) analyzed the role of fiscal institutions in managing the oil revenue boom and concluded that many oil funds have relatively rigid operational rules for the deposit and withdrawal of resources. Many oil stabilization funds have or have had price- or revenue-contingent deposit and/or withdrawal rules (e.g., Algeria, Iran, Libya, Mexico, Russia, Trinidad and Tobago, and Venezuela). The most saving funds are revenue-share funds, where a pre-determined share of oil or total revenues is deposited in the fund (e.g., Equatorial Guinea, Gabon, and Kuwait). Only a number of funds (Norway and Timor-Leste) have the rules, where the operations of the Sovereign wealth funds (SWF) are linked directly to the non-oil budget deficit.

Alsweilem et al. (2015) conducted a comprehensive overview of the policies and institutional arrangements of leading SWF's in different countries such as Norway, Kuwait, Kazakhstan, Chile, and Abu Dhabi. The study identified the key policy levers around sovereign investment vehicles (savings rules, spending rules and investment models), along with aspects of and options for fund governance models. The study concludes that clear rules are essential to ensuring that the policies around resource-based SWF's are consistently pursued and applied, and that the government has to restrain its spending in boom periods as much as it allows maintaining a steady level of spending in bust periods.

The study of Irarrazabal and Ma (2018) investigates the optimal portfolio allocation of a commodity SWF with a long-term investment horizon in Norway, UAE and Chile. The study found that the optimal share of financial wealth invested in risky assets at every point in time is an increasing function of time to depletion, income to financial-wealth ratio and expected growth in commodity revenues.

Silva and Costa (2019) focused on the analysis and comparison of the legal structures of the Norwegian Government Pension Fund and the Brazilian Pre-Salt Social Fund. They found that the success of the SWF depends largely on the rules governing the withdrawal and expenditure of resources, as well as on sound management and investment policies.

In recent years, serious studies have also appeared on the assessment of the use of oil fund in Kazakhstan. Azhgaliyeva (2014), using data of Kazakhstan from January 1994 to July 2013, found positive but statistically significant effect of produced oil on the real government expenditures. Kapparov (2015) found that targeted transfers from the oil fund to the state budget are used inefficiently, and the probability of increasing its assets to 180 billion US dollars by 2020, set by the government in the Concept for the Formation and Use of the NFK in 2010, seems low.

Shagiev and Kuanshaliev (2016) concluded that with an oil price of less than 30 US dollars, the oil fund's resources will be sufficient only for five years. They also noted discrepancies in assessments of the oil fund's assets between the National Bank (NBK) and the Ministry of Finance of Kazakhstan. This is due to the fact that reports on the fund's operations are published by the NBK in US dollars, while the accounting of these operations is carried out by the Ministry of Finance in the national currency. With a sharp change in the exchange rate of the tenge against the dollar, this leads to significant discrepancies in dollar estimates.

The researchers also noted the inefficient use of the oil fund, most of which, or 56 percent, was spent on current government needs in 2001-2015. According to Berik Otemurat, in the conditions of low oil prices and large contributions to the state budget, the oil fund will be enough for 6-7 years (Simon, 2017). Oshakbaev (2017) noted that the share of transfers in the revenue side of the republican budget increased from 33 percent in 2010 to 46 percent in 2017. Expectations to use the oil fund also led to cost inflation.

It is no accident, therefore, that the authorities of Kazakhstan will increase the volume of receipts to the NFK and stabilize the growth rate of budget expenditures in the coming years. In general, fiscal policy will be aimed at reducing the non-oil deficit to 5% by 2030, as well as increasing the assets of the NFK to $100 billion (Prime Minister, 2022b).

3. DATA AND METHODOLOGY

3.1. Data

The data on the industrial activity index taken from the Statistics Committee of the Ministry of National Economy of Kazakhstan. Such indicators as inflation, LIBOR and oil prices are received from the database of the World Bank.

The data on the state budget deficit, revenues and transfers of the NFK to the state budget are obtained from the database of the Ministry of Finance of Kazakhstan, and the data on the exchange rates of tenge to the US dollar and overdue loans are taken from the National Bank of Kazakhstan's database. The dataset covers monthly observations from January 2005 to February 2017 (144 observations).

3.2. Methodology

The expenditure policy of the NFK (spending rule) includes the transfers to the state budget. Transfers consist of guaranteed transfers and targeted transfers.

The guaranteed transfers are used to cover the annual deficit of the state budget, as well as the costs associated with the management of the oil fund and the conducting of its annual audit. The latter costs can be neglected since they are not high (no more than 1-2 percent of the total revenue of the oil fund). The guaranteed transfers usually have a fixed amount.

On the contrary, targeted transfers are of an investment nature and can vary greatly in size and timing, since they are used to finance countercyclical programs, socially significant programs, and strategic infrastructure projects (President's Decree, 2016).

In general, the amount of transfers can be defined as its level achieved in the previous year (T_{t-1}) plus the amount of money required for the implementation of investment projects in the current year. In turn, it depends on the accumulated size of oil fund (A_{t-1}) and the long-term profitability of its real investments (β):

$$T_t = \alpha \cdot T_{t-1} + \beta \cdot A_{t-1}, \quad (1)$$

where α and β are fixed parameters less than one.

The budget constraint on transfers (T), is that their amount should not exceed the receipts to the oil fund (R) from the oil sector at the cut-off price determined by the Guaranteed Transfer Law for the corresponding planning period (President's Decree, 2016):

$$T_t \leq R_t \quad (2)$$

For better understanding the long-term dynamics of oil fund, it is useful to derive steady-state conditions, in which resource revenues and the rate of return on oil fund are stable. The total amount of oil fund in the present time (A_t) will be the sum of oil find in the previous period of time plus total oil fund receipts (X_t) and minus transfers from the oil fund to the state budget (T_t) in the current period:

$$A_t = (1+i_t) A_{t-1} + \varphi \cdot \boldsymbol{X_t} - T_t, \quad (3)$$

where i_t is the return generated on the savings fund and φ is the rate of deduction from the total income of oil firms to the stabilization fund in the current period.

Equation 1 and 3 can be rewritten as following, where steady-state variables are expressed in small caps:

$$a = (1 + i) \cdot a + \varphi \cdot x - t \quad (4)$$

$$t = \alpha \cdot t + \beta \cdot a \quad (5)$$

And Equation (4) can be rewritten as:

$$x = (t - i \cdot a) / \varphi \quad (6)$$

Equation (5) can be rewritten as:

$$a = (1 - \alpha) \cdot t / \beta \quad (7)$$

In the steady state, the size of the oil fund relative to revenue is determined by the parameters of the spending rule, α and β, and the interest rate i:

$$a/x = (1 - \alpha) \cdot \varphi / [\beta - i \cdot (1 - \alpha)] \quad (8)$$

To determine the dynamics of the transfers to be received by the government in the steady state, we can again use Equations (6) and (7):

$x = t – i·(1– α) ·t/ (в·φ) =1/φ·(1– i·(1– α)/в)·t$

Hence, the transfer to the budget is expressed as follows:

$t = x·в·φ /[в – i·(1-α)]$ (9)

As follows from Equation (9), transfers from the oil fund are larger than transfers to it ($t > x$) given that, in addition to annual oil revenues, the government also receives the returns generated on the oil fund's assets. Thus, under the assumption that oil revenues and the rate of return on oil fund's assets are stable, the rules are sufficient to achieve not only the stabilization objective, but also a saving objective (Alsweilem *et al.*, 2015).

From formula 9, the following conclusions about the current oil fund's expenditure policy (spending rules) of the NFK can be drawn:

- The growth rate of total oil fund receipts *(x)* will directly increase the growth rate of the transfers.
- An increase in the long-term profitability of the real investments *(в)* will reduce the growth rate of transfers.
- The growth of the rate of deduction from the total income of oil firms to the stabilization fund *(φ)* will increase the transfers' growth rates.
- The growth of the yield on savings fund (*i)* will increase the growth rate of transfers.
- The growing dependence of the current transfers on the transfer of the previous year *(α)* will reduces the growth rate of the transfers.

The parameters *α* and *b* can be chosen so as to achieve a satisfactory degree of stability in transfers to the government to achieve the stabilization objective; *i* should correspond to the expected long-term return of the savings fund, and *φ* can be chosen to assure the accumulation of an endowment, achieving the saving objective, without jeopardizing the stabilization objective. In turn, the real return on investment *(b)* depends on a number of macroeconomic factors, such as the growth rate of economic activity in Kazakhstan, calculated using the industrial production index as a proxy variable *(IPI)*, the return on investment in foreign assets *(LIBOR)* as a proxy variable, the rate of deduction from the total income of oil companies to the stabilization fund *(φ)*, as well as the inflation rate (INF), the share of overdue loans in total bank loans *(NPL)* and the size of the non-oil deficit in percent of GDP *(D):*

$$\overset{+}{} \quad \overset{+}{} \quad \overset{+}{} \quad \overset{-}{} \quad \overset{-}{} \quad \overset{-}{}$$

$b= f (IPI, LIBOR, φ, INF, NPL, D)$ (10)

If the growth rates of economic activity in Kazakhstan *(IPI)*, the increase in the return on investment in foreign assets *(LIBOR)* and the deduction rate of oil firms to the stabilization fund *(φ)* positively affect the size of the real return on investment, then the growth of inflation *(INF)*, share of non-performing loans in bank loan portfolios *(NPL),* as well as the non-oil deficit in percent of GDP *(D)* reduce it (Equestion 10).

The growth of economic activity *(IPI)* increases the return on investment, as the growth of the economy usually leads to an increase in the return on investment. The growth of return on foreign assets *(LIBOR)* increases the real return on investment in foreign assets. The growth of the rate of deduction from the total income of oil companies to the stabilization fund *(φ)* also increases the assets of the oil fund and its transfers to the state budget.

However, inflation *(INF)* lowers the real return on investment as the nominal return is reduced by the amount of inflation. An increase in the share of problem loans in banks' portfolios (*NPL)* reduces the return on investment, as it increases the need for provisions. The growth of the non-oil budget deficit *(D)* reduces the return on investment due to the crowding out effect of the state budget on investments.

Since there is no information about the rate of deduction from the total income of oil firms to the stabilization fund, the model of expected transfers from oil fund to the state budget can be represented as:

$$\overset{+}{} \quad \overset{+}{} \quad \overset{-}{} \quad \overset{-}{} \quad \overset{+}{} \quad \overset{-}{} \quad \overset{+}{}$$

$T_t = f [T_{t-1}, IPI_t, INF_t, NPL_t, LIBOR_t, D_t, A_t]$ (11)

The methodology for calculating the model variables is presented in Table. 1

Some factors as the transfers from oil fund in the previous period (T_{t-1}), industrial production index (IPI_t), the rate of return on foreign assets $(LIBOR_t)$, and accumulated assets in the oil fund (A_t) in the present time have positive impact on the expenditures of the NFK's assets.

A factor such as an increase in the size of the transfer in the previous period leads to a high probability that the transfer in the current period will be at the same level. The growth of economic activity, as it supports economic growth, increases the size of the transfer from the oil fund. The growth of LIBOR increases the revenues of the oil fund, and hence the transfers from the oil fund to the state budget. An increase in the size of NFK's assets also increases the likelihood of an increase in the size of transfers.

At the same time, the growth of inflation *(INF_t)*, non-payments *(NPL_t)*, and the growth of the non-oil budget deficit *(D_t)* may lead to a reduction in the volume of transfers. Rising inflation reduces transfers, as the allocation of funds from the oil fund to the state budget increases the money supply, and this is fraught with a further increase in inflation. The growth of non-payments in the economy will also lead to a decrease in the size of transfers, as the risks of their non-return increase. In addition, the growth of the non-oil budget deficit reduces transfers, as it increases the risks associated with the preservation of oil assets.

Table 1: The Method of Calculating Variables for the Model

Sign	Name	Calculation method
T	Official transfers from oil fund	The value of total transfers from the oil fund to the state budget in terr of US dollars at current prices, billion dollars
IPI	Industrial production index	The growth rate of industrial production over the same period last year is a proxy of the economic activity in Kazakhstan, %
INF	Retail price inflation	Monthly on an annualized basis compared with the same period last year,%
NPL	Share of overdue loans	The share of overdue loans (more than 90 days) in the loan portfolio of the banking sector, %
LIBOR	London interbank offered rate	Proxy to assess the attractiveness of the use of the oil fund's means as investments in foreign assets,%
D	Non-oil budget deficit	The primary budget deficit plus receipts from oil fund, billion dollars
A	Assets of oil fund	The accumulated assets of the oil fund, billion dollars

Note: This table includes methods of variables calculations. The first column concludes the sign of each indicator, the second column contains the variable names, and the third column shows the calculation method for each variable.

In accordance with Equation 11, a time regression model of official transfers from the NFK to the budget (spending rule) was built:

$$T_t = \propto + \beta_1 IPI_t + \beta_2 INF_t + \beta_3 NPL_t + \beta_4 LIBOR_t + \beta_5 D_t + \beta_6 A_t + \varepsilon_t \quad (12)$$

where *IPI* denotes the industrial activity in Kazakhstan*, INF* represents inflation, *NPL* is the share of overdue loans, *LIBOR* is a proxy variable for the interest rates on stabilization fund, *D* means the non-oil budget deficit, and *A* determines the accumulated assets of the oil fund. The variable ε_t denotes error term. The subscript *t* represents time dimensions.

4. FINDINGS AND DISCUSSIONS

4.1. Preliminary Analysis of the model

The description of statistics on the variables is given in Table 2.

Analysis of the correlation matrix (Table 3) shows the negative impact of the inflation rate *(INF)*, the interest rates on stabilization fund *(LIBOR)*, and non-oil budget deficit *(D)*, on the value of official transfers from the oil fund to the republican budget *(T)*.

The changes in industrial activity in Kazakhstan *(IPI)*, the share of overdue loans *(NPL)*, and total assets of oil fund *(A)* have a positive impact on such transfers. Almost all variables show the correct sign, with the exception of overdue loans, which do not show the theoretically expected result.

Multicollinearity between explanatory variables is not observed since all variables are independent. However, the high correlation is observed between transfers and non-oil budget deficit (98 percent), LIBOR and overdue loans (81 percent), as well as LIBOR and assets of the oil fund (65 percent).

Table 2: Description of Variables Used

	T	IPI	INF	NPL	LIBOR	BD	A
Mean	4.990	0.301	9.479	24.256	1.628	-6.931	47.637
Median	4.476	-0.200	7.442	29.700	1.038	-6.342	45.103

Maximum	11.557	16.600	83.734	39.716	5.426	0.402	89.290
Minimum	0.034	-18.700	-1.193	0.000	0.534	-17.933	5.235
Std. Dev.	3.354	6.804	11.133	11.831	1.397	4.578	23.661
Skewness	0.137	-0.168	4.303	-0.462	1.666	-0.299	0.111
Kurtosis	1.670	3.419	25.104	1.642	4.537	1.963	1.625
Jarque-Bera	9.532	1.494	2906.980	13.944	69.541	7.406	10.018
Probability	0.009	0.474	0.000	0.001	0.000	0.025	0.007
Sum	618.816	37.300	1175.373	3007.745	201.933	-859.410	5907.024
Sum Sq. Dev.	1384.053	5694.670	15246.080	17216.330	240.082	2577.740	68861.630

Note: This table reports the mean, median, maximum and minimum values, standard deviation of the predictor variables, Skewness, Kurtosis, Jarque-Bera and its Probability, Sum of residues, Sum of Squared Deviation. T is transfers from the oil fund to the state budget, IPI is production activity in Kazakhstan, INF is the inflation index, defined as the consumer price index, NPL is the share of overdue loans in the total volume of bank loans, LIBOR is the percentage yield of the savings part of the oil fund, D is a non-oil budget deficit and A is the accumulated assets in the oil fund. Results are computed from Econometric Views, Version 7.2.

Table 3: Matrix of Correlations between Model Variables

	T	IPI	INF	NPL	LIBOR	D	A
T	1.000000	0.217687	-0.140772	0.335700	-0.447714	-0.979476	0.349844
IPI	0.217687	1.000000	0.099565	0.044532	-0.008141	-0.194881	-0.013696
INF	-0.140772	0.099565	1.000000	-0.308471	0.253026	0.105186	-0.180677
NPL	0.335700	0.044532	-0.308471	1.000000	-0.814569	-0.329289	0.391166
LIBOR	-0.447714	-0.008141	0.253026	-0.814569	1.000000	0.432012	-0.654539
D	-0.979476	-0.194881	0.105186	-0.329289	0.432012	1.000000	-0.336568
A	0.349844	-0.013696	-0.180677	0.391166	-0.654539	-0.336568	1.000000

Note: This table reports unconditional correlations. All variables are as defined in Tables 1 and 2.

4.2. Models of Official Transfers from the NFK to the Budget

Based on monthly data set, we built a basic model of the impact of various factors on expenses of the NFK in US dollars (Table 4, Model 0). The shorter observation series from February 2007 to February 2017 (123 observations) are due to the presence of short NPL data series.

Table 4: Models of Impact of Various Factors on Transfers from the Oil Fund to the State Budget

	Model 0	Model 1		Model 2		Model 3		Model 4
	LS	LS	GMM	LS	GMM	LS	GMM	GLM
T(-1)	-0.021	-0.046*	-0.028***	-0.043	-0.028			
IPI	0.0164*	0.012*	0.011**	0.009**	0.006*			0.016**
INF	-0.012**	-0.006	-0.006**	-0.006*	-0.007**			-0.013***
NPL	0.001	0.008	0.004					
LIBOR	-0.131	-0.176	-0.100					
D	-0.713***	-0.706***	-0.709*	-0.707***	-0.715***	-0.707***	-0.708***	-0.698***
A	0.001	0.002	0.004					
C	0.692	0.685	0.072	0.363	0.188	0.123	0.201	
AR(1)		0.655***	0.637*	0.669***	0.637***	0.645***	0.652***	
Obs.	123	123	123	144	144	144	144	144
Adjusted R-sq.	0.960	0.976	0.975	0.981	0.976	0.980	0.975	
S.E. of regression	0.667	0.517	0.520	0.485	0.515	0.498	0.499	
Log likelihood	-120.55	-87.86		-96.95		-103.01		-137.34
F-statistic	494.53	614.66		1444.6		3456.73		
Akaike info criterion	2.090	1.588		1.430		1.462		1.936
Schwarz criterion	2.273	1.672		1.553		1.524		2.018
Durbin-Watson stat	0.749	1.858	1.863	1.878	1.870	1.922	1.927	

J-statistic	9.335	7.731	4.145	
Pearson statistic				56.08

Notes: This table reports the dynamic panel estimation – oil fund's receipts regression using the LS, GMM and GLM estimators. The bottom of the table reports the number of observations, Adjusted R-squared, Standard Errors of regression, Log likelihood, F-statistic, Akaike info criterion, Schwarz criterion, Durbin-Watson statistics, J-statistic, and Pearson statistic. Finally, the statistical significance is defined as *** p< 0.01, ** p < 0.05, * p <0.1.

The variables the non-oil budget deficit *(D)* and inflation *(INF)* proved to be significant indicators in the model. The rest of the indicators showed low statistical significance. The high coefficient of determination (96 percent) is due to the presence of problems of autocorrelation and heteroscedasticity.

Residual autocorrelation was eliminated by using the first-order AR(1) autoregressive model. As can be seen from Model 1, LS, its statistical parameters have improved dramatically.

This is evidenced by the increase in the adjusted R-squared from 96 percent to 97.6 percent, the F-statistics from 494.5 to 614.7 and the Durbin-Watson statistics from 0.749 to 1.858, as well as a decrease in the standard errors of the regression from 0.667 to 0.517 and some improving the coefficients of determination of the model. Some of them, such as transfers in the previous period *(T(-1))* and economic activity in Kazakhstan *(IPI)* along with the non-oil budget deficit *(D)* began to show a significance at the 1 percent level. However, other variables showed low statistical significance.

The generalized method of moments (Model 1, GMM) was used to check the robustness of the calculations, which also showed an improvement in the results compared to the basic model. In this case, the coefficient of determination was 97.5, the Durbin-Watson statistics was 1.863, and the standard errors of the regression was 0.520, which was not significantly different from Model 1, LS.

At the same time, the inflation indicator *(INF)* became significant with a 5 percent standard error, and the indicators such as transfers in the previous period *(T(-1))* and economic activity in Kazakhstan *(IPI)* became statistically significant at the 5 percent and 10 percent levels, respectively.

The second model excluded variables such as overdue loans *(NPL)* and the interest rates on stabilization fund *(LIBOR)*, which were of low statistical significance (Model 2, LS) and didn't show the right signs. This action led to an improvement in the quality of the model compared to the model (Model 1, LS), namely, an increase in the coefficient of determination from 97.6 up to 98.1 percent, F-statistics from 614.66 up to 1444.6 and a decrease in standard errors of regression from 0.517 to 0.485.

The statistics of some variables, such as inflation *(INF)* and constant *(C)*, improved markedly and became significant at the 1 percent level. At the same time, only the significance of economic activity in Kazakhstan *(IPI)* has deteriorated slightly and began to show the significance at the 5 percent level. The coefficients for the other explanatory variables remained at the same level.

To test the robustness of the calculations, we used the GMM method, which showed approximately the same results (Model 2, GMM). The adjusted R-squared showed an explanatory power of 97.6 percent, standard errors of regression were 0.515. The significance of the coefficients remains the same. Only the significance of the inflation *(INF)* slightly decreased to the 5 percent level, and transfers in the previous period *(T(-1))* ceased to be significant.

The third model (Model 3, LS) also excludes such variables as transfers in the previous period *(T(-1))*, inflation *(INF)* and manufacturing activity in Kazakhstan *(IPI)*. This led to an improvement the model, which was evidenced by the growth of the F-statistic to 3456.7, while maintaining the determination of the model at 98 percent. The magnitude and significance of the remaining coefficients of the model for the explanatory variables remained the same.

The model statistics and the significance of the model coefficients did not practically change when using the GMM method (Model 3, GMM), which indicates the correctness of the model specifications. To check the robustness of the model's specification, was also used a Generalized linear model (Model 4, GLM), which eliminates the problem of autocorrelation and heteroscedasticity when weighing residues (Plokhotnikov, 2010). In this model, the non-oil budget deficit *(D)* and retail price inflation *(INF)*, as well as industrial activity *(IPI)* appeared to be significant variables.

The analysis of the models allows drawing the following conclusions about the factors affecting the transfer from the oil fund to the state budget for the period under consideration:

- The size of the non-oil budget deficit *(D)* and inflation *(INF)* are negative, but statistically significant.
- Kazakhstan's industrial activity *(IPI)* is positive and statistically significant.
- The total accumulated assets of the oil fund *(T(-1))* and interest rates on stabilization fund *(LIBOR)* are negative, while statistically insignificant.

- The amount of the total accumulated assets in the oil fund and overdue loans *(NPL)* are positive, while statistically insignificant. NPL shows an incorrect sign, but 'it does not matter, since it was statically insignificant.

Improving economic activity in Kazakhstan *(IPI)* led to an increase in official transfers from the oil fund to the republican budget, while an increase in the non-oil budget deficit *(D)* and inflation *(INF)* led to a decrease in these transfers. This is explained by the fact that the improvement in economic activity creates favorable conditions for the further growth of the national economy, while the growth of the budget deficit and inflation can pose a real threat to the sustainability of the oil fund designated for future generations.

In general, the regression coefficients for explanatory variables in all models were fairly stable, despite different methods and number of variables used. The coefficients of determination remain high in all models. Models explain transfers from the oil fund to the state budget by 96-98 percent. This fact indicates that the models consider all the significant factors affecting such transfers for the considered period of time.

4.3. Calculation of Time for the Complete Exhaustion of the Oil Fund's Assets

Data on the total amount of transfers from the oil fund to the state budget for the forecast period (Table 5) are taken from the Law "On the Guaranteed Transfer from the NFK (Ministry of Finance, 2017).

The directed taxes, investment income, and administrative expenses for the forecast period are assumed at the expected level of 2017.

Oil production in Kazakhstan expected to reach 87 million tons in 2018 (Reuters, 2018) and 89 million tons in 2022 (Ministry of National Economy, 2018). The breakdown into guaranteed and targeted transfers was made on the basis of the proportions between them that existed in 2017.

Table 5: The Total Amount of Transfers from Oil Fund to State Budget for the Forecast Period

Names	Units	Fact	Forecast				
		2017	2018	2019	2020	2021	2022
Transfers	Trillion tenge	4.42	2.6	2.3	2.0	2.0	2.0
- guaranteed	Trillion tenge	2.88	1.7	1.5	1.3	1.3	1.3
- targeted	Trillion tenge	1.54	0.9	0.8	0.7	0.7	0.7
Transfers	Billions US dollars	7.15	6.33	5.50	5.50	5.50	7.15
- guaranteed	Billions US dollars	4.67	4.13	3.59	3.59	3.59	4.67
- targeted	Billions US dollars	2.49	2.20	1.91	1.91	1.91	2.49

Note: Data on transfers for 2018–2020 are taken from the Ministry of Finance of Kazakhstan (2018). As the average exchange rate for the forecast period is used the rate of 363.5 tenge to the US dollar, and as the average annual OPEC crude oil price is used 68.31 U.S. dollars per barrel.

According to all these assumptions, the value of the assets of the oil fund during the forecast period will not decrease significantly and will reach 57.5 billion US dollars by the end of 2022 (Table 6).

Table 6: The Forecast of the NFK's Assets (billions US dollars)

	Fact				Est.		Forecasts			
	2001	2005	2009	2013	2017	2018	2019	2020	2021	2022
National fund assets, total:	1.2	8.1	24.4	70.8	61.5	60.4	59.0	58.5	58.0	57.5
Income, total:	1.3	2.9	15.5	25.9	6.2	6.1	5.0	5.1	5.1	5.1
- Direct taxes	0.7	2.6	9.2	22.0	6.1	5.0	5.0	5.1	5.1	5.1
- Investment income	0.0	0.3	6.2	3.6	0.0	0.0	0.0	0.0	0.0	0.0
Use, total:	0.0	0.0	7.5	9.2	13.6	7.2	6.4	5.6	5.6	5.6
- guaranteed transfers	0.0	0.0	5.7	9.0	8.8	4.7	4.1	3.6	3.6	3.6
- targeted transfers	0.0	0.0	1.8	0.2	4.7	2.5	2.2	1.9	1.9	1.9
- administrative expenses	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1

Note: Data on receipts of the oil fund for 2018-2020 were obtained on the assumption that oil prices for oil remain at the current level and that no other types of revenues are received other than direct oil taxes. Data on transfers for 2018–2020 are taken from the Ministry of Finance of Kazakhstan (2018).

However, if an unfavorable scenario is realized and by assuming that the size of the oil fund's receipts and expenditures remains large at the level of 2017, the assets of the oil fund can be completely exhausted within 7-8 years. If, in addition, world oil prices will fall from 68 to 50 US dollars per barrel, the assets of oil fund will be exhausted in 6-7 years. If world oil prices drop to 30 US dollars, then the oil fund's assets will last only five years.

These results coincide with the calculations of Berik Otemurat, who, in conditions of low oil prices and large transfers to the state budget, suggested that the assets of the NFK would last only 6-7 years (Simon, 2017). This is also consistent with the calculations of Shaginov and Kuanshaliev (2016), which concluded that an NFK with a world oil price of 30 US dollars would be sufficient only for five years.

4.4. Discussions of the Models of Official Transfers

The model of transfers from the oil fund to the state budget built by us includes all relevant factors. This is evidenced by high coefficient of determination of models' about 96-98 percent.

The observed positive impact of economic activity in Kazakhstan (IPI) on the volume of transfers from the oil fund to the budget, as well as high value of the regression coefficient for such a variable indicates that the government is actively using transfers from the NFK to improve the situation in the economy. However, this active anti-cyclical policy of the oil fund is carried out only to certain limits. In the face of a growing non-oil budget deficit the government of the country avoided pursuing an active counter-cyclical policy, as it exposes the assets of the oil fund to the risk of rapid depletion. This hypothesis is confirmed by the negative impact of the growth of non-oil budget deficit (D) on the transfers from the oil fund to budget and the high significance of the coefficient by this variable (Table 10). Rising inflation also leads to a decrease in official transfers from the oil fund to the state budget, since these transfers may increase the risk of its unpredictable acceleration due to the growth of the money supply.

In addition, it was found that the growth of accumulated assets in the previous year leads to an increase in transfers from the oil fund to the state budget, while the growth of interest rates on the stabilization fund (LIBOR) negatively affects such transfers. If the first effect is consistent with our theoretical expectations, then the second effect is not.

In our opinion, the negative impact of interest rates on the stabilization fund may be due to the non-systematic withdrawal of the fund's interest income by the state for the implementation of some current state goals. This can also be supported by information that part of the oil fund's revenues was spent on the purchase of shares in state-owned market companies, and part of them on long-term and very cheap (0.01 percent per annum) financing of the state fund Samruk-Kazyna (Shagiyev and Bukeeva, 2014).

Contrary to our expectations, the increase in NPLs had a positive effect on transfers to the budget from the oil fund, i.e. the government was interested in helping insolvent banks. Perhaps this is due to the fact that all large banks, some of which experienced significant financial difficulties during the analyzed period of time, belong to officials from the ruling elite of the country, who do not refuse to use their powers of authority to save them from insolvency at the expense of the state, even if it is contrary to the fundamental interests of society.

In general, the improvement in internal economic activity leads to an increase in the value of transfers from the oil fund to the state budget, while an increase in the non-oil budget deficit and inflation resulted in a reduction of such transfers.

We have also tested the hypothesis about the adequacy of the NFK's assets. Our calculations confirmed that when executing the transfers approved by the Ministry of Finance of Kazakhstan, maintaining the directed taxes, investment income, and administrative expenses, current rate of the tenge to the US dollar, world oil prices and domestic oil production for the forecast period at the level of 2017, the value of the assets of the oil fund will reach 57.5 billion US dollars at the end of 2022. Upon the occurrence of an unfavorable scenario, when the size of oil fund's receipts and expenditures remains at the level of 2017, the assets of the oil fund can be completely exhausted within 7-8 years. If, in addition, world oil prices fall from 68 to 50 US dollars per barrel and remain at this level, the oil fund's assets will be exhausted in 6-7 years. If oil prices fall to 30 US dollars, then the fund's oil assets will last only 5 years.

5. CONCLUSION AND IMPLICATIONS

As follows from the previous section, if the authorities of the country want the assets of the NFK to be not only preserved, but multiplied for future generations, then it is very important to revise the rules for its formation and use.

Firstly, the NFK should be fully accountable to parliament and should be based on the use of clear and stable fiscal rules for deposits and withdrawals from the oil fund. This will significantly increase the efficiency of accumulation and use of oil fund's assets. Currently, such facts as "the frequent changes to these rules, the remaining scope for the manipulation of the key variables in the rules, the possibility of large withdrawals, and the lack of independence of the management council mean that the political leadership, particularly the President and senior ministers, still have a high degree of control and discretionary power over the fund." (Alsweilem *et al*., 2015, p. 84).

Secondly, the activities of oil fund have to be fully transparent. High transparency will also make it difficult to misuse and inefficient use of oil fund assets. This transparency is currently lacking. Moreover, from 2017, the state has ceased to publish

monthly and quarterly reports on the activities of the NFK. This enables the government to manage the fund's assets at its own discretion, but poses a threat to the safety of the oil fund's assets in the long term.

Thirdly, in order to reduce the amount of transfers from the oil fund to the state budget and ensure the rapid accumulation of its assets, it is necessary to revise the principles for spending the assets of the NFK. Currently, the country uses both 'guaranteed transfers' and 'targeted transfers'. If the first ones have a fixed predetermined volume and are used for strictly defined purposes, then second ones can be used at the request of the state at any time and for any purpose, which is not always economically justified. For example, "one-off withdrawals, called 'targeted transfers', were also permitted and indeed authorized in 2008-2009 in order to finance Samruk-Kazyna, a state development fund, and KazMunaiGas, the national oil company. Targeted transfers totaled approximately $7 billion" (Alsweilem *et al.*, 2015, p. 85).

Fourth, the use of passive management based on index-based management instead of active management based on the use of investment companies can significantly reduce the cost of managing fund assets. Such management will cost many times less, while maintaining an acceptable level of management quality (Wilson, 2006).

Fifth, the concept of an oil fund should be completely revised. This is due to the fact that most likely the price of oil in the future decade will be 65 US dollars per barrel, which is associated with the successful development of a green economy in the world (EBRD, 2018). But this means that in the coming years, if the government doesn't do anything significant to increase the efficiency of use of the fund's assets, future generations may be nothing left.

Therefore, it is no coincidence that Kazakhstan has revised the fiscal rule for formation of the budget for 2023–2025 fiscal years and beyond and subsequent years, which has two key components (NBK, 2021). The first one sets the limit for guaranteed transfers from the NFK at a level not exceeding its revenues from the oil sector at the cut-off price. The second one establishes a direct limit on the growth rate of government spending at the level of long-term economic growth.

As conceived by the developers of the new rule, it will reduce the dependence of the public finance on the oil cycle and thereby ensure the safety of the fund's assets for future generations. It is expected that the application of the new rules will contribute to the recovery of foreign exchange assets of the NFK from $55.8 in 2022 (Trend.az, 2022) to $66.7 billion in 2023, with a further increase to $78.8 - 93.2 billion in 2024 – 2025" (Prime Minister, 2022a).

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THE RELATIONSHIP BETWEEN CURRENCY-PROTECTED DEPOSITS AND BANK PERFORMANCE: CASE OF PARTICIPATION BANKS*

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ABSTRACT

Purpose- This study aims to investigate in which way the foreign Currency Protected Deposit (CPD) system that was put on effect from the 21st of December 2021 affected the performance of the participation banks in Turkey. For this purpose, the financial performance of the participation banks during the 12 months preceding and the 9 months following the carrying into action of CPD has been measured by the means of CRITIC and WAPAS that are methods of the Multi-Criteria Decision Making (MCDM) model.

Methodology: The data used within the scope of this study covers the 12 months of the year 2021 and the 9 months of the year 2022 in reason of the fact that 9 months data was available for 2021. The financial performance of the participation banks was assessed based on 5 criteria that are the total dividend revenues, return on assets, return on equity, operating cost/total assets, foreign assets/total shareholder's equity

Findings- It has been established that the most significant criterion in determining the financial performance of the participation banks is the operating cost/total assets while the least significant criterion is the return on equity. Furthermore, within the period that is investigated; the participation banks showed the worst performance in May 2021 and the best in September 2022.

Conclusion- Consequently the performance of the participation banks showed a fluctuation and got down through 2021. Following the carrying into effect of the foreign Currency Protected Deposit (CPD) system, there has been a bettering in the financial performance of the participation banks in 2022; within a couple of months their performance kept raising.

Keywords: Participation banks, financial analysis, financial performance, MCDM, banking sector
JEL Codes: D81, G21, L25

1. INTRODUCTION

Measuring financial performance in the banking sector increases its importance day by day. In addition to performance measurement, determining the factors affecting performance also has importance. We can say that many factors from inside or outside the banks have an impact on financial performance. Some factors affect financial performances positively while some factors affect them negatively. This study determined how the Currency Protected Deposit (CPD) application, which entered into force on December 21, 2021; it affects the financial performances of participating banks in Turkey. In accordance with this purpose, the financial performances of participation banks were measured with CRITIC and WASPAS, which are among the Multi-Criteria Decision Making (MCDM) models, in the 12 months before the implementation and the following 9-month period.

First of all, the weight of each criterion in the performance measurement of the 5 criteria in the measurement financial performance of the participation banks was determined by utilizing the CRITIC method WASPAS method helped to learn how the course of the financial performance of the participation banks in which period.

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*This study was derived from the paper titled "The Effect of Currency Protected Deposits on Financial Performance of Participation Banks" presented at the 11th Istanbul Finance Congress (IFC-2022).

The criteria with the highest weight and the criteria with the lowest criteria were investigated based on the results of the CRITIC method. Moreover, it also tried to investigate in which periods the participation banks achieved the best financial performance and the worst financial performance based on the results of the WASPAS method.

The results of the study also gave us the chance to evaluate the financial performance of participation banks before the implementation of the Currency Protected Deposit application and how their financial performance was after the implementation of the application. The effect of the application on financial performance was also determined by research.

In the part that follows in the study, point has been made on the papers that were made in the literature. In the subsequent part the application procedures and the data set related to the MCDM methods that are used for achieving the goal of the study. In the fourth part of the study are reported the findings of the integrated model that is suggested for performance assessment. While the last section of the study, the fifth part includes the conclusion, the limitations and the suggestions.

2. LITERATURE REVIEW

This part of the study gave some case studies in which ÇKKV techniques are used in measuring the financial performance of participation banks.

Sufian (2007) aimed to measure the efficiency of the Islamic banking sector in Malaysia. The data of the 2001-2005 period in the Malaysian Islamic banking sector were evaluated using the Data Envelopment Analysis method. According to the results, the technical adequacy of foreign banks is higher compared to domestic banks.

Bader et al., (2008) aimed to analyze the efficiency of 80 banks (37 conventional and 43 commercial banks) in their study with 21 countries in the period 1990-2015. The data regarding the relative banks were analyzed with the Data Envelopment Analysis Method. For the results of the analysis, the efficiency of Islamic banks and conventional banks is close to each other.

Ertuğrul and Karakaşoğlu (2011) conducted a study to evaluate the financial performance of 18 branches of a commercial bank using the VIKOR method. According to the results, there is an increase in the performance of 5 branches.

Mandic et al., (2014) used a fuzzy ÇKKV model to measure the financial performance of banks. They evaluated the performances of 35 banks operating in Serbia for the years 2005-2010 using AHP and TOPSIS methods. For the analysis results, banks in Serbia showed a stable performance in the period of 2005-2010.

Wanke et al., (2016) surveyed to analyze the activities of 88 banks belonging to ASEAN countries from 2010 to 2013 using AHP, Artificial Neural Network, and TOPSIS methods. It can be said based on the results that the efficiency of 88 banks was at a low level in the relevant period.

Ural et al., (2018) endeavored to review the performance of 3 public banks operating in Turkey with ENTROPI and WASPAS methods in their study. The data of the banks for the period of 2012-2016 were included in the scope of the analysis. According to the results, Vakıflar Bank showed the best performance in 2012 and 2013 and Ziraat Bank in other years.

Laha and Bisvas (2019) measured the financial performance of 10 banks operating in India for 5 years between 2012-2017. ENTROPY and COPRAS methods were used in the analysis part of the study. The study found consistent results and it was observed that private-sector banks showed better performance compared to the public sector.

Sarı (2020) compared TOPSIS and PROMEETHE methods in evaluating bank performance. He evaluated 11 Turkish banks over 13 financial ratios. It is observed based on the analysis results that both methods are effective in determining the bank's performance.

Aydın (2020) measured the 2019 performance of state-owned banks operating in Turkey. The performance evaluation of the banks was performed using CRITIC and MAIRCA methods. They determined at the end of the survey that Ziraat Participation Bank showed the best performance in the participation banking sector, Türk Exim Bank in the development and investment banking sector, and Vakıflar Bank in the deposit banking sector.

Akbulut (2020) aimed to measure the performance of the 10 banks with the largest asset size operating in Turkey for the year 2018. The analysis of the data related to the banks in question was made using Gray Entropy, PSI, and ARAS methods. For the results of the Gray Entropy method. Performance ranking made with PSI and ARAS methods showed that Ziraat Bank is the bank with the best performance in the relevant period.

Özkan (2020) measured to review the financial performances of 5 participation banks operating in Turkey for the period 2016-2018 with the TOPSIS method. He concluded that Türkiye Finans Participation Bank showed the best performance.

Yazdi et al. (2020) endeavored to reveal how the performances of banks can be evaluated with a balanced scorecard and MCDM methods. SWARA and WASPAS methods helped to review 6 banks operating in Colombia. For the results, the International Bank of Colombia shows better performance compared to other Colombian banks.

Bayram (2021) conducted research by using CRITIC and EDAS methods from MCDM techniques to evaluate the performance of participation banks operating in Turkey. The alternatives were listed with the EDAS method after the weights of the criteria were determined with the CRITIC method. According to findings, Ziraat Participation showed the best performance in 2019.

Yılmaz and Yakut (2021) analyzed the financial performance of 22 banks traded in BIST in their study. ENTROPY, TOPSIS, and VIKOR methods helped to evaluate the performance of relevant banks over 26 criteria for the period 2009-2018. It was concluded based on ENTROPI method that the criterion with the highest weight is the Liquid Assets / Short-Term Liabilities criterion while the same banks take place in the first three ranks according to both techniques based on TOPSIS and VİKOR methods.

Kendirli and Ergenoğlu (2022) measured the financial performance of 10 banks traded in the BIST with the TOPSIS method. They reviewed the performance via 13 criteria consisting of the data of the banks between the years 2017 and 2019; for the results, the bank with the best performance in the relevant period is the Industrial Development Bank of Turkey.

3. DATA AND METHODOLOGY

This paper uses a hybrid MCDM method consisting of CRITIC and WASPAS methods to measure the effect of Currency Protected Deposit on the financial performance of participation banks. The data regarding the relevant banks were received from the website of the Banking Regulation and Supervision Agency (BRSA). Since it was possible to reach 12-month data for 2021 and 9 months for 2022 at the time of the study, 9 months of data were included in the analysis. 5 criteria helped to evaluate the financial performance of participation banks: Total Dividend Income, Return on Assets, Return on Equity, Operating Expenses/Total Assets, and Foreign Resources/Total Equity. The target direction of the first three criteria was maximum while the last two criteria as minimum, respectively. The criteria were respectively coded as K1, K2, K3, K4, and K5 in the analysis part of the study.

3.1. Critic Method

One of the objective weighting methods introduced in the literature by Diakoulaki et al., in 1995 is the CRITIC method. There can be made an objective weighting by using the standard deviations of the criteria and the correlation between the criteria. The application procedures of the CRITIC method can be seen below (Diakoulaki et al., 1995:764-765; Akbulut, 2020: 475-476):

Step 1: A decision matrix is established with m alternatives and n criteria in the first step of the CRITIC method, with the help of Equation (1).

$$X = \left[x_{ij}\right]_{m*n} = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{bmatrix} \quad (1)$$

Step 2: The normalization process, in the second step of the method, is applied to convert the criteria with different measurement units into common values. Here, Equation (2) is used for useful criteria while Equation (3) is used for useless criteria.

$$r_{ij} = \frac{x_{ij} - x_j^{min}}{x_j^{max} - x_j^{min}} \quad (2)$$

$$r_{ij} = \frac{x_j^{max} - x_{ij}}{x_j^{max} - x_j^{min}} \quad (3)$$

Step 3: In the third step of the CRITIC method, the correlation between criteria is calculated with the help of Equation (4) and the correlation coefficient matrix is established.

$$\rho_{jk} = \frac{\sum_{i=1}^{m} (r_{ij} - \overline{r_j})(r_{ik} - \overline{r_k})}{\sqrt{\sum_{i=1}^{m} (r_{ij} - \overline{r_j})^2 \sum_{i=1}^{m} (r_{ik} - \overline{r_k})^2}} \quad (4)$$

Step 4: Calculating C_j value. The knowledge level of each criterion (C_j) is calculated with the help of Equation (5). the standard deviation value (σ_j) of the column elements of the normalized decision matrix is utilized here.

$$C_j = \sigma_j \sum_{k=1}^{n} (1 - t_{jk}),\ j = 1,2,\ldots,n \quad (5)$$

Step 5: Criterion weights are obtained by using Equation (6) in the last step of the method

$$w_j = \frac{C_j}{\sum_{k=1}^{n} C_k};\ \sum_{j=1}^{n} w_j = 1 \text{ ve } j \text{ ve } k = 1,2,\ldots,n \quad (6)$$

3.2. Waspas Method

WASPAS method that is suggested by Zavadskas et al. (2012) is a MCDM method that integrates weighted sum (WSM) and weighted product (WPM) models. The application steps of the WASPAS method can be seen below (Zavadskas et al., 2012: 3-4; Ghorabaee et al.,. 2016: 217; Karabasevic et al.,. 2016: 5-6).

In the first step of the method, the decision matrix is established as in the CRITIC method.

$$X = \left[x_{ij}\right]_{m*n} = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{bmatrix} \quad (7)$$

The decision matrix elements are normalized in the second application step of the WASPAS method. Here, Equation (8) is used for useful criteria while Equation (9) is utilized for useless criteria.

$$X_{ij}^{+} = \frac{x_{ij}}{max_{ixij}} \quad (8)$$

$$X_{ij}^{-} = \frac{min_{ixij}}{x_{ij}} \quad (9)$$

Equation (10), in the third step, helped to calculate the total relative importance value for each alternative based on the WSM model.

$$Q_i^1 = \sum_{j=1}^{n} X_{ij}^{*} W_j \quad (10)$$

W_j= The criterion weight calculated by the SD method.

In the fourth step, the total relative importance value for each alternative is computed via Equation (11) based on the WPM model.

$$Q_i^2 = \prod_{j=1}^{n} (X_{ij}^{*})^{W_j} \quad (11)$$

The combined optimality value for each alternative is found with the help of Equation (12) in the fifth application step of the WASPAS method.

$$Q_i = 0.5Q_i^1 + 0.5Q_i^2 \quad (12)$$

In the last step of the method, the alternatives are aligned based on the combined optimality value with the help of Equation (13). The alternative with the highest $Q_i$value is considered the best alternative. WASPAS model turns into WPM if X coefficient is accepted as 0 while the same model turns into WSM if X coefficient is accepted as 1.

$$Q_i = \lambda Q_i^{(1)} + (1-\lambda) Q_i^{(2)}, \quad (13)$$

λ=0,0.1,0.2,0.3,0.4,…….1

Right of option is left to the decision maker about which value the λ coefficient will take in the range of 0-1. Moreover, for Zavadskas et al., (2012), the optimal value should be calculated when λ coefficient is determined. Optimal λ değeri Eşitlik (14) yardımı ile hesaplanmaktadır. Optimal λ value is calculated with the help of Equation (14).

$$\lambda = \frac{\sigma^2 Q_i^{(2)}}{\sigma^2 Q_i^{(1)} + \sigma^2 Q_i^{(2)}} \quad (14)$$

4. FINDINGS AND DISCUSSIONS

This part of the study shows the stages of the analysis methods and the findings related to the analysis results. In the first place the application of the analysis steps of the CRITIC method shall be shown then the CRITIC methods shall be displayed. After determining the importance weight of the criteria with the CRITIC method, the WASPAS method analysis steps then shall be given and finally the results obtained according to the WASPAS method shall be identified.

4.1. Results of Critic Method

Table 1 shows the decision matrix established by using the period range data included in the scope of the study on participation banks. By using the data from the banking sector for the period January 2021- September 2022 it has been made use of the Equivalence (1) in the creation of the decision matrix.

Table 1: Initial Decision Matrix

Year/Month	K1	K2	K3	K4	K5
2022/9th Month	70.390,43	2,29	44,55	1,13	1.388,47
2022/8th Month	61.092,41	2,17	41,70	0,97	1.374,74
2022/7th Month	51.046,08	1,89	35,99	0,84	1.428,87
2022/6th Month	42.266,77	1,62	30,41	0,73	1.394,13
2022/5th Month	33.015,72	1,28	23,78	0,61	1.419,68
2022/4th Month	24.551,54	0,91	16,92	0,52	1.414,74
2022/3rd Month	18.177,01	0,64	12,18	0,40	1.599,07
2022/2nd Month	10.881,41	0,50	9,45	0,27	1.548,60
2022/1st Month	4.701,23	0,19	3,78	0,15	1.801,93
2021/12th Month	37.075,63	1,04	18,31	1,44	1.855,78
2021/11th Month	32.661,54	0,81	13,83	1,30	1.848,85
2021/10th Month	28.686,70	0,71	11,73	1,22	1.544,63
2021/9th Month	25.378,68	0,64	10,46	1,11	1.492,89
2021/8th Month	22.170,79	0,61	9,80	1,00	1.439,29
2021/7th Month	19.015,03	0,48	7,77	0,88	1.447,52
2021/6th Month	16.128,34	0,42	6,74	0,77	1.464,99
2021/5th Month	13.218,00	0,34	5,32	0,65	1.465,74
2021/4th Month	10.349,75	0,28	4,29	0,54	1.418,24
2021/3rd Month	7.746,23	0,21	3,29	0,42	1.414,51
2021/2nd Month	4.890,97	0,14	2,08	0,28	1.331,97
2021/1st Month	2.589,13	0,08	1,34	0,22	1.461,65

Decision matrix elements were normalized using equations (2) and (3). Table 2 shows the normalized decision matrix.

Table 2: Normalized Decision Matrix

Year/Month	K1	K2	K3	K4	K5
2022/9th Month	1,00	1,00	1,00	0,24	0,89
2022/8th Month	0,86	0,95	0,93	0,36	0,92
2022/7th Month	0,71	0,82	0,80	0,46	0,82
2022/6th Month	0,59	0,70	0,67	0,55	0,88
2022/5th Month	0,45	0,54	0,52	0,64	0,83
2022/4th Month	0,32	0,37	0,36	0,72	0,84
2022/3rd Month	0,23	0,25	0,25	0,81	0,49
2022/2nd Month	0,12	0,19	0,19	0,91	0,59
2022/1st Month	0,03	0,05	0,06	1,00	0,10
2021/12th Month	0,51	0,43	0,39	0,00	0,00
2021/11th Month	0,44	0,33	0,29	0,11	0,01
2021/10th Month	0,38	0,28	0,24	0,17	0,59
2021/9th Month	0,34	0,25	0,21	0,26	0,69
2021/8th Month	0,29	0,24	0,20	0,35	0,80
2021/7th Month	0,24	0,18	0,15	0,43	0,78
2021/6th Month	0,20	0,15	0,13	0,52	0,75
2021/5th Month	0,16	0,11	0,09	0,61	0,74

2021/4th Month	0,11	0,09	0,07	0,70	0,84
2021/3rd Month	0,08	0,06	0,05	0,79	0,84
2021/2nd Month	0,03	0,02	0,02	0,90	1,00
2021/1st Month	0,00	0,00	0,00	0,95	0,75

Table 3 shows correlation coefficient matrix showing the degree of relationship between criteria created by using normalized decision matrix elements with the help of Equation (4)

Table 3: Correlation Matrix

	K1	K2	K3	K4	K5
K1	**1,00**	**0,98**	**0,97**	**-0,65**	**0,11**
K2	**0,98**	**1,00**	**1,00**	**-0,49**	**0,19**
K3	**0,97**	**1,00**	**1,00**	**-0,45**	**0,20**
K4	**-0,65**	**-0,49**	**-0,45**	**1,00**	**0,26**
K5	**0,11**	**0,19**	**0,20**	**0,26**	**1,00**

Table 4 shows the C_j ve W_j (criteria weights) values for each criterion, obtained by using the standard deviation values of the criteria with the help of Equations (5) and (6)

Table 4: C_j Values Related to Criteria and Importance Weights of Criteria (W_j)

	K1	K2	K3	K4	K5
C_j	0,715610136	0,699138292	0,687701507	1,56649609	0,940867036
$\mathbf{W_j}$	0,155236259	0,151663046	0,149182081	**0,339817704**	0,204100909

Results of CRITIC method show that the criterion with the highest weight in determining the financial performance of participation banks (K4) is the Operating Expense/Total Assets criterion. Regarding Table 4, the criterion with the lowest effect in determining the financial performance of participation banks (K3) is the Return on Equity criterion.

4.2. Results of Waspas Method

The success ranking of the participation banks in the analysis period is evaluated by the WASPAS method at this stage of the application. The initial decision matrix in Table 1 was established within the WASPAS method. Table 5 shows the normalized decision matrix created using equations (8) and (9).

Table 5: WASPAS Method-Normalized Decision Matrix

Year/Month	K1	K2	K3	K4	K5
2022/9th Month	1	1	1	0,13625179	0,959309852
2022/8th Month	0,867907915	0,947033587	0,935896307	0,158574101	0,968888578
2022/7th Month	0,725184952	0,826164089	0,807731475	0,182959698	0,932182535
2022/6th Month	0,600461909	0,708997562	0,68252175	0,21161538	0,955411214
2022/5th Month	0,469037074	0,558122082	0,533769992	0,251226567	0,938219198
2022/4th Month	0,348790933	0,396880725	0,379647132	0,298738002	0,941493071
2022/3rd Month	0,258231343	0,279735142	0,273448159	0,383394156	0,832966827
2022/2nd Month	0,154586465	0,217604888	0,211998931	0,569961285	0,86011347
2022/1st Month	0,066787919	0,082645162	0,084780464	1	0,739191829
2021/12th Month	0,526714166	0,452803146	0,410916672	0,107304427	0,717739775
2021/11th Month	0,464005452	0,352518365	0,310318495	0,118507451	0,720429674
2021/10th Month	0,407537005	0,308801746	0,263340838	0,126400402	0,862324501
2021/9th Month	0,360541679	0,278871682	0,234693938	0,139103562	0,892209912
2021/8th Month	0,314968762	0,26403798	0,21988779	0,155188908	0,925436287

2021/7th Month	0,270136599	0,211044079	0,174472841	0,175229682	0,920172525
2021/6th Month	0,229126831	0,184442632	0,151343446	0,200401231	0,909199825
2021/5th Month	0,187781179	0,147089609	0,119375755	0,236256188	0,908736073
2021/4th Month	0,147033421	0,120348543	0,096383944	0,284093104	0,939168673
2021/3rd Month	0,110046686	0,092918105	0,073809553	0,365385662	0,941643352
2021/2nd Month	0,069483399	0,059474428	0,046766164	0,550411468	1
2021/1st Month	0,036782403	0,036585988	0,030042262	0,714612929	0,911275912

Table 6 shows the total relative importance value calculated with the help of Equation (10) for each alternative based on the WSM model after the normalization process

Table 6: Q_i^1 Values of Alternatives

Year/Month	K1	K2	K3	K4	K5	Q_i^1
2022/9th Month	0,155236	0,151663	0,149182	0,046301	0,195796	0,698178
2022/8th Month	0,134731	0,143630	0,139619	0,053886	0,197751	0,669617
2022/7th Month	0,112575	0,125299	0,120499	0,062173	0,190259	0,610805
2022/6th Month	0,093213	0,107529	0,101820	0,071911	0,195000	0,569473
2022/5th Month	0,072812	0,084646	0,079629	0,085371	0,191491	0,513950
2022/4th Month	0,054145	0,060192	0,056637	0,101516	0,192160	0,464650
2022/3rd Month	0,040087	0,042425	0,040794	0,130284	0,170009	0,423599
2022/2nd Month	0,023997	0,033003	0,031626	0,193683	0,175550	0,457859
2022/1st Month	0,010368	0,012534	0,012648	0,339818	0,150870	0,526237
2021/12th Month	0,081765	0,068674	0,061301	0,036464	0,146491	0,394695
2021/11th Month	0,072030	0,053464	0,046294	0,040271	0,147040	0,359100
2021/10th Month	0,063265	0,046834	0,039286	0,042953	0,176001	0,368338
2021/9th Month	0,055969	0,042295	0,035012	0,047270	0,182101	0,362647
2021/8th Month	0,048895	0,040045	0,032803	0,052736	0,188882	0,363361
2021/7th Month	0,041935	0,032008	0,026028	0,059546	0,187808	0,347325
2021/6th Month	0,035569	0,027973	0,022578	0,068100	0,185569	0,339788
2021/5th Month	0,029150	0,022308	0,017809	0,080284	0,185474	0,335025
2021/4th Month	0,022825	0,018252	0,014379	0,096540	0,191685	0,343681
2021/3rd Month	0,017083	0,014092	0,011011	0,124165	0,192190	0,358541
2021/2nd Month	0,010786	0,009020	0,006977	0,187040	0,204101	0,417924
2021/1st Month	0,005710	0,005549	0,004482	0,242838	0,185992	0,444571

Table 7 shows the total relative importance value for each alternative calculated with the help of Equation (11) based on the WPM model.

Table 7: Q_i^2 Values of Alternatives

Year/Month	K1	K2	K3	K4	K5	Q_i^2
2022/9th Month	1,000000	1,000000	1,000000	0,507965	0,991557	0,503677
2022/8th Month	0,978248	0,991780	0,990165	0,534841	0,993570	0,510499
2022/7th Month	0,951342	0,971454	0,968648	0,561481	0,985769	0,495490
2022/6th Month	0,923874	0,949179	0,944611	0,589942	0,990733	0,484150
2022/5th Month	0,889118	0,915352	0,910597	0,625362	0,987068	0,457460
2022/4th Month	0,849160	0,869224	0,865468	0,663276	0,987771	0,418526

2022/3rd Month	0,810443	0,824313	0,824123	0,721964	0,963385	0,382932
2022/2nd Month	0,748394	0,793503	0,793416	0,826099	0,969712	0,377446
2022/1st Month	0,656978	0,685144	0,692024	1,000000	0,940185	0,292864
2021/12th Month	0,905270	0,886777	0,875748	0,468367	0,934550	0,307724
2021/11th Month	0,887631	0,853737	0,839821	0,484443	0,935264	0,288350
2021/10th Month	0,869929	0,836765	0,819505	0,495174	0,970220	0,286594
2021/9th Month	0,853539	0,823926	0,805546	0,511554	0,976990	0,283128
2021/8th Month	0,835820	0,817124	0,797753	0,530934	0,984309	0,284735
2021/7th Month	0,816133	0,789828	0,770689	0,553305	0,983163	0,270248
2021/6th Month	0,795537	0,773853	0,754510	0,579126	0,980759	0,263827
2021/5th Month	0,771338	0,747744	0,728270	0,612441	0,980657	0,252273
2021/4th Month	0,742596	0,725332	0,705394	0,652043	0,987272	0,244588
2021/3rd Month	0,709934	0,697427	0,677864	0,710257	0,987803	0,235475
2021/2nd Month	0,661025	0,651795	0,633254	0,816359	1,000000	0,222735
2021/1st Month	0,598874	0,605491	0,592796	0,892094	0,981216	0,188158

The alternatives are aligned with the help of Equation (13) by using the WSM and WPM values. It is accepted as λ= 0.50 while calculating the composite optimality value. Table 8 shows the monthly total relative importance values and performance rankings of participation banks for the period of January 2021 and September 2022.

Table 8: WASPAS Method-Performance Ranking of Participation Banks for the Period of January 2021–September 2022

Year/Month	Q_i	Rank
2022/9th Month	0,60092749	**1**
2022/8th Month	0,590058277	2
2022/7th Month	0,553147468	3
2022/6th Month	0,526811741	4
2022/5th Month	0,485704565	5
2022/4th Month	0,441587948	6
2022/3rd Month	0,403265675	9
2022/2nd Month	0,417652572	7
2022/1st Month	0,409550827	8
2021/12th Month	0,351209518	10
2021/11th Month	0,323724873	13
2021/10th Month	0,327466265	11
2021/9th Month	0,322887436	14
2021/8th Month	0,324047962	12
2021/7th Month	0,308786683	17
2021/6th Month	0,301807716	18
2021/5th Month	0,293649263	**21**
2021/4th Month	0,294134408	20
2021/3rd Month	0,297008226	19
2021/2nd Month	0,320329111	15
2021/1st Month	0,316364589	16

We can say when Table 8 is reviewed that participation banks showed the worst performance in May 2021, based on the results of the WASPAS method. The period with the best performance is September 2022.

5. CONCLUSION AND IMPLICATIONS

Since this paper scrutinizes the 12 months before the Currency Protected Deposit application and the 9 months after the application, it is possible to make a comparison between before and after the application. 5 different criteria to be used in measuring financial performances were determined to make this comparison. According to the results obtained with the CRITIC method, the criterion with the highest weight is Operating Costs/Total Assets, and the criterion with the lowest weight is Return on Equity. Moreover, for the WASPAS method, the worst performance occurred in May 2021.

We can say based on the analysis results that the performance of participation banks followed a fluctuating course in 2021 and decreases were observed in the performances during the year. The financial performance of participation banks has increased with the Currency Protected Deposit (KKM) application and the performance increased continuously in 2022; the best performance was in September 2022.

With reference to the findings, the Currency Protected Deposit application affects the financial performance of participation banks positively. It is thought that the study will be a guide for future studies. The effect of Currency Protected Deposits on the performance of the banking sector can be determined from a broader profile after adding up-to-date data and including the entire banking sector in the scope of the study.

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HOW DO SOCIALLY RESPONSIBLE INVESTMENT AND MACROECONOMIC INDICATORS INTERACT WITH EACH OTHER? THE CASE OF SELECTED DEVELOPING COUNTRIES[1]

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ABSTRACT

Purpose- Sustainability is a multidimensional concept that expresses not only sensitivity to environmental policies, biodiversity and climate change, but also corporate governance principles and human rights. Accordingly, socially responsible investment is a kind of investment considering not only financial criteria but also environmental, social and corporate governance factors as well. In today's world, both the increase in social chaos, disasters and epidemics all over the world reveal the importance of addressing the issue of sustainability at the institutional and even governmental level and taking urgent action.

In this context, sustainability indices have been created in many international stock markets since the end of the 1990s, which are created according to various criteria. These indices follow the companies that comply with the concept of sustainability. Today, many developing country stock markets also have sustainability indices.

In this study, the interaction between the change in the sustainability index and macroeconomic indicators in developing countries was examined in order to be able to set forth the significance of the impact level of sustainability on the economy in the developing countries.

Methodology- Within the scope of the subject, the importance of adapting to sustainability in the developing countries and the activities carried out are also discussed. Within the analysis, the annual percentage change in the sustainability index in seven selected developing countries and macroeconomic indicators such as change in consumer price index and change in dollar-based exchange rates were examined for the period of 2015-2022 by the panel data methodology.

Findings- According to the findings, the impacts of changes in exchange rates and consumer price index on the sustainability indices are statistically significant. While exchange rates have negative effect, consumer price indices have positive effect on the sustainability indices.

Conclusion- Findings are expected to reveal the supportability and importance of sustainability in the developing countries and shed light for future research that this issue needs and worth to be investigated more deeply.

Keywords: Sustainability, socially responsible investment, macroeconomic indicators, developing countries, panel data.
JEL Codes: C23, G15, Q50

1. INTRODUCTION

Socially responsible investments have become increasingly popular especially In the last few decades. Socially Responsible Investment (SRI) is known in the literature as green, sustainable, ethical, responsible or impact investing as well. SRI prioritizes social, ethical or environmental conditions as well while considering the top aim of conventional investing as financial profitability maximization (Domini and Kinder 1984; Lowry 1993). There are many definitions and descriptions of SRI but no universal definition. Despite the definitions regarding SRI may vary, they reflect common traits (Ballestero, Pérez-Gladish, and García Bernabeu, 2015). Definition of the Forum for Sustainable and Responsible Investment (SIF, http://www.ussif.org) is that the SRI is an investment process which takes into account environmental, social and governance (ESG) components into investment decision making process in order to get hopeful societal impact besides long-run competing financial returns. SRI and sustainable development have a direct and long-term connection with each other. Since SRI forms the way financial

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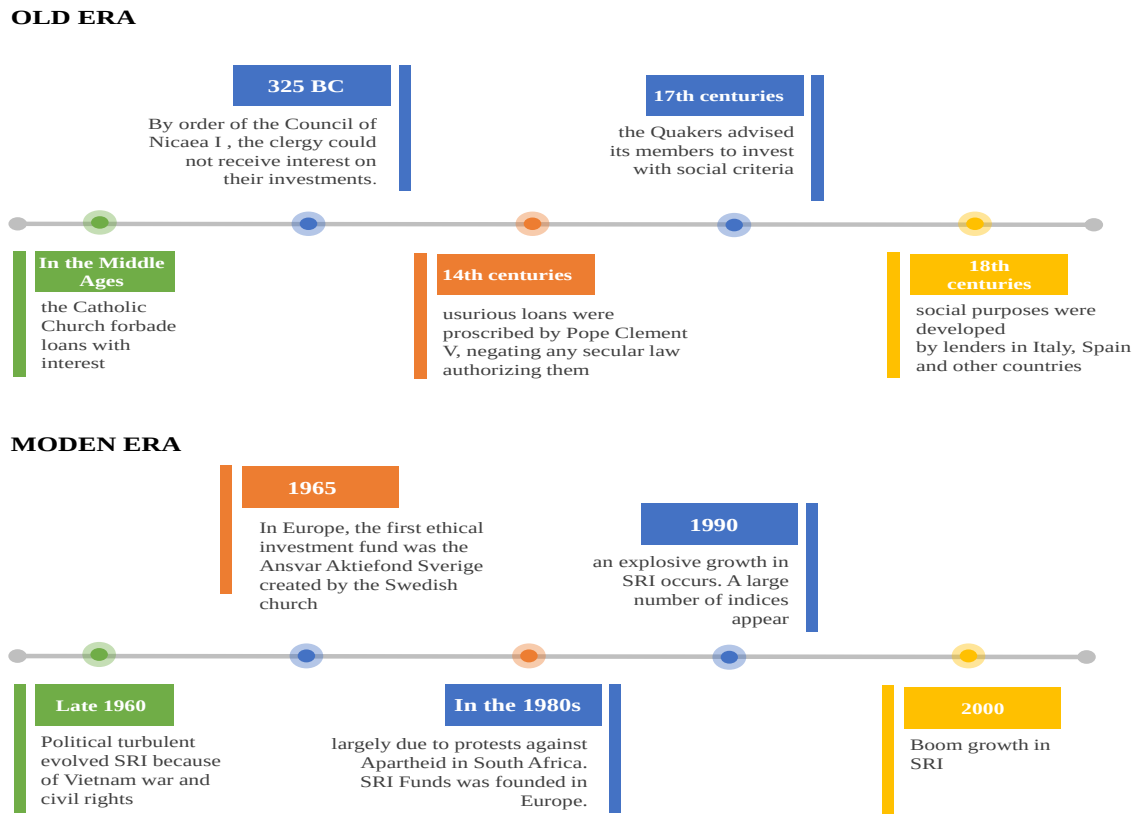
resources are turned into economic and business tasks so as to attain sustainable development for the world (Artie, 2019). Sustainable development has also been defined variously. However, a common definition of sustainable development is the one the Brundtland Commission formed (Brundtland, 1987). Accordingly, sustainable development is defined as "the development that meets the needs of the present without compromising the ability of future generations to meet their own needs". The objective of sustainable development is mainly the long-run balance of both the environment and economy (Hope, 2020: 108). In order to achieve that, the consolidation and recognition of economic, environmental, and social concerns should be realized throughout the proper implication of the decision-making process (Emas, 2015: 2).

The world is facing various environmental and socioeconomic challenges. Hence, both companies and investors are directing their funds towards specific investment strategies which can improve environmental, social and corporate governance (ESG) considerations in order to support the society to address aforementioned challenges and to achieve a sustainable development (Social Investment Forum, 2006).

Fundamentally, the roots of socially responsible investing are thought to date back to very early times in the history. In the Middle Ages, loans with interest was prohibited by the Catholic Church. The first official prohibition of usury by the church was in 325 A.D (Ekelund, Hebert and Tollison, 1989: 314-321). Moreover, Quakers and Methodists had presented guidelines to their followers regarding the types of companies in which they should invest in the 18th Century (Schroders, 2016). The political climate of the 1960s has affected the evolution of the modern socially responsible investing movement (NBUPPE, 2009: 50). During the 1960s, the society's understanding towards the issues related to social responsibility and accountability changed through a series of movements such as the civil rights, and equality for women. In the 1970s, these concerns were expanded so as to include disarmament, fair labor, and the environment. Beginning from the 1980s, socially concerned investors increased rapidly as many sections of the society focused their investment strategies against the racist system of South Africa government. After the incidents such as Bhopal, Chernobyl, Exxon Valdez, and global warming, the concept of SRI has been embraced by millions of people (The Social Equity Group, 2022). In the 1990s this trend was carried on and sustainability indices has been started to be calculated. SRI has been increasing since then (Ballestero et al., 2015: 10-16).

Figure 1: Historical Outline of SRI



Source: Prepared by the authors by using the information obtained from The Social Equity Group (2021), Townsend (2020) and Vincent (2014).

There is a wide range of classifications used in the literature for categorizing the different SRI strategies. It is also important to describe the different investment strategies, used to manage SRI assets as reported by the Global Sustainable Investment Alliance (GSIA) they are the following (Table 1). These strategies move together so as to support responsible business practices and to devote funds for social and environmental benefits throughout the economy (USSIF, 2017: 2).

Table 1: SRI Strategies (GSIA)

Investment strategy	Description
Negative/ exclusionary screening	The excluding certain sectors companies or practices based on selected ESG criteria from a fund or portfolio.
Positive/best-in-class screening	Investing in certain sectors, companies or projects with positive ESG performance.
Norms-based screening	Monitoring investments that cannot meet minimum standards of business practice based on international norms.
ESG integration	Including environmental, social and governance factors into financial analysis systematically by investment managers.
Sustainability themed investing	Investing in sustainability related themes or assets.
Impact/ community investing	Investing on purpose to solve social or environmental problems.
Corporate engagement and shareholder action	Benefiting from the shareholder power aiming to influence corporate behavior.

Source: Global Sustainable Investment Alliance (2021)

This is reflected in the large amounts invested according to SRI principles. In terms of the size of the SRI market, as of the latest available data, for the beginning of 2020, the Global Sustainable Investment Review (2020) reports the global SRI market included $35.3 trillion in 2020. There is also 55% increase during the 2016-2020 period, 15% increase in the 2018-2020 period, and 167% increase in the past eight years (2012-2020). Five major markets are USA, Canada, Europe, Australia and Japan.

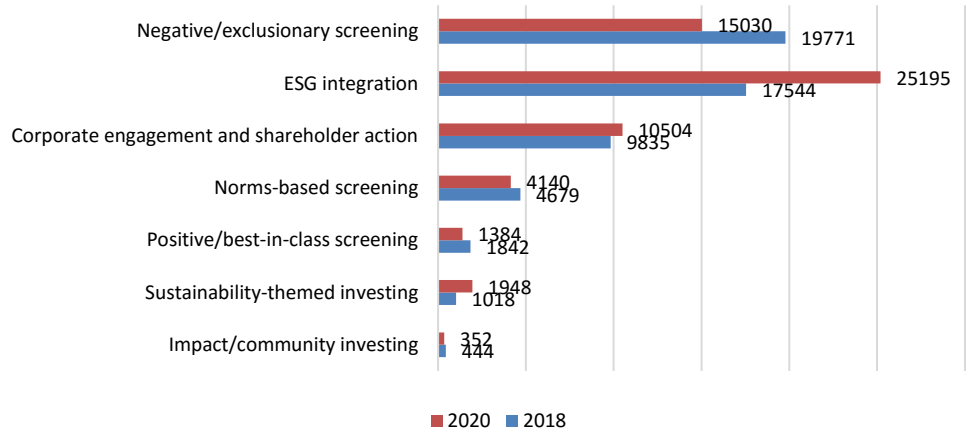
Table 2: Snapshot of Global SRI

Region	2012	2014	2016	2018	2020
Europe	8,758	10,775	12,040	14,075	12,017
United States	3,740	6,572	8,723	11,995	17,081
Japan	-	7	474	2,180	2,423
Canada	589	729	1,086	1,699	906
Australia/New Zealand	134	148	516	734	2,874
Total	13,221	18,231	22,890	30,683	35,301

Source: Global Sustainable Investment Review, 2020

The largest SRI strategy globally continues to be ESG integration, as shown in Figure 2, this is followed by negative or exclusionary screening. Also, the global growth of sustainable investing strategies from 2018 to 2020 is shown in Figure 2. As seen, sustainability-themed investing, ESG integration and corporate engagement have increased during this period. On the other hand, rest of the strategies have all experienced a more variable trend since 2018.

Figure 2: Global Growth of SRI Strategies, 2018–2020 (billion dollars)



Source: Global Sustainable Investment Review, 2020

SRI has expanded dramatically in developed countries. In emerging markets, on the other hand, growth in SRI has not yet occurred on the same scale, but this could soon change. As reported by Karen (2005), practices regarding sustainability including especially the ones related to SRI, have still to be fully evolved in a developing country context. The study reported in this article investigated the interaction between the SRI and macroeconomic indicators in the developing countries. We represent development of SRI in countries by SRI index (Sustainability index). SRI indices where constituents are shares of companies with high performance on ESG practices and specifically for companies trading in stock markets. This index has an important function in terms of favoring the responsible business practice improvement in the countries.

2. LITERATURE REVIEW

From the 1990s the SRIs have showed growth in the financial market and taken the attention of the academic researchers since the early 2000s (Renneboog et al. 2008). According to Luluk (2019) there are three research subjects in the SRI literature, mentioned as investor behavior, SRI development, and SRI performance. Studies focusing on SRI investor behavior investigate the points such as motivation, investment pattern, and decision making. Studies related to SRI development focus on specific areas such as theoretical evaluations, and roles of the participants in the SRI market. Finally, studies investigating SRI performance are found to be the most dominant area of investigation. They focus on the SRI practices and their financial impact. Most of the studies are seen to deal with the connection between financial achievement and corporate social responsibility (CSR). But, there are also studies that are analyzing the impact of SRI from a theoretical context (Dam and Heijdra, 2011).

Very few studies have explored the interaction between SRI (EGS, CSR) practice and macroeconomic performance as reported below.

Chapple and Moon (2005) investigated the relation between Gross National Product (GNP) and CSR activity and found no statistically significant correlation between the indicators. The analysis is conducted on the data obtained from 50 companies in seven Asian countries. The variables considered are the gross national product per capita, social development (life expectancy and adult literacy), economic structure.

Zadek (2006) analyzed National corporate responsibility index, internal dimension, external dimension, environmental management, responsible competitiveness index, national corporate responsibility, macroeconomic environment index, public institutions index, techonology index. It is found that national and regional competitiveness can be supported by responsible business practices.

Muzindutsi and Sekhampu (2013) investigated the effect of various macroeconomic factors on the SRI index in South Africa and set forth a combined long-run influence of these variables on the index, and a two-way causality relationship between the variables. The factors considered for the analysis are government expenditure, import and exports, private consumption, employment growth rate, and gross domestic investment. The tests applied on the data are co-integration test, error correction model and Granger causality test.

Boulouta and Pitelis (2014) analyzed the panel data obtained from 19 developed countries for 6-year period. They studied on exploring conceptually if CSR can have effect on the competitiveness of nations. Findings indicate that, CSR can contribute to

national competitiveness. The variables used in the analysis are GDP per capita, national corporate social performance, innovation, unit cost economies, human capital.

Ahn and Kim (2015) conducted a cross-section analysis and pooled time series analysis, on the data taken from 15 welfare countries for the 1990-2007 period in order to investigate the importance of social services as the main component of social investment strategies on economic performance. The variables used in the analysis are the labor market performance, economic growth and social service tendency measured by social service spending as a percentage of total social spending. It is found that higher social service tendency contributes to labor market performance and economic growth. Also it is found that a larger overall size of the welfare state may negatively affect employment.

Kwarteng, Dadzie, and Famiyeh (2016) examined the effect of sustainability on the competitive advantage of manufacturing firms in Ghana by the structural equation modelling (SEM). They found that social and factors have a positive effect on corporate image but not the environment. Furthermore, it is found that, corporate image and social factors positively affect corporate performance. On the other hand, economic factors and environment do not have any effect on corporate performance.

Harrison and Berman (2016) studied the interaction between corporate social performance and economic cycles. The unbalanced panel data used in the analysis are obtained from 837 firms and comprises 50 variables in the five groups over the years 1995-2009. They set forth that economic growth has influence on corporate social responsibility. But this influence varies in different areas of corporate social responsibility. They also found a significant increase in corporate social responsibility related concerns when the economy weak and vice versa.

Krajnakova, Navickas and Kontautiene (2018) analyzed the relationship between social macroeconomic business environment and the development of corporate social responsibility practices in Baltic Countries and Slovakia. They found that macroeconomic factors may have effect on the development of corporate social responsibility differently. Because of the long-term benefits of corporate social responsibility, firms carry on socially responsible actions even in negative macroeconomic periods. The analysis is conducted on the data taken from the selected countries' economic variables such as inflation rate, unemployment rate and real gross domestic product growth rate for the period of 2006-2016.

Xiaoyan, et al. (2020) analyzed the relation between firm level ESG practices and macroeconomic variables for developed and emerging countries by dynamic panel methods. Findings of the generalized method of moments (GMM) estimators indicate that increase in ESG performance can contribute to living standards which is measured by GDP per capita. They also set forth that positive interaction for social performance is valid for both emerging economies and developed economies. As for the environmental and governance components of ESG, it is found that these factors have significant effects on macroeconomic performance only for emerging economies.

As stated by Chih, Chih and Chen (2010), a positive macroeconomic environment and stronger legal enforcement levels can support the incorporation of corporate social responsibility.

Finally, Bernatonyte, Vilke and Keizeriene (2009) set forth that macroeconomic factors are not always correlated with the corporate social responsibility. The also found that economic depression has mostly negative influence on the development of corporate social responsibility practices.

As seen from the literature reviewed, it is seen that there is no consensus and/or enough research regarding the relationship between in macroeconomic variables and the sustainability in developing countries, and further research is needed. Hence this study is expected to make a meaningful contribution into the literature and shed light for future research.

3. DATA AND METHODOLOGY

The aim of this paper is to determine if there is an interaction between the SRI indices and selected macroeconomic variables from 2015 to 2021 in selected developing countries. The countries selected for the analysis are Brazil, China, India, Indonesia, Malaysia, South Korea and Turkiye. SRI Indices are provided by a stock exchange in developing markets, and they have been a driver for growing attention to responsible investment in developing countries. The SRI index for a country taken is employed in the analysis by calculating annual percentage change in the index (ESGCH), and the data regarding the indices are obtained from the investing.com. The macroeconomic variables which are obtained from the database of World Development Indicators in World Bank are change in consumer price index (CPICH) and change in dollar-based exchange rates (EXCHG). The countries and the time span is determined so as to obtain maximum amount of regularly available data.

The panel data analysis will utilize the following model:

$$ESGCH_{it} = \alpha_0 + \beta_1 CPICH_{it} + \beta_2 EXCHG_{it} + \varepsilon_i \quad (1)$$

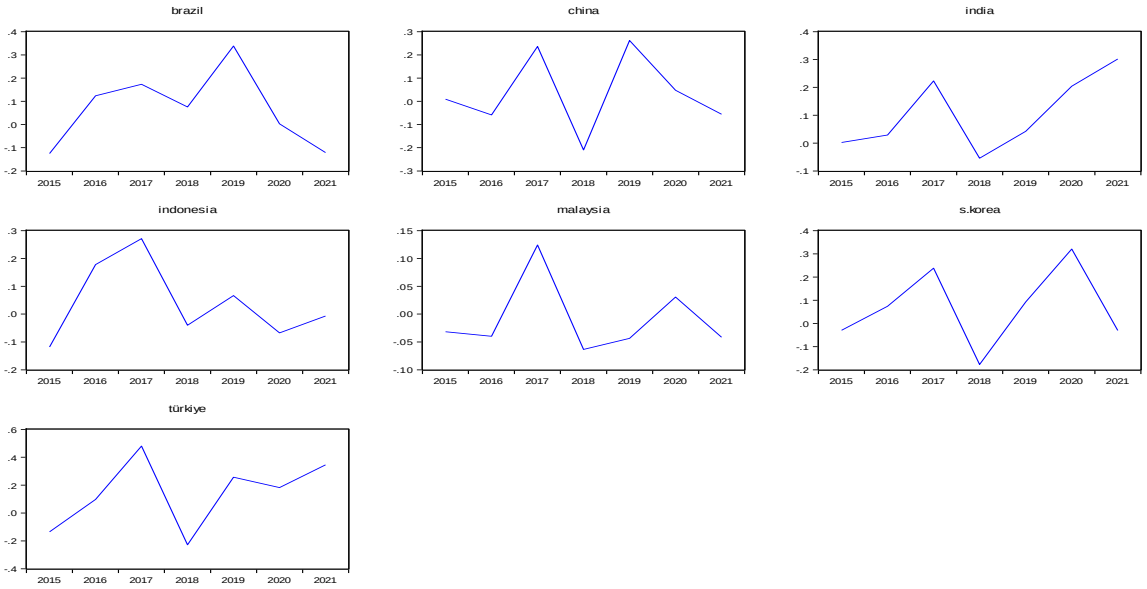
Here i and t represent the related country and the year respectively. α, β_1, β_2, β_3 and β_4, are the parameters to be estimated and ε represents the random error term. The null and alternative hypotheses are set as below:

H_0: The selected macroeconomic variable does not have a statistically significant effect on the SRI index.

H_A: The selected macroeconomic variable has a statistically significant effect on the SRI index.

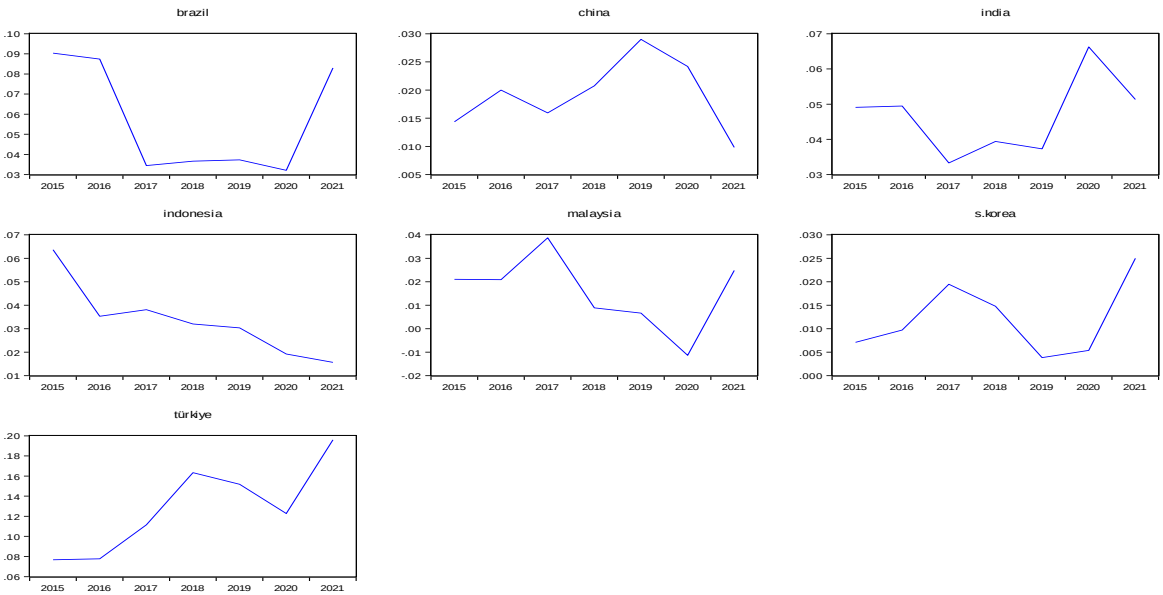
Figure 3, Figure 4 and Figure 5 represent the progress of the variables of Esgch, Cpich and Exchg respectively. Accordingly, the indices tend to decline after 2016 and they mostly increase beginning from 2018. Despite it was the year the pandemic boomed all over the world, it is seen that the change in the indices was on the rise for India, Indonesia and Türkiye in 2020 Figure 3).

Figure 3: Progress of the esgch during 2015-2021 in the Selected Countries



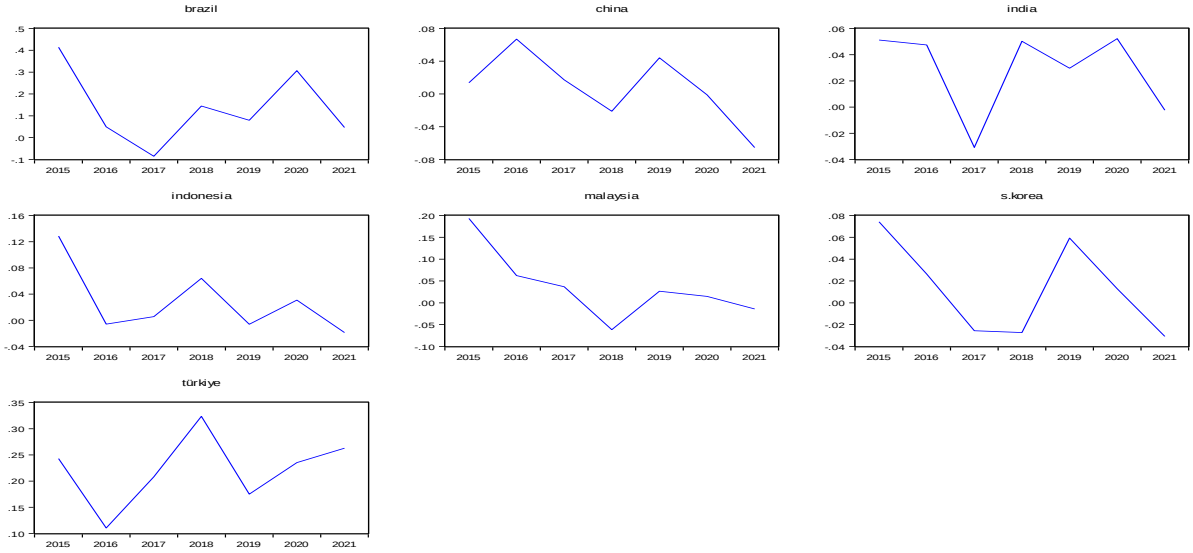
As seen in Figure 4, change in consumer price indices are quite variable and inconsistent for the countries included in the analysis. The most salient point is that while the index is consistently decreasing in Indonesia, it keeps rising sharply in Türkiye. Also Brazil has experiencing a dramatic increase in the index since 2020.

Figure 4: Progress of the cpich during 2015-2021 in the Selected Countries



Change in dollar-based exchange rates has a similar and volatile pattern in the selected developing countries. In contrast to the rest of the countries, the exchange rate in Türkiye has been increasing since 2019 (Figure 5).

Figure 5: Progress of the Exchg during 2015-2021 in the Selected Countries



4. FINDINGS AND DISCUSSIONS

Before panel regression analysis conducted, descriptive statistics and correlation coefficients are presented in Table 3 and Table 4 respectively. The average Esgch is negative only in Malaysia (-0.009) during the analysis period. On the other hand, the mean value for Esgch is higher than the overall mean values in Türkiye (0.143), India (0.107), South Korea (0.070), and Brazil (0.067) for the analysis period which means that sustainability practices are given more importance in aforementioned countries. Average change in consumer price indices (Cpich) and exchange rates (Exchg) are all positive for the countries. The highest change in Cpich in average is for Türkiye (0.129), Brazil (0.057), and India (0.047). On the other hand, change in consumer price index is below overall average values in South Korea (0.012), Malaysia (0.016), China (0.019), and Indonesia (0.033) respectively. Finally, change in exchange rates is dramatically above overall mean values only in Türkiye (0.223) and Brazil (0.136).

Table 3: Descriptive Statistics (2015-2021)

Brazil	**Mean**	**Max.**	**Min.**	**Std. Dev.**	**Malaysia**	**Mean**	**Max.**	**Min.**	**Std. Dev.**
esgch	0.067	0.338	-0.125	0.165	**esgch**	-0.009	0.124	-0.063	0.066
cpich	0.057	0.090	0.032	0.028	**cpich**	0.016	0.039	-0.011	0.016
exchg	0.136	0.414	-0.086	0.171	**exchg**	0.037	0.193	-0.062	0.080
China	**Mean**	**Max.**	**Min.**	**Std. Dev.**	**S.Korea**	**Mean**	**Max.**	**Min.**	**Std. Dev.**
esgch	0.033	0.262	-0.210	0.168	**esgch**	0.070	0.320	-0.178	0.170
cpich	0.019	0.029	0.010	0.006	**cpich**	0.012	0.025	0.004	0.008
exchg	0.008	0.067	-0.065	0.043	**exchg**	0.013	0.074	-0.031	0.043
India	**Mean**	**Max.**	**Min.**	**Std. Dev.**	**Türkiye**	**Mean**	**Max.**	**Min.**	**Std. Dev.**
esgch	0.107	0.302	-0.054	0.134	**esgch**	0.143	0.481	-0.228	0.254
cpich	0.047	0.066	0.033	0.011	**cpich**	0.129	0.196	0.077	0.045
exchg	0.028	0.052	-0.031	0.033	**exchg**	0.223	0.324	0.110	0.068
Indonesia	**Mean**	**Max.**	**Min.**	**Std. Dev.**	**Total**	**Mean**	**Max.**	**Min.**	**Std. Dev.**
esgch	0.040	0.271	-0.118	0.140	**esgch**	0.064	0.481	-0.228	0.162

cpich	0.033	0.064	0.016	0.016	**cpich**	0.045	0.196	-0.011	0.043
exchg	0.028	0.128	-0.019	0.052	**exchg**	0.068	0.414	-0.086	0.108

Table 4 represents the pearson correlation coefficients for the variables. Accordingly, the correlation between Cpich and Exchg is strong and positive, and this finding is statistically significant at 1% significance level. Correlation between esgch and other variables is poorer and statistically insignificant However, these findings cannot explain the impact level and cause and effect interaction between the indicators. For this purpose, panel data regression analysis is conducted.

Table 4: Pearson Correlation Coefficients

	esgch	cpich	exchg
esgch	1.000000		
cpich	0.209013	1.000000	
exchg	-0.053924	0.671614*	1.000000

** indicates statistical significance at the 1% level.*

The panel regression analysis findings for the significant variables are given in Table 6. According to the Hausman test statistics the randome effects model is the suitable model. The model is statistically significant according to the F-stat findings and the Durbin Watson statistics inicate that there is no autocorrelation problem in the data. Findings indicate that both effect of Exchg and Cpich is statistically significant. While Exchg has negative effect (-0.52818), Cpich has positive effect (1.666244) on Esgch.

Table 6: Interaction between SRI Index and the Significant Macroeconomic Variables

(Dependent Variable: E.sgch; 2015-2021).

Variable	Pooled	Fixed	Random
c	0.025596	0.072453	0.025596
exchg	-0.528818***	-0.592972***	-0.52818***
cpich	1.666244**	0.714725	1.666244**
Hausman Test			1.111472
Adjusted R2	0.073872	-0.010619	0.073872
F-stat	2.914334***	0.936953	2.914334***
Durbin-Watson	2.690432	2.725848	2.690432

, ** and * indicate statistical significance at the 1, 5 and 10% levels respectively.*

According to the analysis findings, the model can be estimated as Equation (2). In this respect, the null hyphotheses for change in consumer price index and exchange rates can be rejected. While positive changes in consumer price indices cause an increase in the SRI indices of countries, the same change in the exchange rates results in the opposite way for the indices.

$$ESGCH_{it} = 0.025596 + 1.666244 * CPICH_{it} - 0.528818 EXCHG_{it} + \varepsilon_i \quad (2)$$

5. CONCLUSION AND IMPLICATIONS

In the last few decades, socially responsible investments have growingly become a relevant issue. Socially responsible investment, as an investment process that combines investment decision making and environmental, social and governance considerations together in order to provide positive societal impact and long-term competing financial gains. The study reported in this article investigated the interaction between selected macroeconomic indicators and the SRI in seven developing countries for the period of 2015-2021 by the panel data analysis.

Findings indicate that changes in consumer price indices increase SRI index. This finding may mean that increasing inflation rates cannot have negative effect on sustainability practices. And even under high inflation the developing countries can carry on investing in socially responsible investment. The other significant finding that the increase in dollar-based exchange rates causes a decrease in SRI indices, which is a reasonable finding for the developing countries.

Findings of this research are compatible with those of Muzindutsi and Sekhampu (2013) which could set forth significant effect of selected macroeconomic variables on SRI indices in South Africa. Similarly, Krajnakova et al. (2018) concludes that economic conditions may diversely affect different dimensions of socially responsible actions. On the other hand, findings are found to be contradicting with those of Zadek (2006) asserting responsible business practices can contribute to national and regional competitiveness. Other contradicting studies are of Chih et al. (2010), and Bernatonyte et al. (2009). They conclude respectively that a favourable macro environment contribute to the sustainability and effect of economic depression on the development of sustainability is mostly seen in negative way.

This study indicates that sustainability practices and the macroeconomic environment is interacting with each other despite the limited available observation. Hence, the findings and the issue is open for and need to be supported by further research.

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