

Investigation of the Relationship Between the Tourism Revenue and the Economic Growth for Türkiye: A Relative Sensitivity Analysis Approach



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ABSTRACT: Tourism revenue is an important income component of the Turkish economy since the tourism revenue of Türkiye is ranked among the first fifteen countries in the World. Therefore, the analysis of the effects of tourism revenue of Türkiye on its economic stance is an active research area. This paper investigates the impact of the tourism revenue of Türkiye on the economic growth for the period of 2003-2022 using quarterly data. The causality relationship between the tourism revenue and the economic growth is analysed as the first step employing the Granger causality tests. Then, the relative sensitivity of the economic growth dependent on the tourism income is computed in Python programming language. The result of the relative sensitivity analysis shows that the 1% increment in the tourism revenue leads to the 0.12% increment of the economic growth. The presented method can be applied for the analysis of the effect of the tourism revenue on the economic growth also for other countries.

KEYWORDS: Tourism revenue, economic growth, Granger causality, relative sensitivity analysis.

I. INTRODUCTION

The tourism-based growth theory is an important research area for a long time considering the increments of the tourism revenue thanks to the ease of transportation and the advancements in the tourism services. Tourism revenue is an important component of the economy for both developed and developing countries. The geography of Türkiye has a rich historical background based on Anatolia and the hotel and airport facilities of Türkiye has been among the leading countries of the World. For example, Istanbul airport had more than 425.000 airport operations and 64 million passengers in 2022 and the tourism revenue of Türkiye was more than 40 billion USD in 2022 [1, 2]. Therefore, the tourism revenue obviously takes a great part in the economic structure of Türkiye.

The economic revenue of countries has several components such as the industrial income, income from goods and services, income from the international trade and the tourism income. The tourism facilities consisting of the transportation structure and the hotel facilities of Türkiye supported by its geographical closeness with the European Union, Russia, Africa and the Middle East give boost to the tourism revenues. This is further endorsed by the digital access of the global accommodation and travel companies via smartphones and the Internet. As a result, the tourism revenue of Türkiye has an increasing trend for a long time. The tourism revenue has impacts on various economic parameters such as the gross domestic product, economic growth, exchange rate and tourism investments.

The relationship between the tourism revenue and the economic parameters can be studied in various ways. In this study, the effect of the tourism revenue on the economic development is investigated considering the relationship of the tourism revenue and the economic growth. There are various methods and models for the investigation of the causality between time series in the literature where the Granger and Toda-Yamamoto causality tests are widely used for analysing the causality analysis between econometric series. The Granger test is utilized for the causality analysis of stationary series while Toda-Yamamoto test can also be used for non-stationary time series. In this study, the Granger causality test was utilized for the assessment of the causality relationship between the tourism revenue and the economic growth for Türkiye for the period of 2003-2022 using data taken from official sources. After the evaluation of the causality analysis results, it is observed that the tourism revenue impacts the economic growth for Türkiye. As the next step, relative sensitivity analysis is employed for obtaining the quantitative description of the effect of the tourism revenue on the economic growth for Türkiye. Eviews and the Python programming language are used for the Granger causality test and the relative sensitivity analysis, respectively, in this work.

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II. LITERATURE REVIEW

There are a large number of studies in the literature regarding the impact of the tourism revenue on the economic growth for Türkiye and other developing countries. For example, in the study of Uysal regression and Granger causality analysis are used for the investigation of the effects of the tourism revenue of Türkiye on the economic growth for the period of 1992-2003 and they have concluded that there exists a bi-directional causality relationship between the tourism revenue and the economic growth and that the tourism revenue affects the economic growth in a positive way [3]. In another study, vector autoregressive approach is utilized for the analysis of the impact of the tourism revenue on the economic growth for the period of 1963-2004 and it is shown that tourism revenue has positive impact on the economic growth and that the tourism revenue and the economic growth are cointegrated [4].

In the study of Deger, the relationship of the tourism revenue, export revenue and the economic growth are investigated employing regression and cointegration analyses and they have concluded that the tourism revenue and the export revenue affect the economic growth positively [5]. In 2006, Kizilgol studied the export and tourism-based growth hypothesis for Türkiye for the period of 1963-2005 using error correction model, causality and the cointegration methods and they have shown that there is a long-term causality relationship between the tourism revenue and the economic growth and that the export and tourism based economic growth hypothesis is valid [6]. Structural break and causality analyses were used for the analysis of the effects of the tourism revenue on the economic growth for the period of 1992-2004 using Toda-Yamamoto tests for Türkiye where they have not found a relationship [7]. However, Aslan have shown that the tourism revenue supports the economic growth for the period of 1992-2007 using Johansen cointegration and Granger causality tests [8]. Similarly, Cetintas and Bektas employed autoregressive distributed lag boundary test and the Granger causality test to assess the relationship of the tourism revenue and the economic growth of Türkiye for the period of 1964-2006 and they have concluded that there is a long-term unidirectional relationship from the tourism revenue to the economic growth [9]. On the other hand, Kizilgol and Erbaykal have concluded that there is a unidirectional relationship from the economic growth to the tourism revenue for Türkiye in the period of 1992-2006 using Toda-Yamamoto causality analysis [10]. In another study, Akan and Isik utilized the Granger causality and cointegration methods and have shown that the tourism revenue impacts the economic growth positively for Türkiye for the period of 1970-2007 [11].

Vector autoregressive approach is used by Alp to analyse the impact of the tourism revenue on the economic growth for Türkiye in the period of 1998-2009 and they have shown that there is a positive relationship between the tourism revenue and the economic growth and at least 30% increment of the tourism revenue is required to increase the economic growth [12]. Bahar and Bozkurt used dynamic panel analysis approach for the analysis of the relationship of the tourism revenue and the economic growth for 21 developing countries in the period of 1998-2005 and they have shown that the 1% increment of tourism revenue increases the economic growth by 2.8% [13]. On the other hand, Hepaktan and Cinar used Granger causality tests and concluded that there does not exist causality relationship between the tourism revenue and the economic growth for Türkiye [14]. However, Kadir et al. utilized vector error correction model and the Granger causality tests for the assessment of the tourism revenue and the economic growth for Malaysia for the period of 1989-2009 and they have concluded that these two data are cointegrated and there is a strong causality relationship from the economic growth to the tourism revenue [15].

Lean and Tang employed the causality analysis on Malaysian economic data for the period of 1989-2009 and they have shown that the tourism-led growth hypothesis is valid [16]. Sarmidi and Salleh also investigated the Malaysian economy for the 1997-2004 period and used cointegration and causality analysis and have concluded that there is a unidirectional causality from the tourism revenue to the economic growth [17]. On the other hand, Malik et al. used Johansen cointegration and Granger causality analyses for Pakistan for the period of 1972-2007 and they have shown that there is a cointegrated relation between the tourism revenue and the economic growth [18]. Mishra et al. studied the Indian economy for the 1978-2009 period and have shown that there is a unidirectional causality relationship from the tourism revenue to the economic growth [19]. On the other hand, Bento and Santos analysed the Portuguese economy for the 1997-2004 period and have shown that there is a unidirectional causality from the tourism revenue to the economic growth [20]. In a panel data analysis, Samimi et al. investigated 20 developing countries for the 1995-2009 period using panel vector autoregressive approach and have concluded that there is a bidirectional causality relationship between the tourism revenue and the economic growth [21].

Ekanayake and Long used panel cointegration test for the analysis of the data of 24 countries and have shown that the tourism revenue contributes to the economic growth [22]. Kadir and Karim also used the panel cointegration test for the analysis of the economies of the ASEAN countries for the period of 1998-2005 and have shown that there is a cointegration relationship between the international tourism revenue and the economic growth [23]. Lashkarizadeh et al. have analysed the Iranian economy for the 1980-2009 period utilizing the Granger causality and error correction model and have concluded that there is a bidirectional relationship between the tourism revenue and the economic growth [24]. In another study, the Malaysian economy is investigated

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and it is shown that there exists a unidirectional relationship between the number of tourists and the economic growth for the period of 1974-2010 [25].

Sampayo and Vale studied the European economy for the 1988-2010 period using cointegration analysis and they have concluded that the effect of the tourism revenue on the economic growth is larger for the northern countries [26]. Paudyal investigated the Nepalese economy for the period of 1975-2010 utilizing least squares approach and have shown that there is a bidirectional causality relationship between the tourism revenue and the economic growth [27].

Dragouni et al. used the vector autoregressive method to analyse the time-varying characteristics of the European countries and have shown that the causality relationship between the tourism revenue and the economic growth is inconclusive [28]. On the other hand, Bouzahzah and Menyari used cointegration and Granger causality methods on the economic data of Morocco and Tunisia and have shown that the tourism-led growth hypothesis is valid for both countries for the period of 1980-2020 [29].

In a panel causality approach, Chou have studied the economies of the transition countries for the 1988-2011 period and have found varying results such as the tourism-led growth hypothesis is valid for Lithuania and Slovakia [30]. In addition, Jayathilake have analysed the Sri Lankan economy for the period of 1967-2011 using cointegration and causality methods and have shown that the tourism revenue have impacts on the economic growth in a positive way [31]. Similarly, Kareem studied the economic data of 30 African countries using panel cointegration approach for the period of 1990-2011 and have shown that the tourism revenue has a positive effect on the economic growth [32].

Makochekeka investigated the economies of south African developing countries for the 2000-2012 period employing the regression method and concluded that 1% increment of tourism revenue leads to the 0.16% increment in gross domestic product per person [33].

The rolling window test approach has been utilized by Nonthapot to describe the effects of the tourism revenue on the economic growth for Thailand in the period of 1971-2012 and it is shown that there is a unidirectional causality relationship from the tourism revenue to the economic growth [34]. A similar result was concluded by Kreishan for the economy of Bahrain for the 1990-2014 period using the autoregressive distributed lag analysis [35]. On the other hand, Kumar et al. studied the Malaysian economy for the 1975-2012 period using autoregressive distributed lag and the Granger causality methods and have concluded that there is a unidirectional causality relationship from the tourism revenue to the economic growth [36].

Seghir et al. utilized panel cointegration and panel Granger causality tests for the analysis of the economies of selected 49 countries and have shown that there is a causality relationship from the tourism revenue to the economic growth [37]. Bento employed an empirical investigation for the Portuguese economy using cointegration and causality analysis for the 1995-2015 period and concluded that there is a unidirectional causality relationship from the tourism revenue to the economic growth [38]. Brida et al. used the momentum threshold autoregressive approach for the analysis of the economies of Mercosur countries for the period of 1992-2012 and have shown that there is cointegration relationship between the tourism revenue and the economic growth for the Brazilian economy [39].

Tang and Abosedra analysed the economic data of Lebanon for the 1995-2011 period using bootstrap causality analysis and have concluded that the tourism-led economic growth hypothesis is valid for Lebanon [40]. Similarly, Chulaphan and Barahona used cointegration and causality analysis for the assessment of the economic data of Thailand and have shown that number of incoming tourists increases the economic growth [41].

Isik and Radulescu studied the economies of the European Union countries for the period of 1995-2012 using Pedroni panel cointegration analysis and have shown that the tourism revenue affects the economic growth positively [42]. Ohlan investigated the Indian economy for the period of 1960-2014 employing Bayer and Hanck model, autoregressive distributed lag model, vector error correction model and the variance decomposition methods and has shown that there is a unidirectional causality relationship from the tourism revenue to the economic growth [43].

The relationship of the tourism revenue and the economic growth of Türkiye has also been investigated employing different methods and approaches in the literature as the tourism revenue of Türkiye is among the first fifteen countries in the World. For example, Savas et al. employed the autoregressive distributed lag method and the error correction model-based causality analysis for the investigation of the relationship of the tourism revenue and the economic growth for Türkiye in the period of 1984-2008 and have concluded that there is a unidirectional causality relationship from the tourism revenue to the economic growth and the tourism-led economic growth hypothesis is valid [44].

Atan and Arslanturk used the input-output analysis to assess the effects of the tourism revenue on the economic growth for Türkiye where it is shown that the tourism revenue affects the accommodation and services sectors [45]. Kara et al. also studied the economic data of Türkiye for the 1992-2011 period using the vector autoregressive and Granger causality analyses and they have concluded that there exists a unidirectional causality relationship from the economic growth towards the tourism revenue

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[46]. In another study, the economic data of Türkiye is analysed using the cointegration and causality methods for the period of 1969-2009 and it is shown that there is a unidirectional causality relationship from the tourism revenue to the economic growth [47]. Similarly, the economy of Türkiye has been studied using the Johansen cointegration and the Granger causality analysis methods for the 1960-2006 period and it is concluded that the tourism revenue affects the production and services sectors in a positive way [48].

In another study, the Turkish economic data for the period of 1970-2011 was investigated employing cointegration and error correction models and it is shown that there exists a bidirectional causality relationship between the share of the tourism revenue and the economic growth [49]. Cointegration and causality analysis methods were used in another study to assess the economic data of Türkiye for the period of 1963-2000 where it is shown that there is a bidirectional causality relationship between the tourism revenue and the economic growth [50].

Ozer and Kirca utilized cointegration, vector error correction and Granger causality models for the period of 2003-2012 and they have shown that there is a unidirectional causality relationship from the tourism revenue to the economic growth for Türkiye in the long term [51]. On the other hand, a bidirectional causality relationship was determined between the tourism revenue and the economic growth for Türkiye in the 2003-2013 period using the Granger causality analysis [52]. In another study, vector autoregressive analysis and the vector error correction method were utilized for the assessment of the economic data of Türkiye for the period of 1980-2014 and it is concluded that a 1% increment of tourism revenue leads to the 0.28% increment of the gross domestic product [53].

The combination of the least squares method and the Granger causality approach was used in another study for the Turkish economic data in the 2002-2014 period and it is shown that there exists a Granger causality relationship from the tourism revenue to the economic growth [54]. On the other hand, the relationship between the net tourism revenue and the economic growth was assessed for Türkiye for the 2003-2013 period and it is concluded that there is a unidirectional causality relationship from the net tourism revenue to the economic growth [55]. A bidirectional causality relationship between the tourism income and the economic growth was identified in another study where the Granger causality analysis was employed for the analysis of the economic data of Türkiye for the 1980-2014 period [56]. Toda-Yamamoto and asymmetrical causality analyses were utilized for the analysis of the Turkish economy for the period of 1963-2010 in another work and it is concluded that there exists a unidirectional causality relationship from the tourism revenue to the economic growth for the given period [57].

The tourism-led economic growth hypothesis is validated in another paper in which the vector autoregressive analysis is used on the economic data of Türkiye for the period of 1963-2013 [58]. On the other hand, Johansen cointegration, vector error correction model and the Toda-Yamamoto causality analysis were utilized in combination for the analysis of the Turkish economic data for the 1963-2011 period and it is shown that there exists a unidirectional Granger causality relationship from the tourism revenue towards the economic growth [59]. In another study, autoregressive distributed lag model in conjunction with the causality tests were utilized for the period of 2003-2012 for Türkiye and it is concluded that there is a unidirectional causality relationship from the tourism revenue to the economic growth [60].

Panel analysis, specifically second-generation panel cointegration tests, are used for the assessment of the Turkish economy and the economies of other selected 41 countries in the 1995-2005 period in another work and it is shown that the tourism revenues and the economic growths are cointegrated and that the tourism revenues Granger cause the economic growths [61]. In another paper, the economic data of Türkiye for the period of 1965-2016 is analysed employing the structural break tests where it is shown that the tourism revenue and the economic growth have bidirectional causality relationship [62]. On the other hand, in another study, the economic data of Türkiye and the Turkish Republic of Northern Cyprus are studied utilizing the autoregressive distributed lag method for the period of 1977-2013 and it is shown that the tourism-led growth hypothesis is valid for Türkiye [63].

In this study, the causality relationship of the tourism revenue and the economic growth for Türkiye in the period of 2003-2022 is investigated using the Granger causality analysis. Then, the impact of the tourism revenue on the economic growth is modelled using relative sensitivity analysis in Python programming language. The result of the relative sensitivity analysis shows that the 1% change in the tourism revenue leads to a 0.12% change in the economic growth. It is argued that the method used in this study can also be used for the quantitative analysis of the effects of the revenue components on the economic growth for other countries.

III. MATERIAL AND METHODS

First of all, the quarterly tourism revenue and the economic growth data are taken from the official sources namely the Turkish Statistical Institute (Turkstat) and the electronic data distribution system of the Central Bank of Türkiye (EDDS-CBRT) [2, 64]. The

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period of 2003-2022 is selected as the analysis frame since the share of the tourism revenue in the gross domestic product has increased after the year 2003. The gathered tourism revenue and the economic growth data are shown in Figure 1.

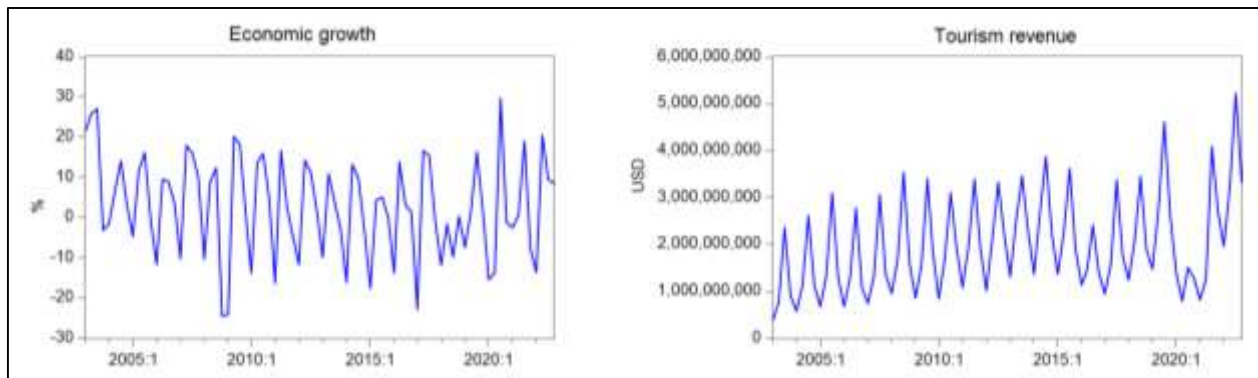


Figure 1. The economic growth and the tourism revenue data taken from the Turkstat and EDDS-CBRT [2, 64]

It is worth noting that the economic growth and the tourism revenue data plotted in Figure 1 are quarterly data. Therefore, there are 80 data samples for each graph spanning 2003Q1 to 2022Q4. As the first step of the data analysis, the causality relationship between the economic growth and the tourism revenue data are assessed employing the Granger causality test. However, the data has to be seasonally adjusted and stationarized before the Granger causality test [65]. These processes are performed in Eviews software [66]. Then, the relative sensitivity analysis is used for the modelling of the relationship between the economic growth and the tourism revenue after performing the Granger causality analysis. The application details and the results of these operations are explained step-by-step in the Results and Discussion section.

IV. RESULTS AND DISCUSSION

The tourism revenue and the economic growth data are seasonally adjusted as the first step. Eviews software is used for the seasonal decomposition. Specifically, seasonal-trend decomposition with Loess (STL) method is utilized for the seasonal adjustment where the periodicity is set as 4 since both series is quarterly data and the smoothing windows coefficients are automatically selected as 35, 7 and 5 for the season, trend and the filter components depending on the length of the time series.

The seasonal-trend decomposition and the seasonally adjusted form of the economic growth data are given in Figure 2. As it can be seen from Figure 2, the seasonal component of the economic growth data has an important portion, which is expected since the economic growth includes components such as the tourism data and the agricultural data which are known to have significant seasonal variations.

The seasonal-trend decomposition is also applied on the tourism revenue data before the Granger causality analyses. The seasonal adjustment of the tourism revenue data is also performed utilizing the seasonal-trend decomposition with Loess method in Eviews whose results are plotted in Figure 3. The tourism revenue also has a strong seasonal component as it can be observed from Figure 3, which is expected considering that the tourism revenue increases in summer and winter seasons. It is worth noting that the tourism revenue is given in United States Dollar (USD) unit and the seasonal component has more than a billion USD peak value indicating that the seasonal effects on the tourism data is significant. Therefore, the values of the seasonal components show that the seasonal adjustment of the economic growth data and the tourism revenue data was actually required and performed. Moreover, the stationarities of the data are also verified using unit root tests enabling to advance to the Granger causality test phase.

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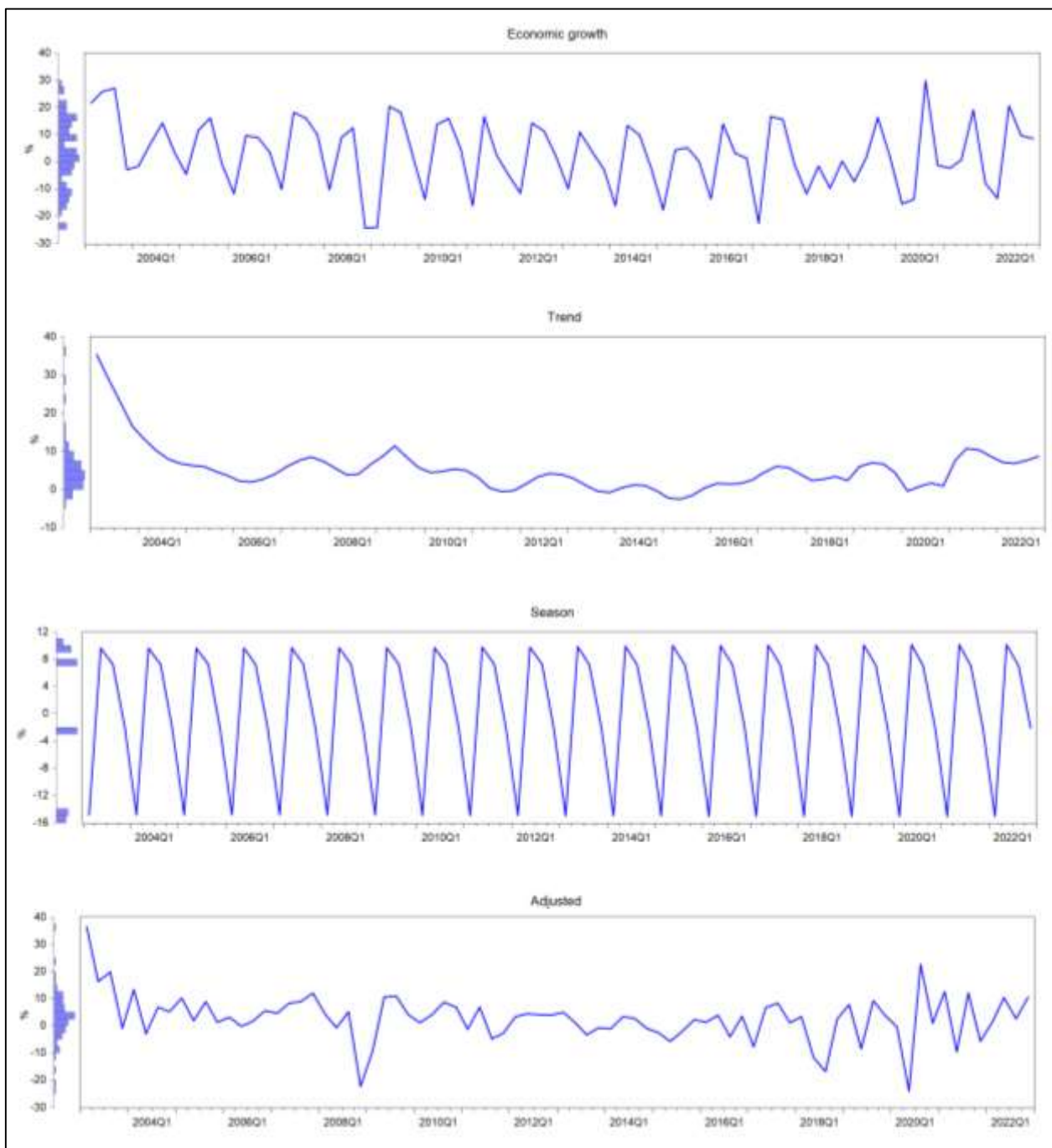


Figure 2. The seasonal-trend decomposition and the seasonally adjusted component of the economic growth data

The Granger causality test was performed in Eviews as the next step. The lag was automatically selected as 2 in the Eviews panel. The obtained Granger causality test results were given in Table 1.

The Granger causality test results shown in Table 1 indicates that the tourism revenue in USD Granger causes the economic growth however the economic growth does not Granger cause the tourism revenue according to the $p < 5\%$ confidence level. In other words, there is a unidirectional causality relationship from the tourism revenue to the economic growth. This is consistent with the studies summarized in the literature review section. The obtained Granger causality relationship between the tourism revenue and the economic growth data is shown in Figure 4.

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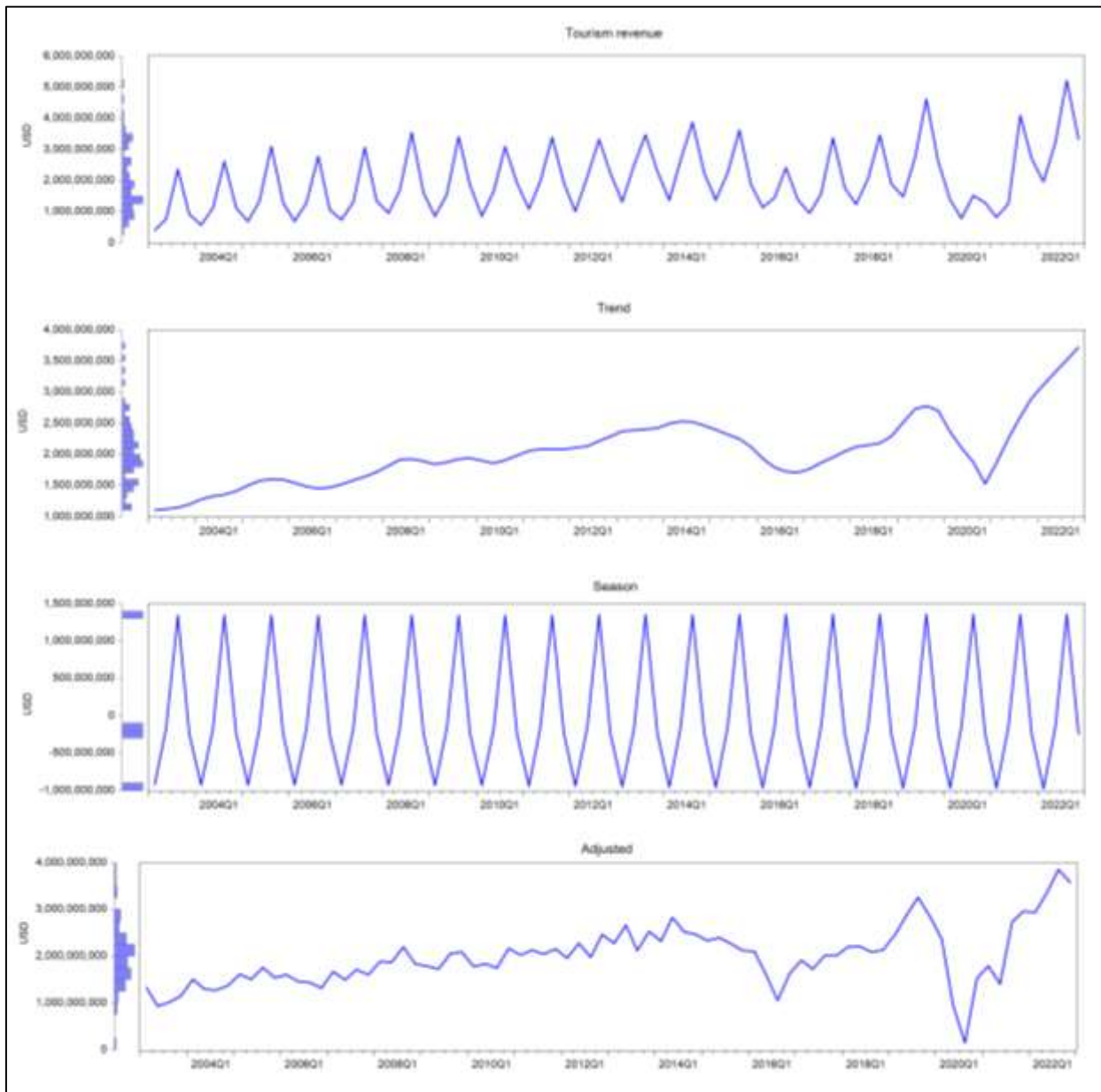


Figure 3. The seasonal-trend decomposition and the seasonally adjusted component of the tourism revenue data

Table 1. The results of the pairwise Granger causality tests

Pairwise Granger Causality Tests			
Date: 03/05/23 Time: 19:28			
Sample: 2003Q1 2022Q4			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Prob.
TOURISM_REVENUE_USD_SA does not Granger Cause GDP_GROWTH_SA	78	5.93361	0.0172
GDP_GROWTH_SA does not Granger Cause TOURISM_REVENUE_USD_SA		0.19010	0.6641

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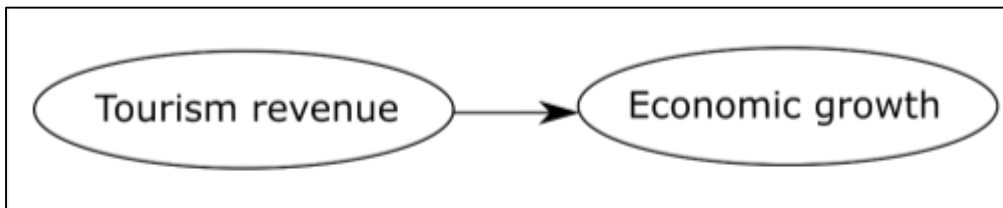


Figure 4. The unidirectional Granger causality relationship between the tourism revenue and the economic growth

The relative sensitivity analysis is performed as the next step in order to quantitatively describe the impact of the tourism revenue on the economic growth. The relative sensitivity of a dependent variable y to an independent variable x is expressed as in Eq. (1) for continuous x and y variables [67, 68].

$$S = \frac{\partial y/y}{\partial x/x} \quad (1)$$

The relative sensitivity can be expressed as in Eq. (2) for discrete x and y variables.

$$S = \frac{\% \Delta y}{\% \Delta x} \quad (2)$$

The relative sensitivity of the economic growth to the tourism revenue is calculated in Python programming language using Eq. (2) by importing the tourism revenue and the economic growth data to the Python workspace and taking into consideration that the differences of the x and y variables are expressed as $\Delta x = x_{i+1} - x_i$ and $\Delta y = y_{i+1} - y_i$. The NumPy and the SciPy libraries are used for the mathematical operations and the Matplotlib library is utilized for graphing in Python programming language. The differentials, in other words discrete derivatives, of the x and y data are plotted in Figures 5 and 6, respectively.

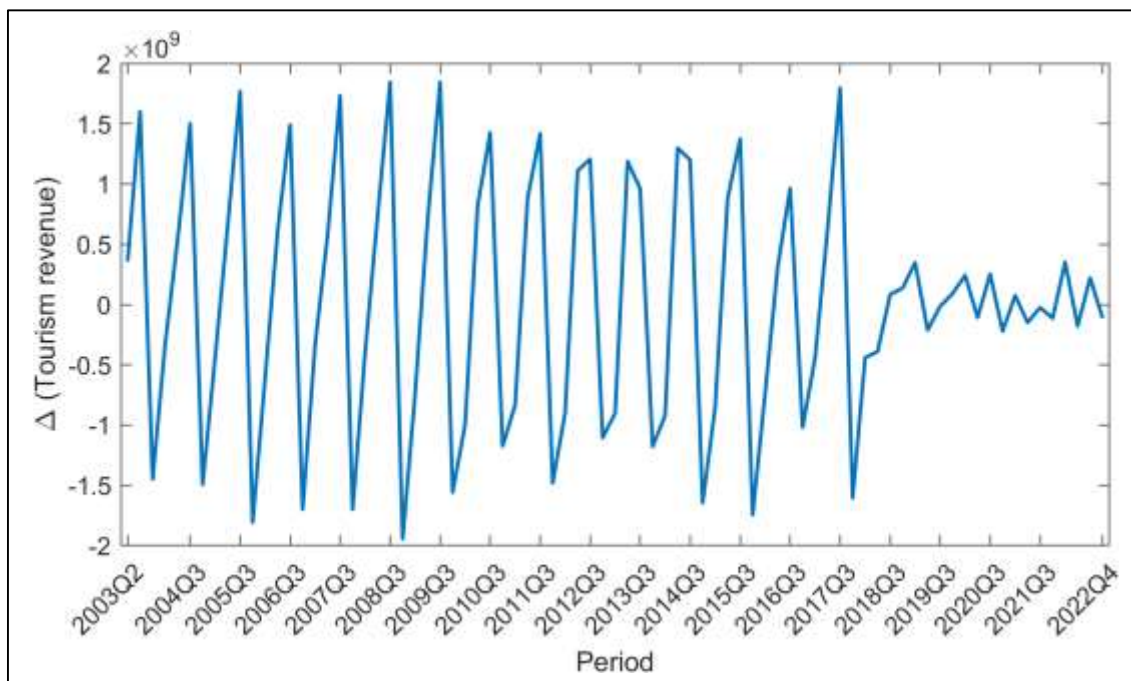


Figure 5. The differential of the tourism revenue computed in Python programming language

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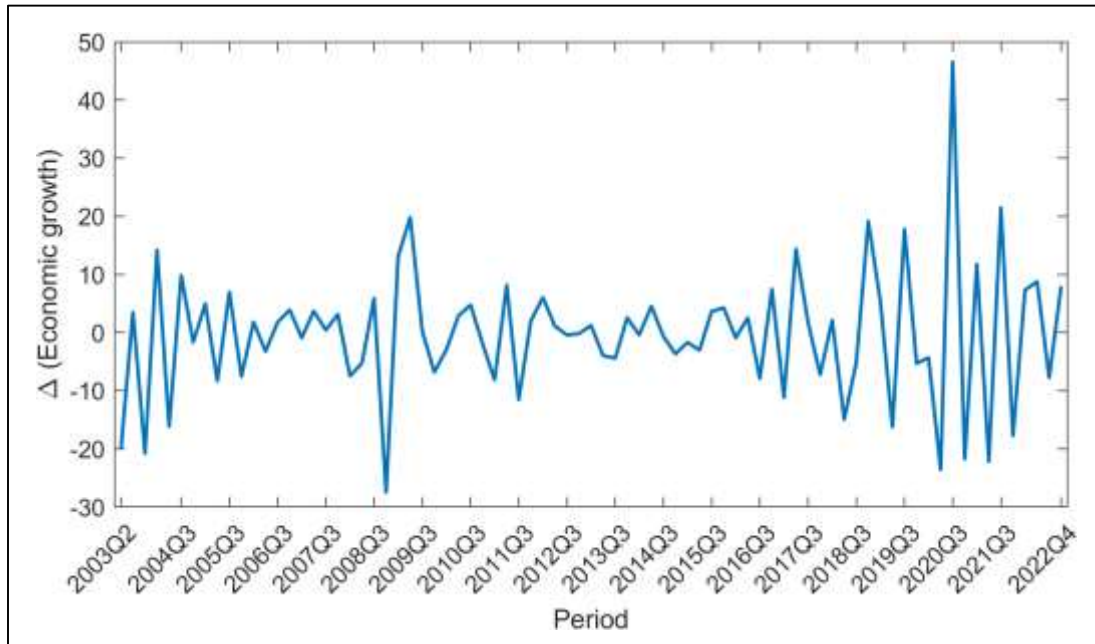


Figure 6. The differential of the economic growth computed in Python programming language.

The relative sensitivity of the economic growth dependent on the tourism revenue is computed as $S=0.12$ in Python programming language using Eq. (2). In other words, the 1% increase of the tourism revenue leads to the 0.12% increase in the economic growth. This order of magnitude is expected since the economic growth is obviously not only dependent on the tourism revenue but also several other factors such as the industrial revenue and the trade balance. It is worth noting that the relative sensitivity analysis approach used in this study for the computation of the impact of the tourism revenue on the economic growth can also be applied to other countries and time periods.

V. CONCLUSIONS

The impact of the tourism revenue on the economic growth for Türkiye for the period of 2003-2022 is investigated in this work. The tourism revenue and the economic growth data are firstly taken from the official sources namely Turkstat and the Electronic Data Distribution System of the Central Bank of Türkiye. Then, the gathered data are seasonally adjusted using the seasonal-trend with Loess method, which is followed by stationarizing the data. The seasonal adjustment and the stationarization processes were performed in Eviews environment. As the next step, the pairwise Granger causality analyses were carried out between the seasonally adjusted tourism revenue and the economic growth data. The Granger causality test results indicate that there is a unidirectional causality relationship from the tourism revenue to the economic growth. In other words, the tourism revenue affects the economic growth but not vice versa. It is worth noting that the Granger causality analysis were performed considering the $p<0.05$ confidence interval to provide accuracy. Finally, the relative sensitivity analysis was employed to explain the impact of the tourism revenue on the economic growth in a quantitative way. The relative sensitivity analysis utilizes the derivative operation for the continuous variables while the difference operation is used for the discrete data. Since the data used for the tourism revenue and the economic growth are discrete, the proportion of the differences of the percent changes of these data are employed for the calculation of the relative sensitivity value. The relative sensitivity computations as well as plotting the difference functions are performed in Python programming language. The results of these computations show that the sensitivity of the economic growth to the tourism revenue is $S=0.12$ for Türkiye for the period of 2003-2022 using quarterly data. In other word, the 1% increment of the tourism revenue increases the economic growth by 0.12%. This level of dependence is expected since there are multiple components affecting the economic growth apart from the tourism revenue such as the industrial revenue and the trade balance. Moreover, it is argued that the Granger causality tests combined with the relative sensitivity analysis as employed in this work can be used for the assessment of the tourism revenue on the gross domestic product and the economic growth also for other countries and time periods.

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