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Analysis of the Co-integration Between the Number of Cruise Tourists and the World Unemployment Rate

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Abstract

Cruise tourism has a great share in marine tourism and appears to be a fast-growing and income-generating sector in the travel industry. The cruise industry, which has a worldwide income of over 27 billion dollars, contributes to employment through the job opportunities it offers. The aim of this study is to analyze whether there is a short- and long-term co-integration relationship between the number of cruise tourists in the world and the world unemployment rate. In this context, data between 1991 and 2019 were analyzed using the Granger causality and vector error correction (VECM) methods. According to the results, there is an equilibrium relationship between the two series in the long term, a 1% change in the number of world cruise tourists reduces the world unemployment rate by 7.6%, and an imbalance between the two series in the short term will reach equilibrium after approximately three years.

Keywords: Cruise shipping, Marine tourism, Co-integration test, VECM analysis, World unemployment rate

1. Introduction

Because of technological developments in the world production of goods and services, labor-intensive production has been replaced by capital-intensive production. Although the growth and development of the market for a certain sector and its diversification with submarkets create opportunities for the labor market, unemployment, which occurs due to employment not increasing sufficiently compared with the population, negatively affects the economic and social situations of countries [1]. In this context, international marine tourism is one of the factors that affect countries' economic growth [2]. The marine tourism value chain consists of many varied factors and logistics processes, including accommodation, transportation, travel organizers, local tourism offices, ports, etc. [3,4].

Cruise tourism is one of the growing areas of marine tourism recently [5]. The economic effects of the cruise industry are shown in tourism, shipbuilding maritime enterprise, shipping agencies, tour agencies, ports, ship supply, and public revenues [6]. Cruise tourism is an economic activity that requires a range of services and facilities, including ports, hotels, restaurants, and tour operators, all of which can create jobs for local residents. In addition, the cruise industry employs many people, including crew members, entertainers, and administrative staff. These economic effects are directly related to the travel program. It is selected depending on the sea voyage and trip duration, port of departure, and tourist attractions included in the program, while optimal vacation periods in terms of geopolitical security and seasonality are also considered [7]. Cruise tourism in the world is concentrated in three main regions: the Caribbean, the Mediterranean, and Southeast Asia/Oceania and the sub-regions of Alaska, Scandinavia, South America, South Africa, Northwest Europe, Bermuda, Canary Islands, Hawaii, and the Indian Ocean Islands [8]. According to the Cruise Lines International Association (CLIA), the cruise industry supports over 1.2 million jobs worldwide and generates approximately $155 billion in economic activity annually. Therefore, the growth of cruise

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tourism can have a positive impact on the unemployment rate in countries where the industry operates, creating jobs and boosting local economies [9].

Studies by [10] and [11] state the direct and indirect economic effects of cruise tourism on destination ports. Direct economic effects are incomes from the activity and consumption of passengers and crew on land as well as the income received by local suppliers of cruise lines for provisioning port and ship services [10]. Indirect economic effects are the earnings produced by the purchases of consumables and services from local suppliers as well as by the increased consumption in the tourism area of influence caused by income growth generated by cruise tourist activities [12-14]. Consequently, this paper indicates that all of these economic activities impact world unemployment rates. Within this framework, the aim of the study is to observe the co-integration between the number of cruise tourists in the world (as an indicator of cruise tourism activity) and world unemployment using statistical analysis methods. In the period 1991-2019, the long- and short-term equilibrium relationship is evaluated between the number of tourists participating in cruise shipping in the world and the world unemployment rate. The reason why the research covers data since 1991 is that the popularity of cruise tourism has increased since the 1970s, it has become a mass market with a broader base, and there has been a noticeable increase in the number of passengers since the 1990s [15]. The reason why it is limited to 2019 is to prevent the temporary negative effects of the coronavirus disease-2019 (COVID-19) pandemic from causing deviations in the analyses. In this paper, the development of cruise tourism and the relationship between global economic activities and unemployment rates are given in the literature review. Datasets were evaluated using the Engle-Granger co-integration test and vector error correction (VECM) analysis to show the cointegration relationship between these variables. In this study, the co-integration relationship between cruise tourism, one of the important sub-branches of marine tourism, and the unemployment rate is revealed. It is thought that the results obtained will provide clues to researchers and guide future studies on the positive reflections of medium- and long-term investments on the workforce and economy for countries to obtain a larger share of cruise transportation.

Cruise tourism is a part of marine tourism activity called touristic sea travel by ship [16]. Albert Blain carried out the first passenger transportation in 1890, which is called cruise ship voyage Üçışık and Kadıoğlu [17], as cited in [18]. In the 1930s, cruise tourism started to develop in the world, especially with the enterprising of Germany. Rapid development in cruise tourism occurred after World War II within the economic development of Europe again. The increase in the number of passengers traveling in the cruise sector is an important indicator of the sector's growth [19]. The number of cruise passengers worldwide was 500,000 in 1970s, 22.04 million in 2014, 23.06 million in 2015 [20] and 27.8 million in 2019 [21]. In addition, the sector hit bottom in 2020 because of the COVID-19 pandemic [22].

Cruise tourism has direct, indirect, and induced effects on the economy. The direct effect is that goods and services are sold directly to cruise ships, passengers, and crew. Indirect effects result from direct suppliers purchasing goods from other companies. The induced effects arise from the expenditures of the parties whose income increases as a result of direct and indirect economic activities [13]. In the report published by CLIA (2018), the total employment created in direct proportion to the increase in cruise industry expenditures in Europe between 2012 and 2017 increased by 23% from 326.9 thousand to 403.6 thousand [23]. In this framework, the effect on total employment has increased since 2012 and is realized as an average of 4.3% per year. On the other hand, middle- and high-income tourists prefer cruise voyages, which are five-star floating hotels where comfort, luxury, and safety are prioritized [24]. These data show that cruise tourism stimulates economic activities and that there is a relationship between unemployment rates. To reveal the existence of this relation, a panel data analysis was conducted to determine whether there is a co-integration relationship between the number of cruise tourists travelled and the unemployment rate in the world.

A literature review shows that there are many studies on cruise tourism using panel data analysis. Bresson and Logossah [25] used panel data analysis to explain the relationship between accommodation tourism and cruise tourism in the Caribbean, revealing general trends. A 1% increase in the number of passengers arriving by cruise ships increased the per capita income of the cities by 3% [25,26]. The study by [27] focused on the determinants of cruise ships length of stay in port and the importance of the effects of length of stay in itinerary planning by collecting panel data on Japanese cruise ports. Accordingly, the cruise lines length of stay in ports is affected by the gross tonnage of the passenger ship, the number of passengers, the voyage distance from the previous port, the voyage distance to the next port, and the quality of the ship. Ahn [28] states that with panel data analysis, the cruise fleet built in the world increased by 0.3% when the world GDP increased by 1.0%, and the cruise fleet built in the world increased by 11.4% when the world maritime traffic increased by 1.0%. Bayat and Özdemir [29] measured the impact of transportation infrastructure and facilities on the turnover of businesses

in the accommodation and food services sub-sector using panel data analysis. In this context, the number of cruise ships docking at the port impacts the turnover of businesses operating in the accommodation and food services sub-sector. Along with all these studies, no study on the subject of research has been encountered in the literature.

2. Methodology

The methodological framework of the study (see Figure 1) is based on three hypotheses (H1, H2, and H3) and data on the number of tourists participating in cruise voyages and the world unemployment rate between 1991 and 2019. H1 states that "there is a co-integration relationship between the number of tourists participating in cruise voyages around the world and the world unemployment rate". H2 states that "there is a long-term relationship between the number of tourists participating in cruise voyages around the world and the world unemployment rate". H3 states that "there is a short-term relationship between the number of cruise tourists participating in cruise voyages around the world and the world unemployment rate".

In accordance with the scope of the study, unit root tests of time series were performed with the Zivot-Andrews (ZA) unit root test and inverse unit root test of AR characteristic polynoma. The Engle-Granger cointegration test was applied for H_1 hypothesis and VECM analysis was applied for the H2 and H3 hypotheses in the EViews software [30]. Validity analysis with autocorrelation LM test and CUSUM test is performed for the outputs of the EG test and VECM analysis.

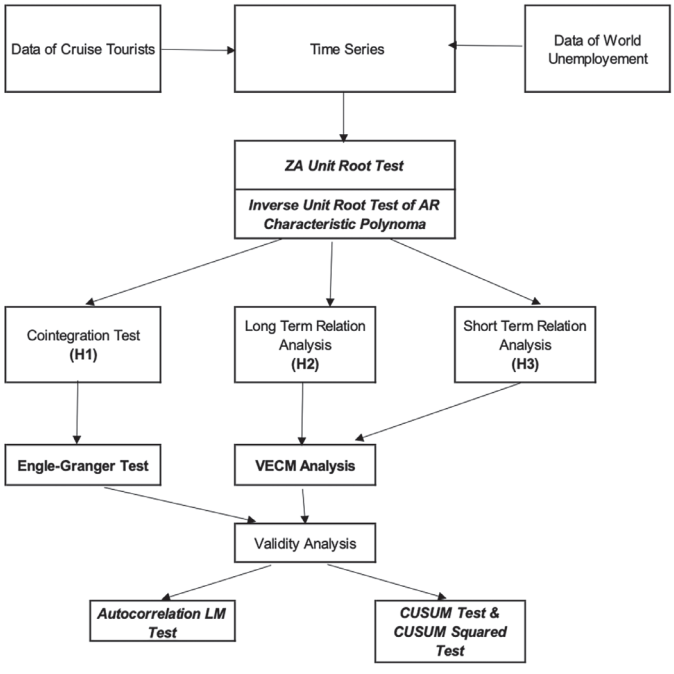

Figure 1. *Methodological framework of the study*

2.1. Unit Root Tests

The stationarity of the time series is evaluated with two types of root tests: unit root test and inverse unit root test. The unit root test is applied according to the methodology of Zivot Andrews, and the inverse unit root test is applied according to the methodology of AR Characteristic Polynoma.

2.1.1. ZA unit root test

The ZA Test is applied to evaluate whether the time series contains a unit root. The ZA test is based on the estimation of the regression equations. The t-statistics and the probability for the time series were calculated [31]. Probability values are calculated from a standard t-distribution and do not consider the breakpoint selection process.

2.1.2. Inverse root test of the AR characteristic polynoma

The inverse unit root test of AR characteristic polynoma is applied to the time series to observe the stability of the series.

2.2. Engle-Granger Co-integration Test

The Engle-Granger (EG) test is applied to evaluate the H1 hypothesis. The EG test is a widely used and easily implemented method in the field of econometry. "*Most importantly, the EG test shows a good size property. However, the power property of the EG test under the alternative can be an issue compared with other popular co-integration tests*" [32].

2.3. VECM Analysis

VECM analysis is applied for the long-term and short-term relation analysis between the time series of the world unemployment and number of cruise tourists, which is a widely used method in literature [33].

2.4. Data of the Study

Data for cruise tourists in the world between 1991 and 2019 are obtained from the World Bank [34], Organisation for Economic Co-operation and Development [35], and World Cruise Market [36]. Figure 2 shows the increase in the number of cruise tourists between 1991 and 2019.

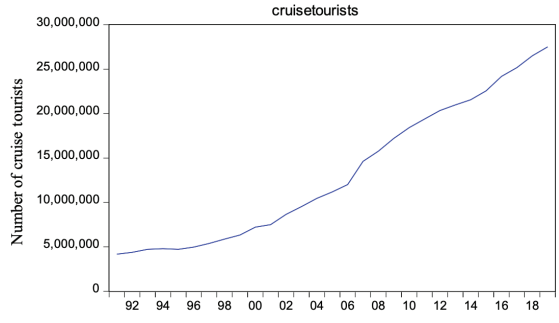

Figure 2. *Number of tourists who participated in cruise voyages around the world between 1991 and 2019*

A graph of the time series of world unemployment between 1991 and 2019 is shown in Figure 3.

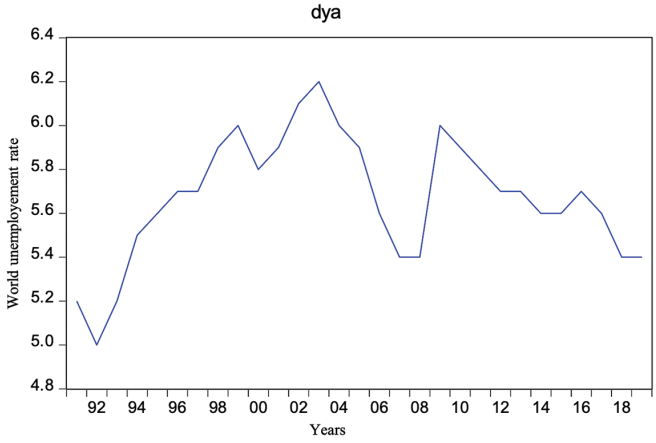

Figure 3. *World unemployment rate between 1991 and 2019*

3. Results and Discussion

Analysis of time series for the H1, H2, and H3 hypotheses according to the methodology given in Section 3 is performed. The optimal lag length of the time series is 1 according to Table 1.

3.1. Outputs of the ZA Structural Break Unit Root Tests for the Time Series

The Zivot-Andrews test, which is one of the structural break unit root tests, was applied to examine whether the series in the study contained a unit root. Probability and t-statistic outputs for the world unemployment time series are presented in Table 2.

The breakout time of the series regarding the world unemployment rate is seen in 2009 (see Figure 4). The t-statistic value is -6.719333 when considering the output measures in Table 2. This statistic value is less than the 1.5% and 10% critical values. The null hypothesis is rejected with error margins of 1.5% and 10% since the test statistic is t= -6.719333<1%; -5.34, 5%; -4.93% and 10%; -4.58%.

The ZA structural break test outputs of the series regarding the number of tourists participating in cruise travel between 1991 and 2019 are given in Table 3 and Figure 5.

The breakout time of the series regarding the number of cruise tourists is seen in 1997 (see Figure 5). When the table is examined, the ZA test statistical value was calculated as -5.370120. This stat value is less than the 1.5% and 10% critical values. The null hypothesis is rejected with error margins of 1.5% and 10% since the test statistic is t= -6.719333<1%; -5.34, 5%; -4.93% and 10%; 4.58%.

3.2. Outputs of the Inverse Unit Root Test of the AR Characteristic Polynomial for the Time Series

The outputs of the inverse unit root test of AR characteristic polynoma are given in Figure 6. The values in the circle indicate the stationarity of the series.

3.3. Outputs of the Engle-Granger Co-integration Test

The "Engle-Granger (Single-equation Co-integration)" test is conducted to determine whether there is co-integration between the number of cruise tourists and the world unemployment rate for the years of 1991-2019 (H1 Hypothesis). Table 4 shows the outputs of the EG co-integration test.

In the first stage of the EG co-integration test, the world unemployment rate is defined as the dependent variable and the number of cruise tourists is defined as the independent variable. Output measures of the test shows that tau= -4.625903 and probe <0.05. Consequently, H_0 hypothesis is rejected.

In the second stage of the EG co-integration test, the number of cruise tourists is defined as the dependent variable, and the world unemployment rate is defined as the independent variable. Output measures of the test shows that tau= -4.026428 and the probe <0.05. Consequently, the H_0 hypothesis is rejected [37].

In two conditions, the world unemployment rate and the number of cruise tourists are defined as dependent variables, the series have an equilibrium relationship in both cases. Consequently, both series are stated to be cointegrated [37]. The result of co-integration is in line with the direct and indirect economic impacts of cruise tourism on destination ports. As stated by Felde [38], revenue generated by cruise tourists and crew with the purchase of goods and services besides port income create a value chain as well as employment. Additionally, studies by [39,40] support the positive impacts of cruise tourism on employment rates.

3.4. Outputs of VECM Analysis

Dependent variable detection analysis is performed to assign the variables on long-term and short-term analysis (see Table 5). The probability value is meaningful at the

Table 1. *Optimal lag-length*

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-464.7474	NA	3.55e+12	34.57388	34.66987	34.60242
1	-377.6082	154.9142*	7.53e+09*	28.41542*	28.70338*	28.50105*
2	-374.7722	4.621640	8.26e+09	28.50164	28.98158	28.64435

1% level, as shown in Table 5. Consequently, the world unemployment rate is an accepted dependent variable for the analysis of Hypotheses H2 and H3).

3.4.1. Long-term relation analysis

The outputs of the long-term relation analysis for the H2 hypotheses are given in Table 6.

There is a significant long-term relationship between two series on four lag lengths (3.011086>1.96). In addition, the long-term relation equation is estimated with Equation 1 according to Table 6.

World Unemployment Rate (WUR)= -0.076130 x Number of World Cruise Tourists (NWCT) +2.992683(1)

Equation (1) shows that 1% increase in the number of world cruise tourists causes a decrease in WUR by 7,6130%. Although the coefficient is small, the number of cruise tourists in the world has an adverse effect on the world unemployment rate. These results show the notion that cruise tourism is a significant contributor to the global economy, providing jobs and generating revenue for many countries [41]. Additionally, the study by Arlı and Nemlioğlu [1] shows the impacts of world cruise tourist increase on the world female unemployment rate, in which a 1% increase in the number of world cruise tourists in the long term reduces the world female unemployment rate by 0.03531. In addition, in a study conducted on the sustainability of the cruise industry, considering the number of tourists, it is stated that in the long term, this industry can respond flexibly to external shocks and is in balance with the presence of an "invisible hand" [42].

Table 2. *ZA test outputs for the world unemployment time series*

Statistics	t-Statistic	Prob.*
Zivot-Andrews test statistic	-6.719333	0.003021
1% critical value:	-5.34	
5% critical value:	-4.93	
10% critical value:	-4.58	

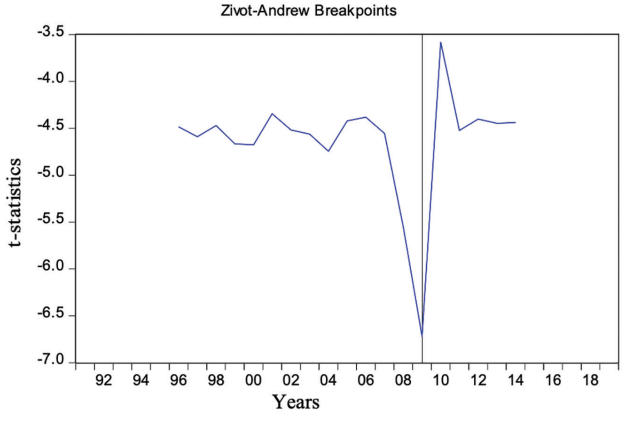

Figure 4. *ZA test statistics for the world unemployment series*

Table 3. *ZA test outputs for the time series of cruise tourists*

	t-Statistic	Prob.*
Zivot-Andrews test statistic	-5.370120	0.012369
1% critical value:	-5.34	
5% critical value:	-4.93	
10% critical value:	-4.58	

3.4.2. Short-term relation analysis

The outputs of the long-term relation analysis for the H2 hypothesis are given in Table 6.

The evaluation should be done on the dependent variable first. The world unemployment rate is a dependent variable, the statistical value of CoinEq1 t is negative, and its absolute value is 2.37>1.96. Accordingly, the error correction model is meaningful and meets our expectations. In addition, an imbalance that may occur in the short term between the world unemployment rate and the number of cruise tourists will be balanced in the long term. The time of occurrence of the balance and the time period of the balance condition are estimated according to the coefficients in Table 7.

Based on the number of -0.369386, which is the coefficient of CoinEq1:

1/0.369386 = 2.707, which means that the two series will reach equilibrium after 2.707 periods. Because our data are annual, it is concluded that an imbalance between the two

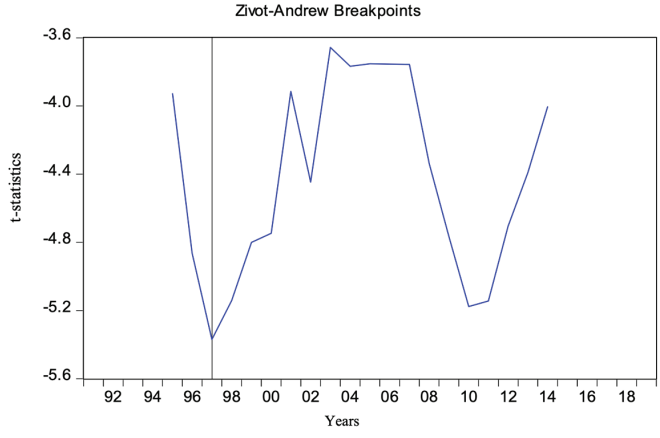

Figure 5. *ZA test statistics for the cruise tourists in the world*

Table 4. *Engle-Granger (Single-equation co-integration test)*

Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
Unemployment	-4.625903	0.0052	-23.57834	0.0044
Cruise	-4.026428	0.0195	-20.87479	0.0124
*MacKinnon (1996) p-values				

series will stabilize after 3 years. Consequently, the short-term relationship between the variables can be considered after 3 years.

3.5. Outputs of the Autocorrelation Test

The Breusch-Godfrey Serial Correlation LM test was applied to determine whether there was autocorrelation between the series. The outputs of the test are presented in Table 8.

According to Table 8, there is no autocorrelation between the series because the Prob. values are greater than 0.05.

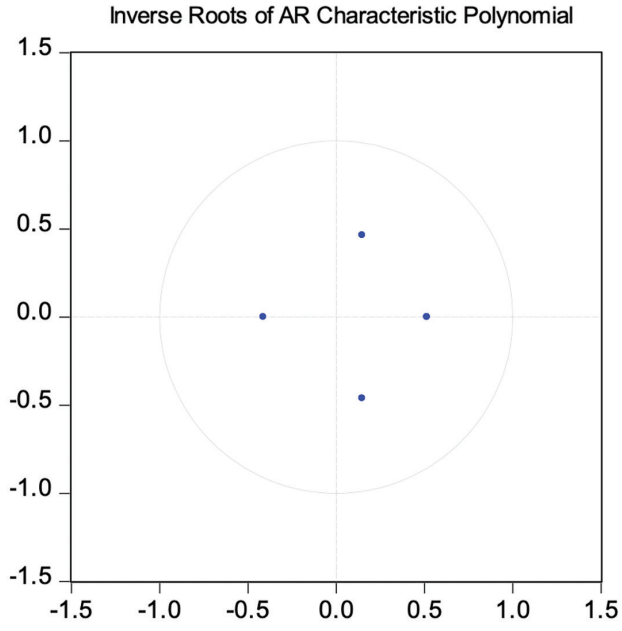

Figure 6. *Inverse unit root test of the AR characteristic polyoma*

Table 5. *Dependent variable detection analysis*

Cointegration Restrictions: A(1,1)=0	
Convergence was achieved after nine iterations.	
Not all co-integrating vectors are identified	
LR test for binding restrictions (rank=1):	
Chi-square (1)	10.91083
Probability	**0.000956**

Table 6. *Long-term relation analysis for the H2 hypothesis*

Co-integrating Eq:	**CointEq1**
LOGWUR(-1)	1.000000
LOGCT(-1)	0.076130
	(0.02528)
	[3.01086]
C	-2.992683

Table 7. *Short-term relationship analysis for H3 hypothesis*

Error Correction:	**D(LOGWUR)**	**D(LOGCT)**
CointEq1	-0.369386	-0.344921
	(0.15574)	(0.21865)
	[-2.37178]	[-1.57751]

3.6. CUSUM and CUSUM of the Squared Test

CUSUM and CUSUM of Squared tests were conducted to determine whether there was structural instability in all phases of the system between the two series. Figures 7 and 8 show the outputs of the tests.

There is no structural instability in all phases of the system between the world unemployment rate (dependent variable) and the number of cruise tourists in the world (independent variable), as shown in Figures 7 and 8. The CUSUM test outputs reveal that all of the findings are suitable for the analysis. These results guarantee the

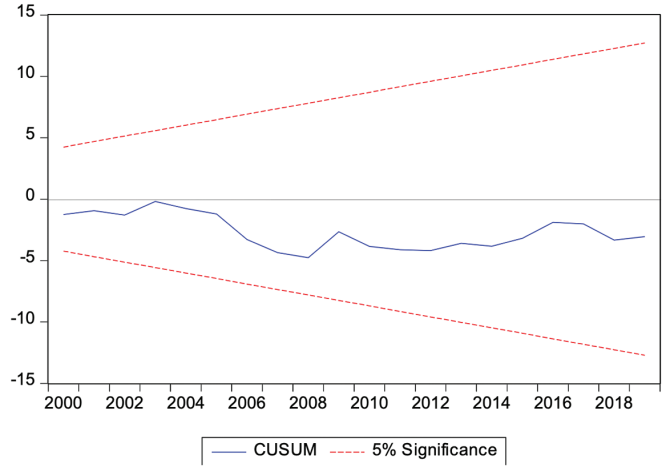

Figure 7. *Outputs of the CUSUM test*

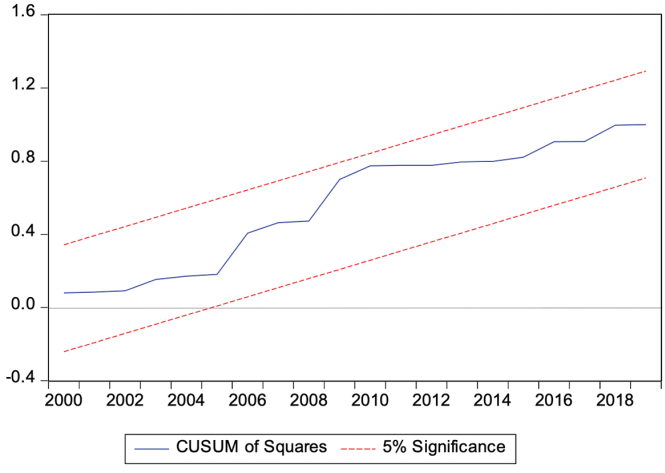

Figure 8. *Outputs of the CUSUM of squares test*

Table 8. *Breusch-Godfrey serial correlation LM test*

F-statistic	0.582468	Prob. F(4,22)	0.6785
Obs*R-squared	2.681328	Prob. chi-square(4)	0.6125

reliability of the long- and short-run estimates. The study by Shahbaz et al. [43] 2019 applied CUSUM and CUSUMsq tests to evaluate tourism-induced income distribution in Malaysia considering the number of tourist arrivals. Their results show that the test plots are between the upper and lower critical limits at 5%. Tourism (tourist arrivals, tourist receipts) improves income distribution by lowering income inequality [43]. Consequently, studies support that an increase in the number of tourists impacts economic issues positively in the world and local.

The aim of this study is to determine whether there is a co-integration relationship between the number of cruise tourists participating in cruise tourism (the factor that causes cruise travel service production) and the world unemployment rate. This study presents the EG co-integration test and VECM analysis for the number of cruise tourists in the world and the world unemployment rate in the period of 1991–2019. The H0 hypothesis is rejected for two different conditions of the variables: first, WUR is dependent and NWCT is independent, and second, NWCT is dependent and WUR is independent. It is observed that the variables have an equilibrium relation when both variables are dependent. Consequently, this study states that the time series of WUR and NWCT are co-integrated. According to Table 4, there is a bidirectional balance between the two series and they move together. In addition, the long-term co-integration equation obtained in Table 6 shows a negative co-integration relationship between the two series. According to the results obtained, 1% increase in the number of tourists participating in world cruise travel reduces the world unemployment rate by 7.6%. Additionally, the VECM analysis outputs for short-term relationships are statistically significant. Imbalance between the variables that may occur in the short-term reach equilibrium after approximately three years.

This study shows that the number of cruise tourist impacts on the world unemployment rate. Consequently, positive impacts and enterprises that increase cruise tourist numbers reduce the world unemployment rate. Considering the resulting relationship, it is recommended to diversify touristic areas and activities and support marketing activities by the public and private sector. According to the studies of Bresson and Logassah [25] and Ceyhan et al. [26], a 1% increase in the number of cruise passengers increases the per capita income of the current destination by 3%. In addition, compliance of port service quality with international standards is important for the satisfaction of visiting passengers. Dilek et al. [44] emphasized that ports should adhere to international standards to increase the share of countries in cruise tourism. Geopolitical conditions are also important for ensuring sustainability and achieving positive economic effects in cruise tourism as stated also by Ito et al. [7]. Therefore, policy makers are expected to make regulations according to geopolitical risks and operational risks.

4. Study Limitations

A limitation of this study is that the data were secondary instead of primary. This study used data on unemployment and the number of cruise tourists in the world for analysis as panel data. Additionally, world unemployment was only analyzed under the impact of the number of world cruise tourists. Furthermore, as stated in the studies by Görlich et al. [45], Güriş and Yaman [46], and Eser [47], macroeconomic indicators and socioeconomic variables are factors affecting unemployment, while Fakih et al. [48] focused on microeconomic causes of unemployment rate. Consequently, in future studies, macroeconomic indicators such as economic growth, inflation, exchange rate, interest rate, public expenditures, current account deficit, investment rates, budget deficit, savings rates, etc., as well as socioeconomic variables and microeconomic causes that affect unemployment can be included in the analyses to obtain outputs that depend on more variables.

5. Conclusion

This study forms the basis for researchers and guides future studies in terms of revealing the co-integration relationship between cruise tourism, one of the important sub-branches of marine tourism, and the unemployment rate. In this context, researchers who have reached the required amount of cruise ship panel data are recommended to conduct panel data analysis and compare the results. Also, all the above relation measures and literature show that the positive developments in cruise tourism cause positive outputs on the world economy. On the other hand, the outputs of the study show that cruise tourism is vulnerable to economic downturns and other external factors, such as natural disasters, pandemics, or geopolitical instability, which can lead to unemployment due to negative impacts on economic activity. Considering the direct and indirect economic impacts and overall outputs stated in this paper, a strategic approach for the development of cruise tourism is necessary in terms of the development of new cruise ship investments, new destination ports promoting the cultural, historical, and natural attractions of destinations, and the development of staff training levels, as global tourism and transport industry cruise tourism needs cooperation of countries with joint marketing campaigns. These strategies can be further developed in another scope of the study.

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Authorship Contributions

Concept design: E. Arlı, and D. Ülker, Data Collection or Processing: E. Arlı, Analysis or Interpretation: E. Arlı, and M. S. Saygılı, Literature Review: M. S. Saygılı, and D. Ülker, Writing, Reviewing and Editing: E. Arlı, M. S. Saygılı, and D. Ülker.

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