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Analyzing the Seasonality in Yacht Exports of Türkiye

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ABSTRACT

The volume of the exports of the sectors moves in a certain trend, and companies and policymakers analyze this trend to make their future plans. However, seasonal volume changes in some sectors can be very sharp and their analysis can be as important as trend analysis. One of these sectors is Türkiye's yacht and watercraft equipment sector. The significance of the seasonal change in exports may indicate that analyzing and understanding the change will increase competitive advantage. In this direction, we decomposed the export data into its components using 258 monthly observations covering the period between January 2002 and June 2023. Afterward, we tested whether the monthly averages of the seasonal factor component obtained from the decomposition were significantly different. The results we obtained with the cluster analysis showed that there are 4 clusters, and the seasonal increase is the highest in the clusters of June, July, and August. On the other hand, the seasonal decrease was determined to be the highest in the January, February, October, and November clusters. It is believed that the results obtained will provide a competitive advantage, especially in terms of the smooth operation of the supply chain and planning of marketing strategies considering the seasonal variation.

INTRODUCTION

The history of the shipbuilding industry in Türkiye goes back centuries. The first shipyard in Türkiye was established in Gallipoli in 1390 during the Ottoman Empire. Following this, the Golden Horn Shipyard, which was established during the reign of Mehmet the Conqueror, became one of the largest shipyards in the world. With the increase in the importance given to the shipyard sector after the proclamation of the Republic, the shipyard investments concentrated in the Bosphorus and the Golden Horn, shifted to the Tuzla region as of 1969 (Seven, 2018). Since 1390, Turkish shipyards have been constructing ships of many types and tonnages at international standards and under the supervision of recognized inspection organizations. The shipbuilding industry, which has grown rapidly in recent years, has become an

important center of gravity especially for the tailor-made ship segment and Türkiye has become one of the world's leading countries in the construction of mega yachts (yachts longer than 25 meters in length) (Seven, 2018). The yacht building industry in Türkiye has been growing steadily, especially for the last ten years. In 2022, the Turkish yacht industry proved to be the world's third-largest high-performance, stylish, modern and cool yacht manufacturer (Turk Yacht, 2022).

While Türkiye has become one of the world's brand countries in the yachting sector, it has become a center of attraction in yacht production and refurbishment activities. While the Turkish ship and yacht services industry exported $ 1.4 billion in 2022, it exported $ 550 million of exports in the first 6 months of 2023 and the yacht industry was among the top 10 countries in the export league, and the length of the yachts produced and the number of orders is increasing rapidly (7deniz, 2023). While Türkiye's yacht export value was $ 185.4 million in 2020, it increased to $ 344.2 million in 2021 and $ 429 million in 2022. The Cayman Islands and the United States of America have been the most important importers in the last two years. Greece, Italy, Malta, United Kingdom, Spain, France, Germany, Russian Federation, Luxembourg and Singapore are among the top 20 countries to which Türkiye exports yachts in 2022 (Trade Map, 2023).

While trend is the most important component for interpreting and predicting the movement of a financial variable, understanding seasonal patterns can also provide many competitive advantages. In this research, the seasonal pattern of Türkiye's yacht and other watercraft equipment exports was aimed to be analyzed. Thus, the study has revealed how export cycles occur at certain times of the year and whether there are significant differences between the cycles by month. It was believed that the outputs of this analysis would have various benefits for people, companies, and governments. First, understanding the seasonal pattern can enable companies in the industry to better understand and plan. According to seasonal cycles, companies can strategically plan their supply, production, and distribution activities. Thus, optimum resource utilization can be achieved according to the seasonally changing peaks and troughs, and they can execute a strategy to make the most sales at the peaks (Ross, 2012). Second, states and governments can use the seasonal pattern to forecast the economic trends and fluctuations in the industry. In addition, commercial policies, export-facilitating incentives, and infrastructure investments can be carried out according to the seasonal situation (Goulding, 2003). Third, understanding the seasonal pattern can facilitate supply chain management. By optimizing their operations, manufacturers, suppliers, and logistics companies can ensure that products are delivered on time without any delays at peaks and that they are not out of stock (Sürie & Wagner, 2008). Fourth, knowing the seasonal change pattern of exports can provide more accurate investment planning (Dieke, 2011). Fifth, companies can maximize their total sales revenue by developing their marketing strategies according to the seasonal cycle, by offering promotional products before high demand (Vasudeva, 2006).

Literature Review

When the relevant literature is examined in the Turkish yacht sector, the number of studies produced so far is quite limited. It is considered that the in-depth examination of a sector in which Türkiye is so strong in exports and the realization of scientific activities that guide future studies are very important in reaching Türkiye's 2053 goals (Karaismailoğlu, 2022). Emphasizing this gap, which has been found to exist in the literature, is among the main motivations of this study. In order to examine the literature in depth, on September 01, 2023, the databases of Web of Science, EBSCOhost, Emerald, Science Direct, Springer, Taylor & Francis, Wiley and Ulakbim, where studies related to the maritime sector were published intensively, were searched with the keywords "yacht export". Only 2 studies were found that included the words together. Although these two studies in the Emerald and Science Direct databases are not directly related to the subject examined, they are explained below.

In the study, which prepared for the yacht industry in Taiwan, Yang & Liu (2016) aimed to determine the criteria for evaluating yacht construction financing of bank loan policies. The results of the research, which

emphasizes the differences between the criteria of the yacht production sector and the criteria of the financing institution, revealed the importance of eliminating the deficiencies in the ship financing application methods for the yacht production sector. Sarvan et al. (2011) conducted a study on companies located in the Antalya Free Zone in order to determine the network-based determinants of innovation performance in clusters of yacht builders clustered in certain regions of Türkiye. As a result of the study, it was concluded that the companies in the region generally rely on national and global networks as information sources and strategic alliances.

Examining the limited number of studies available in the literature, it was seen that Aydın & Yılmaz Aydın (2019) examined Türkiye's competitive power in the yacht manufacturing industry. In the study, which examines the yacht production industry in Türkiye through many different variables such as design, engineering, yacht types, installed engines, and navigation systems, it has been concluded that Türkiye has advantages in order to compete with the world giants in the yacht production sector, but that value-added services have aspects that are open to development. In the same study, it was stated that the material cost in the Turkish yacht production sector is 60% and the labor cost is 40%, and it was claimed that the low-cost labor force is an important competitive advantage of Türkiye. Similarly, Merendino (2014) gave the example of Turkish and Asian yacht builders and stated that the main reason for their competitive advantage, in addition to low labor costs, is the specialized and skilled labor force.

In Türkiye, where four seasons are experienced together, whether the foreign trade activities of various sectors vary according to seasonality is among the topics discussed in the literature. Polat & Uslu (2010) analyzed the seasonal structure of Türkiye's export and import time series for the period 1982-2008 in their study conducted in 2010. As a result of the study, it has been determined that there are deterministic and non-stationary stochastic seasonal components in the foreign trade series. On the other hand, Tunç (2017), in his study on the Western Mediterranean Region, which realizes only 1% of Türkiye's exports, determined a seasonally significant difference in the export of only one of the 3 provinces in the Western Mediterranean region, while there was no significant seasonal difference in the other two provinces. As a result of the study, he suggested that the studies using time series in foreign trade should be seasonally adjusted.

MATERIAL AND METHODS

Data and Methodology

Export data of yachts and other vessels were obtained from the Turkish Statistical Institute (TSI, 2023) website. The Standard International Trade Classification, Revision 4 (SITC Rev4) was used, which was developed by the United Nations for merchandise trade statistics reporting (UN, 2008). In addition, by choosing the fourth level as the digit, statistical export data was reached with the code "7931" and defined as "Yachts and other vessels for pleasure or sports; rowing-boats and canoes". The US dollar currency was chosen as the export value.

The dataset starts from January 2002 and ends in June 2023 and consists of 258 monthly observations. Descriptive statistics of the variables are presented in Table 1. Average monthly exports were approximately $ 13.7 million. In the period when monthly exports reached the maximum, approximately $ 100 million was exported, while in the period when it was minimum, approximately $ 0.12 million was exported. When the distribution of the raw series is examined by using Jarque-Bera, it is quite far from the normal distribution. The main reason for this is that most of the observations are concentrated on relatively small export values. The coefficient of variability, on the other hand, is a relatively high value of approximately 118%, indicating that export figures can vary greatly from month to month. In addition, descriptive statistics of the data in log return form are presented in the table. Although the distribution of this series is relatively normal, the coefficient of variation is a very high rate of 6500%. The reason for this is that although the arithmetically average growth rate is 1.6%, its standard deviation is 110%. In addition, periods of 274% increase and 296% decrease in one month have also been experienced. While exports could be made

in very low quantities in some months, sudden increases were experienced in the following months.

Table 1. Descriptive statistics (TSI, 2023)

Statistics	EXPORT	DLNEXP
Mean	13782831	0.016796
Median	7826432.	-0.007920
Maximum	100994690	2.742142
Minimum	121853.0	-2.964922
Std. Dev.	16360653	1.105662
Skewness	2.593768	-0.166368
Kurtosis	11.10700	2.883604
Jarque-Bera	995.8147	1.330625
Probability	0.000000	0.514113
Observations	258	257

The course of the variable in the period under consideration is presented in Figure 1. As can be seen, the volatility is very high and there is a clear seasonality. However, an increasing trend and a decreasing trend can be observed in some periods. Especially in the post-pandemic period, the sector has also caught an increasing trend, as the demand for yachts has increased a lot due to people's reluctance to stay in hotels. A record export amount of approximately $ 100 million was achieved in August 2008. After this period, the high export performances achieved in the summer seasons came to an end in 2014. In the following period, it increased again and approached a record level. In December 2022, it reached $ 97.9 million, approaching the record. In general, it can be said that the Turkish yacht and sports equipment export sector is in a recovery trend.

Today, many economic and financial data can follow repeating cycles at certain times of the year. The factors that cause these cycles can be holiday seasons, climatic changes, agricultural cycles, changes in supply-demand balance, and seasonality in other influential data. For example, when monitoring the employment rate, higher rates may be observed in the summer seasons due to seasonal effects as more job opportunities are offered in the summer seasons (Schneider, 2022). Or, while examining the situation in grain prices, prices may decrease at certain times of the year due to the harvest season (Devereux, 2009). Whatever the reason, these seasonal regular changes make it difficult to understand the real change in the series. In addition, forecasting with data with seasonal effects does not give accurate results. This makes it difficult for important authorities such as governments, central banks, and other policymakers to make more accurate decisions. For this reason, it is of great importance to determine the seasonal effects in the series and to remove these effects from the series when necessary.

In general, it can be stated that a series consists of 3 main components, which are trend cycle, seasonal, and irregular, as seen in Equation (1):

$$y_t \equiv y_t^{tc} \; x \; y_t^s \; x \; y_t^i \qquad (1)$$

In such an equation, seasonal adjustment is obtained by dividing y_t by the estimation of y_t^s. The estimate of y_t^s is generally defined as a seasonal factor (Osborn & Ghysels, 2001). In this case, the fact that the seasonal factor is higher in certain periods of the year can mean that the normal value is higher at that time due to the seasonal effect. Dividing the raw value by a higher seasonal factor decreases the seasonally adjusted series. In addition, the seasonal factor value allows us to understand at which times of the year the seasonal effect is higher or lower.

Various methods have been developed to decompose the series into its components, to analyze the seasonal effect and to adjust the series from seasonal effects. TRAMO/SEATS is one of these methods and is widely used in the literature. TRAMO is the abbreviation of the Time Series Regression with ARIMA Noise, Missing Observations, and Outliers, while SEATS is the abbreviation of the Signal Extraction in ARIMA Time Series. TRAMO forms the pre-setting process for SEATS by completing missing observations, detecting outliers, separating their effects from the series, and estimating the effects of events such as holidays and trade days (Gómez & Maravall, 1998).

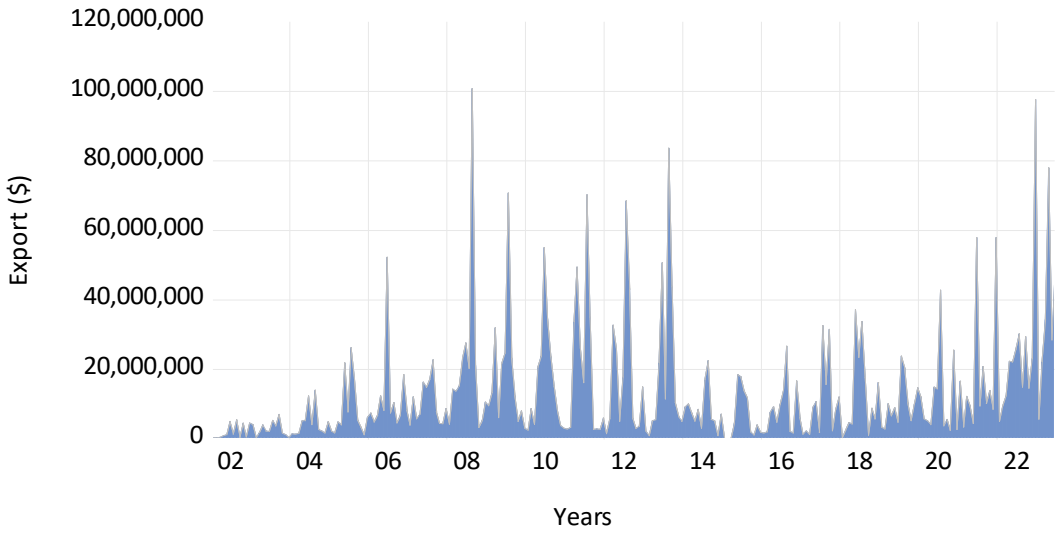

Figure 1. Movement of the variable in the covered period (TSI, 2023)

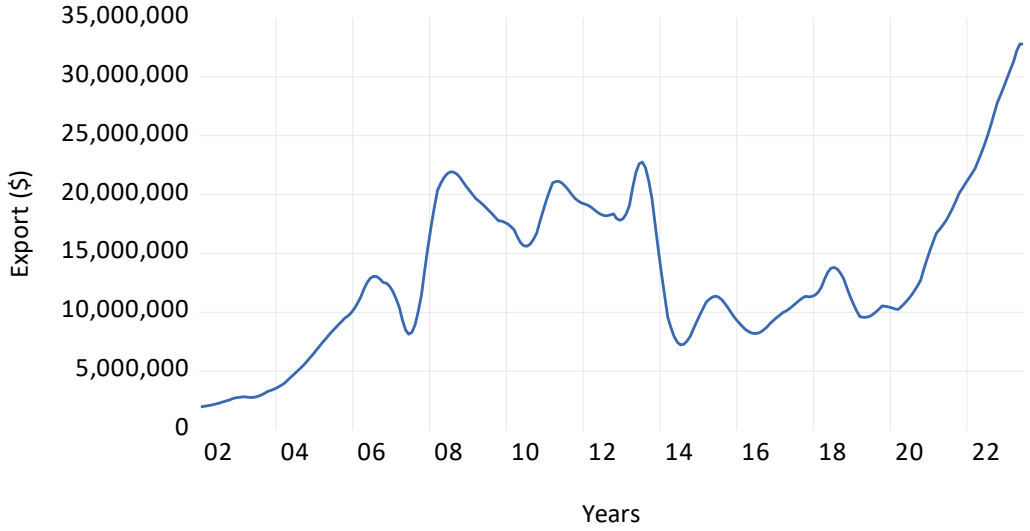

Figure 2. Final trend cycle

EViews software was used to implement TRAMO/SEATS in the study. This application is embedded in this software. The components that can be obtained as a result of the application are the seasonally adjusted series, the seasonal factor, the trend, the irregular, and the cycle. The necessary components for our research are the seasonal factor and the trend. The selection of the ARIMA order required for the model was determined to be automatic based on the minimum information criteria value.

Considering the purpose of the study, the One-Way ANOVA analysis was preferred to test whether the mean of the seasonal factor according to the months changes significantly according to the periods. This method is used to test whether there is a significant difference between the means of 2 or more groups. In the one-way ANOVA method, the dependent variable is divided into 2 components: between-group variation and within-group variation. F statistic is obtained by dividing the mean square of the first one by the mean square of the second one. Using this statistic, the null hypothesis of "there is no significant difference between the means of the groups" is tested. Rejecting the null hypothesis indicates that the mean of at least one of the groups is different from the others. If the null hypothesis is rejected, Post Hoc tests can determine between which groups there is a significant difference. The null hypothesis of the one-way ANOVA test for three groups can be represented in Equation (2):

$$H_0 = \mu_1 = \mu_2 = \mu_3 \quad (2)$$

In testing this null hypothesis, the alternative hypothesis can be shown in Equation (3) as follows:

$$H_1 = At\ least\ one\ of\ \mu_1, \mu_2, and\ \mu_3\ is\ different\ than\ others \quad (3)$$

In addition, to apply the one-way ANOVA test, various assumptions must be provided as much as possible, and this is important for the reliability of the results. These assumptions are (i) randomness of the observations in each group, (ii) normal distribution of the observations in each group and (iii) equal variances of the population in each group (Levine & Stephan, 2010). There is no known general test for measuring the independence of variables. Whether the series in each group is normally distributed can be examined with the Kolmogorov-Smirnov and the Shapiro-Wilk tests in SPSS. In cases where the sample size is less than 30, the Kolmogorov-Smirnov test can be used, and in cases where it is greater than or equal to 30, the Shapiro-Wilk tests test can be used (Cevahir, 2020). ANOVA is a robust estimator even when the groups are not normally distributed, but at least the group sizes should be equal. Levene's test can be used to test whether the variances are equal. Analyzes can also be carried out in cases where the variances are not equal. However, in cases where group sizes are very unequal in size, violation of homogeneity biases the results. In this direction, in cases where the assumptions of normality and homogeneity cannot be met, at least the groups being equal in size will make ANOVA robust (Mooi & Sarstedt, 2011).

It is important whether the variances are homogenous in the selection of the appropriate Post Hoc test. According to the situation of the variances determined by Levene's equality of variance test, the appropriate Post Hoc test is selected and the analyzes are applied. In case equal variances are obtained, Tukey HSD, Tukey-Kramer, Fisher, Newman-Keuls and Duncan Post Hoc tests can be applied. Otherwise, the appropriate tests are Brown-Forsythe, Dunnett's C, Tamhane's T2 and Games Howell. Equal n's cases should also be considered in the selection of these tests because some tests are more robust to these cases (Blumberg, 2014).

Finally, we preferred the K-Means Clustering technique to cluster the months according to the seasonal factors and significant differences obtained in the study. In this method, after preliminary research, *K*, which represents the possible number of clusters, is determined by the user. In this method, it is assumed that all data are numerical. The purpose of this method is to group the inputs in K regions in such a way that the member in each region has the maximum similarity and the maximum difference from the members in the other regions. As a result of the analysis, K averages and clusters are obtained (Kalita, 2023). SPSS software was used in the implementation of one-way ANOVA and K-Means Clustering analysis.

RESULTS

TRAMO/SEATS seasonality analysis method proposed by Gómez & Maravall (1998) was applied first to export variables (Yachts and other vessels for pleasure or sports; rowing-boats and canoes). As a result of the application, the trend, seasonal factor, and seasonally adjusted series were taken as output from the method that allows to obtain many components. Also, automatic ARIMA order selection and data transformation options were selected.

As a result of the applied seasonality analysis, the ARIMA (0, 1, 1) model with 613 AIC values was selected automatically. First, the trend variable was presented, which was decomposed from the export variable as a result of the analysis, in Figure 2. If the temporary decline in 2007 was not counted, exports continued to increase until August 2008, and after the effect of the global economic crisis, it suffered a breakdown. However, this breakdown was only in the trend and there were no definite decreases in exports. After that, the stationary export data showed a sharp decline from July 2013 to July 2014. Afterward, exports, which remained stationary until the COVID-19 pandemic, increased by trend breakdown with the effect of the pandemic and reached its historical peak. The closure of hotels due to the pandemic, the prevention of travel and the risk of crowded environments have contributed positively to the sector, especially by increasing the demand for yachts. Looking at the general situation, it can be said that the period between 2008 and 2013 was the most productive period for the sector.

The monthly course and average of the seasonal factor obtained by decomposing the export variable are presented in Figure 3. In other words, the course of the seasonal factor values for each specific month from 2002 to 2023 and the averages of these values are presented. This variable roughly represents the ratio of the actual value to the seasonally adjusted value. For example, a value of 100 indicates that the two values are equal, a value of 50 indicates that the actual value is half of the seasonally adjusted value, and a value of 200 indicates that it is double. In other words, values above 100 indicate that the business volume increases seasonally in those seasons, while values below 100 indicate that it decreases. As can be seen from the figure, starting from May, the seasonal increase is quite high, especially in June, July, and August. With the exception of only April, the export figures remain relatively low in the remaining months. From this point of view, seasonal effects are evident enough to be discerned visually. However, it should be supported by some statistical methods in order to have a scientific basis.

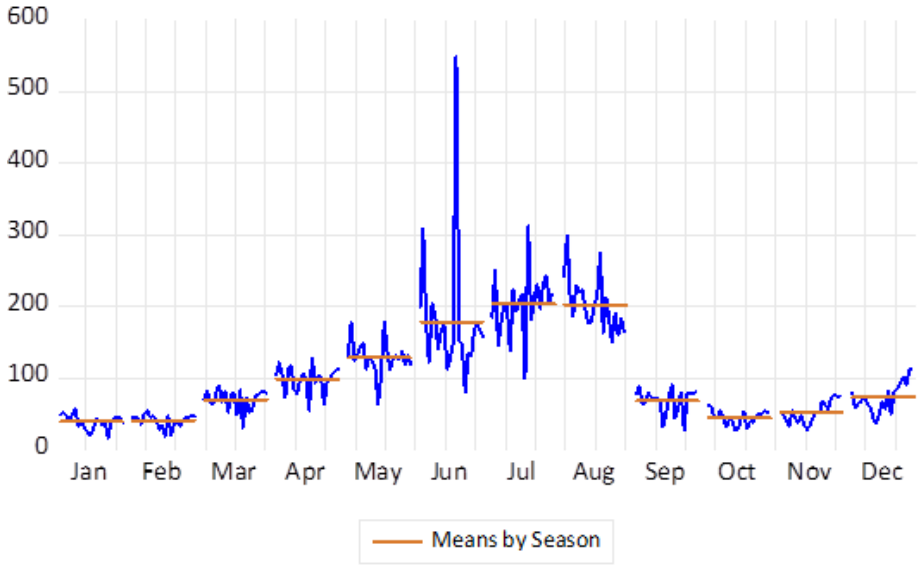

Figure 3. Final seasonal factor by season

Table 2. Descriptive statistics of seasonal factors

Month	N	Mean	Min.	Max.	Std. Dev.	Range	Kurt.	Skew.	K-S. Norm.
January	22	38.9	16.3	57.0	10.4	40.7	-.08	-.51	0.10
February	22	40.6	18.1	55.1	9.3	37.0	.92	-1.13	0.20
March	22	70.2	30.4	90.4	14.6	59.9	1.02	-1.14	0.20
April	22	98.5	54.7	129.0	18.5	74.3	.55	-.85	0.18
May	22	128.4	63.0	179.5	23.5	116.5	3.03	-.16	0.17
June	22	178.8	79.2	549.6	93.8	470.3	12.31	3.24	0.30*
July	21	203.4	99.0	312.7	43.7	213.6	2.02	-.08	0.14
August	21	202.9	149.7	299.5	37.5	149.7	1.05	1.00	0.11
September	21	68.4	26.9	90.9	17.2	63.9	.86	-1.21	0.18
October	21	44.6	26.7	61.8	10.1	35.1	-.58	-.23	0.10
November	21	51.8	27.8	77.8	15.1	50.0	-.99	.27	0.11
December	21	72.7	36.9	112.7	21.4	75.7	-.60	.30	0.12
Total	258	99.8	16.3	549.6	69.2	533.2	6.43	1.82	0.16*

Note: (1) K-S indicates Kolmogorov-Smirnov test. (2) *Normality was rejected at 99% confidence level

Table 3. Test of homogeneity of variances

Value	Levene Statistic	df1	df2	Sig.
Based on Mean	4.797	11	246	.000*
Based on Median	3.766	11	246	.000*
Based on Median and with adjusted df	3.766	11	39.313	.001*
Based on trimmed mean	3.851	11	246	.000*

Note: *Null of homogeneity was rejected at 1%.

Table 4. One-Way ANOVA test result

Value	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	930161.953	11	84560.178	69.160	.000*
Within Groups	300778.848	246	1222.678		
Total	1230940.800	257			

Note: *Null of no significant difference was rejected at 1%.

Table 5. Relationship matrix of variables

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Jan.		1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.15	0.00
Feb.	1.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.34	0.00
Mar.	0.00	0.00		0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.02	1.00
Apr.	0.00	0.00	0.00		0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.01
May	0.00	0.00	0.00	0.00		0.78	0.00	0.00	0.00	0.00	0.00	0.00
Jun.	0.00	0.00	0.00	0.04	0.78		1.00	1.00	0.00	0.00	0.00	0.00
Jul.	0.00	0.00	0.00	0.00	0.00	1.00		1.00	0.00	0.00	0.00	0.00
Aug.	0.00	0.00	0.00	0.00	0.00	1.00	1.00		0.00	0.00	0.00	0.00
Sep.	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00		0.00	0.13	1.00
Oct.	0.99	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		1.00	0.00
Nov.	0.15	0.34	0.02	0.00	0.00	0.00	0.00	0.00	0.13	1.00		0.05
Dec.	0.00	0.00	1.00	0.01	0.00	0.00	0.00	0.00	1.00	0.00	0.05	

Note: (1) Null of no significant difference hypothesis was tested at %1. (2) Grey area indicates rejection of null hypothesis.

The monthly course and average of the seasonal factor obtained by decomposing the export variable are presented in Figure 3. In other words, the course of the seasonal factor values for each specific month from 2002 to 2023 and the averages of these values are presented. This variable roughly represents the ratio of the actual value to the seasonally adjusted value. For example, a value of 100 indicates that the two values are equal, a value of 50 indicates that the actual value is half of the seasonally adjusted value, and a value of 200 indicates that it is double. In other words, values above 100 indicate that the business volume increases seasonally in those seasons, while values below 100 indicate that it decreases. As can be seen from the figure, starting from May, the seasonal increase is quite high, especially in June, July, and August. With the exception of only April, the export figures remain relatively low in the remaining months. From this point of view, seasonal effects are evident enough to be discerned visually. However, it should be supported by some statistical methods in order to have a scientific basis.

Descriptive statistics for seasonal factors by month are presented in Table 2. Since the data set started in January 2002 and ended in June 2023, there are 22 observations in each month until June, and 21

observations in the following months. Statistically, such a small difference is too small to distort the equal size of the groups. According to the statistics, the lowest seasonal factor average belongs to January with 38.9. This shows that the actual value is on average 38.9% of the seasonally adjusted value in January months in the covered period. In other words, export figures show the greatest seasonal decline in January, which is followed by February (40.6), October (44.6) and November (51.8). The highest seasonal factor average belongs to July with 203.4. This month is followed by August (202.9), June (178.8), and May (128.4). The real export value in July is about 2 times the seasonally adjusted value, indicating the high demand in these months.

For testing the normality of the distribution in the groups, the Kolmogorov-Smirnov test was used since the sample sizes were less than 30 in each group. According to the results obtained, seasonal factors of all months except June are normally distributed according to a 99% confidence level. When the whole sample is tested, it does not comply with the normal distribution. The reason why June did not comply with the normal distribution is the extreme seasonal increases experienced in some years in export values in this month, as can be seen in Figure 3. Also, as seen in Table 2, it is the month with the highest standard deviation, range, kurtosis, and skewness values. However, the fact that only one group does not comply with the normality assumption will not invalidate the one-way ANOVA test because the sample sizes in the groups are almost equal.

Within the scope of the research, we applied Levene's homogeneity of variance test to the seasonal factor values of our groups consisting of 12 months and presented the results in Table 3. When the test was evaluated based on the mean, the null hypothesis of homogeneous variances was rejected at a 99% confidence level. The unequal variances do not pose a problem for one-way ANOVA because Post Hoc techniques have been developed that take heterogeneity into account.

The results of the one-way ANOVA test, which tests whether there is a significant difference between the means of the groups, are presented in Table 4. The null hypothesis of this test indicates that there is no significant difference between the means of the groups, as shown in Equation 2. The alternative hypothesis is that the mean of at least one of the groups is significantly different from the others. The results show that the null hypothesis is rejected and at least the mean of 1 group is significantly different from the others. The Post Hoc test should be applied to determine which groups' means differ from each other.

Tamhane's T2 method was preferred in the Post Hoc analysis to make Multiple Comparisons because the variances were not equal. This method is also robust to unequal n's cases in the groups. A detailed comparison chart showing whether the differences between all the months are significant or not is presented in Appendix A. Since it is a very long table, it is included in the appendices. Representing the long table, we developed a relationship matrix showing whether the difference between months was significant and presented it in Table 5, which consists of probability values. Mutual comparisons are tested at a 99% confidence level and the relationships where the null hypothesis is rejected are shown in gray.

The results show that the months of June, July, and August form a cluster and clearly differ from all other months. On the other hand, the difference between them is statistically insignificant. This shows that they are exposed to similar seasonal factor changes. In other words, the export volume increases significantly in the summer season. It is also seen that the months of January, February, October, and November form a cluster. As can be seen from Figure 2 and Table 2, their average seasonal factor values are the lowest ones while average seasonal factor values of June, July, and August are the highest ones. These two clusters consist of months representing two extreme groupings. One of the months that could form a cluster representing the average was May. In this month, there is an increase in export figures with the effect of the season, but not as much as in the summer months, which makes it significantly different from all other months. Finally, March, September and December can be considered as a separate cluster with similar characteristics, whose values show a slight decrease seasonally.

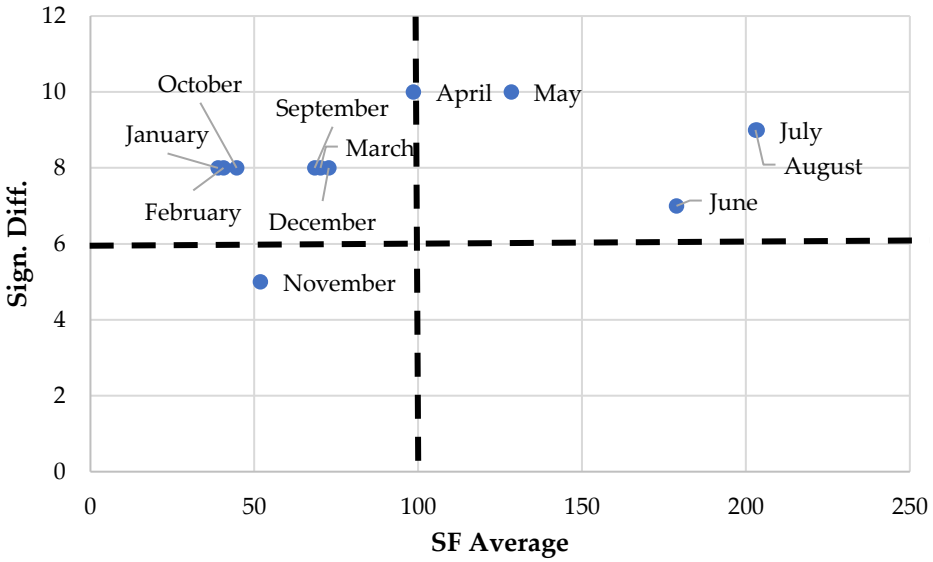

Figure 4. Positions of the seasonal factors by months

The chart in Figure 4 was prepared to reveal the clustering between the months by using the averages we obtained for the seasonal factor and the variables of how many months are significantly different from the related month. Thus, instead of struggling with numbers, it becomes possible to visually detect clusters of results obtained from the analysis. In the figure, the months of the year are positioned according to the mean values of their seasonal factors and their total significant differences from other months in terms of their means. Also, cluster analysis was applied using K-Means to support graphical clustering analysis. As a result of the analysis applied with the initial assumption of 4 clusters, Cluster 1 consists of January, February, October and November, Cluster 2 consists of May, Cluster 3 consists of March, April, September and December, and Cluster 4 consists of June, July, and August. This is a very reasonable result when Figure 3 is examined, because the seasonal factor averages of the relevant months are close to each other.

DISCUSSION AND CONCLUSION

Firms and policymakers aim to understand the movements of the sectors over time and develop policies and strategies accordingly since any information that enables them to get ahead of their competitors by providing a competitive advantage in business life is very valuable. In general, when examining the sector, the future trend is tried to be predicted by using the past and current trends. This general trend provides a great advantage for companies and policymakers to see ahead. On the other hand, it may be useful to analyze some other components such as seasonality and irregularity, although they are not as obvious as the movement trends of the sectors. Having additional information on other components will increase competitive advantage, as the general trend is an issue on which all stakeholders are concerned. In this direction, in our study, we analyzed the seasonal structure of the export volume of Turkish yachts and amusement equipment for water sports. Although it is clear that it will increase in summer and decrease in winter, we aimed to scientifically reveal whether the seasonal oscillation differs significantly according to months and which months show similar characteristics. Understanding seasonal fluctuations is of great importance due to factors such as production activities, supply chain management, distribution network, forecasting, infrastructure investment, commercial policies, on-time delivery, lower costs, and marketing strategies.

In this direction, the seasonally adjusted series was obtained by decomposing the Turkish yacht export variable into trend, seasonal factor and irregularity components using the TRAMO/SEATS tool. Then, one-way ANOVA analysis was applied to determine whether the seasonal factor averages differed significantly from each other according to the months

in the period under consideration. As a result, we determined that at least one month differed significantly from the others. Also, K-Means clustering analysis was applied by using seasonal factor averages and differing month numbers. The results showed that 4 clusters can be formed and the months of June, July, and August, when the seasonal effect is highest, are separate clusters. In addition, May has formed a separate cluster since it is higher than the months outside this cluster on average, but not as high as those in this cluster. On the other hand, the months with the lowest seasonality formed a separate cluster as January, February, October, and November. These months had values well below the seasonally adjusted series, that is, about half as much. This shows that the seasonal decrease in these months is very high, while the seasonal increase in June, July, and August is very high. In addition to the analysis of the general trend of exports, the seasonal variation findings obtained in this study will contribute to the competitive advantages of companies and policymakers by providing opportunities for them to make better plans. Especially for one of the important players in the international yacht industry like Türkiye (Aydın & Yılmaz Aydın, 2019), every strategic information is of great importance in order to consolidate its position.

While this result obtained in the study supports the results obtained by Polat & Uslu (2010), it rejects the results obtained by Tunç (2017). Tunç (2017) examined the Western Mediterranean region as a sample and found seasonal differences in Antalya, the touristic and seaside province of the region with 3 provinces but could not detect seasonal differences in Burdur and Isparta, two non-touristy and non-marine provinces. Considering the results obtained in this study, which is based on Türkiye's yacht export data, it is considered that examining the differences between seasonality and export quantity variables in terms of touristic or seaside regions and other regions will contribute to the current literature. In the study, seasonality in export figures was revealed for the first time in the literature with a statistical method rather than the subjective observations of sector representatives and researchers. Human observations can be misleading due to reasons such as perceptual bias, cognitive bias, limited perspective, and memory limit.

The biggest limitation of the study is that interviews were not conducted with industry representatives. Analyzes could have been enriched by taking into account the information in the sector and models with different variables could have been used. In addition, analyzes were made on "Yachts and other vessels for pleasure or sports; rowing-boats and canoes" data received from TSI (2023). Naturally, there are many types of products under this data set. Seasonal trends of these products can be very different from each other. In further studies, analyzes can be applied according to sub-product groups and the results can be enriched.

Compliance with Ethical Standards

Authors' Contributions

AA: Designed the study. Performed and managed statistical analysis. Wrote the first draft of the manuscript.

NÖ: Designed the study. Wrote the first draft of the manuscript.

Both authors read and approved the final manuscript.

Conflict of Interest

The authors declare that there is no conflict of interest.

Ethical Approval

For this type of study, formal consent is not required.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Appendix A. Multiple comparisons

(I) month	(J) month	Mean Difference (I-J)	Std. Error	Sig.	(I) month	(J) month	Mean Difference (I-J)	Std. Error	Sig.
January	February	-1.67	2.99	1.00	July	January	164.47	9.81	0.00
	March	-31.24	3.84	0.00		February	162.80	9.76	0.00
	April	-59.57	4.54	0.00		March	133.23	10.05	0.00
	May	-89.49	5.50	0.00		April	104.89	10.34	0.00
	June	-139.87	20.13	0.00		May	74.98	10.79	0.00
	July	-164.47	9.81	0.00		June	24.60	22.17	1.00
	August	-163.97	8.49	0.00		August	0.50	12.58	1.00
	September	-29.45	4.38	0.00		September	135.01	10.27	0.00
	October	-5.72	3.13	0.99		October	158.75	9.80	0.00
	November	-12.92	3.98	0.15		November	151.55	10.10	0.00
	December	-33.81	5.17	0.00		December	130.66	10.63	0.00
February	January	1.67	2.99	1.00	August	January	163.97	8.49	0.00
	March	-29.57	3.71	0.00		February	162.30	8.43	0.00
	April	-57.90	4.44	0.00		March	132.73	8.77	0.00
	May	-87.82	5.41	0.00		April	104.40	9.10	0.00
	June	-138.20	20.11	0.00		May	74.48	9.61	0.00
	July	-162.80	9.76	0.00		June	24.10	21.62	1.00
	August	-162.30	8.43	0.00		July	-0.50	12.58	1.00
	September	-27.78	4.27	0.00		September	134.52	9.02	0.00
	October	-4.05	2.98	1.00		October	158.25	8.48	0.00
	November	-11.25	3.86	0.34		November	151.05	8.83	0.00
	December	-32.14	5.08	0.00		December	130.16	9.43	0.00
March	January	31.24	3.84	0.00	September	January	29.45	4.38	0.00
	February	29.57	3.71	0.00		February	27.78	4.27	0.00
	April	-28.33	5.05	0.00		March	-1.79	4.90	1.00
	May	-58.25	5.92	0.00		April	-30.12	5.47	0.00
	June	-108.63	20.25	0.00		May	-60.04	6.28	0.00
	July	-133.23	10.05	0.00		June	-110.42	20.36	0.00
	August	-132.73	8.77	0.00		July	-135.01	10.27	0.00
	September	1.79	4.90	1.00		August	-134.52	9.02	0.00
	October	25.52	3.83	0.00		October	23.73	4.37	0.00
	November	18.32	4.54	0.02		November	16.53	5.01	0.13
	December	-2.57	5.62	1.00		December	-4.36	6.00	1.00
April	January	59.57	4.54	0.00	October	January	5.72	3.13	0.99
	February	57.90	4.44	0.00		February	4.05	2.98	1.00
	March	28.33	5.05	0.00		March	-25.52	3.83	0.00
	May	-29.92	6.40	0.00		April	-53.85	4.53	0.00
	June	-80.30	20.40	0.04		May	-83.77	5.49	0.00
	July	-104.89	10.34	0.00		June	-134.15	20.13	0.00
	August	-104.40	9.10	0.00		July	-158.75	9.80	0.00
	September	30.12	5.47	0.00		August	-158.25	8.48	0.00
	October	53.85	4.53	0.00		September	-23.73	4.37	0.00
	November	46.65	5.15	0.00		November	-7.20	3.97	1.00
	December	25.76	6.12	0.01		December	-28.09	5.16	0.00
May	January	89.49	5.50	0.00	November	January	12.92	3.98	0.15
	February	87.82	5.41	0.00		February	11.25	3.86	0.34
	March	58.25	5.92	0.00		March	-18.32	4.54	0.02
	April	29.92	6.40	0.00		April	-46.65	5.15	0.00
	June	-50.38	20.63	0.78		May	-76.57	6.01	0.00
	July	-74.98	10.79	0.00		June	-126.95	20.28	0.00
	August	-74.48	9.61	0.00		July	-151.55	10.10	0.00
	September	60.04	6.28	0.00		August	-151.05	8.83	0.00
	October	83.77	5.49	0.00		September	-16.53	5.01	0.13
	November	76.57	6.01	0.00		October	7.20	3.97	1.00
	December	55.68	6.86	0.00		December	-20.89	5.72	0.05
June	January	139.87	20.13	0.00	December	January	33.81	5.17	0.00
	February	138.20	20.11	0.00		February	32.14	5.08	0.00
	March	108.63	20.25	0.00		March	2.57	5.62	1.00
	April	80.30	20.40	0.04		April	-25.76	6.12	0.01
	May	50.38	20.63	0.78		May	-55.68	6.86	0.00
	July	-24.60	22.17	1.00		June	-106.06	20.55	0.00
	August	-24.10	21.62	1.00		July	-130.66	10.63	0.00
	September	110.42	20.36	0.00		August	-130.16	9.43	0.00
	October	134.15	20.13	0.00		September	4.36	6.00	1.00
	November	126.95	20.28	0.00		October	28.09	5.16	0.00
	December	106.06	20.55	0.00		November	20.89	5.72	0.05

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