

SOME ASPECTS OF STATISTICAL ANALYSIS OF THE TOURIST ACTIVITY IN PORTUGAL AND ROMANIA

Elisabeta ROȘCA

Faculty of Economics, Administration and Business, "Ștefan cel Mare" University of Suceava, Romania
elisabeta.rosca@usm.ro

Abstract:

This work presents a succinct introduction related to the importance of statistical data in the knowing of the tourism activity and in the decision-making in domain, either using the conclusions of descriptive statistics or those derived from the application of data analysis software. The work presents the conclusions detached from the study of the specialized literature from the two countries, in relation with the statistical methods applied in the analysis of tourism activity (ranking methods, factor analysis, cluster analysis, regression and correlation, ANOVA method, index method and others). The work presents the statistical methodology for analyzing tourism activity applied in this study. In the case study, they were applied methods for analyzing the variability of time series indicators, respectively the variation of absolute levels, the variation of absolute modifications, the variation of relative modifications. Indicators taken in study were: the number of tourist accommodation units, total tourist arrivals (internal and foreign tourists) in Portugal and Romania, during the period 2000-2024; it was realised a medium-term forecast of the market share of foreign visitor arrivals from Portugal in total foreign visitor arrivals in Romania. It was analyzed the relative evolution of the activity of travel agencies from Romania in the relation with Portugal, in the period 2008-2024. The data sources are, mainly, Eurostat and NIS statistics. The data analysis was carried out with the EXCEL and StatPlus programs.

Key words: tourism statistics, time series, regression method, accommodation units number, total tourist arrivals.

JEL classification: C230, C400, L830.

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1. INTRODUCTION

Statistical data observed in the tourism activity are of a great importance, both for academia and for practitioners. The application of statistical concepts and procedures in the tourism activity is not a common practice, because the numbers and formulas are not common elements in tourism. In many studies in the domain of tourism, the descriptive statistics provide the necessary information for the knowledge of this domain, but there are also sides of the tourism activity whose study requires the use of some more complicated methods, procedures that lead to the interpretation of some results, which can form the basis for decision-making by the public authorities or at the basis of the implementation of development plans and policies or, more simply, to explain how the tourism activity is carried out. Not least, the application of statistical methods and techniques in tourism requires the use of some data analysis software, capable to extract more information from data and provide a certain perspective for the future.

The present work aims to identify, through the study of specialized literature, which are some of the statistical methods used in the analysis of the tourism activity in Portugal and Romania and to contribute at the enriching of the conclusions regarding the tourism activity between the two countries by the applying of some statistical methods on the indicators of the tourism activity between Portugal and Romania, during the period 2000-2024, over a time series of length $T=25$ years.

2. STUDY OF THE SPECIALIZED LITERATURE REGARDING ON THE STATISTICAL METHODS USED IN THE ANALYSIS OF THE TOURISM ACTIVITY IN PORTUGAL AND ROMANIA

Statistical research of the tourism activity in Romania is based, in many cases, on the application of the statistical methods of analyzing the chronological and territorial series. Methods of territorial ranking, regression and correlation, analysis of the link between variables, factor analysis and others are statistical methods frequently used in the analysis of the tourist activity. In the work (Lilea, 2008) the author used the relative structure indicators, the graphic method, the rank method for ranking the development regions of Romania, the last in the multi-criteria version, highlighting

as regions with the greatest tourism development the regions South-East, Center, North-West and others. Factor analysis was applied in the work (Boboc et al., 2019) to identify the models that describe the relationships among different statistical indicators of tourism, the authors highlighting the essential characteristics of the main types of tourism developed in Romania, which allowed the formulation of some proposals for economic and social policy measures that to optimize the tourism activity in Romania. In the work (Silvestre and Correia, 2005), the authors developed and empirically validated a model of second-order factor analysis to evaluate the general tourist image of the Algarve Region, Portugal, using the data obtained on the basis of a survey on a sample of tourists which visit this destination. In the work (Butnaru and Jaba, 2009) the authors analyzed the quality of accommodation services offered by the tourist reception structures from the zones of Vatra Dornei, Neamț and Brig (Switzerland), using statistical methods. Analyzed data were collected on the basis of questionnaire and the conclusions resulted from the modeling of the average of the frequencies of the responses received to the questionnaire questions, addressed to the managers of some tourist reception structures from these areas.

The application of these methods led to the identification of some strategic guidelines and directions that can be taken into account at the elaboration of the managerial strategies for the ensuring of the quality of tourist products and services. Some studies deal with the analysis of the tourism forms, such as: mountain tourism (Bacoș and Gabor, 2021; Rebelo et al., 2017), cultural tourism (Țigu et al., 2014; Guedes and Jiménez, 2015), seaside tourism (Vaz and Dinis, 2007; Ionel, 2020), agritourism and rural tourism (Dinis, 2021; Costa, 2021) and others, using statistical methods (Pearson parametric correlation, chi-square test, Student test, cluster analysis, multiple regression and correlation, multifactorial ANOVA method, indices method, graphical method, descriptive statistics a.s.o.). In the work (Dinis, 2021) the author elaborated a study on the link between population migration flows towards a rural territory from Portugal, namely Penamacor and the tourism activity, in order to assess the impact of new mobility models in rural and low-density territories. It is analysed the rural zone at NUTS II and NUTS III levels, using data published by the National Institute of Statistics (Instituto Nacional de Estatística-INE).

A descriptive analysis of tourism demand from the main tourists origin countries who visited Portugal between 2013 and 2019, namely: Portugal (internal tourists) and tourists from the UK, Ireland, Spain, France, Germany, Brazil and Italy, using as data sources, in addition to the conventional statistics provided by INE, the data provided by GT (Google Trends), regarding the volume of web searches for the main tourist destinations from Portugal, is found in the work (Costa (2021). Author used statistical and econometric methods, namely: dynamic regression, exponential smoothing, ARIMA model and the Rstudio software. Analysis of time series components (trend and seasonality) makes the object of numerous studies. In the work (Gordan et al., 2024) the authors approached the trend and seasonality models of the tourist arrivals in agritourism, in Romania, using statistical data at country level from the databases of the relevant ministry and those of the NIS, and as the analysis method was used the decomposition seasonality-trend LOESS (STL). In the work (Zaharia and Gogonea, 2020) the authors analyzed the effect of the seasonality on the use of the capacity of accommodation in operation in Romania, in regional profile.

The conclusions of the study are based on the variability analysis (amplitude, dispersion), resulting the fact that the disparities between regions, in terms of accommodation capacity use, continue to increase, negatively affecting the performance of the tourism industry from Romania. In the work (Kastenholz and Almeida, 2008) the authors analyzed the seasonality in the rural tourism in the zone North Portugal, with the aim to highlight the marketing implications of it on the destination. Data used resulted from a large-scale survey, of volume $n=2280$ statistical units, carried out in the context of studying the rural tourism market, during the period 1998-1999. The results of the study highlighted significant statistical differences between tourist arrivals in the peak season and the low season, regarding the tourist profile, travel behavior, motivations and perceptions about the destination and their knowledge can be an important step for a sustainable tourism activity in rural spaces. Some works analyzed the tourism demand seasonality and they were elaborated forecast calculations regarding internal and foreign tourism demand in Portugal. In the work (Daniel and

Rodrigues, 2010) it was analyzed the seasonality of total tourism demand (internal and foreign) in Portugal, using monthly statistical data, during the period 1976-2006 (372 observations) regarding the number of overnight stays indicator for Portugal and the main tourism countries source for it. External tourism demand forecast in Portugal was approached in the work (Dias, 2023), in which started from the premise that in Europe, about 99% from the total business is represented by the SME sector and similarly in Portugal and, in this context, the EU proposed the RESETTING Project, which has as the aim the promotion of the European SMEs competitiveness in the tourism domain through the use of sophisticated and innovative technological solutions, which create and deliver forecast models, fast enough and of good quality so help the SMEs to remain competitive.

Study of the specialized literature highlights the fact that the tourism activity is of interest for the scientific research from the two countries, both regarding the study of the internal and international tourism in Portugal and Romania, respectively, and regarding the tourist flows between the two countries. In addition to the analyses carried out, some of these presented above, the present work aims to highlight particularities of the tourist circulation between Portugal and Romania, highlighted through statistical methods applied on the data available in the official national statistics and the Eurostat statistics, in the period 2000-2024.

3. STATISTICAL ANALYSIS METHODOLOGY OF THE TOURISM FROM PORTUGAL AND ROMANIA

Comparative analysis of the tourism activity tendency in Portugal and Romania, in the period 2000-2024, carried out using the indicators: number of tourist accommodation units and total tourist arrivals (internal tourists and foreign tourists). For the two time series were calculated and analyzed the averages and variation indicators, absolute modifications and dynamic indices with variable basis (Biji et al., 2010).

Variation study into a time series consists of the studying of the relationship between the considered variable and the time variable. The analysis requires the time series visualizing through a graph and the identification of the evolution tendency of the terms, as well as the calculation and analysis of several statistical indicators. Study of variation in the time series involves the analysis of the following types of variation:

- absolute levels variation from a time unit to another ($y_0, y_1, y_2, \dots, y_{t-1}, y_t$);
- absolute modifications variation from a period to another ($\Delta_{1/0}^y, \Delta_{2/1}^y, \dots, \Delta_{t/t-1}^y$);
- relative modifications variation from a period to another ($I_{1/0}^y, I_{2/1}^y, \dots, I_{t/t-1}^y$).

For the time series of the two indicators were calculated and analysed the average, dispersion, standard deviation and coefficient of variation, the last indicator being interpreted according to the maximum limit of 35%-40%: for values lower than this limit, the series can be considered homogeneous and can be used in forecast calculations. Degree of homogeneity is characterized also by the coefficients of variation calculated for the absolute modifications with basis in chain, in order to verify in what measure the absolute average modification is a representative value for the series terms, case in which it can be concluded that, in the analyzed period, the terms are linked to each other under the form of an arithmetic progression.

Coefficient of variation of the absolute modifications with the basis in chain is calculated with the relation:

$$V_{\Delta}\% = \frac{\sigma_{\Delta}}{\bar{\Delta}} \times 100 \quad (1)$$

and a value $V_{\Delta}\% < 35\% - 40\%$ shows that $\bar{\Delta}$ is representative for the values $\Delta_{t/t-1}^y$ and the series terms follow an arithmetic progression, which can be described by the linear function.

Statistical measurement of the degree of relative variation requires the determination of the dynamics indices with the basis in chain $I_{t/t-1}^y$ and their average is a geometric average. Measurement of the variation degree of the series terms using the coefficient of variation is done by taking the logarithm of the variation indicators, as results from the relationship:

$$V_{\log I}\% = \frac{\sigma_{\log I}}{\log I} \times 100 \quad (2)$$

and a value $V_{log\bar{I}}\% < 35\% - 40\%$ shows that the series terms follow a geometric progression, which can be described by the exponential function.

It was calculated the market share of the foreign visitors from Portugal in the total of the foreign visitor arrivals in Romania (Roșca, 2025). Terms of these series were adjusted using the linear function and the exponential function and on the basis of the regression statistics analysis, it was chosen the best regression function (Levin, 1987), with which it was made the market share forecast and they were estimated the foreign visitor arrivals from Portugal in Romania, on medium term (2025-2027).

They were analyzed the evolution of the share of Romanian tourists visiting Portugal through travel agencies with organizational activity and respectively with intermediary activity, the tourism through travel agencies being only a part of the external tourist demand from Romania to Portugal.

For the calculation of the variation indicators they were used the statistical functions of the EXCEL Program (average; var.p; stdev.p). It was used the StatPlus Statistical Data Analysis Program (function Exponential Smoothing), for the analysis of the total tourist arrivals in Portugal and in Romania and of the market share.

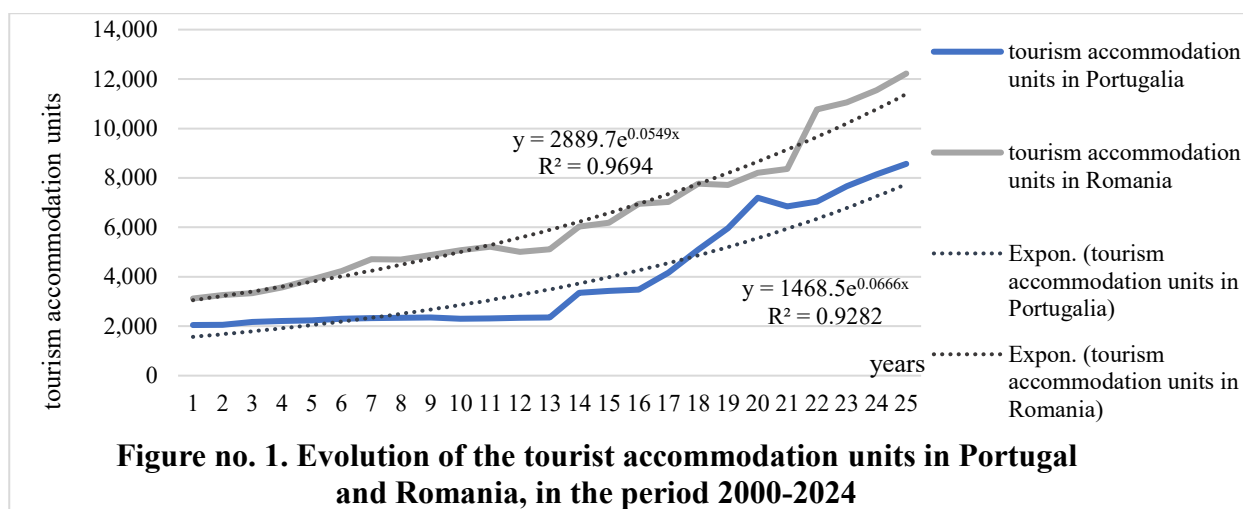
4. CASE STUDY: STATISTICAL ANALYSIS OF THE TOURISM EVOLUTION IN PORTUGAL AND ROMANIA

Analysis of the tourism activity in Portugal and Romania taken in study the tourism supply, characterized by the number of tourist accommodation units, which according to the Eurostat methodology includes hotels, holiday and other short-stays of accommodation, camping grounds, recreational vehicle parks and trailer parks, in the period 2000-2024 and the tourism demand, characterized by the total tourist arrivals (internal and foreign tourists) in the same types of accommodation units, in the period 2000-2024. In the Annex 1 is realized an analysis of the two indicators, on the basis of the averages and variation indicators calculated for the two time series, for the absolute modifications and the dynamic indices with variable basis, in Portugal and Romania. The calculations were performed with the statistical functions of EXCEL Program (average; var.p; stdev.p). Conclusions are also presented in the Annex 1.

They were graphically visualized, through the timelines from the figures no. 1 and 2, the evolutions of the terms of the two indicators: the number of tourist accommodation units and the total tourist arrivals.

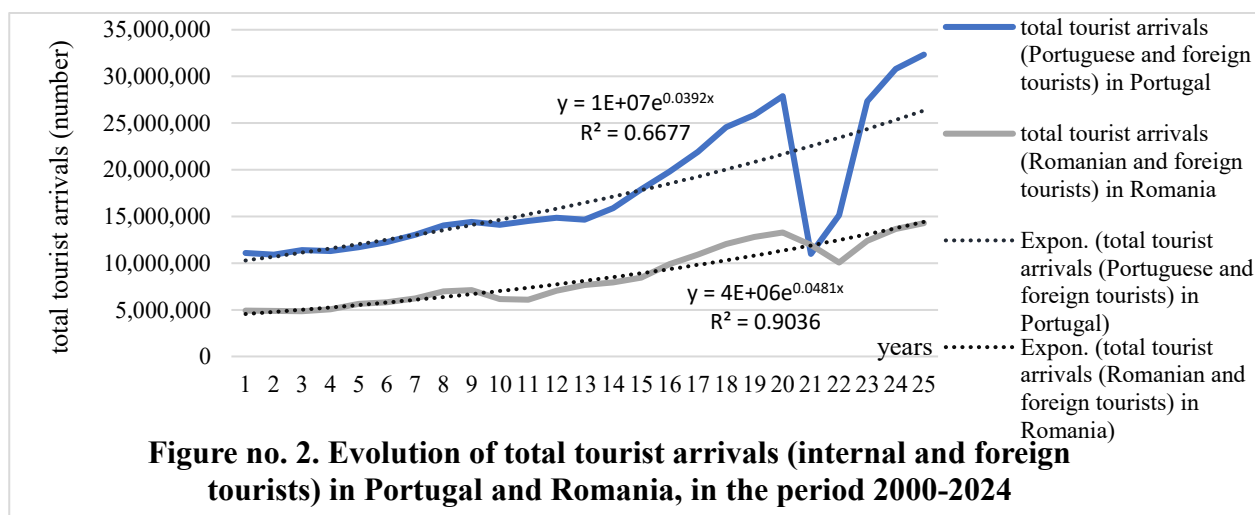
In the Figure no. 1 is presented the evolution of the number of tourist accommodation units in Portugal and Romania, during the period 2000-2024. Conclusions detached from the analysis of the indicators from the Annex 1 lead to an exponential evolution of the indicator in both countries, the graph highlighting the fact that the number of tourist accommodation units is higher in Romania than in Portugal, during the analysis period. The two exponential functions show the increasing tendency of the indicator for both countries. The coefficients of determination have high values for both countries, which shows that the exponential function describes well the evolution of the indicator in period.

In the Figure no. 2 is presented the evolution of total tourist arrivals (internal and foreign tourists) in the period 2000-2024.



Data source: NIS, <https://www.insse.ro>, Eurostat statistics.

Conclusions resulted from the analysis of the indicators from the Annex 1 highlight the existence of an exponential evolution tendency for this indicator in both countries in the analyzed period, the graph highlighting a great number of tourist arrivals in Portugal, where the average annual relative growth was of 104.56%, while in Romania it was of 104.54% (due to the lack of data for Romania in 2020, for this year it was carried out the interpolation of the total tourist arrivals through the average index method).

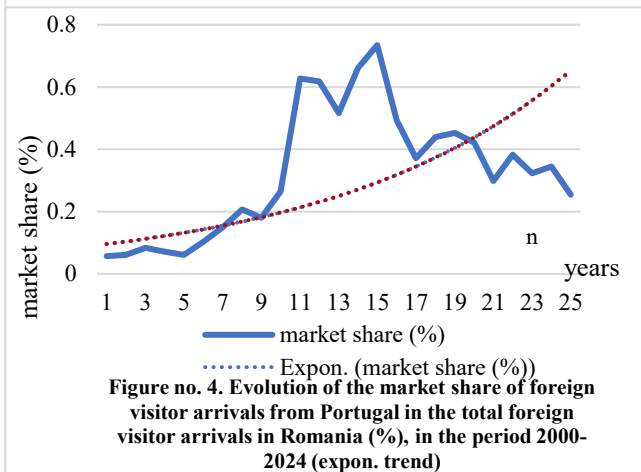
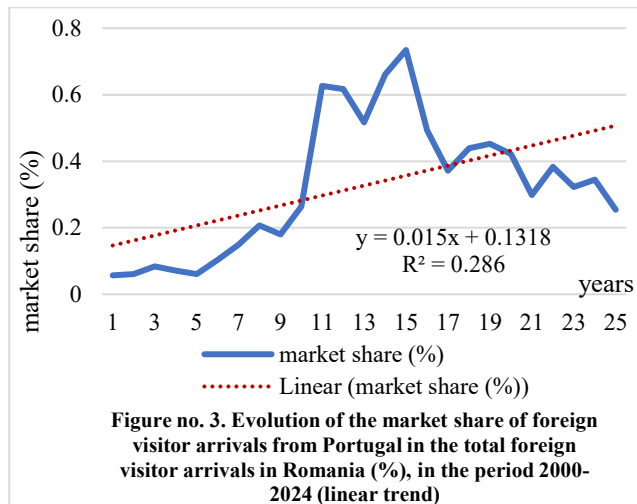


Data source: NIS, <https://www.insse.ro>, Eurostat statistics.

The two exponential functions visualize the indicator increasing tendency in both countries. The coefficient of determination has a higher value in the case of Romania, which shows that the exponential function describes well the evolution of the indicator in period and a lower value in the case of Portugal, but acceptable for its use in the trend estimation and in forecast calculations.

It was calculated the market share (%) of the foreign visitors from Portugal in Romania, during the period 2000-2024, and its evolution was graphically visualized in the figures no. 3 and 4, using two trend functions: linear and exponential. It was realized the market share adjustment using the EXCEL program functions: TREND and GROWTH. It was applied as a test of quality verifying of the adjustment function the criterion: $\sum y_t = \sum \hat{y}_t$, the conclusion being that the linear function achieves a better adjustment (Isaic-Maniu et al., 1999). Statistics of regression leads to the following conclusions: the correlation coefficient $r=0.534772$ shows an increase in the market share of the foreign visitor arrivals from Portugal in Romania, during the period 2000-2024; the linear regression coefficient $b=0.015>0$, shows that the market share has an objective tendency to increase; the coefficient of determination R^2 is higher in the case of the linear regression function, so it is recommended the choosing of the linear function as the regression function; the error coefficient of

the linear regression function is lower than the exponential one, so it is recommended the choosing of linear function as regression function.



It was applied the FORECAST.LINEAR function from the EXCEL Program in order to realize the market share prognosis using the linear trend function and they were estimated the arrivals of the foreign visitors from Portugal to Romania, on medium term (2025-2027), presented in the Table no. 1.

Table no. 1. Prognosis of the market share of the foreign visitors arrivals from Portugal to Romania, on medium term (2025-2027)

Indicators	Years		
	2025	2026	2027
market share (%) of the foreign visitors arrivals from Portugal to Romania	0,522221	0,537237	0,552254
estimate of the foreign visitors arrivals from Portugal to Romania (thousand)	49	52	55

Source: own calculations; data source: NIS, <https://www.insse.ro>, Eurostat statistics.

In the case of the total tourist arrivals in the two countries, it was used the trend function identified in the Figure no. 2 for the exponential adjustment of the indicators, in the period 2000-2024. The calculations were performed with the Program StatPlus, function Time Series/Exponential Smoothing. Returned statistics and the exponential adjustment graph are presented in the Table no. 2 and Figure no. 5.

They are observed both the high values of the four calculated errors, and the lower value of the coefficient of determination R^2 , from which results that the exponential adjustment can be applied with some reservations in the case of the series analyzed for Portugal.

Table no. 2. Exponential Smoothing			
Model	Single		
Alpha	0.1000		
Variable	VAR		
N of valid cases	25		
Mean	17,545,925.2000	Std Dev	6,757,621.2988
Minimum	10,907,349.0000	Maximum	32,335,412.0000
MSE	3.7507E+13	SSE	9.3768E+14
MAPE	26.5147	MAE	4,789,218.0618

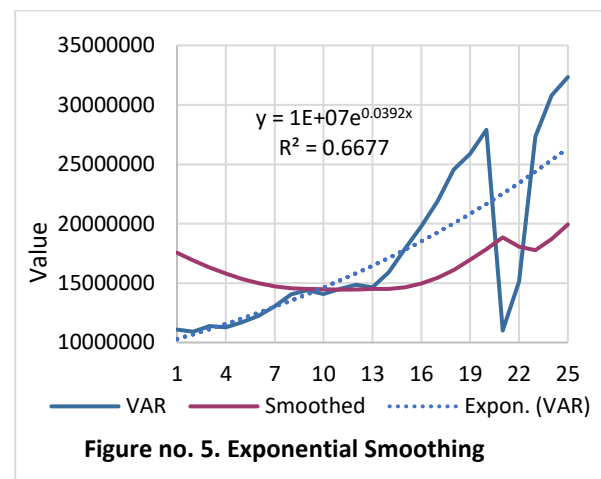
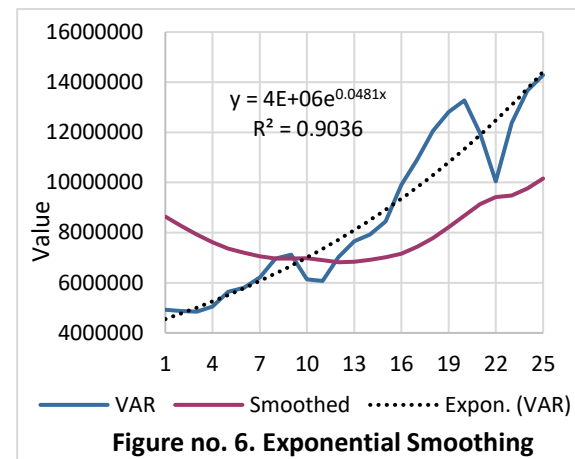
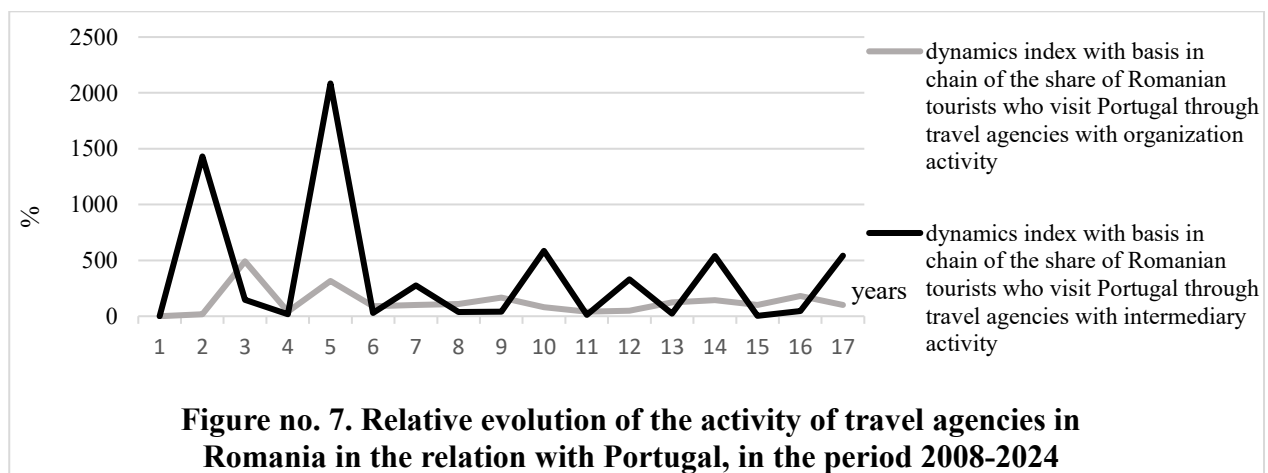


Table no. 3. Exponential Smoothing			
Model	Single		
Alpha	0.1000		
Variable	VAR		
N of valid cases	25		
Mean	8,640,262.0560	Std Dev	3,172,780.3967
Minimum	4,847,476.0000	Maximum	14,282,566.0000
MSE	7.2566E+12	SSE	1.8141E+14
MAPE	27.0578	MAE	2,242,338.1146



In the Table no. 3 and Figure no. 6 they were performed similar calculations for the total tourist arrivals in Romania. Although the errors are large, the high value of the coefficient of determination R^2 argues the exponential adjustment use in the analysis of the given series.

Having at the basis the statistical data on the activity of travel agencies from Romania, regarding the number of Romanian tourists participating at external actions organized by the travel agencies, were calculated the share of the Romanian tourists visiting Portugal through the travel agencies with organizing activity and with intermediary activity, respectively, and the dynamics of the two shares using the indices with basis in chain. In the Figure no. 7 are visualized the evolutions of the two series of indices, in a linear timeline. The absolute indicators have a low level and an oscillating evolution, highlighting a low number of Romanian tourists participating at the external tourist actions organized by the travel agencies on the Portugal destination, both in the case of those with organization activity and in the case of those with intermediary activity. The number of Romanian tourists to Portugal is low, compared with the total number of Romanian tourists who visit foreign destinations, but the relative tendency is of increasing, on annual average with 4.4% in the case of agencies with organisation activity and with 19.5% in the case of the agencies with intermediary activity.



Source: own calculations; data source: NIS, <https://www.insse.ro>.

This analysis can be continued with the analysis of other indicators that characterize tourism activity in the two countries, namely: the analysis of the tourist accommodation offer can be supplemented with the analysis of the number of accommodation places, of the occupancy degree of accommodation capacity a.s.o., and the analysis of tourist demand can be supplemented with the comparative study of the number of overnight stays, of the average length of stay, the analysis of

tourist receipts a.s.o., which are comparison criteria frequently used in the analysis of tourism at the European level.

5. CONCLUSIONS

Work aimed to highlight the importance of the statistical methods in the knowing of the tourism activity from Portugal and Romania and the characterizing of the dimension of tourist activity in/between the two countries.

Study of the specialized literature highlighted what are the subjects of interest in the tourism activity analysis in the analyzed countries and the frequently used statistical methods. It was observed the fact that, for the study of tourism in Portugal and in Romania, they were applied statistical methods of analysis of the chronological and territorial series, such as: the graphic method, the analysis of relative indicators, the analysis of the trend and seasonality, the indices method, regression and correlation models, the analysis of the connection among variables, factorial analysis methods, methods of development regions ranking and others.

Frequently are used, as criteria for structuring of the analyzed indicators, the development regions, origin of tourists, forms of tourism and others.

Data sources are, in both countries, either the official statistics, namely the Instituto Nacional de Estatística-INE in Portugal and the National Institute of Statistics-NIS in Romania, or statistical surveys, on basis of questionnaire, panel data, data provided by GT (Google Trends) a.s.o.

In the case study, they were comparatively analyzed the indicators: number of tourist accommodation units, total tourist arrivals, market share of foreign visitors from Portugal in the total foreign visitor arrivals in Romania, weight of the Romanian tourists which visit Portugal through travel agencies with activity of organization and respectively with intermediary activity, in the period 2000-2024. In analysis it was used the graphical method, calculation and interpretation of the variability in time series, regression using the linear and exponential functions, medium-term prognosis. They were used the Excel and StatPlus programs for data analysis.

The most important conclusions detached from the realized statistical analysis refer to: the increasing evolution tendency of the number of tourist accommodation units and of the total tourist arrivals (internal tourists and foreign tourists), identified as being of an exponential type in Portugal and Romania, in the period 2000-2024; the evolution of the foreign visitors market share from Portugal in the total foreign visitors to Romania, in the period 2000-2024 is better described by the linear function, and the forecasted values for the years 2025-2027 are increasing; for both countries, the exponential adjustment is recommended, the exponential function can be used for characterization the tendency in the given period and medium-term prognosis; the weight of Romanian tourists who visit Portugal through travel agencies with organization and intermediary activity is low, but presents a growing tendency, in the period 2008-2024.

As a development direction opened by this analysis, we propose the introduction of new indicators that characterize tourism activity, especially the number of overnight stays and tourism receipts, with relevance in tourism analyses at the European level.

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Annex 1. Analysis of the variation of tourism activity dynamics indicators in Portugal and Romania, during the period 2000-2024

No. crt.	Indicators of dynamics in tourism	Mean ($m_a; m_g$)	Indicators of variation			Results
			σ^2	σ	V%	
I. Portugal						
1.	Tourist accommodation units (number)	4.013	4.991.396	2.234	56	Average annual number of tourist accommodation units was 4,013 units, having an increasing tendency, more accentuated in the pre-pandemic period (2016-2019). The coefficient of variation has a high value, which highlights an inhomogeneity of the terms of the analyzed time series. Absolute modifications from one year to the other of the number of accommodation units have an average level of 272 units, but a high coefficient of variation, which shows that the variation of terms does not follow an arithmetic progression. The indices with variable basis have an annual average level of 106%, a low standard deviation and a low coefficient of variation (10%), which argues the conclusion that the terms of the series follow a geometric progression evolution model. Total tourist arrivals register an average level during the period of about 17.5 million internal and foreign tourists, value supported as being representative by a coefficient of variation of 38% (<40% - the maximum allowed level), which makes that the indicator can be used in subsequent calculations of determination of the trend and prognosis. Variation indicators calculated for the absolute modifications have high levels, which eliminate the hypothesis of an arithmetic progression evolution tendency. Geometric mean of indices with variable basis is 105%, supported by a coefficient of variation of 21%, which argues the use of a geometric progression model for trend determination and prognosis calculations.
2.	Absolute modifications with variable basis of the tourist accommodation units (number) ($\Delta_{t/t-1}$)	272	159.505	399	147	
3.	Indices with variable basis of tourist accommodation units (%) ($I_{t/t-1}$)	106	110	10	10	
4.	Total tourist arrivals (internal and foreign tourists) (number)	17.545.925	4,4E+13	6.621.090	38	
5.	Absolute modifications with variable basis of the total tourist arrivals (number) ($\Delta_{t/t-1}$)	884.862	1,9E+13	4.456.653	504	
6.	Indices with variable basis of the total tourist arrivals (%) ($I_{t/t-1}$)	105	476	22	21	
I. Romania						
1.	Tourist accommodation units (number)	6.398	7.057.545	2.617	42	Average annual number of tourist accommodation units was 6,398 units, with an increasing but oscillating tendency, more accentuated in the years 2003-2006, 2013-2015, 2017, 2021. Coefficient of variation has a high value, which highlights the inhomogeneity of the terms of this chronological series, on which it is not recommended to be applied calculations of prognosis. Absolute modifications with variable basis have an average level of 379 units and high variation indicators, which leads to the conclusion that the series terms do not follow an arithmetic progression. Indices with variable basis have an average annual level of 106%, variation indicators with low level, which shows that the series terms follow a geometric progression. Total tourist arrivals register an annual average level of about 8.7 million tourists, and the coefficient of variation (of 36%) supports its representativeness, the terms of the series being homogeneous, which can be used in tendency and prognosis calculations. The absolute modifications with variable basis have high variation indicators
2.	Absolute modifications with variable basis of the tourist accommodation units (number) ($\Delta_{t/t-1}$)	379	251.708	502	132	
3.	Indices with variable basis of tourist accommodation units (%) ($I_{t/t-1}$)	106	44	7	6	
4.	Total tourist arrivals (internal and foreign tourists) (number)	8.670.818	0,9E+13	3.144.687	36	
5.	Absolute modifications with	390.102	0,8E+13	921.166	236	

	variable basis of the total tourist arrivals (number) $(\Delta_{t/t-1})$					(V=236%), which eliminates the hypothesis of the evolution of terms in arithmetic progression. Indices with variable basis have an average annual level of 105%, variability indicators are reduced (for example, V=9%), which leads towards the conclusion that the terms of the series follow a geometric progression.
6.	Indices with variable basis of the total tourist arrivals $(\%) (I_{t/t-1})$	105	85	9	9	

Source: own calculations; source of data: NIS, <https://www.insse.ro>, Eurostat statistics.