MODEL OF MEDITERRANEAN CRUISING FROM 2012 TO 2022

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Abstract - This paper explores cruise tourism in the Mediterranean, with a special emphasis on ports for the reception of ships on cruise voyages. The paper analyzes data on the availability of ships and passengers in the busiest ports for the reception of ships on cruise journeys in the Mediterranean. Tendencies in the passenger traffic from 2012 to 2017 were investigated for the five most important cruise ports in the Mediterranean: Barcelona, Civitavecchia, the Balearic Islands, Venice, and Marseille. Based on the mental and verbal findings of the aforementioned, the selected model variables are quantified on the index scale from zero to 100, the model of Mediterranean cruising. In conclusion of the paper, a model based on matrix account is formed, focusing on the direct growth rates for the period up to 2022. At the same time, the presentation of direct and indirect rates can be monitored, both of the changes in the intensity of the variables, and of their structural relationships.

Keywords - Mediterranean, Cruising, Development Model, Matrix Account

I. INTRODUCTION

The Mediterranean is one of the oldest historical focuses and since the very beginning of civilization has always had a significant role. Due to its historical, natural, cultural and civilization aspects, the Mediterranean is one of the most interesting tourist destinations in the world. The research framework of this scientific paper is the cruising tourism in the Mediterranean Sea, with a special emphasis on ports for the accommodation of cruise ships and the development of the Mediterranean cruising model. The purpose of this research is to provide a wider insight into the cruise tourism in the Mediterranean region for the period from 2012 to 2022.
Based on the analysis of the existing literature and statistical data, the aim of the study is to investigate the total movements of the number of passengers in the leading Mediterranean cruise ports. Based on this research, statistics will be presented in detail for the period from 2012 to 2017, as well as the total number of passengers traveling to the most important Mediterranean cruise ports: Barcelona, Civitavecchia, the Balearic Islands, Venice, and Marseille.
The following scientific methods will be used: the method of analysis and synthesis, inductive and deductive methods, abstraction and concretization methods, generalization and specialization methods, comparative method, and evidence and objection method. The scientific paper will quantify the chosen Mediterranean cruising model variables on an index scale from 0 to 100, for the year 2017. The most important variables of this model are: Barcelona, Civitavecchia, the Balearic Islands, Venice, and Marseille.

II. CRUISE PORTS IN THE MEDITERRANEAN

Cruise ports are a segment of cruising, and their purpose is being a connection between the ship and the port, a location where passengers embark on a cruise ship, and where a cruise ship activities are completed. Cruise ports can be divided into two basic types: the home port, and the port of call. [1] The home ports and call ports are chosen by the cruise companies, and to be chosen they have to meet a number of requirements.

The five major home ports in the Mediterranean are: Barcelona, Civitavecchia, the Balearic Islands, Venice, and Marseille. [3] Ports of call are the ports in which ships make stops on cruises. These are determined by tourist destination offer and connections with attractive cities in the immediate vicinity. [9] The European Parliament (EP) has adopted a legislative resolution on the Proposal for a Directive of the EP and the European Council on port reception facilities for ship waste.

This will significantly reduce the resistance of the domicile population to the increasing number of cruise passengers and marine pollution that are often publicly mentioned with regard to cruise tourism. [7]

2.1. Barcelona

Barcelona is a sea port and the capital of the autonomous province of Catalonia, located within Spain. It is located in the southeastern part of the country, 150 km south of the border with France. Barcelona is a commercial center and the main sea port. [11] The port of Barcelona has a modern infrastructure, seven terminals, and is well connected to the city and the airport.

It also has the status of a cruise center-destination because it is attractive for tourists, with well-connected traffic and developed infrastructure. [9] The Carnival Corporation and the Carnival Group in the past years invested 100 million Euros in the construction of a terminal and improvement of the facilities. [4]

Year	Number of passengers (embarked/ disembarked)	Number of passengers in transit	Total number of passengers (embarked/ disembarked + transit)	Port calls
2012	1,265,613	1,084,670	2,350,283	841
2013	1,499,534	1,157,710	2,657,244	881
2014	1,438,383	970,251	2,408,634	774
2015	1,506,286	1,092,966	2,599,232	835
2016	1,222,487	1,141,805	2,364,292	767
2017	1,363,754	1,176,548	2,540,302	749

Table 1: Total number of passenger movements and port calls in Barcelona in 2012-2017 period
Source: http://www.medcruise.com/port/66/barcelona (05 January, 2018.)

Barcelona recorded growth in 2013 and 2015 (Table 1). In 2014, the number of passengers decreased by 9.4%, compared to 2013. Barcelona, as the most popular cruise port in the Mediterranean, grew by 7.9% in 2015 with regard to the previous year. In 2016, there was a recurring drop in the passenger traffic, but in 2017 it showed an increase in the passenger numbers of 7.4%, and a turnover of more than 2.5 million passengers was again reached as in 2011 and 2013.
From Table 1, it follows that for:

- 2012, quantification of the Barcelona variable: 1,265,613 : 2,350,283 = 0.54 on the index scale from zero to 100.
- 2017, quantification of the Barcelona variable: 1,363,754 : 2,540,302 = 0.58 on the index scale from zero to 100.

2.2. Civitavecchia

From MedCruise (2016), it is evident that the port of Civitavecchia is located in Italy, on the coast of the Tyrrhenian Sea, and is the second busiest cruise port in the Mediterranean. It is 80 km away from Rome and the Vatican, the most important tourist destinations in Italy. Civitavecchia is a home port in the Mediterranean, has 6 passenger terminals and 28 quays. Over the past five years, Civitavecchia has recorded more than two million passengers a year. (Table 2).

Year	Number of passengers (embarked/ disembarked)	Number of passengers in transit	Total number of passengers (embarked/ disembarked + transit)	Port calls
2012	643,772	1,300,951	1,944,723	900
2013	972,85	1,604,588	2,577,438	1,002
2014	920,612	1,472,958	2,393,570	1,04
2015	989,998	1,548,261	2,538,259	959
2016	730,938	1,409,101	2,140,039	833
2017	868,143	1,403,509	2,271,652	794

Table 2: Total number of cruise passenger movements and port calls at Civitavecchia in 2012-2017 period
Source:http://www.medcruise.com/sites/default/files/cruise_activities_in_medcruise_ports_statistics_final_0.pdf (02 January, 2018)

In the 5-year period, passenger movement has increased by 16.8%, i.e. from 1.94 million to 2.27 million passengers per year. These results show an increasing interest of passengers and shipping companies for the port of Civitavecchia, which in 2017 was the only port with more than 2 million passengers besides Barcelona. The reason for this is a good geographic position, proximity to a large number of cultural sights, a satisfactory infrastructure, and an excellent connection to the rest of Europe and the world. In 2015, the highest turnover of 2.53 million travelers was recorded, which is also the largest number of passengers in the history of the port of Civitavecchia.
From Table 2, it follows that for:

- 2012, quantification of the Civitavecchia variable: 643,772 : 1,944,723 = 0.33 on the index scale from zero to 100.
- 2017, quantification of the Civitavecchia variable: 868,143 : 2,271,652 = 0.38 on the index scale from zero to 100.

2.3. Balearic Islands

From the data for Ports de Balears (2017), the Balearic Islands, they are the third busiest port-destination for cruise tourism in the Mediterranean. In the Balearic Islands, there are five ports operated by the Balearic Port Authority. All the five ports are infrastructure-equipped and able to receive the world's largest cruise ships. These are: Palma, Alcudia, Mahon, Ibiza, and La Savina.
The increase in the number of passengers between 2012 and 2017 is by 29%, which suggests that every following year the Balearic Islands were becoming more attractive as a cruise destination. The lowest total number of passengers was recorded in 2014. There is a more significant decrease in the number of passengers in transit than in the number of disembarked/embarked passengers.

Year	Number of passengers (embarked/ disembarked)	Number of passengers in transit	Total number of passengers (embarked/ disembarked + transit)	Port calls
2012	571,209	975,53	1,546,739	723
2013	587,048	1,021,656	1,608,704	613
2014	466,385	875,125	1,341,510	632
2015	490,631	1,050,745	1,541,376	699
2016	606,549	980,515	1,587,064	678
2017	553,928	1,442,605	1,996,533	788

Table 3: Total number of passenger movements and port calls in the Balearic in 2012-2017 period
Source: http://www.portsdebalears.com/ (02 January, 2018)

Although a smaller number of ships was seen in 2014 (632 ships), the lowest number of ship calls was recorded in 2013 (613 ships). A much smaller number of ships compared to the previous and the

following years did not result in a smaller number of passengers; on the contrary, the number of passengers increased. Also, the difference in the number of passengers is visible between 2016 and 2017. The number of passengers increased by 26% in 2017, and the number of port calls by 16% (Table 3).
From Table 3, it follows that for:

- 2012, quantification of the Balearic Islands variable: 571,209 : 1,546,739 = 0.36 on an index scale from zero to 100.
- 2017, quantification of the Balearic Islands variable: 553,928 : 1,996,533 = 0.28 on the index scale from zero to 100.

2.4. Venice

The port of Venice, according to https://hr.wikipedia.org/wiki/Venice (10.11.2017.), as well as the city itself, is situated on a group of 118 islets, in a vast wetland lagoon in the northern Adriatic Sea. [5] The city of Venice is an important tourist destination and, after Rome, the most important tourist destination in Italy. Today, Venice is the most important home port in the Mediterranean, and the data show that annually the port of Venice is used by more than 1.4 million passengers for the purpose of embarkation / disembarkation. [1] The home port status has been achieved due to its geographic position. [3] The passenger port of Venice has 9 terminals. [12] The total number of passengers, compared to the passengers in transit, is dominated by the passengers embarking / disembarking (Table 4). In the period from 2012 to 2016, the port of Venice recorded a steady increase in the total number of passengers, while in 2017 a decrease of 8.73% was recorded with regard to 2016.

Year	Number of passengers (embarked/ disembarked)	Number of passengers in transit	Total number of passengers (embarked/ disembarked + transit)	Port calls
2012	1,312,895	304,116	1,617,011	629
2013	1,448,622	337,794	1,786,416	654
2014	1,444,100	331,844	1,775,944	661
2015	1,512,596	303,227	1,815,823	548
2016	1,509,097	224,742	1,733,839	488
2017	1,364,044	218,437	1,582,481	521

Table 4: Total number of passenger movements and port calls in the port of Venice in 2012-2017 period
Source: http://www.vtp.it/en/company/ (02 January, 2018)

Also, in 2017 the total number of passengers was lower by 2.14% than in 2012. [8] The reason for this is a smaller number of passengers in transit, while the number of passengers embarking / disembarking was higher by 4% compared to 2012. The number of ships calling at the port of Venice in 2017 was lower than in the first three years (Table 4). Namely, in the year 2017 at the port of Venice 17% fewer port calls were recorded than in 2012. The largest numbers of ship calls as well as the passengers in transit were recorded in 2014 and 2015.

From Table 4, it follows that for:

- 2012, quantification of the Venice variable: 1,312,895 : 1,617,011 = 0.81 on the index scale from zero to 100.
- 2017, quantification of Venice variable: 1,364,044: 1,582,481 = 0.86 on an index scale from zero to 100.

2.5. Marseille

It is apparent that Marseille is the second largest city in France and the largest French port; at http://www.enciklopedija.hr/natuknica.aspx?id=39102 (18 November, 2017). Geographically, it is located in the south of France, on the coast of the Gulf of Lion. It is one of the busiest cargo and passenger ports in Europe. [6] Today's port extends for over 50 km. [11] Marseille recorded more than 0.5 million passengers as a home port in 2017. [3] In the five-year period, the port of Marseille recorded a continuous increase in the total number of passengers (Table 5). [2] It also recorded the most dynamic growth in the number of passengers and port calls of all the ports in the Mediterranean. The number of passengers in 2017 is higher by 107% than in 2012. The only drop in the number of passengers in transit was recorded in 2016, but the total number of passengers was growing due to the number of passengers embarked / disembarked. Although Marseille is one of the 10 most important home ports in the Mediterranean, it is still more used by passengers in transit than for embarkation / disembarkation. Regarding the number of ship calls at the port of Marseille in 2014, there were 20.1% fewer ship calls than in 2013. Also, there was a decrease of 11% in 2017, compared with 2016. Regarding the total number of passengers, the port of Marseille ranks 5th in the Mediterranean. New investments in infrastructure tend to keep the trend of the increasing numbers of passengers and ship calls.

Year	Number of passengers (embarked/ disembarked)	Number of passengers in transit	Total number of passengers (embarked/ disembarked + transit)	Port calls
2012	268,451	431,649	700,1	335
2013	264,703	545,787	810,49	420
2014	313,322	576,698	890,02	354
2015	381,318	806,713	1,188,031	447
2016	506,412	804,872	1,311,284	497
2017	503,325	947,734	1,451,059	442

Table 5: Total number of passenger movements and port calls at the port of Marseille in the period 2012-2017
Source: http://issuu.com/medcruise.association/docs/medcruise_yearbook_16-17/53?e=15848004/39229756 (05 January, 2018)

From Table 5, it follows that for:

- 2012, quantification of the Marseille variable: 268,451: 700,100 = 0.38 on the index scale from 0 to 100.
- 2017, quantification of the Marseille variable: 503,325: 1,451,059 = 0.35 on the index scale from 0 to 100.

III. FORMING THE MODEL OF THE MEDITERRANEAN CRUISING FROM 2012 TO 2022

Evaluation of the model variables will take into account the synergy effect of the following scientific aspects: the theoretical aspects of individual model's variables, value and meaning of the model's variables in the analyzed period, expected values of the variables in 2018 and 2022.

Zero represents an inherent value. The value of 100 is the one that all the cruise ports in the world strive for, i.e. for all the cruise ships calling at the port to use the port as home port, for embarkation and disembarkation.

Variables of the Mediterranean 2012-2022 cruise model		Inputs y_{it}			Change
		2012	2018	2024	2024/12
1.	Barcelona	54	58	61	7
2.	Civitavecchia	33	38	40	7
3.	Balearic Islands	36	28	22	-14
4.	Venice	81	86	89	8
5.	Marseille	38	35	33	-5

Table 6: Values of the Mediterranean 2012 to 2022 cruising model points
Source: the Authors

Model's vector: $\Delta Y_{2024} \begin{bmatrix} 7 \\ 7 \\ -14 \\ 8 \\ -5 \end{bmatrix}$

Model's reciprocal values vector: $\frac{1}{Y_{2024}} = \left(\frac{1}{61}, \frac{1}{40}, \frac{1}{22}, \frac{1}{89}, \frac{1}{33}\right)$

Matrix account:

$$R_{2020} \begin{bmatrix} \frac{7}{61} & \frac{7}{40} & \frac{7}{22} & \frac{7}{89} & \frac{7}{33} \\ \frac{7}{61} & \frac{7}{40} & \frac{7}{22} & \frac{7}{89} & \frac{7}{33} \\ \frac{-14}{61} & \frac{-14}{40} & \frac{-14}{22} & \frac{-14}{89} & \frac{-14}{33} \\ \frac{8}{61} & \frac{8}{40} & \frac{8}{22} & \frac{8}{89} & \frac{8}{33} \\ \frac{-5}{61} & \frac{-5}{40} & \frac{-5}{22} & \frac{-5}{89} & \frac{-5}{33} \end{bmatrix};$$

$$; \quad R_{2020} \begin{bmatrix} 0{,}110 & 0{,}175 & 0{,}319 & 0{,}079 & 0{,}212 \\ 0{,}110 & 0{,}175 & 0{,}319 & 0{,}079 & 0{,}212 \\ -0{,}230 & -0{,}350 & -0{,}636 & -0{,}157 & -0{,}424 \\ 0{,}131 & 0{,}020 & 0{,}364 & 0{,}090 & 0{,}242 \\ -0{,}082 & -0{,}125 & -0{,}227 & -0{,}056 & -0{,}152 \end{bmatrix}$$

From the matrix account, Table 7 follows.

Model variables	1.	2.	3.	4.	5.
1.	11	17,5	31,9	7,9	21,2
2.	11	11	31,9	7,9	21,2
3.	-23	-35	-63,6	-15,7	-42,4
4.	13,1	2	36,4	9	24,2
5.	-8,2	-12,5	-22,7	-5,6	-15,2

Table 7: Number of points of direct and indirect rates of the Mediterranean 2012-2022 cruising model, on index scale from 0 to 100
Source: the Authors

From Table 7, it can be seen that the point values of selected variables, direct rates of the Mediterranean cruise model from 2012 to 2022, lie diagonally and range from + 11.0 to -63.6.

The point values of the Mediterranean cruise model indirect rates from 2012 to 2022, on an index scale from zero to 100, due to space constraints will not be commented on in this paper.

There are apparent differences in the values of the points in the last column (Change) in Table 6 and the values of points of the Mediterranean cruise model direct rates from 2012 to 2022, shown diagonally in Table 7.

The differences were due to the mutual influence (competition) of the largest cruise ports in the Mediterranean for the selected time period in the model.

IV. CONCLUSIONS

This paper analyzes the data for the five most visited cruise ports in the Mediterranean for the period from 2012 to 2017: Barcelona, Civitavecchia, Balearic Islands, Venice, and Marseille. All of these ports were used as home ports and ports of call. The total traffic in the main home ports in the Mediterranean in 2017 was 6.4% lower than in 2016. Comparing the year 2012 to 2017, there is a growing trend of home ports in the Mediterranean. In the period of five years, the total growth of home port traffic of 7.4% was recorded.

Due to spatial unevenness, the traffic of passengers and port calls are concentrated in only a few countries. According to the data from 2015, six countries, among which Croatia ranks 5th, each had more than one million passengers, i.e. almost 9/10 of the total passenger traffic (88.07%), and five countries, each with more than 1,000 calls, cover more than 3/4 (75.85%) of the total calls. One third of the countries show a symbolic representation (less than 1%).

Barcelona is the most prominent and favorite destination of all the ships on the Mediterranean cruises. It is visited by more than 2.4 million cruise ship passengers annually. It sets an example to other

Mediterranean ports due to port capacities and built infrastructure as well as port connections with other modes of transportation.

In the year 2015, Venice was the most important home port in the Mediterranean, and the data show that annually the port of Venice is used by more than 1.4 million passengers for the purposes of embarkation / disembarkation. This element was the basis of this paper for the quantification of the variables. Based on the mental-verbal knowledge of the aforementioned, for the first time the quantification of the selected model variables on the index scale from zero to 100 has been carried out, i.e. of the information model of the Mediterranean cruising for 2017 has been built.

In this paper, for the first time the point values of the selected variables, direct rates of the Mediterranean cruising model from 2012 to 2022, are obtained using the matrix account.

The highest positive value of the direct rates of the Mediterranean cruising model from 2012 to 2022 will be shown by Barcelona and Civitavecchia, i.e. 11.0, while the lowest positive rate of point value will be shown by Venice, i.e. 9.0.

The highest negative value of the direct rates of the Mediterranean cruising model from 2012 to 2022 will be shown by Europe, i.e. 16.7, while the lowest negative rate of point value will be shown by the Balearic Islands, i.e. 63.6.

From this paper, it follows that by 2022, the Balearic Islands and Marseille will record a decrease in the point value. At the same time, there will be a constant increase in the value of direct rate points for the Mediterranean cruising ports of Barcelona, Civitavecchia, and Venice.

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