Evolution of Tourism in Romania

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Abstract: *The pandemic took humanity unaware and the economy has been affected so that certain sectors have limited or even closed down their activity in 2020. This paper analyzes the evolution of tourism in Romania in recent years. Achieving this goal is based on the forecast of overnight staying in accommodation structures on tourist destinations using the Markov chains as a method of calculation.*
Keywords: *Tourism, overnight staying, Markov chains, pandemic.*

1. Introduction

Tourism is one of the most important industries in the world [3]. The COVID-19 pandemic had a strong negative impact both economically and socially, the whole humanity had to face its effects. Forecasts indicate a loss of over $4 trillion in global GDP by 2021 [6]. This loss represents a major shock for developed economies, but especially for developing ones, which will feel the loss more strongly. Travel restrictions and other measures adopted in 2020 have led to 1.4 billion overnight stays in tourist accommodation in the European Union, decreasing by 52% from 2019 [7].

At the level of Romania, tourism is one of the industries with development potential, an industry that successfully contributes to the gross domestic product. In this paper we analyzed only one specific indicator of tourism, namely overnight stays in tourist accommodation structures on tourist destinations. The data for this indicator are provided by the National Institute of Statistics [8]. This indicator registered an increasing trend in the last 10 years, reaching a value of 30.086.091 overnight stays in 2019, and in the following year to reach 14.579.140 overnight stays. The decline is enormous and demonstrates once again the devastating effect the pandemic has had on

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this industry. In absolute terms the reduction is 15.506.951 overnight stays, and in relative terms it is 51.54%.

2. Research Methodology

Our quantitative research on overnight stays in tourist accommodation structures involved predicting the share of overnight stays in tourist accommodation structures by tourist destinations for the current year. The realization of this desideratum was based on the calculation method of Markov chains.

An important branch of probability theory, stochastic processes represent a parameterized collection of random variables $\{X_t\}_{t\in T}$ defined on the completely additive probability field (Ω, K, P) with values in R^n, where the set of parameters T is considered to be the whole straight line $T = (-\infty,\infty)$, either $T = (0, \infty)$ or $T = [0, \infty)$, or a finite segment [1].

If the set of parameters T = N, instead of process the term chain is used. Markov processes are an important category of stochastic processes, with applications in a multitude of fields, the study of these processes being initiated by the Russian mathematician A.A. Markov (1856-1922).

In the theory of Markov processes with continuous parameter, the following definition of the Markov process appears: A stochastic process X(t) on [0, T] is called a Markov process if for any sequence $0 \le t_0 < t_1 < \dots ,< t_n \le T$ with n = 1, 2, 3,… and for any sequence of states $x_0, x_1,\dots,x_n$ we have: $P(X(t_n) = x_n \mid X(t_{n-1}) = x_{n-1}, X(t_{n-2}) = x_{n-2}, \dots, X(t_0) = x_0) = P(X(t_n) = x_n \mid X(t_{n-1}) = x_{n-1})$.

This relation, called the Markov property, has the following interpretation formulated by M. Iosifescu in [4]: "The whole past of the system evolution is summarized in the existing state at the last moment when it was observed".

In other words, the process "forgets" the past provided that t_{n-1} to be seen as present.

In the theory of Markov processes with discrete parameter is considered Markov chain of random variables, the string of random variables $(f_n)_{n\in N}$ that meets the conditions: $(\forall)\ 0\le t_1\le\dots\le t_n$, $n\ge 2$ and $(\forall)\ i_1,\dots,i_n\in I$, with I = the set of process states, we have:

$$P(f_{t_n}(\xi) = i_n \mid f_{t_{n-1}}(\xi) = i_{n-1},\dots, f_{t_1}(\xi) = i_1) = P(f_{t_n}(\xi) = i_n \mid f_{t_{n-1}}(\xi) = i_{n-1}) \quad (1)$$

whenever the left part is defined.

Equality (1) is called Markov's property and is equivalent to equality:

$$P(f_n(\xi)=i_n \mid f_{n-1}(\xi)=i_{n-1},\dots, f_1(\xi)=i_1)=P(f_n(\xi)=i_n \mid f_{n-1}(\xi)=i_{n-1}),(\forall)n\in N^*$$

The probabilities $P(f_t(\xi)=i_t \mid f_{t-1}(\xi)=i_{t-1})$ are called transition probabilities for the Markov chain of random variables and the matrix that has as elements the transition probabilities is called transition matrix [2].

3. Results and discussions

Starting from the theoretical part of the Markov chains, their practical application to the values recorded by overnight stays in tourist accommodation structures by tourist destinations between 2017 and 2020, allows us to forecast the share of overnight stays by tourist destinations in the current year.

Table 1. Overnight stays in tourist accommodation structures by tourist destinations

Tourist Destinations	Years (Overnight stays in tourist accommodation structures)			
	2017	2018	2019	2020
D1.Balneary resorts	4.204.898	4.405.740	4.805.188	2.208.832
D2.Resorts in the coastal area, excluding the city of Constanta	4.316.379	4.553.407	4.657.955	3.267.464
D3.Resorts in the mountain area	4.178.123	4.544.949	4.810.148	2.613.246
D4.Danube Delta area, including the city of Tulcea	210.334	371.797	380.375	299.766
D5.Bucharest and the county seat cities, exclusively Tulcea	10.341.681	10.712.186	11.055.160	4.119.604
D6.Other localities and tourist routes	3.841.108	4.056.663	4.377.265	2.070.228
Total	27.092.523	28.644.742	30.086.091	14.579.140

Source : http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table (5)

The first stage we go through is to determine the share of overnight stays in tourist accommodation structures by tourist destinations (%).

Table 2. Share of overnight stays in tourist accommodation structures by tourist destinations

Tourist Destinations	Years (%)			
	2017	2018	2019	2020
D1.Balneary resorts	15,521	15,381	15,971	15,151
D2.Resorts in the coastal area, excluding the city of Constanta	15,932	15,896	15,482	22,412
D3.Resorts in the mountain area	15,422	15,867	15,988	17,925
D4.Danube Delta area, including the city of Tulcea	0,776	1,298	1,264	2,056
D5.Bucharest and the county seat cities, exclusively Tulcea	38,172	37,397	36,745	28,257
D6.Other localities and tourist routes	14,178	14,162	14,549	14,200
Total	100	100	100	100

Source : Made by the authors

Next, for each pair of consecutive time periods (t-1/t) = (2017/2018, 2018/2019, 2019/2020), we calculate the partial transition matrices, type 6x6, denoted $G^{t-1/t} = (g_{ij}^{t-1/t})_{i,j=\overline{1,6}}$.

We denote $A = (a_{ij})_{\substack{i=\overline{1,4} \\ j=\overline{1,6}}}$ the matrix whose elements are the values in (Table 2).

The elements of the matrix $G^{t-1/t} = (g_{ij}^{t-1/t})_{i,j=\overline{1,6}}$ are determined as follows:

- for $i = j$: $(g_{ij}^{t-1/t})_{i,j=\overline{1,6}} = min(a_{i1}^{t-1}, a_{i2}^{t})$

The differences $\left(a_{i1}^{t-1} - g_{ii}^{t-1/t}\right), i = \overline{1,6}$ are called negative deviations (ND), and

$\left(a_{i2}^{t-1} - g_{ii}^{t-1/t}\right), i = \overline{1,6}$ are called positive deviations (PD).

- For $i \neq j$:

$$(g_{ij}^{t-1/t})_{i,j=\overline{1,6}} = (a_{i1}^{t-1} - g_{ii}^{t-1/t}) \cdot (a_{i2}^{t-1} - g_{ii}^{t-1/t}) / \sum \text{positive deviations}$$

Table 3. Partial matrix of transition from 2017 to 2018

	D1	D2	D3	D4	D5	D6	2017	ND
D1.	15,381	0,000	0,064	0,075	0,000	0,000	15,521	0,140
D2.	0,000	15,896	0,017	0,019	0,000	0,000	15,932	0,036
D3.	0,000	0,000	15,422	0,000	0,000	0,000	15,422	
D4.	0,000	0,000	0,000	0,776	0,000	0,000	0,776	
D5.	0,000	0,000	0,357	0,418	37,397	0,000	38,172	0,775
D6.	0,000	0,000	0,007	0,009	0,000	14,162	14,178	0,016
2018	15,381	15,896	15,867	1,298	37,397	14,162	100,000	
PD			0,445	0,522				0,967

Source : Made by the authors

$\Rightarrow G^{2017/2018}$ is the matrix whose elements are the values in (Table 3).

Therefore, in 2018 compared to 2017, the tourist destinations which lost percentages are D1 (- 0,140 percent), D2 (- 0,036 percent), D5 (- 0,775 percent) and D6 (- 0,016 percent).

The other destinations gained percentages, with D3 (Resorts in the mountain area) in first place with 0,445 percent obtained by transfer from D1 (0,064 percent), D2 (0,017 percent), D5 (0,357 percent) and D6 (0,007 percent) followed by D4 (Danube Delta area, including the city of Tulcea) with 0,522 percent obtained by transfer from D1 (0,075 percent), D2 (0,019 percent), D5 (0,418 percent) and D6 (0,009 percent).

The other transition matrices are:

- $G^{2018/2019}$ whose elements are the values in (Table 4).

Table 4. Partial matrix of transition from 2018 to 2019

	D1	D2	D3	D4	D5	D6	2018	ND
D1.	15,381	0,000	0,000	0,000	0,000	0,000	15,381	
D2.	0,223	15,482	0,046	0,000	0,000	0,146	15,896	0,414
D3.	0,000	0,000	15,867	0,000	0,000	0,000	15,867	
D4.	0,018	0,000	0,004	1,264	0,000	0,012	1,298	0,034
D5.	0,350	0,000	0,072	0,000	36,745	0,229	37,397	0,652
D6.	0,000	0,000	0,000	0,000	0,000	14,162	14,162	
2019	15,971	15,482	15,988	1,264	36,745	14,549	100,000	
PD	0,591		0,121			0,387		1,099

Source : Made by the authors

This result means that in 2019 compared to 2018 most percentages were earned by D1 (Balneary resorts by 0,591 percent) obtained by transfer from D2, D4 and D5. On the second place in the ranking of earned percentages is D6 (Other localities and tourist routes with 0,387 percent) followed by D3 (Resorts in the mountain area with 0,121 percent).

Most percentages were lost by D5 (Bucharest and the county seat cities, excluding Tulcea - 0,652) they were transferred to tourist destinations D1 (0,350 percent), D6 (0,229 percent) and D3 (0,072 percent). Destination D2 (Resorts in the coastal area, excluding the city of Constanța) continued to lose percentages reaching 0,414 percent lost, the largest transfer being to D1.

- $G^{2019/2020}$ whose elements are the values in (Table 5).

Table 5. Partial matrix of transition from 2019 to 2020

	D1	D2	D3	D4	D5	D6	2019	ND
D1.	15,151	0,589	0,165	0,067	0,000	0,000	15,971	0,821
D2.	0,000	15,482	0,000	0,000	0,000	0,000	15,482	
D3.	0,000	0,000	15,988	0,000	0,000	0,000	15,988	
D4.	0,000	0,000	0,000	1,264	0,000	0,000	1,264	
D5.	0,000	6,090	1,702	0,696	28,257	0,000	36,745	8,488
D6.	0,000	0,251	0,070	0,029	0,000	14,200	14,549	0,349
2020	15,151	22,412	17,925	2,056	28,257	14,200	100,000	
PD		6,930	1,937	0,792				9,658

Source : Made by the authors

Again in 2020 the biggest loss was registered by the destination D5 (Bucharest and the county seat cities, excluding Tulcea - 8,488), this transferring the most percent (6,090 percent) to D2 (Resorts in the coastal area, excluding the city of Constanța).

Compared to the previous year, D1 (Balneary resorts) recorded a loss of 0,821 percent, these being transferred for the most part (0,589 percent) also to D2.

Most percentages were won by D2 (Resorts in the coastal area, excluding the city of Constanța) (6,930 percent), followed by D3 (Resorts in the mountain area by 1,937 percent) and D4 (Danube Delta area, including the city of Tulcea) by 0,792 percent.

The total transition matrix for the period 2017-2020 is the matrix $G^{2017-2020}$ whose elements are the values in (Table 6).

Table 6. Total matrix of transition for the period 2017 - 2020

	D1	D2	D3	D4	D5	D6	Total
D1.	45,912	0,589	0,229	0,143	0,000	0,000	46,873
D2.	0,223	46,860	0,062	0,019	0,000	0,146	47,310
D3.	0,000	0,000	47,276	0,000	0,000	0,000	47,276
D4.	0,018	0,000	0,004	3,305	0,000	0,012	3,339
D5.	0,350	6,090	2,131	1,114	102,399	0,229	112,313
D6.	0,000	0,251	0,077	0,037	0,000	42,524	42,889
Total	46,503	53,790	49,779	4,618	102,399	42,911	300,000

Source : Made by the authors

Using the matrix $G^{2017-2020}$ we calculate the matrix of transition probabilities that we denote with $P^{2017-2020} = (gp_{ij}^{2017-2020})_{i,j=\overline{1,6}}$, whose elements are the values in (Table 7).

Table 7. Matrix of transition probabilities

	D1	D2	D3	D4	D5	D6
D1.	0,980	0,013	0,005	0,003	0,000	0,000
D2.	0,005	0,990	0,001	0,000	0,000	0,003
D3.	0,000	0,000	1,000	0,000	0,000	0,000
D4.	0,005	0,000	0,001	0,990	0,000	0,004
D5.	0,003	0,054	0,019	0,010	0,912	0,002
D6.	0,000	0,006	0,002	0,001	0,000	0,991

Source : Made by the authors

We calculate the structure forecast for 2021 as a product between the transpose of the matrix $GP^{2017-2020}$ and the vector that represents the share of tourists by tourist destinations in 2020. We obtain:

Table 8. Expected structure of overnight stays in tourist accommodation structures by tourist destinations for 2021

Tourist destinations	Years (%) 2021
D1.Balneary resorts	15,045
D2.Resorts in the coastal area, excluding the city of Constanta	24,004
D3.Resorts in the mountain area	18,592
D4.Danube Delta area, including the city of Tulcea	2,383

D5.Bucharest and the county seat cities, exclusively Tulcea	25,762
D6.Other localities and tourist routes	14,213

Source : Made by the authors

This result means that in 2021 an increase in the number of overnight stays for tourist destinations in categories D2, D3, D4 and D6 is anticipated. The highest increase in the number of overnight stays in 2021 compared to 2020 will be recorded by D2 (+1,592 percent), followed by D3 (+0,667 percent). The largest decrease in the number of overnight stays will be registered by Bucharest and the county seat cities, exclusively Tulcea (-2.494 percent) followed by the balneary resorts (-0.106 percent).

6. Conclusions

The COVID-19 pandemic has hit tourism not only in Romania, but also worldwide. The decreases registered in tourism in our country in 2020 are close to the values registered in 2010. Obviously, one of the industries strongly affected by the pandemic is tourism. The relaunch of tourism will become an important factor of economic growth in Romania.

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