Çağ Üniversitesi Sosyal Bilimler Dergisi
Cilt 18, Sayı 2, ss.48-63, 2021
ISSN:1304-8392
https://dergipark.org.tr/cagsbd

Geliş Tarihi / Received: 10.07.2021
Kabul Tarihi / Accepted: 10.09.2021
Araştırma Makalesi / Research Article

Determining Hotel Preferences and the Reasons for These Preferences Using Markov Analysis[1]

Havva KOCABAŞA[2], Fatma Feyza GÜNDÜZ[3]

ABSTRACT: The importance of hotels in tourism regions has developed with the increasing competition in the tourism sector. Knowing the preference rates and the factors that affect the preferences will provide a considerable advantage over their competitors for hotels. For this purpose, a study has been conducted on the preference probabilities and the factors affecting preferences of 4 and 5-star hotels with beaches in Mersin province. The data of the study were obtained from questionnaires applied to 410 people. For the analysis of the preference probabilities, the transition probability matrix, which forms the basis of the Markov chain method, was created and the long-term equilibrium vectors were calculated. As a result of the analysis, it was determined that the three most preferred hotels in the long term are Ulu Resort Hotel (5*), Liparis Resort Hotel & Spa (5*), and Wonasis Resort & Aqua Hotel (5*). The Hidden Markov model was used to determine the factors affecting the preferences of the hotels included in the study. Location, room and facility cleaning, availability of facilities for families with children, and the effectiveness of recommendations or advertisement have been identified as the most important factors affecting hotel preferences.

Keywords: Markov Chains, Hidden Markov Model, Transition Probabilities, Hotel Preferences
JEL Kodu: C01, C40, M10

Markov Analizi ile Otel Tercihlerinin ve Tercih Nedenlerinin Belirlenmesi

ÖZ: Turizm sektöründeki rekabetin her geçen gün artmasıyla birlikte turizm bölgelerinde yer alan otellerin önemi de artmıştır. Otellerin tercih edilme oranlarını ve tercih edilme nedenlerini bilmeleri rakiplerine karşı büyük bir avantaj sağlayacaktır. Bu amaçla Mersin ilinde yer alan 4 ve 5 yıldızlı, plajı bulunan otellerin tercih edilme olasılıklarına ve tercih nedenlerine yönelik bir çalışma yapılmıştır. Çalışmanın verileri 410 kişiye uygulanan anketlerden elde edilmiştir. Tercih edilme olasılıklarının analizi için Markov zinciri yönteminin temelini oluşturan geçiş olasılıkları matrisi oluşturulmuş ve uzun dönem denge vektörleri hesaplanmıştır. Yapılan analiz sonucunda uzun dönemde en çok tercih edilecek üç otelin sırasıyla Ulu Resort Hotel (5*), Liparis Resort Hotel& Spa (5*) ve Wonasis Resort& Aqua Hotel (5*) olduğu belirlenmiştir. Çalışmaya dâhil edilen otellerin tercih edilme nedenlerinin belirlenmesi için Saklı Markov modeli kullanılmıştır. Konum, oda ve tesis temizliği, çocuklu ailelere yönelik imkânların bulunması ve çevredeki kişilerin tavsiyeleri veya reklamların etkili olması otel tercihlerini etkileyen en önemli faktörler olarak belirlenmiştir.

Anahtar Sözcükler: Markov Zincirleri, Saklı Markov Modeli, Geçiş Olasılıkları, Otel Tercihleri
JEL Code: C01, C40, M10

---

[1] Havva KOCABAŞA tarafından Adana Alparslan Türkeş Bilim ve Teknoloji Üniversitesi Uluslararası İşletmecilik programında tamamlanan " Markov Chains and an Application on Hotel Businesses" adlı yüksek lisans çalışmasından türetilmiştir.

[2] Department of International Trade and Finance, Business Administration, Adana Alparslan Türkeş Science and Technology University, Adana.
Email: havvakocabasa1@gmail.com ORCID: 0000-0002-0356-8078

[3] Department of International Trade and Finance, Business Administration, Adana Alparslan Türkeş Science and Technology University, Adana.
Email: ffgunduz@atu.edu.tr ORCID: 0000-0001-7603-6817

1.Introduction

Tourism, especially after the Second World War, started to develop with the intense participation of people under the name of sea tourism within the scope of the sea-sand-sun trilogy (Zengin et al., 2014: 1). Similarly, tourism activities in Turkey have developed mainly within the scope of sea tourism due to its sea, suitable climatic conditions and natural beauties (Kozak, 2012: 20).

Especially the Mediterranean and Aegean regions in Turkey have favorable conditions for sea tourism. Many tourists from the world and other parts of Turkey travel to these regions during the summer months. The density that occurs in these regions during the summer months increases the importance of enterprises in the tourism sector. Tourism businesses are divided into four main sections: accommodation, food and beverage businesses, travel-transportation businesses, and other tourism businesses (Dinçer and Dinçer, 1989: 45). Accommodation establishments are the basis of the tourism sector and are commercial establishments that directly serve tourists (Demirtaş, 2010: 13). Accommodation establishments are businesses organized according to certain standards and rules that meet the needs of tourists such as accommodation, eating-drinking and entertainment during their travels.

Hotels are businesses that provide the accommodation needs of the customers and also include auxiliary units for their eating, sports and entertainment needs (Karaman et al., 2016: 13). In its present meaning, the first hotel was opened in London, England, and later hotels continued to be opened in various countries of America and Europe (Kozak, 2002 as cited in Kaya, 2019: 5). With the emergence of the hotel chain concept in 1908, hotels with the same name spread rapidly all over the world in the 20th century (Dinçer and Dinçer, 1989:46).

The disappearance of economic borders, changes in market conditions, and developments in the fields of internet and information technologies lead to an increase in competition in accommodation businesses as in every business. Especially with the developments in the field of internet and information technologies, tourists can easily access the hotels in the places they will travel, the features of those hotels, and the comments of the tourists who have stayed in those hotels before. With the increase in their options, tourists desire to have the new and unique and want to experience it (Kıycı et al., 2020: 615). In these conditions of increasing competition, accommodation businesses need to constantly conduct market research about consumers (tourists) and be prepared for the demands that may come (Kotler et al., 2003: 301).

In this study, the preference probabilities of 4 and 5-star hotels with beaches in Mersin, which has a coast in the Mediterranean and stands out from its historical and natural beauties, for the next period and the factors affecting these preferences were determined. The reason for choosing the 4 and 5-star hotels with private beaches in Mersin for this study is to ensure that the hotels provide better service to tourists by knowing their preference rates and reasons for the preferences, and thus contribute to the promotion of Mersin province for summer tourism.

The Markov chain method, which has many advantages in terms of future predictions, was used to determine the preference possibilities of the hotels. Markov Chains are a widely used method in the analysis of dynamic and stochastic systems and especially in examining the transitions between different states in which a system can be found (Yavuz and Karabulut, 2016: 222). The Hidden Markov model was used to determine the factors affecting the preference of hotels. Considering the reasons for preference, since the Markov Chains method is incomplete, it was deemed appropriate to use the Hidden Markov model, which examines the reasons for preference due to its internal dynamics (Can and Öz, 2009: 169).

After the introduction, a literature review is given in the second part of the article, and in the third part, the mathematical structure of Markov chains is examined. The application takes part in the fourth chapter, and in the last chapter, the results and recommendations are given in light of the findings.

2.Literature Review

It is known that future uncertainty disappears with estimating studies using Markov analysis (Kıral and Gündüz, 2020: 425). Although a considerable amount of literature has been published on the Markov Chain method in different fields, no study has been found that predicting the next hotel preferences and analyzing the factors affecting these preferences by using the Markov Chain method. Some studies on hotel preferences are summarized below.

Lewis (1985), in his study, determined the factors that affect hotel customers' choice by using regression analysis. Hotel customers were categorized as business and leisure travelers, and the factors affecting the hotel preferences of these categorized groups were compared in the study. Wong and Chi-Yung (2002) identified the factors affecting the hotel preferences of tourists who have come to Hong Kong from other countries. As a result of the findings obtained from the survey method, it was found that the most important hotel features sought by all participants are room price, star rating, location, brand, and room type, respectively. Yavaş and Babakuş (2005) examined the similarities and differences in hotel selection criteria of people traveling for business and leisure purposes in their study, and they analyzed whether the factors affecting the hotel preferences of the two groups were compatible. As a result, it has been observed that the factors affecting the hotel preferences of business and leisure travelers do not match well. Prasetyo (2009) determined the factors affecting busy people's hotel preferences. As a result of the study, it was determined that location, assurance, flexibility and tidiness are most significant factors affecting busy people's hotel choices.

In their study, Emir and Pekyaman (2010) determined what factors families with small children pay attention to when choosing a hotel for their holiday by using parametric tests (Variance Analysis, t-test, and Duncan test). As a result of the study, it was determined that the most significant factor that families with children pay attention to when choosing a hotel is security. Baruca and Civre (2012) identified different factors affecting the hotel preferences of hotel customers of different nationalities. In the study, the characteristics of hotel customers for choosing a particular hotel are divided into four groups: those who choose hotels based on their own experiences and the suggestions of others, those who choose hotels according to advertisements of hotels, those who all verify, and those who choose according to the facilities provided by the hotel. Akgündüz and Bardakoğlu (2012) aimed to determine the factors that affect the hotel preferences of people traveling for tourism purposes according to the differences in gender and educational status in their study. As a result of the study, it was determined that the most significant factor for tourists when choosing a hotel is the service quality. In addition, it was observed that people with postgraduate education attach more importance to service quality when choosing a hotel compared to people with other education levels, and female tourists attach more importance to room cleaning. Yeşiltaş et al. (2012) investigated whether the religious beliefs of local tourists are effective in choosing a hotel. They found that there is a significant relationship between people's attitudes towards religious beliefs and their choice of hotels.

Uçak (2013) aimed to determine how online advertisements, which are one of the factors that affect customers 'hotel preferences and choices. As a result of his study, he found that the advertisements made by hotels on the internet negatively affected the approach of the customers about the hotel. Liu and Re (2013) determined the factors affecting university students' hotel preferences, investigated the effect of hotel servers when a potential hotel customer chooses a hotel and identified how hotel servers affect a university student's choices. According to the results, there is a positive relationship between hotel preferences and location, online information and package are the most significant factors affecting students' hotel choices. Verma and Chandra (2016) identified the factors affecting hotel guests' intention to stay in green hotels and participate in green programs while staying in hotels in India. Energy-saving light bulbs in hotel rooms, recycling boxes in the hotel lobby and hotel rooms, and green certification of hotels were found to be positive factors affecting the hotel preferences of customers. Yıldırım et al. (2018) aimed to identify whether the lifestyles of hotel customers affect their green hotel choices as a result of a survey conducted with 218 academicians. It has been found that hotel customers' tendencies to choose green hotels depend on their lifestyle. Soulidou et al. (2018) determined the factors affecting Greek customers' hotel choices. The data of the study was obtained from an online survey. As a result of the study, cleanliness was identified as the most significant factor in the hotel selection. In his master's thesis, Kaya (2019) aimed to determine the factors affecting the hotel preferences of people who come to the city of Mardin for business purposes with the data obtained from the survey. As a result of the study, it was determined that the gender of the people who come for business purposes does not affect the hotel choices, and the variety of activities in the hotel affects the hotel choices of business people between the ages of 18 and 30. He found that business people with bachelor and postgraduate degrees benefit more from the permanent guest benefits of hotels.

In the study of Wiastuti and Lestari conducted in 2020, it was investigated the influence of the education levels and origins of the Indonesian Generation Z on hotel choices. As a result of the study, it was determined that while traveling, Indonesian Generation Z youth prefer to stay in local hotels of the places they travel rather than well-known hotels all over the world, and they prefer to make reservations through online travel companies instead of making direct reservations from hotels. While the most significant hotel features that students currently studying at high school or university seek are cleanliness and security, for generation Z youth who graduated, room comfort and cleanliness are the most important features they follow in a hotel. Origin differences were determined as a factor affecting hotel choices.

Demir et al. (2021) analyzed the factors that affect people's hotel choices during the pandemic process. The data of the study were obtained from 791 people. During the pandemic period, the features, the human density, and the service application of the facility were determined as the factors affecting people's hotel choices.

3. Material and Method

The study aims to determine the hotel preferences and underlying reasons for hotel preferences with the Markov chains method and the Hidden Markov model.

Mersin province, which has 321 km of coastline and hosts many historical and touristic places such as Chasm of Heaven and Hell, Maiden’s Castle, and Alahan Monastery, was selected for this study. When the summer tourism in Turkey is examined, it has been determined that tourists generally prefer the provinces of Antalya, Muğla and İzmir, which are located in the Mediterranean and Aegean regions. The reason for this is that the mentioned provinces are well promoted in Turkey and the world with their natural beauties and 4 and 5-star hotels with different concepts. It is seen that the province of Mersin, which was selected for this study, has natural and cultural riches like the provinces mentioned, but is not sufficiently introduced to Turkey and the world for summer tourism. The reason for choosing the 4 and 5-star hotels with private beaches in Mersin for this study is to ensure that the hotels provide better service to tourists by knowing their preference rates and reasons for the preferences, and thus contribute to the promotion of Mersin province for summer tourism.

A survey form was prepared as a result of a detailed literature review and observations. Due to the Covid 19 outbreak that coincided with the period when the survey was conducted, the survey could not be conducted face to face. Therefore, the survey was conducted with CATI (Computer Assisted Telephone Interviewing System). 410 people who live in Turkey and have come to Turkey for vacation answered the survey, and analyzes were made with the data obtained from the survey.

3.1. Markov Chains Method

From past to the present, people have tried to predict the future and turn future situations into opportunities as a result of these predictions (Dağlıoğlu and Kıral, 2018: 62). In classical probability theory, knowing the outcomes of previous situations does not affect predictions about the outcomes of future situations. In modern probability theory, knowing the outcomes of previous situations affects the prediction of future situations. In short, situations in the past affect the situations that will occur in the future. Thus, predicting future situations with past data has gained great importance (Gündüz and Kıral, 2020: 278). However, ın such a case, it will be difficult to predict the next situation because there will be too much data available. Thereupon, A. A. Markov started to work on a new type of probability process in 1907. This process is based on the fact that a situation that will occur in the future depends only on the previous situation. Today, this process is known as the Markov chain (Gringstead and Snell, 2012: 405).

For any set $t_1 < t_2 < t_3 \dots \dots < t_n$ of n time points, ıf conditional probability of X_{t_n} depends only on the value of $X_{t_{n-1}}$ from the given value $X_{t_1}, X_{t_2}, \dots, X_{t_{n-1}}$, the stochastic process X_t $(X_t, t \in T)$ is called the Markov process (Cinemre (1997), As cited in Akyurt, 2005: 20).

For the state space S, a Markov process explained by the equation (1) called the Markovian assumption (Öz, 2009:15).

$$\mathrm{P}\left(\mathrm{X}_{\mathrm{t_n}} = \mathrm{x_n} \,\middle|\, \mathrm{X}_{\mathrm{t_{n-1}}} = \mathrm{x}_{\mathrm{n-1}}, \dots, \mathrm{x}_{\mathrm{t_1}} = \mathrm{x_1}\right) = \mathrm{P}(\mathrm{X}_{\mathrm{t_n}} = \mathrm{x_n} | \mathrm{X}_{\mathrm{t_{n-1}}} = \mathrm{X}_{\mathrm{n-1}}) \tag{1}$$

All situations and all t's in the Markov Chain must satisfy the following conditional probability.

$$\mathrm{P}(\mathrm{X}_{\mathrm{t+1}} = \mathrm{j} | \mathrm{X_t} = \mathrm{i}) = \mathrm{p_{ij}}\,, \qquad \mathrm{i}, \mathrm{j} \in \mathrm{S} = \{0,1,2,\dots\} \tag{2}$$

The process starts from one state and reaches from one state to another repeatedly. This probability is independent of t. According to equation (2), the probability that the process that is in the state i at time t is in the state of j at time $t+1$ is indicated by p_{ij}. For the Markov chain, p_{ij}’s indicate the probability of transitions (Gringstead and Snell, 2012: 405). p_{ij} is the one-step transition probability. The following equations are valid for p_{ij}.

$$0 \le p_{ij} \le 1, \qquad i, j \ge 0 \tag{3}$$

$$\sum_{j=0}^{\infty} pij = 1 \qquad i = 0,1,2,\ldots \tag{4}$$

The matrix formed by p_{ij} transition probabilities, namely the transition probability matrix of Markov Chains, is denoted by $P = [p_{ij}]$ (Büyüktatlı et al, 2013: 2).

For the state space $S = \{0,1,2,\ldots\}$, the transition probability matrix of Markov Chains is written as follows.

$$P = [p_{ij}] = \begin{bmatrix} p_{00} & p_{01} & \cdots & p_{0n} \\ p_{10} & p_{11} & \cdots & p_{1n} \\ p_{20} & p_{21} & \cdots & p_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ p_{n0} & p_{n1} & \ldots & p_{nn} \end{bmatrix} \tag{5}$$

Transition probability matrix elements are calculated by the formula $p_{ij} = n_{ij}/\sum n_{ij}$ (Kıral, 2018, p. 41).

3.2. Hidden Markov Model

A Hidden Markov model is a capable statistical tool for modeling time series data (Oflaz, 2016: 11). The first fundamental theory was published in the late 1960s and early 1970s by Baum and Petrie (1966), Baum and Egon (1967), Petrie (1969), and Baum (1972).

A Hidden Markov model enables sampling of situation that cannot be fully sampled by the Markov chain method (Öz, 2009: 63). From this point of view, it is wider and more flexible than the Markov chain method. In the hidden Markov model, the state of the system cannot be observed at any time. Instead, when the system is in a state, it reveals the observation that causes this situation (Haberdar, 2005: 17). The reason why these models are described as "hidden" is that the situations of the system are unknown.

A hidden Markov model is expressed as follows:

- N is the number of states in the model, $S = \{ S_1, S_2, \ldots, S_N\}$ is the set of states, and q_t is the state at time t.
- M is the number of observations belonging to the situations, $V = \{ v_1, v_2, \ldots, v_M\}$ is the observation set.
- The state transition probabilities matrix is shown as $A = \{a_{ij}\}$. A is a matrix of size N×N. The row totals of the matrix are equal to 1. For $1 \leq i, j \leq N$, a_{ij} 's are positive numbers.
- $B = \{ b_j(k)\}$ is the observation probability distribution. This expression gives the probability of observation v_k in state j at time t. For $1 \leq j \leq N$ and $1 \leq k \leq M$, $b_j(k)$'s are positive numbers. B is a matrix of size N×M and the row sums of the matrix are equal to 1.
- $\pi = \{\pi_i\}$ is the initial state distribution. The probability of the system being in S_i state at the initial time is shown as $\pi_i = P[\, q_1 = S_i]$, $1 \leq i \leq N$ (Bicego and Murino, 2004: 281-286).

After the N and M values are determined, the system parameters set $\lambda = (\,A, B, \pi)$ elements create the hidden Markov model (Haberdar, 2005: 18).

3.2.1. Three Basic Problems of Hidden Markov Model

Three basic problems of the Hidden Markov model must be solved in order to be used in real life applications (Rabiner, 1989: 261).

Problem 1 and Solution

Problem 1 is also called the evaluation problem, and it is intended that how to calculate the probability of the observation sequence $P(O|\lambda)$ for observation sequence $O = O_1, O_2, \ldots, O_T$ and the parameter set $\lambda = (A, B, \pi)$ given in a Hidden Markov model.

For the solution of the first problem, namely, to calculate P(O|λ) , Forward and Backward algorithms are used. The values obtained as a result of both algorithms are found the same.

- **Forward Algorithm:**

The forward variable $a_t(i)$ is defined as follows:

$$a_t(i) = P(O_1,O_2,\ldots,O_t,q_t = S_i|\lambda) \tag{6}$$

The Forward variable $a_t(i)$ expresses the probability of the $O_1, O_2, \ldots, O_t$ partial observation sequence of the system in state S_i at time t for the model λ given. Forward direction variable can be solved in three steps.

1) Initialization

$$a_1(i) = \pi_i b_i(O_1), \quad 1 \le i \le N \tag{7}$$

2) Induction

$$a_{t+1}(j) = \left[\sum_{i=1}^{N} a_t\,(j) a_{ij}\right] b_j(O_{t+1}), \;\; 1 \le t \le T-1, \quad 1 \le j \le N \tag{8}$$

3) Termination

$$P(O|\lambda) = \sum_{i=1}^{N} a_T\,(i) \tag{9}$$

- **Backward Algorithm:**

The backward variable is defined by $\beta_T(i)$ and solved in two steps.

1) Initialization

$$\beta_T(i) = 1, \quad 1 \le i \le N \tag{10}$$

2) Induction

$$\beta_T(i) = \sum_{j=1}^{N} a_{ij}\, b_j(O_{t+1})\beta_{t+1}(j), \quad t = T-1, T-2, \ldots, 1, \quad 1 \le i \le N \tag{11}$$

Problem 2 and Solution

Problem 2 is about how to choose the optimal state sequence $\dot{I} = \dot{I}_1, \dot{I}_2, \ldots, \dot{I}_T$ for observation sequence $O = O_1, O_2, \ldots, O_T$ and the model λ in a Hidden Markov model. Viterbi Algorithm is used to solve the problem.

- **Viterbi Algorithm**

To find the optimal single state sequence $Q = \{q_1, q_2, \ldots, q_T\}$ for a given set of observations $O = O_1, O_2, \ldots, O_T$, the following expression is defined:

$$\delta_t(i) = \max_{q_1, q_2, \ldots, q_{t-1}} [\![P[q_1, q_2, \ldots, q_t = i, O_1]\!], O_2, \ldots, O_t|\lambda] \tag{12}$$

$\delta_t(i)$ shows the highest probability of the process that is in state S_i along the single path followed until time t . Using the induction method,

$$S_{t+1}(j) = \left[\max_i \delta_t\,(i) a_{ij}\right] . b_j(O_{t+1}) \tag{13}$$

is obtained.

To bring back the state sequence, it is necessary to follow the independent variable that maximizes the equation $S_{t+1}(j)$ for each t and j. This tracking is done via the array $\psi_t(j)$.

The steps below are followed to find the optimal state sequence.

1) Initialization

$$\delta_1\,(i) = \pi_i b_i(O_1), \quad 1 \le i \le N \tag{14a}$$

$$\psi_1(i) = 0 \tag{14b}$$

2) Recursion

$$\delta_t(j) = \max_{1\le i\le N}[\delta_{t-1}\,(i)a_{ij}]b_j(O_t), \qquad 2 \le t \le T, \qquad 1 \le j \le N \tag{15a}$$

$$\psi_t(j) = arg\,\max_{1\le i\le N}[\delta_{t-1}\,(i)a_{ij}], \qquad 2 \le t \le T, \qquad 1 \le j \le N \tag{15b}$$

3) Termination

$$P^* = \max_{1\le i\le N}[\delta_T\,(i)] \tag{16a}$$

$$q_T^* = arg\,\max\nolimits_{1\le i\le N}[\delta_T\,(i)] \tag{16b}$$

4) Path backtracking

$$q_t^* = \psi_{t+1}(q_{t+1}^*), t = T-1, T-2, \dots, 1 \tag{17}$$

Problem 3 and Solution

Problem 3 is how to adjust the model parameters $\lambda = (A, B, \pi)$ to maximize the probability $P(O|\lambda)$. It is also included as a training problem in the literature. Baum-Welch Algorithm is used to solve the problem.

- **Baum- Welch Algorithm:**

To describe the procedure for re-estimating Hidden Markov model parameters, first, the variable $\xi_t(i,j)$, which has the probability of being in state S_i at time t and in state S_j at time $t+1$, is defined.

$$\xi_t(i,j) = P(q_1 = S_i, q_{t+1} = S_j | O, \lambda) \tag{18}$$

Using the forward and backward variables, $\xi_t(i,j)$can be written as follows:

$$\xi_t(i,j) = \frac{a_t(i)a_{ij}b_j(O_{t+1})\beta_{t+1}(j)}{P(O|\lambda)} \tag{19}$$

For a given set of observations and the model, the relation between$\gamma_t(i)$, which is the probability of being in the state S_i at time t, and $\xi_t(i,j)$ is written as follows.

$$\gamma_t(i) = \sum_{j=1}^{N} \xi_t\,(i,j) \tag{20}$$

The formulas given above are used to re-estimate the Hidden Markov model parameters.

4. RESEARCH FINDINGS

In this study, the Markov Chains method and Hidden Markov Model were used to determine the next hotel preferences and to analyze the factors affecting these preferences of 4 and 5-star hotels with beaches in Mersin province. For this purpose, 410 people were asked about their next hotel preferences and the reasons that affect these preferences. If these people had not previously stayed at any of the hotels in the survey, this is stated as none.

The sequence numbers of the hotels in the survey are shown in Table 1.

Tablo 1. 4 and 5 Star Hotels with Beaches

Sequence Number	**Hotel**	**Sequence Number**	**Hotel**
1	None	**7**	Hotel Royal Sebaste (4*)
2	Wonasis Resort& Aqua Hotel (5*)	**8**	Altın Orfoz Hotel (4*)
3	Ulu Resort Hotel (5*)	**9**	Marvel Tree (4*)
4	Liparis Resort Hotel& Spa (5*)	**10**	Olbios Marina Resort Hotel (4*)
5	Lamos Resort Hotel (5*)	**11**	Marpessa Blue Beach Resort& Spa Hotel (4*)
6	Sahil Martı Hotel (4*)		

4.1. Determining Next Hotel Preferences Using Markov Chains Method

The Markov transition matrix was created with the help of the data obtained from the survey and is shown in Table 2. The numbers showing the columns in this matrix are the hotels in Table 1 and show the hotels where the next accommodation is planned. The numbers showing the rows are the hotels in Table 1 and show the previous accommodated hotels. The point where any column and row intersect gives the number of transition from the previous hotel to the next one. The Markov Transition Probability Matrix was created by taking into account the number of transitions from any hotel to other hotels given in the Markov transition matrix.

Table 2.Transition Matrix

		The Hotels Where The Next Accommodation Is Planned										
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
The Previous Accommodated Hotels	**1**	120	26	22	12	3	5	1	24	11	2	4
	2	5	7	4	3	1	0	0	1	0	2	2
	3	8	0	12	2	2	0	0	2	2	1	1
	4	4	2	0	8	0	0	1	0	0	0	0
	5	1	3	1	1	1	1	0	1	1	0	0
	6	3	3	1	1	1	4	0	3	0	0	2
	7	1	0	1	3	0	0	1	0	0	0	0
	8	7	3	5	5	7	0	0	13	0	2	2
	9	3	0	3	0	0	0	0	0	5	0	0
	10	0	0	3	1	0	0	0	2	0	0	1
	11	0	0	4	0	0	0	0	1	1	0	8

Markov transition probability matrix obtained by using the transition matrix in Table 2 is given in Table 3. The Markov transition probability matrix is formed by dividing the number in each cell of the transition matrix by the total value of the row in which it is located.

Markov Transition Probability Matrix given in Table 3 shows the next preference rates for each hotel. In addition, the loyalty of the hotel customers to the hotel, namely, the fact that the previous hotel is the same as the hotel where the next accommodation is planned, is shown in the diagonal elements of the Markov Transition Probability Matrix.

Table 3. Transition Probability Matrix

		The Hotels Where The Next Accommodation Is Planned										
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
The Previous Accommodated Hotels	**1**	0,5217	0,1130	0,0957	0,0522	0,0130	0,0217	0,0043	0,1043	0,0478	0,0087	0,0174
	2	0,2000	0,2800	0,1600	0,1200	0,0400	0,0000	0,0000	0,0400	0,0000	0,0800	0,0800
	3	0,2667	0,0000	0,4000	0,0667	0,0667	0,0000	0,0000	0,0667	0,0667	0,0333	0,0333
	4	0,2667	0,1333	0,0000	0,5333	0,0000	0,0000	0,0667	0,0000	0,0000	0,0000	0,0000
	5	0,1000	0,3000	0,1000	0,1000	0,1000	0,1000	0,0000	0,1000	0,1000	0,0000	0,0000
	6	0,1667	0,1667	0,0556	0,0556	0,0556	0,2222	0,0000	0,1667	0,0000	0,0000	0,1111
	7	0,1667	0,0000	0,1667	0,5000	0,0000	0,0000	0,1667	0,0000	0,0000	0,0000	0,0000
	8	0,1591	0,0682	0,1136	0,1136	0,1591	0,0000	0,0000	0,2955	0,0000	0,0455	0,0455
	9	0,2727	0,0000	0,2727	0,000	0,0000	0,0000	0,0000	0,0000	0,4545	0,0000	0,0000
	10	0,0000	0,0000	0,4286	0,1429	0,0000	0,0000	0,0000	0,2857	0,0000	0,0000	0,1429
	11	0,0000	0,0000	0,2857	0,000	0,0000	0,0000	0,0000	0,0714	0,0714	0,0000	0,5714

The probabilities of hotel customers to choose the same hotel in their next hotel preferences, namely their loyalty to the hotel, are respectively Marpessa Blue Beach Resort & Spa Hotel (4*), Liparis Resort Hotel & Spa (5*), Marvel Tree (4*), Ulu Resort Hotel (5*), Altın Orfoz Hotel (4*), Wonasis Resort & Aqua Hotel (5*), Sahil Martı Hotel (4*), Hotel Royal Sebaste (4*), Lamos Resort Hotel (5*) and Olbios Marina Resort Hotel (4*).

The initial probability vector (Table 4) was obtained by dividing the total number of rows in the Transition Matrix to the number of people participating in the survey.

Table 4.The Initial Probability Vector

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
0,5610	0,0610	0,0732	0,0366	0,0244	0,0439	0,0146	0,1073	0,0268	0,0171	0,0341

In the Markov Chains analysis, it is observed that the values reach a stable state as the periods pass. These stationary values are obtained by multiplying the Initial probability vector in Table 4 with the Markov transition probability matrix repeatedly until the stationarity is reached. In this study, it has been observed that at the end of 29 periods, stability is achieved, namely, the initial probability vector is fixed.

Table 5. Equilibrium (Fixed) Vector

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**

0,2919	0,0974	0,1724	0,1325	0,0377	0,0130	0,0121	0,0880	0,0618	0,0201	0,0628

When the Equilibrium (Fixed) Vector is examined, it can be recognized that the situation of not choosing any hotel has the highest rate with 29%, and the three most preferred hotels are respectively Ulu Resort Hotel (5*), Liparis Resort Hotel & Spa (5*) and Wonasis Resort & Aqua Hotel (5*). On the other hand, it can be observed that the preference probabilities of Sahil Martı Hotel (4*), Hotel Royal Sebaste (4*) and Altın Orfoz Hotel (4*) decreased, and other hotels increased their preference possibilities.

4.2.Determining The Factors Affecting Hotel Preferences Using Hidden Markov Model

Information on the people participating in the study is shown in Table 6. According to the table, 64.1% of the participants are women and the rest are men. 73.7% of the participants have bachelor's degrees. The majority of participants are civil servants. 29.5% of participants have a monthly income of 2500-5000 TL. In addition, 58.3% are married, and 43.9% have no children.

Table 6. Information on Survey Participants

Variables	**Groups**	**Percentile**	**Variables**	**Groups**	**Percentile**
Gender	Female Male	% 64.1 % 35.9	**Monthly Income**	0 TL- 2500 TL 2500-5000 TL 5000-7500 TL 7500 TL or more	% 23.2 % 29.5 % 27.6 % 19.8
Education Level	Primary Middle school High school Associate Degree Bachelor’s Degree Graduate Degree	% 0 % 1.7 % 6.8 % 5.4 % 73.7 % 12.4	**Marital Status**	Married Single Divorced Widowed	% 58.3 % 36.8 % 3.7 % 1.2
Occupation	Not employed Student Civil Servant Private sector	% 19.5 % 15.4 % 40.2 % 24.9	**Number of Children**	0 1 2 3 or more	% 43.9 % 16.1 % 32.4 % 7.6

Transition probability matrix and emission matrices were created based on the information obtained from the answers given by 410 participants to the questions below.

- Which of the following Mersin hotels have you stayed in, or are you currently staying in?
- What was the most significant factor in choosing the hotel you stayed in for the last time?
- Which hotel would you consider staying in on your next holiday in Mersin?
- What is the most significant factor that will make you choose the hotel you are planning to stay in next?

The transition probability matrix was created by using the previous and next preference reasons for the factors affecting hotel preferences. The reasons for choosing 4 and 5-star hotels with beaches in Mersin are shown in Table 7.

Table 7. The Reasons for Choosing 4 and 5-Star Hotels with Beaches in Mersin

Symbol	**Reasons**
D1	Location
D2	Room and Facility Cleaning
D3	The Friendly and Qualified Staff at A Hotel
D4	Room prices / Special Offers
D5	Beach and Pool
D6	Availability of Facilities for Families with Children
D7	All-inclusive- Full board
D8	Various activities and entertainment at a hotel

D9	Effectiveness of Recommendations/Advertisement
D10	Other

The Di's show the states of the Hidden Markov Model. The transition matrix (Table 8) was created with the information obtained from the survey.

Table 8. Transition Matrix

		The Reason for Choosing The Next Hotel									
		D1	**D2**	**D3**	**D4**	**D5**	**D6**	**D7**	**D8**	**D9**	**D10**
The Reason for Choosing The Previous Hotel	**D1**	31	25	1	6	7	5	2	3	15	3
	D2	6	38	3	1	3	0	3	2	4	1
	D3	1	0	4	2	0	0	0	0	0	0
	D4	3	6	3	19	2	0	3	4	3	1
	D5	1	3	0	2	14	1	1	1	2	0
	D6	0	1	0	1	0	22	1	1	1	1
	D7	6	8	0	1	0	2	13	6	5	0
	D8	3	7	2	0	0	0	1	4	1	0
	D9	4	11	2	1	4	0	2	6	12	0
	D10	8	5	1	5	3	0	4	2	4	14

In Table 8, the point where any column and row intersect gives the number of transitions of the reason for choosing the next hotel from the reason for choosing the previous hotel.

Transition Probability Matrix (Table 9) is created by dividing each cell in the transition number matrix to the sum of the row in which it is located, and shows the probability of transition from each state to another state.

Table 9. Transition Probability Matrix

		The Reason for Choosing The Next Hotel									
		D1	**D2**	**D3**	**D4**	**D5**	**D6**	**D7**	**D8**	**D9**	**D10**
The Reason for Choosing The Previous Hotel	**D1**	0,3163	0,2551	0,0102	0,0612	0,0714	0,0510	0,0204	0,0306	0,1531	0,0306
	D2	0,0984	0,6230	0,0492	0,0164	0,0492	0,0000	0,0491	0,0328	0,0656	0,0164
	D3	0,1429	0,0000	0,5714	0,2857	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
	D4	0,0682	0,1364	0,0682	0,4318	0,0455	0,0000	0,0682	0,0909	0,0682	0,0227
	D5	0,0400	0,1200	0,0000	0,0800	0,5600	0,0400	0,0400	0,0400	0,0800	0,0000
	D6	0,0000	0,0357	0,0000	0,0357	0,0000	0,7857	0,0357	0,0357	0,0357	0,0357
	D7	0,1463	0,1951	0,0000	0,0244	0,0000	0,0488	0,3171	0,1463	0,1220	0,0000
	D8	0,1667	0,3889	0,1111	0,0000	0,0000	0,0000	0,0556	0,2222	0,0556	0,0000
	D9	0,0952	0,2619	0,0476	0,0238	0,0952	0,0000	0,0476	0,1429	0,2857	0,0000

	D10	0,1739	0,1087	0,0217	0,1087	0,0652	0,0000	0,0870	0,0435	0,0870	0,3043

Table 9 shows the dependency ratio of each element on the diagonal to the factor that is effective in hotel selection. So; ıt can be said that a person who chooses a hotel due to "Location (D1)" will choose a hotel for the same reason again in the next hotel selection with a rate of approximately 32%.

The emission matrix (Table 10) was created by considering which hotel the respondents last stayed at and the reasons for choosing this hotel. V_i in Table 10 show the hotels in Table 1.

Table 10.Emission Matrix

	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11
D1	38	8	9	3	3	6	4	16	5	5	1
D2	40	3	0	3	0	8	1	1	4	1	0
D3	2	0	1	1	0	1	0	1	0	0	1
D4	29	4	1	1	2	2	0	3	0	0	2
D5	16	2	0	0	1	0	0	5	0	0	1
D6	11	1	6	1	0	0	0	2	0	0	7
D7	21	2	7	2	1	0	0	7	0	0	1
D8	14	2	0	0	0	0	0	1	1	0	0
D9	20	1	4	3	3	1	0	8	1	1	0
D10	39	2	2	1	0	0	1	0	0	0	1

When Table 10 is examined, the distribution of the factors affecting preferences according to hotels can be easily reached. For example; 16 people have chosen Altın Orfoz Hotel (V8) for Location (D1). When looking at Ulu Resort Hotel (V3), it was chosen by 6 people due to "Availability of Facilities for Families with Children (D6)".

Each number in Table 10 is divided by the sum of the row in which it is located, and thus the Emission probability matrix is obtained. The matrix obtained is shown in Table 11.

Table 11. Emission Probability Matrix

	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11
D1	0,3878	0,0816	0,0918	0,0306	0,0306	0,0612	0,0408	0,1633	0,0510	0,0510	0,0102
D2	0,6557	0,0492	0,0000	0,0492	0,0000	0,1311	0,0164	0,0164	0,0656	0,0164	0,0000
D3	0,2857	0,0000	0,1429	0,1429	0,0000	0,1429	0,0000	0,1429	0,0000	0,0000	0,1429
D4	0,6591	0,0909	0,0227	0,0227	0,0455	0,0455	0,0000	0,0682	0,0000	0,0000	0,0455
D5	0,6400	0,0800	0,0000	0,0000	0,0400	0,0000	0,0000	0,200	0,0000	0,0000	0,0400
D6	0,3929	0,0357	0,2143	0,0357	0,0000	0,0000	0,0000	0,0714	0,0000	0,0000	0,2500
D7	0,5122	0,0488	0,1707	0,0488	0,0244	0,0000	0,0000	0,1707	0,0000	0,0000	0,0244
D8	0,7778	0,1111	0,0000	0,0000	0,0000	0,0000	0,0000	0,0556	0,0556	0,0000	0,0000
D9	0,4762	0,0238	0,0952	0,0714	0,0714	0,0238	0,0000	0,1905	0,0238	0,0238	0,0000
D10	0,8478	0,0435	0,0435	0,0217	0,0000	0,0000	0,0217	0,0000	0,0000	0,0000	0,0217

The underlying reasons for hotel choices were analyzed using the Transition probability matrix and Emission matrix. Matlab program was used for this analysis. Analysis results are shown in Table 12.

Table 12. Probabilities of the Hotels to be Preferred and Hidden Situations

	Observation	**Probability (%)**	**Hidden Situation**
None	V1	53.21	D2
Wonasis Resort& Aqua Hotel (5*)	V2	6.08	D1

Ulu Resort Hotel (5*)	V3	6.22	D1
Liparis Resort Hotel& Spa (5*)	V4	3.95	D2
Lamos Resort Hotel (5*)	V5	2.68	D9
Sahil Martı Hotel (4*)	V6	6.07	D2
Hotel Royal Sebaste (4*)	V7	1.78	D1
Altın Orfoz Hotel (4*)	V8	11.37	D1
Marvel Tree (4*)	V9	3.82	D2
Olbios Marina Resort Hotel (4*)	V10	2.40	D1
Marpessa Blue Beach Resort& Spa Hotel (4*)	V11	2.42	D6

For problem 1 of the Hidden Markov model, the next preference probabilities of the hotels were calculated using the Forward-Backward Algorithm. When looking at the results in Table 12, it can be seen that the probability of choosing the none option is the highest with 53.21% because of Covid-19 pandemic. It was determined that Altın Orfoz Hotel is the hotel to be chosen with the highest probability (%11.37). Altın Orfoz Hotel is followed by Ulu Resort Hotel (%6.22), Wonasis Resort& Aqua Hotel (%6.08), Sahil Martı Hotel (%6.07), Liparis Resort Hotel& Spa (%3.95), Marvel Tree (%3.82), Lamos Resort Hotel (%2.68), Marpessa Blue Beach Resort& Spa Hotel (%2.42), Olbios Marina Resort Hotel (%2.40) and Hotel Royal Sebaste (%1.78).

For problem 2 of the Hidden Markov model, the underlying reasons for the preference probabilities of the hotels, namely the hidden situations, were determined. Viterbi Algorithm was used for the analysis. According to Table 12, we can say that the underlying reason for the preference of Altın Orfoz Hotel, is location (D1) where the hotel is established. It can be seen that Wonasis Resort & Aqua Hotel, Ulu Resort Hotel, Hotel Royal Sebaste and Olbios Marina Resort Hotel are chosen due to their location (D1) as well. The underlying reason for choosing Liparis Resort Hotel & Spa, Sahil Martı Hotel, and Marvel Tree hotels are room and facility cleaning (D2). Unlike other hotels, the underlying reason for choosing Lamos Resort Hotel is the Effectiveness of recommendations/advertisement (D9), while the underlying reason for choosing Marpessa Blue Beach Resort & Spa Hotel is the Availability of Facilities for Families with Children (D6).

5.Results

The Covid-19 epidemic process has negatively affected the tourism sector in Turkey as so all over the world. The tourism sector, which has a great share in the economic development of countries, has experienced serious losses with this process. Turkey, which is at an important point especially in terms of summer tourism, is one of the countries affected by this process. There has been a decrease in the number of tourists in Turkey and although hotels offer new concepts and different options, they have been affected by the covid-19 epidemic. Since Mersin is one of the favorite holiday cities of Turkey, it has become one of the cities that felt the effects of the epidemic process the most.

The comfort offered by accommodation businesses is as essential as the places tourists visit. Since tourism times are very critical processes for both the economic development of our country and the rise in popularity by introducing it to the world, hotel businesses have great duties. The ability of hotel businesses to compete with other businesses depends on many factors as stated in the content of the study. Taking into account all these situations, hotel businesses have a great responsibility. Especially, due to the Covid-19 epidemic, room and facility cleaning is the first feature requested in hotel businesses. In this competitive environment, it is of great importance for hotel businesses to know the next preferences of customers and the reasons for these preferences.

Turkey is a country where tourism activities can be carried out for 12 months, but in this study, an application was carried out on hotel businesses in Mersin, which is mostly preferred for the summer season. Mersin is a city located in the Mediterranean region, which is very popular with its beaches, history and different accommodation options. Although Mersin province has many accommodation facilities, 4 and 5-star hotels with beaches were included in the study so that the study could reach more accurate and definitive results.

The tourism sector in Turkey has been affected heavily by the reason of the Covid-19 pandemic in the period when the study is conducted. For this reason, it is seen that the rate of not choosing any hotel is high in the results of the study. Stopping tourism activities, which are expressed as luxury consumption, significantly reduces the risk of catching Covid-19. In addition, travel bans, halving the hotel capacity, and other restrictive measures have greatly reduced the participation rate of people in tourism activities. It can be considered natural that the percentage of not selecting any hotel for such reasons is high. Furthermore, ıt can be seen that the underlying reason for not choosing any hotel is Room and Facility Cleaning (D2). The extra sensitivity individuals experience in hygiene during the pandemic period also supports the result.

Generally, when choosing a hotel, Room and Facility Cleaning (D2) is one of the most important factors that people pay attention to. Especially in the pandemic environment, most people do not want to stay in hotels because they attach extra importance to the cleanliness factor. People are looking for hygiene and comfort in the hotel rooms like in their house. Considering the reasons for choosing the hotels included in the study, it is seen that the facilities and rooms of Liparis Resort Hotel & Spa (5 *), Sahil Martı Hotel (4 *) and Marvel Tree (4 *) were chosen because they provided the cleaning and comfort that people paid extra attention to during the pandemic period. However, Room and Facility Cleaning (D2) is an important factor as well as a factor that every hotel should pay attention to. Therefore, these hotels selected for room and facility cleaning should change their marketing strategies and focus on other factors that are effective in hotel selection.

Considering the preference rates of the hotels included in the study in the future and the factors affecting these preferences, it can be seen that Wonasis Resort& Aqua Hotel (5*), Ulu Resort Hotel (5*), Hotel Royal Sebaste (4*), Altın Orfoz Hotel (4*) and Olbios Marina Resort Hotel (4*) were chosen due to their Location (D1). When the hotels selected for their location are examined, it is seen that they are established in the most beautiful places of Mersin. Wonasis Resort & Aqua Hotel (5 *) is located close to the city and by the sea. Ulu Resort Hotel (5 *) is far from the city and located at the seafront, where the Taurus Mountains meet the Mediterranean. Hotel Royal Sebaste (4 *) is 45 km from the city center and is close to historical sites in the area. In addition, all rooms are positioned to have a sea view. Altın Orfoz Hotel (4 *) is a seaside hotel where freshwater meets saltwater, which is easy to reach from the city. Finally, Olbios Marina Resort Hotel (4 *) is away from construction and located in a historical area intertwined with nature. It has been determined that these hotels selected due to their location have almost the same location features. Therefore, these hotels must change their marketing strategy to differentiate themselves from the hotels chosen for the same reason like them.

Looking at Lamos Resort Hotel and Marpessa Blue Beach Resort & Spa Hotel, it can be seen that the factors affecting their preference compared to other hotels are different. Lamos Resort Hotel was chosen because of the Effectiveness of Recommendations/Advertisement (D9). In this case, we can say that these hotel customers also recommend it to their family and friends as they are very satisfied with the services of the hotel. It has been determined that Marpessa Blue Beach Resort & Spa Hotel was chosen because of the Availability of Facilities for Families with Children (D6). When the features of the hotel are examined, it is estimated that the hotel is preferred by families with children because of being a small hotel that everything is close to each other, ıt has a children's playground and animated entertainment, and the pool is adjacent to the children's pool in the hotel. These two hotels can develop their marketing strategies and increase their preference rates in the future by emphasizing their differences.

Looking at the findings of the study, it can be observed that the 4 and 5-star hotels with beaches in Mersin could not differ from each other, and the reasons for choosing them were very similar to each other. Moreover, it has been discovered that the number of hotels in different concepts with all-inclusive 4 and 5 stars in Mersin is not adequate and equipped. Compared to the 4 and 5-star hotels with beaches in different coastal cities in the Mediterranean and Aegean regions, it is seen that the facilities of the hotels in Mersin are more limited and insufficient in terms of concept. For this reason the high rate of not choosing any of the hotels in Mersin is also due to the fact that most tourists with the potential to choose Mersin prefer hotels with much better options, especially in Antalya and other coastal cities, by paying the same price.

If Mersin has hotels that have more green areas and more comfortable rooms, with alternative concepts and spread over wider areas, especially for families with children, it is predicted that the tourism activity of the city will increase, and thus it will contribute to the popularity of Mersin in terms of tourism. As a suggestion in the future, this study can be developed and applied to larger populations or in other provinces. For example, the factors affecting hotel preferences of business and leisure travelers can be determined by using the HMM and compared.

References

Akgündüz, Y., & Bardakoğlu, Ö. (2012). *Effects of educational status and gender of tourists on the* *choice of hotel: a research in İzmir*. Dokuz Eylül University The Journal of Graduate School of Social Sciences, 14(4), 13-29.

Akyurt, İ. Z., (2005). *Markov Zincirleri ve trafik sigortası hasarsızlık indirimi veya zamlı prim sisteminin Markov Zincirleri ile ifade edilerek analiz edilmesi*. İstanbul Üniversitesi Sosyal Bilimler Enstitüsü, Yayınlanmamış Yüksek Lisans Tezi.

Baruca, P. Z., & Civre, Z. (2012). *How do guests choose a hotel*? Academica Turistica, 5(1), 75-84.

Baum, L. E. (1972). *An inequality and associated maximization technique in statistical estimation for probabilistic functions of Markov processes.* Inequalities, 3(1), 1-8.

Baum, L. E., & Eagon, J. A. (1967). *An inequality with applications to statistical estimation for probabilistic functions of Markov processes and to a model for ecology*. Bulletin of the American Mathematical Society, 73(3), 360-363.

Baum, L. E., & Petrie, T. (1966). *Statistical inference for probabilistic functions of finite state Markov Chains.* The Annals of Mathematical Statistics, 37(6), 1554-1563.

Bicego, M., & Murino, V. (2004). *Investigating Hidden Markov models' capabilities in 2d shape classification*. IEEE Transactions On Pattern Analysis And Machine Intelligence, 26(2), 281-286.

Büyüktatlı, F., İşbilir, S., & Çetin, E. İ. (2013). *An estimation application according to annual allowances with Markov analysis.* Journal of Alanya Faculty of Business, 5(1), 1-8.

Can, T.,& Öz, E., (2009). *Marka tercihlerine ve tercih nedenlerine Gizli Markov modelinin uygulanması*. Eskişehir Osmangazi Üniversitesi Sosyal Bilimler Dergisi, 10(2), 167-185.

Dağlıoğlu, C.,& Kıral, G. (2018). *Prediction of economical investment tool returns with Hidden Markov model for Turkey*. International Journal of Economics and Innovation, 4(1), 61-75.

Demir, M., Demir, Ş. Ş., Ergen, F. D. E., & Dalgıç, A. (2021). *The factors affecting hotel choice of consumers during the Covid-19 process.* International Journal of Social Sciences and Education Research, 7(1), 82-94.

Demirtaş, N. (2010). Otel işletmeciliği. Ankara Üniversitesi Uzaktan Eğitim Yayınları, 67.

Dinçer, M., & Dinçer, F. (1989). *Türkiye'de konaklama sektörünün gelişimi ve başlıca sorunları üzerine bir araştırm*a. İstanbul Üniversitesi İktisat Fakültesi Mecmuası, 47, 1-4.

Emir, O.,& Pekyaman, A . (2010). *Important factors for families with children in hotel establishment selection: an application in Afyonkarahisar*. Journal of Management & Economics, 17(2), 159-181.

Grinstead, C. M., & Snell, J. L. (2012). *Introduction to probability*. Second Revise Edition, American Mathematical Society, USA.

Gündüz, S., & Kıral, S. G. (2020). *Estimation of voters' preferences with Markov Chains*. Journal of Çukurova University Institute of Social Sciences, 29(1), 270-281.

Haberdar, H. (2005). *Saklı Markov model kullanılarak görüntüden gerçek zamanlı Türk işaret dili tanıma sistemi,* Yıldız Teknik Üniveristesi Fen Bilimleri Enstitüsü, Yayınlanmamış Yüksek Lisans Tezi.

Karaman, A. (Ed.). (2016). Otel işletmeciliği. Eğitim Yayınevi, Konya.

Kaya, M. F. (2019). *Factors affecting hotel selection of business travelers: the case of Mardin*. University of Batman, Institute of Social Sciences, Master's Thesis.

Kıral, E. (2018). *Determination of mobile phone operator preferences Markov analysis: an application of Adana province*. Journal of Çukurova University Institute of Social Sciences, 27(1), 35-47.

Kıral, S. G., & Gündüz, S. (2020). *Determination of factors affecting voter preferences using the Hidden Markov model*. Journal of Çukurova University Institute of Social Sciences, 29(3), 414-428.

Kıycı, Ş., Aksoy, R., & Koçoğlu, C. M. (2020). *The effect of tourist innovativeness on innovative hotel choice*. Itobiad: Journal of the Human & Social Science Researches, 9(1), 608- 635.

Kotler, P., Bowen, J.,& Makens. J. (2003). Marketing for hospitality and tourism. (Third Edition). Usa: Prentice Hall.

Kozak, M. A. (2012). Genel turizm bilgisi. Anadolu Universitesi, Eskişehir.

Lewis, R. C. (1985). *Predicting hotel choice: the factors underlying perception*. Cornell Hotel and Restaurant Administration Quarterly, 25(4), 82-96.

Liu, M., & He, R. (2013). *Factors affecting students' decision of hotel selection*. MBA Student

Scholarship, 17, 1-11.

Oflaz, Z. (2016). *Bivariate Hidden Markov model to capture the dependency in claim estimate*. Middle East Technical University Graduate School of Natural and Applied Sciences, Master's Thesis.

Öz, E. (2009). *An estimation by Hidden Markov model for the İstanbul Stock Exchange*. Journal of Ekonomik Yaklaşım, 20(72), 59-85.

Öz, E. (2009). *Saklı Markov modelleri ve finansal bir uygulama*. Marmara Üniversitesi Sosyal Bilimler Enstitüsü, Yayınlanmamış Doktora Tezi.

Öztürk, A. (2004). *Yöneylem araştırması,* Genişletilmiş 9. Baskı, Ekin Kitabevi Yayınları, Bursa.

Petrie, T. (1969). *Probabilistic functions of finite state Markov Chains*. The Annals of Mathematical Statistics, 40(1), 97-115.

Prasetyo, E. (2009). *Factors affecting busy people in choosing a hotel*. Petra Christian University, Doctoral Dissertation.

Rabiner, L. R. (1989). *A tutorial on Hidden Markov models and selected applications in speech recognition*. Proceedings of the IEEE, 77(2), 257-286.

Soulidou, A. K., Karavasilis, G. I., Vrana, V. G., Kehris, E. C., Theocharidis, A. I. T., & Azaria, A. H. (2018). *Factors affecting hotel selection: Greek customers' perception.*

Uçak, S. (2013). *The effects of internet ads on individual customers' hotel preferences: a field research practice in Balikesir*. University of Bilecik Şeyh Edebali, Institute of Social Sciences, Master's Thesis.

Verma, V. K., & Chandra, B. (2016). *Hotel guest's perception and choice dynamics for green hotel attribute: a mix method approach*. Indian Journal of Science and Technology, 9(5), 1-9.

Wiastuti, R.D. & Lestari, N.S. (2020). *The generation Z characteristics and hotel choices*. African Journal of Hospitality, Tourism and Leisure, 9 (1), ISSN: 2223-814X.

Wong, K. K. F., & Chi-Yung, L. (2002). *Predicting hotel choice decisions and segmenting hotel consumers: a comparative assessment of a recent consumer based approach*. Journal of Travel & Tourism Marketing, 11(1), 17–33.

Yavas, U., & Babakus, E. (2005). *Dimensions of hotel choice criteria: congruence between business and leisure travelers*. International Journal of Hospitality Management, 24(3), 359–367.

Yeşiltaş, M , Cankül, D , & Temizkan, R . (2012). *The effects of religious life styles on selection hotel.* Electronic Journal of Social Sciences, 11(39), 193-217.

Yıldırım, H. M., Sünnetçioğlu, A., & Atay, L. (2018). *The role of lifestyle in the intention to choose green hotel.* Journal of Social Sciences of Muş Alparslan University, 6(ICEESS'18), 9-17.

Zengin, B., Öztürk, E., & Salha, H. (2014*). Evaluation of the alternative tourism potential of Amasya province.* Papers on Social Science, 2014(2), 1-22.