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AN INTEGRATED FORECASTING APPROACH FOR HOTELS

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Summary: *It was aimed to search to be able to forecast the crises which arise from demand fluctuations, and to able to generate a systematic and dynamic process in the hotel businesses. In the quantitative period, forecasting was realized to 149 monthly series of a five star hotel in Ankara via MA, Simple, Holt's, Winter's Exponential Smoothing and ARIMA. The results of these methods were compared by some error measures. At the other side of integration, two Delphi based inquiry panels were realized: The Variables Determination Panel and The Environmental Monitoring Panel. The opinions of second group panelists were used to adjust Winter's Multiplicative forecasts via AHP based approach.*

This process shows that, if the forecasting and adjustment process is applied to hotels monthly, it will be useful for crises arised from demand fluctuations in hotelbusiness. The most important characteristic of model is being elasticity for change and development.

Introduction

In the beginning of 1970s', Analytical Hierarchy Process (AHP) which is not directly forecasting method, was generated as a method of multicriteria decision making by Thomas L. Saaty. AHP is inspried human decision making behaviors which have not generated related learning and regardless awareness.

Actually hierarchy is an unique type of system. It is possible that the system could be defined due to greater system (environment) which involved it and aims of designer. Regardless the function of every component, goals, these goals as a component of mission, are not determined, this system could not be understood. The assumption underlying AHP hierarchy, is the component could be groupping and a component of a group effects the other components in other groups (Saaty 1989).

AHP for Forecasting

Firstly, an AHP model was established to forecast from results of 1978 Karpov-Karchroi chess meet (Saaty, Vargas 1980). After, AHP was adopted to forecast the competitive behaviors (Saaty, Vargas 1985). Several theoretical examples was occured by MacCormac (1989) and Lewis, Levy (1989). AHP is also applicated for wide area (see for these Zahedi 1986, Golden et al 1989; Vargas 1990).

It is useful that the usings AHP for forecasting is considered by two groups. First of these, directly AHP for forecasting via expert opinions. As examples of this group, in inventory and logistic planning (Korpela, Tuominen 1996), demand forecasting of resident in Singapor (Ong, Chew 1996), the forecasting of $/DM parity in Turkey (Ulengin, Ulengin 1994).

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In the second group, AHP is a instrument of forecating adjustment. As examples of this group, Wolfe, Flores earning forecasting ARIMA adjusted with AHP by Wolfe, Flores (1992). In the other examples AHP was used to adjust with CENTROID (Flores, Olson 1990).

Belton and Goodwin had measured on using AHP as a judgemental forecasting. According to this, AHP does not have compedence for using directly judgemental forecasting. However it could be owned a secondary role. For example forecasting adjustment. In this situation, it could be provided new openings and perpectives with AHP (Belton,Goodwin 1996).

Dyer and Forman (1991), have recommended on using AHP for forecasting:

- It could be used as an expert opinion forecasting,
- In the election of most suitable forecasting method
- It could be used to combine various forecasting methods

The three steps process is advised related on AHP for demand forecasting (Korpela, Tuominen 1996: 163):

1) The factor which effects on level and structure of demand, are defined in AHP Hierarchy.
2) The priorities of components in hiearachy are determined.
3) The priorities of components are synthesized to provide whole priorities, and estimated combining demand, tested by consistency.

AHP has some advantages in group making. These advantages are (Dyer, Forman 1992):

- All values, individual and/or group, tangible and/or intangible are contented in group decision process with AHP.
- The discussion focuses on goal instead of options into the group.
- The discussion media in which is considered all factors, is established with AHP.
- The discussion continues untill concessus, due to provide opinions from each member.

During the using AHP in group decision or forecasting procedure, it is asked to compare the criteria duality, via questionary face to face. It is not obligatory that, these members are expert, but it will be better they have knowledge about issues. If the decision would be made with a group joint, while each participant was reported his/her opinions, they also should support others' opinions.

There is no problem, when the participants combined common decision. However if this situation couldn't have been got then the concessus process will start. In that case, it is a way to synthesize via applicate to others opinions or geometrical mean (Dyer, Forman 1991). As it is more suitable in the procedure of transformation the individual opinions to group decisions, geometrical mean is prefered in AHP (Aczel, Saaty 1983; Saaty 1989).

Forecasting in Hotels

The lodging industry has more sensitive structure to demand fluctations. It often meets crises to depend on reduced demand. The demand forecasting in lodging industry has been relatively important to depend on nature of industry and operational characteristics and difficulties. This importance is not only related on wide demand fluctations, but also the efforts to increase occupancy rate.

There are many forecasting issues like bookings, arrivals, nights, duration of stay, revenue in the hotels. These could be estimated sepearetly (disaggreation) or combined (aggreation). Aggreation forecastingruns downwardand called downward forecasting. Upward forecasting is defined as forecasting for each unit sepearetly. In the stationary demand periods, downward forecasting is less costly and more accurately. In contrast, upward forecasting is preferred (Weatherford et al 2001).

In hotels, forecasting differs for individual and group customers. Individual customers are predicted to know future demand. Groups consider the realization of demand. If the hotels repeat forecasting during a month, the forecasting accuracy would increase (Kimes 1999).

In lodging services, both sector (Choi et al 1999; Chow, Shyu, Wang 1998) and business/hotel (Pfeirer, Bodily 1990; Smith, Lesure 1996; Weatherford et al 2001) level studies have weigthly preferred quantitative forecasting methods.

In the Tourism sector which closerly related on lodging, demand forecasting is also an important area. The studies on demand forecasting generally have used quantitative methods (see for details Archer 1980; Uysal, Crompton 1985; Martin, Witt 1989; Witt, Witt 1995). Especially it can be seen using econometrical models increasingly (Witt, Witt 1995). However, Delphi, Executive Board Opinions, Cross Impact Analysis, Probability Forecasting (Witt, Moutinho 2000), Neural Networks (Law, Au 1999) are met as advanced methods.

For short term while the expert opinions are being included to forecasting procedure, it is recommended that forecasting algorithm contented or combined subjective experience, opinions, forecast and knowledge (Rajopadhye et al 2001). Airlines and lodging sector have smilar characteristics to depend on demand natures. In study on Airlines, the impacts of forecasting accuracy on revenue, it is reported that an 10% forecasting adjustment generated increase revenue between %5-20 (Lee 1990).

An Integrated Forecasting Approach for Hotels

Goal and Importance

The reducing future uncertainty, could be increased occupancy rate and decreased costs to depend on idle capacity. In this study, due to analysis demand characteristics, it will be estimated demand fluctations crises. Moreover it is also aimed that continual forecasting procedure systematically for hotels. This procedure should be opened to improvement.

When the studies on demand forecasting were analysized, it could be seen that, these studies focused either national/regional tourism demand or quantitative market analysis. Therefore the approaches of which suitable for hotel, micro level, using quantitative and qualitative methods advantages and, passed ones' limits with the others' are required.

Assumptions and Limitations

The approache of this study, can be applicated to estimate demand and crises by which the hotels/lodging business have orderly past data, sources, technical and intellectual capital. Even if these qualiffications generally belong the larger lodging business, small and medium size hotels also utilize.

This study was realized with real data of a fivestar hotel in Ankara. Even though every lodging business differs from the others, this study deals with common characteristics.

Booking and sales pre-contracts are common ways to reduce future risks and uncertainty in lodging sector. In this study main assumption is there was no booking and sales contract in this hotel. In addition to they are not considered like target market, customer, market segmentation and qualitative demand (yield management).

Data Sources

First hand data sources are experts (tourism academicians, officers, journalists e.t.c.) and professionals (department managers of fivestar hotels, travel agency and F&B managers) in Ankara.
Secondary data for quantitative forecasting is provided from Local Tourism Directorate in Ankara. Each hotel must send to Local Tourism Directorate its arrivals, nights, occupancy rates montly in Ankara.

Operation

The operation was realized by three steps.

First Step: The Panel of Variables
The determination of variables/factors which will be used in AHP model. For this goal, all variables of demand forecasting in lodging sector, the variables belongs to Ankara, and the others. Totaly a list of 40 variables were measured by 21 academicians in the Department of Tourism/Hospitality in a Delphi based panel. According to results of the panel, 25 variables (Table 1) were measured relatively more important by panelists.

Table 1 Grouping The Factors in Model

Criterias	Factors
International Criteria	Global economic crises Wars and other diplomatical crises International organisations/events
National Criterias	Currency Exchanges Inflation Ratio Economic resession or crise
Social Criterias	Political Mobility Terror, Anarchy, strike e.t.c Education and or training activities Utilizing Public /governmental services Activities/Events/organizations in Ankara
Hotel Criteria	Rooms Marketing Activities Sales prices New product/capacity facilities
Natural Criterias	In God likelihood Climate Enviromental/ecological Issues
Competition Criterias	Rooms Sales Prices Marketing activities New product/capacity facilities
Customer Criteria	Potencial Volume Travel frequency Service expectations

Second Step: Forecasting
The quantitative forecasting procedure was applicated to a fivestar hotels' past data in Ankara. The series belong to this hotel, contents 1990-2002 montly 148 periods for arrivals and nights. Arrivals can be defined as the number of persons who arrival hotel during a month. And night can be defined as the number of nights of stayed persons during a month in the hotel. The night figures do not stated room based but bed montly.

Trend and Seasonality of these series are less and stationary relatively. Especially when the first differences were taken, the series have became completely stationary. The seasonality factors can be seen Table 2.

Table 2 The Seasonality of Series

Period	Month	Arrivals	Nights
1	January	0,773346	0,781686

2 February	0,839606	0,831445
3 March	0,874013	0,885224
4 April	0,974557	0,936058
5 May	1,20107	1,11778
6 June	1,02045	1,03631
7 July	0,934402	0,956627
8 August	1,00506	1,06967
9 September	1,17032	1,16042
10 October	1,21761	1,19584
11 November	1,11170	1,08841
12 December	0,869521	0,948865

As quantitaive methods expo-smooth, double expo-smooth, Winters', Decomposition, Moving Average, ARIMA and Regression were applicated to nights and arrivals series. The error measures of these methods are given Table 3 and 4.

Table 3 The Comparison of Forecasting Methods for Arrival Series

Method	MAPE	MAD	MSD
Decomposation	*22*	*850*	*1319621*
Exponential Smoothing	*20*	*726*	*1041545*
Holt's Exposmooth.	*21*	*834*	*1283950*
Winter's Season. Add	*17*	*645*	*826375*
Winter's Season. Multi.	*17*	*631*	*788910*
ARIMA (1,1,1)	*25*	*937*	---------

Table 4 The Comparison of Forecasting Methods for Night Series

Method	MAPE	MAD	MSD
Decomposation	18	1176	2227550
Exponential Smoothing	21	1338	2793334
Holt's Exposmooth.	21	1408	3474267
Winter's Season. Add	15	982	1632602
Winter's Season. Multi.	15	988	1703617
ARIMA (1,1,1)	23	1453	----------

The highest accuracy was obtained from Winters' Seasonality Adjustment. As the forecasting term was short, the expo-smooth were more suitable and available. According to Winters' Method, the results of forecasting for following six months, are given Table 5.

Table 5 Results of Forecasting Process by Winter's (Multiplicative) Seasonality Adjustment

Period	Month	Year	Arrival	Night
149	May	2002	4468	8180
150	June	2002	4195	7233
151	July	2002	4346	6556
152	August	2002	4243	6700
153	September	2002	4672	7882
154	October	2002	4836	8211

Third Step: Forecasting Adjustment

The AHP hierarchy that used for forecasting adjustment, was established at this step. In this hierarchy, goal (level 1), the variables from first step (level 2); scenarios to depend on variables (level 3); the effects on hotel demand (level 4) are positioned as seen Figure 1.

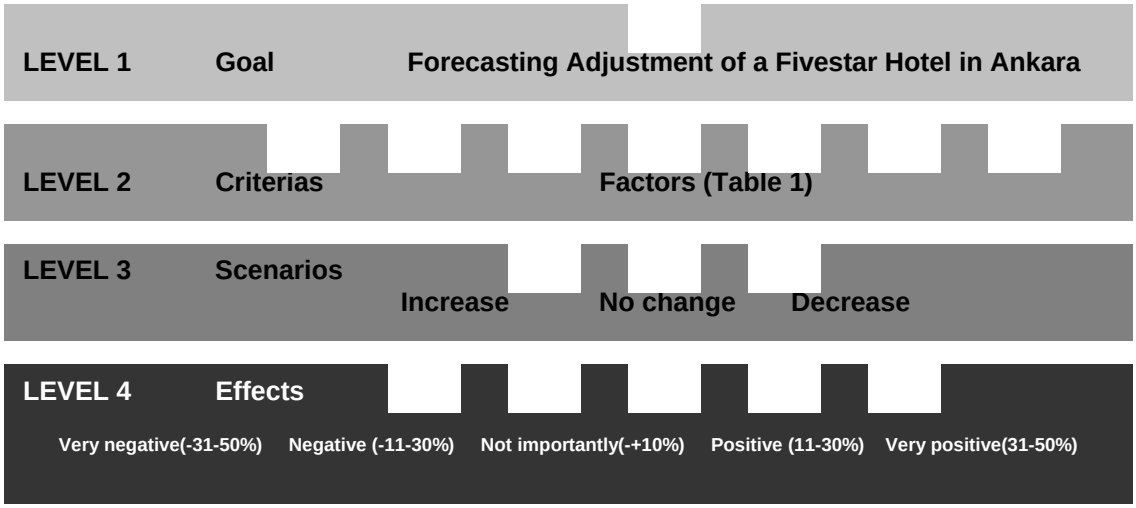

Figure 1 AHP Hierarchy For Forecasting Adjustment

The Delphi based panel was organised and realized with 30 panelists between April 19-26 2002. The panelists are selected from sales/marketing, room division, front office, travel agencies, F&B Business managers as professionalists; and tourism academicians, officers, journalists, advisors, NGO (tourism) represantatives as experts in Ankara.

Various questionaries were tested in individulas and small groups except panelists, and most available, understnadable and easy fullfilable questionery was selected. The dual comparison matrixand nine scale of AHP werent used. There were three type questions in this form. The first type is serviced relatively weights as percentage. Second, probability of scenarios as percentage and third one priorities in five scale. The rates of adjustment were determined to depend on earlier studiescand changings of nights and arrivals figures in hotel, the answers of this question were included to hierarchy with probability values in Table 6.

Table 6 Probability Values of Five Scale in Questionary

Questionary Scale	Value
1 Stronger probability	0,531
2 Stong probability	0,252
3 Fifty-fifty probability	0,124
4 Poor probability	0,062
5 Very poor probability	0,031
Total	1,00

In this inquiry, the panelists do not know the others and various place like Delphi. The questionaries mostly are delivered by hand. The required explanation and details were stated face to face. The return of questionary was realized totaly 27 concerning 13 professionalists and 14 experts.

Results

In the adjustment procedure, it was no required repeated rounds for concessus, instead of this, geometrical mean was preferred. The medians, group medians, deviations, and variances of panelists's

opinions were supported this decide. The results of panel for criterias and factors relatively weights in Table 7, the adjustment gaps in Table 8.

Table 7 The Weights of Criterias and Factors According to Panelists

1 Criterias	2 Factors		1st Normalization 1 X 2
	Global economic crises	0,395	0,0529
International	Wars and other diplomatical crises	0,48	0,0643
Criterias 0,134	International organisations/events	0,125	0,0167
	Currency Exchanges	0,331	0,0516
National Criterias	Inflation Ratio	0,214	0,0333
0,156	Economic resession or crise	0,455	0,0709
	Political Mobility	0,366	0,0567
	Terror, Anarchy, strike e.t.c	0,152	0,0235
Social	Education and or training activities	0,094	0,0145
Criterias	Utilizing Public /governmental services	0,128	0,0198
0,155	Activities/Events/organizations in Ankara	0,26	0,0403
	Rooms	0,288	0,0493
Hotel	Marketing Activities	0,256	0,0232
Criterias	Sales prices	0,31	0,0493
	New product/capacity facilities	0,146	0,0232
	Act of God likelihood	0,53	0,0387
Natural Criterias	Climate	0,15	0,0109
	Enviromental/ecological Issues	0,32	0,0233
	Rooms	0,268	0,0536
Competition	Sales Prices	0,299	0,0598
Criterias	Marketing activities	0,244	0,0488
	New product/capacity facilities	0,189	0,0378
	Potensial Volume	0,323	0,0397
Customer Criterias	Travel frequency	0,342	0,0420
	Service expectations	0,335	0,0414

The panelists, with 37%, showed that the scenarios wouldn't have importantly effected on followed month (May) demand of hotel. According to this, minus or plus 10% deviation from quantitative methods' results was expected.

Table 8 The Results of Adjustment Panel

Estimated Probability	Verbal statement	Quantify Gap
0,3728	Not importantly effect	-10-10%
0,2240	Positive effect	11-30%
0,1638	Negative effect	11-30%
0,1281	Very positive effect	31-50%
0,1064	Very negative effect	-31-50%

The analysis of data, was realized in June and the realized arrivals and nights of hotel had come to Local Tourism Officer. They were a 3777 for arrivals, and 7455 for nights in June.

At the end of adjustment panel, the arrivals had been expected between 3775-4614 and nights 6510-7956 in June for this hotel. So it will not be incorrect to say that the arrivals and nigts were realized in expected gaps. The forecasting error is for arrivals = 3777 – 4195 = - 418, and for nights = 7455 – 7233 = 222.

Even if the adjustment panel seems to succesful, the operation should be repeated several times at business level with department managers as panelist. It was no possible to repeat in this study.

Conclusion

The quantitative forecasting methods oftenly were used in hotels. Newertheles there are many factors which effects on demand of hotels. In quantitative methods, there are some difficulties assesibility, for all factors.

The qualitative methods, if they did not based on quantity, don't get the accuracy results positively with their costs, required efforts, and time. The selection criteria of forecasting methods (easier application, cost, time and source, decision making e.t.c.) show alone qualitative method is not suitable for forecasting in hotels.

For hotels and other lodging businesses, forecast accuracy is seen as the most important selection criteria. Because of this demand fluctations largely effected on operations in this sector. Therefore to maximize the forecasting accuracy, it is the most suitable way that integrated forecasting quantitative and qualitative methods. Firstly at the selection step of quantitative methods, accuracy should be considered. Forecasting adjustment with a quantitaive methods can be achived to pass the limits and disadvantages of quantitaive methods in lodging sector.

AHP has some advantages especially group design, more many factors and assesibility/countability for intangible factors. As it is not directly forecasting method, some characteristics, like dual comparison, nine rank scale e.t.c., difficulties the forecasting adjustment procedure. However, AHP based adjustment procedure has some advantages like flexibility, dynamicality and opening, understandability, easiness.

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