THE CONNECTION IDENTIFICATION BETWEEN THE NET INVESTMENTS IN HOTELS AND RESTORANTS AND TOURISTIC ACCOMODATION CAPACITY BY USING THE ANOVA METHOD

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Abstract:
In the purpose of giving the answers to customers' harsh exigencies, in the Romanian tourism development has to be taking into account especially the "accommodation" component. The dimension of technical and material base of accommodation can be express through: units' number, rooms' number, places number. The most used is "places number" indicator. Nowadays as regarding the tourism Romanian investments there are special concerns caused by peculiar determinations. The study aim is represented by identifying of a connection existence between net investments in hotels and restaurants and tourism accommodation capacity, registered among 2002 -2007period in Romania, by using the dispersion analysis ANOVA method.

Key words: Net Investments, Tourist's accommodation capacity, Variant analysis

JEL Classifications: B23, C13, C51, C52

INTRODUCTION

In the widening conditions and methods improvement of phenomenon commensurable, it is possible the most correct evaluation for hy postasis displayed at micro and macro economy level. Thus is necessary the each analyzed situation depiction, the comparison between two or many collectivities, as well as the analysis influence of the implied factors.

A dispersion analysis method is ANOV A method – Analysis of Variance, contoured by A. Fisher, which suppose grouping and study of interdependencies that appear during route phenomenon display and economical processes. The study of these connections suppose to build a regression model, which implies getting the regression equation, testing the regression model validity, the settlement and testing of correlation report and testing the purport and parameters evaluation for the regression model on the trusting intervals.

In the case of ANOVA method, the analyzed parameters values can be calculated or could be used for determining them the EXCEL software.

1. REALIZING THE REGRESSION MODEL

The evolution of net investments in hotels and restaurants and touristic accommodation capacity in Romania, during 2002-2007, is presented in the following table:

Table no: 1. The evolution of net investments in hotels and restaurants and touristic accommodation capacity, registered in Romania, between 2002 -2007

Years	Net investments in hotels and restaurants (lei million current prices)	Touristic accommodation capacity (existing places)
2002	331,5	272596
2003	481,5	273614

2004	750,4	275941
2005	936,6	282661
2006	1249,2	287158
2007	1600,9	283701

Source: Romanian Statistical Yearbook, INS, 2008, p. 517 .

For determining and analysis the connection between net investments in hotels and restaurants and touristic accommodation capacity, it will be us ed the information from table no: 1, and applied the dispersion analysis method (ANOVA – Analysis of Variance).

ANOVA method supposes the following main aspects: determining the regression equation, testing the validity of the regression model, establishing and testing the multiple reports, and testing the significance and estimate the parameters of the regressi on model.

1.1. DETERMINING THE REGRESSION EQUATION

The identification of the regression equation which adapts the connection between net investments in hotels and restaurants and touristic accommodation capacity suppose to follow these steps:

- Identifying the two variables: x_i and y_i
  x_i – factorial variable – Net investments in hotels and restaurants
  y_i – resultant variable – Touristic accommodation capacity
- Estimating the parameters for the linear regression model: a and b

Linear regression model imply the linear regression equation. Regression equation which shapes the connection between net investments in hotels and restaurants and touristic accommodation capacity is: $y = a + bx_i$.

Parameters a and b are determined using the least squares method, and n represents the observations.

In the following table are presented the intermediary values necessary for applying least squares method:

Table no: 2. The algorithm necessary for applying least squares method

Years	Net investments in hotels and restaurants (lei million current prices)	Touristic accommodation capacity (existing places)	x_i^2	$x_i y_i$
2002	331,5	272596	109892,25	90.365.574,00
2003	481,5	273614	231842,25	131.745.141,00
2004	750,4	275941	563100,16	207.066.126,40
2005	936,6	282661	877219,56	264.740.292,60
2006	1249,2	287158	1560500,64	358.717.773,60
2007	1600,9	283701	2562880,81	454.176.930,90
∑	5.350,10	1.675.671,00	5.905.435,67	1.506.811.838,50

Knowing that n = 6, result:

$$\begin{cases} 6 \cdot a + 5350{,}10 \cdot b = 1675671 \\ 5350{,}10 \cdot a + 5905435{,}67 \cdot b = 1506811838{,}50 \end{cases}$$

so: a = 269343,7 and b = 11,1416.

The regression line is: $y = 269343,7 + 11,1416 \cdot x$

The *a* free term indicates the value of resulting variable when all unessential factors have a constant action. In other words, *a* = 269343,7 indicates the medium level of tourism accommodation capacity variable determined through the other factors influences less net investments in hotels and restaurants.

The positive value of the regression (*b*) indicates the fact that there is a direct connection between the net investments in hotels and restaurants and tourism accommodation capacity, the both variables modifying in the same direction. The value of regression quotient b = 11,1416 reveals the fact that the accommodation capacity increases with approximately 11 places when the investments increase with 1 million.

The following stages in the linear regression model analysis model represent the method checking validity, through which is demanded the model establishment and utilization. In order to find the solution of problems and to facilitate the calculus it has been applied the EXCEL program.

1.2. TESTING THE VALIDITY OF THE REGRESSION MODEL

Testing the validity of the regression model supposes making the following steps:

- Null hypothesis – H_0: the model is not valid
- Alternate hypothesis– H_1: the model is valid
- In report with data is to be applied F test (Fisher Snedecor)
- Is to be settled the purport limit α (in this status α = 0,05, due to appearance probability calculus of the results is 95%) and is get the rejection region limit:
  $F_{\alpha;k;n-k-1} = F_{0,05;1;4} = 7,71$
- Is to be settled the test F statistics

To settle the statistics of test F it has been used EXCEL software. Thus has been getting the following necessary values for validity analysis of the regression model:

Table no: 3 Table ANOVA with necessary values for validity analysis of the regression model

ANOVA					
	Df	SS	MS	F	Significance F
Regression	1	1,41E+08	1,41E+08	14,05434	0,019966
Residual	4	40093989	10023497		
Total	5	1,81E+08			

- The assessment of final decision for testing the model validity depending on the F_c value:
  - If $F_c > F_{\alpha;k;n-k-1}$, then H_0 is rejected, the regression model being statistic valid;
  - If $F_c < F_{\alpha;k;n-k-1}$, then H_0 is supposed true, the regression model not being statistic valid

From the 2.3 table results that, in the case of these two analyzed indicators – The net investments in hotels and restaurants and Tourist accommodation capacity, $F_c = 14,05434 > F_{\alpha;k;n-k-1} = 7,71$, then H_0 is to be rejected, the model of regression being statistic valid.

In table appears also an element that reflects the validity of the model: Significance F. If the achieved value of this element is smaller than 0,05 then is rejected H_0. In the case of this

application, Significance F = 0,019966 < 0,05, from where results that the regression model is statistically valid.

1.3. ESTABLISHING AND TESTING MULTIPLE R

Multiple R, in statistics, is used to measure the intensity rate for a connection between a resultative variable and a factorial variable, while in econometrics is introduced also in the validation stage of linear regression model.

Multiple R $\in$[0,1], his values having the following significance [3]:

- if R = 0, the two variables are independent, so do not there is a connection between them (all the averages are equal);
- if R $\in$(0;0,2], there is o very feebly connection between the studied va riables;
- if R $\in$(0,2;0,5], there is feebly connection between the two variables;
- if R $\in$(0,5;0,75], there is a medium intensity connection between the variables;
- if R $\in$(0,75;0,95], there is a strong connection between the two variables;
- if R $\in$(0,75;1), there is a very strong connection between the variables;
- if R = 1, there is a perfect connection, determinist or functional between the two variables.

In table no: 4 are presented: Multiple R (R), R Square (R^2), Adjusted R Square (R^2) and Standard Error (s_e):

Tabel no: 4 Values for R, R^2, $\bar{R}^2$ and s_e parameters

SUMMARY OUTPUT	
Regression Statistics	
Multiple R	0,882296
R Square	0,778447
Adjusted R Square	0,723058
Standard Error	3165,991
Observations	6

The value of Multiple R is 0,882296. This shows that , between net investments in hotels and restaurants and touristic accommodation capacity there are a strong connection.

R Square is 0,778447 and indicates that the percent influence of the volume of net investments on touristic accommodation capacity is ap proximate 77,84%. Standard Error is 3165,991.

By detailing this component of verifying the model validity, have been determined the elements necessary for complete analysis of the studied phenomenon.

1.4. TESTING THE SIGNIFICATION AND ESTIMATING THE LINEAR REGRESSION MODEL PARAMETERS ON TRUST INTERVALS

Parameters a = 269343,7 and b = 11,1416, raters in linear regression equation:

$$y_i = a + b \cdot x_i \Rightarrow y_i = a + b \cdot x_i$$

have been determined by applying least square method.

Testing the signification of parameters a şi b has in view the size of selected sample.

Because n < 30 it must applied Student test.

The necessary elements for testing parameters and establishing the trust intervals were determined using EXCEL and are presented in an ANOVA table (table no: 5).

Table no: 5 The necessary elements for testing parameters (α, β) and establishing the trust intervals

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	269343,7	2948,442	91,35121	8,61E-08	261157,5	277529,9
X Variable 1	11,1416	2,971955	3,748912	0,019966	2,890109	19,39308

The free term (Intercept) appears under form of a quotient. The value of quotient of 269343,7 indicates the fact that, in the condition of remaining constant the accommodation capacity than the investments have been established at a value of 11, 14.

Due to t_{ca} = 91, 35121, and the signification threshold P-value is 8,61E-08 < 0,05, that means the respective quotient *a* is statistic significant. The lower limit of the trusting interval for this parameter is positive, established at the value of 261157, 5, and the upper limit reaches till the value of de 277529,9.

The value of *b* quotient is approximately of 11, 14 and shows that at the increasing of hotels and restaurants investments by 1 million lei, the tourist's accommodation capacity will increase with approximately 11 places.

Due to t_{cb} = 3,748912, and the signification threshold P-value is 0,019966 < 0,05, means that respective quotient *b* is statistic significant. The lower limit of the trusting interval for this parameter is positive, established by the value of 19,39308, and the upper limit reaches till value of 19,39308.

2. CONCLUSIONS

Following the test of regression model validity, it has been established the fact that this model is statistically valid. Thus, it has been noticed that between net hotels and restaurants investments and tourist' accommodation capacity there is o direct and strong connection, the correlative report having the value of 0,88.

The influence percent of the making investments in hotels and restaurants over tourist' accommodation capacity is of approximately 77,84%.

The values of determined estimators parameters of the regression equation show that at the increasing with 1 million lei of the investments in hotels and restaurants, the tourist' accommodation capacity will increase with approximately 11 places.

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