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# Estimation of the Influence of the Seasonality Factor in the Strategic Activity of Tourism and Hospitality Enterprises

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***Abstract*: Seasonality in the modern interpretation is presented in the form of dynamic oscillatory processes that determine the periods of growth and decline of various kinds of economic phenomena and processes. Among all industries, tourism and hospitality are most clearly affected by the seasonality factor, since it directly depends on periodic changes in climatic conditions during the calendar year. The tour operator, as an active participant in the tourism market and the main producer of tourist products, must take into account the fact that the possibilities of production and consumption within certain tourist destinations are limited by seasonal climatic conditions.**

***This study offers a methodology that is based on the Holt-Winter method, which takes into account the seasonality factor in calculating forecast values. A methodology for calculating forecast values using the MS Excel tool was also developed. The proposed methodology is very simple to implement in practice, which will allow all organizations, when building forecast data, to easily access and use large volumes of data.***

***Keywords* : *Enterprise, Hospitality, Seasonality Factor, Strategic Activity, Tourism.***

## I. INTRODUCTION

In the modern world, an acute shortage of reliable and relevant information that is important for making a managerial decision is revealed. In world practice, there are many methods for forecasting demand, but which one is best for making the right decision? For example, you can use such a technique as "Expert methods" [1-3], on the one hand, the organization focuses on its potential customers and their preferences,

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but this method also has the other side of the coin, and such as the understanding of the expert and the organization. The forecasting process at this point in time is relevant and in demand by large organizations. Prediction as a method is used in economics, namely in management. In world management practice, it is believed that the concepts of "strategy" and "forecasting" are closely intertwined, they are not at all similar and do not replace each other. The strategy and forecasts differ primarily in terms of time limits, as well as in the stage of detailing the characteristics contained in their characteristics, the stage of accuracy and probability of their result as a whole, targeting and, ultimately, the legal basis. Forecasts are indicative, but plans have a prescriptive power. At this point in time, no sphere of society has the ability to do without forecasts as a means of knowing future events [4-7].

To date, in world practice, there are many different interpretations of the methods of strategic planning of an enterprise. But we can distinguish the main areas: like all methods in conducting marketing research, it can be divided into heuristic, in the application of which the most part is subjective. And on economic and mathematical methods, the use of which is dominated by objective principles, which include static methods.

Econometric methods include: forecasting based on time series (extrapolation of a dynamic series, forecasting seasonal and cyclical fluctuations, adaptive forecasting methods, forecasting based on indicators and indices, extrapolating from envelope curves); forecasting based on a regression model; forecasting based on a system of simultaneous equations.

When applying economic and mathematical methods, modeling approaches are clearly formulated and have every chance, and can also be reproduced by other persons who will inevitably come to the same forecast, so *the aim of the study* is to choose the optimal multiplicative model for assessing the influence of the seasonality factor in enterprise strategic planning tourism and hospitality industries.

The need to develop and implement a strategic planning system in the enterprises of the tourism and hospitality industry is dictated by the increasing instability of the external environment, the increase in the rate of its economic and social changes, which significantly exceed the response rate of hotel business entities. The enterprise must determine and forecast the parameters of the external environment,

the range of products and services, prices, suppliers, sales markets, and most importantly, its long-term goals and the strategy for achieving them. This part of the work covers the development of a strategic plan.

## II. PROPOSED METHODOLOGY

### A. Algorithm

The use of multiplicative models is due to the fact that in some time series the value of the seasonal component represents a certain fraction of the trend value. The multiplicative model F in general can be represented as a formula:

$$F = T * S * E \quad (1)$$

where $T$ – trend component;
$S$ – seasonal component;
$E$ – random component (forecast error).

The Holt method (in other sources of Holt) and the modified Holt method, the Holt-Winter method, were taken from existing quantitative methods.
The method proposed by Holt is based on an estimate of the parameter, namely, the degree of linear growth (or decrease) of the indicator over time. The growth factor λ is estimated by the coefficient $b_t$, which in turn is calculated as the exponentially weighted average of the differences between the current exponentially weighted average values of the $u_t$ process and their previous $u_{t-1}$ values. A characteristic feature of this method: the calculation of the current value of the exponentially weighted average ut includes the calculation of the past growth rate bt-1, thus adapting to the previous value of the linear trend. Next, we consider the equation for the Holt method:

$$u_t = Ad_t + (1 - A)(u_{t-1} + b_{t-1}) \quad (2)$$

$$b_t = B(u_t - u_{t-1}) + (1 - B)b_{t-1} \quad (3)$$

where $A$ and $B$ are two smoothing coefficients set independently from each other (take values from 0 to 1).
Before proceeding with forecasting for a particular predictive trend model, it is necessary to clarify the period for which the forecast is made. Throughout this chapter, we assume that the forecast is calculated at $\tau$ time points ahead (the period of establishment), i.e., up to the moment $t + \tau$ (forecast horizon). After estimating the growth (or fall) indicator in the Holt model, the forecast for the time moment $f_{t+\tau}$ is calculated using the following formula:

$$f_{t+\tau} = u_t + b_t \tau \quad (4)$$

where $u_t$ – the estimate of the average current value;
$b_t$ – the expected growth rate;
$\tau$ – the number of prediction time instants.
In the above methods, an obvious drawback is indicators such as a shift, relative to the source data, of the "smoothed" data to the right. These disadvantages include moving average and exponential smoothing methods.
These disadvantages are easily prevented by the Holt method. This method can be considered as a modification of the method of exponential smoothing, where at each stage the data is not just averaged, but a trend component is selected, which is added to the smoothed data.
According to the data smoothed by this method, one can both construct a regression function and calculate predicted values. To the main Holt method, we also refer to the consideration of the modified Holt method - the Holt-Winter method (Winter).

Many products tend to increase or fall in sales, especially when they are first produced or when competing products appear. For some products, seasonal changes in the level of sales are significant, therefore, to forecast the sale of goods, it is advisable to take into account the specific nature of the trend and seasonal fluctuations. Based on the Holt Winter model (Winter, Winters) he created his own predictive model that takes into account the exponential trend and additive seasonality.

The Holt-Winter model is an extension of the Holt method to three-parameter exponential smoothing. This means that the method is characterized by three parameters that must be selected in order to obtain a forecast. The selection of these parameters can be done by simple enumeration. Then we look at the received "forecasts" in the past - the model, select those parameters at which the model most closely repeats reality. Holt-Winter models can take seasonality into account in multiplicative and additive variants. Roughly speaking, the multiplicative case represents seasonality as a product, and additive as a sum.

The Holt-Winter method considered theoretically shows what this model complements the main Holt methodology. Next, we consider a detailed description of the method, in the formulas and more clearly indicate the difference between them. The formula is as follows:

$$Y_p(t + k) = [a(t) + kb(t)]F(t + k - L) \quad (5)$$

where $k$ is the lead period;

$Yp(t)$ is the calculated value of the economic indicator for the t-th period;

$a(t)$, $b(t)$ and $F(t)$ are the coefficients of the model;

$L$ is the seasonality period (for quarterly data L = 4, for monthly data L = 12).

The value of $F(t + k - L)$ is the value of the seasonality coefficient of the period for which the economic indicator is calculated. Obviously, for small values of t, the argument of the functions F will be negative. The refinement of the model coefficients is carried out according to the formulas:

$$a(t) = \frac{a_1 Y(t)}{F(t-L)} + (1 - a_1)[a(t - 1) + b(t - 1)] \quad (6)$$

$$b(t) = a_3[a(t) - a(t - 1)] + (1 - a_3)b(t - 1) \quad (7)$$

$$F(t) = \frac{a_2 Y(t)}{a(t)} + (1 - a_2)F(t - L) \quad (8)$$

At the same time, the application of the algorithm described above does not present significant difficulties in software implementation and gives fairly good results, which makes it possible to use this algorithm for medium-term economic forecasts.

### B. Block Diagram

For clarity, we present the methodology described above graphically (Fig. 1).

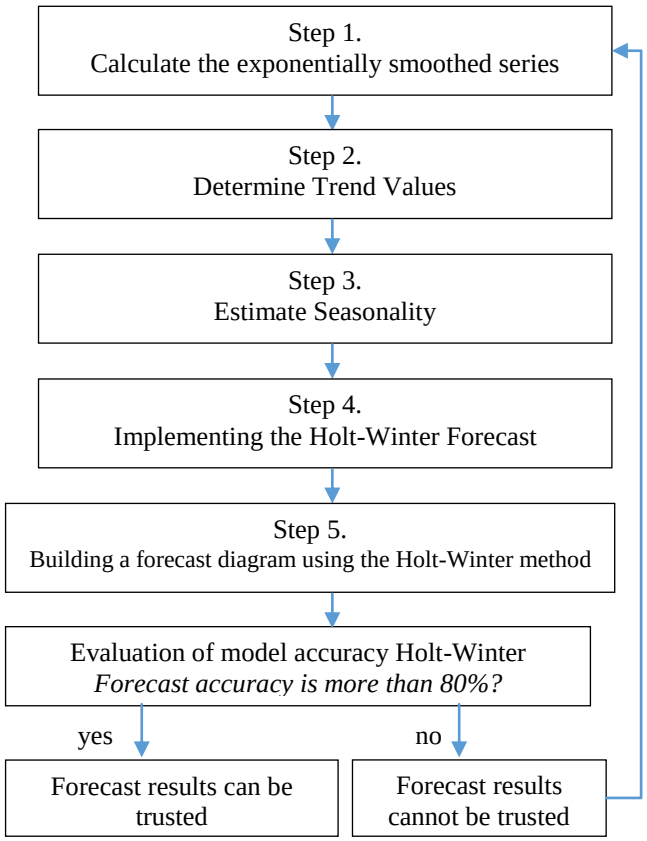



**Fig. 1. Methodology Block Diagram**

## III. APPROBATION OF THE METHODOLOGY: RESULT AND DISCUSSION

After considering this forecasting model in theoretical terms, we can move on to a visual representation of the method. In this case, Microsoft Excel software was used to solve the method, which in the first place will facilitate the perception and understanding of the method.

According to the proposed methodology, we calculate the exponentially smoothed series by the formula (Step 1):

$$L_t = k * \frac{Y_t}{S_{t-s}} + (1-k) * (L_{t-1} + T_{t-1}) \qquad (9)$$

where $L_t$ – the smoothed value for the current period;

$k$ – the smoothing coefficient of the series;

$S_{t-s}$ – the seasonality coefficient of the previous period;

$Y_t$ – the current value of the series (for example, sales);

$L_{t-1}$ – smoothed value for the previous period;

$T_{t-1}$ – trend value for the previous period.

The smoothing coefficient of the series k is set manually and is in the range from 0 to 1.

For the first period at the beginning of the data, the exponentially smoothed series is equal to the first value of the series (for example, sales for the first month) L1 = Y1; Seasonality in the first and second periods of St-s is 1. In the attached file, enter the value L (Fig 2):

D6 =$D$3*C6/$F$1+(1-$D$3)*(D5+E5)

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| 1 | | | Seasonality factor for the first year | | | 1 |
| 2 | | | | k= | B= | q= |
| 3 | | | | 0,5 | 0,9 | 0,5 |
| 4 | Year | Month | Services provided, $ | Lt | Tt | St-s |
| 5 | 1 | 1 | 18250,0 | 18250,0 | | 1 |
| 6 | | 2 | 19425,0 | 18837,5 | 528,8 | 1 |
| 7 | | 3 | 23580,0 | 21473,1 | 2424,9 | 1 |
| 8 | | 4 | 25480,0 | 24689,0 | 3136,8 | 1 |
| 9 | | 5 | 24500,0 | 26162,9 | 1640,2 | 1 |
| 10 | | 6 | 24750,0 | 26276,6 | 266,3 | 1 |
| 11 | | 7 | 27800,0 | 27171,4 | 832,0 | 1 |
| 12 | | 8 | 25400,0 | 26701,7 | -339,5 | 1 |
| 13 | | 9 | 24900,0 | 25631,1 | -997,5 | 1 |
| 14 | | 10 | 23590,0 | 24111,8 | -1467,1 | 1 |
| 15 | | 11 | 22400,0 | 22522,3 | -1577,2 | 1 |
| 16 | | 12 | 22300,0 | 21622,6 | -967,5 | 1 |
| 17 | | | | | | |

**Fig. 2. Calculation of an exponentially smoothed series**

Step 2. Determine the trend values

$$T_t = b * (L_t - L_{t-1}) + (1-b) * T_{t-1} \qquad (10)$$

where $T_t$ is the trend value for the current period;

$b$ – trend smoothing coefficient;

$L_t$ – exponentially smoothed value for the current period;

$L_{t-1}$ – exponentially smoothed value for the previous period;

$T_{t-1}$ – trend value for the previous period. The trend smoothing coefficient b is set manually and is in the range from 0 to 1. The trend value for the first period is 0 (T1 = 0);

We calculate the trend values (Fig. 3):

E7 =$E$3*(D7-D6)+(1-$E$3)*E6

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| 1 | | | Seasonality factor for the first year | | | 1 |
| 2 | | | | k= | B= | q= |
| 3 | | | | 0,5 | 0,9 | 0,5 |
| 4 | Year | Month | Services provided, $ | Lt | Tt | St-s |
| 5 | 1 | 1 | 18250,0 | 18250,0 | | 1 |
| 6 | | 2 | 19425,0 | 18837,5 | 528,8 | 1 |
| 7 | | 3 | 23580,0 | 21473,1 | 2424,9 | 1 |
| 8 | | 4 | 25480,0 | 24689,0 | 3136,8 | 1 |
| 9 | | 5 | 24500,0 | 26162,9 | 1640,2 | 1 |
| 10 | | 6 | 24750,0 | 26276,6 | 266,3 | 1 |
| 11 | | 7 | 27800,0 | 27171,4 | 832,0 | 1 |
| 12 | | 8 | 25400,0 | 26701,7 | -339,5 | 1 |
| 13 | | 9 | 24900,0 | 25631,1 | -997,5 | 1 |
| 14 | | 10 | 23590,0 | 24111,8 | -1467,1 | 1 |
| 15 | | 11 | 22400,0 | 22522,3 | -1577,2 | 1 |
| 16 | | 12 | 22300,0 | 21622,6 | -967,5 | 1 |

**Fig. 3.Calculation of an exponentially smoothed series**

Step 3. Estimate the seasonality using the formula:

$$S_t = q * \frac{Y_t}{L_t} + (1-q) * S_{t-s} \qquad (11)$$

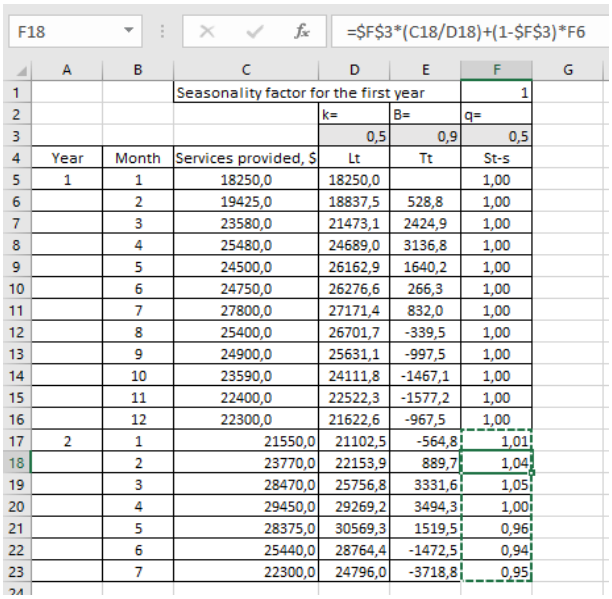
where $S_t$ – the seasonality coefficient for the current period;

$q$ – the seasonality smoothing coefficient;

$Y_t$ – the current value of the series (for example, sales);

$L_t$ – the smoothed value for the current period;

$S_{t-S}$ – the seasonality coefficient for the same period in the previous season.




| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| 1 | | | Seasonality factor for the first year | | | 1 | |
| 2 | | | | k= | B= | q= | |
| 3 | | | | 0,5 | 0,9 | 0,5 | |
| 4 | Year | Month | Services provided, $ | Lt | Tt | St-s | |
| 5 | 1 | 1 | 18250,0 | 18250,0 | | 1,00 | |
| 6 | | 2 | 19425,0 | 18837,5 | 528,8 | 1,00 | |
| 7 | | 3 | 23580,0 | 21473,1 | 2424,9 | 1,00 | |
| 8 | | 4 | 25480,0 | 24689,0 | 3136,8 | 1,00 | |
| 9 | | 5 | 24500,0 | 26162,9 | 1640,2 | 1,00 | |
| 10 | | 6 | 24750,0 | 26276,6 | 266,3 | 1,00 | |
| 11 | | 7 | 27800,0 | 27171,4 | 832,0 | 1,00 | |
| 12 | | 8 | 25400,0 | 26701,7 | -339,5 | 1,00 | |
| 13 | | 9 | 24900,0 | 25631,1 | -997,5 | 1,00 | |
| 14 | | 10 | 23590,0 | 24111,8 | -1467,1 | 1,00 | |
| 15 | | 11 | 22400,0 | 22522,3 | -1577,2 | 1,00 | |
| 16 | | 12 | 22300,0 | 21622,6 | -967,5 | 1,00 | |
| 17 | 2 | 1 | 21550,0 | 21102,5 | -564,8 | 1,01 | |
| 18 | | 2 | 23770,0 | 22153,9 | 889,7 | 1,04 | |
| 19 | | 3 | 28470,0 | 25756,8 | 3331,6 | 1,05 | |
| 20 | | 4 | 29450,0 | 29269,2 | 3494,3 | 1,00 | |
| 21 | | 5 | 28375,0 | 30569,3 | 1519,5 | 0,96 | |
| 22 | | 6 | 25440,0 | 28764,4 | -1472,5 | 0,94 | |
| 23 | | 7 | 22300,0 | 24796,0 | -3718,8 | 0,95 | |

**Fig. 4.** Seasonality Rating

Step 4. Implementation of the forecast using the Holt-Winter method. Forecast for p periods ahead. $\hat{Y}_{t+p}$ is calculated by the formula

$$\hat{Y}_{t+p} = (L_t + p * T_t) * S_{t-s+p} \quad (12)$$

where $L_t$ – the exponentially smoothed value for the last period;

$p$ – serial number of the period for which we make a forecast;

$T_t$ – trend for the last period;

$S_{t-s+p}$ – seasonality coefficient for the same period in the last season.

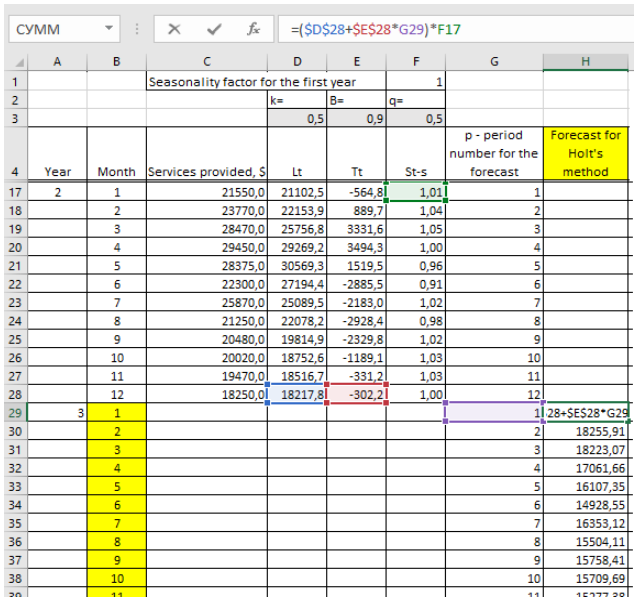
Figure 5 presents the forecast for 11 months in advance. Period numbers are put down in order to make a forecast.

| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| 1 | | | Seasonality factor for the first year | | | 1 | |
| 2 | | | | k= | B= | q= | |
| 3 | | | | 0,5 | 0,9 | 0,5 | |
| 4 | Year | Month | Services provided, $ | Lt | Tt | St-s | p - period number for the forecast |
| 29 | 3 | 1 | | | | | 1 |
| 30 | | 2 | | | | | 2 |
| 31 | | 3 | | | | | 3 |
| 32 | | 4 | | | | | 4 |
| 33 | | 5 | | | | | 5 |
| 34 | | 6 | | | | | 6 |
| 35 | | 7 | | | | | 7 |
| 36 | | 8 | | | | | 8 |
| 37 | | 9 | | | | | 9 |
| 38 | | 10 | | | | | 10 |
| 39 | | 11 | | | | | 11 |

**Fig. 5. Filling periods by numbers**

Enter the forecast formula in the cell. For this, the sum of the values of the exponential series and trend for the last period, multiplied by the period number for the forecast, is multiplied by the seasonality coefficient (Fig. 6).

To stretch the forecast formula for 11 periods ahead, fix the link to the exponential series and the trend value for the last period - for this, select the link and press F4.




| | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| 1 | | | Seasonality factor for the first year | | | 1 | | |
| 2 | | | | k= | B= | q= | | |
| 3 | | | | 0,5 | 0,9 | 0,5 | | |
| 4 | Year | Month | Services provided, $ | Lt | Tt | St-s | p - period number for the forecast | Forecast for Holt's method |
| 17 | 2 | 1 | 21550,0 | 21102,5 | -564,8 | 1,01 | 1 | |
| 18 | | 2 | 23770,0 | 22153,9 | 889,7 | 1,04 | 2 | |
| 19 | | 3 | 28470,0 | 25756,8 | 3331,6 | 1,05 | 3 | |
| 20 | | 4 | 29450,0 | 29269,2 | 3494,3 | 1,00 | 4 | |
| 21 | | 5 | 28375,0 | 30569,3 | 1519,5 | 0,96 | 5 | |
| 22 | | 6 | 22300,0 | 27194,4 | -2885,5 | 0,91 | 6 | |
| 23 | | 7 | 25870,0 | 25089,5 | -2183,0 | 1,02 | 7 | |
| 24 | | 8 | 21250,0 | 22078,2 | -2928,4 | 0,98 | 8 | |
| 25 | | 9 | 20480,0 | 19814,9 | -2329,8 | 1,02 | 9 | |
| 26 | | 10 | 20020,0 | 18752,6 | -1189,1 | 1,03 | 10 | |
| 27 | | 11 | 19470,0 | 18516,7 | -331,2 | 1,03 | 11 | |
| 28 | | 12 | 18250,0 | 18217,8 | -302,2 | 1,00 | 12 | |
| 29 | 3 | 1 | | | | | 1 | 28+$E$28*G29 |
| 30 | | 2 | | | | | 2 | 18255,91 |
| 31 | | 3 | | | | | 3 | 18223,07 |
| 32 | | 4 | | | | | 4 | 17061,66 |
| 33 | | 5 | | | | | 5 | 16107,35 |
| 34 | | 6 | | | | | 6 | 14928,55 |
| 35 | | 7 | | | | | 7 | 16353,12 |
| 36 | | 8 | | | | | 8 | 15504,11 |
| 37 | | 9 | | | | | 9 | 15758,41 |
| 38 | | 10 | | | | | 10 | 15709,69 |

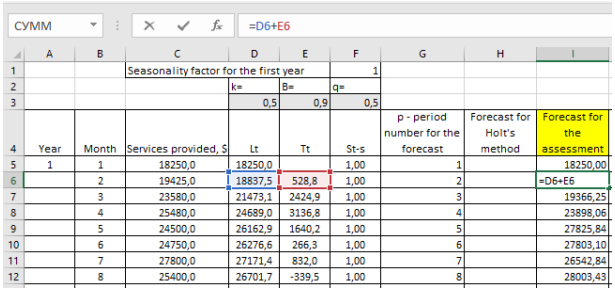
**Fig. 6. The implementation of the Holt-Winter method**

We stretch the formula for a given number of periods ahead, we get a forecast.

When new data becomes available, it is advisable to recalculate the forecast using the Holt-Winter method to clarify the series, trend and seasonality. Also, when preparing data for the forecast, it is always worthwhile to clear the data from factors that will not repeat in the forecast period (for example, sales growth at local exhibitions / fairs) or take into account planned factors that will give additional sales growth (for example, holding sales promotion events).

### Holt-Winter Model Accuracy Assessment

To assess the accuracy of the model, first of all, it is necessary to calculate the forecast for the first period ahead for each month, when sales are known to us. To find the forecast forecast in the first and second years, you need to value the exponentially smoothed series for the previous period, add the trend value for the previous period (we do not multiply the trend value by p, because we make the forecast by 1 period, and in this case p = one) (Fig. 7).




| | A | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | | Seasonality factor for the first year | | | 1 | | | |
| 2 | | | | k= | B= | q= | | | |
| 3 | | | | 0,5 | 0,9 | 0,5 | | | |
| 4 | Year | Month | Services provided, $ | Lt | Tt | St-s | p - period number for the forecast | Forecast for Holt's method | Forecast for the assessment |
| 5 | 1 | 1 | 18250,0 | 18250,0 | | 1,00 | 1 | | 18250,00 |
| 6 | | 2 | 19425,0 | 18837,5 | 528,8 | 1,00 | 2 | | =D6+E6 |
| 7 | | 3 | 23580,0 | 21473,1 | 2424,9 | 1,00 | 3 | | 19366,25 |
| 8 | | 4 | 25480,0 | 24689,0 | 3136,8 | 1,00 | 4 | | 23898,06 |
| 9 | | 5 | 24500,0 | 26162,9 | 1640,2 | 1,00 | 5 | | 27825,84 |
| 10 | | 6 | 24750,0 | 26276,6 | 266,3 | 1,00 | 6 | | 27803,10 |
| 11 | | 7 | 27800,0 | 27171,4 | 832,0 | 1,00 | 7 | | 26542,84 |
| 12 | | 8 | 25400,0 | 26701,7 | -339,5 | 1,00 | 8 | | 28003,43 |

**Fig. 7. Forecast for the assessment of the model**

After the forecasts are calculated, it is necessary to determine the model errors, for this it is necessary to take the forecast for this period from the actual data (Fig. 8).

The error of the model can be both positive and negative. And in the end, the model error provides a basis for finding deviations from the predictive model.

The determination of the deviation of the model error from the predictive model will be calculated by the ratio of the model error squared to the actual value squared (Fig. 8).

And now you can find the accuracy of the forecast, it will look as follows, unit minus the average value of the deviations (Fig. 8).

The final step is to calculate the accuracy of the forecast (Fig. 8).

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | Seasonality factor for the first year | | | 1 | | | | | | |
| 2 | | | | k= | B= | q= | | | | | | |
| 3 | | | | 0,5 | 0,9 | 0,5 | | | | | | |
| 4 | Year | Month | Services provided, $ | Lt | Tt | St-s | p - period number for the forecast | Forecast for Holt's method | Forecast for the assessment | Model Error | Deviation of the model error from | Forecast accuracy |
| 5 | 1 | 1 | 18250,0 | 18250,0 | | 1,00 | 1 | | 18250,00 | - | - | - |
| 6 | | 2 | 19425,0 | 18837,5 | 528,8 | 1,00 | 2 | | 19366,25 | -528,75 | 0,00 | 100% |
| 7 | | 3 | 23580,0 | 21473,1 | 2424,9 | 1,00 | 3 | | 19366,25 | 2106,88 | 0,01 | 99% |
| 8 | | 4 | 25480,0 | 24689,0 | 3136,8 | 1,00 | 4 | | 23898,06 | 790,97 | 0,00 | 100% |
| 9 | | 5 | 24500,0 | 26162,9 | 1640,2 | 1,00 | 5 | | 27825,84 | -1662,92 | 0,00 | 100% |
| 10 | | 6 | 24750,0 | 26276,6 | 266,3 | 1,00 | 6 | | 27803,10 | -1526,55 | 0,00 | 100% |
| 11 | | 7 | 27800,0 | 27171,4 | 832,0 | 1,00 | 7 | | 26542,84 | 628,58 | 0,00 | 100% |
| 12 | | 8 | 25400,0 | 26701,7 | -339,5 | 1,00 | 8 | | 28003,43 | -1301,71 | 0,00 | 100% |
| 13 | | 9 | 24900,0 | 25631,1 | -997,5 | 1,00 | 9 | | 26362,18 | -731,09 | 0,00 | 100% |
| 14 | | 10 | 23590,0 | 24111,8 | -1467,1 | 1,00 | 10 | | 24633,58 | -521,79 | 0,00 | 100% |
| 15 | | 11 | 22400,0 | 22522,3 | -1577,2 | 1,00 | 11 | | 22644,66 | -122,33 | 0,00 | 100% |
| 16 | | 12 | 22300,0 | 21622,6 | -967,5 | 1,00 | 12 | | 20945,11 | 677,45 | 0,00 | 100% |
| 17 | 2 | 1 | 21550,0 | 21102,5 | -564,8 | 1,01 | 1 | | 20655,03 | 447,48 | 0,00 | 100% |
| 18 | | 2 | 23770,0 | 22153,9 | 889,7 | 1,04 | 2 | | 20537,73 | 1616,14 | 0,01 | 99% |
| 19 | | 3 | 28470,0 | 25756,8 | 3331,6 | 1,05 | 3 | | 23043,60 | 2713,20 | 0,01 | 99% |
| 20 | | 4 | 29450,0 | 29269,2 | 3494,3 | 1,00 | 4 | | 29088,41 | 180,79 | 0,00 | 100% |
| 21 | | 5 | 28375,0 | 30569,3 | 1519,5 | 0,96 | 5 | | 32763,54 | -2194,27 | 0,01 | 99% |
| 22 | | 6 | 22300,0 | 27194,4 | -2885,5 | 0,91 | 6 | | 32088,76 | -4894,38 | 0,03 | 97% |
| 23 | | 7 | 25870,0 | 25089,5 | -2183,0 | 1,02 | 7 | | 24308,92 | 780,54 | 0,00 | 100% |
| 24 | | 8 | 21250,0 | 22078,2 | -2928,4 | 0,98 | 8 | | 22906,49 | -828,25 | 0,00 | 100% |
| 25 | | 9 | 20480,0 | 19814,9 | -2329,8 | 1,02 | 9 | | 19149,86 | 665,07 | 0,00 | 100% |

**Fig. 8. Evaluation of model accuracy Holt-Winter**

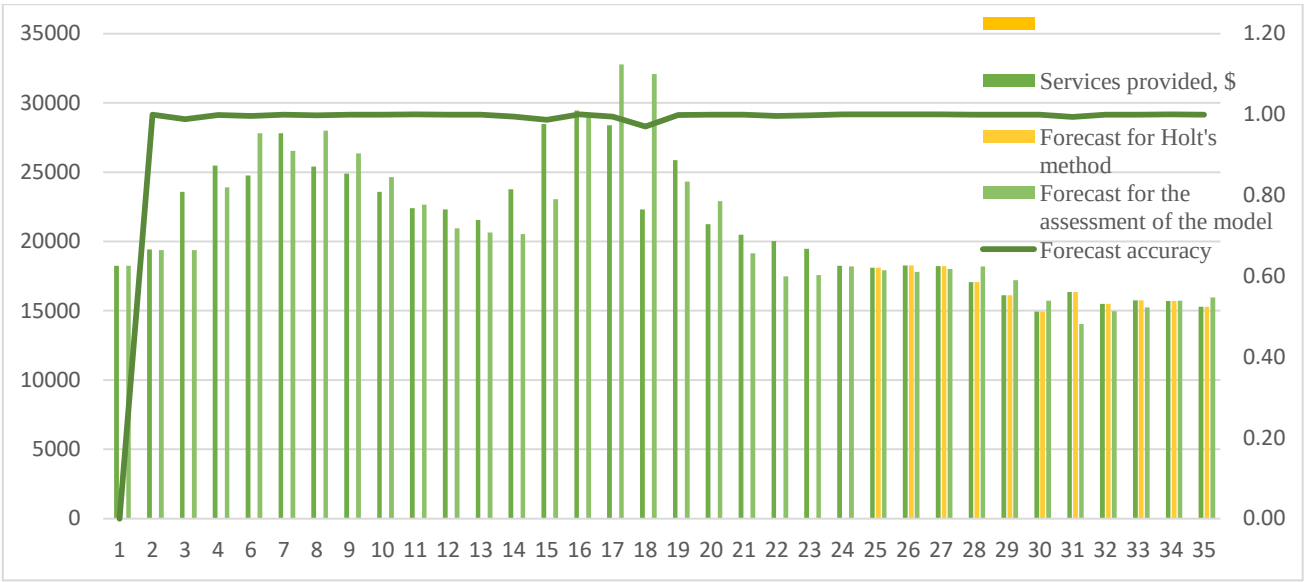



**Fig. 9. Graphical representation of the results.**

Calculations show that the proposed methodology for estimating the seasonality factor is extremely accurate (the maximum deviation from existing data is 5%) (Fig. 9).

Accordingly, it can be used for tourism and hospitality enterprises to strategize their activities, which ultimately will increase their competitiveness, ensure customer loyalty and, most importantly, achieve their goals, both in the short and medium and long term.

## IV. CONCLUSION

The study of forecasting methods is an important component of management activities in all existing enterprises. Forecasting is considered one of the methods for predicting internal and external performance criteria.

Forecasting as a way to reduce risks stimulated by uncertainty allows us to find out more potential environmental conditions in the future (political, scientific, technical, financial, environmental, social). Forecasting gives the likelihood of assessing the immediate and long-term consequences of decisions.

Seasonal oscillatory processes exist in all spheres of human activity and have a serious impact on the development of socio-economic processes in general.

The seasonality factor, for tourism and hospitality enterprises [8-11], is very important and cannot be ignored, since this industry occupies an important place in the social sphere, and this factor, in turn, is involved in the formation of the market attractiveness of enterprises and ensures the competitiveness of enterprises in the market.

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