FORECASTING HOTEL INCOME IN CURRENT UNSTABLE DEVELOPMENT SITUATIONS

Julia Shevchuk[1], Mykola Denysenko[2]

[1]*Graduate student of Business Economics and Tourism Department, Kyiv National University of Technology and Design, Kyiv, Ukraine, e-mail: shevchuk.ya@knutd.edu.ua*

[2]*Doctor of Science (Economics), Professor of Business Economics and Tourism Department, Kyiv National University of Technology and Design, Kyiv, Ukraine, e-mail: profden3@gmail.com, ORCID: https://orcid.org/0000-0001-8767-9762*

Citation:
Shevchuk, J., & Denysenko, M. (2020). Forecasting hotel income in current unstable development situations. *Economics, Finance and Management Review*, (3), 20–28. https://doi.org/10.36690/2674-5208-2020-3-20

Received: August 19, 2020
Approved: September 25, 2020
Published: October 01, 2020

This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (**CC BY-NC 4.0**) license

OPEN ACCESS

Abstract. *The article describes the development of an economic-mathematical model that allows to identify the influence of factors on the formation of income of hotels and similar accommodation in Ukraine and to forecast the level of hotel industry income. To create an economic-mathematical model, the analysis of statistical data characterizing the hotel industry in Ukraine for the period from 2010 to 2019 has been carried out. To forecast the hotels income and similar accommodation for the short term, a forecast of such indicators as operating costs of hotels and similar accommodation, housing resources of hotels and similar accommodation has been built. To do this, Box-Jenkins method (ARIMA), which is a part of the Statistica application package, is used. On the basis of the economic-mathematical model the forecast of influence of operating expenses and housing resources of hotels and similar accommodation on income of hotels and similar accommodation has been made. The analysis of the main parameters of the economic-mathematical model, which are quite significant (there is a close relationship between other indicators, the proximity of the economic-mathematical model to sample statistics, the significance of factors on the studied indicator, the homogeneity of the forecast complex, the proximity of empirical theoretical distribution, absence of multicollinearity), as well as surpluses demonstrates that we have created an adequate model of short-term forecast. According to the forecast for 2020-2022 in Ukraine, some reduction in operating costs, housing resources in hotels and similar accommodation and income of hotels and similar accommodation is expected. This situation is due to the current unstable situations that have arisen in the country and in the world. The hotel business is strongly influenced by various internal and external factors: economic, social, geopolitical, legislative transformations, force majeure, climatic conditions, market dynamics, including goods, services and resources. Directly or indirectly, these factors determine the amount of income of hotels and similar accommodation, as an important indicator of development, due to the price aspects in the market of hotel services and the demand for hotel services.*

Keywords: *forecast, hotel, indicators, income, operating expenses, housing resources.*

JEL Classification: C53, L83, M21

Formulas: 2; fig.: 8; tabl.: 1; bibl.: 11

Introduction. The current development status of the hotel industry of Ukraine is influenced by various unstable national and world trends. The dynamics of the hotel industry is marked by the intensification of qualitative changes and structural transformations, the interaction of elements on the basis of a systematic approach that is exposed to the external situations. The situation analysis and study of functioning and trends in the hotel business is an important step in the economic activity development of economic entities of the hotel industry in Ukraine. The number of hotel business enterprises gradually increased, the reason for this was the increase in demand for mini-hotels, apartments, guest houses. The number of budget accommodation facilities (hotels without categories, hostels) have reasonably

increased, and the number of dormitories decreased. In recent years, there have been some processes of consolidation of hotels and similar accommodation.

In world statistics, the determinants of hotel profitability are room occupancy with an average value approaching 70%, and the average cost of one day's stay, which is about $ 85 [1]. In Ukraine, there is still a fairly low level of housing resources [2]. Kyiv, the tourist cities Odessa, Lviv, Dnipro, Kharkiv, Uzhhorod, Mykolayiv, etc. are the most provided with housing. This indicates a significant potential of the hotel market of large tourist cities, but not for all segments.

The most financially stable in 2015-2019 are hotels that link the cost of rooms to foreign currency. These include 4-star and 5-star hotels of high quality. The most difficult and strongest turbulent periods (political perturbations, economic conflicts) affect 4-5-star hotels. Accordingly, the occupancy of the number of rooms for this category decreases. The reason is the predominant location of the hospitality facility on a foreign guest, primarily business people.

Income is a motivating factor, an important source of hotel business, the main criterion for assessing the production and economic activity of each enterprise. Therefore, an important feature of economic analysis is research, analysis, evaluation, forecasting the impact of various factors on the income level of the hotel industry using methods of economic-mathematical modeling to find reserves and opportunities for their mobilization in the current and future periods.

Literature review. Kapranova L., Nikitin D. (2018) [3], Ostapenko J. (2016) [1] consider the main problems and prospects for the development of the hotel industry through the prism of statistics. Bereshchak V. (2019) [4], Ilyin A. (2020) [5] provide an overview of the hotel market, describe the situation with hotels in Ukraine, identify factors that have an impact on the hotel business. Yurynets Z., Baida B., Petrukh O. (2015) [6] investigate the issues of functioning and developing of the hotel industry, competitiveness of the hotel industry and the economy in general within the innovation component. However, these authors only state the need to use economic-mathematical modeling to predict the development of the hotel segment and theoretically note the factors that affect the hotel industry.

Empirical experience of methods application of the system analysis and methodology of functional modeling for development research of processes of hotel economy has been received from works by Topolnik V., Rakova K. (2014) [2]. Abdullaeva AA (2009) [7] describes the impact of information technologies, their role in the effective management of the hotel business. However, these authors do not use econometric modeling methods, the Box-Jenkins method, which best allows you to select indicators that affect the impact on the hotel industry, the process of income generation and to predict the development of the hotel segment.

Aims. The purpose of the study is to develop an economic-mathematical model that allows to identify the factors impact on the income formation of hotels and similar accommodation in Ukraine.

Methods. During the study there have been used Box-Jenkins method (ARIMA) (to predict indicators such as operating costs of hotels and similar accommodation, hotel housing and similar accommodation); economic-mathematical modeling (to

build a model and identify the impact of operating costs of hotels and similar accommodation, hotel housing and similar accommodation on the level of income of hotels and similar facilities); method of analysis, synthesis, generalization (when forming logical conclusions about the forecasting results).

Results. To create an economic-mathematical model, the analysis of statistical data characterizing the hotel business in Ukraine for the period from 2010 to 2019 has been carried out. The model parameters have been set on the basis of statistical data, which are given in table 1.

Table 1. Statistical data for creating an economic-mathematical model

Years	Income of hotels and similar accommodation, UAH mln.	Operating expenses of hotels and similar accommodation, UAH mln.	Housing resources of hotels and similar accommodation, ths. sq.m.
	Y	x_1	x_2
2010	3423,64	3981	1700,6
2011	3608,76	4043	1624,6
2012	4486,84	4182	1805,3
2013	4957,53	4250	1996,1
2014	5012,43	4334	1604,8
2015	5112,14	5892	1338,5
2016	6710,16	5640	2187,4
2017	8629,3	5590	1907,5
2018	10293,3	5542	2092,6
2019	11434,6	5500	2134,5

Source: based on [8]

The economic-mathematical model (1) has been obtained:

$$Y = a_1 + a_2 x_1 + a_3 x_2, \quad (1)$$

Y - income of hotels and similar accommodation, UAH million;
x_1 - operating expenses of hotels and similar accommodation, UAH million;
x_2 - housing resources of hotels and similar accommodation, ths. sq.m.;
a_1 - free members of the formed equation;
a_2, a_3- coefficients of the formed regression equation.

The research uses the functions and principles of constructing multiple regression using the application package Statistica 6.0, which allow to identify the influence degree of these factors on the study object using step-by-step multifactor analysis [9].

Let us analyze such indicators as operating costs of hotels and similar accommodation, housing resources of hotels and similar accommodation. The indicators change over time can be seen in Fig. 1. Operating costs of the hotel industry in Ukraine tend to fluctuate over time. The turning point in the changes is 2015 and 2016. The reason for the reduction of operating costs was the social and economic crisis, political instability in the country, reduced tourist flow, reduced housing resources of hotels and similar accommodation, reduced supply of hotel business, rejection in the need to modernize rooms.

However, this situation has gradually improved and the number and quality of hotel services have improved accordingly.

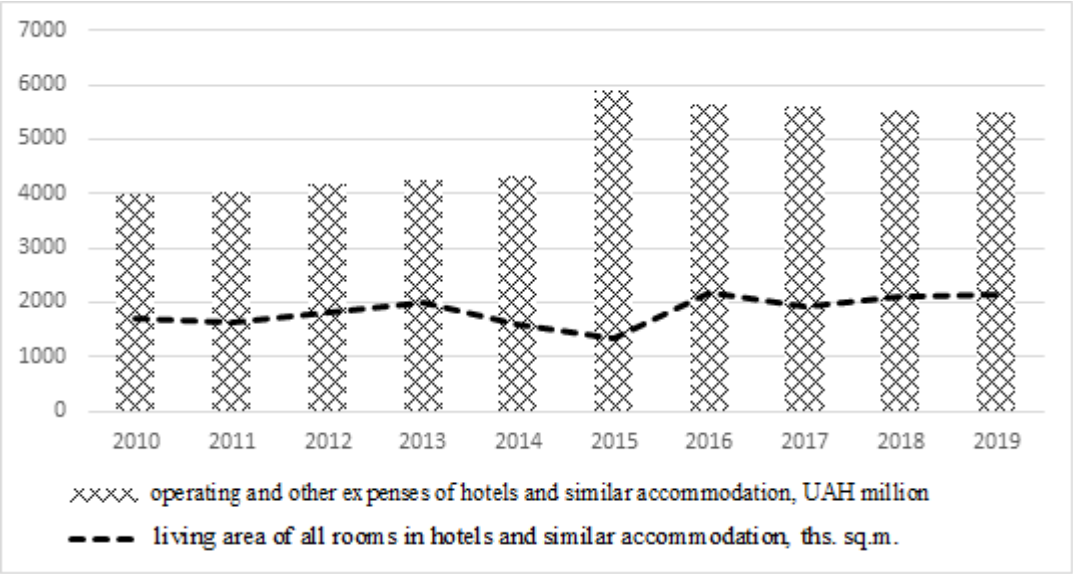

Figure 1. The indicators changes over time to create an economic-mathematical model

Source: generated by the author

To forecast the income of hotels and similar accommodation for a short period, you first need to build a forecast of such indicators. as operating expenses of hotels and similar accommodation and housing resources of hotels and similar accommodation. To do this, let us use Box–Jenkins method (ARIMA), which is part of the application package Statistica [9, p. 61]. The forecast model created based on Box-Jenkins method (ARIMA) has advantages as it is marked by accuracy and adequacy for carrying out research for the short-term period [9, p. 196].

Fig. 2 and Fig. 3 show the procedure for creating a short-term forecast for the indicators: operating costs of hotels and similar accommodation, housing resources of hotels and similar accommodation.

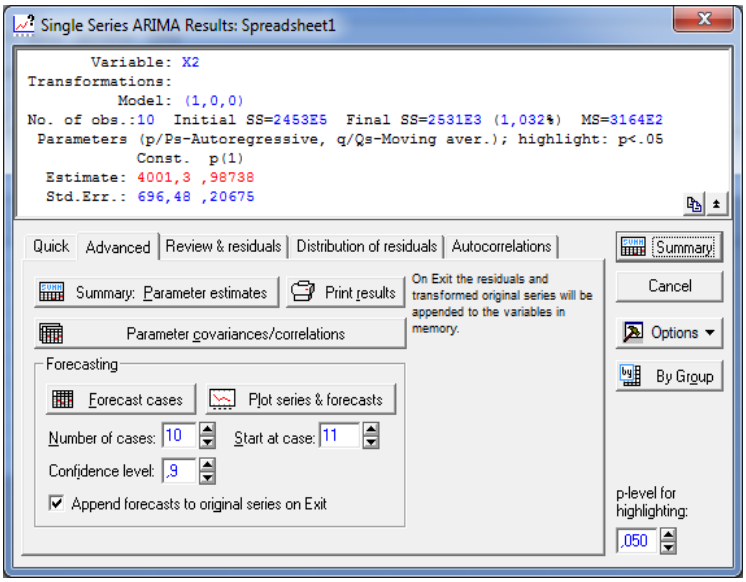

Figure 2. Adjustments and results of Box-Jenkins method (ARIMA) application for the indicator of operating costs of hotels and similar accommodation

Source: generated by the author

Given the auto-correlation function and the partial auto-correlation function, it should be noted that the best model for these indicators will be ARIMA (1,0,0).

Input: X2 (Spreadsheet1)
Transformations: none
Model:(1,0,0) MS Residual= 3164E2

Paramet.	Param.	Asympt. Std.Err.	Asympt. t(8)	p	Lower 95% Conf	Upper 95% Conf
Constant	4001,347	696,4838	5,745069	0,000431	2395,253	5607,442
p(1)	0,987	0,2068	4,775719	0,001398	0,511	1,464

Figure 3. Parameters of the ARIMA model for operating costs of hotels and similar accommodation

Source: generated by the author

The analysis of Fig. 3 allows us to see that the estimates of the model parameters are quite significant (p <0.1). The analysis of surpluses shows that we have created an adequate model of short-term forecast for operating costs of hotels and similar accommodation.

There have been taken similar actions to forecast the housing resources of hotels and similar accommodation.

The forecast of indicators for the short-term period of time is presented in Fig. 4.

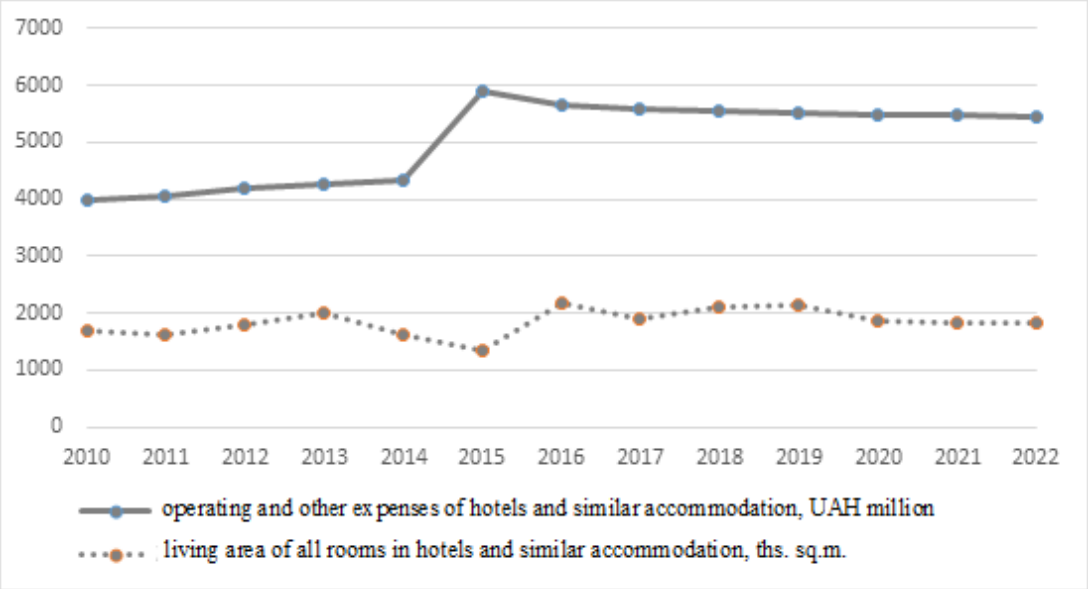

Figure 4. Forecast for the indicators of operating costs and housing resources of hotels and similar accommodation

Source: generated by the author

According to the forecast for 2020-2022 in Ukraine, some reduction in operating costs and housing resources in hotels and similar accommodation is expected.

The results of the forecast for the indicator of income of hotels and similar accommodation are shown in Fig. 5.

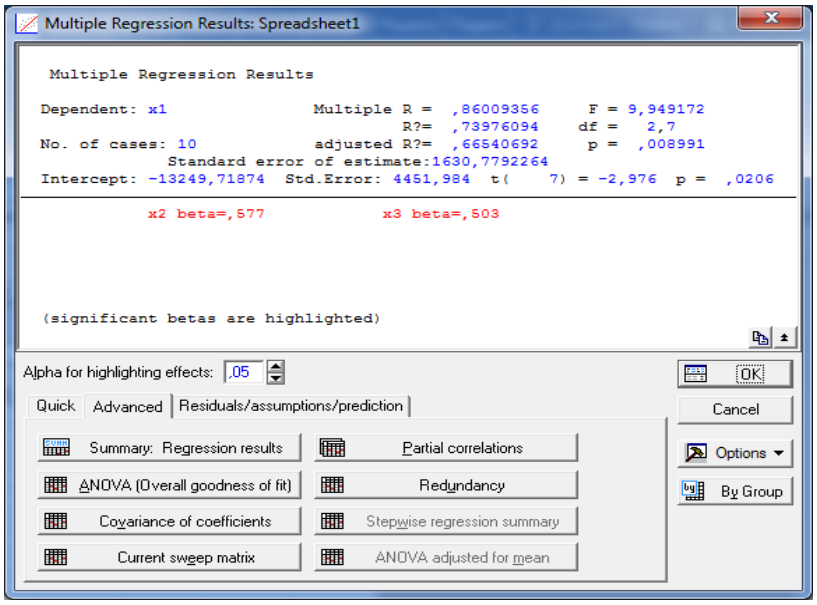

Figure 5. Forecasting results for the indicator of income of hotels and similar accommodation

Source: generated by the author

The correlation matrix for indicators of income of hotels and similar accommodation, operating expenses of hotels and similar accommodation, housing resources of hotels and similar accommodation is shown in Fig. 6:

Variable	Correlations (Spreadsheet1)		
	x1	x2	Y
x1	1,000000	0,264308	0,710034
x2	0,264308	1,000000	0,655805
Y	0,710034	0,655805	1,000000

Figure 6. Correlation matrix for indicators

Source: generated by the author

According to the data obtained in Fig. 6, we can see indicators (above average) for the income of hotels and similar accommodation. The homogeneity of the predicted population, the proximity of the empirical distribution to the theoretical one and the absence of multicollinearity have also been revealed.

The forecasting results for the indicator of income of hotels and similar accommodation are presented in Fig. 7.

N=10	Regression Summary for Dependent Variable: Y (Spreadsheet R= ,86009356 R?= ,73976094 Adjusted R?= ,66540692 F(2,7)=9,9492 p<,00899 Std.Error of estimate: 1630,8					
	Beta	Std.Err. of Beta	B	Std.Err. of B	t(7)	p-level
Intercept			-13249,7	4451,984	-2,97614	0,020627
x1	0,577008	0,199923	2,1	0,713	2,88615	0,023445
x2	0,503298	0,199923	5,2	2,060	2,51746	0,039959

Figure 7. The result of multiple regression for the income of hotels and similar accommodation

Source: generated by the author

Figure 7 shows that the parameter estimates are significant because *p* is less than 0.05. The analysis of surpluses and parameters shows that we have created an adequate model of short-term forecast for the income of hotels and similar accommodation.

One of the main indicators that characterizes the density of the correlation between the selected factors, the proximity of the mathematical form of the relationship relative to the sample statistics is the coefficient of multiple correlation. The correlation coefficient varies from -1 to 1, and: if R> 0, then between the random variables and the independent variable there is a direct relationship, if R <0, then between these random variables there is an inverse relationship [10]. For the created model R = 0,86. This indicator characterizes the close relationship between other indicators and the proximity of the economic-mathematical model to the sample statistics.

In the course of creating an econometric model, one of the problematic issues is to establish the significance of the influence of individual factors on the studied indicator. The significance of the factors influence on the studied indicator is determined by F-statistics. According to Fisher's criterion F (2.7) = 9.9492 (significantly higher than the tabular critical value), we can conclude that the relationship between the indicators is significant. The standard estimate error is 1630.8, i.e. the coefficients estimates are quite statistically significant.

Thus, the created economic-mathematical model will look like:

$$Y = -13249,7 + 2,1x_1 + 5,2x_2 \quad (2)$$

On the basis of the economic-mathematical model the influence forecast of operating expenses and housing resources of hotels and similar accommodation on incomes of hotels and similar accommodation has been made (Fig. 8).

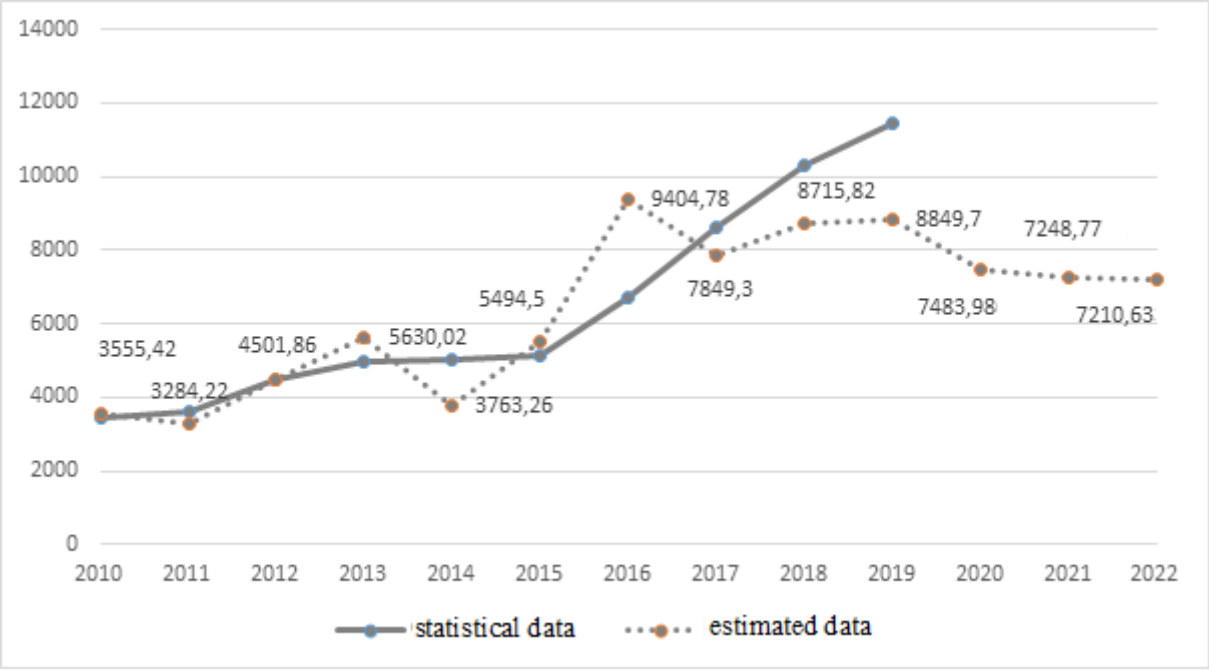

Figure 8. Income forecast of hotels and similar accommodation

Source: generated by the author

From Fig. 8 it can be concluded that the income level of hotels and similar accommodation in 2020-2022 will decrease. This situation is due to the current unstable situations that have arisen in the country and in the world.

Discussion. The change in the income level of hotels and similar accommodation is to some extent due to changes in the quantity and quality of hotel services and rising prices. The cost of living in hotels and similar accommodation in Ukraine is significantly higher than the cost of living in hotels of similar class in the EU. The high prices for hotel accommodation can be explained primarily by the small number of it in the market of hotel services.

The cost of living in hotels of different categories in Ukraine ranges from $ 6-8 (in hotel-type dormitories in the regions) to $ 300-400 in 4-star hotels. At the same time, the Premier Palace Hotel costs around $ 3,000 [3].

Due to the localization of demand for hotel services, it is worth noting the focus of guests on lower price segments. Due to the reorientation towards organized customer groups, the workload in almost all hotel segments has increased slightly. In general, the growing share of Ukrainian tourism affects changes in the structure of demand for hotel services, target audience, consumer behavior. Quite often, hotel assets are a part of a strategy to diversify the income of large companies, especially when it comes to foreign investors.

The hotel business is strongly influenced by various internal and external factors: economic, social, geopolitical, legislative transformations, force majeure, climatic conditions, market dynamics, including goods, services and resources. Directly or indirectly, these factors determine the amount of income of hotels and similar accommodation, as an important indicator of development, due to price aspects in the market of hotel services, demand for services and so on.

A significant part of the profitability of collective accommodation in Ukraine accounts for the income of hotels and similar accommodation, in the structure of which the main share is due to income from the rooms sale, additional services provision [1]. The financial and economic crisis in the country has led to a deterioration in living standards, lower social security and basic human needs, which at the same time leads to lower demand for hotel services, as such services are usually not essential goods, and virtually no stimulating in development of the tourism sector of the economy reduces the profitability of enterprises in the hotel sector in general [11].

Conclusion. Thus, based on the above, the hotel industry as an important sector of Ukraine's economy, which interacts with other segments in a dynamic, uncertain external environment and contributes to the development of the economy as a whole, needs state support given the new stage of global business development and new global trends, different internal and external factors (economic, social, geopolitical, legislative transformations, force majeure, climatic conditions, dynamics of market conditions, including goods, services and resources). The main prerequisites for the hotel industry development and increasing the profitability of the hotel sector should be to stimulate the development of the tourism sector of the economy, increasing living standards and social security. In order to improve the hotel business, it is

necessary to stimulate the development of tourism and hotel industry, attract foreign visitors through the development and implementation of national and regional programs, strategies for hotel business development, monitoring the implementation of these programs, creating appropriate conditions to attract investment in the hotel industry.

Author contributions. The authors contributed equally.

Disclosure statement. The authors do not have any conflict of interest.

References:

1. Ostapenko, Ya. O. (2016), "Income of the hotel industry through the prism of statistics", *Current economic problems*, №2 (176), pp. 329-336 [in Ukrainian].

2. Topolnik, V.G. and Rakova, K.V. (2014), "Modeling of hotel management processes on the example of the hotel "Tsentral" in Donetsk", *Bulletin of DonNUET*, № 1 (61), pp. 144–157 [in Ukrainian].

3. Kapranova, L. and Nikitin, D. (2018), "Hotel market in Ukraine: problems and prospects of development", *Bulletin of the Azov State Technical University. Series: Economic Sciences*, № 35, pp. 109–116 [in Ukrainian].

4. Bereshchak, V. (2019), "Everything will be, if you wait a bit. Results of the 1st half of 2019 in hotel real estate". URL https://propertytimes.com.ua/gostinichnaya_nedvizhimost/use_bude_yakscho_trohi_zachekati_pidsumki_1_pivrichchya_2019_roku_v_gotelniy_neruhomosti [in Ukrainian].

5. Ilyin, A. (2020), "Hospitable Ukraine: how the hotel market is developing". URL https://hromadske.ua/posts/iak-rozvyvaietsia-hotelnyi-rynok [in Ukrainian].

6. Yurynets, Z., Bayda, B. and Petruch, O. (2015), "Country's economic competitiveness increasing within innovation component", *Economic Annals—XXI*, № 9-10, pp. 32-35

7. Abdullaeva, A.A. (2009), "Information technologies, their role in effective management of hotel business enterprises", *Transport business of Russia*, № 9, pp. 75-78 [in Russian].

8. State Statistics Service of Ukraine. Official site. URL:http://ukrstat.gov.ua [in Ukrainian].

9. StatSoft Inc. Electronic Statistics Guide. URL: http://www. StatSoft/ru/homr/textbook/default.htm [in Ukrainian].

10. Khalafyan, A.A. (2007), *STATISTICA 6. Statistical data analysis*. Kyiv: Binom Press [in Ukrainian].

11. Denysenko, M.P. and Bobrovnyk, A.V. (2017), "Ukraine's competitiveness at the international level", *Problemy innovatsijno-investytsijnoho rozvytku*, № 12, pp. 4-10 [in Ukrainian].