“Modeling the possibilities of economic adaptation of trade enterprises and hospitality industry in the context of epidemiological zoning”

AUTHORS	Iryna Melnyk Yuriy Turyanskyy https://orcid.org/0000-0002-4892-0653 https://publons.com/researcher/AAS-6453-2020 Ihor Mishchuk https://orcid.org/0000-0001-5661-0164 https://publons.com/researcher/F-4185-2019 Nataliia Mitsenko https://orcid.org/0000-0002-0337-8346 https://publons.com/researcher/F-7270-2019 Roksolana Godunko https://orcid.org/0000-0003-4066-4146 https://publons.com/researcher/F-8710-2019

ARTICLE INFO	Iryna Melnyk, Yuriy Turyanskyy, Ihor Mishchuk, Nataliia Mitsenko and Roksolana Godunko (2020). Modeling the possibilities of economic adaptation of trade enterprises and hospitality industry in the context of epidemiological zoning. *Problems and Perspectives in Management*, *18*(4), 191-202. doi:10.21511/ppm.18(4).2020.17
DOI	http://dx.doi.org/10.21511/ppm.18(4).2020.17
RELEASED ON	Wednesday, 02 December 2020
RECEIVED ON	Wednesday, 30 September 2020
ACCEPTED ON	Tuesday, 24 November 2020

LICENSE	This work is licensed under a Creative Commons Attribution 4.0 International License

JOURNAL	"Problems and Perspectives in Management"
ISSN PRINT	1727-7051
ISSN ONLINE	1810-5467
PUBLISHER	LLC “Consulting Publishing Company “Business Perspectives”
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”

NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
21	2	6

© The author(s) 2020. This publication is an open access article.

BUSINESS PERSPECTIVES

LLC "CPC "Business Perspectives"
Hryhorii Skovoroda lane, 10,
Sumy, 40022, Ukraine

www.businessperspectives.org

Iryna Melnyk (Ukraine), **Yuriy Turyanskyy** (Ukraine), **Ihor Mishchuk** (Ukraine), **Nataliia Mitsenko** (Ukraine), **Roksolana Godunko** (Ukraine)

MODELING THE POSSIBILITIES OF ECONOMIC ADAPTATION OF TRADE ENTERPRISES AND HOSPITALITY INDUSTRY IN THE CONTEXT OF EPIDEMIOLOGICAL ZONING

Received on: 30th of September, 2020
Accepted on: 24th of November, 2020
Published on: 2nd of December, 2020

© Iryna Melnyk, Yuriy Turyanskyy, Ihor Mishchuk, Nataliia Mitsenko, Roksolana Godunko, 2020

Iryna Melnyk, Doctor of Economics, Associate Professor, Department of Tourism and Hotel and Restaurant Business, Faculty of Commodity, Management and Servicing, Lviv University of Trade and Economics, Ukraine.

Yuriy Turyanskyy, Doctor of Economics, Associate Professor, Department of Economics, Lviv Regional Institute of Public Administration, National Academy of Public Administration under the President of Ukraine, Ukraine.

Ihor Mishchuk, Doctor of Economics, Associate Professor, Head of the Department of Entrepreneurships, Trade and Logistics, Lviv University of Trade and Economics, Lviv, Ukraine.

Nataliia Mitsenko, Doctor of Economics, Professor, Head of the Department of Economics, Institute of Economics and Finance, Lviv University of Trade and Economics, Ukraine. (Corresponding author)

Roksolana Godunko, Ph.D. Student, Department of Economics, Institute of Economics and Finance, Lviv University of Trade and Economics, Ukraine.

Abstract

The article identifies the negative impact of the coronavirus crisis on the expected efficiency of retail, hotel, restaurant and tourism businesses. The aim of the paper is to develop a methodological algorithm for short-term forecasting of opportunities to restore the effective activity of enterprises under quarantine restrictions.

Seasonal component adjustments were performed in the Demetra+ software. Modeling the recovery of effective activity included an assessment of the influence of macroparameters on the dynamics of an enterprise's sales volumes under pre-quarantine conditions, defining the size of economic losses, determining coefficients of macroindicators' dynamic influence under conditions of differentiation of quarantine restrictions, constructing a matrix of multiple regression equations, which clearly demonstrates the forecast prospects for restoring the effective activity of enterprises, depending on the quarantine zoning. A situational model of the possible scenario dynamics of enterprises' trade turnover was built taking into account the quarantine zoning and the logical transformational algorithms of influence on variable system parameters caused by it. The thermometer principle was used as a fuzzy logic tool to consider the specifics of the dynamics of various linguistic variables and bring the forecast model as close as possible to the epidemiological zoning logic. Approbation of the methodology revealed a clear correlation between the severity of quarantine restrictions and the expected growth of enterprise activity amounts. In a more advanced form, the method should be used for short-term macroeconomic forecasting when determining quarantine restrictions and epidemiological zoning.

Keywords turnover, macroparameters, quarantine, crisis, unemployment, forecasting

JEL Classification C32, C43, E27

INTRODUCTION

In March 2020, the World Health Organization identified the outbreak of the SARS-CoV-2 coronavirus, which causes COVID-19, as a pandemic (World Health Organization, 2020). Public expectations for moderate but steady global economic growth in 2020 turned out to be unrealistic: the global FTSE All World index (the main indicator of the state of the world economy) lost about 13% in the first week after the pandemic (Bloomberg, 2020). The introduction of quarantine restrictions by the Government of Ukraine has had a significant negative impact on all areas of socio-economic life, and the understanding that the pandemic situation may remain unstable for quite some time, is driving the search for quarantine models that would allow businesses to adapt to the slow but steady recovery of the economic

This is an Open Access article, distributed under the terms of the Creative Commons Attribution 4.0 International license, which permits unrestricted re-use, distribution, and reproduction in any medium, provided the original work is properly cited.

Conflict of interest statement:
Author(s) reported no conflict of interest

system. Given the high degree of uncertainty about the economic consequences of the pandemic crisis, the modeling of quarantine measures bearing in mind the interests of business is relevant and requires careful analysis of all possible forecast scenarios.

The paper is structured as follows: Section 1 briefly describes the relevant literature. Section 2 contains data and methodology. Section 3 presents the empirical results. The last sections are devoted to discussion and conclusions.

1. LITERATURE REVIEW

The analysis of scientific publications on the economic aspects of pandemic restrictions and the strengthening of quarantine measures shows the predominance of negative assessments of the possibility of rapid and full recovery of world markets. Thus, Maksymenko (2020) notes that the period of economic downturn can significantly exceed the timeframes of quarantine measures, since the restriction on business causes a change in the configuration of the concept of public space, hindering economic recovery. Rudnytska and Petrenko (2020) studied the problems of overcoming the pandemic crisis by increasing the investment attractiveness of Ukrainian enterprises through the prism of international business rules, focusing on the IMF forecasts for global economic recovery to 5.8% in 2021. At the same time, the authors note that these projections have significant systemic constraints, requiring coordinated action to prevent large-scale bankruptcies, job losses and financial instability, while the expected results will be partial.

Examining the specifics of small business problems in a pandemic, Yehorova and Artemenko (2020) note that more than 2 million micro and small businesses in Ukraine have suffered significant income losses due to complete or partial closure. Losses due to a decrease in orders are suffered by enterprises operating in the field of transportation, restaurants, almost completely paralyzed tourism, hotel business, non-food stores. Analysts from Wells Fargo & Co., BMO Financial Group, ABN Amro, Rabobank and Berenberg unanimously predict economic decline due to significant incidence of COVID-19, excessive market volatility, reduced consumer spending in non-food retail and restaurants, as well as declining demand in the tourism industry (Zacks Investment Research, 2020).

It should be noted that most studies of economic and social problems in a pandemic are highly specialized and fragmentary, highlighting only certain aspects, such as the willingness of business management to exogenous shocks (Brown & Kline, 2020), marketing business strategies in quarantine (J. Crick & D. Crick, 2020). Verikios (2020) analyzed the economic consequences of the pandemic and linked the extreme socio-economic disruptions to the harsh prevention measures imposed by governments. For modeling, the author used the global CGE model, in which the world economy is represented by regional entities with their own trade and investment flows. The simulation allowed the author to identify the direct economic consequences of quarantine restrictions, which include a decrease in household consumption of tourism, transport and retail services, a surge in demand for medical services, and an increase in unemployment (including temporary).

The results of the Maksymenko's study (2020) show that the economic downturn can last much longer than the terms for which quarantine measures are established. Governments are tightening restrictions on business to stop the spread of the pandemic. During quarantine measures, there is a reduction in consumer spending on tourism, entertainment, food, falling exports and reduced imports due to disruption of supply chains, reduced productivity due to adaptation to new ways of working. Enterprises have problems with liquidity, reduced access to current assets, reduced turnover and layoffs. Fedulova and Dzhulai (2020) note that quarantine measures due to the COVID-19 pandemic have led to qualitative and quantitative changes in the economy due to the closure of state borders, shutdowns, closures of a large number of enterprises and the application of numerous restrictions on doing business. There is a liquidation of certain sectors of the economy and a radical redistribution of labor resources among oth-

http://dx.doi.org/10.21511/ppm.18(4).2020.17

ers. Businesses also face challenges in maintaining business activity, financial stability and jobs. That is why an important issue today is to determine the priorities for the adaptation of certain economic activities in the process of overcoming the recession caused by the COVID-19 virus pandemic and the ability of enterprises to ensure continuous operation.

Examining the dynamics of Ukraine's economy during the COVID-19 pandemic, Sokurenko (2020) notes that to predict the trajectory of key macroeconomic indicators for 2020–2021, it is difficult to take into account the uniqueness of the current crisis, which is mainly administrative in origin and not accompanied by such past phenomena, such as a significant outflow of capital or a rapid devaluation of the UAH due to excessive foreign trade deficits or panic in the foreign exchange market. On the other hand, the COVID-19 pandemic is observed against the background of the entry of the Ukrainian economy into the declining phase of the business cycle (from mid-2019), which implies increased depth and longer duration of the crisis. Although in the first quarter of 2020, the decline in GDP was only 1.5%, a much larger decline in this indicator is expected in the future, and the recovery of the pre-crisis level of GDP is expected no earlier than in the next two or three years. The baseline scenario assumes that in the IV quarter of 2020, the decline in GDP will be 12.8%, and GDP growth will resume only at the end of 2021. In the optimistic scenario, the peak of the crisis will be observed in the third quarter of 2020 and at the end of 2021 GDP growth will be 4.4%. If the quarantine measures are longer, the retail trade turnover will decrease by about 14.0%, instead, the waiver of restrictions will allow to return to the pre-crisis level of retail trade in 2021. However, the existing forecasts are quite contradictory, which suggests the feasibility of refining the results using alternative statistical methods.

A careful analysis of the scientific findings revealed that the authors are aware of the socio-economic consequences of both the actual spread of the pandemic and the risks associated with quarantine restrictions. The vast majority of researchers call the high degree of uncertainty a critical risk for the economic environment, since today it is impossible to assess the time prospects of curbing the pandemic, as well as the level of social losses and financial cost of global economic recovery. At the same time, there are almost no attempts in the literature to model compromise options of institutional prohibitions and restrictions that would allow for the possibility of survival and gradual recovery for business structures.

2. AIMS

This paper aims to develop a methodological approach to algorithmization of modeling short-term forecasts for the recovery of effective enterprise activity of retail trade, hotel and restaurant and tourism businesses in the context of quarantine restrictions and epidemiological zoning.

3. METHODS

In accordance with the recommendations of the European Commission (2016), an indirect method of seasonal adjustment with subsequent aggregation into the indicator was used to calculate indicators of business expectations. Calendar adjustments to obtain refined estimates of the seasonal component and improve the quality of the adjusted series were made in the Demetra+ software (UNECE, 2011). A time series of four years was used (16 observations on a quarterly basis).

The business confidence indicator was calculated according to officially defined methods (State Statistics Service of Ukraine, 2017) separately for retail trade enterprises ($BCRT_t$) and services ($BCFS_t$):

$$BCRT_t = \frac{X_{1t} + X_{2t} - X_{3t}}{3}, \qquad (1)$$

where X_{1t} – seasonally adjusted value of the balance of the assessment of changes in turnover for the previous three months at time t; X_{2t} – seasonally adjusted value of the balance of the assessment of changes in turnover in the next three months at time t; and $X3t$ – seasonally adjusted value of the balance of the current inventory of goods at time t.

$$BCFS_t = \frac{X_{4t} + X_{5t} + X_{6t}}{3}, \qquad (2)$$

where X_{4t} – seasonally adjusted value of the bal-

ance of the assessment of changes in the business situation for the previous three months at time *t*; X_{5t} – seasonally adjusted value of the balance of the assessment of changes in demand for services for the previous three months at time *t*; and X_{6t} – seasonally adjusted value of the balance of the assessment of changes in demand for services in the next three months at time *t*.

Modeling of forecast prospects was carried out in four stages using the analysis data of the State Statistics Service of Ukraine (2020). At the first stage, the influence of selected macroparameters (changes in real GDP, changes in real disposable income and unemployment rate of the population aged 15-70) on the dynamics of enterprises in pre-quarantine conditions was detected by multiple regression analysis ($p < 0.05$). Estimation of regression equations included determining regression coefficient estimation vectors, defining pairwise correlation coefficients, verifying variables for multicollinearity by Fisher's F-test, determining factor-to-result density, comparative evaluation of analyzed factors on the resulting trait, evaluating the coefficient of determination R^2. The significance of multiple regression equations was assessed using Fisher's F-test.

The second stage of modeling involved calculating the forecast values of the parameters of change in sales of goods (services) by enterprises (by the linear trend method) and comparing them with statistically significant values to determine the degree of economic losses due to quarantine restrictions.

In the third stage, intermediate coefficients of dynamic impact of selected macro indicators were determined under the conditions of differentiation of quarantine restrictions related to zoning according to the level of epidemic danger. The thermometer principle was used as a tool of fuzzy logic, which allowed considering the specifics of the dynamics of different linguistic variables.

In the fourth stage of modeling using multiple regression analysis ($p < 0.05$), a matrix was constructed that clearly demonstrated changes in the parameters of multiple regression equations that reflected the forecast prospects for restoring effective enterprise activity of retail, hotel and restaurant and tourism business, depending on quarantine zoning.

4. RESULTS

In March 2020, the spread of the coronavirus pandemic and the restrictions imposed by the government marked the beginning of the crisis in Ukraine. The performance of all economic sectors deteriorated, and there was a direct regional correlation between the incidence of COVID-19 and the decline in industrial production. Deteriorating consumer sentiment led to a decline in retail trade. It was only in May that the business community became cautiously optimistic about the gradual recovery of economic activity due to the partial lifting of quarantine restrictions (NBU, 2020). Expectations of a smooth course of economic

Table 1. Expected changes in sales of goods (services) by enterprises (% of the total number of enterprises) in 2016–2019

Source: Compiled by the authors according to the State Statistics Service of Ukraine (2020).

Type of economic activity of enterprises	2016				2017				2018				2019			
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
Retail:	10	–13	7	11	21	–5	6	18	29	–8	7	21	15	–5	11	21
• vehicles	–19	–14	15	8	30	2	24	31	32	–8	16	18	9	–8	8	12
• – food, beverages and tobacco	13	–17	18	7	13	–4	3	8	29	–10	20	29	2	–7	35	14
• – fuel	–27	–45	27	16	–25	–20	30	15	–33	–26	33	38	–25	–33	29	8
• – other goods	36	–2	–14	15	39	–3	–11	16	42	1	–18	21	41	7	–6	28
Provision of temporary accommodation services	–20	–11	56	39	–23	–14	34	33	–23	3	37	23	–19	–26	28	5
Food and beverage service activities	–9	–22	–14	–26	–3	3	0	–8	13	–10	–8	–3	17	3	–34	–5
Activities of travel agencies, tour operators, other reservation service and related activities	–20	–7	21	0	–36	–7	21	14	7	–21	36	14	–36	18	9	18

http://dx.doi.org/10.21511/ppm.18(4).2020.17

Source: Built by the authors according to the State Statistics Service of Ukraine (2020).

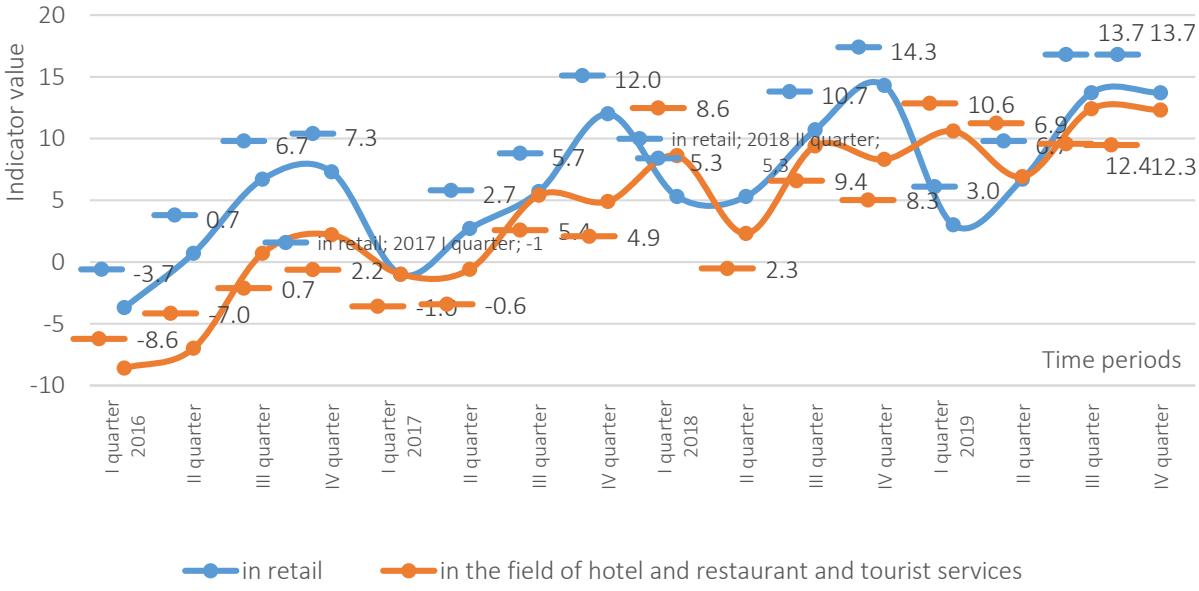

Figure 1. Indicator dynamics of entrepreneurial confidence of retail trade, hotel and restaurant and tourism business in 2016–2019

crisis among Ukrainian entrepreneurs were due to the positive pre-quarantine dynamics of retail, hotel, restaurant and tourism businesses (Table 1), which correlated with a high degree of reliability with the positive dynamics of GDP, growth in real disposable income and a decrease in the unemployment rate.

The success of enterprises in these areas in the pre-quarantine period is also confirmed by the dynamics of entrepreneurial confidence indicators (Figure 1).

In the third quarter of 2020, the business community realized that strict quarantine restrictions did not reduce the level of pandemic danger, but dealt a devastating blow to the socio-economic system of Ukraine. To predict the prospects for restoring the effective activity of enterprises of retail trade, hotel and restaurant and tourism business under different scenarios of quarantine restrictions, an algorithm was proposed the first stage of which involved determining the impact of macro indicators on changes in sales in quarantine conditions. Using the multiple regression equation, the dependence of changes in sales of goods (services) by enterprises was calculated on changes in real GDP (x_1), changes in real disposable income (x_2), and unemployment rate of the population aged 15-70 years (x_3) (Table 2).

For retail enterprises, pre-quarantine dependence is described by the equation

Table 2. Quarterly dynamics of individual macroeconomic indicators in Ukraine in 2016–2019

Source: Compiled by the authors according to the State Statistics Service of Ukraine (2020).

Indicators	2016				2017				2018				2019			
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
Change in real GDP (% of the corresponding quarter of the previous year)	0.3	1.8	2.6	4.5	2.6	2.7	2.4	2.2	3.5	3.9	2.7	3.7	2.9	4.7	3.9	1.5
Change in real disposable income (% of the corresponding quarter of the previous year)	13.7	15.6	19.6	14.0	33.3	27.5	27.1	30.0	27.0	27.6	20.8	16.8	16.6	14.7	13.9	11.1
Unemployment rate of the population aged 15-70 (% of the labor force of the corresponding age)	9.9	9.0	8.8	9.7	10.1	9.1	8.9	9.9	9.7	8.3	8.0	9.3	9.2	7.8	7.3	8.7

$Y = -62.54 + 1.42x_1 + 0.18x_2 - 7.95x_3 \left(R^2 = 0.83\right).$

The economic interpretation: an increase in real GDP by 1% leads to an increase in sales by 1.42%; an increase in real disposable income by 1% leads to a slight increase in retail trade (by 0.18%); an increase in the unemployment rate by1% leads to a decrease in trade turnover by 7.95%.

For enterprises whose subject of activity is the provision of temporary accommodation services, the dependence is described by the equation

$Y = 62.30 + 1.15x_1 + 0.01x_2 - 6.48x_3 \left(R^2 = 0.87\right).$

The economic interpretation: an increase in real GDP by 1% leads to an increase in sales of services by 1.15%; an increase in real disposable income by 1% has almost no effect on performance (growth of 0.01%); an increase in the unemployment rate by 1% leads to a decrease in the volume of services by 6.48%.

For restaurants, the dependence is described by the equation

$Y = -47.25 + 0.25x_1 + 3.29x_2 - 0.52x_3 \left(R^2 = 0.81\right).$

The economic interpretation: an increase in real GDP by 1% leads to an increase in sales of services by 0.25%; growth in real disposable income by 1% increases the volume of activity by 3.29%; an increase in the unemployment rate by 1% reduces the trade turnover by 0.52%.

For tourism enterprises, the dependence is described by the equation

$Y = 108.35 + 0.59x_1 + 0.10x_2 - 11.43x_3 \left(R^2 = 0.9\right).$

The economic interpretation: an increase in real GDP by 1% leads to an increase in sales of services by 0.59%; growth in real disposable income by 1% increases the volume of activity by 0.1%; an increase in the unemployment rate by 1% reduces turnover by 11.43%.

At the second stage of modeling, the forecast values of the parameters of changes in sales of goods (services) by enterprises (by the linear trend method) were calculated and compared with real statistical values to determine the magnitude (extent) of economic losses due to quarantine restrictions (Table 3).

Uncertainty about the development of the pandemic in Ukraine makes it difficult to model forecast scenarios for overcoming the crisis for the retail, hotel, restaurant and tourism businesses. Specialists from the Ministry of Health of Ukraine have identified a adaptive quarantine model, which allows the gradually recovering business (Milanova, 2020) at red, orange, yellow and green levels of epidemic danger.

In regions with a green level of epidemic danger, almost all quarantine restrictions for businesses are lifted. The yellow level of epidemic danger implies insignificant restrictions concerning the prohibition of hostels, night work (from 24.00 to 7.00) of restaurants and restrictions on holding mass events in them for 20 or more people.

The orange level of epidemic danger expands the list of prohibitions: in addition, the activities of all accommodation establishments, except hotels, are prohibited; occupancy of permitted food es-

Table 3. Comparison of forecast (trend) and statistically significant values of expected changes in sales of goods (services) by enterprises of retail trade, hotel and restaurant and tourism business in 2020

Source: Compiled by the authors according to the State Statistics Service of Ukraine (2020).

Type of economic activity of enterprises	2020 (trend)			2020 (statistic)			Deviation		
	I	II	III	I	II	III	I	II	III
Retail:	24.5	–2.5	21.0	15.0	–26.0	–19.0	–9.5	–23.5	–40.0
• vehicles	34.5	–5.0	12.5	14.0	–46.0	–21.0	–20.5	–41.0	–33.5
• food, beverages and tobacco	14.0	–3.5	15.0	17.0	–23.0	–2.0	3.0	–19.5	–17.0
• fuel	–28.0	–23.5	11.0	–17.0	–41.0	0.0	11.0	–17.5	–11.0
• other goods	44.0	8.5	26.0	34.0	2.0	–42.0	–10.0	–6.5	–68.0
Provision of temporary accommodation services	–20.5	–19.0	–4.5	–34.0	–71.0	–74.0	–13.5	–52.0	–69.5
Food and beverage service activities	28.0	9.0	–2.0	11.0	–66.0	–80.0	–17.0	–75.0	–78.0
Activities of travel agencies, tour operators, other reservation service and related activities	–22.5	11.0	25.5	–30.0	–80.0	–100.0	–7.5	–91.0	–125.5

http://dx.doi.org/10.21511/ppm.18(4).2020.17

Source: Authors' development.

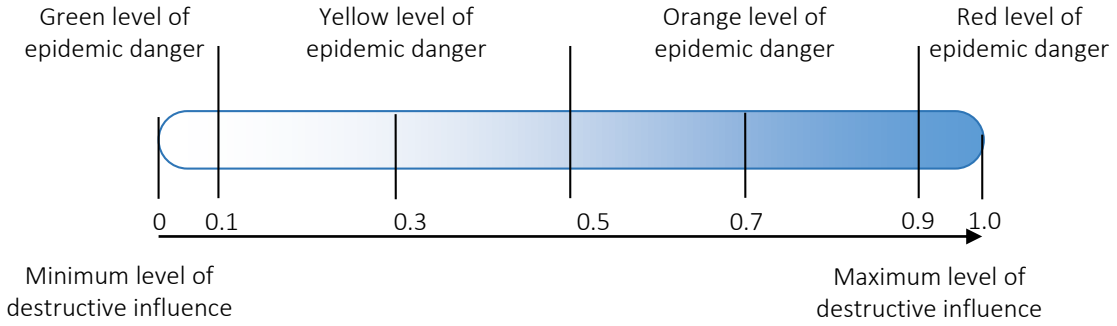

Figure 2. Application of the thermometer principle to determine the correction factors

tablishments is limited to 50% of seats; significant transport restrictions are introduced.

In regions with a red level of epidemic danger, a ban on shopping and entertainment centers, cafes and restaurants is added.

Construction of a situational model of the scenario dynamics of turnover of trade, hotel and restaurant and tourism business should take into account quarantine zoning and the resulting logical-transformational algorithms for influencing the variable parameters of the system. The use of the thermometer principle as a tool of fuzzy logic to determine the correction factors in the obtained regression equations (Figure 2) allows considering the specifics of the dynamics of various parameters to influence the change in activity and bring the forecast model as close as possible to the logic of epidemiological zoning.

Given that the strictest quarantine restrictions were in place at the beginning of the pandemic (in the second quarter of 2020), the third stage of modeling compared the trend values of variable parameters of the model (conditionally corresponding to the green level of epidemic danger) with statistically recorded data (conditionally corresponding to the red level epidemic hazard) and simulated modeling in accordance with the proposed principle of intermediate impact factors (Table 4).

The simulated parameters of the predictive model of the possibilities of effective activity recovery reveal changes in the structural parameters of multiple regression equations (Table 5).

The economic interpretation of the obtained models:

- for retail trade enterprises: an increase in real GDP by 1% will lead to an increase in expected sales volumes by 0.03% in the yellow scenario, to a decrease by 1.12% and by 2.27% in the orange and red scenarios, respectively; an increase in the real disposable income of the population by 1% will lead to a slight in-

Table 4. Modeling intermediate impact coefficients based on the results of comparing trend and statistically significant values of individual macro indicators in the second quarter of 2020

Source: Authors' development. * Compiled by the authors according to the State Statistics Service of Ukraine (2020).

Indicators	Trend values (green level)	Statistics (red level)*	Deviation module	Yellow level	Orange level
Change in real GDP (% of the corresponding quarter of the previous year)	5.80	–11.40	17.20	0.10	–5.60
Estimated impact coefficient	1.00	–1.97	X	0.02	–0.97
Change in real disposable income (% of the corresponding quarter of the previous year)	20.70	6.60	14.10	16.00	11.30
Estimated impact coefficient	1.00	0.32	X	0.77	0.55
Unemployment rate of the population aged 15-70 (% of the labor force of the corresponding age)	7.50	12.60	5.20	9.20	10.90
Estimated impact coefficient	1.00	1.68	X	1.23	1.45

Table 5. The system of dependence equations of the turnover dynamics of retail trade, hotel and restaurant and tourism business on the selected macroparameters under various pandemic scenarios

Source: Authors' development.

Type of economic activity of enterprises	Green level	Yellow level	Orange level	Red level
Retail	$Y = -62.54 + 1.42x_1 + 0.18x_2 - 7.95x_3$	$Y = -62.54 + 0.028x_1 + 0.14x_2 - 9.78x_3$	$Y = -62.54 - 1.38x_1 + 0.10x_2 - 11.53x_3$	$Y = -62.54 - 2.80x_1 + 0.058x_2 - 13.36x_3$
Provision of temporary accommodation services	$Y = 62.30 + 1.15x_1 + 0.01x_2 - 6.48x_3$	$Y = 62.30 + 0.023x_1 + 0.01x_2 - 7.97x_3$	$Y = 62.30 - 1.12x_1 + 0.01x_2 - 9.40x_3$	$Y = 62.30 - 2.27x_1 + 0.003x_2 - 10.89x_3$
Food and beverage service activities	$Y = -47.25 + 0.25x_1 + 3.29x_2 - 0.52x_3$	$Y = -47.25 + 0.005x_1 + 2.53x_2 - 0.64x_3$	$Y = -47.25 - 0.24x_1 + 1.81x_2 - 0.75x_3$	$Y = -47.25 - 0.49x_1 + 1.053x_2 - 0.87x_3$
Activities of travel agencies, tour operators, other reservation service and related activities	$Y = 108.35 + 0.59x_1 + 0.10x_2 - 11.43x_3$	$Y = 108.35 + 0.12x_1 + 0.08x_2 - 14.06x_3$	$Y = 108.35 - 0.057x_1 + 0.055x_2 - 16.57x_3$	$Y = 108.35 - 1.16x_1 + 0.032x_2 - 19.20x_3$

crease in the expected retail trade turnover in all scenarios (by 0.14% – for yellow, 0.1% – for orange and 0.06% – for red); an increase in the unemployment rate by 1% will lead to a decrease in the expected trade turnover by 9.78% in the yellow scenario, by 11.53% in the orange scenario and by 13.36% in the red scenario of the pandemic development;

- for enterprises whose subject of activity is the provision of temporary accommodation services: an increase in real GDP by 1% will lead to a slight increase in expected sales of services by 0.02% in the yellow scenario, to a decrease of 1.12% – in orange and 2.27% – in red; growth in real disposable income by 1% has almost no effect on the expected results of enterprises (growth from 0.01% to 0.003% in different scenarios); an increase in the unemployment rate by 1% will lead to the expected reduction of services by 7.97% in the yellow scenario, by 9.4% – in the orange scenario and by 10.89% – in the red scenario of the pandemic development;

- for restaurant enterprises: an increase in real GDP by 1% will have almost no effect on the increase in expected sales of services (growth by 0.005%) in the yellow scenario, will lead to the expected decrease by 0.24% – in orange and 0.49% – in the red scenario; growth in real disposable income of the population by 1% will lead to the expected growth of trade in all scenarios (by 2.53% – in yellow, by 1.81% – in orange and by 1.05% – in red); an increase in the unemployment rate by 1% will lead to the expected reduction in trade by 0.64% – for the yellow scenario, by 0.75% – for orange and by 0.87% – for the red scenario of the pandemic;

- for tourist enterprises: an increase in real GDP by 1% will lead to an expected increase in sales of services by 0.12% in the yellow scenario, by 1.12% – in the orange scenario and to the expected decrease by 1.16% – in the red scenario; an increase in the real disposable income of the population by 1% will lead to a slight expected increase in turnover in all scenarios (by 0.08% – yellow, by 0.055% – orange and by 0.032% – red); an increase in the unemployment rate by 1% will lead to the expected decrease in turnover by 14.06% in the yellow scenario, by 16.57% in the orange scenario and by 19.20% in the red scenario of the pandemic development.

Thus, a clear correlation is noted between the severity of quarantine restrictions and the expected changes in the volume of business. Realizing that the proposed model does not include numerous parameters of impact on the activities of retail, hotel, restaurant and tourism businesses, this study deliberately ignored the possible fluctuations of the independent variable, exploring only the cumulative impact of the pandemic dynamics of the three macro indicators. In a more extended form, given more exposure parameters, the described technique can be used for short-term macroeconomic forecasting in determining quarantine restrictions and epidemiological zoning.

http://dx.doi.org/10.21511/ppm.18(4).2020.17

5. DISCUSSION

The results of the study confirm the correctness of the national policy of replacing total quarantine with adaptive restrictions (Verkhovna Rada of Ukraine, 2020a), which allow businesses to survive in difficult conditions. The introduction of a set of legal norms has legally defined special working conditions during the quarantine period, in particular, confirmed the possibility of remote work for many employees. Thus, the administration of trade establishments was obliged to limit the number of visitors in the trade hall, determining routes for customers, conducting regular ventilation, sanitation of premises and equipment, which significantly affected the capacity of stores and, as a result, led to a decrease in turnover.

Restaurant enterprises that were banned for visiting in March 2020 began to resume their activities since the beginning of June, but they are subject to a number of restrictive rules that negatively affect sales: the distance between tables should be at least 1.5 m, one table can accommodate no more than four people (excluding children under 14), floor should be marked to maintain the social distance of at least 1.5 m near crowded places, institutions cannot hold holidays, banquets, workshops, classes and any public events with more than 10 people.

The Ministry of Health of Ukraine has developed rules for the operation of hotels, hostels and recreation centers during quarantine. Among the main limitations is the need to ensure social distance. Although the activities of hospitality enterprises were practically not subject to administrative restrictions, the decrease in the turnover of these enterprises was influenced by factors such as restrictions on movement due to the ban on transport connections and the closure of borders.

The development of the tourism sector could not be called satisfactory even before the lockdown, because the potential of the Ukrainian tourism industry is still not fully realized. If in the world economy the share of tourism is about 10% of GDP, in Ukraine – less than 2%. At the same time, tourism provides the formation of income of the subjects of hotel business, passenger transportation, restaurant business, trade, entertainment and culture, etc. Due to quarantine restrictions and the inability to partially go online or retrain, the tourism business has almost completely stopped. To mitigate the effects of the COVID-19 pandemic, the National Tourism Organization of Ukraine in partnership with the World Tourism and Travel Council (WTTC) presented a series of protocols for the main sectors of Ukraine's tourism sector (National Tourism Organization of Ukraine, 2020). They consider the current guidelines of the World Health Organization, which are constantly updated in accordance with new information about COVID-19. Concentration on domestic tourism, offering new tourism products, taking into account the modern realities of safe travel in times of crisis, may provide a promising opportunity for the recovery of the tourism sector in Ukraine (Barna & Tabaka, 2020).

It is important to emphasize that the impact of pandemic restrictions on the Ukrainian economy during March-July 2020 led to an increase in unemployment and a decrease in income due to lower wages, job loss or income of individual entrepreneurs. At the same time, lockdown had virtually no impact on the incomes of socially disadvantaged groups. Therefore, rising unemployment and declining real incomes only partially explain the loss of turnover of trade, hotel and restaurant and tourism businesses. The scale of the impact of the COVID-19 pandemic largely depended on the complexity of products of different economic sectors, their suitability for remote forms of organization. That is why service enterprises have suffered the most from the epidemic. It should be noted that the hotel and restaurant and tourism businesses were suspended in accordance with the decisions of public authorities (KMU, 2020) and not due to changes in market conditions. This has led to a significant reduction in the number of employees involved (Table 6).

Thus, the largest losses of human resources due to pandemic restrictions were suffered by the restaurant business (especially in the second quarter of 2020) and the tourism sector. Slightly lower staff losses were related to retail enterprises, while hotel establishments practically managed to preserve their labor potential. In addition, most companies have used quarantine easing to improve the staffing situation as early as the third quarter of 2020, which gives hope for a full recovery with the lifting of restrictions.

Table 6. Comparison of expected changes in the number of employed in retail trade, hotel and restaurant and tourism business according to the 2016–2019 trend analysis and in connection with the lockdown in 2020 (% of the total number of enterprises)

Source: Compiled by the authors according to the State Statistics Service of Ukraine (2020).

Type of economic activity of enterprises	2020 (forecast values)			2020 (statistics)			Deviation		
	I	II	III	I	II	III	I	II	III
Retail:	6.0	5.5	6.0	3.0	–15.0	–5.0	–3.0	–20.5	–11.0
• vehicles	8.5	8.5	8.5	0.0	–19.0	–10.0	–8.5	–27.5	–18.5
• food, beverages and tobacco	8.5	10.0	8.5	–2.0	–26.0	–14.0	–10.5	–36.0	–22.5
• fuel	9.5	6.5	7.5	3.0	–11.0	–7.0	–6.5	–17.5	–14.5
• other goods	5.5	4.0	5.5	5.0	–14.0	–3.0	–0.5	–18.0	–8.5
Provision of temporary accommodation services	7.0	–3.0	5.5	4.0	–11.0	4.0	–3.0	–8.0	–1.5
Food and beverage service activities	–10.5	15.0	6.0	–9.0	–38.0	–30.0	1.5	–53.0	–36.0
Activities of travel agencies, tour operators, other reservation service and related activities	28.5	8.5	–28.0	12.0	–12.0	–58.0	–16.5	–20.5	–30.0

Among the institutional tools for business support, one should note the exemption from payment or deferral of payment of taxes for the period of quarantine for business entities whose activities are prohibited by the Cabinet of Ministers of Ukraine dated March 11, 2020 No. 211 – restaurants, shopping malls, tourism enterprises. Nevertheless, among the most significant endogenous factors of the negative impact of the exponential spread of COVID-19 on enterprise recovery, the Verkhovna Rada of Ukraine (2020b) highlights a significant decline in effective demand, significant unemployment due to the return of workers and mass layoffs; mass bankruptcy of medium and small businesses, which is expected to lead to a further decline in GDP.

CONCLUSION

This paper notes the negative impact of the coronavirus crisis on business performance. Destructive consequences can be extremely critical and cause a chain reaction of imbalance in all macroeconomic indicators of Ukraine's development.

A methodological algorithm has been developed to model a short-term forecast for the resumption of turnover of retail trade, hotel and restaurant and tourism businesses under quarantine restrictions and epidemiological zoning. The modeling involves four stages and includes assessing the impact of macroparameters on the dynamics of sales in pre-quarantine conditions, determining the degree of economic losses from quarantine restrictions, defining the coefficients of dynamic impact of macro indicators under the differentiation of quarantine restrictions according to the level of epidemic danger, and constructing forecast prospects for restoring effective activity of the enterprises of retail trade, hotel-restaurant and tourist business depending on quarantine zoning.

The correlation between the severity of quarantine restrictions and the expected changes in the turnover of enterprises has been revealed. In the process of modeling, possible fluctuations of the independent variable were deliberately not considered; only the cumulative effect of the pandemic dynamics of the three macroindicators on the expected dynamics of retail trade, hotel and restaurant and tourism business turnover was studied. In a more extended form, given a larger number of exposure parameters, the described technique is advisable to be used for short-term macroeconomic forecasting when determining quarantine restrictions and epidemiological zoning. Timely identification of weaknesses and critical points of the economic downturn will allow adequately developing methods of economic and social support from the government to optimize and reduce the negative impact of the pandemic on the activities of retail, hotel, restaurant and tourism businesses.

http://dx.doi.org/10.21511/ppm.18(4).2020.17

AUTHOR CONTRIBUTIONS

Conceptualization: Iryna Melnyk, Yuriy Turyanskyy, Ihor Mishchuk.
Data curation: Roksolana Godunko.
Formal analysis: Nataliia Mitsenko.
Funding acquisition: Iryna Melnyk, Yuriy Turyanskyy, Ihor Mishchuk, Nataliia Mitsenko, Roksolana Godunko.
Investigation: Nataliia Mitsenko, Ihor Mishchuk, Iryna Melnyk.
Methodology: Iryna Melnyk, Yuriy Turyanskyy, Nataliia Mitsenko.
Project administration: Nataliia Mitsenko, Iryna Melnyk.
Resources: Iryna Melnyk, Yuriy Turyanskyy, Ihor Mishchuk, Nataliia Mitsenko, Roksolana Godunko.
Supervision: Nataliia Mitsenko, Iryna Melnyk, Yuriy Turyanskyy.
Software: Iryna Melnyk, Yuriy Turyanskyy, Ihor Mishchuk.
Validation: Nataliia Mitsenko, Roksolana Godunko.
Visualization: Ihor Mishchuk, Roksolana Godunko.
Writing – original draft: Iryna Melnyk, Nataliia Mitsenko.
Writing – review and editing: Yuriy Turyanskyy, Ihor Mishchuk.

REFERENCES

1. Barna, M. Yu., & Tabaka, N. M. (2020). Diialnist turystychnoi haluzi u pandemiinyi ta postpandemiinyi period [Activities of the tourism industry in the pandemic and post-pandemic period]. Proceedings of the *International scientific-practical conference "Modern directions of economic development, entrepreneurship, technologies and their legal support"* (pp. 173-174). Lviv: LTEU Publishing House. (In Ukrainian). Retrieved from https://tourlib.net/statti_ukr/barna7.htm
2. Bloomberg. (2020). *Official site.* Retrieved from https://www.investing.com/indices/ftse-all-world
3. Brown, R. S., & Kline, W. A. (2020). Exogenous shocks and managerial preparedness: A study of U.S. airlines' environmental scanning before the onset of the COVID-19 pandemic. *Journal of Air Transport Management, 89,* 101899. https://doi.org/10.1016/j.jairtraman.2020.101899
4. Crick, J. M., & Crick, D. (2020). Coopetition and COVID-19: Collaborative business-to-business marketing strategies in a pandemic crisis. *Industrial Marketing Management, 88,* 206-213. https://doi.org/10.1016/j.indmarman.2020.05.016
5. European Commission (EC). (2016). *The Joint Harmonised EU Programme of Business and Consumer Surveys: User Guide.* Brussels: Directorate General for Economic and Financial Affairs. Retrieved from https://ec.europa.eu/economy_finance/db_indicators/surveys/documents/bcs_user_guide_en.pdf
6. Fedulova, I., & Dzhulai, M. (2020). Ekonomichni naslidky pandemii Covid-19 dlia pidpryiemstv Ukrainy [Economic consequences of the COVID-19 pandemic for Ukrainian enterprises]. *Visnyk KNTEU*, 4, 74-91. (In Ukrainian). DOI: http://doi.org/10.31617/visnik.knute.2020(132)06.
7. Maksymenko, I. (2020). Ekonomichna polityka derzhavy v umovakh pandemii COVID-19 [Economic policy of the state in the terms of COVID-19 pandemic]. *Materials of the International scientific-practical conference "Modern technologies of commercial activity and logistics"* (pp. 229-231). Kyiv: KNEU. (In Ukrainian). Retrieved from https://ir.kneu.edu.ua:443/handle/2010/33667.
8. Milanova, Ya. (2020). *132 tysiachi khvorykh i zhorstkyi karantyn u chervni. U MOZ rozpovily pro stsenarii poshyrennia COVID-19 [132 thousand patients and strict quarantine in June. The Ministry of Health told about the scenarios for the spread of COVID-19].* (In Ukrainian). Retrieved from https://suspilne.media/
9. National Tourism Organization of Ukraine. (2020). *COVID-19 HUB.* (In Ukrainian). Retrieved from http://www.ntoukraine.org/covid19_ua.html
10. NBU. (2020). *Financial Stability Report. June 2020.* Retrieved from https://bank.gov.ua/en/stability/report
11. Rudnytska, A., & Petrenko, I. (2020). Financial and Economic Crisis in 2020: Threats and Prospects for The Development of National Companies. Dew Dealgens in The Anticrisis Management of the Company. *Materials of the International scientific-practical conference "Modern technologies of commercial activity and logistics"* (pp. 237-339). Kyiv: KNEU. (In Ukrainian). Retrieved from https://ir.kneu.edu.ua/handle/2010/33670
12. Sokurenko, S. V. (2020). Prohnozy ekonomichnoi dynamiky v Ukraini pid chas pandemii Covid-19 [Forecasts of macroeconomic developments in Ukraine in the time of Covid-19

pandemic]. *Herald of Lviv University of Trade and Economics*, 59, 57-64. (In Ukrainian). Retrieved from http://www.lute.lviv.ua/fileadmin/www.lac.lviv.ua/data/pidrozdily/Naukovi_Vydannya/Vydan_Ekon/Docs/maket_59.pdf#page=57.

13. State Statistics Service of Ukraine. (2017). *Metodyka rozrakhunku indykatoriv dilovykh ochikuvan [Method of calculating indicators of business expectations]* (54 p.). Kyiv. (In Ukrainian). Retrieved from http://www.ukrstat.gov.ua/metod_polog/metod_doc/2019/175/m_rido.pdf

14. State Statistics Service of Ukraine. (2020). *Makroekonomichni pokaznyky [Macroeconomic indicators]*. (In Ukrainian). Retrieved from http://www.ukrstat.gov.ua

15. UNECE. (2011). *Prakticheskoe posobie po sezonnoy korrektirovke programmnyim obespecheniem Demetra ot ishodnyih ryadov do predostavleniya [A practical guide to seasonal adjustment with Demetra+ software from original series to provision]*. (In Russian). Retrieved from http://www.unece.org/fileadmin/DAM/stats/publications/Practical_Guide_to_Seasonal_Adjustment_for_web_RU.pdf

16. Verikios, G. (2020). The dynamic effects of infectious disease outbreaks: The case of pandemic influenza and human coronavirus. *Socio-Economic Planning Sciences, 71,* 100898. https://doi.org/10.1016/j.seps.2020.100898

17. Verkhovna Rada of Ukraine. (2020a). *Pro zapobihannia poshyrenniu na terytorii Ukrainy hostroi respiratornoi khvoroby COVID-19, sprychynenoi koronavirusom SARS-CoV-2:* Postanova No. 211 vid 11.03.2020 [*On prevention of the spread of acute respiratory disease COVID-19 caused by coronavirus SARS-CoV-2 on the territory of Ukraine:* Resolution No. 211 of 11.03.2020]. (In Ukrainian). Retrieved from https://zakon.rada.gov.ua/laws/show/211-2020-%D0%BF#Text

18. Verkhovna Rada of Ukrainy. (2020b). *Pro vnesennia zmin do deiakykh zakonodavchykh aktiv Ukrainy, spriamovanykh na zapobihannia vynyknenniu i poshyrenniu koronavirusnoi khvoroby (Covid-19): Zakon Ukrainy No. 530-IX vid 17.03.2020 [On Amendments to Certain Legislative Acts of Ukraine Aimed at Preventing the Occurrence and Spread of Coronavirus Disease (Covid-19): Law of Ukraine No. 530-IX of March 17, 2020].* (in Ukrainian). Retrieved from http://w1.c1.rada.gov.ua/pls/zweb2/webproc4_1?pf3511=68397

19. World Health Organization. (2020). *Coronavirus disease (COVID-19) pandemic*. Retrieved from https://www.who.int/emergencies/diseases/novel-coronavirus-2019

20. Yehorova, O. V., & Artemenko, H. P. (2020). *Problemy maloho biznesu Ukrainy pid chas pandemii koronavirusu [Problems of small business in Ukraine during the coronavirus pandemic].Proceedings of the II International scientific-practical conference "Modernization of the economy: current realities, forecast scenarios and development prospects"* (pp. 241-243). Kherson. (In Ukrainian).

21. Zacks Investment Research. (2020). *Investment Research*. Retrieved from https://www.investing.com/analysis/etfs-to-the-rescue-amid-coronavirusled-volatility-200516018

http://dx.doi.org/10.21511/ppm.18(4).2020.17