Factor determinants of the consumer market development

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ABSTRACT

This paper substantiates that increasing the capacity of the consumer market is an important direction of the life quality improvement policy. Its implementation is the major strategic priority of all reforms in Ukraine. Based on the methods of economic and mathematical modeling, namely constructing the linear multiple regression equation, the level of impact of stimulating and destimulating factors on the consumer capacity of the oblasts of the Carpathian region is determined.

Keywords: Factor, Consumer Market, Carpathian Region, Consumer Goods, Consumer Capacity

1. Introduction

Increasing the consumer market capacity is an important priority of the implementation of economic, social, and managerial reforms directed at improving the quality of life. The consumer market is the most developed goods market in Ukraine since the domestic producers provide the domestic consumer market with 81.4% of food products. Food companies nowadays, on the one hand, play an important role for the creation of value chains by securing the entire technological cycle of agricultural processing, and on the other hand, are active participants of the country’s foreign trade, forming over 50% of the foreign trade turnover of agricultural products (Milk.UA.info, 2018). Therefore, to determine the factors that impact the functioning of regional markets, we focus on the development of the regional consumer market (food market).

2. Literature review

The issues of the consumer market development in Ukraine nowadays are becoming increasingly relevant in the context of currently aggravated global problems. A range of scientists devote their research to this problem. In particular, Haydutsky (2004) and Pavlova et al. (2021) examined the global experience of food provision and draw parallels with domestic practice. Ivanyuk (2015) and Hurmak (2017) researched the agricultural market, represented the structure of food consumption, and defined the major elements of the consumer market provision with food. Meeting the needs for quality goods at accessible prices through the
change of the mechanism of the consumer market development is covered by Kolomiyets (2016). Tolok (2018), and Yakymchuk et al. (2020) characterized the impact of environmental conditions on the quality and safety of consumer goods. Panuhnyk et al. (2019) examined the socio-economic nature of consumer market support in Ukraine, namely its entities and main macroeconomic functions oriented at production, sales, and consumption of food that are performed by the country to secure the consistent social reproduction process and guarantee the security of the country. Shushpanov addresses the issue by defining the risk groups among the population for whom food consumption is one of the leading health determinants. The population is researched across gender, age, marital status, social status, income, and place of residence (Shushpanov, 2016). Barna (2017) constructed a model to study the differences in the purchase behavior of the population on the consumer market of the EU Member States and Ukraine. The model provided the authors with an opportunity to argue that income is the main factor of differences, just like the same as tastes and preferences of consumers. Zhang et al. (2016) studied the consumer confidence in food products and determined that the confidence was formed in different ways. Among other things, it is about personal relations or various organizational mechanisms established by governments, private companies, or civil society organizations. Wong et al. (2018) in their research of the consumer market, focused on environmental problems accompanying food production paid special attention on the development of the Theory of Planned Behavior research model and prognosis of consumers’ purchase intention to organic food. Nagyová et al. (2016) emphasized the efficiency of agricultural companies’ policy and their opportunity to access financial resources. Prunteva et al. (2021) examined the provision of the consumer market with food and define the risks of impact on agricultural companies as the basis for agricultural production. Toderasc (2017) researched the process of transition of consumers’ provision from the wholesale to the retail level, emphasizing the importance of all trade institutes in the process. Irtyshcheva et al. (2020) analyzed the business activity in the food industry and calculated the regional capacity of the food security on the example of the Black Sea Region of Ukraine. It contributed to showing the condition of the consumer market and defining the priorities of its provision with food. Zablodska et al. (2020) and Simkiv et al. (2020) and Dziabenko et al. (2018) considered the consumption in conditions of sustainable development of business processes at Ukrainian companies.

The authors of the paper hypothesize that the households’ monetary expenditures, average monthly wages, consumer price index, and dynamics of the expenditures of the population are the major stimulating factors that increase consumer capacity of the population in the oblasts of the Carpathian region.

3. Materials and Methods

The method of factor analysis was used to find the relationship between the factors of the regions’ socio-economic development and the consumer capacity of the regional food market. The method provides an opportunity to qualitatively and quantitatively estimate the changes of certain indicators against the final values and generate on this basis the efficient managerial decisions regarding the regulation of regional markets’ development.

Economic-mathematical modeling with correlation analysis shows the relationship between the volume of sold products on regional food markets of Ukrainian regions (output indicator – the volume of sold food products of regions, Y1, Y2, Y3, Y4, Y5) and socio-economic factors of impact on the development of the industry and a consumer (independent variable, indicator, factor, Xn. X1 – disposable income per capita, UAH; X2 – average monthly wages, UAH; X3 – GRP per capita, UAH; X4 – consumer price index; X5 – households’ monetary expenditures on food, UAH/month; X6 – total consumer expenditures, %; X7 – change of volumes of the populations’ income, %; X8 – change of volumes of the populations’ expenditures, %; X9 – number of population (actual), thous. persons; X10 – export, mln. UAH; X11 – import, mln. UAH). The capital region and the oblasts of the Carpathian region (Kiyivska, Chernivetska, Zakarpatska, Lvivska, and Ivano-Frankivska oblasts) are selected for the analysis.

Over 60 factors were selected at the initial stage of the research based on the official statistical data – the indicators of the regional food market and consumer behavior in Ukrainian regions in 2008-2018 (Xn). The availability of correlation with the output indicators (Y1, Y2, Y3, Y4, Y5) and the absence of multicollinearity between two and more independent factors was researched for the correct analysis and construction of multifactor regression models. After the factors were verified for the absence of linear dependence, 16 independent variables were selected. To construct adequate econometric models, the data was standardized and homogenized to avoid a high non-standardized error.

4. Results and discussion

The results of the correlation analysis in Table 1 prove the existence of a strong relationship between the selected economic factors and independent variables – most correlation coefficients are close to 1. The density of the relationship is verified by the coefficients of the determination (R²), which are also getting close to 1, while the reliability of results is verified by Student’s t-test.
Table 1

Analysis of factors’ impact on the volumes of sold food products

| Xₙ  | Correlation coefficient | Coefficient of determination | Student’s t - test | Significance value | Slope coefficient (Y) | Slope coefficient (X) |
|-----|------------------------|------------------------------|--------------------|-------------------|-----------------------|-----------------------|
| Y₁  | 0.950090               | 0.902672                    | 9.13623            | 0.000008          | 0.950090              | 0.950090              |
| Y₂  | 0.960064               | 0.921723                    | 10.29449           | 0.000003          | 0.960064              | 0.960064              |
| Y₃  | 0.948985               | 0.900572                    | 9.02874            | 0.000008          | 0.948985              | 0.948985              |
| Y₄  | 0.832291               | 0.810427                    | 1.02557            | 0.332764          | 0.322911              | 0.322911              |
| Y₅  | 0.955712               | 0.913386                    | 9.74214            | 0.000004          | 0.955712              | 0.955712              |
| Y₆  | 0.782859               | 0.846630                    | 2.80416            | 0.020572          | 0.682859              | 0.682859              |
| Y₇  | 0.816345               | 0.802672                    | 0.49703            | 0.631800          | 0.163450              | 0.163450              |
| Y₈  | 0.891172               | 0.902615                    | 0.49162            | 0.634753          | 0.161717              | 0.161717              |
| Y₉  | 0.954094               | 0.929261                    | 1.92948            | 0.085743          | 0.540939              | 0.540939              |
| Y₁₀ | 0.907210               | 0.823029                    | 6.46061            | 0.000115          | 0.907210              | 0.907210              |
| Y₁₁ | -0.864241             | 0.841269                    | -2.51475           | 0.033052          | -0.642406             | -0.642406             |

Note: calculations based on statistical data.

Comment:
Y₁ – the volume of sold food products in Chernivetska oblast, thou. UAH; Y₂ – the volume of sold food products in Zakarpatska oblast, thou. UAH; Y₃ – the volume of sold food products in Lvivska oblast, thou. UAH; Y₄ – the volume of sold food products in Ivano-Frankivska oblast, thou. UAH.
X₁ – disposable income per capita, UAH; X₂ – average monthly wages, UAH; X₃ – GRP per capita, UAH; X₄ – consumer price index; X₅ – households’ monetary expenditures on food, UAH/month; X₆ – total consumer expenditures, %; X₇ – change of volume of the populations’ income, %; X₈ – change of volume of the populations’ expenditures, %; X₉ – number of population (actual), thous. persons; X₁₀ – export, mln. UAH; X₁₁ import, mln. UAH.

The results of the correlation analysis show that the factor of average monthly wages (correlation coefficient 0.960064) has the strongest impact on the volume of sold food products in Chernivetska oblast (Y₁) and the import of products in the region (correlation coefficient shows the inverse relationship and amounts to -0.864241) has the least impact. Such factors as total.
consumer expenditures and change of volume of the populations’ income have the weakest impact on the output variable in terms of the volume of the region’s consumer market with the respective correlation coefficients of 0.782859 and 0.816345.

Such socio-economic factors as the households’ monetary expenditures on food products and average monthly wages (with the correlation coefficients of 0.977767 and 0.970170, respectively) substantially impact the volume of sold food products in Zakarpatska oblast (Y2).

Meanwhile, GRP per capita and households’ monetary expenditures on food (coefficients are 0.993900 and 0.993062) have the strongest impact on the volume of sold food products in Lvivska oblast (Y3). The consumer price index and the change of volume of the populations’ expenditures have the strongest impact on the volume of sold food products in Ivano-Frankivska oblast (Y4) among the factors with the direct and inverse relationship (correlation coefficients 0.971932 and -0.821901, respectively).

The linear multiple regression equation for Lvivska oblast (Table 2) shows that the consumer price index (X4), GDP per capita (X3), change of volume of the populations’ income (X7), households’ monetary expenditures on food (X5), and export (X10) are the stimulators of the consumer capacity development of food industry market in the region, while import (X11) is the destimulator.

Table 2
Results of the regression analysis of the consumer capacity of the regional food market in Lvivska oblast and socio-economic factors

| Groups of factors | Standardized regression coefficients | Standard error b | Student’s t-test | Significance value |
|-------------------|--------------------------------------|------------------|-----------------|------------------|
| Intercept         | 0.00001                              | 0.0144           | 0.0000          | 1.0000           |
| Consumer price index, X4 | 0.4690                        | 0.0868           | 5.4011          | 0.0057           |
| GRP per capita, X3    | 0.3844                        | 0.0634           | 6.0617          | 0.0037           |
| Change of volume of the populations’ income, X7 | 0.0392                        | 0.0208           | 1.8854          | 0.1325           |
| Households’ monetary expenditures on food, X5 | 0.0745                        | 0.0199           | 3.7502          | 0.0199           |
| Export, X10         | 0.1446                        | 0.0532           | 2.7201          | 0.0530           |
| Import, X11         | -0.0330                       | 0.0281           | -1.1739         | 0.3056           |

Regression equation: 

\[ Y_3 = 0.00001 + 0.4690X_3 + 0.3844X_5 + 0.0392X_7 + 0.0745X_5 + 0.1446X_{10} - 0.0330X_{11} \] (1)

Note: calculations based on statistical data.

Therefore, the results of the analysis confirm that the volume of sold food products in Lvivska oblast mostly depends on the financial instability of households, consumer price index, and volume of foreign trade activity (export and import of consumer products). The consumer price index has the strongest impact on the consumer capacity of Lvivska oblast (standardized regression coefficient is 0.4690), which shows that even the slightest changes in the price policy of food producers and suppliers can have a substantial effect on the level of consumption of food products. According to the received results, the GRP per capita that characterizes the level of economic development, the results of economic activity of all economic entities in the region, its production capacity, and the productivity of the economy in general is the second parameter by the impact on the output indicator (standardized regression coefficient is 0.3844). The import of food products has the least impact on the volume of sold food products in the region (standardized regression coefficient is – 0.0330). Import’s impact on consumer behavior in the region in the total set of socio-economic factors is only 3.30%. In our opinion, it is caused by the prevailing consumption of domestic products and location close to the border, which brings more opportunities to buy the consumer products in the neighboring countries (Poland, Hungary).

Table 3 shows the results of the verification of the reliability of the developed economic-mathematical model by the parameters of stepwise regression and factors ranking by partial correlation coefficients.
Table 3
Results of reliability of the constructed multiple regression equation for the consumer capacity of the regional food market in Lvivska oblast

| Factors       | Partial correlation coefficients | Semipartial correlation coefficients | Coefficients of determination | Standard error | Student’s t-test | Significance value |
|---------------|----------------------------------|-------------------------------------|--------------------------------|----------------|------------------|-------------------|
| $X_4$         | 0.93777                          | 0.08184                             | 0.03044                        | 0.06956        | 5.40114          | 0.00569           |
| $X_3$         | 0.94964                          | 0.09185                             | 0.05710                        | 0.04290        | 6.06166          | 0.00374           |
| $X_7$         | 0.68595                          | 0.02857                             | 0.53071                        | 0.46929        | 1.88540          | 0.13245           |
| $X_8$         | 0.88236                          | 0.05682                             | 0.58253                        | 0.41747        | 3.75023          | 0.01994           |
| $X_{10}$      | 0.80566                          | 0.04121                             | 0.08119                        | 0.91881        | 2.72006          | 0.05298           |
| $X_{11}$      | -0.50619                         | -0.01779                            | 0.29009                        | 0.70991        | -1.17389         | 0.30556           |

Analysis of stepwise regression

| Factors       | Multiple correlation coefficient | Coefficients of multiple determination | Adjusted coefficient of multiple determination | F-test | Slope coefficient (Y) |
|---------------|----------------------------------|----------------------------------------|-----------------------------------------------|--------|-----------------------|
| $X_4$         | 0.99390                          | 0.987837                               | 0.987837                                      | 730.9612 | 0.000000              |
| $X_3$         | 0.99664                          | 0.993292                               | 0.005455                                      | 6.5059  | 0.034139              |
| $X_7$         | 0.997460                         | 0.994927                               | 0.001634                                      | 2.2549  | 0.176887              |
| $X_8$         | 0.998491                         | 0.996985                               | 0.002058                                      | 4.0963  | 0.089412              |
| $X_{10}$      | 0.999382                         | 0.998765                               | 0.001780                                      | 7.2098  | 0.043553              |
| $X_{11}$      | 0.999541                         | 0.999082                               | 0.000316                                      | 1.3780  | 0.305560              |

**Note:** calculations based on statistical data.

The results confirm the decisive impact of the GRP per capita indicator and consumer price index on the volume of sold food products in Lvivska oblast. The level of consumption on the regional food market depends on them at 94.96 % and 93.78 %. 80 % of food consumption depends on the expenditures and income of the population. Below are the results of the regression analysis of the estimation of factors’ impact on the consumer market of Chernivetska oblast. The results of the analysis of the multiple regression by stepwise regression with F-test are given in Table 4.

Table 4
Results of the multiple regression of the dependence between the volume of sold food products in Chernivetska oblast and socio-economic factors

| Factors                      | Parameters of regression equation and correlation coefficients |
|------------------------------|----------------------------------------------------------------|
|                              | Standardized regression coefficients | Standard error | Student’s t-test | Significance value | Partial correlation coefficients | Semipartial correlation coefficients | Acceptable deviation |
| Intercept                    | 0.00001                          | 0.0008       | 0.00001         | 1.0000            | 0.9987                           | 0.0226                          | 0.0016               |
| GRP per capita, $X_3$        | 0.5702                           | 0.0207       | 27.5261         | 0.0013            | 0.9999                           | 0.0979                          | 0.1759               |
| Households’ monetary expenditures on food, $X_2$ | 0.2334                           | 0.0020       | 119.001         | 0.0001            | 0.9992                           | 0.0287                          | 0.1449               |
| Change of volume of the populations’, $X_7$ | 0.0755                           | 0.0022       | 34.9254         | 0.0008            | 0.9951                           | 0.0117                          | 0.0082               |
| Import, $X_{11}$             | 0.1289                           | 0.0091       | 14.2200         | 0.0049            | 0.9996                           | 0.0416                          | 0.0046               |
| Consumer price index, $X_4$  | 0.6135                           | 0.0121       | 50.5260         | 0.0004            | -0.9997                          | -0.046                          | 0.0573               |
| Export, $X_{10}$             | -0.1938                          | 0.0034       | -56.424         | 0.0003            | -0.9965                          | -0.014                          | 0.0052               |
| Total consumer expenditures, $X_8$ | -0.1907                        | 0.0114       | -16.766         | 0.0035            | -0.9687                          | -0.005                          | 0.0025               |
| Average monthly wages, $X_9$ | -0.0909                          | 0.0165       | -5.5152         | 0.0313            | 0.9987                           | 0.0226                          | 0.0016               |

**Note:** calculations based on statistical data
According to Table 4, the volume of the sold food products in Chernivetska oblast closely correlates with such parameters as GRP per capita ($X_3$), consumer price index ($X_4$), and households’ monetary expenditures on food ($X_5$). They all directly impact the level of consumer capacity in the region (standardized regression coefficients are 0.5702, 0.6135, and 0.2334, respectively) and impact the volumes of food products sales by the other eight independent socio-economic factors at 23-57%.

The factors included in the multiple models of consumer capacity of the regional food market under research are both stimulators (GRP per capita, households’ monetary expenditures on food, change of volume of the populations’ income, import, and consumer price index), the regression coefficients are positive, and destimulators (export, total consumer expenditures of the population, and average monthly wages), where the respective coefficients are negative.

Among all the selected factors, income of the population and foreign economic activity impact the volume of sold food products on the regional market of Chernivetska oblast the most. Calculations of multiple regression show that GRP per capita ($X_3$) impacts the volume of food products sales at 99% (partial correlation coefficient), while the impact of the income of the population ($X_7$) is lower and amounts to only 7.55%.

The equation of the model of dependence between the factors of socio-economic development of Chernivetska oblast ($X_3$, $X_5$, $X_7$, $X_{11}$, $X_4$, $X_{10}$, $X_6$, $X_2$) and the volume of sold food products in the region ($Y_1$) are represented by the Formula (2).

$$Y_1 = 0.00001 + 0.5702X_3 + 0.2334X_5 + 0.0755X_2 + 0.1289X_{11} + 0.6135X_4 - 0.1938X_{10} - 0.1907X_6 - 0.0909X_2$$

(2)

Zakarpatska oblast has its features in terms of forming the regional consumer market. The analysis of the factors’ impact on the development of the regional food market in Zakarpatska oblast allows presenting the following results (Table 5).

**Table 5**
Results of the regression analysis of the consumer capacity of the regional food market in Zakarpatska oblast and socio-economic factors

| Groups of factors                                      | Standardized regression coefficients | Standard error b | Student’s t-test | Significance value |
|--------------------------------------------------------|--------------------------------------|------------------|------------------|-------------------|
| Intercept                                              | 0.00001                              | 0.0062           | 0.0000           | 1.0000            |
| Total consumer expenditures, $X_6$                     | -0.6401                              | 0.0770           | -8.3106          | 0.0037            |
| Import, $X_{11}$                                       | 0.2774                               | 0.0260           | 10.6766          | 0.0018            |
| Change of volume of the populations’ income, $X_7$     | 0.3890                               | 0.0149           | 26.0289          | 0.0001            |
| Consumer price index, $X_4$                           | 1.0121                               | 0.0689           | 14.6851          | 0.0007            |
| Export, $X_{10}$                                       | -0.4886                              | 0.0314           | -15.5609         | 0.0006            |
| Households’ monetary expenditures on food, $X_5$      | 0.1303                               | 0.0103           | 12.6774          | 0.0011            |
| GRP per capita, $X_3$                                  | 0.4929                               | 0.0423           | 11.6401          | 0.0014            |

Regression analysis

| Multiple correlation coefficient                      | 0.99993746                           |
| Coefficient of determination                         | 0.99987492                           |
| Adjusted coefficient of determination                | 0.99958306                           |
| F-test                                                | 3425.9 > F_{tab}                      |
| Degrees of freedom                                   | 7.3                                  |
| Standard deviation                                   | 0.02042                              |
| Probability level (p)                                | 0.00001                              |

*Multiple regression equation:*

$$Y_1 = 0.00001 + 0.6401X_6 + 0.2774X_{11} + 0.3890X_7 + 0.0121X_4 - 0.4886X_{10} + 0.1303X_5 + 0.4929X_3$$

(3)

Note: calculations based on statistical data

The consumer price index impacts the consumer capacity of the region the most (standardized regression coefficient is 1.0121). Same as in the other regions under research, the parameter has a dominating impact on the volume of food products sales.

According to the received results, total consumer expenditures of the population in Zakarpatska oblast is the second parameter by the impact on the output indicator (standardized regression coefficient is -0.6401). The parameter acts as a destimulator because it has an inverse impact on the volume of sold food. It can be explained by the fact that the region under research is oriented at imported products bought abroad and is confirmed by a high level of the coefficient of determination that amounts to 0.2774. The
higher is the impact of the indicator on the volume of food consumption in the region, the higher yet inverse is the impact of food products export in the region (standardized regression coefficient is -0.4886).

The households’ monetary expenditures on food have the least impact on the volume of sold food products (standardized regression coefficient is 0.1303). It is caused by the fact that food products in the region under research constitute the low elasticity category of goods on the consumer market. It is the category of goods that hardly respond to the price, and the population will buy the goods even if the prices grow.

Ranking of factors by partial correlation coefficients and the results of verification of the reliability of the developed economic-mathematical model by the parameters of stepwise regression are given in Table 6.

**Table 6**
Results of the reliability of the constructed multiple regression equation for the consumer capacity of the regional food market in Zakarpatska oblast

| Factors | Detailed multiple correlation analysis | | | | |
|---|---|---|---|---|---|
| | Partial correlation coefficients | Semipartial correlation coefficients | Acceptable deviation | Standard error | Student’s t-test | Significance value |
| X₆ | -0.9790 | -0.0537 | 0.0070 | 0.9930 | -8.3106 | 0.0037 |
| X₁₁ | 0.9871 | 0.0689 | 0.0618 | 0.9382 | 10.6766 | 0.0018 |
| X₇ | 0.9978 | 0.1681 | 0.1867 | 0.8133 | 26.0289 | 0.0001 |
| X₄ | 0.9931 | 0.0948 | 0.0088 | 0.9912 | 14.6851 | 0.0007 |
| X₁₀ | -0.9939 | -0.1005 | 0.0423 | 0.9577 | -15.5609 | 0.0006 |
| X₅ | 0.9908 | 0.0819 | 0.3944 | 0.6056 | 12.6774 | 0.0011 |
| X₃ | 0.9891 | 0.0752 | 0.0233 | 0.9767 | 11.6401 | 0.0014 |

Stepwise regression analysis

| Factors | Multiple correlation coefficient | Coefficients of multiple determination | Adjusted coefficient of multiple determination | F-test | Slope coefficient (Y) |
|---|---|---|---|---|---|
| X₆ | 0.958093 | 0.919667 | 0.919667 | 103.0334 | 0.000003 |
| X₁₁ | 0.982589 | 0.965482 | 0.045815 | 10.6182 | 0.011552 |
| X₇ | 0.990066 | 0.980230 | 0.014748 | 5.2219 | 0.056208 |
| X₄ | 0.993683 | 0.987406 | 0.007176 | 3.4188 | 0.113946 |
| X₁₀ | 0.996140 | 0.992296 | 0.004890 | 3.1375 | 0.134947 |
| X₅ | 0.997109 | 0.994226 | 0.001930 | 1.3369 | 0.311936 |
| X₃ | 0.999937 | 0.999975 | 0.005649 | 135.4917 | 0.001362 |

Note: calculations based on statistical data

Multiple correlation coefficients show the strongest impact of the change of the income of the population in the region and export of food products (standardized regression coefficients are 0.9978 and -0.9939, respectively). The data in Table 4 and Table 8 lead to the conclusion that the parameters of export and import of food products have the strongest impact, adjusting 98 % and 99 % of the variation of the dependent variable.

The regional specifics of the factor analysis of the regional food market in Ivano-Frankivska oblast is shown in Table 7.

The factors included in the multiple model of the consumer capacity of the regional food market under research are both stimulators (GDP per capita, number of the actual population, and disposable income per capita) because the standardized regression coefficients are positive and destimulators (consumer price index, change of the volume of income and expenditures of the population, export) with negative respective coefficients.

GDP per capita (standardized regression coefficient is 0.9681) has the strongest impact on the volume of sold food products among all the selected factors. The parameter correlates at 42.44% (partial correlation coefficient) at the leveled values of other socio-economic factors.
Table 7
Results of multiple regression of the dependence between the volume of sold food products in Ivano-Frankivska oblast and socio-economic factors (estimation by stepwise regression with F-test)

| Factors | Parameters of the regression equation and correlation coefficients | Partial correlation |
|---------|-------------------------------------------------|---------------------|
| Intercept | 0.00001 | 0.0309 | 0.0000 | 1.0000 | 0.9552 | 0.1813 | 0.0351 |
| GRP per capita, $X_3$ | 0.9681 | 0.1732 | 5.5882 | 0.0113 | -0.4244 | -0.0263 | 0.0331 |
| Consumer price index, $X_4$ | -0.1447 | 0.1782 | -0.8118 | 0.4763 | -0.9167 | -0.1289 | 0.4119 |
| Change of volume of the populations’ income, $X_7$ | -0.2008 | 0.0506 | -3.9729 | 0.0285 | -0.8190 | -0.0802 | 0.1525 |
| Change of volume of the populations’ expenditures, $X_8$ | -0.2054 | 0.0831 | -2.4719 | 0.0899 | -0.9400 | -0.1548 | 0.1307 |
| Export, $X_{10}$ | -0.4282 | 0.0897 | -4.7718 | 0.0175 | 0.9207 | 0.1326 | 0.1891 |
| Number of population (actual), $X_9$ | 0.3050 | 0.0746 | 4.0876 | 0.0265 | 0.8806 | 0.1045 | 0.2581 |
| Disposable income per capita, $X_1$ | 0.2056 | 0.0639 | 3.2194 | 0.0486 | 0.9552 | 0.1813 | 0.0351 |
| Multiple correlation coefficient | 0.99841985 |
| Coefficient of determination | 0.99684220 |
| Adjusted coefficient of determination | 0.98947400 |
| F-test | 135.29 > $F_{tabl.}$ |
| Degrees of freedom | 7.3 |
| Standard deviation | 0.1026 |
| Probability level ($p$) | 0.00096 |

Note: calculations based on statistical data

The equation of the model of dependence between the independent features of the socio-economic development in the region ($X_3$, $X_4$, $X_7$, $X_8$, $X_9$, $X_10$, $X_1$) and the volume of sold food products in Ivano-Frankivska oblast ($Y_4$) is represented by Formula (4).

$$Y_4 = 0.00001 + 0.9681X_3 - 0.1447X_4 - 0.2008X_7 - 0.2054X_8 - 0.4282X_{10} + 0.3050X_9 + 0.2056X_1$$  \(4\)

Another two factors substantially impact the volume of sold food products in Ivano-Frankivska oblast compared to the other four regions under research – the number of the actual population in the region ($X_9$) and disposable income per capita ($X_1$). It can be explained by the fact that the region has a geographic-economic peculiarity (mountain area), namely a large number of small villages that form the need of the population for food and a large share of employed abroad, who send money home, thus forming high income per capita.

The reliability of the conducted analysis with a stepwise estimation of multiple regression is presented in Table 8.

Table 8
Results of the reliability of the constructed multiple regression equation for the regional consumer market capacity in Ivano-Frankivska oblast

| GRP per capita, $X_3$ | 0.951579 | 0.905502 | 0.905502 | 86.2402 | 0.000007 |
| Consumer price index, $X_4$ | 0.971447 | 0.943709 | 0.038207 | 5.43001 | 0.048144 |
| Change of volume of the populations’ income, $X_7$ | 0.979339 | 0.959105 | 0.015396 | 2.63532 | 0.148540 |
| Change of volume of the populations’ expenditures, $X_8$ | 0.985437 | 0.971087 | 0.011982 | 1.95645 | 0.165903 |
| Export, $X_{10}$ | 0.988466 | 0.977065 | 0.005978 | 1.30318 | 0.305340 |
| Number of population (actual), $X_9$ | 0.992941 | 0.985932 | 0.008867 | 2.52133 | 0.187510 |
| Disposable income per capita, $X_1$ | 0.998420 | 0.996842 | 0.010910 | 10.3648 | 0.048605 |

Note: calculations based on statistical data
It is worth mentioning that the factors included in the multiple regression equation like GRP per capita, number of the actual population in the region, and disposable income per capita are the stimulators because the regression coefficients are positive. Other parameters of the economic-mathematical model are destimulators and their growth will affect the consumer capacity of the region.

5. Conclusion

The results of calculations have shown that the consumer capacity of each oblast of the Carpathian region under research is influenced by a range of stimulating and destimulating factors. Moreover, the dominating factors determined in the process of regression equations constructing have indicated the features and problems of forming and use of the consumer capacity in the oblasts of the Carpathian region. The consumer price index and GRP were established to have a substantial impact on the volume of sold food products in all oblasts. GRP and households’ monetary expenditures on food have the strongest impact on the volume of food products consumption in Lvivska oblast. Average monthly wages, consumer price index, and dynamics (change) of the volume of the population’s expenditures are of the highest level of impact in other oblasts of the Carpathian region.

The factors determined in the process of carrying out the analysis can be the ground for the selection of priority directions for regional economic policy that would promote the strengthening of regions’ competitive advantages or elimination of the negative impact of destimulating factors.

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