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Forecasting the Increase in the Export Potential of Small Businesses Based on a Multifactor Econometric Model.

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ABSTRACT

The article proposes a methodology for calculating the export potential of decisions made in the innovative activities of firms by creating a multifactor econometric model. An econometric analysis was conducted, as a result of which forecast indicators of the volume of exports carried out by small businesses were developed. The volume of investments in fixed assets of small businesses, the number of operating business entities, investments in the production of export-oriented products. The forecast of the volume of innovation exports for the period (2022-2027) produced by small businesses was calculated on the basis of actual data and graphs of the value of these data were constructed. The purpose of forecasting is shown, the essence of which is to establish the possible identification in the future of factors affecting the market, including the market situation, structural shifts in the economy, the emergence of new markets for goods that form price changes. This methodology can be widely used in calculating the export potential of decisions taken in the innovative activities of firms for the medium and long term periods of innovation export.

INTRODUCTION.

Global changes occurring in the world economy require continuous adaptation of Uzbekistan's foreign economic policy to new conditions for its more effective integration into the world economy. Uzbekistan is actively developing an export strategy, the state and dynamics of the implementation of export potential for effective and large-scale development of exports in all areas of the economy, including the entrepreneurial sphere.

The interaction of an open economy with the economies of other countries occurs in two ways: through the purchase and sale of goods and services on world commodity markets, which is accomplished through the export and import of goods.

Export (from Latin Exportare, Latin Export) is the export of goods, technologies and services produced within the country for their sale on the foreign market. [1]Depending on the origin or purpose

[1]Gregory Mankiw . Harvard University principles of Macroeconomics . Second edition. Harcourt collag publishers. Ford Worth, Piladelphia , San Diego, New York, Orlando Austin, San Antonio, Toronto, Montreal, London, Sudney , Tokio . S. 400

of the exported and imported goods, a distinction is made between the export and import of goods and export technologies: the export of domestic goods produced in the country of export "one of the ten principles of economics " states that trade brings benefits to each of its participants (p.406) ibid [2].

The economic potential of export is determined by the achievements of science and technology, the volume of production capacity, the availability of transport, labor resources, the quality of their professional training, the degree of development of non-manufacturing sectors - all this forms the necessary conditions for creating an export potential strategy.

According to this strategy, a number of resolutions of the President of the Republic of Uzbekistan Sh.M. Mirziyoyev have been adopted in the Republic of Uzbekistan to create the necessary legal, financial and organizational assistance in increasing the production of modern products that are competitive in foreign markets. promoting it for export.

An important direction for increasing export potential is stimulating innovative activity in the sphere of small business. To achieve the export potential of small business, it is necessary to increase the weight of high-tech and innovative products in the export structure.

In the Decree of the President of the Republic of Uzbekistan № PP-307 “On approval of the strategy of innovative development of the Republic of Uzbekistan for 2022-2026”, it is stated: “ To approve: forecast indicators for the implementation by organizations of economic sectors, projects for the development of production of science-intensive and innovative products based on new developments and technologies for 2023-2026.”[3]

By compiling a multi-factor econometric model, the prospects of small businesses for the full use of their export opportunities are shown; an export forecast for the future is calculated: using a multi-factor econometric model.

The calculation of the export indicator obtained by us using this model methodology can be used in economic calculations of the forecast for the medium and long term.

ANALYSIS OF LITERATURE ON THE SUBJECT.

The works of foreign scientists R. Drucker, R. Anderson, J. Johansson, S. Harvey are devoted to the issues of development and increase of export potential of small business. Uzbek scientists have studied the problems of export in various industries, for example, in the works of Usmanova D. M. the increase of export potential in viticulture is considered, the influence of strategic marketing on the issues of increase of export potential in small business is studied in the works of U. V. Gafurov, A. Sh. Kholmuradov, R. A. Sadykov, M. R. Boltaboev, G. P. Gulyamov, D. A. Abdieva, Sirozhiddinov N. and others.

Increasing the export potential of small businesses is studied in the works of CIS economists Tishkov V.N., Aniskina Yu.N., Prokushev E.F., Smirnov A.N., Katsik D.E., Trostyansky D.V.[4]

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[2]N. Gregory Mankiw "Principles of Macroeconomics. 2nd edition trans. from English. Peter, 2003, 576 p.

[3]Resolution of the President of the Republic of Uzbekistan for 2022-2026 On organizational measures for the implementation of the strategy of innovative development of the Republic of Uzbekistan for 2022-2026 No. PP-307 06.07.2022 https://www.lex.uz/ru/docs/6102468

[4] Kambarova Sh.M. Development of innovation processes in Uzbekistan to increase the export potential of small business. Monograph.-T.: Publishing house of "Lesson press" LLC, 2023.-144 p.

The scientific research of the above-mentioned scientists made it possible to form a number of theories and methodologies, allowed the national economy to form a competitive environment and made a great contribution to the development of entrepreneurial activity.

RESEARCH METHODOLOGY.

In the process of research, methods of statistical-economic, systemic and comparative analysis, monographic studies, systematization, grouping, author's calculations, logical-content analysis, etc. will be used.

ANALYSIS AND RESULTS.

Forecast indicators are based on forecasting the prospects for economic growth. "Forecasting " is[5] a scientifically based prediction of the possible state of the country's economy or its individual areas, spheres, judgment on alternative paths, methods and terms for achieving a particular state" ... Associated with the analysis of the state and assessment of the prospects for economic development, scientific and technological progress, social development. Forecasts are divided into short-term (1.5) years, medium-term (3-5 years) and long-term (7-10-15) years.[6] One of the common forms of “Forecasting” is the programs, structure and methods of constructing various economic models in small business.

The experience of East Asian countries has shown that “all cases of successful economic development of countries implied the use of an industrialization strategy based on the export of industrial goods”[7].

The share of small business and private entrepreneurship in the economy of developed countries is manifested in the growing weight of small business. Thus, a study of foreign experience has shown that the share of small business in the US GDP is 50%, in Japan - 55%, in the EU countries 60-70%. The basis of small business exports in developed countries is the sale of technology, for example, 50% of licenses sold in the US belong to small businesses , in Japan - 55%.[8]

In the context of globalization of the world economy, the experience of developed countries is of great importance for the developing economy of Uzbekistan. Taking into account the possibility of the output of Uzbekistan's products by exporting them to world markets. In this regard, it is of great importance to improve the methodology for assessing the export potential of small businesses and forecasting it for the future. This goal can be achieved by determining the features and trends of the correlation-regression relationship between innovations in the field of forecasting for the future,

[5]Business language. Directory, 1995 p. 614, IPK “Sharq”
[6]Business language. Directory. 1995 p. 419, IPK “ Sharq”
[7] International economics. Theory and Policy fifth edition. Paul R. Krugman. Masachusetts Institute of technology. Maurice Obstfeld. University of California, Berkeley. Питер 2003. 832 с., 307 с. https://www.amazon.com/International-Economics-Theory-Policy-5th/dp/0321033876
[8] Global innovation index 2020. https://www.wipo.int/publications/ru/details.jsp?id=4514

export volumes, which is one of the priority areas of scientific research, when creating a multifactor econometric model.

The creation of a multifactor econometric model based on the export potential of small businesses and the factors influencing it is of great importance. Checking the constructed model using various tests and determining the statistical significance of the model makes it possible to forecast future periods of export-oriented products and make scientifically sound decisions on the development of this area.

For multifactor econometric modeling of these processes, the following indicators for the Republic of Uzbekistan were selected: volumes of exports carried out by small businesses and private entrepreneurship entities, volume of investments in fixed capital in small businesses, number of operating business entities (as of January 1), investments in the production of export-oriented products.

We introduce the following definitions as dependent and influencing factors when constructing a multifactor econometric model:

- dependent (resulting) fact or (2000-2021): (y) - volume of exports of products carried out by small businesses and private entrepreneurship entities (thousand US dollars);

- influencing factors (2000-2021): x_1 - volume of investments in fixed capital of small businesses (billion soums); x_2 - Number of operating business entities (as of January 1); x_3 - investments in the production of innovative export-oriented products (million soums).

Since the units of measurement of the variables included in the econometric model are different, and also for a better explanation of the interpretation of the multifactor econometric model, we logarithmize (lny, lnx_1 , lnx_2 and lnx_3) all the values of the factors in natural form, and when constructing a multifactor econometric model, comparative descriptive statistics are carried out before the factor model. The results obtained are reflected in the table below (**Table** 1).

Table 1

Descriptive statistics of factors included in the multivariate econometric model [9].

□	Lnxy	lnx_1	lnx_2	lnx_3
Mean (average)	14.15262	8.212282	11.88803	3.682188
Median (median)	14.39369	8.610920	11.87793	3.683867
Maximum	15.44487	11.51687	12.92684	4.065602
Minimum	12.36457	4.743191	11.29133	3.234749
Std. Dev. (standard deviation)	1.066448	2.052261	0.470064	0.218194
Skewness (tilt asymmetry)	-0.502016	-0.075742	0.611418	-0.064590
Kurtosis (excess)	1.655183	1.886192	2.398863	2.443771
Jarque-Bera (Jacques Berat)	2.464535	1.105577	1.624607	0.285319
Probability	0.291631	0.575343	0.443835	0.867049
Sum (sum)	297.2050	172.4579	249.6485	77.32594
Sum Sq. Dev. (sum of standard deviation)	22.74625	84.23553	4.419198	0.952171
Observations	21	21	21	21

[9] Econometrics. Textbook for Universities / edited by Corresponding Member of the Russian Academy of Sciences I.I. Eliseeva. – M.: Finance and Statistics, 2003. – 344 p. Developed by the author based on the author's actual research data .

According to the data in Table 1, for the dynamics of each factor, you can see its average value, median, mode, maximum and minimum values. You can also see the standard deviation, dispersion, excess and asymmetry of each factor.

The skewness is the coefficient of asymmetry, which indicates that it is a normal distribution if it is zero, and also the symmetry of the distribution. If this coefficient is very different from 0, then the distribution is considered asymmetric (i.e. not symmetric). If the coefficient of asymmetry is greater than 0, i.e. positive, then the graph of the normal distribution for the factor under study will be shifted to the right. If it is less than 0, i.e. negative, then the graph of the normal distribution for the factor under study will be shifted to the left. The graphs of the normal distribution functions of all factors are presented in Figure 1 below .

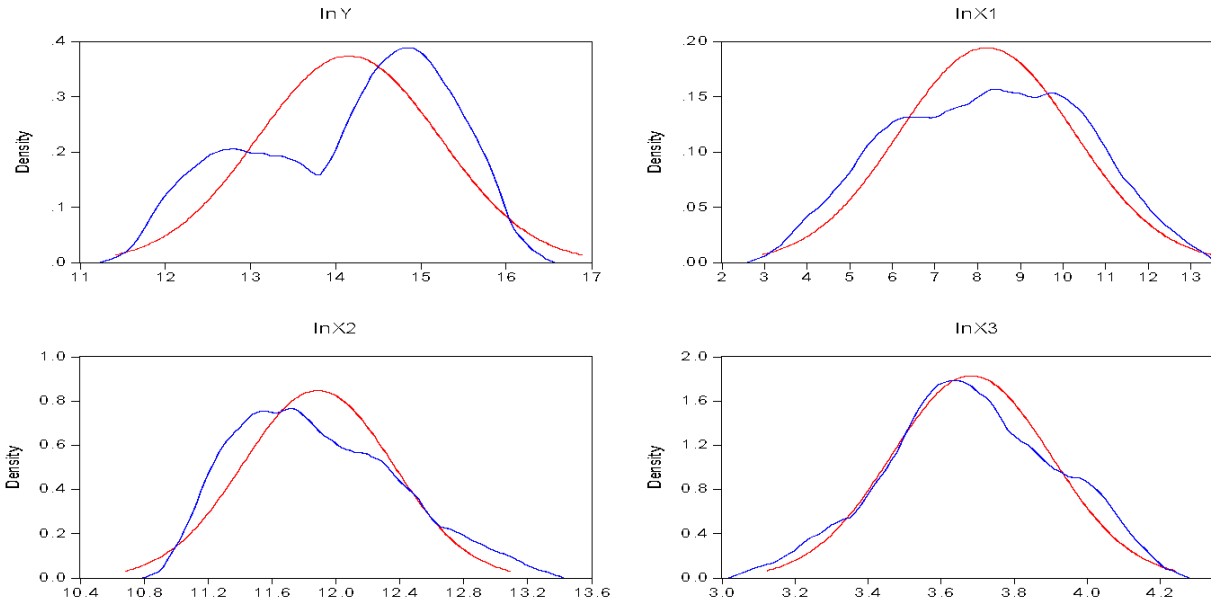


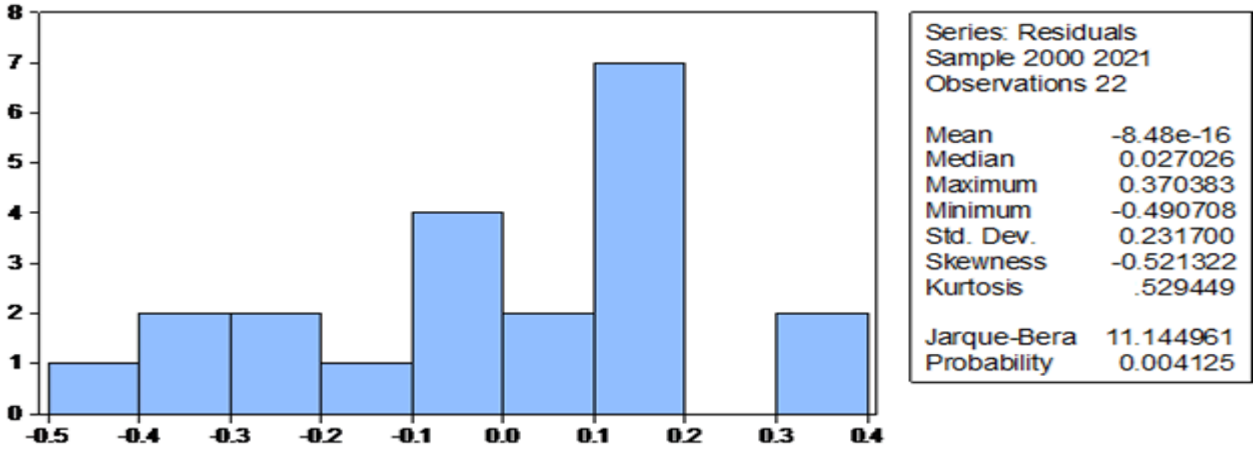
Figure 1. Graphs of the normal distribution functions of factors

It is evident from Figure 1 that almost all factors obey the law of normal distribution. Since the values of the asymmetry coefficients of the factors lny, lnx_1 and lnx_3 are negative, you can see that the "left peak" on their graphs is longer than the "right peak", and the graph of the distribution function is shifted to the right. Only Due to the positive value of the asymmetry coefficients of the lnx_2 factor , it can be seen that the "right peak" on their graphs is longer than the "left peak", and the graph of the distribution function is shifted to the left.

These shocks generally indicate changes in the dynamics of the factors under study. While some factors had a sharp increase in some years, in others the changes were not significant. In general, so far all the factors under study obey the law of normal distribution.

In addition, if the value of the excess coefficient of any factor were equal to 3.0, the vertex of the graph of this factor would be equal to the vertex of the graph of the normal distribution function. From the data in Table 1, it is clear that the excess coefficients of all factors are less than 3.0 (1.6552, 1.88620, 2.3989 and 2.4438, respectively). This shows that the graph of these factors is flatter than the graph of the normal distribution (Fig . 2).

The graph of the normal distribution of the resulting factor is shown in Figure 2.



2. Figure . Checking that the resulting factor obeys the law of normal distribution

To check whether the resulting factor (lny) obeys the normal distribution law, the Jarque-Bera test is used. This test is a statistical test that checks the errors of observations with moments of normal distribution up to the moment of the normal third moment of distribution (skewness) and fourth moment (kurtosis) and $S = 0$ and $K = 3$.

It is clear from Figure 2 that the resulting factor follows a normal distribution. This is confirmed by the calculated parameters and criteria, i.e. the calculated Jarque-Bera coefficient is equal to 11.144961, and its probability (probability) is less than 0.05 (probe=0.004125).

To select factors of a multifactor econometric model, it is necessary to conduct a correlation analysis. For this purpose, proper and paired correlation coefficients between factors are calculated.

The calculation of the pair correlation coefficient is performed using the formula:

$$r_{xy} = \frac{n\sum x_i y_i - \sum x_i \sum y_i}{\sqrt{\left(n\sum x_i^2 - \left(\sum x_i\right)^2\right)\left(n\sum y_i^2 - \left(\sum y_i\right)^2\right)}} \quad (1)$$

The matrix of partial and paired correlation coefficients between factors is presented in the table below (Table 2).

Table 2

Matrix of partial and paired correlation coefficients between selected factors[10]

	Lny	lnx_1	lnx_2	lnx_3
lny	1.000000			
lnx_1	0.957759	1.000000		
	14.51725	-----		

[10]Kambarova Sh.M. Increasing the export potential of small businesses in Uzbekistan and multifactor econometric modeling affecting it. //Journal of innovations in social sciences ISSN-2181-2594, volume: 2 issue: 04/2022. Impakt factor-7.6 41-54 b.

	0.0000	-----		
$\ln x_2$	0.880374	0.6657509	1.000000	
		1.47178.4717		
	8.091120	8	-----	
	0.0000	0.0570	-----	
$\ln x_3$	0.846840	0.7726236	0.6662456	1.000000
	6.940511	1.9.91078	1.4.497638	-----
	0.0000	0.0051	0.0574	-----

From the above 2 - table it is clear that the proper correlation coefficients are those that show the density of the relationships between the resulting factor ($\ln y$) and the factors it influences ($\ln x_i$). Therefore, the partial correlation coefficients y show that there are close connections between the resulting factor (ln y) and the influencing factors, that is, the values of the partial correlation coefficients are greater than 0.7, and it is not possible to include them in the multifactor model.

In addition, Table 3 also shows the pair correlation coefficients showing the density of relationships between the influencing factors ($\ln x_i$, $\ln x_j$). This is the most important case, and the influencing factors should not be closely related to each other. That is, there should be no multicollinearity between the influencing factors. If the value of the pair correlation coefficient between two influencing factors is greater than 0.7, a multicollinearity problem arises. The calculation results in Table 2 showed that there is no multicollinearity between the influencing factors.

In addition, the VIF coefficient (variance inflation factors – variance excess factors) is also used in determining multicolleniality. Table 3 below shows the VIF coefficient values calculated for each factor.

Table 3
Multicollinearity between influencing factors measure the effect

Variable	**Coefficient of dispersion**	**Centered VIF**
$\ln x_1$	0.017116	1.82803
$\ln x_2$	0.180961	2.66183
$\ln x_3$	0.491649	7.412041
C	26.40984	Na

Taking into account the factors influencing the poverty headcount ratio (ln y), $y = f(x_1, x_2, x_3, x_4)$ the following logarithmic representation of the multivariate econometric model follows from the original function below:

$$\ln y = \ln a_0 + a_1 \ln x_1 + a_2 \ln x_2 + a_3 \ln x_3 + a_4 \ln x_4 + \varepsilon_i \quad (2)$$

When determining unknown parameters in a multivariate econometric model (2) $a_0, a_1, a_2, ..., a_n$ the "least squares method" is used. Based on this, the results of the conducted

econometric analysis are reflected in Table 4 below (**Table 4**).

Table 4

Estimation parameters of the multifactor econometric model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\ln x_1$	0.954547	0.130829	7.296165	0.0000
$\ln x_2$	1.252787	0.425395	2.944995	0.0091
$\ln x_3$	1.849156	0.701177	2.637217	0.0173
C	28.01572	5.139050	5.451536	0.0000
R-squared	0.952797	Mean dependent var		14.15262
Adjusted R-squared	0.944467	S.D. dependent var		1.066448
S.E. of regression	0.251314	Akaike info criterion		0.245414
Sumsquaredresid	1.073696	Schwarzcriterion		0.444371
Loglikelihood	1.423154	Hannan-Quinn criter.		0.288593
F-statistic	114.3816	Durbin-Watson stat		1.756707
Prob (F- statistic)	0.000000			

Using the data in Table 4 above, the mathematical representation of the multivariate empirical econometric model would be as follows:

$$\ln \hat{y} = 28.0157 + 0.9545 \ln x_1 + 1.2528 \ln x_2 + 1.8492 \ln x_3 \quad (3)$$

The calculated multifactor econometric model (3) shows that in small business the volume of investment in fixed capital ($\ln x_1$) increases by an average of one percent, while the volume of exports (lny) carried out by small enterprises and private entrepreneurs increases by an average of 0.9545 percent. While the number of operating enterprises ($\ln x_2$) increases by an average of one percent, the volume of exports carried out by small enterprises and private entrepreneurs (lny) increases by an average of 1.2528 percent. While investment in the production of export-oriented products ($\ln x_3$) increased by one percent, the volume of exports carried out by small enterprises and private entrepreneurs (ln y) increased by an average of 1.8492 percent.

When checking the statistical significance of the multifactor econometric model (3), structured by the volume of exports carried out by small businesses and private entrepreneurs of the multifactor econometric model (3), or the adequacy (adequacy) of the process under study *, the* Fisher F-criterion is used. Autocorrelation the calculated *value of the Fisher F* -criterion is compared with its value in the table.

If $F_{\text{score}} > F_{\text{table}}$, then the multifactor econometric model (3) is called statistically significant and can be used to forecast the resulting indicator for future periods - the volume of exports carried out by small businesses and private entrepreneurs (ln y).

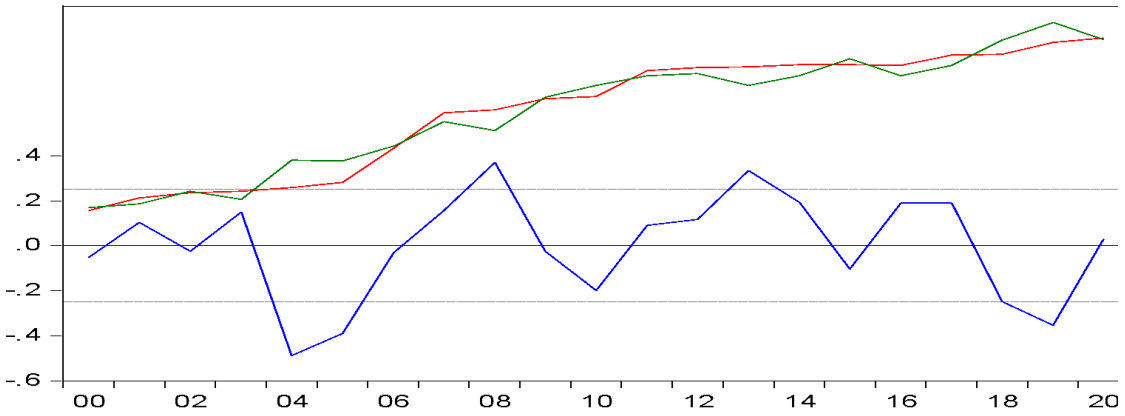


Figure 3. Graph of actual (actual), estimated (fitted) values of export volumes carried out by small and private entrepreneurs, and the differences between them (residual)

It can be seen from Figure 3 that (3) the graph of values calculated for the volume of exports carried out by small businesses and private entrepreneurs using the multifactor econometric model is very close to the graph of its actual values, and the differences between them are also not that great. This is further evidence that (3) the multifactor econometric model can be used to forecast the volume of exports carried out by small businesses and private entrepreneurs for future periods.

As a result of the conducted econometric analysis, forecast indicators of such factors as the volume of exports carried out by small businesses and private entrepreneurship entities, the volume of investments in fixed capital in small businesses, and the number of operating business entities were developed. x_3 , investments in the production of export-oriented products x_3 **(Table 5).**

Calculated (3) MARE coefficient (Mean Absolute Percentage Error) when forecasting the result for future periods from a multifactor econometric model.

$$MAPE = \frac{1}{n}\sum_{t=1}^{n-1}\frac{\left|F_t - F_t^*\right|}{F_t}\cdot 100\% \qquad (3)$$

,

where F_t are the actual values of the time series, F_t^* and are the forecast values. According to this forecast criterion $MAPE < 10\%$ - high forecast accuracy $10\% < MAPE < 20\%$, good $20\% < MAPE < 50\%$ forecast accuracy, satisfactory forecast accuracy and $MAPE > 50\%$ unsatisfactory forecast accuracy.

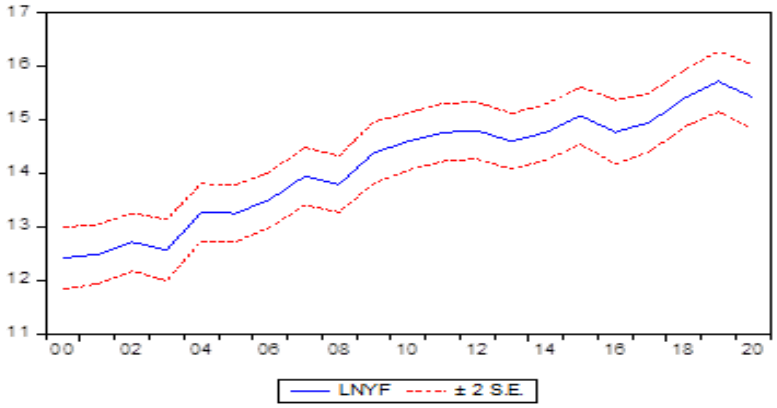


Figure 4. Indicators of the use of the calculation model in the forecast.

If it is less than 15.0 percent (mape = 1.2982), which means it is 1.2982 percent. That is why (3) the multifactor econometric model can be used to predict the volume of exports carried out by small enterprises and private enterprises.

Table 5

Forecast indicators of the volume of export of innovative products sold by small businesses and private entrepreneurship entities and factors influencing it[11]

Years	The volume of exports of innovative products sold by small and private businesses y	The volume of investments in fixed capital in small businesses in the body, x_1	business entities tate x_2	Investments allocated for the production of innovative products, aimed at x_3
2021	100,0	100,0	100,0	100,0
2022*	117,6	138,9	107,5	103,3
2023*	138,3	193,0	115,6	106,7
2024*	162,6	268,2	124,3	110,3
2025*	191,3	372,7	133,7	114,0
2026*	224,9	517,8	143,8	117.9
2027*	264.5	719.4	154.6	121.7

* - forecast period

In the forecast period (2022-2027), the volume of exports carried out by small businesses and private entrepreneurs increased by 2.6 times, investments in fixed assets increased by almost 7.0 times, small businesses producing export products increased by 1.5 times, and investments in the production of export products increased by 21.7%.

[11] The table is compiled and calculated based on statistical data from the Statistical Agency under the President of the Republic of Uzbekistan www. stat.uz

Thus, in our republic in 2022-2027 the volume of exports of innovative products produced by small businesses and private entrepreneurship entities will increase.

Graphs of the values of these factors in the forecast period are shown in the figures below (5)

Figure 5. Forecast values of the volume of exports of innovative products sold by small businesses and private entrepreneurs for 2022-2027
(in percent).

When checking the calculated econometric model according to a number of criteria, it was found that it is statistically significant, all its parameters are reliable, and there is no autocorrelation in the resulting factor and it was found that the obtained indicator can be predicted for future periods according to this model. The forecast is presented in the form of table 5 above. Fig. 5 shows that the volume of exports of innovative products of small businesses and private entrepreneurship in our republic in 2022-2027 will increase.

Thus, the purpose of forecasting is to establish the possible identification in the future of factors influencing the market, including the market situation, structural shifts in the economy, investment activity among consumers of the industry, the dynamics and level of national income, the impact of new progressive technologies on producers and consumers, the emergence of new markets for goods that will form a change in prices.

Methodologically, in the medium-term and long-term forecast, all private and random factors of influence are removed; the longer the forecast period, the more generalized the forecast becomes.

CONCLUSIONS. Increasing the export potential of small businesses is the presence of such well-thought-out principles of activity, thanks to which stable effective activity of firms in the foreign market is ensured. Economic and mathematical modeling in the export forecast gives the enterprise the opportunity to take into account not only its current interests, but also long-term export goals when making a decision.

Thanks to the forecast, the enterprise can respond to market volatility, ensures stable export development. The advantage of this method of calculating a multifactor econometric model allows you to specify export plans. With the help of the "Forecast" they plan and implement "breakthroughs" to foreign markets with the most promising goods. This method can be widely used in calculating the export potential of decisions taken in the innovative activities of firms for the medium and long-term

periods of innovation export.

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