9-жадвалга кўра, ARDL модели регрессион тенгламадаги омил белгилар, мос равишда, 0.25, 0.12 ва 2.94 қийматларини ҳосил қилган бўлса, стандарт хатоликлар 0.2, 0.13 ва 0.89 қийматларини ташкил қилган.

Шунингдек, ANOVA жадвалидаги ҳақиқий қиймати F=4.85 қийматини ташкил этди.

Модель бўйича тузатилган детерминация R-squared=0.49 ва коэффициенти сифати ижобий қийматни ҳосил қилган.

ARDL модели асосидаэконометрик тенглама ишлаб чиқилди.

$$Y=0.25Y_{t-1}+0.12X1+2.94X2-10.84 \quad (5)$$

Хулоса ва таклифлар. Миллий иқтисодиёт бўйича асосий капиталга ўзлаштирилган инвестициялар ўсиш суръати, мамлакат молия секторида қимматли қоғозлар савдо ҳажмининг ўсиш суръати ва иқтисодий фаолиятда саноат тармоқларининг ялпи қўшилган қийматининг ўсиш суръатининг ўзаро таъсирини ўрганиш бўйича олиб борилган таҳлиллар ва хулосалар натижасида қуйидаги таклиф ва тавсиялар ишлаб чиқилди:

1. VAR модели тенгламаси бўйича эконометрик модель ***LnY=0.17lnX1+2.80lnX2-3.04*** га кўра, мамлакат молия секторида қимматли қоғозлар савдо ҳажмининг ўсиш суръатининг 1%га ортиши, асосий капиталга ўзлаштирилган инвестициялар ўсиш суръатининг 0,17 фоизга ортишига олиб келади. Шунингдек, иқтисодий фаолиятда саноат тармоқларининг ялпи қўшилган қиймати ўсиш суръатининг 1 %га ортиши асосий капиталга ўзлаштирилган инвестициялар ўсиш суръатининг 2,80 %га ортишига олиб келади.

2. ARDL модели тенгламаси бўйича эконометрик модель $Y=0.25Y_{t-1}+0.12X1+2.94X2-10.84$ га кўра, асосий капиталга ўзлаштирилган инвестициялар ўсиш суръатининг 1 %га ортиши бир йилдан кейин асосий капиталга ўзлаштирилган инвестициялар ўсиш суръатининг 0,25 фоизга ортишига олиб келади. Мамлакат молия секторида қимматли қоғозлар савдо ҳажмининг ўсиш суръати 1 %га ортиши асосий капиталга ўзлаштирилган инвестициялар ўсиш суръатининг 0,12 %га ортишига олиб келади ҳамда иқтисодий фаолиятда саноат тармоқларининг ялпи қўшилган қийматининг ўсиш суръати 1 %га ортиши асосий капиталга ўзлаштирилган инвестициялар ўсиш суръатининг 2,94 %га ортишига олиб келади.

3. Бизнинг фикримизча, тадқиқот бўйича VAR ва ARDL моделларининг эконометрик тенгламаларидан келиб чиқиб, ARDL модели бугунги кун миллий иқтисодиётимизда оптимал модель ҳисобланади. ARDL моделидан шуни кўришимиз мумкинки, асосий капиталга ўзлаштирилган инвестициялар ўсиш суръати бир йилдан кейин ҳам ижобий иқтисодий таъсирини кўрсатади.

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MEVA-SABZAVOTLAR EKSPORTINI RIVOJLANTIRISHDA EKONOMETRIK MODELLASH USULLARINING SAMARALI QO‘LLANISHI

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Annotatsiya. *Ushbu maqolada O‘zbekistonda meva-sabzavot mahsulotlari eksporti holati o‘rganilib, meva-sabzavot mahsulotlari eksportiga ta’sir etuvchi omillar bo‘yicha olingan ma’lumotlar matematik va statistik usullar yordamida tahlil qilingan. Olingan modelning prognoz sifati baholandi va tahlil natijalariga ko'ra ushbu yo'nalishni yanada rivojlantirish bo'yicha xulosalar chiqarildi.*

Tayanch so'zlar: *qishloq xo'jaligi mahsulotlari, meva-sabzavotlarga ta'sir qilish, natija omili, ta'sir etuvchi omillar, korrelyatsiya koeffitsiyenti, regressiya tenglamasi parametrlari, multikollinearlik, ekonometrik model, modelni baholash.*

ЭФФЕКТИВНОЕ ПРИМЕНЕНИЕ МЕТОДОВ ЭКОНОМЕТРИЧЕСКОГО МОДЕЛИРОВАНИЯ ПРИ РАЗВИТИИ ЭКСПОРТА ФРУКТОВОВОЩЕЙ

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Аннотация. *В данной статье изучено состояние экспорта плодоовощной продукции в Узбекистане, а полученные данные о факторах, влияющих на экспорт плодоовощной продукции, проанализированы с использованием математических и статистических методов. Оценено качество прогноза полученной модели и по результатам анализа сделаны выводы о дальнейшем развитии данного направления.*

Ключевые слова: *сельскохозяйственная продукция, экспозиция плодоовощной продукции, фактор результата, влияющие факторы, коэффициент корреляции, параметры уравнения регрессии, мультиколленарность, эконометрическая модель, оценка модели.*

EFFECTIVE APPLICATION OF ECONOMETRIC MODELING METHODS IN THE DEVELOPMENT OF EXPORTS OF FRUITS AND VEGETABLES

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Abstract. *In this article, the state of fruit and vegetable exports in Uzbekistan was studied, and the data obtained on factors affecting the export of fruit and vegetable products were analyzed using mathematical and statistical methods. The quality of the forecast of the obtained model was assessed and conclusions were drawn on the further development of this area based on the results of the analysis.*

Key words: *agricultural products, fruit and vegetable products exposition, result factor, factors affecting, correlation coefficient, regression equation parameters, multicollenarity, econometric model, model evaluation.*

Introduction. Horticulture occupies a special place in ensuring the welfare of the population and the food security of the country. The existing conditions for the development of the industry in Uzbekistan make it possible to produce products of the industry in much larger quantities than what will be sufficient to meet the country's domestic needs. High competitiveness of export-oriented products can also be achieved. Because the natural and climatic conditions of our country, the labour potential of the industry, and the economic and organisational conditions that contribute to the development of the industry are sufficient.

Agriculture is one of the main sectors of the economy and requires increased attention due to the fact that most of the population in rural areas is employed in this area, and that, as a result of agricultural exports, a healthy balance of trade and foreign exchange reserves can be maintained. After all, international trade not only leads to increased productivity but also increases the level of employment in countries, thus making it possible to participate in the global economy. This leads to the stimulation of economic growth.

The President in his “Adress to the Oliy Majlis” on December 29, 2020, also stated that “the fight against poverty will be the main economic issue of 2021. The most rapidly developing factor in reducing poverty and increasing the incomes of the rural population is a sharp increase in productivity and efficiency in agriculture.

Therefore, a variety of measures are planned to grow this industry and boost exports, and entrepreneurs are given advantages and financial support. The government of our nation has implemented reforms in this area with the goal of raising the productivity of a significant sector of the economy-agriculture – by introducing new technologies, conserving resources, accelerating the process of further processing, and boosting the price of export-oriented goods.

Analysis of literature on the topic. In the past ten years, econometrics has made significant scientific progress, and the range of research and scientific work that employs econometric and economic-mathematical approaches is continuously expanding. The fact that numerous economists, including R. Fridj and J. Tinberg (1969), L. Klein (1980), T. Haavelmo (1989), J. Heckman and D. McFadden (2000), J. Engrist and G. Imbens (2021), have received the prestigious Nobel Prize in their field of study is proof that econometrics is recognised and studied by scientists all over the world.

According to the definitions of illustrious scientists provided in the book "Econometrics" by N.Sh. Kremer and B.A.Putko, we gain an understanding of the numerous interpretations of econometrics. According to definitions, one of the fields of economics devoted to the creation and use of statistical techniques for determining the relationship between economic variables is econometrics (S. Fischer and others). The primary goal of econometrics

is to add empirical support to economic reasoning (L. Klein). The aim of econometrics is to derive economic laws empirically (E. Malenvo). When studying the economic environment in which we live, econometrics serves as both a telescope and a microscope (C. Griliches). According to S.A. Ayvazyan, econometrics integrates a number of techniques and models that allow qualitative relationships based on economic theory, economic statistics, and mathematical statistics to have quantitative representations. [2]

In his textbook "Econometrics," V.P. Nosko states: "Econometrics is a set of procedures for analysing the correlations between various economic indicators (factors) based on real statistical data." This methodology uses mathematical statistics and probability theory as its tools. These techniques can be used to detect new, previously undiscovered correlations between economic indicators, disprove various assumptions concerning the presence of certain relationships between economic indicators put forth by economic theory, and forecast future values of economic indicators. One of the main areas of study in contemporary economics, along with microeconomics and macroeconomics, is econometrics. To analyse statistical data, econometrics use mathematical statistics and probability theory techniques. But although some models and techniques are more frequently employed in macro-level research, others are more frequently used in micro-level study. [3]

The textbook "Econometrics" by I.I. Eliseeva gives a brief historical overview of the origins and progress of econometrics, discusses coupled regression from the perspective of econometric analysis, i.e., the particulars of the regression equation and its correspondence to the original data, discusses the properties of residuals, and illustrates the potential using straightforward econometric tests. The situation of using spatial data and all the issues that arise in this case are also taken into consideration in the presentation of econometric modelling, which corresponds to the nature of economic processes and phenomena, first and foremost: nonlinearity of efficiency, multicollinearity of variables, and heteroscedasticity of random residuals. [4]

When we look at studies from other countries, we also notice that the demand for fruits and vegetables is rising significantly on a global scale. Because of the rise in the import of fruits like grapes, melons, citrus fruits, apples, and others in developed countries, we are now seeing a thorough investigation of this issue[6]. The extension of developing nations' exports into rich nations' markets will boost both the number of their more developed trading partners and global economic expansion. Research is being conducted on a large group of professionals in the food industry in both developed and developing countries. This research is being done for many people in the fields of agriculture, export, and trade, as well as to further enrich the diets of developed countries, ensure diversity and security in the world food supply, and achieve a sustainable level of diversification of trade in fruits and vegetables from developing countries to developed countries.

Research methodology. Data from the State Statistics Committee and experimental estimates of transport costs based on the findings of an expert survey were used to explore the effects of fruit and vegetable production volumes and transport costs on the volume of fruit and vegetable exports. [5] For the relationship between the volume of fruit and vegetable output in the republic and transport expenses, an econometric model has been created. The parameters of the linear regression equation were established using the least squares approach, and a correlation analysis was completed between the model's contributing elements. The econometric analysis of the republic's exports of fruit and vegetable products utilises statistical data from 2011 to 2020.

Analysis and results. The majority of the focus on this subject in our nation is producing outcomes. Despite the pandemic's detrimental effects, exports of fruits and vegetables reached USD $1 billion in 2020. (Figure 1).

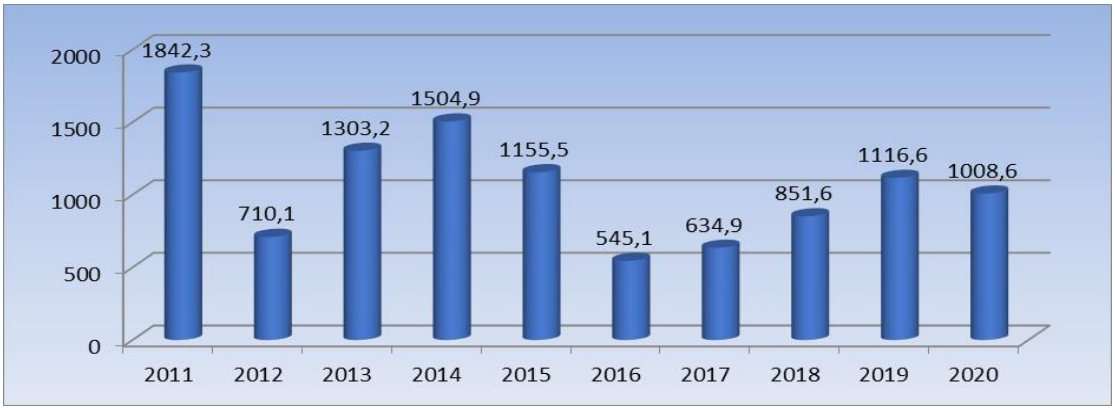

Figure 1. The volume of exports of fruits and vegetables (million US dollars)
State Statistics Committee www.stat.uz

The State Statistics Committee states that even if exports of fruits and vegetables slightly decline in 2020 as a result of the epidemic, overall exports have increased in recent years. The sector, however, is concentrating on supply chains, infrastructure, market penetration into Europe, and production that is export-oriented.

An examination of agricultural indicators for the production of fruits and vegetables reveals that the sector had significant increase beginning in 2016. (Fig. 2). Naturally, this is promising because it means that there will be an abundance of food on the home market, more people will be working in agriculture, and so on. Studying how this issue affects the rise in exports of fruits and vegetables is also crucial.

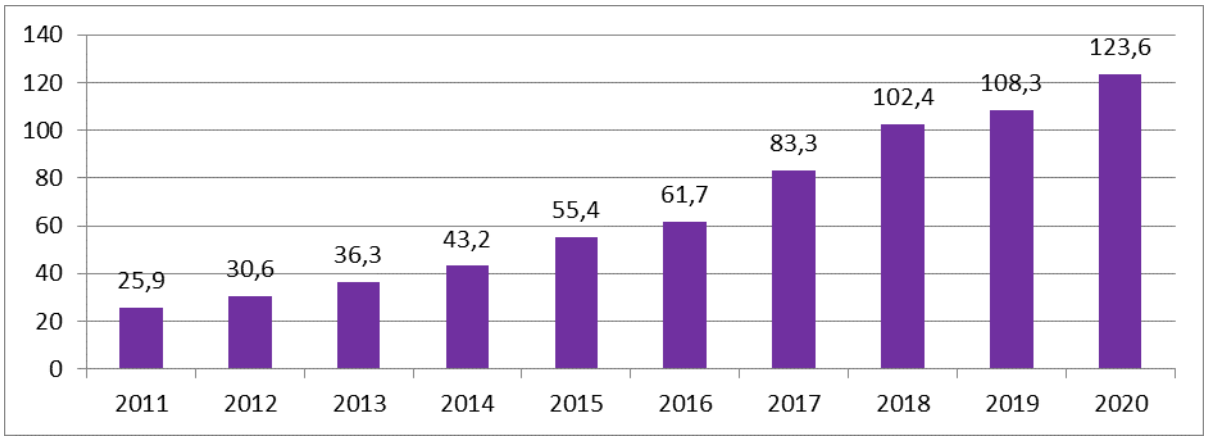

Figure 2. Volume of fruit and vegetable production (billion sum)

State Statistics Committee www.stat.uz

It makes use of statistical data that affects the amount of fruit and vegetable product production (X1) (SSCom data), transport costs (X2) (experimental direct transport costs based on the findings of an expert poll), and the amount of fruit and vegetable product export (Y).

It is feasible to create plans and recommendations for the further development of the sector after determining the impact of these aspects. First, in order to determine the relationship between the resulting component and the influencing factors, the correlation coefficient is examined (Table 1).

Table 1

Correlation coefficient between factors

		y	*x1*	*x2*	
	y	**1**			
	x_1	**-0,3813**	**1**		
	x_2	**0,966446**	**-0,40263**	**1**	

The Author's Process.

The table reveals a very tight connection between the second influencing factor and the resultant factor, which is below the inverse average for the first influencing component. Given that there is no multicollinearity among the contributing elements, it is clear from the statistical data analysis that the cost of transportation directly affects the export of fruits and vegetables.

It is necessary to create a linear regression equation in the plural of the following form in order to explore the relationships between the components that have been analysed:

$$y = a_0 + a_1 * x_1 + a_2 * x_2 + \ldots + a_n x_n \quad (1)$$

Where y is the resulting factor, $x_1, x_2, \ldots, x_n$ - influencing factors and $a_0, a_1, a_2, \ldots, a_n$ - regression equation parameters. Using the least squares method, it will be possible to determine the parameters of the regression equation using the following system of normal equations:

$$\begin{cases} n * a_0 + a_1 \sum x_1 + a_2 \sum x_2 + \ldots + a_n \sum x_n = \sum y \\ a_0 \sum x_1 + a_1 \sum x_1^2 + a_2 \sum x_1 * x_2 + \ldots + a_n \sum x_1 * x_n = \sum y * x_1 \\ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \\ a_0 \sum x_n + a_1 \sum x_n * x_1 + a_2 \sum x_n * x_2 + \ldots + a_n \sum x_n^2 = \sum y * x_n \end{cases} \quad (2)$$

Conclusions and offers. According to the findings, there are other issues in the supply chain rather than an increase in product cultivation that are responsible for the rise in fruit and vegetable exports. This specifically relates to researching the needs of the importing nations, prioritising the size of the sector in terms of packaging design and researching the needs of the importing nations in this regard, as well as maintaining supply chain continuity. Simultaneously, in order to advance agriculture, it is required to raise the level of the sector's material and technical assistance, address issues with the sector's financial support, offer financial incentives to large producers to promote the sector's growth, and expand its export potential. The issue of exports of the items in this sector being as liberalised as possible must be taken into account.

Fruit and vegetable exports are a significant and expanding area of international trade. Based on this, methodological analysis of several important decisions is of utmost relevance for entrepreneurs involved in this economic activity. This will undoubtedly result in challenges that need to be solved, some of which are related to the complexity of the process, the dearth of many agents, options, information, and modelling tools. Additionally, we believe it's critical to give digital agriculture additional attention, to move the Smart Agriculture program's work along, and to make it easier for business owners in the sector to document their exports. In conclusion, it should be noted that new equipment and technologies must be added to the infrastructure supporting agriculture in order to develop the sector in our nation, increase exports of the industry's goods, and secure its place and position in future global markets. Additionally, service activities must be further enhanced, and new innovations must be introduced.

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ТЕМИР ЙЎЛ ХИЗМАТЛАРИ ТИЗИМИДА РИСКЛАРНИ МИНИМАЛЛАШТИРИШНИНГ ИҚТИСОДИЙ-МАТЕМАТИК МОДЕЛИ

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Аннотация. *Ушбу мақолада темир йўл транспорти хизматларини ташкил этишда олимларимиз олиб борган илмий ишлар асосида, темир йўл тармоқларида хизматларни бошқаришга оид қабул қилинаётган бошқарув қарорларини рискка нисбатан тоифланиши, тоифалаш асосида рискларни минималлаштиришнинг иқтисодий-математик модели ишлаб чиқилди ҳамда рискларни минималлаштириш тизимини бошқариш самарадорлигини баҳолаш методикаси тавсия қилинди. Ушбу тавсиялардан корхона ва ташкилотларда рискларни тоифалаш ва уларни минималлаштиришда қўлланилиши мумкин.*

Калит сўзлар: *рискка нисбатан нейтрал, рискка нисбатан эҳтиётқор, рискка нисбатан мойил, рискларни сифат бўйича баҳолаш, миқдорий баҳолаш, статистик баҳолаш.*