ISSUE OF DISCRETE FORECASTING METHODS OF INDUSTRY DEVELOPMENT

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Abstract: The article examines discrete methods of forecasting the development of the industry and their application in modeling economic, environmental, and technological processes.

Index terms - forecast, least squares method, model, technological process, optimization, discrete transformation.

1.INTRODUCTION

In January-September 2019, the average monthly growth rate of prices for paid services for the population was 1.4%. Compared to December 2018, in September 2019, the cost of tariffs for paid services for the population increased by an average of 13.7%, and compared to September 2018 by 19.5%.

2 ANALYSIS AND RESULTS

In accordance with the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan dated July 30, 2019 No 633 "On changes in prices and tariffs for fuel and energy resources", new tariffs for electricity and gas for domestic consumers were introduced. In August, electricity tariffs rose by 18.0%, network gas by 18.8%, and liquefied natural gas by 17.9%. Tariffs for cold water supply and sewerage have been increased in almost all regions since August this year on the basis of decisions of local authorities. Tariffs for this type of service increased by an average of 8.2%. This month, the average growth rates of tariffs for hot water and heat supply services in the country were 9.0% and 9.5%.

The dynamics of prices for water supply, sewerage, waste collection and disposal remained relatively stable in January-July this year (prices increased by only 0.5% over 7 months). In August and September, producer prices in this sector increased by 1.7% and 4.5%, respectively, while the growth rate of prices for the first 9 months of this year was 6.9%.

From the beginning of the year, the cost of water collection, processing and distribution by pipes increased by 13.1%, wastewater treatment, transportation and disposal by 10.4%. In September 2019, the price level of water treatment and piping distribution increased by 34.9% compared to September 2018, and wastewater treatment, transportation and disposal increased by 27.5%.

Electricity, gas, steam supply and air conditioning The volume of products produced by electricity, gas, steam supply and air conditioning enterprises amounted to 14.1 trillion soums. soums (6.0% of the total volume of industrial output). In January-September 2019, the volume of electricity generation, transmission and distribution in this industry, as well as steam supply and air conditioning increased by 1.1% compared to the same period last year.

Water supply, sewerage system, waste disposal The volume of products produced by water supply, sewerage system, waste disposal enterprises amounted to 1.8 trillion. soums (0.8% of the total industrial output). Compared to the same period last year, secondary raw materials containing aluminum - 1.7 times, secondary raw materials containing copper - 2.7 times, services for the removal, cleaning and treatment of garbage cans, clarifiers and septic tanks - 2.0 times. , water treatment and distribution services - by 26.4%, wastewater disposal, transportation and treatment services - by 33.3%, non-hazardous waste collection services - by 76.3%.

One of the most important laws of economic development in the world is the interdependence of economic growth and the growing role of services in the national economy, which is explained by the increasing share of labor, material and financial resources used in services. With the development of society and the growth of productive forces, there is a certain development of the service sector. Here, in particular, there is an increase in employment in the industry, an increase in the technical equipment of labor, the introduction of advanced technologies. Today, the role of the services sector, which is one of the most important sectors of the economy, is of great importance.[4]

This is due to the complexity of production, the saturation of the market with goods based on daily and personal demand, the rapid growth of scientific and technological progress that renews

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the life of society. The growth of the services sector in the economic sphere is related to market conditions, the speed of payment for services rendered and the low cost of materials, which are important factors that lead to increased value added and ultimately GDP growth. All this is impossible without information, finance, transport, insurance and other services. In addition, services are an integral part of trade in goods (especially technically complex) because the sale of goods requires an evolving network that consists primarily of services provided at the time of sale and after-sales services. The establishment of new enterprises and organizations, as well as the use of innovative technologies by existing enterprises and organizations and the expansion of the list of services provided will help to create more jobs and improve the welfare of the population in the future. As of October 1, 2019, about 386.0 thousand enterprises and organizations operating in the country were registered. Of these, more than 253,000 enterprises and organizations operate in the services sector. This figure increased by 21.0% compared to the same period last year. The share of enterprises and organizations operating in the services sector was significant, as of October 1, 2019, it amounted to 65.7%, the share of enterprises and organizations operating in the industrial sector in the observed period - 17.8%, construction - 9.2% The share of agriculture, forestry and fisheries was 7.3%. It is obvious that the share of the service sector is growing every year.

The growth of enterprises operating in the field of small business has had a positive impact on the growth of the total number of enterprises and organizations operating in the services sector. Thus, compared to 2018, as of October 1, 2019, their number increased by 40.5 thousand units and amounted to 191.7 thousand units, an increase of 26.8%.

In January-September 2019, the number of newly established enterprises and organizations in the field of services (47.0 thousand units) increased by 22.2 thousand units compared to the previous year. Compared to the same period in 2018, the growth of newly established enterprises and organizations engaged in trade activities increased by 3.2 times or 19.2 thousand units. At the same time, there is an increase among enterprises and organizations providing accommodation and catering services.

Today, the services sector is one of the fastest growing sectors of the economy.

Social, political, public problems cannot be solved without raising the economic potential of the regions and their sustainable development. Regional policy goals can only be achieved through the implementation of cost-effective projects. Prospects for socio-economic development of modern Uzbekistan depend on the rational use of all resources of each economic district and region of the republic, taking into account national and local interests. The level of development of the services sector will ensure the territorial and social mobility of the population, the development of new economic zones, increase production efficiency and consumption of material products. The high share of the total volume of services is explained by the relatively high real incomes of the population. The level of development of the services sector will ensure the regional and social mobility of the population, the development of new economic zones, increase production efficiency and consumption of material products.

The level of development of the services sector is an indicator of ensuring a decent quality of life of the population, as a factor influencing the development of the services market is the growth of real incomes and living standards of the population. With the formation of the post-industrial information society in our country, the role of the services sector is growing, as the needs of the population are constantly growing and their diversity is constantly expanding. Further, ensuring the sustainable growth of the economy through the creation of new jobs, improving investment, tax, monetary policy, science and technology policy and the use of new information and communication technologies will lead to qualitative structural changes in the structure of services. This has allowed to form a rational structure of production and consumption of services in Uzbekistan, to further improve the living standards and quality of life.

President Shavkat Mirziyoyev has adopted a resolution on measures to further improve the system of storage and use of multi-apartment housing in 2017-2021.

It is planned to implement a program to further improve the system of repair, improvement and use of multi-apartment housing. The resolution is aimed at improving the living conditions of the population, timely and quality repair of utilities and common areas of the multi-apartment housing stock, as well as the improvement of areas adjacent to the multi-apartment housing stock with children's and sports grounds. implementation of measures is defined.

It is known that the utilities sector plays an important role in improving the living standards of our people, meeting the daily needs of the population, creating comfortable living conditions for them.[5]

Since the establishment of the Ministry of Housing and Communal Services on April 18, 2017 at the initiative of the President, 9 Decrees and 15 Resolutions on the development of the sector, the allocation of large sums from the state budget under investment programs indicates the height.[6]

There are a number of issues related to drinking water and heat supply, gas and electricity supply, as well as school water and environmental issues.[7]

Significant improvement in the quality of clean drinking water and heat supply to the population, further improvement of the system of access to multi-apartment housing.

Extensive work has been done in the regions of the country on the development of drinking water supply and sewerage infrastructure, gas and electricity supply. As a result, the drinking water supply of more than 800,000 people and sewage services of more than 75,000 people have been improved.

In connection with the fact that 2020 is the year of "Development of Science and Digital Economy", a lot of work is being done on the widespread use of information technology in the system. Therefore, in order to carry out online monitoring and control of the processes that determine the environmental status of water supply and sewerage, heat supply, gas and electricity supply, work is underway to implement innovative ideas and establish effective activities. measures are being taken to increase.

The issue of development of public utilities is directly related to the formation of the cost of services in accordance with the requirements of the time. At the same time, the transition to setting tariffs taking into account the full cost of services and modernization costs, reducing drinking water losses, installation of flow meters and meters in the production and distribution of drinking water, widespread introduction of public-private partnership mechanisms in this area. is one of the important tasks.

Monitoring of processes related to water and heat supply, electricity and gas supply, training water organizations for the continuous implementation of measures to improve the quality of uninterrupted supply of clean drinking water, hot water, electricity and gas supply to apartment buildings and other services It is necessary to strengthen the work of all dispatching and emergency services, as well as to adapt these activities to modern requirements.

We know that the management of an apartment house includes a set of measures to ensure comfortable and safe use of residential and non-residential premises, adequate maintenance of common property and the use of common property.

All this is under the control of the state and the public: state control over the management of apartment houses is carried out to ensure compliance with the rules and regulations of technical operation of apartment buildings and sanitary norms, rules and hygiene standards. The use of the multi-apartment housing stock is carried out by the Inspectorate for Supervision of the Sphere and its regional inspectorates through studies and monitoring.

The maintenance of the common property includes the maintenance of its technical and sanitary condition, its maintenance, repair and other activities aimed at creating the necessary conditions for the maintenance and use of this property. The maintenance of the common property is aimed at ensuring the proper technical and sanitary condition of the common property.

In accordance with mandatory norms, the management body of an apartment house must take mandatory measures and work to prevent it in situations that may pose a direct threat to the apartment house, people's lives, health, property and the environment. Mandatory norms include fire safety, sanitation, urban planning norms, measures for servicing an apartment house.

If there is a real threat to the life, health and property of individuals or the environment in an apartment building, the Housing Inspectorate must take measures to eliminate this risk by notifying the owners of the premises and the management of the apartment building in advance. [8]

If the mathematical expression of this relationship cannot be analytically expressed by certain laws, then the method of experimental-statistical modeling is used. To do this, an experiment is conducted first. By changing the value of the input parameter (X), the values of the output parameter (U) are determined. These values are poured into the coordinate system, the experimental points are combined, and a regression “curve” is constructed. The regression curve can take different forms, such as a straight line, a parabola, or another shape.[9]

Depending on the appearance of the regression curve, the dependence equation is chosen (for example, U = kX + b is the straight line equation). To find the coefficient of this equation, the “least squares method” is used. According to this method, the deviation of the calculation points from the experimental points should be minimal. For example, if the shape of the regression curve is close to a parabola, then it is $y = b_0 + b_1x + b_2x^2$ can be expressed by the equation in the form.

Using the "least squares method" to determine the coefficients of the equation, we obtain the following system of normal equations:

$$\left.\begin{aligned} b_0 N + b_1\Sigma x_i + b_2\Sigma x_i^2 &= \Sigma y_i \\ b_0 \Sigma x_1 + b_1\Sigma x_i^2 + b_2\Sigma x_i^3 &= \Sigma x_i y_i \\ b_0 \Sigma x_1^2 + b_1\Sigma x_i^3 + b_2\Sigma x_i^4 &= \Sigma x_i^2 y_i \end{aligned}\right\}.$$

If we solve this system and find the unknowns and replace them, the result is a regression equation of parabolic form. In some cases, the

relationship between the parameters according to the shape of the regression curve may be in the form of a transcendental function, i.e.

$$y = b_0 b_1^x \quad \text{or} \quad y = b_0 x^{b1}$$

an be expressed by the equations in the form. To determine the coefficients of an equation of this kind, this equation is first logarithmized and reduced to the form of a linear equation, i.e.

$\lg y = \lg b_0 + x \lg b_1$ (1) or $\lg y = \lg b_0 + b_1 \lg x$ (2)

$\lg y = z$; $\lg b_0 = a$; $\lg b_1 = a_1$; $\lg x = t$ as we define (1) and (2) equations

$$z = a_0 + a_1 x \quad (3)$$

$$z = a_0 + b_1 t \quad (4)$$

linear equations in the form appear, and we can determine the coefficients of the equation by applying them to the methods described above.

In constructing such models, experiments, observations, and statistical data representing the relationship between two or more factors are used, on the basis of which multifactor empirical functions are constructed. The resulting analytical expression is evaluated, and if it meets all the required criteria, then the constructed empirical function will be adequate and can be used to predict the factors under consideration. Multifactor empirical functions can be written as follows:

$$y = F(x_1, x_2, \ldots, x_n),$$

where u is the result factor, x1, x2,…, xn are the argument (influencing the result factor) factors. The multifactor analytical approach can be F linear or nonlinear. To obtain an adequate model based on the data obtained, the sum of the squares of the difference between the actual and theoretical values of the resulting factor must be minimal. Based on this criterion, we can choose the theoretical connection equation (regression equation). We use the least squares method to construct such equations. In the assessment, the total correlation coefficients are calculated and the Fisher criterion is used.

To assess the reliability of the application of the empirical formula in practice, we determine the correlation coefficient (r) for the linear relation and the correlation index for the linearity. In the case of a linear connection, the level of connection reliability is determined from the following relationship:

$$\sigma_r = \frac{1 - r^2}{\sqrt{n}},$$

where r is the correlation coefficient, i.e.

$$r = \frac{\sum_i (x_i - \bar{x})(y_i^* - \bar{y}^*)}{n \cdot \sigma_x \cdot \sigma_{y^*}}, \qquad \bar{x}, \bar{y} -$$

arithmetic mean values of factors, σ_x ,σ_{u^*} **x** and

$\bar{y}^*$ - of $\bar{x}, \bar{y}$ -from ɳ mean square distance , y_i^* , y_i – current and theoretical values of the resulting factor, *n* – number of experiments.

If $r > 3\sigma_r$ (*n*>50) then the link is considered significant and this condition is satisfied:

$$\frac{r}{\sigma_r} > 3,$$

The degree of importance of the connection in the case of nonlinear connections $\sigma_h = \frac{1 - h^2}{\sqrt{n}}$ is determined from the relationship and the correlation index is calculated as follows:

$$\eta = \frac{\sigma_y}{\sigma_{y^*}},$$

in this $\sigma_{y^*} = \sqrt{\frac{\sum_i (y_i^* - \bar{y}^*)^2}{n}}$;

$\sigma_y = \sqrt{\frac{\sum_i (y_i - \bar{y}^*)^2}{n}}$;

If $r > 3\sigma_h$ (*n* >50) then the relationship is significant and the following relation holds:

$$\frac{r}{\sigma_h} > 3,$$

In determining the quality of the resulting regression equation, the determination coefficient D = r2 is used (in the relationships between X and Y).

To estimate the significance of the coefficient of determination, we use the Fisher criterion F and it is calculated as follows (n-number of experiments and m-number of argument factors): $\Phi = \frac{D}{1 - D} \frac{n - m - 1}{m}$. In this case, if the relation F> Fkrit is satisfied, then the obtained regression equation will be adequate and can be used to analyze and predict the process.

The calculation of the required level of income by industry costs is made taking into account the operating costs (in accordance with the approved plan of investments and services), which include:

- all annual production costs (e.g., materials, wages, electricity, depreciation allowances);
- current expenses (for example, sales and management expenses, other operating expenses and losses);
- expenses for modernization and reconstruction paid from the annual income of the organization;
- expenses for financial activities (interest expenses);
- benefit to the organization.

The resulting amount should be sufficient for the entity to repay the principal amount of the agreed debt during the planning period, taking into account its cash costs, over the life of the investment and services plan.

The tariff is calculated on the basis of costs and net profit corresponding to the services provided and takes into account the following:

- on standardized costs - taking into account normative and technical documents (recipes, raw materials and materials, heat and electricity, labor consumption standards, etc.) and normative documents on standardization approved by the relevant authorities;
- on non-normalized costs - based on the analysis of reporting indicators and taking into account changes in prices according to the forecast.

If the technical and technological norms of raw materials, fuels, energy and other resources are approved by the relevant competent authorities in the minimum and maximum consumption ranges of these resources, the price regulator for the purpose of calculating the price (tariff) uses.

Costs for water supply and sewerage services are calculated separately, and indirect material costs, production overheads, indirect labor costs, operating costs and financial operating costs are allocated to these types of services in proportion to the salaries of production staff.

The average tariff required for water supply services in the first year of the period is calculated as follows:

$$OT = (D_{d1} + D_{d2} + D_{d3} + and...) / (H_{c1} + H_{c2} + H_{c3} and…)$$

in this:

OT — average tariff required for water supply services;

$D_д$ — required level of income (by years);

H_c — volume of water sold (by years).

The average tariff required for sewerage services in the first year of the period is calculated as follows:

$$OT = (D_{d1} + D_{d2} + D_{d3} + ва\ х.к.з) / (H_{c1} + H_{c2} + H_{c2} and...)$$

in this:

OT — the average tariff required for sewerage services;

$D_д$ — Required level of income (by years);

H_c — water discharge capacity (by years).

Annual operating expenses are calculated on the basis of previous expenses, as well as changes proposed and justified in such expenses. It is known that costs for development and modernization are included in addition to the net profit structure of the organization.

3.CONCLUSIONS

If in the previous reporting period the organization managed to save fuel and energy resources through the introduction of technological processes, resource-saving modern technologies, in the next revision of tariffs the costs for fuel and energy resources, raw materials and revised cost norms applied as a result of modern resource-saving technologies taken into account.

The funds saved through the introduction of modern resource-saving technologies will be taken into account in the net profit and 50% will be directed to the development and modernization of infrastructure, the introduction of energy and resource-saving technologies and equipment. The rest will be directed to the organization's employee incentive fund.

At present, there are modern devices for metering of drinking water, hot water, gas and electricity, which are widely used to regulate the activities of public utilities.

Individual hot water metering devices (hereinafter referred to as individual metering devices) - the actual volume of hot water (its temperature should be in the range of 50-75o C) or its parameters that the consumer interacts with the supplier for hot water supply services technical safety, quality of heat energy calculation in hot water passing through a pipe section with a scale expressed in units of measurement adopted in the Republic, produced in necessary and sufficient gradations to measure the flow of different quantities of water that meet the requirements of technical conditions for use, repairability, interchangeability, free approach to device indicators (quantity) is a measuring instrument that performs the calculation.

By comparing the sum of the indicators of computing devices in a multi-storey house and the amount of resources actually provided, we can determine the amount of resources not covered in the fall, on the basis of which we can avoid excessive resource consumption.

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