STATISTICAL METHODS OF FORECASTING.

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Abstract: Statistical forecasting methods are inextricably linked with the time of predicting one or another event in the life cycle of the product. Forecasting is a probabilistic process, taking into account the impossibility of accurately predicting the conditions and factors that will affect the implementation of an existing event in the future.

Key words: statistic, product, prediction, probability, raw material, stability.

Forecasting issues are tracked through the new product development stages. Among them; prediction of characteristics of product sales in the market; reliability links and structure of the product predict its use; prediction of product production system stability; prediction of quality stability of constituent raw materials and materials; forecasting of product sales and others. The choice of forecasting methods depends on many factors, including the size of the past (old) data set, the required accuracy of the forecast, the cost of time and expenses for making the forecast, etc. Time forecasting is divided into short term (up to one year), medium term (up to three years) and long term (over three years) [1]. It is known that the accuracy of the prediction that separates the actual process from the prediction is greater (accuracy of the prediction depending on the duration of the prediction). Most forecasting methods require a sufficient number of initial data, without which they cannot work. The existing methods of forecasting can be

divided into two groups: qualitative and quantitative. Classification of forecasting methods Qualitative methods of forecasting are built using the opinion of experts who have knowledge in a certain field. Quantitative methods are based on the processing of numerical arrays of data, and are divided into random (or causal) or time series analysis methods [2]. Casual methods are used when predictions involve large numbers of interconnected factors. Searching for mathematical (equality or inequality) and other relationships makes sense of the casual method. Temporal (dynamic or chronological) simulation is concerned with the sequential evaluation of individual indicators in time series. For example, product price or sales forecast. One of the main criteria that should be guided by forecasters when choosing a suitable method is the cost of forecasting. The second part of costs is more significant for the budget of the organization [3].

Time series analysis (analysis). Temporary series are divided into two types; with constant, x(x1, x2,...xn) the quantity of the observed indicators corresponding to a certain constant of time T(t1, t¬¬2, tn) >tn-1; interval (interval) when the corresponding time intervals are indicated: (t0-n1), (t1-t2) ... (tn-1-tn).

In forecasting problems, time series are used when the number of real values (quantities) is significant. Time series simulation allows us to analyze from scratch what might happen in the absence of additional factors. The development of processes that are actually observed in life consists of some stable tendencies (trends) and some random elements. Mamentary (a) and intermediate (b) temporal series. This is reflected in the fluctuation of the value of indicators around the trend line. Skewed trends smooth the dynamic series values of the indicators by separating the general trends. It is the choice of the slanting thread that determines the results of the balirat in many cases, although it is considered an afterthought. The trend can be affected by new seasonal and cyclical founders. Cyclic organizers are distinguished from seasonal ones by the long duration and non-constantness of the amplitude [4]. Usually, seasonal organizers are measured in days and weeks, while cyclical ones are measured in years and so on. In this work, cyclic generators

will not be considered for the sake of simplicity. At the same time, we accept that the trend is characterized by a linear relationship. Sales tenders at the beginning and end of the product life cycle. We will consider three methods of learning temporary series in examples. Classification of time series analysis methods [5]. An example. Let's assume that the determination of the defects of products made in the enterprise will be built with the following temporary series. In the same way, let's make the temporary series shorter and replace the time with the serial number of the day. t - agenda number; x is the number of defects.

Moving average method. This method is divided into moving (sliding) means and comparative (sliding) means.

a) moving (sliding) method of the middle. This method consists in the fact that at the time of forecasting, the calculation of the indicator is built by averaging the amount of this indicator several days ago. Let's say we only have metrics data for the first three days. Let's calculate the number of defects predicted for the fourth day of the disaster (Thursday, April 6). To do this, we determine the average value (quantity) of the number of defects for the past three days. In general, the calculation formula of the forecast is as follows [6]:

where: - the real (real) amount of the indicator at the moment of time, N is the (previous) number of the moment of time, the prediction at the moment of time. Plot of line (x) and prediction (f) by moving average method. We evaluate the accuracy of the prediction. Any part of a dynamic range covered by a trace can be treated as a selection. An increase or decrease in line length or observation density at each time interval changes the observation size or observation density value of the indicators. However, the value of the "mean" for each segment of the series can be viewed as a selective estimate of some "true" mean. Taking this into account, it is possible to determine the error of the "selective" mean and confidence intervals. For a small number of observations, we estimate its confidence limits fmax and fmin using Student's distribution. Taking into account the average amount of the segment of lines x to the advancing moment t, the amount of prediction fk is

calculated. The equation for the average selectable confidence limit has the following form [7]. where - (n-1) degrees of freedom and the tabular quantity of the Student's statistic with the confidence level of the probability R, Sx - the mean squared error of the "mean" (prediction). In turn, the average squared deviation of sample n is equal to the following: From the given equations, we determine the number of defects for Thursday, April 6, the reliability limits and the error of the prediction. From equation (3), when n=3, we get = 1.52. We assume that the reliability probability is R = 0.90. Then = 1.9. In this case, from the formula (1), we get the following: As can be seen in Figure 1.6, when calculating the prediction for the first three observations from the given intervals, the number of defects made by shop workers on Monday, April 3 and Thursday, April 6 indicators did not fall. This is due to our acceptance of the calculation of the probability of low reliability of observations. Calculations show that the upper limit of prediction in 11 defects can be obtained when the reliability probability is R = 0.94 [8].

b) It is necessary to conduct frequent observations when making a forecast with the method of comparison (sliding) of the average, method of averaging. The actual metrics used tend to have the same impact level, with "new" data generally weighted. Taking into account that the weight indicator ⩓i is included in the formula (1), the number of the prediction in the conditions that the weight of today's indicator is 0.6, yesterday's is 0.3, and the previous day's is 0.1 We calculate the value. We display the obtained results in a graph. Plot of time series (x) and prediction (f) by means comparison method.

Exponential correction method. The deviation of the previous prediction from the real indicator is taken into account in the forecast with the exponential correction method, and the calculation itself is determined (carried out) by the following formula:

References:

1. Juraboevich B. N. Products in Manufacturing Enterprises the Essence of Quality Management //International Journal of Development and Public Policy. – 2021. – Т. 1. – №. 5. – С. 117-118.
2. Бадалов Н. Ж., Бадалов У. Н. КОРХОНАЛАРДА МАҲСУЛОТЛАР СИФАТИНИ БОШҚАРИШНИНГ АСОСИЙ ФУНКЦИЯЛАРИ //Academic research in modern science. – 2022. – Т. 1. – №. 1. – С. 38-45.

3. O’g B. O. N. et al. The role of quality management system in increasing product quality in enterprises //Web of Scientist: International Scientific Research Journal. – 2021. – Т. 2. – №. 12. – С. 228-233.
4. Jo‘raboevich B. N. QUALITY EXPORT PRODUCTS IN ENTERPRISES GENERAL AND SPECIAL IN PRODUCTION IMPORTANCE OF REGULATIONS //ResearchJet Journal of Analysis and Inventions. – 2022. – Т. 3. – №. 6. – С. 1-7.
5. Jo‘raboevich B. N. QUALITY EXPORT PRODUCTS IN ENTERPRISES GENERAL AND SPECIAL IN PRODUCTION IMPORTANCE OF REGULATIONS //ResearchJet Journal of Analysis and Inventions. – 2022. – Т. 3. – №. 6. – С. 1-7.
6. Jo’raboyevich B. N. ROLE OF COMPARISON, CALIBRATION AND METROLOGICAL CERTIFICATION IN ENTERPRISES //Web of Scientist: International Scientific Research Journal. – 2022. – Т. 3. – №. 10. – С. 168-175.
7. Jo‘raboevich B. N. QUALITY EXPORT PRODUCTS IN ENTERPRISES GENERAL AND SPECIAL IN PRODUCTION IMPORTANCE OF REGULATIONS //ResearchJet Journal of Analysis and Inventions. – 2022. – Т. 3. – №. 6. – С. 1-7.
8. BADALOV U. N. O. THE IMPORTANCE OF TESTING LABORATORIES AND THEIR ACCREDITATION //INTERNATIONAL SCIENTIFIC CONFERENCE" INNOVATIVE TRENDS IN SCIENCE, PRACTICE AND EDUCATION". – 2022. – Т. 1. – №. 2. – С. 163-169.