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Improvement of the Methodology of Liquidity Management of Grain Processing Enterprises

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Abstract

This article is devoted to improving the methodology of liquidity management of grain processing enterprises. The article proposes optimal solutions for assessing the probability of ensuring liquidity of enterprises using theoretical, methodological rules and methods of liquidity management of grain processing enterprises, an innovative conceptual model that assesses the impact of random factors on the liquidity of enterprises and makes short-term forecasts. The results of the study are used to make scenario decisions related to assessing the probability of ensuring liquidity of processing enterprises, strengthening the financial stability of enterprises, effective production management, accelerating the turnover of working capital, reducing the cost of products, achieving the maximum level of profit, increasing the level of profitability, increasing production efficiency, influencing the increase, reducing costs, searching for internal reserves of production.

Keywords

Enterprises Liquidity Management, Probability Theory and Methods of Mathematical Statistics, Random Factors, Scenario Decision Making, Influence of Factors on Increasing Production Efficiency, Strengthening the Financial Stability of Enterprises

1. Introduction

Improving the methodology of enterprise liquidity management is one of the current problems of scientific research. The study of this problem is caused by the losses of several hundred billion rubles as a result of the crises that occurred in the Russian payment and settlement system in 1998 (Rudnenko, 2007). Such phenomena require scientific research related to the liquidity management of

enterprises of the payment and settlement system of the country.

At the beginning of the 20th century, since the category of liquidity was practically not used in the economy, all relations between enterprises, industries, the population and the state were carried out on the basis of planning under the dominance of state property. In this situation, bankruptcy events did not occur, since there was no insolvent enterprise. When there is a shortage of working capital at enterprises, they are replenished by higher authorities. As a result, dozens and even hundreds of transactions were carried out at the expense of the authorized capital of enterprises (Rudnenko, 2007).

The use of available models and algorithms in the liquidity management system makes it possible to effectively manage the company's financial position and make decisions at various levels. This opportunity requires the use of modern methods of economic and mathematical methods, probability theory and mathematical statistics in economic analysis. As a result, it will be possible to effectively manage production at enterprises, accelerate the turnover of working capital, reduce costs, reduce the cost of production, maximize profits, increase profitability, make decisions at various levels and ensure financial stability and liquidity (Pyatakov, 2003).

Economic reforms are important in managing the liquidity of enterprises, which is directly related to the accounting of production processes. It is characterized by the timely fulfillment of obligations by the enterprise, the production and payment cycle. In the process of reforming, it is necessary to take into account the specifics of liquidity, financial stability of the enterprise and their specifics. The lack of clear and realistic liquidity management at enterprises does not allow realistically reflecting the turnover of funds, effectively managing production processes, reducing costs, reducing the cost of production, ensuring financial stability. Therefore, the purpose of improving the methodology of liquidity management of enterprises is to ensure the liquidity and financial stability of enterprises, increase production efficiency, search for internal production reserves while reducing costs, and achieve economic efficiency (Abdullaev & Abdullaev, 2024).

However, neglect of liquidity management at the enterprise, imperfect planning, violation of the rules of management organization, and inability of enterprises to perform the relevant functions can cause disruption of financial relations in liquidity and threats. But solutions to some problems in the theoretical and practical aspects of effective management have not yet been found. One of such problems is the development of a scientific methodology for effective management of enterprise liquidity in the conditions of complex production. This is especially evident in the reform of public accounting in Uzbekistan in accordance with international financial reporting standards (Abdullaev & Abdullaev, 2024).

2. A Review of the Literature

Economists such as Pyatakov R. Yu., Chizhov M.S., Lapenkov V.I. conducted scientific research on the problems of improving the methodology of accounting for

liquidity management of enterprises and its implementation in practice. In particular, Pyatakov R. Yu. developed a liquidity management model based on the method of structural-coefficient analysis, this method serves to ensure the payment stability of the enterprise; the influence of liquidity factors on the payment stability of the enterprise by its location and nature is systematized; the role of the liquidity position and the mechanism for timely coverage of current liabilities is based on financial stability; a classification of types of liquidity is proposed. During the study, a system of indicators was formed, which included indicators intended for managing the liquidity of enterprises (Pyatakov, 2002; 2003).

Chizhov M.S. classified business processes, analyzed the mechanism of influence of business processes on dynamic liquidity; the enterprise developed an algorithm for organizing dynamic liquidity management; substantiated the processes of developing complex formulas for liquidity management at the enterprise; developed and proposed a model of dynamic liquidity (Chizhov, 2000).

Lapenkov V.I. by assessing the dynamics of the current liquidity of production processes and sales of products, planning the dynamics of the current liquidity ratio through analytical and accounting modifications, assessing the current liquidity of the enterprise taking into account creditors, assessing the impact of structural changes on the current liquidity of the enterprise, a segmental system of objective assessment of the financial and economic activities of the enterprise was developed, such methods (Lapenkov, 1997; 2000).

3. Methodology

Having developed the following innovative conceptual models for estimating and forecasting the liquidity of enterprises, taking into account the influence of random (economic) factors, using the sources of probability theory and mathematical statistics.

Assume that the function $R = R(t)$ is a time-dependent random variable. Here, the amount R is based on the data of the quarterly balances (t_k) of enterprises at a constant moment of time. B where we take the liquidity of enterprises as the "probability of the event". In the problem R is the value of the quantity t in a constant moment of time R_{kp} indicates the probability of being greater than a critical amount. R_k the amount is the lower limit of the rating, which represents the situation of enterprises that do not ensure the liquidity of the enterprise and have completely lost the source of their funds as a result of the losses (Lloyd & Lederman, 1990).

Over the years, the parameters of the quarterly balance sheets of enterprises are included in the model and calculated. We determine the ratings of enterprises by assessing the probability of their liquidity using their numerical values on their balance sheets by quarter. Here R_{kp} the amount is calculated as the arithmetic average of the company's rating.

To discuss the problematic issue raised R_t we accept the hypothesis about the distribution law of a random variable. In this case, from the distribution laws of

random variables, we focus on the uniform distribution law, binomial distribution law, Poisson distribution, normal distribution law or Gaussian distribution law.

For this, random variables that are equal to each other in our problem at first $\theta^{(n)}$ let's see, that is

$$\theta^{(n)} = \theta_1 + \theta_1 + \theta_3 + \cdots + \theta_n$$

If the mathematical expectation for random variables a_n is the mean squared variance σ_n is mutually equal according to, then the quantity of the normal distribution for random variables will have the following form:

$$\mu^{(n)} = 1/\sigma_n \left(\theta^n - a_n\right)$$

Muavr According to Laplace's theory, $n \to \infty$ the normal distribution law of random variables follows the Gaussian law (Lloyd & Lederman, 1990).

A.M. Lyapunov according to the theory, if the value of *n* has a large value, then $\theta_1 + \theta_1 + \theta_3 + \cdots + \theta_n$ the normal distribution law of the sum of arbitrary random additions corresponds to the Gaussian law (normal distribution law), otherwise the results are as follows

$$\sum_{k=1}^{n} M\left(\theta_n - a_n\right)^3 : \left(\sum_{k=1}^{n} D\theta_n\right)^{3/2} \quad \left(a_n = M\theta_n\right)$$

will have an appearance.

If the variance of the large additive quantities is greater than the variance of the other additive quantities, then the conditions imposed on the distribution are violated or they seem to disappear after the normal distribution. In some cases, Lyapunov conditions (regularities leading to Poisson's law) may also be violated.

If these conditions satisfy the Gaussian law after the normal distribution, it means that even before the normal distribution, the Gaussian law assumes that the arbitrary arithmetic mean and variance are taken into account. Therefore, regardless of the distribution of the sum of arbitrary random variables, it is distributed according to the Gaussian law (Lloyd & Lederman, 1990).

R_i sum of quantities since the quantity *R* is a sum of randomly added quantities, it is possible to talk about the normal distribution of the random quantity *R* many times.

It is known that the normal distribution law is represented by two parameters. These parameters can be the moments of the first and second-order time or the mathematical expectation (*mR*) and dispersion (*DR)* of random variables *R.*

"x" is determined with the help of the following formula:

$$f\left(x\right) = \frac{1}{\sqrt{2\pi\sigma}} e^{-(x-a)^2/2\sigma^2} \tag{1}$$

The graph of this function has a "bell" shape. The peak of the bell corresponds to the mathematical expectation of a random variable. Here, the larger the variance of the random variable, the flatter the curve of the density function of the normal distribution.

In practice, there is a way to determine which distribution law a random variable belongs to. To determine this $\aleph^2$ criterion is accepted. This criterion is used to check whether the random variable "*x*" corresponds to the normal distribution law $F_0(x)$. This criterion is called *agreement criterion.* If $\aleph^2 \geq \aleph_a^2$ if the conditions of the form are fulfilled, the conditional hypothesis of the form $H_0\left(F_x(x) = F_0(x)\right)$ is rejected. In this case

$$\aleph^2 = \sum_{k=1}^{k} \left(M_i - np_i\right)^2 / np_i$$

$\aleph^2$ is called a deviation from the true distribution.

$\aleph^2$ the amount is calculated according to the accuracy determined by the special schedule depending on the level of the free number (*a* amount).

Suppose that the random variable $R = R(t)$ depends on time. If the time function $R(t)$ accepts invariant random variables, then this process is called *a random process.* For example, if the amount *R is determined* based on the data of the quarterly balance sheets of the enterprise, then the amount *R* can take random amounts at a fixed moment in time (t_k) (Lloyd & Lederman, 1990).

In a certain period of time (from the current moment of time T_{np} up to the moment of time) to find a solution to the problem of probability T_{np} of liquidity of enterprises at a moment in time *R* can assume a random variable forecast ($R\left(T_{np}\right)$).

Considering the past period of time (R_1, t_1), (R_2, t_2), ..., (R_n, t_n) as a set of points, it is possible to determine the extension of the rating to a certain time or to forecast the future of the mathematical expectation of random quantities, taking into account certain errors.

Using the method of least squares, it is possible to find a solution to the problem of location of a set of points on a straight line (R_1, t_1), (R_2, t_2), ..., (R_n, t_n). If the sampling distribution is a normal distribution, then the method of least squares is directly compatible with the method of maximum similarity.

To select a set of points (R_1, t_1), (R_2, t_2), ..., (R_n, t_n) it is necessary to use the mathematical expectation (mR), variance (*DR)* and normal distribution of the random variable *R:*

$$mR = a + b * t \tag{2}$$

The Gauss-Markov theorem, using the method of least squares a and b for linear parameter estimation, all classes must have $mR(t)$ minimum variance. The extension error of the function is equal to the square root of the variance of the random variables. The larger the forecast error, the longer the forecast period. The mean square deviation of the random variable extension Δt *R* during the time interval is determined using the following formula:

$$KO = \sqrt{DR + DR * \left(\Delta t * b\right)^2} \tag{3}$$

From an equation of the form (2) a and b to calculate the parameters, we use the following matrix:

$$\begin{pmatrix} a \\ b \end{pmatrix} = \begin{pmatrix} n & \sum t_i \\ \sum t_i & \sum t_i^2 \end{pmatrix}^{-1} \times \begin{pmatrix} \sum R_i \\ \sum R_i t_i \end{pmatrix} \tag{4}$$

here n – R_i number of random variables; t_i – R_i time corresponding to random variables moments.

Using the formula of the form (4) a_1 and a_2 the coefficients are determined:

$$a = \frac{\sum R_i * \sum t_i^2 - \sum R_i * t_i * \sum t_i}{n * \sum t_i^2 - \left(\sum t_i\right)^2} \tag{5}$$

$$b = \frac{n * \sum R_i * t_i - \sum R_i * \sum t_i}{n * \sum t_i^2 - \left(\sum t_i\right)^2} \tag{6}$$

R is a random amount of dispersion the following formula using defined as:

$$D_k = \frac{1}{n-1} * \sum \left(mR_i - R_i\right)^2 \tag{7}$$

R random of the amount average quadratic difference random the mathematical expectation of the quantity (mR) is defined as:

$$\sigma = \sqrt{D_R} \tag{8}$$

To determine the multifactor correlation coefficient, we use the following formula:

$$KR = \frac{\sum \left(a + bt_i\right)^2}{\sum R_i^2} \tag{9}$$

Now R is a random variable mathematician waiting T_{np} at the moment of time (forecasting on the date of mathematician do not wait to determine $N\left(R, mR, DR\right)$ the change of random variables using R the normal distribution, the probability value (p).

Using these expressions, (p) we determine the probability value in the range of random variables with the following formula:

$$p\left(c \le R \le d\right) = \frac{1}{\sqrt{2\pi}} \int_c^d \mathrm{e}^{-(R-mR)^2/2\sigma^2} \mathrm{d}R_i \tag{10}$$

In our research, enterprises are selected based on conditions such as the loss of the ability to ensure the liquidity of enterprises, the end of the source of the enterprise's own funds.

In our study, if R the rating amount is below 0,36, the firm will be insolvent and their equity will be completely depleted. As a result, this enterprise is forced to terminate its activity (go bankrupt). In such cases, the activity of the enterprise is recognized as "dangerous or dangerous".

To determine c the probability value of the event (the lower limit of the definite integral (p) $c = R_{kp}$, and the upper limit d is assumed to be infinite, we use the following formula:

$$\Phi\left(t\right) = \sqrt{\frac{2}{\pi}} \int_0^t \mathrm{e}^{-s/2} \mathrm{d}s \tag{11}$$

The probability value of the event (p) normal of distribution definite integral

from the function Riyashi and Laplace probability values calculated using the information in the table. The information in the table about the probability values of Laplace helps to determine the probability value of the event (p).

The probability of a random variable if substitutions are made in the expression $R \quad s = \frac{R - mR}{\sigma}$ in the formula (10). The expression $\Phi(t)$ of the function *(c)* over the interval from the interval to infinity is determined by the formula of the following form:

$$p(c \le R \le \infty) = \Phi\left(\frac{\infty - mR}{\sigma}\right) - \Phi\left(\frac{c - mR}{\sigma}\right);\ \Phi\left(\frac{\infty - mR}{\sigma}\right) = 0.5$$

$$p(c \le R \le \infty) = 0.5 - \Phi\left(\frac{c - mR}{\sigma}\right). \tag{12}$$

So, $\Phi\left(\frac{c - mR}{\sigma}\right)$ to determine the value of the function in the form, we use the information from the table of Laplace's probability values and (p) determine the probability value of the event.

Enterprises determine the level of liquidity by calculating the probability value of the event (p).

Ensuring the liquidity of enterprises is directly related to the impact of internal and external threats. We use the following sequence of algorithms to estimate and forecast the probability of companies' liquidity:

1) R for the approximation of the random variable $y_R = a + bt$ of eq a and b we determine the coefficients.

2) R we find the mean squared deviation **(** σ **)** value of the random variable.

3) The multifactor correlation coefficient (r_m).

4) In the near term R the forecast value of the random variable (R_{np}) we find.

5) The forecast value of the mean squared deviation (σ_{np}) let's find out.

6) We find the value (s) of the argument of the normal distribution function using the Laplace probability integral.

7) In the current period, we determine (p) the level of probability of ensuring the liquidity of enterprises.

(12) the amount of probability of ensuring liquidity of enterprises using the formula (p) for enterprises is found using the sequence of algorithms presented above (**Table 1**).

Therefore, these models and algorithms serve as an innovative way to estimate and forecast the liquidity rating of enterprises for a certain period (month, quarter, year).

In this case, they are taken into account and summarized in terms of quantity and quality in accordance with the period of assessment and forecasting of the liquidity rating of the enterprise.

4. Results

Functionality for performing experimental calculations in Electronic calculator

Table 1. Ensuring the liquidity of enterprises probability assessment.

Company name	The equation parameter, (a)	The equation parameter, (b)	Average square deviation, (σ)	Correlation coefficient, (r_m)	Rating forecast value, (R_{np})	Average square deviation, forecast value, (σ_{np})	Function argument (s)	Probability value, (p)
Company 1	a_1	b_1	σ_1	r_1	R_{np1}	σ_{np1}	s_1	p_1
Company 2	a_2	b_2	σ_2	r_2	R_{np2}	σ_{np2}	s_2	p_2
Company 3	a_3	b_3	σ_3	r_3	R_{np3}	σ_{np3}	s_3	p_3
Company 4	a_4	b_4	σ_4	r_4	R_{np4}	σ_{np4}		
...	...	...	...	...	...	...	...	...
Company n	a_n	b_n	σ_n	r_n	R_{npn}			p_n

to solve the given problem supply, software, information supply and other organizational and methodological measures will be developed and based on models and algorithms related to the provision of liquidity, taking into account the conditions and characteristics of the enterprise's activity. His models and the relationship between algorithms i is provided by a single database (Abdullaev & Abdullaev, 2024).

A single database is the basis of information provision. Information processing to the information source input and output data into separate groups are separated. Data collection of enterprises financial statements, accounting, standards and other similar types of information.

Through the data entered into the memory of the Electronic computer ensuring the liquidity of each enterprise analyze the level, the optimal value of the liquidity indicator i of each enterprise is formed by making changes to the initial parameters within the accepted limits. The obtained n results depend on the level of supply, the experimenter decides whether to continue or terminate the study. For this reason, based on the rule of systematic information and logical communication of the given problem, we developed a scheme for assessing the degree of ensuring the liquidity of enterprises with the help of software (**Figure 1**).

In the study, we developed the solution parameters of the given problem by evaluating the level of ensuring the liquidity of enterprises and implementing algorithms and models for finding quick forecasting solutions.

The assessment of the liquidity of enterprises has been balanced, and managers of different levels will compare the results of the decisions made on alternative options. If the result of any of the generated alternative scenarios does not satisfy the experimenter, managers at different levels refer to the database again and re-realize the algorithms and models using new quantitative data (Abdullaev & Abdullaev, 2024).

The iterative procedure continues until the results of the assessment of the companies' liquidity are found according to the scenarios.

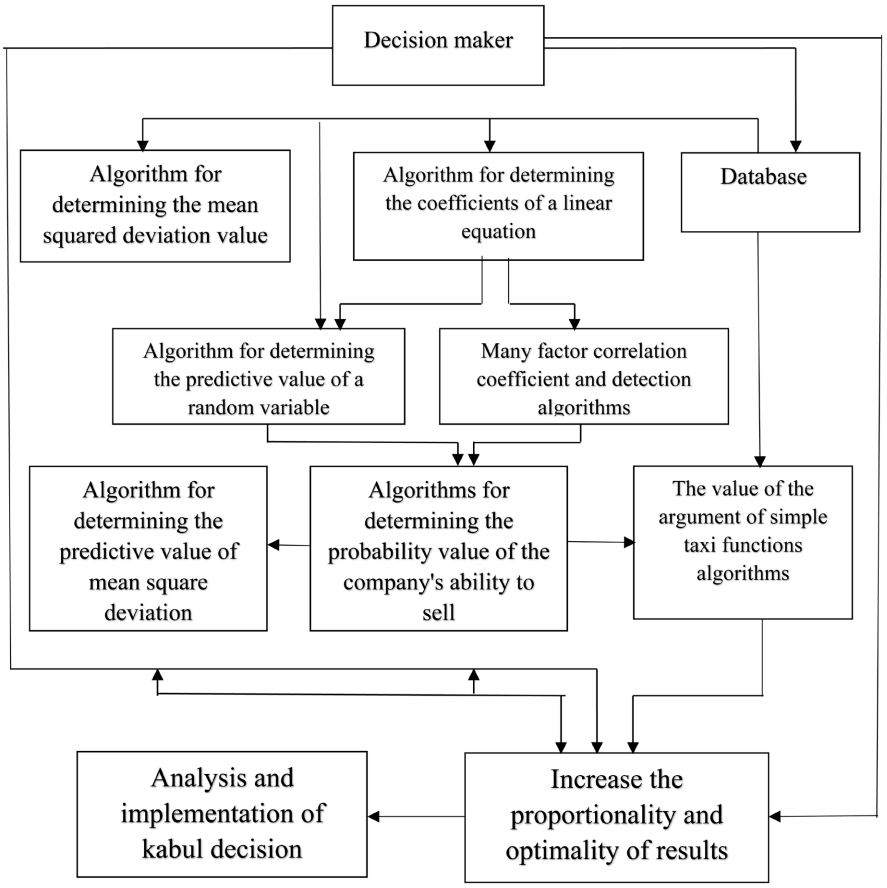


Figure 1. The mechanism for assessing the liquidity of enterprises.

The database envisages the possibility of using information taking into account the economic conditions of the enterprise calculated the probability of ensuring their liquidity using the data of the quarterly balance sheets of the enterprises within the "Uz grain products" joint-stock company for the period of 2018-2023. In the table, we have placed a sequence in the decreasing order of the probability of ensuring the liquidity of each enterprise (from the highest amount to the lowest amount) (**Table 2**).

$\Phi\left(\frac{a-y_p}{\theta}\right)$ values of the integral function of the normal distribution of the form are found using information from the place table of probability values.

Liquidity of enterprises after the performed calculations probability value (p) is determined in the following calculation procedure. For example:

$$p\left(a \le R \le \infty\right) = \Phi\left(\frac{\infty - y_p}{\theta}\right) - \Phi\left(s\right) = 0.5 - \Phi\left(-3.34787\right)$$

$$= 0.5 + 0.499689 = 0.999689$$

In **Table 3**, the value of the probability of liquidity of enterprises (p) *reliable enterprises* in the range of 90% - 100%; *satisfactory enterprises* in the range of 60% - 89%; enterprises represented in the percentage below 59% are evaluated as *enterprises in critical condition*.

Table 2. Calculation of the probability rating of the probability of ensuring the liquidity of the enterprises within the joint-stock company "Uzgrainproducts".

Company name	The equation parameter, (a)	The equation parameter, (b)	Average square deviation, (σ)	Correlation coefficient, (r_m)	Rating prognosis i value, (R_{np})	Average square deviation, forecast value, (σ_{np})	Function argument, (s)	Probability value, (p)
"Asaka grain products" JSC	0.6447	−0.0095	0.0888	0.7932	0.4927	0.0888	1.3832	0.9162
"Bogot grain products" JSC	1.0644	−0.0336	0.1659	0.7847	0.5268	0.1667	0.9404	0.8264
"Baghdad grain products" JSC	0.4388	−0.0037	0.0422	0.6925	0.3796	0.0422	0.2274	0.5871
"Jizzakh grain product lots" JSC	0.4053	0.0084	0.0668	0.8147	0.5397	0.066 8	2.5400	0.9945
"Dostlik grain products" JSC	0.7401	−0.0216	0.0555	0.7189	0.3945	0.0556	0.4405	0.6700
"Aktosh grain products" JSC	0.3889	−0.0025	0.0363	0.6876	0.3165	0.0363	0.0173	0.5398
"Jomboy grain products" JSC	0.6832	0.0046	0.1145	0.8225	0.7568	0.1146	3.3787	0.9996
"White grain products" JSC	0.6499	−0.0063	0.1389	0.7997	0.5491	0.1390	1.2892	0.9015
"Kuva grain products" JSC	0.4032	−0.0031	0.0399	0.6957	0.3467	0.0399	0.0159	0.5590
"Khonka grain products" JSC	0.4132	−0.0038	0.0417	0.7086	0.3763	0.0417	0.0257	0.5793
"Shorchi grain products" JSC	0.5376	0.0077	0.1790	0.8147	0.6608	0.1791	1.6241	0.9478
"Khorazm grain products" JSC	0.4946	−0.0045	0.0931	0.7657	0.4226	0.0931	0.5649	0.7139

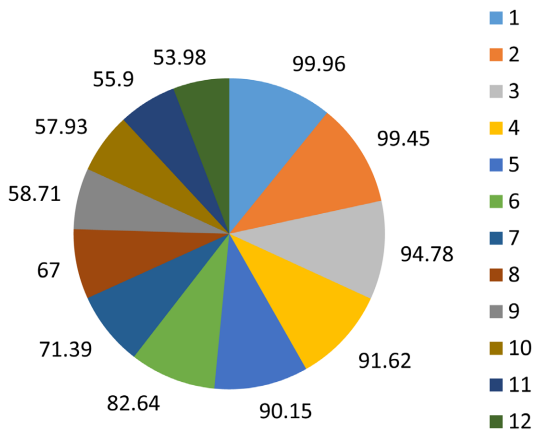
According to the information obtained in the research, enterprises such as "Jomboy grain products" JSC, "Jizzakh grain products" JSC, "Shorchi grain products" JSC, "Asaka grain products" JSC, "Oqoltin grain products" JSC are reliable *enterprises with a high* rating; "Aqoltin Grain Products" JSC, "Bogot Grain Products" JSC, "Khorazm Grain Products" JSC, "Dostlik Grain Products" JSC are *moderately satisfactory enterprises*; Enterprises such as "Baghdod Cereal Products" JSC, "Khonka Cereal Products" JSC, "Quva Cereal Products" JSC, "Aqtosh Cereal Products" JSC *enterprises whose* ratings *are in doubt (in critical condition).*

Therefore, this method serves to assess the probability of ensuring the liquidity of grain processing enterprises and to make short-term forecasts.

The diagram below shows the probability of ensuring the liquidity of enterprises within the joint-stock company "Uzgrainproducts" using the information in Table 3.

Table 3. The result of the probability of ensuring the liquidity of enterprises within the joint-stock company "Uzgrainproducts".

Enterprise rating	Company name	Probability of supply	
		$r(a \le R \le \infty)$	%
1 place	"Jomboy grain products" JSC	0.9996	99.96
2 seats	"Jizzakh cereal products" JSC	0.9945	99.45
3 seats	"Shorchi grain products" JSC	0.9478	94.78
4 seats	"Asaka grain products" JSC	0.9162	91.62
5 seats	"Oqoltin cereal products" JSC	0.9015	90.15
6 seats	"Bogot cereal products" JSC	0.8264	82.64
7 places	"Khorazm cereal products" JSC	0.7139	71.39
8 seats	"Dostlik grain products" JSC	0.6700	67.00
9 places	"Baghdad grain products" JSC	0.5871	58.71
10 places	"Khonka cereal products" JSC	0.5793	57.93
11 places	"Quva grain products" JSC	0.5590	55.90
12 seats	"Aktosh grain products" JSC	0.5398	53.98



Picture 1. Diagram of the probability of ensuring the liquidity of enterprises within the joint-stock company "Uzgrainproducts", in percentage terms.

The liquidity rating of any company is based on the use of probability theory and mathematical statistics methods. The innovative conceptual model developed in our study serves as a method for calculating the liquidity rating of enterprises. This method of probability theory and mathematical statistics helps users to not only the current state of the enterprise's activity, but also to ensure the liquidity of enterprises and short-term forecasting, early detection of the emergence of economic threats and risks, assessment of their prevention and elimination, and to increase the efficiency of making quick management decisions are given.

5. Conclusion

In the article, a concept was developed with the help of theoretical, methodological

rules and methods of liquidity management accounting of grain processing enterprises, in which optimal solutions for assessing the probability of ensuring liquidity of enterprises, a conceptual model was developed that assesses the impact of random factors on the liquidity of enterprises and makes short-term forecasts.

The results of the research are related to the scenario of finding the probability of ensuring liquidity in processing enterprises, making effective decisions, strengthening the financial stability and liquidity of enterprises, effective management of production, accelerating the turnover of working capital, reducing the cost of products, achieving the maximum level of profit, increasing the level of profitability, funding the effect of turnover on increasing production efficiency, reducing production costs, looking for internal reserves and internal provides an opportunity for optimal use of potential, early detection of economic threats and risks, their prevention and evaluation. He recognizes the increasing threats, takes time to avoid the decrease in liquidity, maintains the image of safe enterprises, and ensures that the financial stability and liquidity of enterprises create an opportunity.

Intellectual Property

We confirm that we have given due consideration to the protection of intellectual property associated with this work and that there are no impediments to publication, including the timing of publication, with respect to intellectual property. In so doing we confirm that we have followed the regulations of our institutions concerning intellectual property.

Research Ethics

We reaffirm that any aspect of the work covered in this manuscript that involves the liquidity of grain companies has been conducted independently, and such verifications are acknowledged within the manuscript.

Authorship

All listed authors meet the ICMJE criteria. We attest that all authors contributed significantly to the creation of this manuscript, each having fulfilled the criteria as established by the ICMJE. We confirm that the manuscript has been read and approved by all named authors. We confirm that the order of authors listed in the manuscript has been approved by all named authors.

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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