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METHODS FOR ASSESSING SOLVENCY IN THE FINANCIAL DIAGNOSTICS SYSTEM OF AN ECONOMIC ENTITY

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ABSTRACT

The paper substantiates the need to assess the solvency of an enterprise not in the past, but in the future. The authors substantiate the limited applicability of solvency ratios proposed by other scientists and specialists, as well as the usability of those indicators for future periods. The authors' conclusions are based on the results of studying by them the possibilities of ratio analysis to assess the solvency margin of an economic entity. The paper discloses an approach to building a model for assessing the solvency of a company in a future period; this approach is based on a comparison of predicted cash flows.

The authors adhere to the approach based only on cash flows (monetary approach) to assess the solvency of a company in the future. To build cash flows, it is proposed to apply the schemes for the transformation of receivables and payables into cash, taking into account the periods of deferrals provided by the agreements and the risks of default by debtors. The authors have compiled a list of factors that influence the formation of cash flows. The paper presents the procedure for constructing a model for assessing solvency, taking into account factors that influence it. The authors also proposed a model for the conversion of receivables and payables into cash through a deferral indicator. The paper demonstrates the possibility of using the predictive solvency model by both internal and external stakeholders.

Disciplinary: Business Management (Accountings/Financial Management).

1. INTRODUCTION

Financial diagnostics is an integral element of the analytical work to determine the economic condition of an economic entity, the stage of its life cycle, as well as the identification of phenomena that prevent the enterprise under investigation from maintaining a stable position and achieving its goals. The key link in financial diagnostics is the solvency characteristics of the economic entity, the

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support of which is the basis of the financial health of an enterprise. In the event of insolvency, the enterprise cannot develop and expand its business. To get out of a crisis state, first of all, it involves paying off debts to suppliers and creditors and restoring the solvency of the enterprise as a whole. Thus, the basis of the characteristics of the financial health of an economic entity is the solvency ratio, the accuracy of which affects the quality of the entire financial diagnosis.

The most common methods of financial diagnostics of enterprises, including solvency assessment, are analytical procedures, which are based on ratio analysis. These analytical procedures can be based on individual ratios, a group of indicators united by the target focus of the study, statistical models with the inclusion of additional factors or weight constants.

The current methodology for assessing the solvency of an economic entity, enshrined in the regulatory documents of the Russian Federation is based on the calculation of liquidity indicators, namely, absolute and current liquidity ratios, liquidity ratio of funds, and the degree of solvency for current liabilities indicator. Many Russian scientists, in particular, Kovalev (2006), Gradov (2007), Efimova (2010), Krejnina (2010), Savickaya (2000), Sheremet (2009) and others refer to this solvency assessment methodology and analyze it.

In addition to calculating the system of ratios, Sheremet (2009) finds it appropriate to analyze the solvency balance, which includes an assessment of the absolute indicators characterizing the size of non-payments by companies to credit organizations, suppliers, and the budget. Because long-term solvency characterizes the financial stability of a company, Lukasevich (2010) proposes additionally to use an autonomy indicator calculated as the ratio of the equity capital to the size of the company assets to assess solvency. This indicator is called the coefficient of total solvency. Melnik & Gerasimova (2007) include financial soundness indicators in the solvency assessment procedures. Instead of solvency ratio, Seleznev & Ionova (2010) use the financial leverage ratio calculated as the borrowed capital to equity capital ratio. Thus, the difference in the methods of assessing solvency proposed by Russian scientists lies only in the composition of the ratios used.

More sophisticated solvency assessment models may include rating systems and a weight component. So, the scoring model for the integrated assessment of the financial soundness of an economic entity proposed by D. Duran includes three indicators: return on equity, current liquidity ratios, and financial independence. The scientist attempted to assess solvency not through the availability of funds allocated for debt repayment, but through an assessment of the possibility to generate them. The Credit-Men method developed by J. Depalian and used to assess the possibility to repay obligations by an economic entity has three fundamental differences from the previous model: different quantitative and qualitative composition of indicators, application of weights to indicators, and rationing of each indicator.

A solvency assessment for an economic entity is also carried out by applying the Audit Expert methodology to compare assets systematized by the degree of their liquidity in descending order with liabilities systematized by their maturity in ascending order. Compliance with the required ratio allows us to assess the accounting liquidity and, therefore, the solvency margin of the economic entity. The solvency assessment problem when using the Audit Expert methodology lies in the ambiguous nature of equity capital and the various structures of the company liabilities. As a rule, equity capital, regarded as a “safety margin” in assessing solvency, consists of the authorized capital invested by the owners of an economic entity and the profit generated over the entire existence of the enterprise. But capital also includes other items, for example, additional or reserve capital, which

cannot be used to pay off liabilities. Therefore, without a detailed analysis of the capital structure, comparing its entire amount with the company liabilities is unreasonable.

Analysis of solvency assessment methodologies allows us to draw several conclusions. Firstly, the regulatory acts of the Russian Federation regulate methods for calculating several indicators, with the help of which it is recommended to analyze solvency. Secondly, among Russian scientists, there is no unanimous opinion on the solvency ratio. Thirdly, in the foreign practice of solvency analysis, there is a generally accepted solvency ratio, which goes back to the studies of W. Beaver.

The works by Arens et al. (2012), Jooste (2007), Maverick (2015), Kieso et al. (2014), recommend to calculate Solvency Ratio indicator using the formula:

$$\text{Solvency Ratio} = \frac{(\text{Net After} - \text{Tax Income} + \text{NonCash Expenses})}{\text{ShortTerm Liabilities}} + \text{LongTerm Liabilities}) \quad (1)$$

Solvency Ratio calculation for solvency assessment is recommended by International GAAP 2016 (Ernst & Young, 2013).

Beaver Ratio is similar in its meaning and is calculated by the formula (Beaver, 1966):

$$\begin{aligned}\text{Beaver Ratio} &= \text{Operational Cash Flow} / \text{Total Debt} \\ &= \text{Operational Cash Flow} / (\text{Short Term Debt} + \text{Long Term Debt}) \quad (2)\end{aligned}$$

This indicator reflects the ratio of net cash flow to total liabilities. Operating cash flow is calculated by adjusting the actual net profit of the period under study for non-monetary items such as changes in inventories, receivables, and payables from operating activities during the period, depreciation and expenses that were incurred but not paid in the same period. All these data can be obtained from the accounting (financial) statements. The Total Debt value is taken from the balance sheet of the company at the end of the period under study.

The ratio value is compared with critical values, which vary depending on the industry sector of the enterprise. The amount of net cash flow, being the generated cash for the period, shows the sufficiency of resources to repay the debt available at the end of the reporting period.

The inclusion in the formula for calculating the solvency ratio of all obligations, and not just the amount of debt that must be repaid in the period under study, minimizes the level of the ratio, which characterizes it as more conservative. But the application of this formula can show the adequacy of net cash flow to cover the currently known amount of debt, but it will not reflect the real situation of a shortage of funds to cover accounts payable, which will be formed soon.

An important difference between Russian and foreign solvency assessment practices is the use of liquidity ratios. While the Russian regulations envisage the use of liquidity ratios to characterize solvency, a foreign practice strictly separates these concepts. A solvent is an enterprise that can fulfill its obligations in the long term. So, Flynn et al. (2016) describe the solvency ratio as follows: "The solvency ratio is a key metric used to measure an enterprise's ability to meet its debt obligations and is used often by prospective business lenders. The solvency ratio indicates whether a company's cash flow is sufficient to meet its short- and long-term liabilities" (Flynn et al., 2016). Therefore, the concept of solvency in this interpretation is closer to the term financial soundness, which is traditional for Russian literature.

Liquidity, as the ability of an enterprise to quickly sell its assets to receive cash, is certainly associated with solvency and is its guarantee. However, these are not identical concepts and it is not

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practical to identify solvency with liquidity. In Russian practice, the concept of "liquidity" is more applicable to the characterization of the provision of short-term liabilities with relevant assets. Earlier, we determined the limitations of liquidity indicators used to assess the solvency margin:

1) Absence of solvency's dependence on the length of the period for the transformation of material values at different stages of the production process into cash with its continuous nature;

2) Liquidity ratios do not reflect the content of the liquidity concept as the ability of assets to transform into cash, but reflect the ratio of groups of assets and groups of liabilities;

3) The procedure for calculating the quick asset and current liquidity ratios does not take into account differences in the maturities of liabilities and the period of circulation of individual groups of assets;

4) Incompatibility of accounts payable and property estimates repayment, excluding cash (Karzaeva, 2015; Karzaeva & Karzaeva, 2016).

Another example of worthlessness of solvency assessments using traditional ratio analysis tools are enterprises that are part of a group of companies and often have large amounts of receivables and payables to other companies in the group or parent company. This is the so-called intragroup debt. This circumstance requires either an adjustment of liabilities for the amount of intra-group debt or an assessment of the solvency of the entire group relative to external creditors.

As foreign scientists note, non-financial analytics also plays an important role in assessing solvency. "Certain events can create a risk to an entity's solvency. In the case of business, the pending expiration of a patent may pose risks to solvency as it will allow competitors to produce the product in question and it results in a loss of associated royalty payments. Further, changes in certain regulations that directly impact a company's ability to continue business operations can pose an additional risk. Both businesses and individuals may experience solvency issues should a large judgment be ordered against them after a lawsuit" (Rittenberg et al., 2008). Beams et al. (2016) emphasize the need to make adjustments for industry specifics when analyzing the solvency of an enterprise: "Companies in debt-heavy industries like utilities and pipelines may have lower solvency ratios than those in sectors such as technology. To make an apples-to-apples comparison, the solvency ratio should be compared for all utility companies, for example, to get a true picture of relative solvency" (Beams et al., 2016). Sandstrom (2016) also notes that the solvency ratio is not always justified: "Measuring cash flow rather than net income is a better determinant of solvency, especially for companies that incur large amounts of depreciation on their assets but have low levels of actual profitability. A company may have a low debt amount, but if its cash management practices are poor and account payable is surging as a result, its solvency position may not be as solid as would be indicated by measures that include only debt" (Sandström, 2016).

Thus, the ratio analysis proposed by both Russian and foreign scientists and specialists cannot ambiguously characterize the solvency of an enterprise without additional analytical procedures.

The main objective of this study was to build a model for assessing the solvency margin of an economic entity in the future period based on the principle of comparability of the compared indicators. A model for assessing the solvency level on the basis of comparable cash flows, on the one hand, of expected cash receipts in a future period under study, and, on the other hand, planned payments in the same period, will more accurately determine a company's solvency taking into account operating, financial and investment activities.

Following the purpose of the study, the following tasks were identified as the main ones:

- Identification of factors affecting the formation of cash flows in future periods;

- Development of a model for assessing the solvency margin based on comparable cash flows for the analyzed period.

2. METHOD

The methodological basis of the study was the fundamental principles of finance and financial analysis theories. When constructing a model for assessing a solvency margin, the method of lengthening the classical model was used. The study is based on the analysis of scientific work in the field of financial analysis, in particular, the development of solvency ratios for companies.

As the factual material of the study, actual information on the results of seven years of the second decade of the 21st century from 13 enterprises located in Moscow was used.

3. RESULTS

Persons making managerial decisions are interested not so much in information about the achieved solvency level as in the ability of an economic entity to fulfill its obligations in the future. Therefore, they need to assess long-term solvency, i.e. maintaining the ability of a company to repay its debt in the future. Payables should be compared with available cash and future cash flows for a correct assessment of solvency.

Methods for assessing solvency based on cash flows proposed by Russian scientists and specialists are based on historical data (Efimova, 2010; Yusubova, 2016; Kogdenko, 2015; Sandulova & Kotlyar, 2017), which limits the scope of application of the results since positive cash flows in the past do not guarantee the continuation of such a trend in the future. This approach is due to the desire of the authors of the developments to give a universal tool both for internal to the enterprise under study and for external users of this tool. It seems that the solvency of the enterprise in the future can be assessed only based on the planned performance indicators of the enterprise (revenue, expenses and, consequently, cash flows). Since the planned indicators are internal and, as a rule, confidential information contained in budgets, estimates and other similar documents, only employees of this enterprise can assess solvency in future periods. Therefore, this indicator is intended for internal use by managers of an economic entity, but this does not exclude the possibility of providing it to external users as part of integrated reporting. Planned cash flow indicators increase the accuracy of solvency assessment and increase its reliability.

To determine the predicted solvency, it is necessary to apply comparable data on planned cash receipts and payments, i.e. attributable to the same future period: year, quarter, and month. Also, a necessary condition for the correctness of the solvency assessment is the accounting of only cash flows generated as a result of the implementation of the planned business operations. Solvency ratio is defined as the ratio of the planned cash inflows and their planned outflows, including all types of activities: operational, investment, financial. Urgent sale of assets or unscheduled fundraising to repay liabilities is adverse factors for the enterprise, indicating the crisis situation of the company, which threatens the continuity of its activities. Given the excess of cash over liabilities to maturity, we can talk about the solvency of the company in a specific future period.

Solvency ratio based on cash flows was proposed by Efimova (2010):

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$$KSt = \frac{CBt+CIt}{COt} \quad (3)$$

Where:

K_{St} - solvency ratio for the period t;

T - the period for which solvency is examined. If solvency is examined for 12 months of the planned year, then t will take values from 1 to 12;

C_{Bt} - the amount of cash at the beginning of the period under study;

C_{It} - cash flow for the period under study;

C_{Ot} - cash outflow for the period under study.

However, Efimova (2010) used this ratio to assess solvency in previous periods. We propose to put this model as the basis for building a model to assess the solvency of the company in the future.

When calculating the solvency ratio, all proceeds should be taken into account, including the company's operating, investment and financial activities in the period under study:

$$KSt = \frac{CBt+COIt+ CIOt+ CFIt}{COOt+ CIOt+CFOt} \quad (4)$$

Where:

K_{St} - solvency ratio for the period t;

t - the period for which solvency is examined;

C_{OIt} - cash inflow from operating activities for the period under study;

C_{OOt} - cash outflow from operating activities for the period under study;

C_{IIt} - cash inflow from investing activities for the period under study;

C_{IOt} - cash outflow from investing activities for the period under study;

C_{FIt} - cash inflow from financing activities for the period under study;

C_{FOt} - cash outflow from financing activities for the period under study.

Data on cash flow from investment and financial activities for the planned year is almost always known and fixed by contracts. Also, they are not as numerous and regular as proceeds from operating activities, so information about them should be taken from the relevant budgets. The largest categories of cash inflows should be distinguished in the proceeds from investment and financial activities:

From investment activities

– From the sale of fixed assets and intangible assets;

– From the sale of interests in joint ventures, equity and debt instruments of other companies;

– From loans received and provided earlier to other companies;

– For other reasons characteristic of the given economic entity;

From financial activities

– From issuing shares or issuing other equity instruments;

– From attracting short-term or long-term debt instruments;

– For other reasons characteristic of the given economic entity.

When generating cash outflows from investment and financial activities, the following payments are taken into account:

On investment activities

– Acquisition of fixed assets;

– Acquisition of securities of other enterprises and the state;

– Providing loans to other companies;

– For other reasons characteristic of the given economic entity;

On financial activities

– Repayment of long-term bills, bonds, mortgage bonds;

– Dividend payment;

– Repayment of credits and loan obligations;

– For other reasons characteristic of the given economic entity.

The most complex components of the solvency indicator assessment formula (2) are cash inflow and outflow on operating activities. This is because the revenue recognized for the period under study does not coincide with the cash inflow. Deviations occur when there are many obligations. Firstly, the terms of contracts may provide for prepayments and advances. Secondly, the terms of contracts may also provide for deferred payment. In this case, the deferral period may be different. It is determined by the financial policy after contracts. Therefore, receivables can be settled before the revenue recognition period and can be paid in the following periods. Also, quite often debtors violate payment discipline. These circumstances should be considered when planning cash flows (Figure 1).

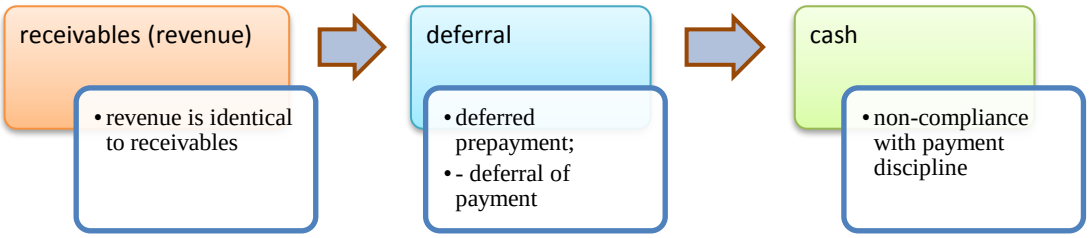

Figure 1: The scheme for the transformation of receivables into cash

When recognizing the period under the study of the coming year for which it is necessary to assess the solvency margin, to determine the indicator of cash inflows as a result of operating activities, it is necessary to have the following data:

- Advances received at the beginning of the year,
- Accounts receivable at the beginning of the year
- Planned revenue for the year,
- Deferred payments at the end of the year,
- Advances expected to be received at the end of the year,
- The debtor default ratio.

Advances received at the beginning of the year should reduce the amount of receivables recognized which should be converted into cash in the period under study. This indicator can be obtained from accounting data. On the contrary, advances expected to be received at the end of the year, increase cash inflows as a result of operating activities, but they are not accounted for in revenue. This indicator can only be obtained from internal information of the sales department regarding the planning of concluded agreements and the conditions for their sales. External users can obtain this indicator by extrapolating the amount of advances received at the end of the previous year, information about which is contained in the financial statements.

Data on the volume of planned revenues for the period under study can be obtained from the sales budget. External users can obtain data about this indicator by extrapolating the amount of revenue received for the previous year, information about which is contained in the financial

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statements. Of course, the indicators will vary, but the predicted data can also be calculated according to optimistic and pessimistic scenario options.

Accounts receivable at the beginning of the period under study are included in cash inflows. However, the receivables should be included in the inflows, taking into account the debtor's default rate, which can be calculated for the previous period as the quotient of dividing overdue debt by its entire volume. The most accurate indicator will be if the values formed for the period (previous year) are recognized as receivables and overdue receivables. However, the indicator of overdue receivables for the year is quite difficult to obtain, so we can restrict ourselves to a ratio calculated based on the amount of receivables and its overdue share at the end of the previous year. These data are contained in the financial statements.

A deferral period should be set in order to exclude a part of the receivables that will be received next year. It should be emphasized that the deferral period is not the same for different debtors. Calculating the deferral period for each sale is a time-consuming task, even if all planned sales are contracted. The last condition is hypothetical in nature; therefore, at the time of planning it is not known what deferrals will be granted. In this case, there are several options for setting a deferral period. The first option recognizes the average value of the deferred payment. For example, in accordance with the contract policy, deferrals are granted for 15, 30 and 45 days. In this case, the average value will be 30 days ((15 + 30 + 45) / 3). For the second option, the deferral is tied to the sales volume. For example, it is statistically established that 50 % of sales are carried out with a deferred payment of 15 days, 30% - 30 days, 10% - 45 days, and 10% - payment is made immediately or before the sale.

In the first option, the amount of receivables should be reduced by the revenue of the last month (30 days). If during planning the amount of revenue for each month is known, then the amount of receivables decreases by the amount of revenue of the last month. If the value of sales by months has not been established, then we can recognize it as even (1/12) or taking into account its dynamics for the previous year, for example, 1/10. In addition, to calculate the deferred receivables determined in days, we need to know the average daily revenue, which is calculated as the quotient of dividing the monthly revenue by the number of days in a month (S / d).

For the second option, the calculation of the amount of receivables is more complicated. Firstly, it is necessary to establish its value for the last two months of the year, which follows from the ability to provide a deferral of 45 days. Secondly, the value of sales, as in the first embodiment, can be established in various ways, which is determined by the specifics of the company.

Suppose, that in recent months equal sales of 100 € are planned. For simplicity, we assume that there are 30 days in each month. In November, deferrals may be granted that will not be repaid in the year under study, only for a duration of 45 days, while from 10% of revenue. A deferral of 45 days may be granted for receivables that were recognized in the last 15 days of November, and, therefore, cash will only be received next year. Therefore, the volume of receivables generated in November should be reduced by 5 € (15 days x 100 revenue / 30 days x 10%). In December, also with a deferral of 45 days, the amount of receivables will be 10 € (30 days x 100 revenue / 30 days x 10%), with a deferral of 30 days - 30 € (30 days x 100/30 x 30%), with a deferral of 15 days - 25 € (15 days x 100/30 x 50%).

The formula for calculating the amount of receivables for which deferred payment is provided that will be received next year, for the i-th month is as follows:

$$D_i = \frac{d_{iDP} \times S_i}{d_i \ x \ k_d} \quad (5)$$

Where:

D_i - the amount of receivables for which deferred payment,

d_{iDP} - the number of days of deferred payment in i-th month,

d_i - the number of days in the i-th month;

S_i - revenue of i-th months;

k_d - the share of the revenue for which the deferral is given for this number of days.

The formula for calculating the amount of receivables for which deferred payment is provided, which will be received next year, for all months is as follows (as the summation of Equation (5)):

$$\sum_{i=1}^{12} D_i = \sum_{i=1}^{12} \frac{d_i \times S_i}{d_i \times k_d} \quad (6)$$

Then the cash flow from operating activities for the year under study (C_{OIt}) can be calculated by the formula:

$$C_{OIt} = (S_t - D_i)k_R - AR_0 + AR_1 + R_0 \cdot k_R \quad (7)$$

or

$$C_{OIt} = \left(S_t - \left(\sum \frac{d_i \times S_i}{d_i \ x \ k_d}\right)\right)k_R - AR_0 + AR_1 + R_0 \cdot k_R \quad (8)$$

where:

S_t - revenue in the year under study, t;

Di: amount of receivables for which deferred payment

AR_0 - the amount of advances received at the beginning of the year under study, t;

AR_1 - the amount of advances planned to be received at the end of the year under study, t;

R_0 - the amount of receivables at the beginning of the year under study, t;

k_R – the debtor default rate concerning obligations for the year preceding the year under study, t.

The cash outflow from operating activities can be determined from the procurement budget. However, similarly to the cash inflows and receivables ratio recognized for the period under study of the acquisition, they do not coincide with cash outflows. These discrepancies are also caused by the advances or deferred payments stipulated by the agreements. Therefore, accounts payable can be repaid before the procurement period and can be paid in the following periods (Figure 2).

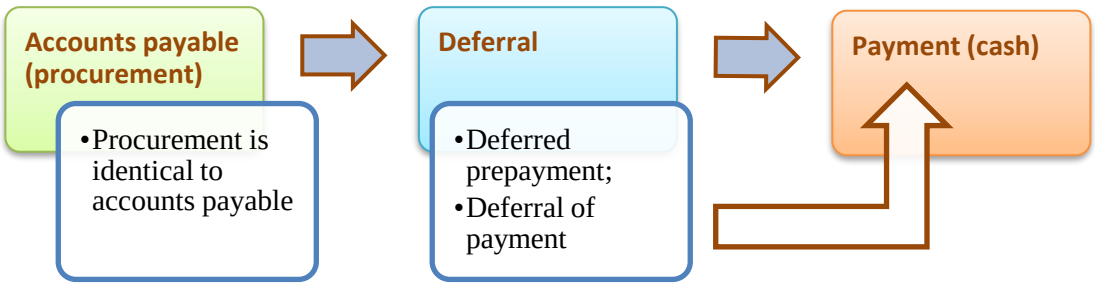

Figure 2: The scheme on the transformation of payables into cash

The cash outflow under operating activities can be determined from the procurement budget, which is formed on the basis of the expense of the manufactured product and the monthly stock required by the enterprise. As is known, overstocking the warehouse is unfavorable for the company,

however, the need for a certain stock is due to a number of factors:

– Logistic leverage (the longer the batch of goods delivery period, the greater should be its stock in the warehouse)

– Providing a discount to the supplier when purchasing a certain volume of products;

– Contractual relationships with customers, assuming the constant availability of a certain amount of products in stock (with regular shipments to key customers);

– Expanding the customer base and increasing sales.

The optimal size of the stock (St) at each enterprise is determined based on the specifics of the business and is individual. But for calculating the volume of purchases it can be set in proportion to the amount of material expenses (Cm) for the production of the product (n). To calculate the required purchase indicator (Cu), we can use the standard balance equation:

$$St_{0.} + Cu - Cm = n\ Cm \quad (9),$$

where

St_0 - the value of stocks at the beginning of the month;

Cu - the volume of purchases in a month;

Cm - the value of material expenses for the production of the entire volume of products per month;

n Cm - the amount of stocks sufficient to ensure a continuous production process.

Then the volume of i-th purchases in one month (Cui) will be

$$Cui = n\ St_1 - St_0 + Cm_i \quad (10),$$

where

i - serial number of the month,

n - the number of cases

St_1 - revenue in the year under study;

Cm_i - the value of material expenses for month i

The volume of purchases (in a period t) Cu_t and, therefore, accounts payable per year can be determined by the formula

$$Cu_t = n\ St_1 - St_0 + \sum_{i=1}^{12} Cm_i \quad (11).$$

The term Cm_i is related to the value of material expenses for the i-th production of the entire volume of products.

The formula for calculating the amount of accounts payable (CI), according to which deferred payment is provided, and which will be paid next year, for the i-th month:

$$CI_i = \frac{d_{iDP} \times Cu_i}{d_i \ x \ k_d} \quad (12),$$

where:

CI_i - amount of accounts payable for i-th product,

d_{iDP} - the number of days of deferred payment in i-th month,

d_i - the number of days in the i-th month;

Cu_i - procurement volume in the i-th month;

k_d is the share of purchases for which a delay is granted in a given number of days.

The formula for calculating accounts payable for which deferred payment is provided, which will

be received next year, for all months:

$$\sum_{i=1}^{12} CI_i = \sum_{i=1}^{12} \frac{d_i \times Cu_i}{d_i \times k_d} \quad (13)$$

The value of predicted material expenses for the period under study can be obtained by internal users from the expense budget. External users can obtain this indicator value by extrapolating the amount of material expenses received for the previous year; information about it is contained in the financial statements. However, it is difficult to establish the required volume of stocks, but we can use the data on stocks of raw materials from financial statements. External users can also calculate predicted expense data using optimistic and pessimistic options.

The deferred payment is determined similarly to the procedure for its calculation for buyers and customers. Given the uniform distribution of payments, an adjustment must be made for the number of days of deferred payments. As with client payments, when calculating payments to suppliers, it is appropriate to apply a methodology for shifting payments between periods and focusing on the time of purchase within the same reporting period.

In addition to payments, suppliers of material assets must include in the calculation of cash outflows the salaries and other payments to employees of the company, contributions to social insurance funds, and payments for production services provided by counterparties, for example, the supply of electricity, water and heat, etc., and also paying taxes. This information can be obtained by internal users from the expense budget. External users can obtain this indicator by extrapolating the relevant information contained in the financial statements.

Then the cash outflow from operating activities for the year under study (C_{OOt}) can be calculated from

$$C_{OOt} = (Cu_t - CI_i) + (P_t - CIp_i) + CL + CIF + T - AI_0 + AI_1 + CI_0 \quad (14),$$

or

$$C_{OOt} = \left(Cu_t - \left(\sum \frac{d_i \times Cu_i}{d_i \times k_d}\right)\right) + \left(P_t - \left(\sum \frac{d_i \times PC_i}{d_i \times k_d}\right)\right) + CL + CIF + T - AI_0 + AI_1 + CI_0 \quad (15),$$

where

CIp_i - contributions to pay for the i-th product,

Cu_t - purchases in the year under study, t;

P_t - payables to suppliers and contractors for the services rendered, consumed in the production process for the year under study, t;

PC_i - costs of production services for the year under study, t;

AI_0 - the amount of advances issued at the beginning of the year under study, t;

AI_1 - the amount of advances planned for payment at the end of the year under study, t;

CI_0 - payables at the beginning of the year under study, t;

CL – wages to employees for the year under study, t;

CIF - contributions to insurance funds for the year under study, t;

T - tax payments in the year under study t.

The general formula for predicted solvency, taking into account all the factors that influence it, will take the form

$$\frac{CBt + CIt + CFit + \left(\left(St - \sum\frac{d_i \times S_i}{d_i \times k_d}\right)k_R - AR_0 + AR_1 + R_0 \times k_R\right.}{CIOt + CFOt + \left(Cu_t - \left(\sum\frac{d_i \times S_i}{d_i \times k_d}\right)\right) + \left(P_t - \left(\sum\frac{d_i \times PC_i}{d_i \times k_d}\right)\right) + CL + CIF + T - AI_0 + AI_1 + CI_0} \quad (16)$$

CFit – cash inflow from financing activities for the period under study;

CFOt – cash outflow from investing activities for the period under study;

CBt –the amount of cash at the beginning of the period under study;

CIOt – cash outflow through the period of t

CL - cash inflow from operating activities for the period under study;

CIF - cash inflow of financial activities;

T- the time period

CIt - cash inflow from investing activities for the period under study;

Si- revenue i-th product under the study

CI_0 - cash inflow from investing activities for initial activity;

4. CONCLUSION

This study gives significant results. It was proposed to evaluate the solvency of a company not on the date of preparation of its accounting (financial) statements, but in the future (next year), taking into account both the planned cash inflows and obligations arising in the period under study. In connection with the existing restrictions on the use of existing methods for assessing solvency, an approach is substantiated to construct a model of predicted solvency based on cash flows (monetary approach). By lengthening the classical model period, a new model for assessing predicted solvency based on cash flows has been built by comparing future earnings and upcoming payments of the enterprise in the future period under study. A model for the conversion of receivables and payables into cash through a deferral indicator was developed in order to maximize the accuracy of prediction values and the reliability of the methodology as a whole. The possibility of using the predictive solvency model not only by company specialists but by external stakeholders is shown.

Based on the model of the predicted annual solvency of a company, it is possible to build solvency assessment models for shorter periods: six months, a quarter, and a month. This is important for planning the financial activities of the company and will allow its managers to timely develop tools to prevent insolvency threats.

5. DATA AND MATERIAL AVAILABILITY

Relevant information regarding this study is available by request to the corresponding author.

6. REFERENCES

Kovalev V.V. Financial analysis: methods and procedures, - M.: Finansy i statistika, 2006. 559p.

Gradov, A. P. (2007). Economic strategy of the company. *SPb.: Special literature*, 959p.

Efimova, O. V. (2010). Finansovyi analiz. Sovremennyi instrumentarii dlia priniatiia ekonomicheskikh reshenii.[Financial analysis. Modern tools for economic decisions]. Moscow. *Omega-L Publ*.

Krejnina, M. N. (2010). Financial condition of the enterprise. Methods of estimation. M.: IKC "DIS". 224p.

Savickaya, G. V. (2000). Analiz hozyajstvennoj deyatel'nosti predpriya-tiya [Analysis of economic activity of

the enterprise], Minsk, 688 p.

Sheremet, A. D. (2009). Kompleksnyi analiz khozyaistvennoi deyatel'nosti: uchebnik dlya vuzov [A comprehensive analysis of economic activity: a textbook]. *Moscow, INFRA-M Publ*.

Lukasevich, I. Y. A. (2010). Financial management: a textbook. M.: Eksmo, 2, 768.

Melnik, M. V., & Gerasimova, E. B. (2007). The analysis of financial and economic activity on the enterprises: the manual. *M.: INFRA-M*.

Seleznev, N. N., & Ionova, A. F. (2010). Financial analysis: Textbook. *M: UNITY DANA*.

Arens, A. A., Elder, R. J., & Mark, B. (2012). *Auditing and assurance services: an integrated approach*. Boston: Prentice Hall.

Jooste, L. (2007). An evaluation of the usefulness of cash flow ratios to predict financial distress. *Professional Accountant*, *7*(1), 1-13.

Maverick, J. B. (2015). Key financial ratios to analyze the mining industry. *Investopedia*, *08*(26), 56-82.

Kieso, D. E., Weygandt, J. J., & Warfield, T. D. (2014). Intermediate Accounting IFRS. *Edition (USA: Wiley)*.

Ernst &. Young. (2013). *International GAAP 2013: Generally Accepted Accounting Principles Under International Financial Reporting Standards*. Wiley.

Beaver, W. H. (1966). Financial ratios as predictors of failure. *Journal of accounting research*, 71-111.

Flynn, D., Koornhof, C., Kleynhans, J. E., Meyer, L. A., Posthumus, L., Arendse, R., & Muriro, E. (2016). Fundamental Accounting. *Juta & Company Ltd*, 788p.

Karzaeva, N. N. (2015). The scope of the solvency ratios in evaluating the continuity of the activities of economic entities. *Accounting, Analysis, Audit*, 2, 31-36.

Karzaeva, N. N., & Karzaeva, E. A. (2016). Tools to improve the solvency of economic entities. *Accounting, Analysis, Audit, 4*, 33-41.

Rittenberg, L. E., Schwieger, B. J., & Johnstone, K. M. (2008). Auditing: A Business Risk Approach 6. bs. *Mason, USA: Thomson South-Western*.

Beams, F. A., Anthony, J. H., Bettinghaus, B., & Smith, K. A. (2016). *Advanced accounting*. Pearson Education Limited 2018.

Sandström, A. (2016). *Handbook of solvency for actuaries and risk managers: theory and practice*. Chapman and Hall/CRC.

Yusubova, G. K. (2016). Evolution of accounting methodology and cash flow analysis. Avtoref. dis. kand. ekon. nauk: 08.00.10. Sankt-Peterburg, 25p.

Kogdenko, V. K. (2015). Methods of analysis of the consolidated statement of cash flows. *Economic analysis: theory and practice*, *32*, 335-341.

Sandulova, E. V., & Kotlyar, I. A. (2017). Cash flows in assessing the solvency of the organization. Current research: from theory to practice proceedings of the International scientific-practical conference under the General editorship of A. I. Vostretsov. Novosibirsk: Publishing house CRNS. 187-190.

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