# FINANCIAL MANAGEMENT IN THE CONDITIONS OF UNCERTAINTY

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ABSTRACT: This report deal with the functional capabilities of the Decision Making Support System designed for enterprise's financial management in the conditions of uncertainty.
Keywords: firm's financial analysis, financial management, liquidity, bankruptcy, capital, structure risk, decision making support system, fuzzy sets, fuzzy number.
The purpose of the financial management is to obtain a number of key's indicators more informative, that reflect the financial state of the enterprise's activity, investment, risk structure capital and so on. To reach this purpose in the conditions of uncertainty is very difficult, even for powerful information technologies of management. Therefore we propose to use decision making support system (DMSS) processing the economic and finance information represented as fuzzy data.

The DMSS financial management (FM) consist of the next parts [2]:

- firms financial analysis;
- value of money, bond and stock evaluation;
- evaluation of investments;
- capital structure and leverage;
- financial forecasting.

## FUZZY AND INTERVAL REPRESENTATION DATA IN THE FINANCIAL ANALYSIS OF STATE OF AN ENTERPRISE

Complexity of the financial analysis due to absence of precise prognosis of some ratios leads to the necessity of using data's fuzzy modeling. The authors used fuzzy number data and confidence intervals for realization of the next problems: determining rates of return, Altmans Z-ratio, break-even point [4,8].

The system under consideration are realized the following problems:

preliminary analysis of the enterprises financial reporting;

calculation and analysis of total liquidity;

calculation and analysis of liquidity, soundness, turnover, gains and profitability coefficients;

estimation of bankruptcy and sanation of the enterprise according to requirements of the government;

estimation of the enterprise's state with multifactor models (Altmans and et.);

calculation the critical point of profitability and other characteristics of the enterprises financial state.

Overall liquidity analysis is made for estimation of credit rating of the enterprise. For carrying out the such analysis the start rough balance is transformed to net balance which hasn't regulative position and has only the positions reflecting a real financial state of enterprise. Assets and liabilities of the statement are subdivided on four parts according terms of a debt redemption and overall liquidity of the statement (balance sheet) is obtained at $A_1 \geq Ï_1$, $A_2 \geq Ï_2$, $A_3 \geq Ï_3$, $A_4 \leq Ï_4$, where $A_i$, $Ï_i$, i=1, 2, 3, 4 accordingly are assets and liabilities of the statement.

For integrated assessment of the balance liquidity is used a general current position too:

$$l = \frac{\sum_{i=1}^{4} a_i A_i}{\sum_{i=1}^{4} a_i \ddot{I}_i}$$

where

$A_i$, $\ddot{I}_i$ – are totals of parts of the start balance for the assets and the liabilities correspondingly,

$\alpha_i$ – are weighted coefficients of funds significance from their submitting and redemption of liabilities point of view.

Accounting balance sheet and profit-and-loss statement are used for calculation of main financial coefficients. At traditional approach the financial coefficients give a number of possibilities both for assessment of an enterprise's status at concrete instant in time and for the forecast of its development.

For research of diverse aspects of financial-and-economic activity of the enterprise we need to consider a few coefficients. Choosing of such coefficients depends from the concrete enterprise, types of its activity, its size, an aspect of studying. It can be selected next groups of coefficients:

1. Liquidity ratio.
2. Business activity coefficient
3. Net profit ratio.
4. Coefficients of solvency or structure of capital.

In FM system under consideration in conditions of uncertainty as well for forecasting of future situations the classical methods of estimating coefficients are insufficient. Therefore for assessment in the system FM a financial state of the enterprise is used the methods with applying of elements from theory of fuzzy sets [4, 8]. As a source data in the system is used a confiding intervals, fuzzy triangular numbers, fuzzy intervals.

In general case a fuzzy number is determined as a subset of a number axes having a belonging function $\mu_A(x):R\rightarrow[0,1]$.

To solve this problem it is convenient to use a parametrical representation of fuzzy numbers. So a fuzzy triangular number can be defined by set of three parameters A=(a, b, c), where *b* is the central value (mode) of the fuzzy number, *a* and *c* are the boundaries of a belonging interval. Operations with fuzzy numbers are introduced on the base of Zade principle in following way: changing a hypothetical operation with arithmetical one we have received a definition for this actions under fuzzy triangular numbers [4]. A fuzzy interval or tolerance fuzzy number are determined by four parameters $A=(a_1, a_2, \alpha, \beta)$, where $a_1$, $a_2$ are boundaries of a tolerance interval, $\alpha$, $\beta$ are the left and right coefficients of fuzziness correspondingly. A belonging function for a fuzzy interval can be writing in the form of:

$$m_A = \begin{cases} L\left(\dfrac{a_1 - x}{\acute{a}}\right), & x < a_1, \\ R\left(\dfrac{x - a_1}{\hat{a}}\right), & x > a_2, \\ 1, & a_1 \le x \le a_2. \end{cases}$$

Comparison of the received coefficients and use of a fuzzy arithmetic with the standard coefficients or indices of different enterprises is made on the base of Hemmint's distance [4].

Given the fact that financial analysis making calculations and analysis of large numbers of financial coefficients is a multicriterion problem so one of the most effective means to decide it is the neuro-networks. The prediction capability of the models is improved by using enhanced learning technique. Note that this is the classical cases of neural networks. To use the neural networks we included 5 variables (ratios) used in Altmans Z-model and 35 important variables financial analysis for firms, such as ROE, ROI, Investment, Assets and others [1, 5-8].

**Financial mathematics.** In order to receive results of calculations in different sections of financial management the system under consideration is realized the operations of financial mathematics using fuzzy number data. That is a calculation of quantities for present and future value of a cash-flow, an annuity and others values can be made not only with precise but also with fuzzy numbers.

Evaluation of investment. In this part are calculated the following indices: the weighted average cost of capital, cost of debt, cost of preferred stock, cost of retained earnings, marginal cost capital and generated a project of a capital budget. For assessment of investments is used a few methods among them the following methods: NPV (Net Present Value),

IRR (Internal Rate of Return) and MIRR (Modified IRR). There are both means for calculation and analysis of risk and for construction an optimal capital budget.

**Capital Structure**. Definition of the optimal capital structure is made on base of calculation and analysis of the effects of financial and operating leverages, degree of financial leverage and combining of theses leverages [2].

DMSS FM under development is an open system allowing to extend its functional possibilities by including both new functions of financial management and new information technologies

In view of presence in the system both interface for user and for expert the last one have possibility to input into the system new solutions which are absent in it and which afterwards will be active for user.

The user has possibility to reveal initial prerequisites and reasons formulated by a system of making decisions.

For carrying out calculations with interval and fuzzy data was used the method of object oriented programming. System for supporting a decision-making was designed on Visual Basic language. This makes it possible to operate with fuzzy number data in accordance with rules of usual mathematics.

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