

Using of personalized approach for assessment of the financial condition of the company

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Abstract. This paper proposes ways of personalization the process of analysis and management of financial flows of the company that provide definition of strategy for business development.

In order to ensure the individual approach have been analyzed the methods of optimization of for making strategic decisions and have been identified peculiarities of their application in this area. This allowed to determine several measures to provide for dynamic changes that occur in the financial condition of the company under the influence of implemented solutions and select the most appropriate decisions to change strategy.

For successful implementation, the search of strategy should to provide an individual approach to determining the quality of finances management by taking into account the personal data of activity the company.

The modern concept of use of computers and information technology and implementation the expert knowledge provides for the creation of intelligent information systems in specific subject areas: management, audit, statistics etc. Therefore, for solving the basic problems is proposed development of intellectual information system of financial management, which will offer the user optimal options, making for strategy development through intellectual component.

As the prototype of such a system is the intelligent information system of financial management (IISFM) that is characterized by a set of informational, technical, programmatic and technological means of telecommunication, knowledge bases and data banks, methods and procedures.

Key words: decision support system, personalized approach, financial management, intellectual system of financial management, personalized of financial data.

INTRODUCTION

The problem of financial management have always been in the limelight of modern management because lack or wrong use of financial resources can cause for slowdown of enterprise performance level by lowering important indicators of its activity.

The effective financial resources management ensures the rational use of financial resources on all levels of the management structure of the market. Scientists researching the financial management: VG Getman,

J. Bryummerhoff, A. Premchand, N. A. Kamordzhanova, N. P. Kondrakov, N. N. Trenev, E. S. Stoyanov, I. A. Dombrovskaya and Y. Malyshev et al. [1,5]

In view of key principle of the theory of competition, where the winner is faster than others reacts to business changes and adopt a more faithful and strategic decisions [6]. The information technologies help to enterprise managers in resolving these complex problems.

Therefore, the content of the information providing financial management is defined by sectoral peculiarities activity of the enterprises their organizational and legal form of functioning, scope and degree of diversification of financial activities and a number of other conditions. Specific parameters of the system are derived from both external (located outside the enterprise) and internal sources.

Today, the development and implementation of a single financial policy has a significant place in the general mechanism of business management. The role of financial management is determined that it touches all aspects of economic activity: practical, analytical, scientific, technical, marketing, logistics etc., and reflects the influence of numerous internal and external factors. Special place among the goals and objectives of the enterprise in the area of financial management are:

- The constant increase enterprise value,
- Maximize the cost of invested own funds,
- Minimizing the attraction of foreign capital.

That is why the study of rational financial management assessment process is an actual topic in today's conditions of unstable financial market.

Under market's economy, need to improve the management process of finances of enterprises that will improve the quality of financial operations and growth of enterprise profit. Consequently, there is a need to find a qualified mechanism for personalized management of financial flows of the company, determining the capital structure for the composition and sources of income, and for assessment the received financial decisions.

As a result, to use of this system received suggested solutions correspond to objectives of modern information

technology of financial management and ensure timely provision of credible information to specialists and managers for make informed decisions.

OBJECTIVES

For a personalized assessing the state of the company success and achieving significant reduction of planning terms, reduce its complexity, expanding possibilities for the analysis of the different plan versions and selecting the optimal option of strategy development, there is a need to create intelligent system of effective management of financial processes of the company.

THE MAIN RESULTS OF THE RESEARCH

The decision to assess the financial condition of the company are held on the basis of company's balance sheet. Decision are taken for solving this class of problems consistent with both the requirements of national legislation and the international standards.

Some existing information systems for financial analysis of the enterprises are intended to identify the main trends of its development, calculate the baseline standards for planning and forecasting, assessment of its creditworthiness. These programs are designed for professional economists and analysts who understand the essence of economic phenomena, and for beginners. Based on the review of existing systems and using of data for the standard criteria reporting, can be conducted analysis in the following areas (Fig. 1).

A necessary condition for this class of systems is adaptive for each client. By working with task of analysis can be faced with the need to take account of the specific characteristics – industry, business or project. In this regard, a strategy of solutions is developed for a specific business that is very effective for making personalized decisions.

The main purpose of the formation of financial solutions is to get the key parameters of certain companies that provide objective and accurate picture of its financial position, profits, losses and changes in assets structure and liabilities in settlements with debtors and

creditors. It is necessary the formation of the current financial position and its projection for the near or more distant prospect, ie the expected financial condition parameters.

While implementing the main objective of financial management are needed to solve the basic challenges:

- ensuring the formation of the necessary volume of financial resources;
- ensuring the efficient use of financial resources;
- ensuring the effective management of monetary circulation of the enterprises;
- ensure the necessary liquidity of current assets of the enterprise;
- ensuring the maximization of profit of the company;
- ensuring the financial stability and solvency of the enterprise.

These objectives of the financial management process are interconnected and interdependent sometimes. Therefore, in the financial management the certain tasks have to be mutually optimized for the most effective results in solving its main goal.

The successful operation of the business primarily depends on the objective and planned strategy of financial operation and development.

The main tasks of the financial strategy currently considered (Fig. 2).

The modern concept of use of computers and information technology and implementation the expert knowledge involves the creation of intelligent information systems in specific subject areas: management, audit, statistics, international business, stock market securities, etc.

The concept of the development of new approaches for the successful conduct of financial flows management suggests compliance of three principles [1; 2]:

- The need for a new product at the consumer;
- Coordination of activities to meet customer needs;
- Profitability analysis (analysis of innovative activity results).

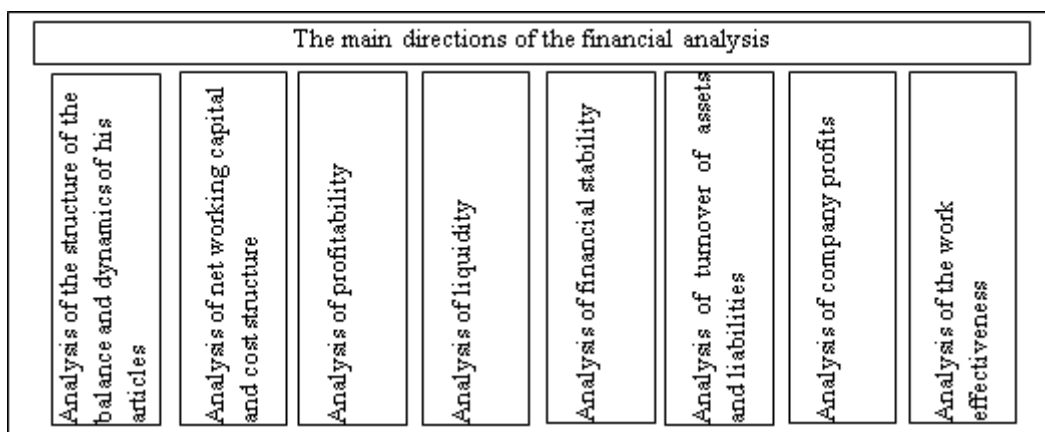


Fig. 1. The main directions of the financial analysis of the company

Methods of strategic decisions optimization

Today there are many methods and algorithms that help solve the problems of this class, however, given the formulation of the problem, consider only some of them that best suited to the task of decision-making system.

Data mining tools are intended to gain knowledge about some or other objects of Economic Analysis, which accumulated in information storage by analytical data processing. To perform data mining using various methods of applied mathematics and information technologies, especially methods of linear algebra, classical mathematical analysis, discrete mathematics, multivariate statistical analysis. These methods can solve many tasks in Economics and Management, which is part of the analytical decision-making preparation.

For a personalized assessment of financial activities considered several methods of optimization solutions, including:

- cluster analysis method;
- method of associative rules;
- method of logic output.

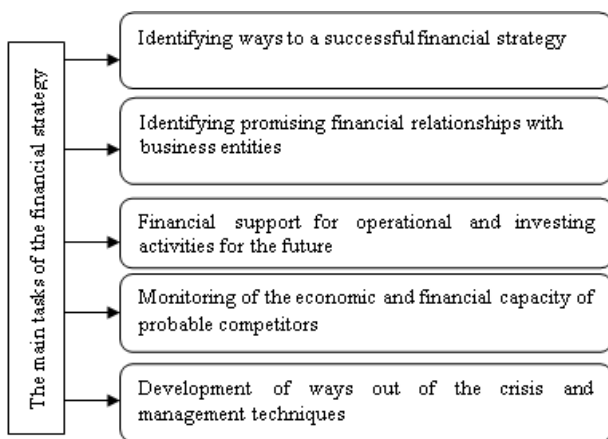


Fig. 2. The main objectives of financial strategy

The hierarchical agglomerative methods

There is one of the hierarchical agglomerative methods – the method of single communication. This method is to find two similar objects by the similarity matrix. Under rule association from this method, there is a new candidate for inclusion in the cluster. It joins an existing group in the event that it has a higher level of similarity with a certain member of this group. So, for the unification of the two objects only need one connection between them [3].

The sequence of union of system parameters can be represented visually in a tree diagram – dendrogram. The tree diagram shows the result of applying the method of single communication up to six data points shown in Fig. 3. For full clustering of this method based on the similarity matrix of dimension $N \times N$ need exactly $N - 1$ steps. The first step, there are objects that are treated as separate clusters. The next steps, all parameters are merging gradually into the main group. The result of these methods are clusters that do not overlap, but they are other elements that attached to the broader cluster, which is at the highest level of similarity [5].

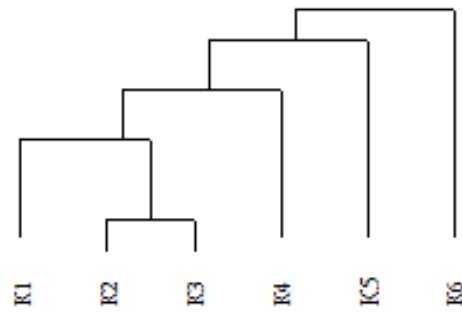


Fig. 3. Example of dendrogram for six data

Example 1:

Suppose, there are a series of evaluation criteria in the system: absolute liquidity ratio (K1) interim coverage ratio (K2), the total coverage ratio (K3), the rate of property (K4) coefficient of borrowed funds (K5), coefficient of correlation of borrowed and own funds (K6) that gradually merged into the main group Fig. 3.

The agglomerative hierarchical methods have several disadvantages along with them versatility and ease:

The cost of computing resources to preserve the great similarity matrix (number of records can reach several thousand when to use IFMIS);

The objects are separated into clusters by only one passage, the unsuccessful the initial partition cannot be changed on the next steps.

Algorithms of associative search rules

These algorithms are intended to find all the rules, and the support and the reliability of these rules should be higher than some advance certain threshold, which called the minimum support (minsupport) and minimum reliability (minconfidence), respectively [3].

Association rules is: “The event U following from the event R”.

As a result of this type of analysis we set a pattern of the following form: “If a set of R met in the transaction, we can conclude that the set of U should appear in the same transaction”.

One problem of associative search rules – algorithmic complexity in finding the set of elements often occur because of the increasing number of elements u_m , exponentially increasing the number of potential sets of elements U, where $u_m \in U$:

$$U = \{u_1 \wedge u_2 \wedge \dots \wedge u_m\}.$$

There are algorithms of associative search rules: AIS and SETM. In these algorithms the elements of set are generated and are calculated “on the fly” during scanning of the database. The inconvenience of their application – other generation and counting of many elements that are encountered often. To improve their work was proposed Apriori algorithm [4]. The work of this algorithm consists of several stages, each of which has the following steps:

- formation of candidates;
- counting candidates.

Formation of candidates – the stage at which the algorithm creates a set of i-element sets (i – step number) by scanning the database. There is not calculated the support of sets at this stage [6].

Calculation of candidates – the stage at which is calculated support each i -element set. Also is made a clipping of sets, the support is less than a minimum established by the user.

For the first time the task of searching of associative rules was proposed for finding of common patterns of purchases that had carried out in supermarkets. [7] We can apply it to another subject area of financial analysis – to select a template of solutions, which are often used for special value of evaluation criteria.

Example 2:

Consider the work of Apriori algorithm on the example of transactional database (DB). Minimum support level is 3. The variables are assigned to the solutions (Table 1), TID – a unique identifier that identifies each operation or transaction:

$$qbc = \{q, b, c\}$$

Consider a set of solutions that includes, for example {plan the number and composition of employees; planning of salary fund; calculational plan of cost of capital}. Imagine it through variables. This set of solutions meets in our database three times, that support of this set is 3:

$$SUP(qbc) = 3$$

At a minimum level of support (equal to 3), a set of solutions qbc is pattern that often occurs.

$\min_sup = 3$, {plan the number and composition of employees; planning of salary fund; calculational plan of cost of capital} – pattern that often occurs.

However, Apriori algorithm reduces the number of candidates, cutting off those who consciously cannot meet often based on information about cut off candidates at earlier stages of the algorithm.

Therefore, the set is taken into account if its support above minimum value by defined user (minsupport). These sets often called [2].

Clipping of candidates is based on the assumption that all subsets have to meet frequently in the set of selected decisions. If a subset is in the set that was defined as one that occurs infrequently in the previous stage, then this candidate is not involved in the formation and counting of candidates.

The advantage of Apriori methods is the high accuracy and stability. Although they are working only with binary signs of objects and “are not” associate dependency with little support.

The features of this algorithm is this when clipping candidates that do not often occur and do not have significant impact on its application in making financial decisions when selecting scheme of development strategy.

Logic output algorithm

The procedure of logic output cannot be attributed to the direct or the reverse of output mechanism, conventionally it is called mediocre chain of reasoning [1, 7]. The mechanism consists in appointment a value to each event (decision) E_i , that reflects the value of this event in the process of logic output. During the dialogue with the user, events are selected with the highest prices. In the process of output, the values of events are listed all the time according to the current obtained results.

Example 3:

In the knowledge base is the finite set of hypotheses H_1, H_2, \dots, H_n ; and finite set of events E_1, E_2, \dots, E_s , where each hypothesis H_i corresponds to a subset of events E_i .

The algorithm is to build an array $P(H_i)$ of apriori probabilities for all hypotheses H_i .

In order to calculate the cost of events using the expression:

$$C(E) = \sum_{i=1}^n \left| P(H_i / E) - P(H_i / \bar{E}) \right|,$$

where

$$P(H / E) = \frac{P(E / H)P(H)}{P(E)},$$

corresponds to the formula of Bayes and the expression $P(H/E)$:

$$P(H / \bar{E}) = \frac{(1 - P(E / H))P(H)}{1 - P(E)},$$

In the case of IISFM $P(H / E)$ – the probability of salary fund planning application when the company is the dependent on the investment; $P(H / \bar{E})$ – the probability of salary fund planning application when the company is not dependent on the investment.

Table 1. Sets of decisions that often occur

| TID | Proposed solutions | Variables |
|-----|---|--------------|
| 100 | plan of the number and composition of employees; planning of salary fund; calculational plan of cost of capital; | q, b, c |
| 200 | planning of salary fund; plan of production and sales; | b, d |
| 300 | planning of salary fund; plan of the number and composition of employees; plan of production and sales; calculational plan of cost of capital; | b, q, d, c |
| 400 | plan of improving of productivity; plan of production and sales; | e, d |
| 500 | plan of the number and composition of employees; planning of salary fund; plan of production and sales; calculational plan of cost of capital; | $q, b, d,$ |
| 600 | planning of transport costs; | f |

So, C(E) is defined as the sum of the maximum possible probability in all n hypotheses contained in the knowledge base. Next, the system selects the event with a maximum value C(E) and asks the appropriate questions to user. According to the received response runs recalculation of the all probability P(Hi). After the formation of the new array of probability the cost of all the events will have been recalculated again and the process will repeats.

One of the principles that are implemented in these expert systems is the use of upper and lower thresholds for probabilities of individual hypotheses [6]. If the probability of P(H) after accounting for all the events exceeds the upper limit Max(H):

$$P(H) > Max(H),$$

then the hypothesis H is taken as the basis for a possible conclusion. If

$$P(H) < Min(H),$$

where Min(H) – lower threshold, then the hypothesis H is rejected as unlikely.

If at some point of system operation reveals that for any hypothesis H_k following condition:

$$P_{min}(H_k) > P_{max}(H_i), \text{ for } i \neq k,$$

where Pmin(H) – the current minimum the probability of hypothesis H and under P_{max}(H) – the current maximum allowable the probability of for hypothesis H.

Then hypothesis H_k is more probable and continued expertise is not appropriate.

The knowledge base corresponding IISFM contains records that affect the knowledge of specific solutions (hypotheses) and knowledge of the criteria for which are assigned the appropriate steps. Each hypothesis has the appropriate formal record:

$$N; P(H); \prod_{i=1}^n E_i; (n_k); P(E_{nk} / H); P(\bar{E}_{nk} / H),$$

where N – name of hypothesis H; $\sum_{i=1}^n E_i$ – the number of all events of this hypothesis; n_k – the number of event; P(E_{nk} / H) – the probability of events implementation for this hypothesis; P(E_{nk} / \bar{H}) – the probability of events implementation when this hypothesis is not correct.

Have the hypothesis Hi:

planning of salary fund: 0,1;2;(1;0;0,99);(2;0,7;0,05);

plan of improving productivity: 0,05;2; (2;1;0,01); (6;0,9;0,02).

Events Ei are shown in Table 2.

Table 2. Cost of events

| Event | C1(Ei) | C2(Ei) |
|-------------------------|--------|--------|
| credits potential | 0,9325 | 0,9972 |
| a large part of capital | 3,2334 | 0,0541 |
| dependent on investment | 1,4345 | 1,2567 |
| liquid | 0,1496 | 0,8633 |

According to the table can say that the cost of events C₁(E_i) The first request is related with an event E₂ (it has maximum cost 3,2334): Are large part of capital?

If the user answers YES, then have to recalculate new probability and value. Table 2 we see that the cost of events C₂(E_i) next request will be associated with the event E₃ (y 1,2567).

The feasibility of using this method of decision-making at definition of financial analysis is low, because the ambiguity of the results lowers the objectivity and quality of the financial management of the company.

Features of implementation of system solution

To solve the main tasks proposed the development of intellectual information system of financial management, which will suggest best options for making development strategy to users by intellectual component.

The prototype of this system is an intelligent information system of financial management (IISFM), characterized by a set of information, technical, programmatic and technological means of telecommunication, knowledge bases and data banks, methods and procedures, engineering personnel that implement the collection, transmission, processing, analysis, forecasting and accumulating information for the preparation and effective management solutions of financial development strategy [6]. Basis for the development information support the specific IISFM at the organization of the internal database (choice of the required composition of indicators, way of its organization, methods of grouping and the sample necessary data).

CONCLUSIONS

1. Considering the peculiarities of the algorithm of search the associative rules truncation the candidates that do not meet very often. This does not significantly affect its use in making financial decision when selecting scheme of development strategy. The obtained results indicate a high accuracy and stability of management decisions concerning financial development the company.

2. The successful operation of the business primarily depends on the objective, deliberate and planned financial strategy of operation and development. The proposed expert system of support management decisions solves complex interdependent tasks whose implementation is based at use of modern management methods, the use of economic and mathematical methods and models complex technical tools and information technology. Also IISFM provides a automation of performance functions and procedures of decisions of qualified financial.

3. The aim of the system consists in presenting to the user only necessary minimal information but sufficient for a decision-making, due to processing data, filtering information and selecting the appropriate parameters and ways of calculations.

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