ABSTRACT:
In this article we consider concepts and components of the Financial Decision Making System that is being developed in the Institute of Business and Management Technology, BSU. Such system can be successfully used either for training experts in financial analytics and financial management or for financial managers and financial directors in an enterprise for the effective financial decision making.

KEYWORDS: Financial analysis, company financial performance, decision making support system, ratio analysis, financial leverage, business evaluation

1. INTRODUCTION

Company financial performance is characterized by a system of indicators, that reflect the presence, placement and usage of financial resources, appearing as a result of cooperation of all the elements belonging to the financial relations system.

Financial analysis allows the company management to control the money turnover by themselves, form and use financial resources, and allows to forecast the possibility of crisis situations arising and therefore to eliminate bankruptcy risk.

Since existing methods and models of company financial statement estimation are very common and rarely used in practice “as is”, it’s proposed to use some kind of mixed measurement model to get more accurate results. It is caused by the fact that every common method comes with some disadvantages and limitations, which are being neutralized if these methods are used as a complex.

There exist the following financial analysis methods:
- horizontal (or trend) analysis;
- vertical (or structural) analysis;
- factor analysis;
- comparative analysis;
- ratio analysis;
- integral analysis.

Financial ratios analysis is the one most widely used. It helps in revealing the symptoms of the hidden facts, problems that need deeper investigations.

The main source of information for financial analysis is the data coming from accounting and management accounts:

1) Data concerning the company property (assets) and sources of its income (liabilities) by the beginning and the end of the period analyzed, represented as an analytical balance.

2) Data concerning the results of company activity for the period analyzed, represented as an analytical profit-and-loss report.
One of the most important problems for the company management and financial department, especially while facing the world financial and economic crisis, is computerized financial diagnostics of the company and the monitoring of its activity from the point of view of reasonable managerial decision-making. The financial decision-making support system (FDMSS) helps in finding solutions to the before mentioned problems timely, determination of the weak links in business and by making well-reasoned financial decisions improving the efficiency of company activities [1, 2, 5].

FDMSS application has the following application domains:

- As a learner’s guide and as a software, that can be used by students getting a higher education degree and attendees of the retraining courses for fulfilling laboratory works, course and graduation papers;
- As a tool applied for analysis and forecast of the company financial performance, for measurement of bankruptcy possibility, for decision-making support in companies and enterprises;
- As a tool for credit capacity estimation of a loan recipient in banks and financial consulting companies.

The system can be operated by the following users: company management, financial officials and managers, financial department employees, bank credit departments employees.

2. FDMSS FUNCTIONAL CHARACTERISTICS

FDMSS has the following functional abilities [3, 4]:

1) Funds flow forecast with an ability to be corrected
2) Bank funds condition analysis
3) Account payable analysis
4) Debt recovery analysis
5) Values and evolution of the major financial indices analysis (number of days of accounts receivable and payable, resources, gross and operational profit rate, make-out point etc.)
6) Creation and analysis of sales reports
7) Creation and analysis of operational (weekly) commercial reports
8) Expenses analysis
9) Budget analysis

FDMSS uses the following information source, available in the company as accounting data for several periods (3 – 4 years, several quarters or current information by each month) [3, 4]:

- Company financial statement;
- Profit-and-loss report;
- Funds flow report.

Given the abovementioned data, FDMSS performs an analysis and formulates decisions about the company financial performance in the form of interest-bearing rates, ratio values and text messages – conclusions about the behavior of some index.

FDMSS contains the following sections:

1. Horizontal (trend) analysis implies comparison of financial rates during some period of time to determine the company development trend.

Vertical (structural) analysis implies the determination of major financial rates structure to study them more properly.

To analyze and make the conclusions the system chooses rates with deviations having the biggest values that happened during the period.

2. Company financial stability. Having assets and liabilities statement as a basis, the financial stability mode is determined: absolute, normal, minimal and critical, and financial stability considering time: current, short-term and long-term outlook.
3. Statement liquidity. Statement liquidity analysis includes comparison of payables, grouped by liquidity degree, and liabilities, grouped by dates of their recovery, ordered by dates ascending.

4. Rate analysis of the company financial performance. About 80 rates (indices) are grouped into 8 groups:
   - operational analysis;
   - operational costs;
   - liquidity and paying capacity;
   - funds management quality;
   - business activity;
   - company financial stability and flexibility;
   - profitability;
   - debt services;

5. Bankruptcy possibility measurement:
   - Belarusian method;
   - Russian models;
   - Altman models and other models.

6. Influence of financial control handles on values of important indicators of company activity measurement:
   - financial control handles;
   - operational control handle;
   - conjugated control handle;
   - “Dupont” model.

7. Forecasting of the values for the most important financial and economic indices of company activities.

8. Business cost estimation. Business cost is the price that can be paid on the free market, where while investing money investor buys an asset that is supposed to bring profit in the future. Basing on this approach, company potential, its opportunities and prospects are estimated first of all. This procedure is performed in several steps.

1) Forecasting time-frame is determined. It is the period that can be used for company activity forecasting with high probability (3 – 7 years).

2) Main company activity indicators are forecasting for the given period: cash flow (CF), free cash flow (FCF) etc.

3) Discount multiplier is determined. Most widespread methods are:
   - CAMP – for cash flow of the own funds
   - WACC – for cash flow of all the funds invested

4) The forecast indicator is reduced to the present situation. The sum of present values will be the business cost.
   Let’s bring an example.
   “X” company owner wants to know how much his business costs. Having forecast company activity for 3 years, he calculated FCF (free cash flow) indicator. It shows up to be:
   1 year – 20,000 $
   2 year – 22,000 $
   3 year – 27,000 $
   Using the model of weighted average cost of capital, discount multiplier was found to be about 30%. Having discounted FCF, its present values (PVFCF) have been obtained. PVFCF sum gives the answer to the question of the cost of business. Its cost is 40,692 $.
3. FINANCIAL DIAGNOSTICS

How do we make a step from analytical activity to the problem diagnosis? How do we make financial analysis goal-oriented, by transforming it from the most important instrument for financial documents and reports quality check to the solid basis for financial diagnostics, core of which lies in the estimation of quality of financial decisions made by the company management?

This article contains the description of one of the possible variants for analytical activity in the sphere of finances that brings us closer to the understanding of the essence of financial politics. The prototype of this variant was a new model of financial analysis, elaborated by the specialists from New York Society of Security Analysts, world-wide known for certifying independent financial analysts and awarding them with CFA (Certified Financial Analyst) degree.

The system described represents international “standards” of the modern financial analysis and implies a certain sequence of actions, including:

1) elaboration of a concept of comparative analysis and choice of the basis for comparison of analytical ratios;
2) carrying out trend analysis of ratios;
3) definition of the general size of financial documents;
4) calculation of inner liquidity ratios;
5) calculation of operational performance and profitability ratios;
6) factor analysis of profitability using Dupont investment model;
7) risks estimation: of the business, financial and operational ones;
8) development dynamics analysis and estimation of growth potential.

Special attention here is given to the concept and modeling of sustainable development, that underlie the growth potential estimation.

Size and quality of the documents. Sequential studies of contemporary analytical system help to determine its several important peculiarities, the implementation of which brings financial analysis closer to the financial diagnostics. If three first parameters of the above mentioned system are quite traditional, because what is at issue is: a) formation of the well-grounded basis for comparison; b) construction of inner dynamics of ratios basing on the principles of horizontal analysis; c) implementation of vertical analysis for two main financial documents – the rest points can be surprising because of unusual phrasing, structure and analysis sequence, because of unusual explanations of traditional definitions and phenomena of financial management, and finally because of showing up new ways of analytical activity, which have never belonged to financial analysis before, and were simply unknown to the most of the analysts.

Ratios comparative analysis as it is generally understood, if not considering imperative analysis, based on rates, is neither more nor less than comparison of computational ratios with their average branch-wise values. Specialized agencies publish periodical statistical article collections that can be used for comparative analysis.

The question “what is to be done” for financial analysis to be more efficient from the point of view of financial forecasting and useful for managerial decisions is not that easy to answer. It comes out, that for building a basis for comparison of financial ratios financial analysis for a manager loses sense at all. To give an answer to that, or to make comparative analysis more efficient, modern financial management practice suggests forming company clusters with homogenous features, including similar methods to measure profitability, amortization, resources, similar sized companies, companies, being in one and the same phase of development, and so on, after that it’s suggested to study strong and weak sides of every cluster. There are several ways to do that.

Trend analysis is connected to studying financial ratios dynamics. Its usage lets partly abandon comparative analysis, being inseparably connected with construction of comparison basis. In case of trend analysis we’re talking about studying of inner dynamics of financial ratios, about choice of an “ideal” ratio and comparing it to all ratio values coming after the “ideal” one.

New approaches to liquidity estimation. In the new financial analysis system liquidity estimation has far more complex nature, which lets revealing or splitting this complex feature of financial prosperity of the company. In accordance with this complex approach to the first three financial ratios of current, fast and critical liquidity, ratios of working capital elements turnover are added: accounts receivable, resources and accounts payable. In this case resource turnover and receivable ratios are withdrawn from the group of business activity ratios. This group in the new
A system of financial analysis simply doesn’t exist, business activity ratios are divided into two groups. First group of ratios dealing with working capital management efficiency goes to the pack of liquidity estimators, and the second one goes to the pack of indicators helping to perform operational profitability estimation. New approach to the liquidity estimation has one more specific feature. Cash conversion cycle, or financial, or cash, or just conversion company cycle, is added to the liquidity ratios pack. Cash conversion cycle, or pure operational cycle – is a period of time needed for the cash spent on buying resources, to turn into cash again.

\[
\text{Cash conversion cycle} = \text{average collection period} + \text{average resource turnover period} - \text{period of payments to suppliers}
\]

**Profitability and risks.** Operational activity estimate is often identified with management efficiency estimate. That’s because in the new financial analysis system operational activity estimate is encapsulated into a separate financial analysis module that consists of a set of financial profitability ratios, which, in their turn, are divided into two ratio classes.

Class A groups operational efficiency ratios. With the help of these ratios estimation of assets management efficiency is performed. Among operational efficiency ratios one can find total assets turnover, fixed assets turnover, equity capital turnover ratios. During calculation of each of these three ratios average values of total assets, fixed assets and equity capital are used. This means, that during calculation values are taken by the beginning and the end of the year, and sum received is divided in halves.

Class B contains ratios of operational profitability. These ratios include all variants of profit rates: net profit rate, gross profit rate, operational profit rate – which characterizes in some way efficiency of managerial activities, answering the question, which part of selling they are able to turn into profit.

Company profitability is characterized by two main indicators. Total profitability of the company is generally associated with equity capital income, i.e. with ROE (Return on Equity), and operational income with an indicator of invested capital yield, i.e. with ROIC (Return on Invested Capital).

Financial ratios used by analysts to measure uncertainty of formation of company incomes, form a group of risk analysis ratios. Methodological risks are divided into three groups in this module: business risks, financial and operational risks. In accordance with that, risk analysis ratios are divided into three categories: business risks analysis ratios, ratios of financial risks analysis, ratios of operational risks analysis.

There are two ways to measure business risk. First one implies measurement of business risk by ratio of standard divergence of operational profit and its average value and represents a covariance ratio for operational profit. Second one is about measuring the ratio of standard divergence of sales and their average sales covariance ratio.

Financial risk measure is determined by a share of borrowed capital in the whole capital structure. The bigger this share is the higher is the measure of financial risk. Business and financial risks are inversely proportional.

Financial risks ratios are divided into three groups:

1) ratio, defined by relation of long-term debt and equity capital;
2) financial leverage ratios;
3) coverage ratios. Not so long ago there were two of them: financial burden ratio and percentage payments ratio.

Nowadays these two ratios are replaced with their various modifications. Instead of profit before payment and percentage (operational profit version) in the numerator of each of both ratios indicator of profit before percentage payments, taxes and amortization, i.e. EBITDA indicator:

\[
\text{Percentage payments ratio} = \frac{\text{EBITDA}}{\text{percentage payments}}
\]

\[
\text{Financial burden ratio} = \frac{\text{EBITDA}}{\text{percentage payments} + \left( \frac{\text{principal}}{1 - t} \right)}
\]

where \( t \) is tax rate.

Among modern financial management practices there is an alternative group of coverage ratios, based on cash flow. In this case we’re talking about classic structure of cash flow. It is either net profit plus amortization, this cash flow is called nowadays banker cash flow. Or it’s an operational cash flow, which structure is defined by international standards of financial reporting.
Cash flow and percentage payments correspondence ratio = (net profit + amortization) /
/ percentage payments
Cash coverage ratio = (net profit + amortization + percentage payments ) /
/ percentage payments
Correspondence of operational cash flow and long-term debt ratio = net profit +
+ amortization ± ΔWCR / long-term debt balanced price,
where ΔWCR – working capital needs increment ratio.
Correspondence of operational cash flow and total debt ratio = net profit +
+ amortization ± ΔWCR / total debt

Factorial analysis of profitability using Dupont model. This algorithm for analyzing profitability revives the principles of modeling and cooperation of financial ratios under the aegis of equity capital profitability. Dupont model in its new quality is oriented to factorial trend analysis and future forecasting. Its traditional purpose is still preserved. Analysis of differences in average branch-wise profitability is performed with its help. During factor analysis of profitability well-known three-factorial decomposition of total profitability of company equity capital is used.

\[ ROE = P \times A \times T, \]
where \( P \) – pure profit rate (pure marginal profit), \( A \) – total assets turnover, \( T \) – financial leverage.

Indispensable condition of Dupont model implementation in the modern conditions is a requirement to the level of statistical parameters, which are included into model calculations. All ratios in this model have average values, and, in the first place, the joint stock capital itself. Thus, Dupont model in this case looks in the following way:

\[ ROAE = \frac{A \times AEAT}{AS} \times \frac{AA}{AS}, \]
where \( ROAE \) – return on average equity (for a period of time); \( AEAT \) – average value of net return (return after tax payments) (for a period of time); \( AS \) – average sales value (for a period of time); \( AA \) – average assets value (for a period of time).

Extended formula of Dupont model, or as it’s called five-component decomposition of total corporate profitability is used a bit more rarely in modern financial analysis practices.

Estimation and forecasting of development potential. Outlook vision is coming out today as a new element of analytical activity, which implementation lets to rise a question about financial diagnostics, essence of which comes to estimation and expertise of financial enterprise politics. Financial politics, representing a set of financial strategies used in enterprise management, finishes the sequence of activities of analyzing the current situation and in many respects predetermines the future and development potential of an enterprise. The foundation of this stage of financial analysis, letting to make a step from company financial diagnostics, is SGR (sustainable growth rate) model that gives out the formula for optimal growth rate calculation for each enterprise.

Sustainable growth is often called self-reachable, self-paying back or balanced growth. It’s not an easy thing to consider. This phenomenon hasn’t been considered in the set of instruments and technologies of financial management. But everything has changed recently. Analysis and forecast of growth rate, estimation of development potential with the help of sustainable growth rate model have become an essential final stage of financial analysis, which opens up a new era of financial management at the same time – the era of its strategic direction, subject of which is the enterprise financial politics. SGR model has become the foundation for growth potential estimation, which is taken into account during script planning and formation of alternative financial forecasts. Let’s bring several examples on the things being described.

Formula that helps to calculate self-reachable sales growth rate can be represented in the following way. If accumulation standard represent a ratio of net surplus and profit after tax payments, i.e.

\[ Accumulation \ of \ equity \ capital \ rate \ (or \ profit) \ (R) = net \ surplus / \]
/ equity after taxation (EAT),
then self-reachable growth rate, which is equal to equity capital growth rate, can be written in the following form:

\[ g = ROE \times R, \]
where equity capital profitability is calculated by division of net profit or profit after taxation, received by the beginning of the year, to balance price of equity capital by the beginning of the year. The latter circumstance comes out to be very important for all analysts, experts and managers. \( ROE \) is split into three factors: profit rate, turnover of total assets and financial leverage \( (A/E - assets, \ correlated \ with \ equity \ capital) \), and in this case sustainable growth rates represent correlation of four parameters:

\[ g = ROE \times R = P \times A \times T \times R, \]
where \( P \) – net profit rate; \( A \) – assets turnover; \( T \) – financial leverage; \( R \) – accumulation standard.
Equity capital profitability in its turn can be written as a result of multiplication of operational profit rate, invested capital turnover, financial leverage and tax effect ratio. Thus,

\[
Sustainable \ growth \ rate \ (g) = \frac{accumulation \ rate \times \ operational \ profit \ rate \times \ capital \ turnover \times \ financial \ leverage \ multiplier \times (1- \ effective \ tax \ rate)}{accumulation \ rate}
\]

This equation distinctively represents five factors that influence company growth potential without attracting third-party funds (including shares emission). Second and third factors reflect operational strategy of the company (its operational profit rate and invested capital turnover), first and fourth factors reflect its financial strategy (its accumulation rate and financial leverage multiplier), fifth factor reflects real taxation strategy of the company. It’s important to notice, that if all the five factors are fixed or stable, company cannot develop faster that its optimal growth rates. Growth rate can be increased only in case of new shares emission. Moreover, companies with growth rates, exceeding self-reachable growth rates, are in fact, experiencing cash shortage. The companies having factual growth rates less than self-reachable are generating positive cash flows, experiencing excess of cash. In this case they have to solve their investment problems. There is one more unresolved problem in these complicated from the financial point of view situations, that is company managers behavior and their strategies: financial and operational.

To reach a predefined level of profitability of equity capital with given self-reachable growth rate and with given accumulation rate it’s necessary:

1) at the first stage: to express equity capital profitability via correlation of self-growth rate and accumulation rate, in particular:

\[
Return \ on \ equity \ (ROE) = \frac{sustainable \ growth \ rate \ (g)}{accumulation \ rate \ (R)}
\]

2) at the second stage it is necessary to answer the question, which combination of financial leverage and return on invested capital will give a higher level of return:

\[
Return \ on \ invested \ capital \ (ROIC) = \frac{Return \ on \ equity \ (ROE)}{financial \ leverage \ multiplier \times (1- \ efficient \ tax \ rate)}
\]

Thus, having answered the question about value of return on invested capital with sustainable growth rate specified, the level of turnover of invested capital with operational return rate specified can be defined:

\[
Turnover \ of \ invested \ capital = \frac{return \ on \ invested \ capital}{operational \ return \ rate}
\]

As a result of these calculations managers get quantitative orientations for their operational activities.

Sustainable growth notion is connected not only with profits. Sustainability is needed while estimation of shares profitability in the foreseeable future, while extrapolation of the existing profitability rate, while forecasting changes that change the direction of established trends. Dealing with this bunch of problems needs to be started with disaggregation of shares profitability:

\[
Sales / Assets (S / A) \times \frac{net \ profit}{sales} \times \frac{sales}{assets} (A) \times \frac{net \ assets}{net \ assets} (NA) \times \frac{net \ assets}{shares \ emission} = \frac{net \ profit}{shares \ emission}
\]

or

\[
Assets \ turnover \times \frac{sales \ profitability}{financial \ leverage} \times \frac{book \ value \ of \ share}{book \ value \ of \ share}
\]

Investigation of this formula says that profits won’t be growing as a result of sales growth, because sales are being in the denominator for sales profitability and in the numerator for assets turnover. Only by increasing one of these four parameters of the equation or by decreasing number of shares one can achieve their profitability growth.

To achieve sustainable growth of shares profitability company needs to book some part of its income. The bigger this part is, the bigger book value per share will be accumulated, the higher profitability growth rate will be. Hence, the following formula is valid:

\[
Sustainable \ growth \ rate = return \ on \ equity \times \ profit \ reinvestment \ rate
\]

where

\[
profit \ reinvestment \ rate = 1 - dividend \ payment \ rate
\]

Shares redemption or decreasing of number of shares released stays one more unrecorded opportunity of shares profitability dynamics stabilization. In the 90-ies most of the companies have been using this way in the conditions of limited possibilities of incomes growth.
4. PRODUCTION RULES

Production rules is one of the most popular methods of knowledge representation in FDMSS [1, 5]. Production rules has the following form:

IF <conditions> THEN <conclusion>.

The “conditions” part can contain several relations, connected by the logical operations AND (\&\&), OR (\|) or NOT (\neg). IF \(x > a\) AND \(y < b\) OR \(z > c\) THEN conclusions \(d\)

Examples from the area of enterprise financial analysis:

1) IF revenues grow AND revenue growth rate is more than prime cost growth rate THEN growth of company financial performance

2) IF assets rise AND circulating assets grow AND revenue grows THEN growth of company financial performance

The following examples of relations appearing in the conditions can be given (from the beginning to the end of a period):

- circulating assets increase;
- accounts receivable decreases;
- net gain increases;

Thus, the core of the financial analysis procedure is a set of production rules, according to which FDMSS makes the conclusions basing on truth.

It seems evident, that one production rule is not enough for making a conclusion on the company financial performance.

In general a great number of such conclusions have to be considered. If these conclusions agree, or almost agree, the system forms the final conclusion. If the conclusions received do not agree, the system gives out a positive and negative conclusion with the condition of production rules to an expert (a financial analyst). Considering this information, an expert should formulate the final conclusion.

5. FDMSS IMPLEMENTATION

Nowadays it is very hard to manage any medium to large organization successfully without using of enterprise computer-based resource planning systems. A lot of consolidated ERP systems have been developed lately, which include various components including Financials, Distribution, Human Resources Backbones; Supply chain management; Decision Support Systems etc. One can name SAP, Oracle Applications, Infor Global Solutions, Microsoft as the largest ERP vendors worldwide. Considering indisputable advantages of the mentioned software all of these products are extremely expensive, difficult to embed and support.

In organizations not having ERP systems financial managers and accounting officials lack of some simple, easy-to-start, freeware product which is sufficient for understanding financial and balance statement analysis and applying the analysis data to organizations’ management solutions. To satisfy these purposes the Financial Management Helper application has been developed on SBMT financial subdepartment.

The application is based on Oracle XE freeware database engine as a back-end, the front-end is a Rich Web Application created using Oracle Apex software. The principal design of the application is shown on Fig. 1.
The chosen design scheme excludes necessity of installing any software and makes it easy to get started to using the application, the only things essential are valid balance and profit-loss statements and Internet connection. The core software features include (see Fig. 2):

1. Balance statement analysis including the following procedures: vertical analysis, horizontal analysis, aggregate analysis.
2. Profit-loss statement analysis.
3. Bankruptcy analysis including the following methodologies: Belorussian methodology, Russian methodology, Altman Z-Score Financial ratios.
4. Ratio analysis comprising current ratio, capital structure, financial viability, profitability analysis.

The application implies several interactive facilities:

1. Highlighting weak and strong areas in balance profit-loss, and ratio analysis. The example is shown on Fig. 3, where ratios not satisfying to certain norms are highlighted with red color.
2. Predicting bankruptcy situations based on the bankruptcy analysis results.

3. Visual time history of ratios variations. The example is shown on Pic. 2, where ratios dynamics is denoted with red or green arrow, with red arrow corresponding to regressive changes and green arrow corresponding to positive changes.

4. Training “what-if” feature: balance or profit-loss parameters can be changed in real-time mode with immediately responding ratios and interactive dynamics history. The example is shown on Fig. 4, where current assets value can be changed with liquidity indicators immediately changing:

Fig. 4 “What-if” analysis example

All these application features are aimed to help financial and accounting official make managerial solutions based on the modern management and financial accounting methods.

The further goal of the development is to add some decision support features which could serve the management level of the organization and help to take decisions, which may be rapidly changing and not easily specified in advance.

6. REFERENCES