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August 16, 2018

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Abstract. The new applications of annual fiscal accounting analysis at the risk assessment are discussed in this paper. The system analysis methods that can be used to identify the industry or sector of the companies based on their annual fiscal accounting are described. The industry or sector identification make possible conflict data processing and review of supplier and contractors for identification their main type of economic activity in order to exclude the risk of contracting with an unreliable company. It is very important when choosing a supplier or contractor, and also when banks or credit unions make decisions about the issuance of loans. Other application is financial analysis with taking in to account industry or sector specific in order to make adequate opinions about financial sustainability statement of company or vice versa. Taking into account industry or sector specific make possible to reliably forecasting bankruptcy and assessment of enterprise value for example in cases of mergers and acquisitions. One of the promising applications is the identification of the life stage of the company. An example of the characteristic structure of the balance sheet of Russian construction companies is shown. It is also shown that traditionally recommended ranges of financial ratios are not characteristics of them. The linear equation to assessment of enterprise value of Russian construction companies is shown. This equation could be used as industry formulas method of business valuation.

Keywords: Risk Assessment, System Analysis, Fiscal Accounting.

1 Introduction

1.1 The task of industry or sector identification

For the purposes of this research, the task of industry or sector identification will be defined as follows – determination of the main type of economic activity and specific sector or industry on the basis of its balance sheet or other financial accounting.

1.2 Scope of applications of industry or sector identification at the risk assessment

Authors view the next six applications of the task of industry or sector identification based on annual fiscal accounting analysis (table 1). All of these applications are directly related to risk assessment.

Table 1. Applications of the annual fiscal accounting analysis at the risk assessment

No.	Applications at the risk assessment	Uncertainty and Risks	Risk for owners and stockholders
1	Review of suppliers or contractors for identification of their main type of economic activity	The conclusion of contracts with suppliers and contractors who do not have competence in the field of the contract, including the case of a contract with a "dummy" companies	Customers of goods, works or services
		Financing companies for the implementation of projects that are not characterized by their activities	Banks and Credit Unions, Private Investors and Investment Companies
2	Conflicting data processing	Development of ineffective measures and programs to support industry companies Non-targeted support of companies	State government, National statistical offices and Institutes, Tax services
3	Financial analysis	A financially sustainable company may be incorrectly classified as unstable or vice versa	Banks and Credit Unions, Private Investors and Investment Companies
4	Bankruptcy prediction and forecasting	The bankruptcy of the contractor and the failure of the project implementation deadlines	Customers of goods, works or services
		Issuance of loans and credits to companies with high risk of bankruptcy	Banks and Credit Unions, Private Investors and Investment Companies

		Introduction of special bankruptcy procedures of companies for which this is provided by law, for example, agricultural enterprises	Shareholders, Banks and Credit Unions, Private Investors and Investment Companies
5	Business Valuation	The enterprise value may be underestimated or overestimated	Shareholders, Private Investors and Investment Companies
6	Life Cycle	The company may have threats that are specific to a particular stage of the life cycle, for example, start-up company or monopolist	Shareholders, Private Investors and Investment Companies, Venture Companies

The authors used the annual fiscal accounting of Russian companies as initial data, but its balance sheets are compiled according to Russian regulations on accounting¹. Despite attempts to bring Russian accounting rules closer to International Financial Reporting Standards and International Accounting Standards they still differ [1]. That is why the scope of current results has limitation in international practice.

However, in this article, the authors sought to show exactly the new opportunities for annual fiscal accounting analysis taking into account industry or sector specific, focusing on the application of these results in the field of risk assessment and risk management.

1.3 Applications of industry or sector identification at the risk assessment

Consider each of the suggested applications in details.

Review of suppliers or contractors for determination their main type of economic activity.

Selection of new suppliers and contractors presupposes the existence of the risk associated with the uncertainty of their behavior. For example, the next risks exist when a company works with contractors: delay in the schedule of work, budget overruns, contractors' failure to fulfill obligations and etc.

The risks increase if the opportunistic behavior is present in the implementation of the contract, consequently, there is a probability of supply failure, delivery of poor quality goods and etc. As a result, the costs of eliminating opportunistic behavior are increasing, for example, costs of supervision, quality control, legal costs. Also some companies are used for concluding contracts only.

¹ direction of Minfin RF of 06.07.1999 #43n «On approval of the Regulations on Accounting "Accounting statements of the organization»

Risk minimization is a check of the contractor (check of experience in the implementation of similar projects, reputation in a certain area). The authors propose to conduct a preliminary audit of the financial statements of the contractors. The goal of the audit is to determine the main activity. The preliminary assessment will reduce the number of potential contractors, therefore, it will reduce the transit costs.

Conflicting data processing.

Information and data about companies collected by state or region statistical offices and specialized organizations, such as self-regulating organizations, may differ significantly. It leads to a distortion of information in the development measures and programs to support industry companies.

For example, 9683² entities registered in the Perm krai indicated the 45-th class «Construction engineering» according to All-Russian Classifier of Types of Economic Activity. In other words the main types of activity are construction, reconstruction, overhaul and maintenance of buildings and structures including individual house building and repairs. At the same time, only 1974³ of these entities have a membership in the construction self-regulatory organizations, that is, they have the permits for conducting construction and installation works⁴.

Significant difference of statistical data may lead, for example, to non-targeted support of companies and as a consequence, to ineffective spending of state budget funds or reduction funds of programs to support industry companies, while they are really necessary for business entities.

Financial analysis with taking into account industry or sector specific.

Traditional methods of financial analysis do not include the industry-specific factor and can lead to the wrong definition of financial stability of the company and vice versa. Therefore, there is a possibility of refusal to Financing of the company's activities or financing at high interest rates, as a result, the lost profit of the credit institution and the deterioration of the borrower.

Risk minimization is the definition of financial ratios, which correspond to the specifics of the industry and the level of development of the national economy.

For example, many companies of construction industry have been working successfully in the Russian market for a long time, but the liquidity and autonomy ratios are low because companies have a high share of receivables and payables.

² Distribution of companies and organizations by types of economic activity in Perm Krai http://permstat.gks.ru/wps/wcm/connect/rosstat_ts/permstat/resources/acfc2c0040a5b22ba63fe7367ccd0f13/10.1.html accessed 2018/07/26

³ Register of self-regulating organizations in Perm city and Perm Krai <https://perm.reestr-sro.ru> accessed 2018/06/01

⁴ not all types of construction and installation work require membership in the self-regulatory organizations and have the permits. List of works that do not require membership in self-regulatory organization available at <https://glavsro.ru/a117516-kogda-nuzhno-vstupat.html> accessed 2018/07/30

Bankruptcy prediction and forecasting with taking into account industry or sector specific.

A similar situation exists in preventing or predicting bankruptcy. The traditional models of Altman, Tuffler, Fulmer, Springate, Fox, etc., on the one hand, are non-sectoral, on the other hand, the models were determined on the indicators of companies in developed countries. Consequently, the prognostic ability decreases if the models are used for a particular industry for countries of another level of economic development [2].

For example, the construction industry in Russia has a negative dynamics of bankrupt enterprises among other industries: in the three quarters of 2017, 1 951 construction companies were declared bankrupt. This is the historical maximum of this indicator. Moreover, in 2007 the share of construction companies in the total number of bankrupts was 8%, in 2016 the share increased to 20%.

Based on the data, the authors determined the prognostic ability of traditional models for Russian construction companies. As a result, the most reliable is the Springate model, but the model determines the financial position of 67% of the enterprises from the sample only [3].

Risk minimization is the definition of financial and economic performance indicators that take into account the peculiarities of the national economy and the industry to build models for predicting bankruptcy.

The dynamics of growth of the number of Russian construction companies in the active stage of bankruptcy is presented in figure 1.

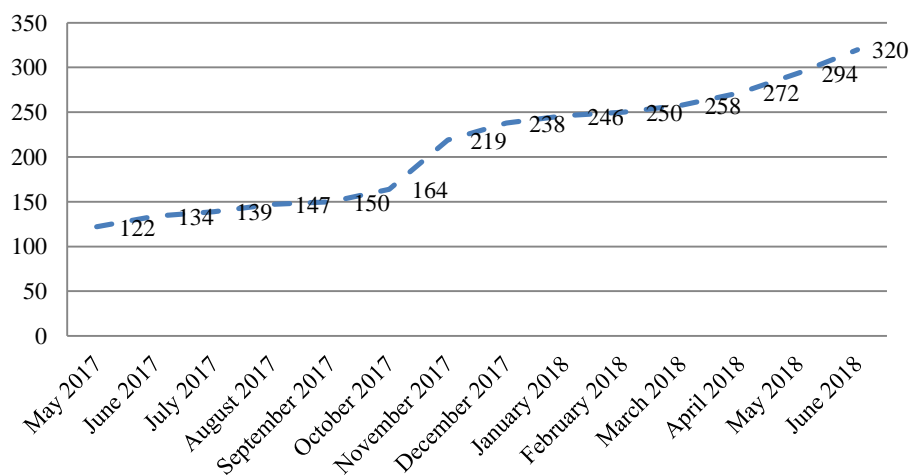


Fig. 1. Dynamics of growth of the number of developers in active bankruptcy procedures, Source: erzrf.ru

Business valuation.

Business valuation is widespread in many applications, not only in providing shareholders and management of the company with information about the value of their

company or a stake, but also in the management of a portfolio of shares, due to diligence, mergers and acquisitions and etc.

The risk of assessing a business without industry characteristics analysis lead to underestimation or overestimation of value of company, consequently, making wrong management decision. This risk is typical for countries with developing economies, including Russia. It is necessary to continuously update the industry coefficients and one of the methods of direct market comparison approach – industry formulas method is not applied in practice.

The authors propose to mitigate this risk through the identification of the most characteristic item on a balance sheet for industrial enterprises and the establishment of new multipliers or create the regression equation between the balance sheet and company value / share price.

The stage of life cycle of an enterprise.

It is well-known that the company may have specific threats at different stages of life cycle [4, 5]. Financial ratios, taking into account the specifics of the industry, allow us to assess the current state of the company, that is, to determine the phases of the life cycle and the use of the Boston consulting group matrix [6], innovation snail [7] and in the future, the assessment and development of measures to improve the efficiency of the company.

The list of suggested applications (see, table 1) may be expanded or shortened in future.

According to the results of the review of publications and studies, the authors did not find the proposed applications based on the analysis of industry-specific features of accounting, of course, except of financial analysis and bankruptcy forecasting. However, the attempts of other researchers to build industry models (see [8, 9]) are based on a single methodological tools for solving all applications - the universal cognitive analytics system «Eidos» [10, 11] described in subsection 2.1. Therefore, the authors considered the proposed applications to be new, which is reflected in the title of this paper.

2 Data and Methods

2.1 Methods and models

This research was made with using system analysis methods [10, 11] based on the information theory. These methods are designed to eliminate the uncertainty of the analyzed object state or to determine the information importance of the features of the identified object.

In general, these methods (table 2) are abstract and can be used to study a wide variety of subject areas. Information importance of the features based on frequency of manifestation of features in classes.

Table 2. Models used in universal cognitive analytics system «Eidos»

Designation	Name of model ⁵	Equation	Note
INF1	Amount of information in formula named after A. Kharkevich	1	N_j – volume of features in j -th class;
INF2		1	N_j – volume of objects in j -th class;
INF3	The difference between the actual and theoretically expected frequencies	2	
INF4	Return on Investment ⁶	3	N_j – volume of features in j -th class;
INF5		3	N_j – volume of objects in j -th class;
INF6	The difference between the conditional and unconditional relative frequencies	4	N_j – volume of features in j -th class;
INF7		4	N_j – volume of objects in j -th class;

Particular models of information importance of features have the following form:

$$I_{ij} = \Psi \cdot (\log_2(N_j \cdot N) - \log_2(N_i \cdot N_j)), \quad (1)$$

$$I_{ij} = N_j - N_i \cdot N_j / N, \quad (2)$$

$$I_{ij} = (N_j \cdot N) / (N_i \cdot N_j) - 1, \quad (3)$$

$$I_{ij} = N_j / N_j - N_i / N, \quad (4)$$

where I_{ij} – value of information importance of i -th features for j -th class;

i – number of features (in this research – a certain range of the enterprise balance sheet in relative terms);

j – number of class (in this research class is mean industry or sector, in case of bankruptcy prediction we used only two classes: companies are bankrupts and companies are not bankrupts);

N_j – amount i -th features in j -th class in training sample;

N_i – amount i -th features in training sample;

N_j – amount j -th class in training sample;

N – volume of training sample.

⁵ All of these models called by Professor Lutcenko E.V.

⁶ This model called “Return on Investment” by Professor Lutcenko E.V., but isn’t investment term

Ψ – normalization factor transforming amount of information in formula named after A. Kharkevich in bits and ensuring for her compliance with the correspondence principle with R. Hartley's formula;

Normalization factor Ψ is calculated by the following form:

$$\Psi = \log_2 W^* / \log_2 N, \quad (5)$$

where W – volume of all classes,

φ – Hartley's emergence rate calculated by the following form:

$$\varphi = \log_2 \sum_m C_w^m / \log_2 W, \quad m = 1, \dots, M \quad (6)$$

where M – volume of all classes.

A direct assessment of the ownership of a company to an industry or sector class is calculated according to the following formula:

$$B_j = \sum L_i \cdot I_{ij}, \quad L_i = \{0, 1\}, \quad i = 1, \dots, M \quad (7)$$

where L_i – variable describing the presence of ($L_i=1$) or absence ($L_i=0$) features i at the analyzing object (in this research – analyzing company).

2.2 Initial data

The specific weight of the balance sheet items was used to identify the industry as an information signs⁷. The final result was obtained by normalizing the articles in relation to the balance sheet.

The study uses 30 items of assets and liabilities. Each of the articles was divided into 10 segments, as a result, 300 features were formed, with the help of which it was planned to identify the industry. The study was conducted on the basis of accounting data of 500 enterprises belonging to five sectors of the economy: Construction, Mining, production of chemicals and products, Agriculture and forestry, as well as Information and communication technologies and communications.

For forecasting of bankruptcy of the initial data was taken as 200 Russian companies in the construction industry. 100 enterprises of the sample were liquidated or are under liquidation due to bankruptcy. The other 100 enterprises are economically prosperous, for which bankruptcy cases were not opened. In order to assess the financial stability of enterprises on the basis of the models data of their balance sheet and statement of financial results were taken. For the companies which are bankrupts the financial statements for the year preceding the year of the beginning of the bankruptcy case are used, for "healthy" companies there were financial statements of the year 2015.

⁷ direction of Minfin RF of 05.10.2011 #124n «On the introduction of changes in the forms of financial statements of organizations approved direction of Minfin RF of 02.07.2010 #66n»

Deferred revenues																											
Other short-term liabilities																											

3.2 Financial analysis

Table 4. Typical ranges of the coefficients of the financial analysis of the Russian construction companies

Ratio	0-.05	.06-.10	.11-.15	.16-.20	.21-.25	.26-.30	.31-.35	.36-.40	.41-.45	.46-.50	.51-.55	.56-.60	.61-.65	.66-.70	.71-.75	.76-.80	.81-.85	.86-.90	.91-.95	.96-1	
debt-to-equity ratio																					
cash ratio																					
quick ratio																					
current ratio																					

3.3 Bankruptcy prediction and forecasting

Based on the balance sheets of training sample using "Eidos" 270 intervals of values of balance sheet items were determined, that is, each of the 27 main items of the balance sheet was divided into 10 intervals. Intervals characterize a certain financial position of the construction company.

The most typical articles of the balance sheet and ranges of values of these articles are discussed below (table 5 and table 6).

Table 5. The main features of enterprises-bankrupt construction industry

No.	Name of balance sheet item	Specific weight in total assets	Force of influence of feature
1	Short-term financial investments	30-40% 40-50% 20-30%	9,498 7,999 7,498
2	Cash and cash equivalents	<6%	8,484
3	Fixed assets	<8%	5,490
4	Equity	<0%	7,498
5	Short-term liabilities	>98%	5,996

Table 6. The main features of "healthy" enterprises of the construction industry

No.	Name of balance sheet item	Specific weight in total assets	Force of influence of feature
1	Short-term financial investments	0-10%	41,009
2	Retained earnings	> 16%	10,504
3	Accounts payable	<37%	10,004
4	Short-term liabilities	7-52%	9,003
5	Equity	<42%	8,514

3.4 Business valuation and share assessment

The preliminary study allowed to obtain an express model (8)⁸, that assesses the market value of Russian construction companies. The model is obtained using the methods of correlation and regression analysis. Data on the market value of shares in public companies is a training sample of the model. The explanatory variables are selected accounting data, which mostly characterize the construction companies.

$$EV = IA \times 1,73 + FA \times 0,15 - FI \times 0,05 - IY \times 0,23 + DTA \times 1,16 + \quad (8)$$

$$In \times 0,73 + CA \times 0,20 + VAT \times 0,80 - 30984,$$

where EV – enterprise value of Russian civil engineering company, IA – intangible assets, FA – fixed assets, FI – short-term financial investments, IY – income yielding investments into tangible assets, DTA – deferred tax assets, In – inventories, CA – capital assets, VAT – value added taxes.

The resulting model should be referred to the class of models of industry coefficients, widely used in countries with developed economies. The proposed method should be referred to direct market comparison approach. Express-method can be used not only to assess the market value of the business, but also as a basis for decision-making by investment companies. The method makes it possible to assess the level of market value of assets in the portfolio. In addition, this technique will create models of bankruptcy forecasting for domestic enterprises of various industries. The models will take into account the specifics of the economic activity of enterprises. This is certainly an actual topic for the study.

4 Conclusion

The new applications of annual fiscal accounting analysis at the risk assessment are discussed in this paper. The system analysis methods that can be used to identify the industry or sector of the companies based on their annual fiscal accounting are de-

⁸ The initial data for the construction of the regression equation were the data, which are recorded according to the Russian accounting rules. The equation cannot be used to estimate the value of shares of companies that carry out accounting under IFRS.

scribed. The industry or sector identification make possible conflict data processing and review of supplier and contractors for identification their main type of economic activity in order to exclude the risk of contracting with an unreliable company. It is very important while choosing a supplier or contractor, and also when banks or credit unions make decisions about the issuance of loans. Another application is financial analysis with taking into account industry or sector specific in order to make adequate opinions about financial sustainability statement of company or vice versa. Taking into account industry or sector specific makes possible to create reliably forecasting bankruptcy and assessment of enterprise value for example in cases of mergers and acquisitions. One of the promising applications is the identification of the life stage of the company.

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