

Formalization of Analytical Procedures for Assessing the Risks of Material Misstatement in Financial Statements due to Fraud

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ABSTRACT

During an audit, the risk of possible misstatement in financial statements is assessed with analytical procedures, the input information in which is the values of the audited company's financial indicators selected by the auditor.

The purpose of this study was to justify the selection and systematization of analytical procedures for assessing the risk of material misstatement in the audited entity's accounting information. For this purpose, the authors analyzed quantitative methods currently used in practice to assess the risk of material misstatement in the financial statements due to their dishonest preparation. The ratios controlled by the known methods generally include only financial performance indicators of organizations. However, in the case of intentional misrepresentation in the financial statements, the financial indicators may also be intentionally misstated so that the control ratios used to check the integrity of the statements remain within acceptable limits. The identified problems make it necessary to find the most effective ways to assess the risk of deliberate misstatement in financial statements. The development of this process is also facilitated by the well-known fact that audit standards contain only framework requirements for the assessment of material misstatement risk in respect of the audited financial statements, so that the development of the corresponding methodology is left to the discretion of each audit company. In this regard, the authors recommend that analytical risk assessment procedures should involve non-financial indicators as well as the financial ones, since non-financial indicators are difficult to manipulate. The study substantiates the choice of non-financial indicators used in analytical procedures for assessing the risk of fraudulent misstatement in financial statements. A set of control ratios has been developed, including

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non-financial indicators for organizations involved in different types of activity.

CCS CONCEPTS

• Applied computing → Law, social and behavioral sciences → Economics

KEYWORDS

Risk of material misstatement of financial statements; Fraud; analytical procedures; Controlled ratios; Non-financial indicators.

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As it is known, the actions of the auditor aimed at detecting the facts of fraud in the audited entity are governed by ISA 240, the Auditor's Responsibilities Relating to Fraud in an Audit of Financial Statements. The standard obliges the auditor to identify and assess the risks of material misstatement of the financial statements due to fraud (paragraph 10-a, cl. 25 of ISA 240). The standard also notes that the risks of material misstatement due to fraud may be expressed in unusual or unexpected relationships that have been identified in performing analytical procedures (paragraph 22 of ISA 240). It is known that the analytical procedures are the subject of ISA 520, Analytical Procedures. ISA 520 recommends a number of analytical procedures, in particular, comparison of the financial and other information on the audited entity with comparable information for previous periods; comparison of the actual performance of the audited entity with the expected outcomes (e.g., estimates or forecasts, as well as the auditor's assumptions); comparison of financial and other information concerning the audited entity with the information about organizations that have similar activities (for example, a comparison of the profitability of the audited entity with the profitability of other organizations of comparable size in the same sector of the economy), etc. A number of specific analytical

procedures designed to identify signs of fraud of the audited entity are proposed in the works of foreign authors: Beneish [5] and Roxas [17], Jones [11], Dechow [7], Spathis [20] and others. A. Safonova, A. Silchenko, P. Leonov, A. Kozhina et al. believe that using analytical tools in the example of concrete financial statements to check if they contain evidence of manipulated data elements enables to expand the range of most efficient analytical procedures for assessing the involvement of organizations in dubious transactions [16, 18].

We will analyze the analytical methods suggested by the above-mentioned authors for the detection of the signs of fraud in the audited entities from the point of view of their applicability in the context of business activity in the Russian Federation.

The purpose of this study, therefore, is to select, formalize, and systematize analytical procedures that would allow monitoring in real-time mode to assess the risk of material misstatement of accounting information. The methods of research included analysis, synthesis, systemic and logical approaches.

2. LITERATURE REVIEW

The Beneish method modified by M. Roxas (M-score method, [20]) is based on the analysis of growth rates (compared to the year preceding the reporting period) of six indicators: receivables turnover ratio, gross margin, asset quality, revenue, and depreciation. The idea of the method is that a sign of falsification of reporting can be an excessively sharp change in any of the above indicators. The authors of the method conducted a study of the financial statements of a number of companies whose reporting was assumed to be reliable, and a number of companies which were found to have falsified their reports; this resulted in a regression equation for the M-score composite index:

$$M\text{-score} = - 6.065 + 0.823*DSRI + 0.906*GMI + 0.593*AQI + 0.717*SGI + 0.107*DEPI, (1)$$

where DSRI is the days sales receivable index (growth rate); GMI is gross margin index; AQI is asset quality index; SGI is sales growth index; DEPI is the index of depreciation.

According to M. Roxas, the reliability of reporting is indicated by the values of the M-score index below - 2.76.

Other known analytical methods include the Jones model and its modifications [12] (considering such factors as total assets, the ratio of income growth to the total assets, the ratio of the value of fixed assets to total assets); the Dechow model [7] (calculation of F-score taking into account the change in such indicators as net non-monetary assets, accounts receivable, capital investments, revenue from cash payments, return on assets), the Spathis model [20] (takes into account the following indicators: profitability of sales by revenue from sales, return on assets by gross profit, receivables turnover ratio, financial leverage, Altman's Z-score).

It should be pointed out, however, that the methods based on the system of indicators suggested by Beneish and those used in all the other models were tested on the reports of American public companies [10], which were listed companies, and, therefore, the falsifications found in their reports included overstatements in respect of their revenue, profit, and assets. From the analysis of the dependence (1), it is obvious, for instance, that the lower the revenue index (growth rate) is, the more favorable the M-score

index becomes. Thus, the Beneish and Roxas model is not applicable for detecting falsifications in statements that are based on revenue understatements [9, 14, 15].

The use of the Beneish model and its modifications in the Russian context to identify unfair revenue overstatement also raises a number of questions. A number of Russian scholars are of the same opinion [22, 23, 24]. For instance, the study entitled "Analysis of the Possibility of Manipulating Financial (accounting) Reporting Data based on Financial Indicators", presents the results of a research on a control group consisting of 676 construction industry enterprises classified as medium-sized businesses (G. V. Sobolev, D. G. Tolkacheva). The study shows that "the level of deviation of the average industry indicators from the value of the coefficients calculated by Beneish is significant." In addition, the authors [19] point to the incorrectness of the Beneish model, which was revealed when testing it on some Russian organizations that falsified their statements by overstating their results in order to obtain loans.

In their work, M. A. Shtefan and N. V. Feruleva [21] present the results of a study of 60 Russian companies, including 28 companies in respect of which there are court decisions confirming the fact of reports falsification for the purpose of obtaining loans. The estimates obtained by the authors [21] show that "the application of M. Beneish and M. Roxas models to the indicators of financial statements of Russian companies does not allow for identification of all cases of fraud." In addition, as the authors [21] point out, in some cases, studies based on the models of M. Beneish and M. Roxas gave low ratings to the companies whose reliability of reporting was beyond reasonable doubt.

The authors suggest that this situation is due to the specifics of the Russian business environment (inadequate level of payment discipline; increase in the cost of sales due to delayed equipment upgrades; high growth rate of the share of indebtedness in the sources of financing, etc.). It is obvious that, as a result, the numerical values recommended for composite indices in the above analytical models will only be valid for the sample of economic entities whose data were used to determine the values. In this regard, as noted by A. G. Amzelt [3], and we cannot disagree with him, a more promising method would be based not on the calculation of composite indices, but on the study of the dynamics of changes in the selected indicators.

The analysis of the literature data shows that the list of financial indicators suggested by the above-mentioned foreign authors, as well as in a number of works by Russian researchers [1, 2, 8, 13, 25], such as M. A. Alekseev, S. A. Dudin, V. V. Glinskiy, as sources of information for analytical procedures aimed at assessing the risk of material misstatement of the financial statements, is very diverse. At the same time, it should be noted that unscrupulous management of an organization may resort to deliberate misrepresentation of certain financial indicators, in order to ensure that control ratios that indicate the integrity of reporting remain within acceptable limits. For example, an organization's management overstates its reported sales revenue in order to demonstrate that the targets have been achieved. At the same time, the cost of sales is also overstated in such a way that the change in the return on sales by profit from sales looks plausible.

In this connection, a number of authors, both Russian (A. G. Amzelt, S. V. Arzhenovskii, A. V. Bakhteev) [3, 4], and foreign (J. F. Brazel, K.L. Jones, M.F. Zimbelman, C. Ittner, D. Larcker) [6, 11] suggest that analytical risk assessment procedures should be based not only on financial but also on non-financial indicators, since the latter are difficult to manipulate, or, at least, such manipulations are difficult to hide. In their work, J. F. Brazel, K.L. Jones and M. F. Zimbelman [6] noted, for example, that there is a relationship between the dynamics of revenue indicators and the dynamics of non-financial indicators, such as the number of employees, the number of retail outlets, and the number of distribution centers of the company.

3. RESEARCH METHODS

The research methods used were the following:

1. The analysis, including the analysis of known methods for constructing analytical procedures that monitor the growth rate of financial indicators selected by the authors; the analysis of literature data on the experimental testing of known methods for constructing analytical procedures.
2. Hypothetical method, which consists in proposing a scientific hypothesis that improves the reliability of analytical procedures by using non-financial indicators.
3. Systematic approach, which consists in systematizing the requirements for hypothetical non-financial indicators and constructing a system of non-financial indicators that meet these requirements.
4. The synthesis of controlled indicators of analytical procedures, including financial and non-financial indicators.
5. Formalization, which involves the construction of formal dependencies linking the controlled indicators of analytical procedures with financial and non-financial indicators.

4. RESULTS

It should be noted that the modern literature does not provide any analysis and systematization of non-financial indicators which, together with financial indicators, could form controlled ratios used to assess the risk of material misstatement of the financial statements due to fraud.

Obviously, non-financial indicators used for this purpose must be:

- a) economically justified;
- b) quantitative;
- c) accessible from the sources of information.

Non-financial indicators that meet these requirements are provided, for example, in Article 346.29 of the Tax Code of the Russian Federation that establishes the tax base for the application of the unified tax on imputed income. These include: the number of employees (for organizations that provide services), the area of sales facilities (for retail organizations), the area of the service halls (for catering organizations), the area of accommodation (for hotel organizations), the number of vehicles (for transport organizations).

Non-financial indicators of organizations provided by the statistical forms of Rosstat are also economically justified and available from information sources (table 1).

Table 1. Indicators provided by Rosstat forms

Type of activity of the organization	Name of the indicator	The source of information
Not limited	Average number of employees, people.	Form No. 1-T (Rosstat Order No. 485 of 06.08.2018)
Manufacturing	Electricity costs, rubles	Form No. 1-predpriyatie (Rosstat order No. 461 of 27.07.2018)
Wholesale trade	Storage area, m ²	Form No. 1-TORG (Rosstat Order No. 418 of 22.07.2019)
Health services	Number of beds, beds. Number of doctors.	Form No. 1-zdrav (Rosstat Order 493 of 10.08.2018)
Travel agency activity	The number of tourists sent on tours (both in Russia and to other countries)	Form No. 1-turфирма (Rosstat Order No. 466 of 30.07.2018)

As can be seen, the universal non-financial indicator for organizations of all types of activity is the average number of employees (ANE). Since it is known from practice that the indicators most likely to be misrepresented are sales revenue and profit, the following can be proposed as controlled indicators.

1. Revenue per employee (RE):

$RE = R / ANE$, 1000 rubles/person,
where B is sales revenue in thousand rubles.

2. Profit from sales per employee (PSE):

$PSE = PS / ANE$, 1000 rubles/person,
where PS refers to profit from sales, in thousand rubles.

3. Net profit per employee (NPE):

$NPE = NP / ANE$, 1000 rubles/person,
where NP is net profit, in thousand rubles.

A financial indicator provided for manufacturing organizations by Rosstat No. 1-predpriyatie form is the amount of expenses on electricity. In order to assess the risk of fraudulent misrepresentations, it is better to exclude the impact of possible changes in the price of electricity from this indicator and use a non-financial indicator of electricity consumption (EC), measured in kilowatt-hours. The information source for this indicator can be acts and invoices received from the power supply company. Then the controlled indicators can be revenue, profit from sales and net profit per kilowatt-hour of consumed electricity (R/EC, thousand rubles/kWh; PS/EC, thousand rubles/kWh; NP/EC, thousand rubles/kWh).

In a similar manner, controlled indicators can be defined for the following types of organizations:

- wholesale. Non-financial indicator: warehouse area (WA), sq. m, source of information: form No. 1-TORG of Rosstat;
- retail. Non-financial indicator: the area of sales facilities (ASF), sq. m., the source of information: inventory and title documents of the organization;
- catering. Non-financial indicator: the area of the service room (ASR), sq. m., the source of information: inventory and title documents of the organization;
- hotel business. Non-financial indicator: the area of residential premises (ARP), sq. m., the source of information: inventory and title documents of the organization;
- motor transport. Non-financial indicator – number of vehicles (NV), vehicles, the source of information: analytical accounting data on account 01, calculation of transport tax;
- healthcare. Non-financial indicators: the number of beds (NB), beds, the number of doctors (ND), people, the source of information: form No. 1-zdrav of Rosstat;
- travel agencies. Non-financial indicator: the number of tourists sent on tours (NTS), people, the source of information: Rosstat form No. 1-turfirma.

For instance, for a motor transport company, the controlled indicators are revenue, profit from sales, and net profit per vehicle (R/NV, thousand rubles/vehicle; PS/NV, thousand rubles/vehicle; PE/NV, thousand rubles/vehicle). For retail organizations: revenue, profit from sales, and net profit per square meter of sales floor space (R/ASF, thousand rubles/sq. m; PS/ASF, thousand rubles/sq. m; NP/ASF, thousand rubles/sq. m), etc.

5. CONCLUSIONS

An analysis of the growth rates (indices) of the controlled ratios proposed above makes it possible to assess the risk of material misstatement of financial reporting due to fraud. Dramatic changes in the proposed controlled indicators increase the risk of material misstatement in a particular statement item, which means that the auditor has to perform additional audit procedures. For example, if revenue and profit per kilowatt-hour of consumed electricity sharply decrease, it may be due to fraudulent actions of a manufacturing company such as unrecorded production.

A review of methods for assessing the risk of material misstatement in the financial statements resulting from fraudulent reports preparation brings us to a number of conclusions. First, adequate risk assessment has long been a scientific and practical challenge that foreign and domestic scientists are trying to deal with. Second, researchers assessing the risk of material misstatement in financial statements are increasingly more interested in non-traditional analytical procedures that can be used for those purposes on the basis of controlled and justified non-financial indicators. The use of the proposed controlled non-financial indicators in analytical procedures will allow the auditor, in their risk-assessment activity, to take into account a variety of relationships between risk-generating factors. Third, in the future, research in the field of assessing the risk of material misstatement in financial

statements, in our opinion, should be aimed at the adaptation of the quantitative and non-quantitative methods that will allow formalizing analytical procedures for risk assessment in real-time mode.

REFERENCES

- [1] Alekseev M. A., Dudin S. A. An Indicator for Detecting Misrepresentations of the Company's Performance. // Vestnik IPB (Vestnik Professionalnykh Bukhgalterov). 2017. No. 6.
- [2] Alekseev M. A., Glinsky V. V. On the Assessment of Possible Distortions in the Reporting of Economic Entities / M. A. Alekseev, V. V. Glinskii, L. K. Serga, M. L. Pyatov // Voprosy Statistiki. 2019. No. 7.
- [3] Amzelt A. G. Analytical Procedures for the Expression of the Risks of Material Misstatement as a Result of Fraudulent Actions. // Auditor. 2013. No. 12.
- [4] Arzhenovskii S. V., Bakhteev A. V. Analytical Procedures as a Tool for Identifying the Risk of Financial Statements Falsification: Methodological and Methodological Aspects. // Auditorskie vedomosti. 2016. No. 12.
- [5] Beneish M.D. The Detection of Earnings Manipulation// Financial Analysts Journal, 1999, Vol. 55, № 5. P. 24 - 36.
- [6] Brazel J.F., Jones K.L., Zimbelman M.F. Using non-Financial Measures to assess fraud risk // Journal of Accounting Research, 2009, Vol. 47, № 5. P. 1135 - 1166.
- [7] Dechow P.M., Ge W., Larson C.R., Sloan R.G. Predicting Material Accounting Misstatements // Contemporary Accounting Research, 2011, Vol. 28, № 1. P. 17 - 82.
- [8] Demidenko, D. S., Malevskaia-Malevich, E. D., Dubolazova, Y. A., & Victorova, N. G. (2018). Optimization of the innovation process management at a manufacturing enterprise. Paper presented at the Proceedings of the 31st International Business Information Management Association Conference, IBIMA 2018: Innovation Management and Education Excellence through Vision 2020, 996-1003.
- [9] Dereck Barr-Pulliam. 2019. The effect of continuous auditing and role duality on the incidence and likelihood of reporting management opportunism. DOI:<https://doi.org/https://doi.org/10.1016/j.mar.2018.10.001>
- [10] Farr, Liz. Future of the Audit. Journal of Accountancy; August 2017, Vol. 224. Issue 2, p 2-3, 2 p.
- [11] Ittner C. and Larcker D. Are Nonfinancial Measures Leading Indicators of Financial Performance? An Analysis of Customer Satisfaction // Journal of Accounting Research, 1998, Vol. 36. P. 1 - 35.
- [12] Jones K.L. Improving fraud risk assessments through analytical procedures. Doctor of Philosophy, UMI, Dissertation Services, The University of Arizona, 2004.
- [13] Kichigin, O. E., Nadezhina, O. S., Degtereva, V. A., & Ovsyanko, D. (2018). The concept of participation of fuel-energy companies in development of regional socio-economic systems. Paper presented at the Proceedings of the 32nd International Business Information Management Association Conference, IBIMA 2018 - Vision 2020: Sustainable Economic Development and Application of Innovation Management from Regional Expansion to Global Growth, 6837-6842.

- [14] Kochinev Yu.Yu., Antysheva E.R., Viktorova N.G.. Audit in the Context of the Digital Economy. Vision 2025: Education Excellence and Management of Innovations through Sustainable Economic Competitive Advantage Proceedings of the 34rd International Business Information Management Association Conference, IBIMA 2019. 2019. C. 3070-3082.
- [15] Kochinev, Y. Y., Antysheva, E. R. (2019). Risk assessment in selective audit procedures. Paper presented at the Proceedings of the 33rd International Business Information Management Association Conference, IBIMA 2019: Education Excellence and Innovation Management through Vision 2020, 2826-2834.
- [16] Leonov, P.Y., Kozhina, A., Leonova, E., Epifanov, M., & Sviridenko, A. (2020). Visual analysis in identifying a typical indicators of financial statements as an element of artificial intelligence technology in audit. *Procedia Computer Science*, 169, 710-714.
- [17] Roxas M. L. Financial Statements Fraud Detection Using Ratio and Digital Analysis // Journal of Leadership, Accountability and Ethics, 2011, Vol. 8(4). P. 56-66.
- [18] Safonova A. V., Silchenko A. D. Falsification of Financial Statements: the Concept and Tools for Detection // // Uchet. Analiz. Audit. - 2018. - No. 6.
- [19] Soboleva G. V., Tolkacheva D. G. Analysis of the Possibility of Manipulating Financial (Accounting) Reporting Data Based on Financial Indicators. // Auditorskie Vedomosti. 2014. No. 7.
- [20] Spathis C.T. Detecting False Financial Statements Using Published: Some Evidence from Greece // Managerial Auditing Journal, 2002, Vol. 17, № 4. P. 179 - 191.
- [21] Stefan M. A., Feruleva N. V. Detection of Financial Statements Fraud in Russian Companies: Analysis of Beneish and Roxas Models Applicability// Russian Journal of Management, 2016, No. 3, p. 49-70.
- [22] Victorova N., Vylkova E., Pokrovskaia N., Shukhov F. Information technology and innovation in taxpayer registration and numbering: national and international experience. Proceedings of Peter the Great St. Petersburg Polytechnic University International Scientific Conference on innovations in digital economy, October 24-25, 2019, Saint - Petersburg, Russia. ACM, New York, NY, USA, 2019.
- [23] Victorova N., Vylkova, E., Pokrovskaia, N., Shukhov, F. Tax regulation of small and medium-sized science-based business: Scales and productivity. IOP Conference Series: Materials Science and Engineering, 2019, 497 (1).
- [24] Victorova N.G., Valebnikova, N.V., Valebnikova, O.A. Improvement of methods of budgeting for the industrial enterprises of the Russian Federation for the purpose of maintaining essential competitive advantages in Hi-tech sectors of economy. Proceedings of the 33rd International Business Information Management Association Conference, IBIMA 2019: Education Excellence and Innovation Management through Vision 2020. pp. 1689-1700.
- [25] Zaborovskaja, O. V., Kichigin, O. E., & Nadezhina, O. S. (2018). Management of the income of municipalities in the conditions of the world economic crisis. Paper presented at the Proceedings of the 31st International Business

Information Management Association Conference, IBIMA 2018: Innovation Management and Education Excellence through Vision 2020, 918-925.