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DETECTING FRAUD IN ACCOUNTING USING SELECTED METHODS

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Abstract. *In practice, the methods of committing economic crime take the form of corruption, misappropriation of assets and fraudulent financial reporting. In the case of fraudulent financial reporting, it is primarily a falsification of financial and non-financial information. Some Slovak companies were revealed as tax fraudulent entities. Some methods of detecting accounting fraud were used in their cases in the article. Findings in this context brought interesting connections.*

Key words: *financial statements, Benford's law, Beneish M-score*

1. INTRODUCTION

Financial statements may contain inaccuracies that arose for various reasons. These inaccuracies are differentiated into errors and fraud. The ultimate approach to defining error and fraud is provided by International Standard on Auditing ISA 240. An error is an unintentional error in financial statements, such as an incorrect acquisition and processing of data, an incorrect accounting estimate, or an incorrect application of accounting principles. An error is also an unintentional misclassification of accounts or incorrect reporting. On the other hand, fraud corresponds to the intentional action of one or more persons involved, which involves the use of lies to obtain an unjustified or illegal advantage. The standard distinguishes between two types of fraud, namely fraudulent financial reporting and theft of assets. Fraudulent financial reporting involves the manipulation, falsification of data, or omission of amounts in financial statements. The theft of property manifests itself in various ways, for example, misuse of income, theft of property, payment for undelivered services or property. Managers' motivations for

earnings management were reviewed by Healey & Wahlen (1999). According to these authors, earnings management includes fraudulent accounting or fraudulent reporting. A model using discretionary accruals for detecting earnings management and fraudulent reporting was developed by Jones et al. (2008).

2. LITERATURE OVERVIEW

The author Amat (2019) dealt with the detection of legal and illegal accounting manipulations and with warning signs of them. As a suitable tool for detecting possible manipulation in financial statements, he emphasized the indicator of the difference between profit and cash, which was originally proposed by Sloan (1996). This ratio of difference between profit and cash is calculated as net profit minus cash from operations divided by assets (p. 116). If the result is higher than 0.10, this indicates possible manipulation. Elsayed (2017) elaborated an overview of the literature that describes "red flags" as indications indicating possible frauds (p. 15). This author summarizes the indices in five areas of investigation: in the financial performance of the entity; in the indicators of financial analysis; in the area of management efficiency; compliance with accounting procedures; and compliance with the principles of "corporate governance". Goel (2014) stated "cash flow from operations should be greater than or equal to net income, as a quality of earnings" (p. 355). Another indicator which indicates the possible manipulation with cash is the Quality of Income Ratio. According to Libby et al. (2011), "the quality of income ratio measures the portion of income that was generating in cash" (p. 651). Favorable result of the ratio between cash from operating activities and net income is more than 1. Also in recent works, the authors dealt with the possibility of detecting fraud in accounting through tools such as Benford's law and Beneish M-score. Arboleda et al. (2018) used Benford's law to detect sales fraud. Some data warehouse operators have chosen to use this technique. The selected operators provided signs of possible frauds but did not confirm this law as strictly stated (p. 18). The application of Benford's law suitability to ten sectors and six emerging countries was implemented by Shi et al. (2017). Despite the fact that the correctness of the use of this law has not been confirmed, due to the wide scope of use, the law cannot be interpreted as unreliable (p. 888). The study of Papík & Papíková (2022) realized on companies reporting under US GAAP using eight data mining techniques found companies which possiblly overestimated revenues and manipulated asset values. The authors used seventeen variables of the extended Beneish M-score model for the analysis. The authors concluded that the differences between US GAAP and IFRS can cause difficulties in predicting accounting fraud (p. 16). The influence of earnings management on the cash conversion cycle and inventory management was examined by Sawarni et al. (2023). Using the Beneish M-score, they found that an increase in earnings management favors lengthening the cash collection cycle and inventory management, as well (p. 4).

3. RESEARCH OBJECTIVE AND METHODOLOGY

The aim of the research was to find out whether some companies, recently revealed as tax fraudsters, also manipulated accounting data. The surveyed companies stopped communicating with the tax authorities, or did not pay income tax and ceased operations. The three investigated subjects were engaged in the processing of poultry meat (Poultry, joint stock company); in the production of frozen meat products (Globaltrading, Ltd.); and in the distribution of energy (Power Trade, joint stock company). Poultry, j.s.c., used false accounting documents, charged fictitious costs, abused value added tax, and evaded taxes. Globaltrading, Ltd. engaged in frozen meat fraud and failed to prepare financial statements. After an increase in business, Power Trade, j.s.c. suddenly ceased operations and did not pay its liabilities. The cases of the mentioned companies have been published in the print media and the company names have been changed.

3.1. Research question

The main research methods were Beneish M-score and Benford's law. An additional indicator was the Quality of Income Ratio, which gives the ratio of cash flow from operating activities with net income. Three mentioned methods were supposed to help detect the manipulation of accounting data. The analyzed data related to three companies that were revealed as tax fraudsters. It was investigated whether these companies also manipulated accounting data. Based on this starting point, the research question was set:

RQ: Do the mentioned methods detect the manipulation of accounting data?

In this sense, at least one of the three methods should reveal the manipulation of accounting data. The hypothesis is set:

Hypothesis 1: At least one of the three methods helped to reveal the manipulation of accounting data.

3.2. Beneish M-score

The Beneish M-score mathematical model is used for financial models. It contains eight variables to detect possible data manipulation. The model contains indicators with variables (Beneish, 1999):

1. Days' sales in receivable index (DSRI): index of the ratio of receivables to sales in the ratio of periods t and t-1. Large increase in the DSRI could suggest revenue manipulation.
2. Gross margin index (GMI): gross margin index as the ratio of sales margin in period t-1 and t. If the result is more than 1, it indicates earnings manipulation. Such deterioration is a signal for possible earnings manipulation.
3. Asset quality index (AQI): index of adjusted assets to total assets in period t to period t-1. If AQI is more than 1, the company has more deferrals and it indicates earnings manipulations.
4. Sales growth index (SGI): index of sales growth. Beneish (1999) foresaw a positive relationship between SGI and earnings manipulation.
5. Depreciation index (DEPI): index of the share of adjusted depreciation for period t-1 to period t. The result of more than 1 shows probability of manipulation to increase profit.

6. Sales, general, and administrative expenses index (SGAI): index of the ratio of SGA expenses to sales, period t to period t-1. Beneish (1999) assumed the growth of SGAI as a signal of the probability of manipulation.
7. Leverage index (LVGI): leverage index of total debts to total assets, in period t to period t-1. Index more than 1 means more debt covenants for possible earning manipulation.
8. Total accruals to total assets (TATA): total accrual amounts to total assets. Growth in accruals could lead to possible earnings manipulations.

An M-score less than -2.22 (threshold) indicates that the company will not be a manipulator, and an M-score greater than -2.22 indicates that the company is likely to be a manipulator of accounting data (Goel, 2014).

Tarjo & Herawati (2015) observed the use of Beneish M-score which was generally confirmed, but with a caveat. They found out that out of eight indicators, financial fraud was revealed by five significant indicators (GMI, DEPI, SGAI, SGI, TATA). The remaining three indicators (DSRI, AQI, LVGI) were not significant (p. 928). The modification of Beneish's M-score for the purpose of revealing earnings management was implemented by Narsa et al. (2023). Of the eight indicators of the classic Beneish relationship, they kept five (GMI, SGI, DEPI, SGAI, TATA) and added four: 1/CAT (Current Assets Turnover), FAR (Fixed Assets Ratio), EC (Equity Concentration), AO (Audit Opinion). The authors found that out of a sample of 284 companies, half of them are moving towards data manipulation and earnings management (p. 11). Ramírez et al. (2017) analyzed a family business in the food industry that was demonstrably fraudulent in financial statements. The results of the analysis showed that the DSRI and TATA indicators present aggressive accounting practices, and the SGI and LVGI indicators indicated a propensity for financial statement fraud (p. 48).

3.3. Benford's law

The probability of occurrence of the first digit places was investigated and confirmed by Newcomb (1881). *D* in formula is a number from 1 to 9:

$$\text{Probability}(d) = Log_{10}\left(1+\left(\frac{1}{d}\right)\right), \text{ for } d = 1, 2, ...9 \tag{1}$$

Benford's law is based on the regularity of occurrence of the first digit of numerical sums. The numerical amounts are taken from the lines of the financial statements. The natural occurrence of the first digits has a rule and is called Benford's law.

Expected distribution of leading digits under Benford's law is in table:

Table 1 Theoretical Expected Frequencies of the First Digits

Leading digit	1	2	3	4	5	6	7	8	9
Frequency	30,1%	17,6%	12,5%	9,7%	7,9%	6,7%	5,8%	5,1%	4,6%

Source: Durtschi et al., 2004

The Kolmogorov-Smirnov test (KS) was used to compare the occurrence of the actual frequency of numbers – leading digits (AD) with the expected (theoretical) frequency

(ED). The KS test is a non-parametric test used to compare probability distributions (Hazewinkel, 2001).

$$KS = max\{| AD_1 - ED_1 |,| (AD_1 + AD_2) - (ED_1 + ED_2) |,...,| (AD_1 + AD_2 + ... + AD_9) - (ED_1 + ED_2 + ... + ED_9) |\} \quad (2)$$

Leading number is the first number of the absolute value of the accounting data. By comparing of cumulative values of actual and expected distribution, maximum difference in values of distribution was detected (KS).

Maximum difference between cumulated values was calculated and potential manipulation is recognized if KS > 1,36/√P, where P is the total number of first digits of amounts.

3.4. Quality of Income Ratio

Libby et al. (2011) state that "the quality of income ratio measures the portion of income that was generated in cash" (p. 651). This indicator can be considered as another suitable tool for data manipulation detection. Analysts evaluate the quality of income ratio as a general indicator of the ability to generate cash through operating activities. The value of the indicator should be higher than 1. A higher value of the indicator points to a less likely manipulation to increase revenue and net income. If the value of the indicator is lower than 1, it indicates an increase in non-cash assets. Another reason for a low ratio can be aggressive reporting of revenues or concealment of costs. Also, inappropriate management of non-cash assets and reduction of liabilities is reflected in the decrease of this indicator.

$$Quality\ of\ Income\ Ratio = \frac{Cash\ flow\ from\ Operating\ Activities}{Net\ Income} \quad (3)$$

4. RESULTS AND DISCUSSION

Accounting data were taken from financial statements: Balance sheet, Income statement, and Statement of cash flows, for the period of five years. The periods differed depending on which years the companies published the financial statements – Poultry, j.s.c. for 2018-2022; Globaltrading Ltd. for 2016-2020; Power Trade, j.s.c. for 2011-2016.

4.1. Results from Beneish M-score model

The Beneish M-score results indicated possible data manipulation of all three companies (red colour when higher than -2,22), Table 2. Poultry, j.s.c. shows possible manipulation in two years out of the five monitored years. Globaltrading's results confirm data manipulation in each year. Power Trade, j.s.c. shows possible manipulation in three years out of five. The extremely high values for this company in the second and third year are due to the huge changes in reported sales.

Table 2 The results of Beneish M-score model, all companies

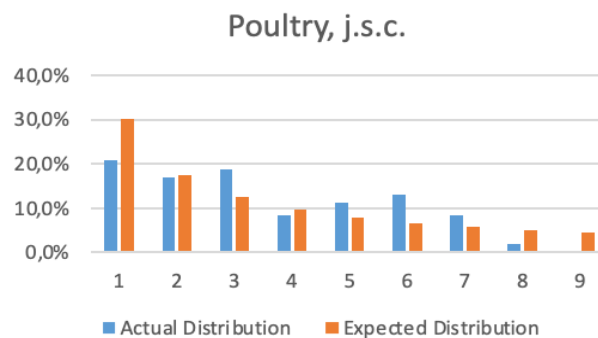|	Poultry, j.s.c.	Globaltrading, Ltd.	Power Trade, j.s.c.
Year 5	-3,40	-1,90	282,75
Year 4	-0,93	-2,02	-43,25
Year 3	-3,96	-2,15	-0,02
Year 2	1,62	0,16	14,89
Year 1	-2,70	-1,87	-3,03

Source: Own calculations

4.2. Results from Benford's law model

For this model, the values of the amounts from the financial statements that were used: balance sheet, income statement and cash flow statement. The first digits of the amounts should follow the expected distribution of values, Arboleda et al. (2018). The frequency of the number of each leading digit was counted. The actual frequency of leading digits to the expected distribution (theoretical frequency) according to Benford's law was compared. Kolmogorov-Smirnov (KS) statistics was used and compared whether KS is greater than the square root of P (Cut-off). The results point to possible manipulation as they approach the Cut-off values (Table 3). The expected distribution was not compliant with actual distribution of any company (Figures 1,2,3). The result of KS statistics approached the cut-off limit value. This confirms possible data manipulation. Power Trade, j.s.c. shows the greatest differences between the actual and expected distribution.

Table 3 The results of Benford's law model, all three companies

	KS	Cut-off
Poultry, j.s.c.	10,0%	13,2%
Globaltrading, Ltd.	10,9%	13,7%
Power Trade, j.s.c.	11,6%	13,9%

Source: Own calculations

Fig. 1 The results of Benford's law model for Poultry, j.s.c.
Source: Own processing

Globaltrading, Ltd.

Fig. 2 The results of Benford's law for model Globaltrading, Ltd.
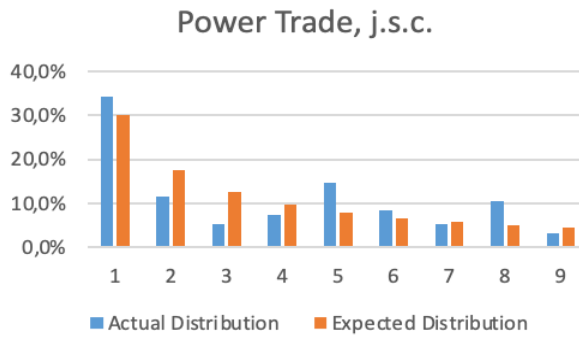*Source*: Own processing

Power Trade, j.s.c.

Fig. 3 The results of Benford's law model for Power Trade, j.s.c.
Source: Own processing

4.3. Results from Quality of Income Ratio model

Company Poultry, j.s.c. shows fluctuating levels of cash flow and net income. In two cases out of five, it exceeded criterion 1. It hints at possible data manipulation (Figure 4). In the case of Globaltrading Ltd., both cash flow and net income developed evenly, as evidenced by the value of the Quality of Income Ratio indicator. Only this indicator did not point to possible manipulation in this company (Figure 5). The company Power Trade, j.s.c. showed an extremely high value of cash flow and a loss at the same time in the fourth year. In the fifth year, the company showed almost no activity. Fluctuating value of the indicator indicates possible data manipulation (Figure 6). This method has a weakness in that if two negative numbers are divided, the result is positive and can be greater than 1.
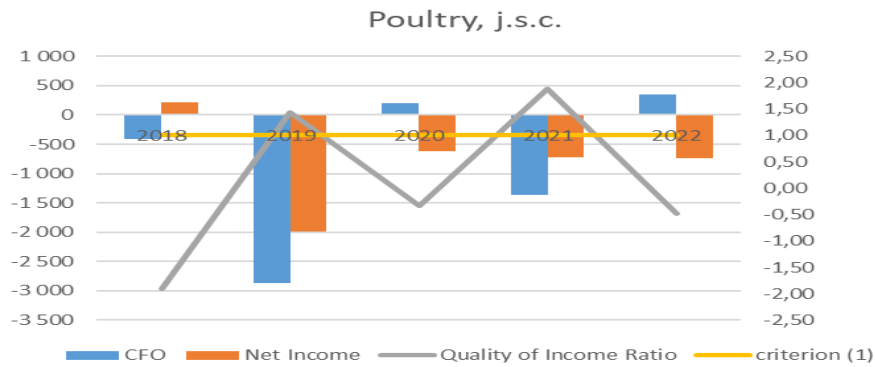
Poultry, j.s.c.

Fig. 4 The results of Quality of Income Ratio Poultry, j.s.c.
Source: Own processing
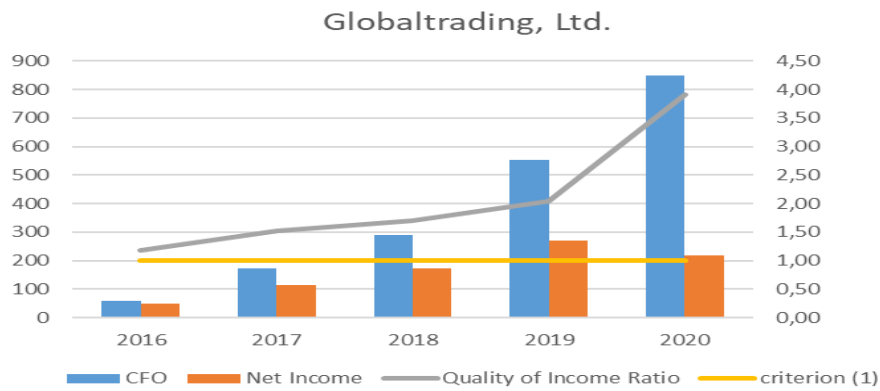
Globaltrading, Ltd.

Fig. 5 The results of Quality of Income Ratio for model Globaltrading, Ltd.
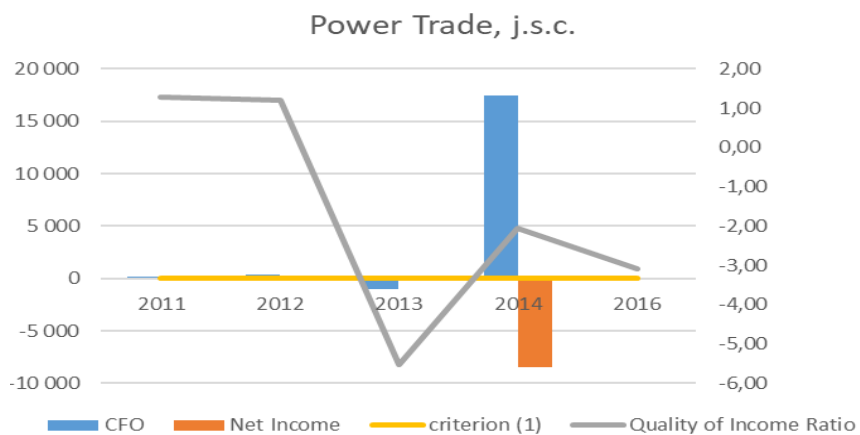*Source*: Own processing

Power Trade, j.s.c.

Fig. 6 The results of Quality of Income Ratio for Power Trade, j.s.c.
Source: Own processing

5. FUTURE RESEARCH DIRECTIONS

The performed analysis shows that it is possible to expand the number of companies for the purpose of verifying the application of Beneish M-score and Benford's law methods.

6. CONCLUSION

The aim of the article was to point out the possible manipulation of accounting data by those subjects that were exposed as tax fraudsters. Three methods were used to detect manipulation: Beneish M-score, Benford's law, and Quality of Net Income. The research question was set: Do the mentioned methods detect the manipulation of accounting data? And established hypothesis: At least one of the three methods helped to reveal the manipulation of accounting data. The hypothesis was confirmed - Beneish M-score and Benford's law indicated possible data manipulation, while the Quality of Net Income method did not reveal possible manipulation in one case. The weakness of this method is in the division of two negative numbers when the result is positive and greater than 1. It can be stated that Beneish M-score and Benford's law methods confirmed the possible manipulation of accounting data by tax fraudulent entities.

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OTKRIVANJE PREVARA U KNJIGOVODSTVU KORIČŠENJEM ODABRANIH METODA

U praksi, metode izvršavanja ekonomskog kriminala sastoje se od korupcije, pronevere imovine i lažnog finansijskog izveštavanja. U slučajevima lažnog finansijskog izveštavanja, radi se pre svega o falsifikovanju finansijskih i ne-finansijskih informacija. Otkriveno je da je nekoliko slovačkih kompanija bilo subjekt finansijske prevare. Neke metode otkrivanja finasijskih prevara u ovim slučajevima opisane su u ovom radu- u ovom kontekstu, otkrića su dovela do interesantnih veza.

Ključne reči: *Finansijski izveštaji, Benfordov zakon, Beneiš M-skor*