Fraud in Accounting and Taxation and Its Detection

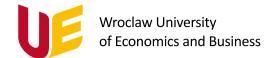**The Practice of Central
and Eastern European Countries**

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Fraud in Accounting and Taxation and Its Detection

The Practice of Central and Eastern European Countries

edited by Piotr Luty

**Wroclaw University
of Economics and Business**

Ladies and Gentlemen,

Friends of the Wroclaw University of Economics and Business!

We are all concerned with the tragic situation in Ukraine. We help as best as we can. We declare support and help. We offer places in our homes, psychological and material help, we organize collections of the most necessary things.

Our University has many friends who will surely join us. Over 200 students from Ukraine study at our university, constituting a significant part of our academic community. Many of them are currently in an extremely difficult situation. We can help the most by joining forces, which is why the Foundation for the Development of the Wroclaw University of Economics and Business has launched a special fundraiser, which will be allocated to the most urgent needs reported by our students from Ukraine, including:

- accommodation,
- costs of living and meals,
- treatment costs,
- helping families of the WUEB students,
- psychological support.

Let us not be indifferent to the suffering and fate of the Ukrainians who are hit by Russia's aggression. **Let's open our hearts.**

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Introduction

The monograph aims to familiarize readers with issues related to tax avoidance in the context of the accounting information system and legal solutions. Tax avoidance is a common phenomenon, and breaking the law in this area is a crime. The number of publications in SCOPUS is evidence of this (search for the phrases „tax avoidance", „tax evasion", „tax frauds"). Since 1930, 4,199 publications on this topic have been written. The introduction of restrictions by states in the taxation of their activities will always cause dissatisfaction in a large group of citizens, leading to the tax avoidance phenomena. This monograph focuses on the description of tax avoidance in countries with a similar history, i.e. in Central and Eastern Europe, with particular emphasis on the countries of the Visegrad Group. The authors hope that the results of quantitative and qualitative analyses and legal regulations and literature, included in individual chapters, will extend the current state of knowledge and inspire further research.

In line with the title of this monograph, in addition to the phrases related to tax avoidance such as „fraud detection", „manipulation" and „tax", words linked to the accounting information system, as well as „accounting" and „financial statements" were also selected for the analysis. The search for the research gap was carried out using the SCOPUS database. The research gap analysis included keywords in articles that met the search criteria. Using the VOSviewer tool, the strength of combinations of phrases appearing in the abstracts was checked. In this way, the lack of combinations of specific terms was revealed, which may indicate the existence of a research gap justifying the creation of this monograph.

An analysis (as of 04/12/2021) of the resources of the SCOPUS database under the phrases „fraud detection" and „tax", „accounting", „manipulation" and „financial statements" showed 413 publications dating from 1979 un to 2022, see Figure 1. One can distinguish four subject clusters based on words used in abstracts in the selected works. The four identified clusters included the 35 words with the most substantial connection strength and appeared in the abstracts at least ten times. Figure 1 presents a keywords analysis.

The first cluster covers the disclosure of tax fraud in the context of committing a crime. The second cluster focuses on using big data, including neural networks

Fig. 1. Keywords analysis

Source: own study based on VOSviewer.

or machine learning to detect fraud, while the third cluster, including the latest publications, concerns artificial intelligence and anomaly detection. The fourth cluster focuses on making decisions.

Based on the analysis of the keywords, some areas should be better described in the context of tax avoidance research. The literature indicates many models used to reveal potential fraud in financial statements. The question, therefore, is what is the effectiveness of using models to detect fraud in financial data in different accounting systems. It is also essential to implement anti-tax avoidance tools from 'sealing' the tax system. Advanced tools based on artificial intelligence are used to detect fraud in general, and fraud of financial data. Fraud detection requires constant adaptation and searching for new methods in a constantly changing world.

The issue of tax avoidance is topical, as evidenced by the growing trend in the number of publications in this area. A detailed analysis of the journals, including their scientific areas, shows that most publications appeared in computer science journals, which may be supported by the methodology of tax fraud detection using advanced calculation methods.

Fig. 2. Number of documents by year

Source: own study based on www.scopus.com.

The topics covered in scientific articles are wide-ranging, however it is worth noting that most of the publications were written by authors from the United States, India, Brazil, Sou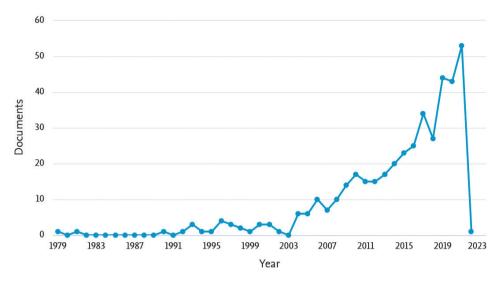th Korea, and Western European countries such as Belgium, Germany, Spain. Authors from Central and Eastern Europe have a smaller share in scientific achievements; out of the 971 authors in the studied group, only three articles were written by Poles, and Slovaks and Czechs, and two by Hungarians. This monograph attempts to fill this gap in scientific cooperation. The choice of the SCOPUS database means that the analysis does not include local publications written in languages other than English. Additionally, the SCOPUS database includes journals of high scientific quality.

The monograph consists of five chapters. The first chapter aims to identify potential areas in which there is a significant probability of fraud in terms of the protection of owners, and regions with a substantial probability of tax avoidance in the field of income tax in terms of government revenue. As these are two somewhat independent areas, a prerequisite for their identification is the need to analyse the interrelations between the financial reporting system and the income tax rules. The chapter focuses on the V4 countries.

In the second chapter, the authors described counteracting the erosion of the tax base, which is currently one of the most critical issues of the global tax policy. An example of such a tendency is the general anti-avoidance rule (GAAR). GAAR gives the tax authorities the power to cancel a particular tax benefit of transactions

in cases when the tax advantage is the main (or one of the primary purposes) for the taxpayer's action and if the manner of the taxpayer's conduct is artificial. The chapter aims to verify whether implementing the GAAR clause into the Polish tax system has increased the tax risk for Polish entrepreneurs. The authors understand tax risk as the inability to determine the correct scope of taxation before the transaction is completed. To answer the research questions, they examined the Annual Reports of the Director of National Tax Information (Krajowa Informacja Skarbowa – KIS) for the period 2016-2020. The collected data on instruments of tax risk minimization in Poland and its historical analysis allowed for assessing the consequences of implementing Polish GAAR in a relatively broad context. The study results prove that strict anti-avoidance rules can indeed lead to the protection of the Polish tax base, but at a high cost, namely increasing the tax risk for Polish taxpayers.

In the third chapter, the authors reveal the main aspects of the influence of uncertainty on the definition of tax risks and the policy of their identification in the Russian Federation. Uncertainty in taxation, as a rule, arises from the impossibility to provide for all the situations that may occur in practice in regulatory documents. Therefore, legislative acts define only general principles (directions) of problem-solving in many cases. There may also be occasions where there are no general principles or contradictions in the regulatory framework. In all of these situations, the accountant is indeed faced with uncertainty. Today the issues of combating tax abuse have gone beyond the framework of national legislation. They are developing, taking into consideration international experience and recommendations of the many documents generated by international organizations.

The fourth chapter focuses on the matter of using robotics and automation for accounting and tax purposes and for identifying potential tax fraud. The authors aimed to find a solution that would allow automated checks without increasing taxpayers' paperwork, and modelled a fictitious example to analyse four steps – from placing an order to making a payment as part of a standard business transaction. Weaknesses were identified that could have a negative effect on taxpayers in the form of liability for any VAT unpaid by their business partners. The authors propose that this check is partially replaced by a feature integrated in online banking services where banks conduct real-time checks on payment recipients using publicly available databases, drawing the taxpayer's attention to any threat.

The fifth, and final, chapter addresses the problem of VAT fraud detection. It presents a solution which may reduce fraud thanks to a fully automated process that includes several elements such as digital invoices, blockchain technology and

AI algorithms. VAT fraud is currently a key challenge for tax authorities worldwide. The European Commission estimates the losses as exceeding 150 billion EUR a year in the European Union alone. Furthermore, it is deemed that this money lines the pockets of criminals and terrorists. The authors of this chapter presented solutions to some challenging issues, pointing out how to leverage AI techniques to identify possible VAT fraud on the grounds of distributed ledger; they also showed how to keep sensitive data secret while recorded in a publicly disclosed ledger, and furthermore proposed implementing multi-signature technology and encryption methods to provide required confidentiality.

The authors hope that this publication will inspire further research on tax avoidance. The pereparation of the monograph was possible thanks to the involvement of scientists from the Visegrad Group countries and sharing their knowledge during scientific seminars as part of a project financed by the International Visegrad Fund no. 22010083.

Piotr Luty

1

Possible way of fraud detection in accounting and financial reporting

Hana Bohušová*

1.1. Introduction

Financial reporting is a unified system of data on the performance and financial position of a company. Financial statements present this data, and are prepared based on financial accounting data. The form of financial statements is suitable for all groups of users, external users and the management of companies. Financial statements are also vital to the tax authorities to ensure the accuracy of taxes. Although these reports are produced under strict legal requirements and prescribed reporting standards and subject to external audit, the accounting data and financial statements may be open to manipulation and fraud to achieve an intended portrait of the company for various reasons. Possible manipulation with financial statements and accounting fraud not only damages the confidence of external users, but is also harmful to all management analyses. Fraud detection and manipulation of financial statements is the subject of accounting research.

The motives for fraud and manipulation differ in terms of the purpose of the information. The majority of fraud and manipulation of financial statements is connected with the use of false or misleading information in the financial statements with the motive to improve company figures. This results in harm or injury to creditors, current and potential investors, and potential employees. The most infamous among such fraudulent scandals were Enron (2001), WorldCom (2002), Tyco (2002), and Satyam (2009). The main fraudulent techniques were the overstatement of performance of companies by inflating revenue, the overstatement of assets and the understatement of liabilities. The motive, especially of the listed companies, is to raise accounting earnings even if it increases corporate tax, and the other identified reasons for manipulating financial

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statement figures was corporate income tax evasion. There is extensive research concerning fraud detection and tax evasion by publicly traded corporations (Desai, 2005; Desai & Dharmapala, 2006; Erickson, Hanlon & Maydew, 2006; Frank, Lynch, & Rego, 2009; Hanlon & Heitzman, 2010; Plesko, 2000, 2007; Yin, 2003). There is only limited research regarding small and medium companies in Europe, especially in transition economies.

This chapter aims to identify the main reasons and areas of possible fraud and manipulation in accounting, and the possible methods for determining the reasons. The research concerns in particular US-listed companies reporting according to US GAAP – as an example of the Anglo-Saxon accounting system, and they are mainly aimed at fraud detection (Beneish, 1999; Cecchini, Aytug, Koehler, & Pathak, 2010; Dechow, Ge, Larson, & Sloan, 2011; Green & Choi, 1997; Summers & Sweeney, 1998). The research covers the issue of fraud detection only from one point of view, and the conclusion may not be comprehensive for every kind of company around the world.

The research in this issue concerning non-listed companies reporting to national GAAP worldwide is limited. The paper addresses the methods for manipulating financial statements and fraud detection used in previous research.

The fundamental precondition for fulfilling this goal is:

- analysis of the primary purposes of accounting and income tax
- study of the relation of financial reporting and corporate income tax
- comprehensive analysis of available accounting systems and financial reporting, identification of differences and the users of this information
- analysis of available methods for fraud detection
- the possible utilization of financial statement fraud detection methods in particular countries.

1.2. Relation between accounting and taxation as a starting point for fraud and manipulation identification

Companies are subject to rules for tax and financial reporting purposes. There is a level of dependence on financial reporting and taxation in each jurisdiction. Due to the absence of any income tax harmonization, income tax rules differ in individual countries around the world. Countries define the amount of income tax which companies must pay, prescribe the tax base calculation, stipulate items that reduce the tax base, and those that increase the tax base in their laws. The main objective of these rules is to set unified rules for the quantification of income tax for all business entities in the jurisdiction. However, the preparation

of a fiscal income statement (tax return) comes from accounting information through fiscal correction.

The primary purpose of taxation is to raise revenue to meet substantial public expenditure. Most government activities must be financed by taxation. Taxation is an instrument of economic policy, which affects the total production volume, consumption, investment, industrial location and technologies, the balance of payments, distribution of income, etc. The objective of financial reporting is to provide financial information about the reporting entity applicable to existing and potential investors, lenders and other creditors in providing resources to the entity. Those decisions involve buying, selling or holding equity and debt instruments and providing or settling loans and other forms of credit.

It is clear that the objectives of taxation and financial reporting differ significantly. Whittington (1995) concluded that the principles of taxation would not lead to adopting accounting policy as a basis for corporate income tax. Financial reporting to investors and accounting for tax purposes have significantly distinct objectives. Different amounts might be appropriate in different circumstances. Due to these different objectives of taxation and financial reporting, it is clear that the motivation for manipulating figures stems from various reasons and the goals differ. Financial statement manipulation refers to using creative accounting ploys and accounting fraud to make the company's financial statements reflect what it wants its performance to look like, rather than its actual performance.

There has been extensive research regardin the relations between accounting and taxation in individual countries, for example, Hoogendoorn (1996), Blake, Akerfeltd, Fortes, and Gowthorpe, (1997), Lamb, Nobes, and Roberts, (1998), Porcano and Tran (1998), Aisbit (2002), Doupnik and Salter (1993).

In terms of financial reporting, a company's management has two types of motivations or incentives for manipulating financial reporting: capital market incentives and contract-based incentives. Financial reporting affects the price of a company's stock and its bonds. There is research on the stock price reaction to the release of information on financial statements, focused mainly on the impact of reported earnings on the price of stocks. It was concluded that earnings announcements contain value relevant information and that the stock market reacts quickly and efficiently to this information (Hayati, 2010; Nasar, 2002; Opong, 1996). When management is rewarded with stocks or has bonuses tied to earnings, incentives to manipulate financial statements appear. The choice of accounting treatments and other legal or illegal ways of earnings management can affect financial performance reporting. Therefore, management has incentives

to choose accounting treatments to maximize earnings. Companies with debt may be motivated to manipulate financial statements to maintain debt covenants.

However, according to Alm (2018), taxes are far from inevitable, and companies take actions to reduce their tax liabilities. Some of them are legal 'tax avoidance' activities, such as income splitting, postponement of taxes and tax arbitrage across income that faces different tax treatment, while some are illegal and intentional actions taken by companies to reduce their legally due tax obligations using financial statement manipulation or even financial statement fraud, such as underreporting incomes by overstating deductions, exemptions and credits.

1.3. Accounting system and tax relations

The issue of inconsistency in accounting practices in various parts of the world has attracted the interest of many researchers worldwide (Gujarathi, 2008; Lin & Wang, 2001; Nobes & Parker, 1995; Radebaugh, Gray, & Black, 2006; Salter & Niswander, 1995). Hofstede (1980) developed a model of culture that distinguishes one human group from another. Accounting is a technique of information concerning economic activity of company processing, practised within varying cultural, political, economic and social contexts. The national accounting systems have been significantly affected by these contexts. Radebaugh et al. (2006) pointed out that a country with high uncertainty avoidance and low individualism is be more likely to exhibit a conservative measurement of income, and a preference to limit the disclosure to those closely involved in the business. They significantly contrast the 'Anglo' and the Latin and Germanic cultures.

Nobes mentioned another way of looking at the environment of accounting. He identified other direct potential influences such as legal systems, corporate financing, and tax systems. Some countries have a legal system that relies upon a limited amount of statute law interpreted by the courts, which then build up a large number of case laws to supplement the statutes. Other countries have a system of law that is based on codified rules linked to ideas of justice and morality; they become doctrine. This difference has the important effect in that company law or commercial codes need to establish accounting and financial reporting rules. The nature of accounting *regulation* in a country is affected by its general system of laws. Based on this approach, two accounting models can be identified. The first one is the Anglo-American model. According to Oluku and Ojeka (2011), this model heavily influences professional standard-setting bodies, emphasizes capital markets and relies upon debt financing and equity provided by the public. It holds in high regard accurate and fair financial statement presentation (the UK, the USA).

The second one is the Continental European model and is found in cultures not as influenced by the USA. There is less emphasis on presenting true and fair financial statements and more emphasis on the government. The financial information provided to users under this model is directed more towards creditors than investors, as most of these entities receive funding from lending agencies (Oluku & Ojeka, 2011).

The next difference in national accounting systems is how taxation regulations determine accounting measurements and the overall relation between accounting rules and taxation systems. There are two extreme types of the institutional relations between the accounting system and tax rules independence of systems, and the dependence on systems. Independence is a situation where companies use different accounting rules and rules for determining the corporate income tax base. Conversely, dependence is defined as a situation where the financial statements and determination of the corporate income tax are based on tax rules.

Extensive research on the relations between accounting and taxation has been carried out covering both national and various European and international countries. In this respect, the analogue method was used (Aisbit, 2002; Blake, Akerfeltd, Fortes, & Gowthorpe, 1997; Choi & Mueller, 1992; Doupnik & Salter, 1993; Haller 1992; Hoogendoorn, 1996; Lamb et al., 1998; Nobes & Parker, 1995; Porcano & Tran, 1998; Radcliffe, 1993). Doupnik and Salter (1993) developed a classification of countries based on accounting schemes, obtaining their classification based on similarities of accounting standards and similar features of capital markets, namely the similarities in corporate governance mechanisms.

Hoogendoorn (1996) developed a taxonomy regarding accounting and taxation in major EU countries. There are six levels of relations, from dependence (Belgium, Italy, Germany) to independence (Ireland, the UK, the Netherlands). Choi and Mueller (1992) stressed that the types of accounting rules that exist in a country are a product of the economic, political and other environments, which have determined the nature of the system. The classifications by Nobes and Parker (1995) and Choi and Mueller (1992) are based on the orientation of financial statements, namely macro-economic orientation and microeconomic orientation. Micro-economic orientation refers to the fact that financial statements prepared primarily for shareholders and their development is not influenced by tax rules. The financial statements reflect an accurate picture of companies, and additionally such an approach generates two types of results: accounting and tax results. Macro-economic orientation acknowledges the influence of tax rules; the companies prepare financial statements, mainly to the interests of creditors or the state, to determine the effects of tax purposes.

The arguments for the independence of both systems are that the tax system and the financial reporting system have entirely different objectives and users. The aim of the tax system is primarily tax collection. Companies aim to minimize the income tax burden, therefore the rules are based on preventing an income tax base reduction. For a tax system to operate successfully within the law requires a degree of certainty that may not always be appropriate for commercial accounting.

The objectives of accounting and financial reporting are entirely different from the objectives of the tax system. The main aim of financial reporting is to provide true and fair information about the financial position, performance, and changes in the business's financial situation. This information is useful to a wide range of users who make economic decisions. Therefore, the purpose of accounting and financial reporting rules is to determine the financial performance of the economic activity. The goal of companies is to present themselves as successfully as possible in order to reduce the cost of capital and increase its value.

For the reasons mentioned above, it is unlikely that the form of accounting rules can serve objectives of financial reporting and the completely different objectives of the tax system. Aisbit (2002) concluded that a close relation between accounting and taxation leads to a problematic interpretation of the results of financial statements. Contrarily, Desai (2005) stated that because the double reporting system allows accounting for tax revenue and tax purposes, the quality of profit reporting will decrease because the dual nature of corporate profit reporting can contribute to the simultaneous degradation of profit reporting for the profit reporting for capital markets and tax authorities. Lamb, Nobes, and Roberts (1998) stressed the historical link between accounting and taxation; the existence of taxation determines, to some extent, the existence of accounting. Dependence and independence are the extreme variants of the relationship. The classification by Lamb et al. (1998) provides five levels of relations between accounting and taxation, characterized in terms of accounting rules and taxation:

1. Disconnection (tax and accounting rules are separate, independent and detailed).
2. Identity (accounting is 'the leader', accounting affects taxation).
3. Accounting leads (accounting rules or accounting options are adopted for financial reporting purposes and tax purposes, this is possible because of the lack of specific tax rules to be sufficient).
4. Tax leads (tax rules or options are adopted for tax purposes and financial reporting purposes, this is possible because of the lack of specific accounting rules to be sufficient).

5.   Tax dominates (a tax rule or option is imposed both for the financial and tax reporting, conflicting with financial reporting rules).

1.4. Financial statements – manipulation and fraud

Businesses should present financial information on their activity in a true and fair view, however there is the motivation to satisfy the needs of shareholders by maximizing profit and to evaluate management in their management of entrusted assets. According to Shah (1988), the manipulation of financial statements can be perceived as the process by which managers use specific gaps or ambiguities within the accounting rules to distort information, making the company look more attractive. When there are gaps, manipulations of accounting figures occur, leading to the extreme flexibility and transformation of financial statements from what they should be to what managers particularly want; many authors use the term creative accounting for this activity. Tarba and Rusu (2011) stated that creative accounting describes accounting practices derived from regulated accounting standards, explained by complex accounting creation techniques. In this process, the goal is to change the real state of a company in the desired direction using a selection of legal treatments. Accounting fraud as a part of accounting manipulation may be defined as the intentional manipulation of financial statements to create a false image of corporate financial health. Furthermore, it involves an employee, accountant, or the organization itself misleading investors and shareholders. A company can falsify its financial statements by overstating its revenue, not recording expenses, and misstating assets and liabilities. International Auditing Standard No. 240 defines accounting fraud as "an intentional act carried out by one or more persons in the management team, those responsible for the government of the entity, employees or third parties, which involves the use of deception to gain an unfair or illegal advantage".

This means that financial statements fraud (FSF) is the deliberate action of issuing misleading financial statements to avoid negative opinions about a company's financial stability and performance. Accounting fraud can take various forms. According to Worthy (1984), most techniques for manipulating financial statements can be grouped into three broad categories: changing accounting methods, tampering with managerial estimates of costs, and shifting the period when expenses and revenues are included in the results. Additionally, Rezaee (2002) described the ways of FSF as:

• Falsification, alteration, or manipulation of material financial records, supporting documents, or business transactions.

- Material intentional omissions or misrepresentations of events, transactions, accounts, or other significant information from which financial statements are prepared.
- Deliberate misapplication of accounting principles, policies, and procedures used to measure, recognize, report, and disclose economic events and business transactions.
- Intentional omissions of disclosures or presentation of inadequate disclosures regarding accounting principles and policies and related financial amounts.

More attention to accounting manipulation and fraud detection has been paid, especially in the last two decades, mainly due to significant accounting fraud cases discovered at large companies such as Enron, Lucent, WorldCom and Satyam.

Financial accounting fraud detection has received considerable attention from investors, academic researchers, media, the financial community and regulators. According to Yue (2007), accounting fraud is executed by making falsified financial accounting statements where the numbers are manipulated by overstating assets, spurious entries related to sales and profit, misappropriation in taxes, or understating liabilities, debts, expenses or losses. Accounting fraud is a problem that negatively affects the users of accounting information.

There are two general approaches to financial statement manipulation: outflows from the afore-mentioned objectives and the motives for manipulation of financial statements. The former exaggerates current period earnings on the income statement by artificially inflating revenue and gains or deflating current period expenses. This approach makes the company's financial condition look better than just meeting the established expectations. The latter approach requires the exact opposite tactic: to minimize current period earnings on the income statement by deflating revenue or inflating current period expenses, especially for tax purposes.

1.5. Research in the area of FSF

According to Perols and Lougee (2011), research on the history of FSF and its discovery is important because it adds to the understanding of fraud, which can aid the auditors and regulators to detect fraud directly and serve as a basis for future research on fraud. FSF research started in 1975 and continues today. Dechow, Sloan, and Sweeney (1995) examined the motives and causes of earnings' manipulation. According to the conclusion of this study, firms with weak corporate governance are more likely to manipulate earnings to lower the cost of external financing; they also revealed that firms manipulating earnings, experience significant increases in their capital costs.

Further research in the area of FSF is the consequence of the significant accounting scandals at the turn of the new millennium. The epicentre of the 2001 to 2002 scandals was in the United States. Some of the companies involved included AOL, Bristol-Myers Squibb, Cendant, Computer Associates (CA), Conseco, Dynegy, Enron, Sunbeam, Tyco, Waste Management, WorldCom and Xerox. Manipulation and fraud in financial statements can seriously affect the economies in countries worldwide. Despite increased supervision, and changes of laws, fraud has not stopped. FSF has become a popular area of investigation among accounting academics because of the size of the losses. The research concerning fraud detection in publicly traded corporations was conducted by, for example, Plesko (2000), Yin (2003), Desai (2005), Erickson et al. (2006), Frank et al. (2009), Hanlon and Heitzman (2010), Desai and Dharmapala (2006), Perols and Lougee (2011), Drábková (2015), Dimitrijevic, Jovkovic and Milutinovic (2020).

1.6. FSF detection methods

The extent of FSF cannot be known primarily because reliable statistics are not available; FSF continues until it is detected and revealed, and the nature of FSF is changing in line with technological progress and globalization. According to the ACFE 2020 Report to the Nations (2020), FSF represents only 10% of detected fraud, yet when it does occur, it is the most costly type of crime, resulting in an average loss of $ 8,693,000 in 2020. It is necessary to use all available tools to detect as much FSF as possible.

The most straightforward tool is whistle-blowing, which means that an individual with knowledge of wrongdoing, including FSF, informs those with the authority to remedy the situation. In the case of FSF, the appropriate remedial agency can be members of management not involved in the fraud, the board of directors, audit committees, internal auditors, external auditors, and outside regulators.

The majority of FSF has common features, referred to as "financial statement red flags". A red flag is a warning or indicator suggesting a potential problem or threat with a company's stock, financial statements, or news reports. The use of red flags in assessing the risk of management fraud was introduced by Albrecht and Romney (1980), and Loebbecke, Einng, and Willingham (1989), who developed the L/W model containing three conditions or attitudes under which fraudulent financial reporting might be perpetrated. The three conditions, i.e. condition (C), motivation or incentive (M), and attitude (A), are considered as three variables that form the assessment describing the possibility of having FSF:

$$P\,(FSF) = f\,(C;M;A),$$

where: *P (FSF):* probability of FSF if *C* or *M* or *A* = 0, then *P* (FSF) = 0.

Loebbecke, Eining and Willingham's (1989) study was a modified "red flags list". The variables are connected with 46 red flags, but they did not consider the relative importance of the individual factors. Bell, Szykowny, and Willingham (1993) developed a discriminant function based on these red flags, and formed their logistic regression model from the questions (the list of questions concerning these red flags is in Appendix).

Albrecht and Romney (1980) evaluated 95 potential red flags for detecting management fraud. Their further research on this issue (Albrecht & Romney, 1986) proved that one-third of these red flags were significant predictors of management fraud. Based on the result of research of red flags, the Auditing Standards Board of American Institute of Certified Public Accountants (AICPA) issued Statement of Auditing Standard (SAS) No. 82: consideration of fraud in a financial statements audit that was then superseded by SAS No. 99: consideration of fraud in a financial statements audit. Based on the red flag literature review, the most common warning signs include accounting anomalies such as: growing revenues without a corresponding growth in cash flows, consistent sales growth while competitors are struggling, and a significant surge in a company's performance within the final reporting period of a fiscal year. One can add depreciation methods and estimates of assets' useful life that do not correspond to those of the overall industry; outsized frequency of complex third-party transactions, many of which do not add tangible value, and can be used to conceal balance sheet debt; the sudden replacement of an auditor resulting in missing paperwork; a disproportionate amount of management compensation derived from bonuses based on short-term targets, which incentivizes fraud.

Albrecht, Albrecht, and Albrecht (2004) suggested using additional methods besides the red flag approach in detecting financial statement fraud. These could be analytical procedures including horizontal, vertical ratios and other analysis of financial statements; digital analysis (i.e. Benford's Law, 1938) on financial databases, the empirical fraud-hypothesis approach, and data mining commercial software such as audit command language. Many authors such as Subramanyam and Wild (2009), Persons (1995), Spathis (2002), Pasekova, Kramna, Svitákova, and Dolejsova (2019), recommended the analysis of financial statements, including its basic methods — horizontal and vertical analysis and financial ratios as helpful in discovering and examining unexpected relations in financial data presented in the financial statements as the basic level of external control. Financial analysis techniques can help investigators find and examine unexpected

relationships in financial information. There is the premise that relatively stable relations exist among economic events, while unforeseen deviations most likely indicate errors and might indicate illegal acts or fraud. Analytical procedures are employed to detect and examine associations of financial information that do not appear reasonable, such as differences that are not expected, the absence of differences that are expected, potential errors, potential fraud and illegal acts, as well as other unusual or non-recurring transactions or events.

Vertical and horizontal financial statement analysis introduces a simple approach to fraud detection. Vertical analysis involves taking every item in the income statement as a percentage of revenue and comparing the year-over-year trends that could be a potential red flag cause of concern. The balance sheet also uses total assets as the comparison benchmark to monitor significant deviations from regular activity. Horizontal analysis implements a similar approach. Financial information is represented as a percentage of the base years' figures. By analysing ratios, information regarding day's sales in receivables, leverage multiples, and other metrics can be determined and analysed for inconsistencies. Ratio trends are widely used by researchers such as Cecchini et al. (2010), Lin et al. (2003), Liou (2008). Other researchers (Beneish, 1999; Fanning & Cogger, 1998; Persons, 1995; Ravisankar, Ravi, Raghava Rao, and Bose, 2011; Spathis, 2002) used the analysis of ratios as one of the methods to determine fraud based on the presumption that financial difficulties and higher debt levels may motivate managers to engage in fraudulent activities.

The ratios used for FSF detection could be grouped into the folowing:

- The first group of indicators is based on the assumption that the relatively high indebtedness is the incentive for manipulation of financial statements. Minnis (2011) provided evidence of the strong relationship between interest rates and key financial statement ratios variables and quality of financial statements: the total debt to total assets (TD/TA) ratio or the total liabilities to total assets (TL/TA) ratio; the total debt to equity (TD/Eq) ratio.
- The second group of indicators concerns liquidity. The lower liquidity could also be considered an incentive for FSF engagement. The working capital to total assets ratio or the current assets to current liabilities ratio is utilized.

Another fraud motivation for company managers is to keep sustainable growth. For this reason, activity, profitability, asset composition ratios are used, namely the sales to total assets ratio, the net profit to sales ratio, the net profit to total assets ratio, the current assets to total assets. Instead of net profit, gross profit in the numerator of these ratios also appears as a reasonable indicator for financial statement fraud detection.

According to Persons (1995), Kaminski, Wetzel, and Guan (2004), Kirkos, Spathis, and Manolopoulos (2007), Perols and Lougee (2011), the inventories, and accounts receivable are considered as the financial statement items which allow a subjective estimation, due to the possible prudence principle application. Thus the ratios used to determine such fraudulent statements are the inventories to sales ratio, the inventories to total assets ratio, and the accounts receivable to sales ratio. The industry benchmarks must be compared. All the aforementioned financial ratios employed data from annual financial reports, the average number of ratios utilized is from 8 to 10 – Beneish (1999), Green and Choi (1997), Kirkos et al. (2007), Persons (2011), Spathis (2002). Other researchers used large feature sets, of almost more than 20 ratios (Kaminski et al., 2004).

The three main research approaches to financial statement fraud detection may be classified as conditional distribution, discretionary accruals, and specific accruals. The first is based on the presumption that managers have incentives to meet or beat specific earnings benchmarks (bottom-line figures, analysts' forecasts). According to this approach, any significant incoherence in the earnings distribution around these benchmarks results from the managerial manipulation of accounting figures. The employed methodologies are intended to detect any irregularities in earnings patterns, representing any discontinuities around specific reference points. The first theory based on discontinuities is the application of Benford's law. Other approaches based on discontinuities are described in the studies by Beatty, Ke, and Petroni (2002), Burgstahler and Dichev (1997), Dichev and Skinner (2002). The other two approaches are based on managing accruals, where accruals are seen as the result of reporting economic transactions representing the difference between cash flows from the operating activities and net income.

Benford's law is one of the most popular FSF detection and data falsification methods. It is a mathematical formula that can be utilized to determine the strength of a company's financial statements. The physicist Frank Benford developed the concept in 1938. He concluded that unfalsified data is usually sufficient for a predictable pattern (first significant digit); however, falsified data do not suffice. More numbers begin with the digit 1 than begin with the digit 2, more begin with 2 than 3, and so on. Based on this pattern, the distribution of the first digit in a number is not random, it is logarithmic.

Benford's law can be used to detect anomalies in data, whether from clerical errors, random chance, or outright manipulation. In 1994, Nigrini (2012) proved that Benford's law can be used to detect deception and fraud, and concluded that it provides a solid basis for the separation of suspicious data with a high degree of manipulation from data with a very low probability of manipulation, which is very important in further analyses.

According to Burgstahler and Dichev (1997), Beatty et al. (2002), companies' frequency distribution of earnings shows discontinuity around the earnings level targets. If earnings are not managed to achieve certain earnings levels, the frequency distribution of earnings does not show a discontinuity. It is expected that the number of companies that achieve results lower than a given level to a certain extent and the number of companies that achieve results higher than that given level to the same extent is not significantly different. If earnings are managed to achieve certain earnings levels, the frequency distribution of earnings shows a discontinuity in correspondence with such earnings levels.

Burgstahler and Dichev (1997) used the cross-sectional distributions of earnings changes and earnings to prove that firms manage reported earnings to avoid earnings decreases and losses. They found unusually low frequencies of small reductions in earnings and small losses, and unusually high frequencies of small increases in earnings and small positive income. They showed that two components of earnings, cash flow from operations and changes in working capital, have been used to increase earnings.

There are two opposite earnings management practices. In the first, companies manage earnings to avoid losses. The second is that companies with positive earnings manage them downward to minimize earnings. In the majority of cases, companies manage earnings to avoid losses – Beatty et al. (2002), Burgstahler et al. (2006), Daske, Gebhardt, and McLeay (2006), Holland and Ramsay (2003), Jacob and Jorgensen (2007), Kerstein and Rai (2007), Revsine, Collins, Johnson, and Mittelstaedt (2009). Marques, Rodrigues, and Craig (2011), Poli (2013), whilst other companies manage earnings to minimise positive earnings. The minimization of positive earnings has been documented in certain countries with a close relation between accounting and tax systems (e.g. Germany, France, Belgium and Italy), where there are fiscal incentives – minimizing tax payments.

Burgstahler and Dichev (1997) used the frequency distribution of earnings to identify the presence of discontinuities to detect earnings management practices. Burstahler and Dichev (1997) employed the following formula to define earnings:

$$E_{it} = \frac{NE_{it}}{TA_{it-1}}$$

where: E_{it} – earnings reported by company i in financial year t; NE_{it} – net income reported by company i in financial year t; TA_{it-1} – total assets of company i in financial year $t-1$.

There are many different methods using accruals for FSF detection. The models use total accruals, and discretionary accruals for potential FSF – Healy (1985), DeAngelo, (1986), Jones (1991), Dechow et al. (1995), Kothari, Mizik, and Roychowdhury (2005) as a proxy, whereas others use specific financial statements items and scores – McNichols and Wilson (1988), Beneish (1999). Accounting standards accept non-discretionary accruals (economical accruals), and accounting entities are even required to account for them to report true and fair information. Discretionary accruals (managerial accruals) are created deliberately to manipulate changes in the reported earnings and alternate to cash flows selected purposefully by managers.

Healy (1985) used the comparison of the mean of total accruals weighted by total assets as a measure of non-discretionary accruals for earnings management detection. He focused on CEO remuneration and the tendency to manipulate earnings. He firstly identified total accruals and then estimated non-discretionary accruals with a model. Ultimately, he took the difference between total accruals and non-discretionary accruals to find discretionary accruals quantified as the difference between total accruals and non-discretionary accruals.

Below is Healy´s model for nondiscretionary accruals:

$$NDA_{t+1} = \frac{1}{n}\sum_{t=1}^{n}\frac{TA_t}{A_{t-1}}$$

where: TA_t – total accruals of company in period t; NDA_t – non-discretionary accruals of company in period t; A_{t-1} – company's total assets at the end of period $t-1$.

A modified Healy´s approach was used by DeAngelo (1986), who tested earnings management by computing first differences in total accruals and assuming that the first differences have an expected value of zero under the null hypothesis of no earnings management. This model uses the last period's total accruals to measure non-discretionary accruals. DeAngelo (1986) took management buyouts and earnings management relations into consideration, suggesting that management might tend to reduce earnings to decrease share prices in the period of buyouts. The author also indicated that they would manipulate earnings in an upward direction after the buyout period to smooth income in total. Hence, total discretionary accruals in two periods would be zero. Just like Healy (1985), DeAngelo (1986) assumed discretionary accrual as the change in total accrual between consecutive periods.

The DeAngelo model for nondiscretionary accruals is as below:

$$NDA_t \;=\; \frac{TA_{t-1}}{A_{t-2}}$$

where: *NDA* – non-discretionary accruals of company in period *t*; *TA* – total accruals of company in period *t*; *A* – total assets.

According to Dechow et al. (1995), the DeAngelo model can be viewed as a particular case of Healy´s model. The estimation period for non-discretionary accruals is based only on the previous year's observation. A common feature of both models is that they use total accruals from the estimation period to proxy for expected non-discretionary accruals. Suppose non-discretionary accruals are constant over time and discretionary accruals have a mean of zero in the estimation period, hence in that case both the Healy and DeAngelo models will measure non-discretionary accruals without error.

Jones (1991) proposed a model with the assumption that nondiscretionary accruals are constant. The model tries to control the effect of changes in a firm's economic circumstances on nondiscretionary concerns at the relation between import quotas and companies' tendency to report lower income before investigations and decisions of import quotas. Jones's model differs from its predecessors in that it estimated non-discretionary accruals as a function of change in the company's revenues, depreciation, and assets.

The Jones model for nondiscretionary accruals is as below:

$$NDA_t \;=\; \beta_1 \left(\frac{1}{A_{t-1}} \right) + \beta_2 \, (\Delta Rev_t) + \beta_3 \, (\Delta PPE_t)$$

$$TA_t \;=\; \beta_1 \left(\frac{1}{A_{t-1}} \right) + \beta_2 \, (\Delta Rev_t) + \beta_3 \, (\Delta PPE_t) + \gamma_t$$

where: A_{t-1} – company's total assets in year $t-1$; ΔRev_t – the difference of operating revenue; ΔPPE_t – fixed assets in year *t*.

Jones (1991) indicated that the model successfully explains around one-quarter of the variation in total accruals.

Dechow et al. (1995) modified the Jones model. Instead of using the change in revenues, they subtracted the change in receivables from the change in revenues, and argued that including change in receivables to the model would reduce specification bias and provide more robust results. The modified Jones model was designed to eliminate its conjectured tendency to measure discretionary accruals

with an error when discretion is exercised over revenues. Accrual-based models were subject to intense criticism by McNichols (1998) and Beneish (1999). They failed to distinguish between the accruals resulting from changes caused by the economic environment and changes caused by the manipulation of accounting data. Alternative models use financial ratios to predict FSF earning manipulation, earning management, and bankruptcy development, e.g. Beneish, Altman Z-Score and Dechow F-score.

The Beneish model is a mathematical model which evaluates eight ratios to determine the likelihood of earnings manipulation. The Beneish M-score was developed in 1999. The theory of the model is supported by the presumption that companies manipulate their profits by reporting manipulated gross margins – increased expenses, and last but not least, an increase in sales. The model consists of eight indicators that identify anomalies in the financial statements that may result from the manipulation of earnings or other fraudulent types (Beneish, 1999). The variables are based on the company's financial statements, and the score is derived from the model to describe the degree to which the earnings have been manipulated (Nwoye, Okoye, and Oraka, 2013), and developed a statistical model to discriminate manipulators from non-manipulators. The variables concerning asset quality, depreciation, gross margin, leverage and other variables are employed in the model, and the M-score (1997) is calculated as follows:

$$\text{M-Score} = -4.84 + 0.92 \times DSRI + 0.528 \times GMI + 0.404 \times AQI + 0.892 \times SGI + 0.115 \times DEPI \ 0.172 \times SGAI + 4.679 \times TATA - 0.327 \times LVGI.$$

The initial set of eight economic indicators was later reduced to five indicators in 1999.

$$\text{M-Score} = -6.065 + 0.823 \ DSRI + 0.906 \ GMI + 0.593 \ AQI + 0.717 \ SGI + 0.107 \ DEPI,$$

where: *DSRP* – days' sales in a receivable index – increase in receivables that is not proportionate to the sales may be sign of revenue inflation; *GMI* – gross margin index – there should be a positive relation between a decrease in GMI and the probability of manipulated earnings; *AQI* – asset quality index – if AQI is greater than 1, it is an indication of a company's potential involvement in cost deferral. there is positive relation between an increase in AQI and manipulated earnings; *SGI* – sales growth index – this variable is included in the model with the aim of analysing debt agreements incentives for manipulation of earnings; *DEPI* – depreciation index – if the DEPI index is greater than 1, it means that the rate at which assets depreciate has slowed down, indicating that the company has examined its estimates of the assets useful life (a positive relation between the DEPI

index and earnings manipulation is expected); *SGAI* – sales index, general and administrative expenses; *TATA* – total accruals/total asset – it is expected that greater positive accruals are related to the increased likelihood of earnings manipulation; *LVGI* – leverage – this variable is included in the model with the aim of analysing debt agreements incentives for manipulation of earnings (Beneish, 1999).

An M-score (1997) greater than –2.22 is a sign for further investigation whether the firm is manipulating its earnings, while an M-score is lower than –2.22 signals that the company does not manipulate its figures. The M-score level moved to –1.99. Finally, in 2012, the M-score reached –1.78 threshold for the manipulation of financial statements for the five variables model. Beneish's M-score's significant limitations are that it can be used only to find the manipulation of the overstated profits; it cannot be used to reveal the understated profits. The model is a probability theory model and does not guarantee FSF detection in a company. The Beneish model and all other ratio-related models do not describe the complete picture of the statement's situation, it can only rely on the results comparable to the industry and the specific firm's historical average.

The other model is the F-model developed by Dechow et al. (2011), which is considered a general FSF detection tool. This model follows a methodology similar to Beneish (1997, 1999) in developing a score to predict which companies manipulate financial statements. It uses variables such as accrual quality, performance, non-financial measures, off-balance-sheet activities and market--based measures. Dechow et al. (2011) used an F-score computed as follows:

$$VALUE = -7.893 + 0.790 \times RSST + 2.518 \times \Delta REC + 1.191 \times \Delta INV + 1.979 \times$$
$$SOFTASSETS + 0.171 \times \Delta CASHSALES - 0.932 \times \Delta ROA + 1.029 \times ISSUE$$

where: $RSST$ – [(TotalAssets$_t$ – Cash&Equivalents$_t$ – Investments&Advances_ Other$_t$ + InvestmentsatEquity$_t$ – Total Liabilities$_t$ – PreferredStock$_t$) – (TotalAssets$_{t-1}$ – Cash&equivalents$_{t-1}$ – Investments&Advances_Other$_{t-1}$ + InvestmentsatEquity$_{t-1}$ – TotalLiabilities$_{t-1}$ – PreferredStock$_{t-1}$)] / [0.5(Total Assets$_{t-1}$ + TotalAssets$_t$)] – this variable measures changes in current assets excluding cash, it is an accrual-quality variable similar in spirit to discretionary accruals from the modified Jones model, but it does not require regression to calculate; ΔREC – (REC$_t$ – REC$_{t-1}$) /0.5(TotalAssets$_{t-1}$ + TotalAssets$_t$) – if it is indicated that large changes in accounts receivables show revenue and earnings manipulation. The manipulation can occur through the fraudulent recognition of revenue and large changes in accounts receivable falsified cash flows from operating activities; ΔINV – (Inventory$_t$ – Inventory$_{t-1}$) / 0.5(TotalAssets$_{t-1}$ + TotalAssets$_t$) – large

changes in inventory may indicate inventory surpluses, shortages, obsolescence, or liquidation; *SOFTASSETS* – (TotalAssets$_t$ – netPP&E$_t$ – Cash&equivalents$_t$) / TotalAssets$_t$ – It is suggested that when a soft asset is high on the balance sheet, managers have more abilities to change and adjust assumptions to influence short-term earnings; Δ*CASHSALES* – {[Salest – (RECt – REC$_{t-1}$)] / [Sales$_{t-1}$ – (REC$_{t-1}$ – REC$_{t-2}$)]} – 1 – for a firm not engaged in earnings manipulation, the growth rate in cash sales can be compared to the growth rate in revenues, but supposes that just the change in cash sales is a key metric to monitor when evaluating the potential for earning manipulation; Δ*ROA* – [NetIncomet / 0.5(TotalAssets$_{t-1}$ + TotalAssets$_t$)] – [NetIncome$_{t-1}$ / 0.5(TotalAssets$_{t-2}$ + TotalAssets$_{t-1}$)] – earnings volatility may be an indicator of earnings manipulation because a decline in performance indicators may be a reason for financial statement manipulation; ISSUE – dummy variable has value 1, if the company issued long-term debt or common stock in year t; 0 otherwise. This variable may indicate operating cash flow problems.

According to Dechow et al. (2011), *VALUE* is converted to a probability as follows:

$$F\text{-}Score = (e^{VALUE} / (1 + e^{VALUE})).$$

The resulting probability is then divided by the unconditional likelihood of misstatement (= 0.0037) to obtain the F-score. The unconditional chance of misstatement equals the number of misstatement firms divided by the total number of firms in the Dechow et al. (2011) sample. An F-Score of 1.00 indicates that the firm has the same probability of misstatement as the unconditional expectation (the likelihood of misstatement when randomly selecting a firm from the population). F-Scores greater than 1 indicate higher chances of misstatement than the unconditional expectation.

For FSF detection, it is also necessary to mention the Altman model and the Altman Z-score. The model was developed by Altman (1968) to predict possible bankruptcy in the next two years and examine a company's financial health. The main reason is that companies with weak financial health are considered potential financial statements' manipulators. Altman's indicator is built on five financial indicators that are obtainable from a company's financial statements:

the Z-score model is then calculated by the formula:

$$Z\text{-}SCORE = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 0.999X_5,$$

where: X_1 – working capital/total assets; X_2 – retained earnings/total assets; X_3 – EBIT/total assets; X_4 – market value of equity/total liabilities; X_5 – sales/total assets.

Depending on the results, it could be concluded whether a company is subject to insolvency risk and then to bankruptcy risk or not. When the Z-Score is above 2.99, the company is in a 'safe zone'; when the result is under 1.81, the company is in a 'distress zone', which is considered as a dangerous area, when the Z-Score has a value between 2.99 and 1.81 it is in a grey zone where the results are not certain. This model has been approved by Loebbecke et al. (1989), Persons (1995), and Summers and Sweeney (1998), who considered financial stress as a motivating factor for fraud on financial statements. This model was primarily developed for listed US manufacturing companies. The coefficients used in the model were developed on the sample used, which means that it may be inaccurate for companies in different countries. The business and its environment are also continually changing. Using the previous score ranges to classify firms has proved to be inappropriate, therefore it is subject to many modifications. In 1977 the model was also modified for non-listed US manufacturing companies:

$$Z\text{-}SCORE = 0.717X_1 + 0.847X_2 + 3.107X_3 + 0.42X_4 + 0.998X_5,$$

where: X_1 – working capital/total assets; X_2 – retained arnings/total assets; X_3 – EBIT/total assets; X_4 – share capital/total liabilities; X_5 – sales/total assets.

The classification ranges for this model have been changed. If the score is above 2.9, the company is healthy, and below 1.23 the company is regarded as going bankrupt. Values ranging from 1.23 to 2.9 represent the so-called grey area with no precise prediction. The grey area for this model is wider than the original Altman´s model.

The latter model was modified in 1999 for non-manufacturing companies.

$$Z\text{-}SCORE = 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4,$$

where: X_1 – working capital/total assets; X_2 – retained earnings/total assets; X_3 – EBIT/total assets; X_4 – equity/total liabilities.

The classification ranges for this model have been changed. If the score is above 2.6, the company is healthy, and below 1.1 the company is regarded as going bankrupt. Values ranging from 1.1 to 2.6 represent the so-called grey area with no precise prediction.

For emerging markets, the Z-score was modified by adding a constant of 3.25.

$$Z\text{-}SCORE = 3.25 + 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4,$$

where: X_1 – working capital/total assets; X_2 – retained earnings/total assets; X_3 – EBIT/total assets; X_4 – share capital/total liabilities.

Using Altman's model, Pustylnick (2011) modified the two model coefficients for bankruptcy and fraud prediction: working capital to total assets was changed by shareholder equity; net sales to total assets – by revenue to total assets, which were considered more representative variables to fraud detection by various researchers. As a result, the P-score model was developed by Pustylnick (2011). The values of coefficients were not changed.

$$P\text{-}SCORE = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + X_5,$$

where: X_1 – shareholders equity/total assets; X_2 – retained earnings/total assets; X_3 – EBIT/total assets; X_4 – market value of equity/total liabilities; X_5 – revenue/total assets.

Based on Atman´s research, Pustylnick (2011) revealed significant changes in time between the P-score and Z-score models. The P-score changes [ΔP] were higher than the Z-score [ΔZ] in cases when companies were involved in accounting scandals.

Applying these models for non-US GAAP reporting companies can be questionable. The content of individual items could be slightly different in financial reporting according to national GAAPs. Due to this fact, there were indexes developed for companies operating in European countries.

The Neumaiers (2005) developed four IN indexes based on a dataset of manufacturing companies in the Czech Republic, namely: IN95 index (bankruptcy prevention), IN99 index (prosperity prediction), and IN01 and IN05 index, both used for bankruptcy and prosperity prediction. The IN05 (2005) index is a modification of the IN01 index (2001).

IN99 can be calculated as:

$$IN99 = -0.017X_1 + 4.573X_2 + 0.481X_3 + 0.015X_4,$$

where: X_1 – assets/ liabilities; X_2 – EBIT/assets; X_3 – revenue/ assets; X_4 – current assets/the sum of short-term liabilities and short-term bank loans.

IN05 can be calculated as:

$$IN05 = 0.13X_1 + 0.04X_2 + 3.97X_3 + 0.21X_4 + 0.09X_5,$$

where: X_1 – assets/ liabilities; X_2 – EBIT/interests; X_3 – EBIT/ assets; X_4 – revenue/ assets; X_5 – current assets/short-term liabilities.

According to the value of the final score, companies can be classified into the following groups:

$$IN99 > 2.07\ IN05 > 1.6 - \text{healthy situation},$$

$2.07 > IN99 > 0.684\ 1.6 > IN05 > 0.9$ – grey zone,
$IN99 < 0.648\ IN05 < 0.9$ – unhealthy situation.

The above-mentioned methods could be considered as traditional methods. While traditional methods have been successfully used in detecting anomalies in financial statements, modern methods based on machine learning techniques have proven to be even more effective in classification performance as they simplify the processing of extensive data. Machine learning and data mining with extensive data bring more accurate results for predicting and classifying information. Data mining plays an essential role in FSF detection. According to the conclusions of Sohl and Venkatachalam (1995), Green and Choi (1997), tools such as artificial neural networks (ANN), decision trees, support vector machines (SVM), and Bayesian belief networks are relevant for the detection of FSF. Sohl and Venkatachalam (1995) predicted FSF using a neural network. In 1997, Green and Choi (1997) developed a Neural Network fraud classification model which used five ratios and three models using different expectation methods to develop data input. The results supported the conclusion that Neural Networks have significant capabilities as a fraud detection tool. Additionally, Fanning and Cogger (1998), Yoon et al. (1993), and Bell et al. (1993) used ANNs to develop a fraud detection model. They investigated rules associated with the data available in financial reporting for complex equations with multiple variables development. Fanning and Cogger (1998) employed financial ratios and qualitative variables as input vectors to develop a fraud detection model. A strength of ANN's is their use of inductive logic; ANN's learning is based on the provided data and can remain precise as more data becomes available. According to Kim and Sohn (2010), there are some shortcomings regarding ANNs: the dependence on the researchers' experience or knowledge to pre-process data to select control parameters, difficulty to generalize the results due to overfitting and difficulty for ANN to explain the prediction results due to its lack of explanatory power.

SVM is an artificial intelligence learning method. It is a machine learning technique based on statistical learning theory and structural risk minimization. SVM constructs a linear model to estimate a decision function using non-linear class boundaries based on support vectors. SVM trains linear machines for an optimal hyperplane that separates the data without error and the maximum distance between the hyperplane and the closest training points. Pai et al. (2011) and Moepya, Nelwamondo, and Walt (2014) used the SVM model for detecting top management fraud.

Decision trees are one of the simplest methods for inductive learning. They can process both continuous and discrete variables. A tree structure is established with known facts and classifications to generalize relevant judgment rules. The most used decision trees are CART, CHAID, C5.0, and QUEST. CART (classification and regression tree) is a binary decision-tree technique utilized for continuous data or non-parametric data classification. The classification process is based on dividing conditions on the quantity and attributes of the data; the Gini index can also be used. Each step of the division process separates the data into two subsets, and the process is repeated for each subset to identify the next dividing conditions. Data are divided into two subsets to construct a tree structure. The process is finished when data are no longer divisible.

CHAID (chi-square automatic interaction detector) is a branch of the decision tree algorithm. The CHAID algorithm mainly relies on chi-square tests to construct decision trees, and the optimal splitting branch is identified by repeating the process of combinations and divisions. C5.0 is an improvement of ID3. The ID3 methodology refers to information gain as the criteria of constructing decision trees, and this typically results in over-learning due to a vast number of input variables. C5.0 uses the gains ratio to replace the previous criteria, however the fundamental concept remains the same. The development of a decision tree is based on entropy, no matter how the tree structure is grown. The C5.0 methodology ranks the values of continuous rows of data and calculates again the gains ratio of individual categories. The value with the most significant gain is used as the splitting point for the tree structure. QUEST (quick, unbiased efficient statistical tree) assumes the target variable is continuous to create splitting rules. This algorithm can quickly perform calculations and avoid the bias possible in other methods; it is also suitable for explanatory variables with multiple categories.

Kirkos et al. (2007) explored the effectiveness of data mining classification techniques in firms that issued fraudulent financial statements, and identified the factors associated. They investigated the use of decision trees, neural networks and Bayesian belief networks to identify fraudulent financial statements. They concluded that neural and decision trees were the two most popular data mining techniques, but Bayesian Classification showed better efficiency and effectiveness in some application areas. Kotsiantis, Zaharakis, and Pintelas (2006) explored the effectiveness of machine learning techniques such as decision tree, ANN, Bayesian network, K – Nearest Neighbour, SVM in detecting firms that issue fraudulent financial statements. All the variables used in the sample were extracted from formal financial statements, but concluded that the research in analysing the critical components of financial statements is

limited to qualitative contents to detect fraud. Kaminski et al. (2004) provided evidence that financial metrics such as ratios have a limited ability to predict fraud accurately. Beaseley (1996) researched accounting fraud and non-financial information and found a correlation between accounting fraud and non-financial information, such as corporate governance. Merkl-Davies, Brennan, and McLeay (2011) stressed the relation of financial information to managerial behaviour and the expected reactions of stakeholders. Textual information such as Management Discussion and Analysis (MD&A section of the annual report) and the language used in the MD&A, which aims at providing investors with an insight into the management's opinions regarding the organisation's prospects, can be an indicator of fraudulent behaviour. Management might be tempted to manipulate the information to present the organization morefavourably, and could also deliberately exclude important information, thus leading to the same outcome. Li (2008) classified studies that analysed the use of language within annual reports into two groups.

The first group is dependent on pre-determined lists of words associated with a specific sentiment, such as negativity, optimism, deceptiveness, and ambiguity. The second group relies on machine learning to extract informative features for automatic differentiation between fraudulent and non-fraudulent texts. Machine learning is used in the detection of financial statement fraud by several researchers, e.g. Cecchini et al. (2010), Hajek and Henriques (2017), Humpherys, Moffitt, Burns, Burgoon, and Felix (2011). Humpherys et al. (2011), found that fraudulent disclosures use more often activation language, words, imagery, pleasantness, group references and less lexical diversity than non-fraudulent ones. Previous research on textual analysis of company-related texts was also surveyed by Kearney and Liu (2014), Nassirtoussi, Aghabozorgi, Ying Wah, and Ling Ngo (2014) and Loughran and McDonald (2016). Significant differences in word categories have been observed for firms with low/high earnings and stock returns (Li, 2008) and market-to-book ratio (Myšková & Hajek, 2016). Hajek and Henriques (2017) combined textual analysis with financial data. They showed that although financial variables are essential for detecting fraud, it is possible to enhance the performance through the inclusion of linguistic data.

1.7. Possible application of FSF detection methods in particular systems

As can be seen from the approaches to the detection of FSF described in previous subsections, there are many different approaches developed by academic research and in practice. The majority were primarily designed especially for FSF and

manipulation detection in large publicly traded companies in the United States. The principal reason for manipulation and FSF is the presentation of companies in the best possible light, based on which critical variables and their values are quantified. It follows that these methods cannot be applied in general.

The main contribution of the analysis of methodological approaches of these methods is identifying areas of potential manipulation in financial statements and FSF, the derivation of indicators and variables associated with specific areas, and the approach to quantify their critical values for the relevant purpose. The analysis of the existing methodological procedures can be used to modify them for use in alternative accounting systems (continental) and to identify manipulation, and FSF carried out for purposes other than overestimating the financial position and performance of the company.

Table 1.1. Possible application of FSF detection methods

Method	Accounting system	Detection of inflating or deflating	Possible use in particular countries
Benford's law	Anglo-Saxon, Continental	Both	Ready for use
Bankruptcy models	Anglo-Saxon, Continental	Inflating profit	Special methods for individual accounting systems (IN05, IN05)
Conditional distribution	Anglo-Saxon, Continental	Both	Ready for use
Beneish model	Anglo-Saxon	Inflating profit	Modification for individual accounting system
Dechow model	Anglo-Saxon	Inflating profit	Modification for individual accounting system
Accrual models	Anglo-Saxon, Continental	Both	Modification for individual accounting system
Neural Network fraud classification models	Anglo-Saxon	Inflating	Modification for individual accounting system
Support vector machine	Anglo-Saxon	Inflating	Modification for individual accounting system
Decision trees	Anglo-Saxon, Continental	Both	Modification for individual accounting system

Source: own work based on literature survey.

Table 1.1 below summarizes the results of the analysis and identifies areas that are subject to subsequent modification for use in a particular jurisdiction in identifying companies showing signs of tampering and FSF. This is primarily a deliberate reduction in performance and the recognition of lower economic results to reduce income tax.

1.8. Conclusions

The survey and analysis of FSF detection methods are used worldwide; most of them are designed especially for the use by companies, auditors, and users of financial statements information published by listed companies. These methods were developed in the United States, and they are suitable especially for the Anglo-Saxon accounting system. They aim to detect reported profit inflation, while all V4 group countries use continental accounting systems, and manipulation of financial statements is concerned with profit smoothing, especially for tax purposes. Despite the differences between the objectives of financial statements manipulation, the areas of possible manipulation are identified, and the common variables for detection are defined. This is an area of further research in modifying methods for use in V4 group countries.

Appendix

Q1.   Are management operating and financial decisions dominated by a single individual? C

Q2.   Does management place undue emphasis on meeting earnings projections or other quantitative targets? M A

Q3.   Have managers recently entered into collusion with outsiders? A

Q4.   Does your experience with management indicate a degree of dishonesty? A

Q5.   Does management display a propensity to take undue risks? A

Q6.   Does management display significant disrespect for regulatory bodies? A

Q7.   Have managers lied to the auditors or been overly evasive in responses to audit inquiries, or have they shown some other indications of dishonesty? A

Q8.   Do client personnel display significant resentment of authority? A

Q9.   Is management's attitude toward financial reporting unduly aggressive? A

Q10. Do key managers exhibit strong personality anomalies? A

Q11. Is this a new client? C

Q12. Is there an attempt to cover up an illegal act? A

Q13. Does the client have a weak control environment? C A

Q14. Are there frequent and significant difficult-to-audit transactions or balances? C

Q15. Is the client a public company?

Q16. Is a significant amount of judgment involved in determining the total of an account balance or class of transactions? C

Q17. Have there been instances of material management fraud in prior years? A

Q18. Is the client's organization decentralized without adequate monitoring? C

Q19. Is the client in a period of rapid growth? M C

Q20. Does the client have solvency problems? M

Q21. Does a conflict of interest exist involving the client entity and/or its personnel? C A

Q22. Do accounting personnel exhibit inexperience or laxity in performing their duties? C

Q23. Is the client confronted with adverse legal circumstances? M

Q24. Is the client's profitability relative to its industry inadequate or inconsistent? M

Q25. Has the client entered into one or a few specific transactions that have a material effect on the financial statements? C

Q26. Has the client entered into a significant transaction or transactions with one or more related parties? C

Q27. Is management and/or key accounting personnel turnover high? C

Q28. Is management inexperienced? C

Q29. Is the client currently or was the client recently involved in a purchase, sale, or merger transaction with another company? C

Q30. Has the company recently entered into a significant number of acquisition transactions? C

Q31. Is the direction of change in the client's industry declining with many business failures? M

Q32. Is the client's industry in a state of rapid change? M

Q33. Are the client's operating results highly sensitive to economic factors (inflation, interest rates, unemployment, etc.)? M

Q34. Does a substantial portion of management compensation depend on meeting quantified targets? M

Q35. Are there adverse conditions in the client's industry or external environment? M

Q36. Is the client subject to significant contractual commitments? M

Q37. Is a significant portion of management's personal wealth in the form of holdings in the client entity? M

Q38. Does management perceive their job is threatened by poor performance? M

Q39. Does management exhibit undue concern with the need to maintain or improve the reputation/image of the entity? M

Q40. Do managers appear to engage in an inappropriate lifestyle, to have personal financial difficulties, or to live beyond their means? M

Q41. Is management's reputation in the business community poor? A

Q42. Has management engaged in frequent disputes with the auditors, particularly about the aggressive application of accounting principles that increase earnings? A

Q43. Does management place undue pressure on the auditors, particularly through the fee structure or the imposition of unreasonable deadlines? A

Q44. Has the client engaged in opinion shopping? A

Q45. Do managers display a hostile attitude toward the auditors? A

Q46. Are key managers considered highly unreasonable? A

Q47. Do key managers display a significant lack of strength of character? A

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2

Effects of the GAAR clause – the Polish perspective

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2.1. Introduction

Counteracting the erosion of the tax base is currently one of the most critical issues of the global tax policy, affecting the shape of national tax systems. An example of such a tendency is the implementation of the General Anti-Avoidance Rule (GAAR) to the national legislation. In the European Union, some Member States have applied domestic or agreement-based provisions aimed at tackling tax evasion, tax fraud and abusive practices – both in a general or specific way. As those provisions could have different levels of severity, the inclusion of a common minimum anti-abuse rule into the European tax law was perceived as essential. Due to this, the European Union has taken special measures to create a uniform framework for its functioning in each member state for national corporate tax systems and internal market.

The implementation of the Anti-Tax Avoidance Directive with the European GAAR standard required taking into account the framework of the tax systems of each EU country. Depending on the severity of the anti-avoidance clause, it also brought some consequences in the area of tax risk. An example is Poland, where the 2016 application of the GAAR measures had a significant impact on the level of tax risk for domestic taxpayers.

This study attempted to falsify the thesis stating that the implementation of a General Anti-Avoidance rule in Poland has increased the tax risk of entrepreneurs. Task risk – understood as the inability to determine the correct scope of taxation before the transaction is completed – encompasses in its semantic range both issues related to substantive tax law, as well as its formal aspects. The research period chosen for the analysis was 2014-2020. The study examined the Annual Reports of the Director of National Tax Information (in

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Polish: Krajowa Informacja Skarbowa – KIS) for the years from 2016 to 2020. The collected data on instruments of tax risk minimization in Poland and its historical analysis allowed for assessing the consequences of implementing Polish GAAR in a relatively broad context. The study results prove that severe anti-avoidance rules can indeed lead to the protection of the Polish tax base, but at a high cost, namely increasing the tax risk of Polish taxpayers. The results may also contribute to future research in other tax jurisdictions.

First the paper presents the main issues related to GAAR: the motives for introducing anti-abusive clauses, a brief history of their application, the circumstances of introducing the clause into the Polish legal system, and the characteristics of the Polish provision. The next part presents tax risk in the context of previous scientific research. It describes the instruments for its minimization, available to the Polish taxpayer, both general and individual. The analytical section examines the changes in using Polish tax risk minimization instruments during the research period. In the final part, the authors summarize the analyses. The comparison of the number of individual interpretations and protective opinions issued shows that the tax risk has increased significantly after introducing the anti-abuse clause.

2.2. The GAAR clause in Poland

General anti-avoidance rules (GAAR) are one of the main measures taken against international aggressive tax planning. As the sets of rules within a country's tax code, GAAR clauses typically apply by focusing on the substance of a transaction or arrangement. One common feature is to limit or deny tax benefits when insufficient economic substance is present. Such a denial can occur when the taxable income of a firm is reduced as a result of a transaction that has no reasonable commercial purpose, or where the purpose of a transaction is to directly or indirectly alter the tax incidence (Johansson, Skeie, & Sorbe, 2016, p. 8).

The history of GAAR introduction is quite long – with 28 countries across the world having implemented it before 2005 and seven more by the end of 2014 (Johansson et al., 2016, p. 16). Countries with GAAR include the UK, France, Germany, the Netherlands, Belgium, Canada, China, Singapore, Italy, South Africa, Kenya and Australia. In recent years many more countries have implemented GAAR or amended the existing rules to address specific base erosion and profit shifting (BEPS) concerns. The introduction of GAAR also continued to be topical in jurisdictions such as Poland (Waerzeggers & Hillier, 2016, p. 3).

General Anti Avoidance (GAAR) provisions were first introduced into the Polish General Tax Act (Art. 24b) at the beginning of 2003, but were soon abolished after

the judgement of the Constitutional Court (May 11, 2004, ref. no. K4/03). The Court stated that the provisions were inaccurate and allowed too many arbitrary actions to the tax authorities, and as such violated the principle of citizens' confidence in the state and law.

In 2015, following the widespread discussion on the international profit shifting of multinational enterprises and the erosion of the state tax base, the Polish Minister of Finance announced comprehensive modifications to the General Tax Act. Among the projected changes, there were also General Anti-Avoidance Rules, to be implemented in order to counteract tax avoidance, with a particular focus on transactions and arrangements of an artificial and abusive character (Brodzka & Biernacki, 2016, p. 518). As a consequence, the GAAR rules were again implemented into the General Tax Act. Pursuant to Art. 119a, tax avoidance was "[a]n act carried out primarily in order to obtain a tax benefit that, in the given circumstances, contradicts the object and purpose of a tax law provision, (…) if the manner of conduct is artificial (tax avoidance)"[1].

A key element of any GAAR is the definition of the conditions which, when met, allow the tax authority to question the effectiveness of an act performed by the taxpayer – and to deny the tax benefits obtained from such an act (or series of transactions). Such a determination may be made in the following circumstances: (1) there is a "scheme" that results in the taxpayer receiving a "tax benefit"; and (2) having regard to the substance of the scheme, it can be concluded objectively that the taxpayer or one of the persons who entered the scheme, did so for the sole or dominant purpose of enabling the taxpayer to obtain that tax benefit (Waerzeggers & Hillier, 2016, p. 2).

The Polish GAAR regulation refers to the concept of "tax advantage", which has been defined very broadly in Art. 3 point 18 of the General Tax Code, as: (a) failure of a tax liability, postponement of the emergence of a tax liability or reduction of its amount; (b) arising or overstating a tax loss; (c) arising an overpayment or the right to a tax refund or the overpayment or tax refund; (d) no obligation to collect the tax by the payer, if it results from the circumstances indicated in point (a).

The Polish GAAR were to apply to tax benefits obtained after the date of entry into force of the amended General Tax Code, i.e. July 15, 2016. It is worth mentioning that the GAAR rules allowed retroactivity, as they could apply to transactions performed before that date if the actual tax benefits were to be obtained after July 15, 2016.

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[1] The scope of the GAAR encompassed all taxes except VAT, for which a separate legislation has been introduced in 2016 (Art. 5.5. of the VAT Act of March 11, 2004).

The Polish legislator has foreseen certain exceptions from GAAR, among others, transactions resulting in tax advantages not exceeding PLN 100,000 in a given settlement period, and cases where a taxpayer has obtained so-called "securing opinions". The ruling is binding for the tax authorities, but only to the extent covered by the opinion. It can be also changed in cases of conflicts with judgements of the Constitutional Tribunal or European Court of Justice.

In the case of finding grounds for applying GAAR, the tax authorities should determine the tax consequences of transactions by not taking into account the legal arrangements employed by the taxpayer (or by taking into account what is described as "appropriate activity"). In order to do so, the tax authorities would need to: (1) prove that the taxpayer's intention was indeed to avoid taxation, (2) demonstrate the tax benefit gained as a result.

The Polish rule – similarly to that in other countries – is also accompanied by special procedural solutions. Following in the footsteps of other states, an advisory committee has been appointed, the Council for Counteracting Tax-Avoidance Matters. During the tax assessment proceedings pending in tax-avoidance cases, the Minister of Finance may seek an opinion of the Council. Seeking the opinion of the Committee is mandatory for tax administration only in cases when the taxpayer asks for it (Olesińska, 2017, p. 106).

The following years have brought more changes in the GAAR solutions, triggered by the European Anti-Tax Avoidance Directive (Council Directive…). As some EU Member States applied domestic anti-abusive provisions of different levels of severity, the Commission decided to set a common minimum level of protection for national corporate tax systems and internal market. The amended Anti-Tax Avoidance Directive contained five legally binding anti-abuse measures, which all Member States should apply against common forms of aggressive tax planning[2]. One of them was the EU standard of General Anti-Abuse Rule, to be applied by the EU Member States from 1 January 2019.

Poland decided on a very restrictive implementation of the EU GAAR clause and changed the existing anti-abuse rules (Kuźniacki, 2021, p. 237). The new wording of Art. 119a of the General Tax Act has broadened the definition of tax avoidance. Previously, tax avoidance was considered as activities performed primarily for the

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[2]   The ATAD sets forth five anti-avoidance minimum standard rules: (1) Controlled foreign company (CFC) rule: to deter profit shifting to a low/no tax country, (2) Switchover rule: to prevent double non-taxation of certain income, (3) Exit taxation: to prevent companies from avoiding tax when re-locating assets, (4) Interest limitation: to discourage artificial debt arrangements designed to minimize taxes, and (6) General anti-abuse rule: to counteract aggressive tax planning when other rules do not apply.

purpose of obtaining a tax advantage. Such an activity had to be contrary to the object and, at the same time, the purpose of the provision – the conditions had to be met cumulatively. In the new legal reality, it is sufficient for the tax advantage to be the main or one of the main objectives. In addition, this activity is to be contrary to the object or purpose of the act or its provision. As a consequence, in order to apply the clause it will be enough to meet only one of the above-mentioned conditions.

Moreover, from 1 January 2019, the PLN 100,000 threshold of tax benefits, that resulted in the exclusion of GAAR application, was also abolished. Consequently, the anti-avoidance rule may apply to any tax benefit, irrespective of its value. At the same time, in Polish GAAR cases, the authorities have gained a new competence of levying an additional tax liability of up to 120% of the tax-benefit obtained by the taxpayer.

Such implementation of the EU GAAR standard, although permissible under the Anti-Tax Avoidance Directive, can indeed lead to the protection of the Polish tax base, but at a significant cost of increasing the tax risk of Polish taxpayers.

In order to present a full picture of the Polish tax reality, it should be emphasized that the regulator has also foreseen some special anti-abuse solutions, among them the tax law abuse clause introduced into the provisions regulating Value Added Tax. Pursuant to art. 5 (4) of the Polish VAT Act[3], the abuse of law is understood as performing an activity as part of a transaction which, despite meeting the formal conditions laid down in the provisions of the act, is essentially aimed at obtaining tax benefits, the granting of which would be contrary to the purpose of these provisions. In income taxes, the legislator also introduced the rule of economic purpose for restructuring activities – a presumption that if certain restructuring activities are not carried out for economic reasons, the tax authorities have the right to assume that they were followed in order to evade or avoid taxation (Art. 12.13-14 of CIT Act[4]).

2.3. Tax risk in Poland and instruments of its minimization

For many years, risk has been the subject of research in economic sciences. Due to the ambiguity of this concept, first of all, risk should be distinguished from uncertainty. Risk is quantifiable (Knight, 1921). It is an objective category that can be estimated using probability calculus, which distinguishes it from uncertainty *sensu stricto*, as a category of faith (Tarczyński & Mojsiewicz, 2001). In

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[3] See (Ustawa z dnia 11 marca… 2004 r.), further as VAT Act.
[4] See (Ustawa z dnia 15 lutego… 1992 r.), further as CIT Act.

the area of the tax system, risk is perceived in terms of the continental model as a potential loss (cost, expense) that may arise in the future. This is a negative perception, unlike the Anglo-Saxon model, where risk is equated not only with loss, but also with profit (win, income).

Previous studies of tax risk have analysed its impact on individual areas of a company's operation, such as the responsibility of the management board (Erle, 2008) or the cost of capital (Rego, 2013). However, there was no comprehensive risk impact analysis. In monographic works, tax risk is always analysed from the perspective of taxpayers' settlements (Bakker & Kloosterhof, 2010). This tendency also dominates in Polish-language publications (Furman, 2012; Jędruszek, Łukaszewicz-Obierska, & Ziobrowski, 2013; Suseł & Wołowiec, 2009; Wyrzykowski, 2015).

Risk integration with the tax system can be recognized by linking a quantifiable element to the tax base. Ultimately, the loss from the perspective of both the taxpayer and the recipient of tax revenues is related to the incorrect measurement of the tax or failure to pay it. This combination is justified by the economic consequences of imposing the tax, which leads to creating the so-called *excess burden* (Grądalski, 2004). This is illustrated in Figure 2.1.
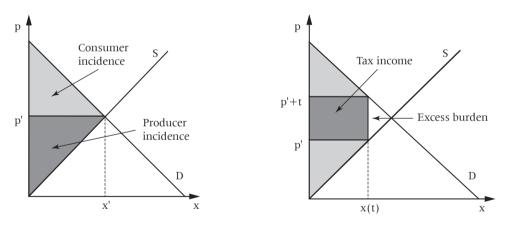

Fig. 2.1. Economic costs of tax imposed

Source: on the basis of (Grądalski, 2004).

Figure 2.1 shows that increasing the price of product (p ') by the amount of tax (t) leads to a decrease in the quantity of sales from x' to x (t). At the same time, tax revenues do not fully cover the cost incurred by the taxpayer. The highlighted white triangle in Figure 2.1 shows additional tax-related losses that cannot be compensated even if the tax amount is fully refunded to the taxpayer (the so-called *Harberger triangle*).

The sources of tax risk may be formal and substantial. On the one hand they are connected with the procedures of tax assessment, control and collection (formal aspect), and on the other hand, with the construction of individual types of taxes through elements of tax techniques (substantial aspect). In Poland and many other European countries, the dominant method of determining tax liabilities is the so-called self-calculation of tax (the legal basis in Poland is Art. 21 § 1 point 1 of the General Tax Code)[5]. Thus, in formal terms, the tax risk is closely related to the control of entrepreneurs. In turn, the material risk is related to the construction of the tax. Both the formal and material risk is of a secondary nature, as it is a consequence of imposing a tax. Consequently, the primary tax risk can be distinguished, which results from the very fact of the existence of a tax and the related losses in welfare system. The formal and substantive sources of tax risk based on Polish legislation are illustrated in Figure 2.2.
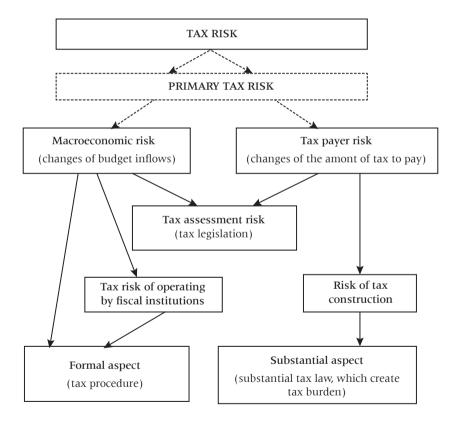

Fig. 2.2. Formal and substantive sources of tax risk

Source: on the basis of Polish legislation.

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[5] See (Ustawa z dnia 29 sierpnia… 1997 r.), further as a General Tax Code.

The above-mentioned sources of tax risk affect several areas of the tax system. The first is tax legislation and the accompanying volatility of tax law. The second is the formal area related to the variability of interpretations of the applicable tax law provisions, made both by the tax authorities and administrative courts. The tax authorities' interpretation is expressed in the content of post-inspection decisions, which have a defining and ex-ante impact due to the taxpayers' self-calculation method. From the taxpayer's perspective, receiving such a decision leads to the necessity to pay both the tax and the late payment interest. Administrative courts exercise control over the activities of administration, including tax administration. In Poland, the control of issued decisions is both of a reverse, and since 2015, also of a substantive nature. Court case law sets out directions for interpreting tax law provisions, which, however, are not binding on the tax authorities. The third area of tax risk is the method of tax construction. In theoretical terms, the tax may be related to the tax base in a general way, through general clauses. Due to the intrusive nature of the tax, this solution carries the risk of not taxing certain factual situations. The second solution is, however, a detailed (casuistic) connection of the tax burden with the actual state of affairs. This leads to the necessity of frequent adjustments of regulations in order to prevent taxpayers from creating artificial structures in the area of private law, which would allow for minimizing the tax burden. The legislator uses both methods in the domestic provisions of substantive law.

Instruments minimizing tax risk can be divided into two groups. The first comprises soft impact solutions, which are a form of well-established practice in the functioning of the tax system. Although there is no direct possibility of their enforcement (failure to comply with such measures is not subject to sanctions), these instruments should be used in tax systems. The second group consists in hard impact instruments, the implementation of which may be subject to administrative coercion. In practice, measures from both groups are used in the national tax system.

In analysing the impact of Polish GAAR on tax risk, one should first pay attention to the instruments minimizing the risk connected with regulatory interpretation. The complicated shape of the tax law norms and the imprecise shaping of the rights and obligations of the addressee closely related to the general clauses of tax law. In Poland, in this area, the legislator introduced two types of solutions. While the instruments of the first type make it possible to define the rules of applying the law in a general (abstract) manner, the second type of instruments is of an individual nature.

Among the first type of measures there are the general interpretations of the Minister of Finance, and, in force from 1 January 2017, tax explanations (Art. 14a § 1 of the General Tax Code). The purpose of these solutions is to ensure the uniform application of tax law by the tax authorities. The protective function of general interpretations and tax explanations has been narrowed down to the period of their validity, i.e. from the moment of publication to the repeal or amendment (Art. 14k et seq. of the General Tax Code).

In the area of administrative judiciary, the role of general interpretations is played by resolutions of the Supreme Administrative Court (Najwyższy Sąd Administracyjny – NSA). The resolutions are adopted to clarify legal provisions, the application of which has resulted in discrepancies in the jurisprudence of administrative courts, as well as for the purpose of resolving serious doubts. The protective function of the resolution for taxpayers is provided for in the Act on Proceedings Before Administrative Courts (Ustawa z dnia 30 sierpnia… 2002 r.). According to Art. 269 § 1, if any composition of the administrative court hearing the case does not share the position taken in the resolution, it shall present the resulting legal issue to the appropriate panel for resolution.

In the group of individualized instruments minimizing the tax risk, there are individual interpretations of tax law. Individual interpretations, currently a permanent element of the tax system, enable taxpayers to obtain answers from the tax authorities on how the actual state of affairs described in the interpretation will be interpreted. The fact that over the years several tens of thousands of interpretations have been issued annually, has made them a popular instrument for reducing tax risk in Poland.

Solutions from the second group also contain the so-called established interpretative practice. Interpretation practice is understood as "explanations of the scope and method of application of tax law, dominant in individual interpretations issued in the same factual states or in relation to the same future events and the same legal status, during the accounting period and the 12 months before the beginning of this period" (Art. 14n § 5 of the General Tax Code). Thus, such a practice is nothing more than the aggregation of individual interpretations, which together constitute another instrument of risk minimization.

The last solutions in this group are Advanced Pricing Agreements (APA). Advance pricing arrangements are a type of contract concluded between the taxpayer and the tax authority, in which the authority accepts the choice and method of applying transfer prices. Their purpose is to minimize the tax risk in settlements between related entities.

2.4. Individual interpretations and the GAAR clause

Before the introduction of the Polish GAAR clause, taxpayers willingly used individual tax interpretations as instruments to minimize tax risk. However, since 2016, none of the clauses (i.e. both the GAAR clause and the special anti-abuse clauses foreseen in other Acts) may be subject to such interpretations. Along with the general GAAR clause, the legislator introduced another tax risk hedging instrument, i.e. securing opinion. The securing opinion may only specify the tax consequences of the transaction for the purposes of a general anti-abusive clause, and it cannot be used in the case of special clauses. Moreover, the cost of its issuance is PLN 20,000 (approximately EUR 5,000). This is a significant expense for the taxpayer, considering that the cost of an application for an individual tax ruling is PLN 40 (approximately EUR 10).

Such a change obviously increased taxpayers' expenses on activities aimed at minimizing tax risk. Nevertheless, one should additionally pay attention to the number of individual interpretations issued after the GAAR regulations came into force. As mentioned above, until 2016, taxpayers could exclude the risk of tax optimization subject to GAAR, through individual interpretations, while since the introduction of GAAR, such interpretations cannot be applied for in this respect. The tax authorities refuse to release them.

Table 2.1 presents the number of interpretations issued in the audited period, along with the number of securing opinions issued.

Table 2.1. Individual interpretation *versus* securing opinions in 2014-2020

Individual interpretations	Year	Securing opinions
37 891	2014	–
37 710	2015	–
33 605	2016	0
25 718	2017	2
23 529	2018	1
21 032	2019	5
20 270	2020	22

Source: Annual Reports of KAS in Poland.

Since 2014, the number of individual interpretations issued has been decreasing every year. This tendency was particularly noticeable from 2016 to 2020, where the decrease amounted to over 13,000 interpretations in absolute numbers. Undoubtedly, the introduction of the GAAR clause, along with the possibility

of requesting securing opinions, was not the only reason for this phenomenon. Nevertheless, the data presented in Table 1 clearly indicate that the number of securing opinions issued at that time did not supplement such a significant decrease in the number of individual interpretations.

Therefore the question arises, in how many cases have the tax authorities refused to release individual interpretations, arguing that it was necessary to apply for a protective opinion? The obtained data are presented in Table 2.2.

Table 2.2. Amount of refusals in issuing individual interpretations in 2014-2020

Year	Individual interpretations	Refusals	[%] Refusals as the total amount of interpretation issued
2014	37 891	–	–
2015	37 710	–	–
2016	33 605	–	–
2017	25 718	650	2.53
2018	23 529	331	1.42
2019	21 032	209	0.99
2020	20 270	138	0.68

Source: Annual Reports of KAS in Poland.

The introduction of the GAAR clause along with the possibility of requesting securing opinions has not yet resulted in refusals to issue the interpretation in 2016. Refusals, on a historically largest scale, appeared in the following year. This phenomenon is justified mainly by the period of issuing individual interpretations, ranging from 3 to 6 months.

In the following years, the number of refusals decreased. Nevertheless, the comparison of the data from Table 2.2 with the data from Table 2.1 shows that the tax authorities, first of all, refused to issue individual interpretations, and taxpayers did not decide to apply for a securing opinion. This may be associated with the significantly greater costs and the more complex procedure for obtaining a securing opinion. It is worth stressing that the taxpayer applying for such an opinion must provide much more data and information than in the case of individual interpretations.

Table 2.2 shows that the significant decrease in the individual interpretations issued in 2014-2020 was only to a small extent due to the introduction of the GAAR clause and the option of securing opinion. Notably, the presented statistics of refusals to issue an individual tax ruling due to the necessity to apply the GAAR

clause refer only to those taxpayers who submitted an application and were refused investigating it. However, there is no information on how many cases the application was not filed at all because the taxpayers did not want to disclose their transactions or plans for their settlement, or did not believe in the possibility of obtaining a positive opinion.

2.6. Conclusions

General anti-abuse rules feature in tax systems to tackle abusive tax practices that have not yet been dealt with through specifically targeted provisions. GAARs have therefore a function aimed to fill in gaps which should not affect the applicability of specific anti-abuse rules. Within the EU, GAARs should be applied to arrangements that are not genuine, otherwise the taxpayer should have the right to choose the most tax efficient structure for its commercial affairs. When evaluating whether an arrangement should be regarded as non-genuine, it should be possible for Member States to consider all valid economic reasons, including financial activities.

In Poland, in its present form, GAAR applies to broadly understood activities that are not sufficiently motivated by economic or business considerations. In the justification to the amendment of the anti-abuse clause, the legislator emphasized intentions to implement the preventive function of the law, and thus to shape appropriate attitudes of respect for the law among taxpayers. Nevertheless, the question of whether the creation of such complex and extensive rules, subject to many conditions, will help shape taxpayers' attitude, seems to be justified.

One of the severe consequences of such modified legal reality is increased tax risk for Polish taxpayers – also those who do not intend to engage in aggressive tax practices. The application of GAAR is commonly manifested by numerous provisions on the refusal to issue individual tax interpretations, which has little to do with the actual prevention of tax avoidance.

Moreover, implementing GAAR in Poland has caused a significant decrease in the total number of individual interpretations (issued in 2016/17, when the GAAR clause became operational). It is worth mentioning that since 2016, the number of refusals to issue the individual interpretation, because of the GAAR clause, also decreased. Taxpayers may have stopped submitting applications for this tool, perceiving such actions as "hopeless".

The possibility of securing opinion did not 'compensate' for the smaller number of issued individual interpretations. Undoubtedly, it should be stated that the

introduction of the GAAR clause, together with the possibility of requesting a securing opinion, both increased the entrepreneurs' cost of minimizing the tax risk and limited the possibility of using the hitherto very popular individual interpretation.

Finally, it can be stated that the thesis presented in the introduction has been falsified. There are no sufficient data to verify it, but comparing the amount of individual interpretation's decline and the amount of securing opinions issued in the studied period, the tax risk – as defined in the first part of the paper – has been raised significantly.

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3

Anti-avoidance rules in fiscal law. Evidence from Russia

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3.1. Introduction

Dozens of studies in recent years have indicated that the problem of tax evasion has become an urgent issue on the global agenda, requiring an integrated approach and the joint efforts of countries to deal with it. Aiming to find optimal approaches to resolve existing and alleged conflicts of anti-tax norms, the article provides comparative analysis of the Russian tax law provisions and the law in Continental and Anglo-Saxon models.

In order to achieve the goal of preventing the abuse of tax law, both within one country and internationally, the article examines the issues of the formation of tax law models, the main trends in the coexistence of accounting and tax accounting, the role of professional judgment in the formation of reporting, and indicators for calculating taxes. Considerable attention in the study is devoted to the issues of control measures carried out by the tax authorities in Russia, and the regulation procedures regarding general and special anti-deviation norms in tax law.

The article discusses the main aspects of the influence of uncertainty on the definition of tax risks and the policy of their identification in the Russian Federation. As a rule, uncertainty in taxation arises from the impossibility to provide for all cases that may arise in practice in regulatory documents, and therefore, in many cases, legislative acts define only general principles (directions) of problem solving. There may also be situations when there are not even any general principles, or there are contradictions in the regulatory

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framework. In all of these, the accountant indeed faces uncertainty. Today the issues of combating tax abuse have gone beyond the framework of national legislation, and they develop taking into consideration international experience and the recommendations of a number of documents created by international organizations.

The OECD in its report on tax base erosion and profit shifting (BEPS), pointed out that the introduction of special anti-deduction norms in the national legislation is one of the measures to prevent non-payment of taxes. In this regard, the procedure for the regulation and application of anti-avoidance rules in Russian legislation requires detailed coverage.

3.2. Formation of anti-avoidance norms functioning system in Russian tax law

The development and improvement of market relations in Russia, the expansion of financial and economic activities, and the desire to organically integrate into the global political and economic system have lead to the need to study, analyze, theoretically comprehend and apply the best international experience in accounting and taxation in practice.

The content of accounting and taxation is influenced by a variety of factors: legal regulation, the financial system, the general economic situation in the country, foreign economic relations and other factors. The most significant factor influencing the level of accounting development is the legal system.

Thus, depending on the type of legislation and the degree of government influence on various aspects of life, it is customary to distinguish such accounting models as Continental and Anglo-Saxon. The main differences between these models of accounting are presented in Table 3.1.

Table 3.1. The main differences between the Continental and Anglo-American accounting models

Indicators	Continental European Accounting and Reporting System	Anglo-American Accounting and Reporting System
1	2	3
Socio-economic environment		
Capital markets	Capital is mainly represented by the banking sector	Capital is mainly raised through stock markets
Culture	Focused on the state	Individualistic

1	2	3
The legal system	Codified law is dominant; law is the source of detailed accounting rules	Case law is dominant; accounting standards developed by private standardization organizations
Fiscal system	The financial accounting and reporting system and the taxation system are closely linked	Tax regulations do not affect the practical implementation of financial accounting and reporting
Accounting and reporting objectives		
Main users	Creditors, tax authorities, investors	Investors to a large extent
Principles of accounting and financial reporting	The predominance of the precautionary principle	Objective representation, accurate reflection of the state of affairs
The amount of information disclosed	Trends towards a reduction in the amount of information disclosed	Trends towards an expansion of the volume of disclosed information
Application of accounting policy	Significant number of alternative recognition or measurement options	There are practically no measurement options and alternative recognition
Calculation of profit to be distributed	Calculation of income based on expediency (reasonableness): • the principle of caution; • restriction on the distribution of income.	The calculation of income is part of the applicability of the solution: • objective representation, accurate reflection of the state of affairs; • dominance of the build-up principle; • no restrictions in the distribution of income.
Correlation of taxation and financial reporting	Mutual influence of taxation and financial reporting	Lack of reciprocity

Source: (Malis, Anisimov, & Danilkevich, 2019).

However, in the authors' opinion, the separation of two models of accounting and taxation systems coexistence is relatively conditional.

When considering the historical aspect of the accounting models formation, it should be noted that the emergence and development of the accounting and taxation systems occurred relatively independently of each other, and their emergence was caused by different economic and political realities. The reason for this was economic activity, whereas for tax accounting it was the increasing role of the state in the life of society.

The Continental model of accounting and taxation appeared at the end of the 19th century in Prussia, where the following rule was introduced: the amount of book profit should be equal to the taxable amount. The main principle of this concept is based on the fact that any financial report should be compiled in the interests

of the state, while with the Continental accounting model, the legislation is based on Roman law. This legal system determines the laws of a strictly deterministic nature. Most countries give accounting standards the status of law. This concept is close to the Russian practice of interaction between the two systems, which existed until the end of the 1990s.

The Anglo-American (Anglo-Saxon) concept originated in the UK. Its guiding principle is based on the fact that the balance sheet profit is fundamentally different from the profit calculated for tax purposes. The difference in the understanding of accounting and taxable profit is caused, first of all, by the orientation of accounting (financial) statements to the interests of a wide range of investors, which is due to the highly developed securities market, as well as the lack of strict legislative regulation of financial accounting rules.

In the Anglo-American accounting system, accounting is considered not only as a system of records, classification and generalization of financial data by registering transactions and events in monetary units, but also as a means of providing quantitative financial information about the economic entities in order to use this information for making managerial decisions.

As a rule, most users of reports do not analyse the financial results of an individual company, but rather consider alternatives for placing their funds with companies in a wide variety of industries. Thus, in order to make intercompany comparisons, the information provided by companies must be standardized, and compiled according to the same norms and rules. In countries that use the Anglo-American model of accounting, standards are developed not by government authorities, but by public professional organizations.

A characteristic feature of the Continental model of accounting regulation is that the state is involved both in the process of developing accounting rules and in the process of applying them in practice. The accounting rules of organizations are designed to form the input to the national accounting system through which the state controls the economy. This circumstance is due to the centuries-old tradition of management centralization and the desire of entrepreneurs to enlist and receive state support. The latter has a significant impact on accounting by establishing a taxation system and the requirement to reflect all expenses for tax purposes on accounts. The procedures for calculating taxable profit based on accounting data are strictly regulated.

Tables of accounting profit adjustments are being developed to determine tax liabilities. Professional accounting organizations are assigned the role of consultants on the practical application of the norms developed by the state, as well as researchers in the field of accounting.

Thus, the Continental and Anglo-Saxon models assume two unrelated parallel lines of development in accounting and taxation.

The radical social changes that took place in the middle of the last century (the expansion and integration of international financial markets) brought the world economy to a qualitatively new level – globalization. In the field of financial reporting due to the specifics of its objects, the processes of globalization are also reflected.

The dynamism of relations, involving constant changes in the external and internal environment, meant that the rigid accounting procedures inherent in the continental accounting model were unable to account for the diversity of business transactions and to provide users with necessary and adequate information.

The main trends in the development of accounting and taxation are as follows:

*   the inclusion of not only the company's property in accounting, but also all the resources for which control is exercised;
*   the main purpose of accounting is not only to determine the financial result of an enterprise, but also to ensure effective managerial decisions based on accounting information;
*   the use of fair value measurements and forward-looking estimates instead of historical estimates of assets.

The main trends in the development of accounting are (Rasskazova-Nikolaeva, 2008):

*   the need to provide perspective and forecasting information;
*   provision of non-financial information about the main factors generating value for the enterprise;
*   provision of financial information about the objects of the post-industrial economy (human capital, innovation, brands and trademarks);
*   providing financial and non-financial information about the company's environmental and social performance;
*   providing accounting statements not for a specific group of users, but creating a general user orientation of accounting statements.

A significant role in producing reliable financial information should be given to the professional judgement of the accountant, who acts as a link between the needs of the users of financial statements and the presentation requirements of the accounting system.

The study and analysis of the existing positions of academic economists has led to the conclusion that, for the most part, the conditions of uncertainty are singled out by scholars as the domain of professional judgement. Uncertainty

as an element of economic science was first considered in neoclassical theory. The American economist, F. Knight, was the first to introduce the concepts of uncertainty, information vacuum and irrational behaviour as important components of economic subjects' activity. In his book, *The Concept of Risk and Uncertainty*, he interprets uncertainty as a lack of awareness and the need to act on opinion rather than knowledge. G. Tintner suggested the equally compelling idea that uncertainty is the result of at least two causes: „imperfect foresight and the human inability to solve complex problems with many variables, even when an optimum exists".

As a rule, uncertainty in taxation arises due to the inability to provide all situations that may arise in practice in regulatory documents, and therefore, in many cases, legislative acts determine only the general principles (directions) of solving the problem. There may also be cases when there are even no general principles, or there are contradictions in the regulatory framework. In all of these situations the accountant is indeed confronted with uncertainty. Thus, the emergence of uncertainty in the accounting and tax sphere can be a consequence of both the complete absence of a regulation that establishes the accounting procedure, and the result of ambiguity or the lack of clarity in its presentation (Rasskazova--Nikolaeva, 2008). A unified concept of 'uncertainty' does not exist today, although research regarding its essence, nature of occurrence and characteristics is constantly conducted.

Federal Rule (Standard) of Auditing No. 8 „Understanding the activities of the audited entity, the environment in which it is carried out, and assessing the risks of material misstatement of the audited accounting (financial) statements", mentions that uncertainty or ambiguity may arise when accounting for individual business transactions due to the inconsistency of regulatory requirements or their absence. It is also indicated there that significant uncertainty may be associated with cost parameters, for example, with respect to estimated indicators.

Uncertainty in accounting refers to the incompleteness and inaccuracy of internal and external information about the business transaction, the object of accounting, causing the possibility of unpredictable events with unknown probabilistic characteristics, which determines the need for professional accounting judgment.

Let us distinguish two types of uncertainty depending on the possibility of levelling the negative consequences on the quality of the judgment developed by the specialist:

• true uncertainty, i.e. uncertainty associated with the absence of a valid standard that regulates accounting practices;

- temporary uncertainty, i.e. uncertainty caused by the ambiguity of interpretations of the rules enshrined in the legislation, their inconsistency and insufficient information about the object being considered or the operation being performed.

In the authors' opinion, the uncertainty of situations that an accounting specialist faces in practice is predetermined by their dependence on a variety of variables (changes in accounting and tax legislation, strategic and tactical directions of the organization's development, new economic phenomena).

As a result of the analysis of the regulatory legal acts in the field of taxation, the study found that nowadays enterprises may face uncertainty in the formation of reporting in:

- identification of objects as assets and the choice of ways to classify them;
- valuation of assets and liabilities;
- reflection of the period of the business transaction;
- assessment of the materiality of the economic life facts in order to disclose information in accounting (financial) statements.

In turn, the formation of the professional judgment of an accountant in these conditions of uncertainty inevitably carries a certain amount of risk.

In relation to the areas of professional judgment, risks arise:

- with regard to accounting policy (the formation of accounting policy provisions without taking into account the specifics of financial and economic activity and its scope, the absence of part of the provisions actually applied in practice, the contradiction of the fixed provisions of accounting practice);
- in relation to the accounting object (documentation and definition of the accounting unit, classification of the object, the method of initial and subsequent assessment, the method of writing off costs for individual accounting objects as part of the expenses of the current period, adaptation of the standard methodology for reflecting information about the accounting object on second and third-order accounts and (or) its development in the absence of generally accepted approaches);
- with regard to accounting principles (implementation of the assumption of consistency in the application of accounting policy, temporary certainty of the economic facts of life, compliance with the requirement of rationality, etc.).

It is worth noting that an accountant's professional judgment, while increasing the risk of misrepresentation of information in the financial statements, often acts as a tool to reduce information risks. The optimality of the decision always implies

risk analysis. The accountant's task is not only to find alternative solutions, but first of all to analyse their risks and choose between minimizing risk (expenses) and maximizing possible expected results (income) from the professional judgment. When departing from the current rules that do not comply with the principle of reliability of reporting, the accountant must explain and justify his/her professional judgment in the notes to the balance sheet and the financial results report.

Situations in which it is necessary to express one's professional judgment are diverified for a modern accountant, but they can be reduced to strategic (on the formation of accounting policy principles) and tactical current work of an accountant (on accounting and preparation of financial statements).

The analysis of the uncertainty of regulatory legal acts in the field of accounting and the risks associated with the use of professional judgment of an accountant allowed to identify the main factors that determine the need for the use of professional judgment: the possible variability of tax accounting methods regulated by legislative acts; limited situations of financial and economic activity regulated by legislation; individual characteristics of certain organizations; uncertainty of some regulatory legal acts in the field of taxation.

Uncertainty and risk always accompany the decision-making process in all spheres of human activity. Business entities, when making economic decisions, including taking into account the information contained in the financial statements of enterprises, are in a situation of uncertainty about the consequences of these decisions. Most of the decisions of economic entities are related to their desire to achieve the maximum possible income. In an unstable economic situation, attention to risk, as well as its impact on profitability, and accordingly, tax indicators, increases significantly.

Not only did 2020 change everyday life, but it also resulted in tightening fiscal control. Although the number of field tax inspections in 2020 decreased by a third, monitoring activities additionally brought almost 300 billion roubles to the budget of the Russian Federation. Moreover, more than a half (158 billion roubles) we provided by analytical work as a result of the unconstrained application of amended tax returns.

Nowadays, the majority of fiscal control is being carried out in the process of pre-inspection analysis using the powerful technical capacity of the Federal Tax Service. Following the pre-inspection analysis, the tax agency defines the expediency of field tax inspections. On the website of the Federal Tax Service it is declared that the decrease in the general number of inspections is based on the

"point" approach to the selection of monitored objects and the enhancement of analytical components during the preparation of monitoring.

The programs assign risk levels based on algorithms and send out tax claims and notifications without the participation of specialists, and also, even before the inspection, they inform the inspectors where and what to look for. Having identified connections using internal resources, the inspector analyses information from open sources: the company's website, social networks, articles and online publications that directly or indirectly indicate the interdependence and submission to control to one entity (Avdiyskiy, 2021).

It is important to underline that the courts take the results of automatic Federal Tax Service control as sources of evidence that confirm receiving unjustified tax benefit.

There is a consistent trend that the development of Big Data technologies allows the processing and classification of huge amounts of data without the direct participation of a person. In spite of this, the human factor is decisive in the question of complexity and quality of control over taxpayers.

Nowadays, questions of countering tax abuse go beyond the borders of national law and evolve in line with international experience and the recommendations of a range of documents prepared by international organizations.

The OECD, in its report on the erosion of the tax base and the withdrawal of profits from taxation, indicated that the introduction of special anti-avoidance norms into national legislation is one of the measures to prevent the non-payment of taxes.

Before 2017 there were no similar rules in Russia and the elements of the legal approach were actually assigned by adjudication principles formulated in the resolution of the Plenum of the Supreme Arbitration Court of the Russian Federation from 12 June 2006 No.53. In August 2017, Federal Law 163-FZ "On amendments to Part One of the Tax Code of the Russian Federation" dated 18 July 2017 commenced and enshrined at statutory level the norms directed on the actions against tax abuse (Letter of the Federal Tax Service of Russia, 2017).

On 11 March 2021, the Letter of the Federal Tax Service of Russia No. BV-4-7/3060@ dated 10 March 2021 „On the practice of applying Art. 54.1 of the Tax Code of the Russian Federation" was published. Paragraph 3 of the Letter emphasizes that in addition to the general rules on countering tax abuse (Art. 54.1 of the Tax Code of the Russian Federation), the Tax Code contains special rules against tax evasion (rules of the actual recipient of income, transfer pricing rules, thin capitalization

rules, etc.). It is indicated that Art. 54.1 of the Tax Code is applied if taxpayers are allowed to distort information about the facts of economic life in order to circumvent the conditions for applying the norms defining the rules of taxation, and formal compliance with the requirements established by them. This is also an important clarification, since inspections often refuse to apply special rules against tax evasion, applying a more vague general rule.

The Letter in question outlines the criteria for evaluating transactions reflected by taxpayers in order to reduce the tax liability, as well as an algorithm for determining the tax consequences if economic transactions do not meet the specified criteria.

Article 54.1 is one of the most conflicting articles of the Tax Code. Considering the short period of the article's continuance, i.e. a little more than three years, and the shorter period of its active implementation – not more than two years, an impressive number of cases initiated under Art. 54.1 of the Tax Code of the Russian Federation have already been accumulated. Thus, as of the beginning of November 2021, during the period of validity of the article, 862 inspections were conducted on the decisions of tax inspections that entered into force, 683 of them are in the courts.

Half of those were considered by the courts of first instance, 272 decisions were made in favour of the tax authorities, the decisions of the tax authorities were completely cancelled in 24 cases, and in 44 more the requirements were partially satisfied. The level of appeal against decisions in the appellate and cassation instances was also high – 223 cases were submitted to appeal, 145 – to cassation, 88 of them were considered, 68 – in favour of the tax authority, and 13 decisions were partially cancelled. Moreover, these data prove the lack of uniformity in judicial practice, thereby confirming the general active search for approaches and understanding of the provisions of Art. 54.1 of the Tax Code of the Russian Federation.

Article 54.1 of the Tax Code deals with the limits on the exercise of rights to calculate the tax base and (or) the amount of tax, levy or insurance contributions (Tax Code of the Russian Federation, 2000). The introduction of special anti-avoidance rules into the national legislation was caused by an objective necessity, as many years of court practice in terms of obtaining an unjustified tax benefit have formed multiple approaches to the assessment of key concepts, making it difficult to apply them uniformly.

Experts distinguish three types of violations in the structure of the article in question:

1) information misrepresentation by the taxpayer on the facts of economic life, on objects of taxation to be reflected in the tax or accounting records or

tax returns, in order to reduce the tax base or the amount of tax to be paid (Art. 54.1.1.1 of the Tax Code);

2)   making a transaction (operation) for the purpose of non-payment (incomplete payment) and (or) offset (refund) of the tax amount, that is, the absence of a business purpose (sub-item 1, item 2, Art. 54.1 of the Tax Code of the Russian Federation);

3)   execution of an obligation under a transaction (operation) by a person who is not a party to a contract concluded with a taxpayer (sub-item 2 of item 2 of Art. 54.1 of the Tax Code of the Russian Federation).

Analysis of tax arbitration practice has identified several of the most common categories of unjustified tax benefit cases. The first are cases of failure to exercise due diligence. The key decision here is the Ruling of the Supreme Court of the Russian Federation on Economic Disputes of 14 May 2020, No 307-ES19-27597 in the case of the "Zvezdochka" shipbuilding company. It is noteworthy that the case was heard by the courts of first instance before Art. 54.1 was inserted into the Tax Code, so the Court could not opine on the positions developed by the jurisprudence already under that article. „However, the wording used in this court ruling brings the era before the adoption of Art. 54.1 of the Tax Code of the Russian Federation as close as possible to the provisions introduced by the new article," the expert stressed.

The second category of cases is the application of the calculation method (the so-called „tax reconstruction"). After the adoption of Art. 54.1 of the Tax Code of the Russian Federation for fictitious document management with dubious counterparties, the tax authorities began to remove not only VAT deductions, but also income tax expenses. While previously the courts were guided by the position set out in Resolution No. 53 of the Plenum of the Supreme Arbitration Court of the Russian Federation, which provides that in cases where a taxpayer has not accounted for transactions in accordance with their actual economic substance, the court should determine the scope of the taxpayer's rights and obligations based on the economic substance of the relevant transaction (by calculation), the approach has changed with the adoption of Art. 54.1 of the Tax Code (Grigoryeva, 2019). This is due to the appearance in sub-paragraph 2 of Clause 2 of Art. 54.1 of the Tax Code of the Russian Federation of an indication of the obligation fulfillment under a transaction by a person who is a party to the contract.

In the academic community, it is customary to distinguish the following types of malpractice: lawful reduction, which does not represent a public danger and does not involve taxpayer liability; non-payment, for which there is a penalty under the Tax Code; an abuse involving penalties; an administrative (tax) offence punishable not only by penalties under the Tax Code but also by fines under the

Code of Administrative Offences (CAO); an offence with increased public danger that carries penalties under the Criminal Code. An example of international practice is the European Court of Justice judgment of 21 February 2006 in Case C-255/02 (Halifax case), in which the Court stated that the consequence of a finding of abuse should not be the imposition of a fine (application of this penalty requires a clear and unambiguous legislative basis), but rather the creation of the obligation to pay the corresponding debt as a result of the failure to pay, resulting in the wrongful deduction of all or part of the „input" Value Added Tax (VAT).

An equally problematic area of application of Art. 54.1 of the Russian Tax Code is its relation to the mechanism of ‚tax reconstruction', which suggests that if a taxpayer has misrepresented a business transaction in its accounts, the tax authority must calculate tax liabilities based on the actual economic substance of the transaction.

Although Art. 54.1 of the Tax Code does not explicitly prohibit tax reconstruction, with its introduction the possibility of determining taxpayers' tax liabilities in cases of abuse of their rights by calculation has effectively come to nothing. This is largely due to the approach of the Russian Federal Tax Service (FTS), as reflected in Letter No. CA-4-7/16152@ of the Russian FTS dated 16 August 2017, where the agency pointed out that, based on the provisions of the article, when an abuse of right is established in the actions of a taxpayer, the tax authority does not determine by calculation the scope of the rights and obligations of the taxpayer who allowed a distortion of the actual economic substance of a financial and economic transaction (Letter of the Federal Tax Service of Russia, 2017).

The tax authorities stressed that if they determine the existence of at least one of two circumstances defined in paragraph 2 of Art. 54.1 of the Tax Code, the taxpayer should be denied the right to accounting for the costs incurred, as well as the application for deduction (credit) of VAT amounts to the full amount of the transaction (transactions) concluded by the taxpayer. This effectively disproved the possibility of applying the tax reconstruction enshrined in Ruling of the Plenum of the Supreme Arbitration Court of the Russian Federation No. 53.

Today, the general position of the Russian Ministry of Finance and the Federal Tax Service is that if a tax audit reveals that a business transaction was not accounted for by the taxpayer in accordance with its actual economic sense (for example, a transaction involving the delivery of goods is recorded, but the counterparty could not deliver that goods due to its nominal nature, the contract work could not have been performed by the stated contractors because they are nominal and lack the relevant technical resources) and that the purpose of these transactions was to overstate their expenses and VAT deductions, previous tax benefit practice

does not apply. Meanwhile, the tax authority has the right to impose additional taxes (VAT and income tax) on these types of transactions in full.

The key arguments of courts in favour of tax reconstruction are the following:

1) Article 54.1 of the Tax Code does not set out the consequences of non--compliance with the requirements set out therein which the tax authorities impute to taxpayers, there is no prohibition on carrying out a tax reconstruction of the profits tax liability by establishing the expense part by calculation on the basis of subparagraph 7(1) of Art. 54.1 of the Tax Code. Article 31(1)(7) of the Tax Code does not appear in the rule in question;

2) It follows from Art. 54.1 of the Tax Code that when there is a formal document turnover with a declared counterparty, but when a third party actually fulfils an obligation in non-compliance with the conditions of Clause 2 of Art. 54.1 of the Tax Code, there is a prohibition on the taxpayer obtaining an unjustified tax benefit precisely by means of unreliable (formal) documents. Clause 2 of Art. 54.1 of the Tax Code, a ban on obtaining an unjustified tax benefit by the taxpayer specifically on false (formal) documents which does not relieve the tax authorities from the obligation to verify – were in reality any business transactions carried out under the guise of formal documentation, in order to identify their true economic sense and determine the true extent of the tax liabilities;

3) a taxpayer who has not submitted any documents on completed transactions to the tax authority for inspection will be put in a better position than a taxpayer who submitted documents that do not fully comply with Art. 54.1 of the Tax Code, which contradicts the principles of justice and legal certainty;

4) the complete non-inclusion of costs in the calculation of profits tax in a situation where the facts of the receipt of goods by the taxpayer and the subsequent use of the goods in the taxpayer's activity are not disputed inevitably leads to a distortion of the real amount of tax liabilities for profits tax;

5) the introduction of Art. 54.1 of the Tax Code was not accompanied by a change in the principles of legal regulation in the area of taxation, the introduction of additional tax offences and sanctions, or a narrowing of the powers of the tax authorities;

6) Article 54.1 of the Tax Code should be applied taking into account the principles of tax law (Art. 3 of the Tax Code, Art. 57 of the Constitution of the Russian Federation), in particular, the tax must have an economic justification and cannot be arbitrary;

7) it is the responsibility of the tax authority to determine the amount of all tax liabilities of the taxpayer for the audited periods based on the conclusions

    laid down in the tax audit act and which are the basis for making decisions on additional tax assessments (Art. 82, Art. e 89 of the Tax Code);

8) continuity of law enforcement practice developed prior to Art. 54.1 of the Tax Code (Rulings of the Plenum of the Supreme Arbitration Court of the Russian Federation No. 53, 30 July 2013 No. 57);

9) the provisions of the tax law do not allow for an additional charge to be levied in excess of the amount established by law, such an additional charge becomes an additional measure of tax liability, which is not provided for in the current tax law;

10) the tax authorities, in the course of tax control measures, determine the scope of the tax liability on the basis of the taxpayer's actual business performance (Decision of the Russian Constitutional Court No. 1440 of 4 July 2017).

The analysis of judicial practice allowed to identify two conditions, the presence or absence of which may affect the right to apply the tax reconstruction:

1) the reality or unreality of the transaction (since the costs of a non-existent transaction could not be incurred, a complete refusal to conduct a tax reconstruction is legitimate);

2) the reality or unreality of the counterparty (if the counterparty is not real, and the transactions are real, then, as practice shows, the taxpayer has the right to apply a tax reconstruction both in terms of accounting for the expenses actually incurred under the transaction, and in terms of VAT deductions).

As for VAT deductions, refusals to apply the VAT deduction within the framework of tax reconstruction for transactions in respect of which misrepresentations were made, took place even before the introduction of Art. 54.1 in the Tax Code of the Russian Federation. After the introduction of the new article, the position of the Federal Tax Service of Russia regarding deductions has not changed – both expenses are not fully taken into account, and VAT deductions are not applied, although there is no unity on this issue in judicial practice.

In addition, the most common basis for negative business decisions of the Federal Tax Service is a sign of the interdependence of the group's entities. The Decision of the Constitutional Court of the Russian Federation of July 4, 2017 No 1440-O on the case of „Master Tool" was illustrative, which worked through individual businesses and companies with related attributes in order to preserve the right to apply special tax regimes when selling tools. As a result, the amount of additional charges was 227 million roubles. The Letter of the Federal Tax Service dated August 2017 summarizes court practice on 'splitting' and provides 17 signs of 'artificial splitting'. However, in practice there are even more signs, characterized by varying degrees of their influence on the decision of the courts.

It is believed that the splitting of business is often imputed to taxpayers who use special tax regimes (Simplified Tax System (STS) and the patent, formerly Unified Imputed Income Tax (UTII)) and individual enterprises (often 6% STS) in the group, in practice the Federal Tax Service often have questions to businesses under the general system of taxation, paying VAT, associated with the creation of 'technical' companies to VAT deductions/VAT reimbursement and overstating the cost of income tax.

When analysing the splitting of a business, the following circumstances raise many questions from the tax authorities:

1)   the absence of the business unit's own personnel;
2)   the agent (subcontracting organization) has only one key principal (customer) working with it at different prices;
3)   lack of own (leased) warehousing, production trading premises, the maintenance of which is systematically calculated;
4)   the separation of business units into a separate structure does not have an economically justified business purpose, such as the expansion of markets – both horizontal and vertical;
5)   business units do not have their own client bases;
6)   the difference in sales price within the group of companies and on the external market is not explained by technological, marketing and strategic decisions;
7)   settlements between business units are performed with significant delays.

In addition to the above, one of the unsuccessful and most common (not only in these authors practice) circumstances is the division of premises and the volume of activities. For example, retail space is divided between the Limited Liability Company (LLC) and the sole proprietorship. However, the costs of security, garbage removal and disposal, and communication services are incurred by one sole proprietorship, and there are no reimbursements from the LLC. In turn, settlements for the maintenance of cash register equipment and repairs are made only on behalf of the LLC. In catering organizations, for instance, it is often the case that there are two receipts from different legal entities – for food and alcohol, although both are in the same territory, served by the same waiters and use the same R-keeper system.

It is quite common for records to be kept in one place, using the same computer programs, a single personnel policy is defined, a single working hours regime is established, a formal distribution of employees among several employers, the presence of a common representative by proxy, a single contact information – a common address and phone number.

All these factors give away the imitative nature of the business divisions and its controllability to one person (group of persons). In addition, the risk occurs when the actual content of the business process does not correspond to the actual state of affairs. In other words, when the subjects have no signs of independence, and the model lacks a business purpose for their appearance, i.e. there is no reasonable economic reason why it is built in this way.

Frequently, one is faced with the fact that the tax authorities make claims against the company, interacting with individual entrepreneurs, performing the functions of the manager (and others), qualifying these relations as labour. As a result of the analysis of the claims made, the authors would like to note the basic attributes by which these relations are defined as labour:

1) contracts provide for the systematic performance of services with their regular payment;
2) the subject matter of the contracts contains a clear indication of specialisations and professions, as well as a specific type of commissioned activity;
3) the contracts include a clause stipulating that the services must be provided in person;
4) the contracts impose material liability;
5) free of charge provision of the Company's property and workplaces;
6) all the reports of sole proprietorship are sent by proxy by one person, an employee of the Company.

A vast number of questions is prompted by affiliation not only with relatives, but also with former employees. However, the formation of new organizations from employees who previously worked in the audited organization is not an independent sign indicating the receipt of an unjustified tax benefit. In this issue, the main point is to prove the independence of the subjects of entrepreneurial activity, the conclusion and execution of contracts in order to carry out their statutory activities, independent payment for their services by transferring funds to their bank accounts, independent accounting of their income, and the definition of the object of taxation.

Thus, in the course of the pre-inspection analysis, the tax authority identifies operations aimed at obtaining an unjustified tax benefit, the main ones of which include:

1) searching for connections with 'problem' counterparties (in order to aggressively optimize VAT and obtain cash);
2) detection of controlled entities on special tax regimes (STS, UTII, patent taxation system) and signs of artificial splitting of business;
3) detection of operations with offshore jurisdictions.

To prove the planned scheme of tax evasion, inspectors establish the absence of financial and economic transactions and analyse:

1) the presence of affiliation (interdependence) of persons;
2) the real structure of business organization: who actually provided the services and goods – the Federal Tax Service is trying to prove that the work was done by the organization's employees and not by contractors, or not done at all (for this purpose they question not only current but also former employees of the organization);
3) documents confirming the questionable operation, including correspondence, minutes of meetings, logs of entry and exit, etc.), as well as information from the traffic police, the use of which allows to easily verify the specified vehicles in the consignment note, and the reality of the transport carried out;
4) location of business units at the same address, common communication contacts, settlement accounts in the same bank, sending reports and bank payments from the same IP, MAC-addresses, the presence of the goods throughout the chain of operations in the same warehouse, etc;
5) the possible costs of the organization to rent fixed assets, to counterparties, the head of which is the owner/beneficiary of the business;
6) controlled foreign companies (CFC) involved in the structure of the company;
7) information obtained by the operational units of the Ministry of Internal Affairs.

The listed attributes are key for field audits because they provide the tax authorities with predictable additional accruals and presuppose a well-tested procedure of control measures. However, the most critical factor is the lack of financial resources for the independent financing of activities: funds are received not by the main activity, but at the expense of loans, bills of exchange. In other words, the entities do not have signs of independence, and cannot justify the business purpose of their emergence and existence, which casts doubt on the independence of business units and clearly indicates their artificiality.

It is important to mention that if the tax authority suspects in the actions of a group of taxpayers a ploy of splitting the business, this may serve as grounds for a sudden seizure of documents and inspection of premises, sometimes together with the Interior Ministry (if the planned amount of arrears is more than 15 million roubles). Ruling of the Supreme Court of the Russian Federation of 17.04.2020 No 306-ES20-3991 pointed out that given the information available to the tax authority in carrying out seizure does not excluded the principle of surprise, because the evidence sought (for example, showing the real movement of inventory items, which were not included in the object of taxation) can be destroyed, hidden, changed or replaced by the latter.

Not only splitting a business, but also splitting real estate is widespread. Thus, the owner of the property (the building) through a sublease transferred the premises in it to third parties for their use, with the proceeds settling on interdependent companies applying the simplified taxation system. Everything was managed by the real estate owner and operating links, the directors of subtenants were nominal and not aware of all the activities of their organizations, and the interdependence meant complete control and coordination of the actions of all participants in the operation. The courts also took into account that all the companies regularly provided interest-free loans to each other. These circumstances are reflected in the Decision of the Supreme Court of the Russian Federation from 26.06.2020 No 305-ES20-8962 and served as the basis for the conclusion of the allocation of revenue to low-tax units through the implementation of splitting the business in order to obtain an unjustified tax benefit (Ruling of the Supreme Court of the Russian Federation, 2019).

Note that as of the beginning of 2021, most of the disputes on artificial splitting of business (72%) were resolved in favour of the tax authorities and the main emphasis is placed on the unproven controllability and non-self-ownership of business activities by participants of interrelated business operations. At the same time, it is important to understand that entrepreneurs must defend their interests in court, proving the business purpose and independence of entities. Analysis of positive decisions for the taxpayer allowed to outline the following tactical points that businesses should pay attention to when they have a dispute with the tax authorities on the issues of splitting the business:

1) availability of the group business unit's own personnel;
2) availability of other principals (customers) working with the agent (subcontracting organization) at different prices;
3) availability of own (leased) warehousing, production and trade facilities, settlements for the maintenance of which are performed systematically;
4) separation of a business unit into a separate structure has an economically justified business purpose (for example, expansion of sales markets – both horizontal and vertical);
5) the subjects have their own client bases;
6) the difference in the price of sales within the group of companies and in the foreign market is explained by technological (tenants made inseparable improvements to the facility, so the rent was lower), marketing and strategic decisions;
7) payments between business units are made on time without delays.

Thus, in order to conclude about the artificial splitting of business, it is necessary not only to determine the dependence of persons engaged in business activities,

but also to prove their actual economic non-sufficiency and the absence of other reasonable goals in building a chain of counterparties, except for the preservation of tax preferences from the use of special tax regimes.

3.3. Conclusions

In the current challenging economic situation, the tax authorities of all countries, including Russia, have a serious problem of improving control over the correctness, timeliness and completeness of the collection of taxes and other mandatory payments. In this regard, the choice of the correct forms and methods of tax control by the tax authorities contributes not only to the stable replenishment of the budget with financial resources, but also to the observance of the legally established rights and freedoms of taxpayers.

At the present stage of the internal financial policy development of the Russian Federation, the forms and methods of tax control are given considerable attention. This is due to the fact that being one of the main revenue items of the budget of the Russian Federation, tax revenues significantly affect not only the economic, but also the overall national security of the state. In connection with the above, the analysis of the historical path of formation and the order of modern regulation of anti--avoidance norms in tax law, presented in the article, is of considerable importance.

The content of the taxation principles is paramount for understanding the methodological essence of taxation and tax administration in the international sphere. Therefore in the study, first of all, the principles of taxation formation in the Anglo-Saxon and Continental models were considered. In addition to the disclosure of the basic principles, the main factors determining the need for the development of professional judgment and its influence on the formation of calculated data were revealed in the article. Additionally, the conducted analysis of the norms on combating tax evasion in the Russian legislation is of practical importance.

In conditions of increasing globalization, the national economic policy of countries, including tax policy, cannot develop in isolation and without taking into account the impact of the economic policies of other powers. As a result of international cooperation, general principles of taxation and control of transnational corporations are being developed, as well as thousands of bilateral tax agreements based on common standards necessary for the separation of powers of competing countries to tax the profits of international companies. The current rules also demonstrate their weaknesses over time, which create opportunities for minimizing taxation and withdrawing profits, which is a reason for the growing concern of state authorities.

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4

Robotics and automation for accounting and tax purposes

Lucie Semerádová*, Pavel Semerád**

4.1. Introduction

Robots and the automation process are gradually beginning to replace usual human activities (Bloom, McKenna, & Prettner, 2018; Halal, Kolber, & Davies, 2016). Although the current situation regarding the COVID-19 pandemic is not due to the influence of robotics, it demonstrates a certain parallel with future developments in the labour market.

People will work more from home (Gonzales-Sanguino et al., 2020; Semerád, Otavová, Semerádová, Hrdličková, & Matzka, 2020). Human interactions, which significantly influence human relations and mutual trust, will also diminish. People will become just anonymous operators, communicating with each other and performing tasks within each process.

Unemployment can also be expected to rise due to the massive rate of substitution of human labour, which can be automated using algorithms and predictable user behaviour (Hildebrand & Bergner, 2019). On the other hand, new jobs and professions can also be assumed to emerge (Borland & Coelli, 2017).

One area where automation is gradually replacing human labour is financial accounting (Crookes & Conway, 2018; Seasongood, 2016). The concept of financial accounting is not only understood as a process involving the entry, classification, measurement and summary of economic information, but also as one leading to compliance with tax obligations.

It is precisely the communication between taxable persons and the tax authorities – which will take place automatically in real time and only with minimal human

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intervention – that can be a benefit, for example, leading to the more successful detection of tax evasion.

One can see this as a great opportunity to make it easier for compliant operators to do business. This way, they do not have to experience constant uncertainty that their business partner will cheat them and that they will have to fulfil their tax obligations on the partner's behalf. This way robots could – through automation – check payers' business partners in real time, alerting them early about potential dangers and the threat of being involved in some kind of tax fraud. This paper aimed to propose such an automated solution without disproportionate paperwork burden and financial costs for taxpayers.

In order to meet the set goal, the study first identified, using an analysis of standard accounting practices for a fictitious model example, areas of possible misconduct for VAT payers. In particular, using a fictitious example of a taxpayer, the authors gradually evaluated each of the steps from placing an order through the point of receipt of a taxable transaction and of a tax document (including its check) to the payment.

Subsequently, the study looked for ways to eliminate these weaknesses, or at least to reduce the risk of liability for outstanding VAT to which the taxpayer may be exposed. However, it should be remembered that there must not be any disproportionate administration on the part of the VAT payer.

As a result, the authors also analysed other tools that are commonly used by taxpayers in their activity, looking for those that can also be used for additional checks. Finally, the study evaluated and proposed the appropriate implementation method for these solutions.
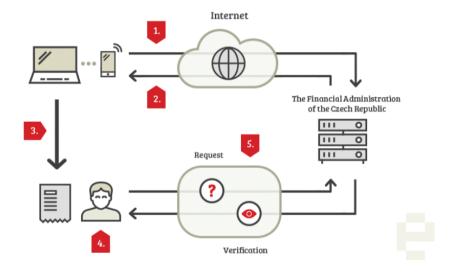
4.2. Theoretical background

It should be mentioned that attempts to detect tax fraud have been made for a long time (e.g. Albarea, Bernasconi, Marenzi, & Rizzi, 2020; Yitzhaki, 1974). The problem, however, is that most of the activities leading to the detection of tax fraud are usually only possible to be done retrospectively (ex-post). In the case of income tax, inspection may normally be carried out not earlier than after twelve months (after the end of the calendar year or financial year), while for the value added tax, this period is of at least one month.

However, there have been significant changes in this sector over the last ten years. In the Czech Republic, for example, an obligation was introduced in 2016 for VAT payers to submit control statements (Semerád & Bartůňková, 2016). While

this still does not replace the obligation to file a tax return or a recapitulative statement, the information contained can be compared mutually. The point is that individual VAT payers send information on all taxable transactions in an electronic format. Thus, the tax authority can check, once it received the data, that both parties (the recipient and the provider of the taxable transaction) have the same values.

In 2017, a system of electronic records of sales was introduced (Radvan & Kappel, 2015; Semerádová & Semerád, 2016). Thanks to this measure, all sales received in cash are recorded automatically within 48 hours at the latest (Figure 4.1). The electronic sales records system does not cover bank transfers and payments via cards, as they maintain the so-called digital footprint. This was not possible for payments in cash even after the introduction of control statements.

1. Entrepreneur sends XML data message about the transaction to Financial Authority.

2. Financial Authority sends back confirmation of receipt with unique code (FIK - Fiscal Identification Code).

3. Entrepreneur issues a receipt (including the FIK) and provides it to the customer.

4. The customer receives the receipt.

5. Registration of the sale can be verified through the web application of the Financial Authority. The customer can verify his/her receipt; entrepreneur can verify the sales registered under his name.

Fig. 4.1. Online registration of sales

Source: (Financial Administration, 2021).

Bank transfers, however, also had their weaknesses. Prior to the 2013 amendment of the VAT Act, there were almost uncontrollable payments made between domestic and foreign bank accounts (Sladkovský, 2013). This particularly concerned the area known as carousel fraud since in this context (e.g. Pfeiffer & Semerád, 2013) there is a targeted attack on VAT. The entity that is responsible for collecting and paying VAT as part of intra-Community transactions becomes an out-of-contact entity before the tax obligation has been met. This is referred to as a *missing trader* in tax theory.

The thus arising entity has a single objective in the chain. It is intended to elicit the refund claim and transfer the received payment to other (foreign) bank accounts immediately. However, when it is to pay VAT, it no longer has enough liquid assets and the state is therefore deprived of the VAT that remains outstanding. Any further transactions between entities in the chain now take place normally. The entities claim refunds and fulfil their tax obligations. It is estimated that EU countries lose around 140 billion EUR to VAT fraud per year (European Commission, 2020).

At first glance, it looks like the tax authorities are defenceless. However, there is some hope provided through the judgments of the European Court of Justice, such as Hallifax (C-255/02)[1] and Kittel (C-439/04)[2]. If it is demonstrated that the entity may have known and should have known that it is part of a fraud, its claim for refund may be denied. This provision has also been implemented in the Czech Value Added Tax Act as Section 109: Liability for outstanding VAT (Act No. 235/2004...). Similarly, the Czech Tax Authority has started to use security orders more frequently to block the bank accounts of suspicious entities before they become out-of-contact operators.

Nevertheless, fraudsters were able to circumvent this provision. Either payments for taxable transactions were made via direct debit companies or were sent to bank accounts abroad. In response, the tax authority extended the conditions under which the recipient is liable for outstanding VAT. An obligation has been introduced for all VAT payers to register their bank accounts with their tax authority, enabling recipients to send money to such accounts without any threat of a penalty. Since these accounts are publicly available on the web portal of the

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[1]   Judgment of the Court (Grand Chamber) of 21 February 2006. Halifax plc, Leeds Permanent Development Services Ltd and County Wide Property Investments Ltd v Commissioners of Customs & Excise.

[2]   Judgment of the Court (Third Chamber) of 6 July 2006. Axel Kittel vs Belgian State (C-439/04) and Belgian State vs Recolta Recycling SPRL (C-440/04).

Financial Administration (Financial Administration, 2013), no recipient could claim they did not know about the unknown bank account.

Another important change was the introduction of a register of unreliable payers. The same place that lists publicly available registered bank accounts provides information as to whether the entity is a reliable or unreliable payer. As per Sec. 106a, "unreliable payer" refers to a payer who is in serious breach of their obligations related to tax administration (Act No. 235/2004...).

However, the recipient has the possibility to exculpate themselves with respect to liability for outstanding VAT in that it is sufficient for them to pay VAT on that taxable transaction directly to the tax authority's account. Yet the problem comes at the very moment when the recipient is about to submit the payment as it may happen that while the provider had not been identified as an unreliable payer by the time of receipt of the tax document (invoice), it becomes one by the due date. This requires an additional check by the recipient, which it must however carry out (manually) before each and every payment unless the recipient's accounting software does the service. This practice needs to be changed. It is necessary to make it easier for compliant operators to do business, for example by protecting them from unfair business partners through IT solutions.

4.3. Results and discussion

Model example

This example is about a VAT payer for whom the authors analysed four key points as they would happen in the ordinary course of business. All of these four points are specific in that the taxpayer (in their own interest) has to verify their business partner manually.
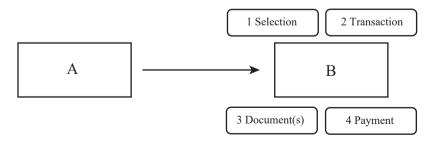

Fig. 4.2. Four key points of responsibility

Source: own work.

Selecting a business partner and placing an order

Business cooperation starts by choosing an appropriate partner. With globalization, entities need not focus only on the domestic market – they can also request goods from business partners from abroad. However, this examplewill only focus on the domestic market.

Depending on the subject of the transaction, the recipient may execute a tender procedure, for example, under the Act on Public Tenders, or by means of online product comparator services. It is enough for the recipient to know the parameters of the product, article or service and to receive potentially reasonable trading offers. Next the bids can be compared with each other, whether based on the price and date of delivery or the reliability of the partner according to other customers' reviews.

In addition, the recipient may make use of publicly available databases for the verification of the business partner, such as the Public Register and Collection of Documents (Figure 4.3), the Administrative Register of Operators (Figure 4.4), the Trading Register (Figure 4.5), the VAT payer verification service (Figure 4.6), and the Customs Administration of the Czech Republic (e.g. Registry of Fuel Traders – Figure 4.7) etc.

Fig. 4.3. Public Register and Collection of Documents

Source: (Ministry of Justice of the Czech Republic, 2021).

Fig. 4.4. The Administrative Register of Operators

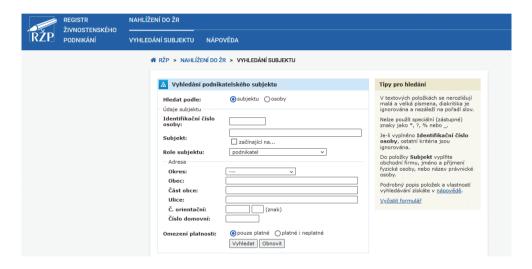Source: (Ministry of Finance of the Czech Republic, 2021a).

Fig. 4.5. The Trading Register

Source: (Ministry of Industry and Trade of the Czech Republic, 2021).

Fig. 4.6. The VAT payer verification service

Source: (Ministry of Finance of the Czech Republic, 2021b).

Since each entity operates independently and under its own responsibility, it is only at its discretion which of the business partners it chooses. Next there is a request for quote and an order is placed. Depending on the terms and conditions agreed by both parties, the order may include an advance payment.

Fig. 4.7. Registry of Fuel Traders in the Czech Republic

Source: (Customs Administration of the Czech Republic, 2021).

There are numerous legal requirements mentioned above, however, the taxpayer must comply with all of them early as it pays the advance, otherwise it could run the risk of liability for outstanding VAT.

Receipt of the taxable transaction

In order for the recipient to exercise their refund claim, all legal conditions must have been complied with. In particular, it cannot be a fictitious supply and the recipient must prove the facts of the matter for each transaction. This can be demonstrated through e.g. delivery notes, delivery records, television/radio spot records in the case of advertising, or photographic documentation, as applicable. The taxpayer should also verify the identity of the provider.

Key point of the responsibility of VAT payer manual system

While the previous two points were built mainly on the principle of human control which is very difficult to outsource, automation can be used when the tax documents are received and checked. If a tax document contains a QR code, it can be scanned into an accounting application, minimizing the risk of error

when transcribing information (Veber, Švecová, Krajčík, & Mašín, 2018). Up-
-to-date accounting programmes that are linked to an email client can do this
automatically (VŠB, 2020).

This can automatically verify the business partner and compare its identification
data with the publicly available data on the public administration portal. The
actual extent of the respective taxable transaction may be verified by an authorized
person as part of the internal communication, particularly with respect to delivery
dates, quality and quantity.

The fact that the provider is an unreliable payer may also be revealed as a result
of this check, thereby taking measures to protect the taxpayer from the negative
effects of the liability for outstanding VAT.

Automated payment system

Regardless of whether an advance has been paid before or during the delivery,
the recipient must meet their obligations and make a payment. This can be done
either manually by transcribing the payment details into the electronic banking
system or by importing payment details directly from the accounting software. In
some cases, payment can also be made in cash, which may be very difficult to do
with respectto distance, or even impossible in terms of legislation since there is
a limit (CZK 270,000) for the maximum daily amount of cash payment according
to the act on the limitation of cash payments.

In terms of liability for outstanding VAT, the business partner should be re-checked
prior to making the payment. Should the taxpayer ignore this requirement, the
relevant legal measure would be applied to them. As the authors consider the
above to be an excess paperwork exercise, they proposed an automated payment
system as a solution.

It can be stated that the weakest link for which there is a risk of liability for
outstanding VAT is the moment of making the payment. The items that precede it
can be verified by the taxpayer, either in person or through their staff.

The moment of making a payment is a very administratively demanding step, since
the taxpayer must re-check their business partner, i.e. the partner's registered
bank accounts and whether the partner's status is "Reliable" or "Not Reliable". In
essence, the bank account number indicated on the invoice is nothing to rely on.

Yet here there is room for using the means of automation and robotics on the part of
the bank, as the bank could implement, as part of the process of creating a payment
order or before it is finally submitted, a tool verifying who is the account owner and

whether or not the account is registered with the tax authority. There could also be a connection to the register of taxpayers and a detail telling whether the entity's status is "Reliable" or "Not Reliable" at the time of payment (Figure 4.8).

Šablona nebo můj účet	FÚ pro JMK Brno ▼				Zaplatit fakturu ze souboru
	Předčíslí	Číslo účtu	Kód banky		
Na účet	721	— 77628621	/ 0710 ▾		
	FÚ pro JMK Brno				

Is the account registered with the tax authority   YES/NO
Is the entity "Reliable" or "Not Reliable"

Variabilní symbol	
Konstantní symbol	
Specifický symbol	
Zpráva pro příjemce	
Poznámka pro mne	

Fig. 4.8. Modified Internet Banking

Source: modified version of Internet Banking (AirBank, 2021) by the authors.

Such an upgrade of electronic banking systems seems to be possible. Already there are banks (e.g. AirBank, 2021) that indicate to the user entering the account number who is that bank account's owner. Consequently, one can see no reason to hesitate in making this option an across the board requirement for all banks.

What banks have not yet been addressing is the connection to the VAT payer verification portal. However, given that banks are already using online banking robots (ČSOB, 2020), these robots could be programmed to verify the information available from the register before the payment has been submitted, and to provide this information to the online banking user.

The user would then have to re-confirm that they insist on the full amount of the payment even though the payee had been identified as an unreliable payer. Obviously, this feature requires costs to be invested by banks, but even if they projected them in their client fees, this would save not only time, but also money spent in any duplicate payment as part of the liability for outstanding VAT.

4.4. Conclusions

The present paper focused on the matter of using robotics and automation for accounting and tax purposes as well as for identifying potential tax fraud.

As mentioned in the theoretical part, in current practice tax entities have to verify their business partners manually when entering each accounting transaction. In this way they have to check the particulars of the business partner and its real existence (to avoid non-existent companies).

Additionally, they have to verify that their partners have sufficient authorisations to carry out business activities (e.g. fuel traders). They also have to check that their partner is not an unreliable taxpayer on behalf of whom they may be liable to pay VAT in the future. At the same time, they must verify the bank accounts into which they pay invoices. Should they pay into an unregistered account with the tax authorities, they would again be liable for the tax obligations of the business partner.

It is precisely because of this administrative complexity and constantly repetitive activity that automation is an appropriate option. Believing that paying into the account of a business partner is the key threat, the authors propose that every bank should be required to implement robotics in their online banking systems to verify this business partner's information on behalf of the payer, as the invoice may be registered at a time when the business partner is not an unreliable payer but may become one on the day of payment. Failure to check this before payment could get the taxpayer into a lot of trouble.

Some banks are already able to identify the beneficiary by showing the owner's name on the display directly as part of the bank account information. Therefore the study proposes that this information should be supplemented by details specifying whether the bank account is registered with the tax authority, and if the owner is identified as an unreliable taxpayer. Based on this information, which can be verified in real time on several public administration web portals, the payer can then decide whether or not to execute such a payment order.

The overall assessment of our proposal, i.e. advantages vs. disadvantages, is presented in Table 4.1. The authors anticipate that additional funds will be required for the production, development and maintenance of this IT solution. These direct costs will be borne by banks. However, this will minimise uncertainty on the part of compliant entities and simplify the whole process of liability for unpaid tax. At the same time, it is assumed that banks will indirectly pass on some of the costs to users of banking systems in the form of fees. Even so, these

Table 4.1. Evaluation of the proposal in terms of its benefits for the selected entities

Criterion/entity	State	Taxpayers	Third party
Current costs	0	+	0
Costs of creating IT solutions	0	0	–
Ongoing maintenance costs	0	0	–
What is the data availability	0	0	0
Change in the level of certainty on the payers' side	Cannot be evaluated	+	Cannot be evaluated
Detection of potential fraud over time	+	+	0
Overall rating	Positive	Positive	Negative

Source: own work.

costs will be lower than if taxpayers had to compensate the state for the entire amount of VAT they are currently liable for.

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5

Modern technologies for VAT fraud detection

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5.1. Introduction

The purpose of the paper was to present a new concept of VAT collection system and to address several challenging issues. The proposed solution deals with VAT fraud by merging a digital invoice system, blockchain technology based on public ledger and AI fraud detection methods. It also refers to the issue of keeping secret sensitive data which are to be stored in publically disclosed blockchain.

The problem of fraud detection is usually addressed in the literature in the context of risk management in the banking or insurance industries. In retail banking, losses resulting from cash loan frauds can reach up to 30% of total credit risk losses. Therefore, insurance companies and commercial banks are greatly interested in developing models that minimize fraud risk. Unlike commercial companies, the EU Member States did not implement efficient solutions and are still debating on possible technologies.[1]

VAT fraud crimes are a significant problem not only for Member States of the European Union, but also for other countries where the tax system is based on the value-added principle. The faulty EU VAT cross-border transactions system is still being used by criminal organizations. The European Commission estimates that losses due to the so-called VAT gap may exceed 150 billion EUR a year. According to estimates by the Polish Ministry of Finance, in 2016 the tax gap in Poland has been significantly reduced. In 2017, it was around 14% of expected tax revenues, while in 2015-2016 it was 23.9 % and 20% percent respectively.

P. Moscovici (EU Spring Package 2019), Commissioner for Economic and Financial Affairs, Taxation and Customs (2014-2019) pointed out that the Member States have increased the efficiency of VAT collection, although losses

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[1]   European Union member states lose 170 billion euros a year due to tax avoidance and evasion (2020 report at World Economic Forum annual meeting in Davos).

of EUR 150 billion per year remain unacceptable. He emphasized that this money not only lines the pockets of criminals, but also of terrorists. He also onserved that significant improvement can be achieved only by a thorough VAT system reform.

In nominal terms, in 2016 the VAT gap decreased by EUR 10.5 billion to EUR 147.1 billion. Therefore, the gap has fallen to 12.3% of total expected VAT revenue, with the gap for the previous year equal to 13.2%. However, the individual improvements within the EU Member States vary. In recent years, the VAT gap has decreased in 22 Member States, where Bulgaria, Latvia, Cyprus and Poland appeared to be the most successful. In each of these countries, VAT losses decreased by more than 5 percentage points, however the VAT gap has increased in six Member States – Romania, Finland, Great Britain, Ireland, Estonia and France.

In recent years, the Polish Ministry of Finance has actively started tracking tax crimes by the implementation of advanced models for identification of VAT and excise fraud schemes. These methods have significantly contributed to the reduction of tax losses. Further development in the system requires the use of advanced AI solutions. Criminal organizations are constantly improving fraud schemes, benefiting from the lack of adequate exchange of information and thorough analysis.

5.2. VAT fraud detection and new technology in the taxation area

Cognitive technologies seem to be adequate as they enable the processing of large amounts of data, information and knowledge and can perform innovative functions, yet the complexity of architecture requires hardware providing high computing power. Cognitive technologies can learn and predict what information will potentially interest the recipient (Hernes & Bytniewski, 2017; Park, 2011). The use of cognitive technology in public finance management allows to introduce new solutions in the field of:

- semantic representation and processing of knowledge,
- automatic conclusions based on information processed by the system,
- automatic generation of decision proposals,
- automatic generation of black lists of suspicious companies,
- assessment (evaluation) of the quality of knowledge accumulated in the system,
- automatic monitoring of phenomena occurring in a company's environment,
- automatic implementation of the control function in the field of VAT,

- implementation of the system's permanent learning process,
- automatic adaptation to changes in public finance regulations.

In Poland the battle with VAT fraud is conducted by the Ministry of Finance, based on a centralized database which requires constant updating by merging additional data from the other ministries. The quality of the collected data is also far from its initial specification, which impacts on the efficiency of the VAT fraud detection process. This is undoubtedly one of the key challenges faced by the developers of IT systems. The scale of the collected data requires special treatment including Big Data technology (Hilbert & López, 2011). Data analysis, concerning billions of records, requires advanced technology. VAT fraud detection systems operate on sensitive and confidential data. This fact precludes the use of some IT technologies based on virtual solutions, i.e. remote server access and cloud computing services offered by leading market players such as Microsoft, IBM and Amazon (Wang, He, & Wang, 2012).

The other EU Member States have also developed their own tools to tackle VAT fraud problems. They are developing AI and traditional statistical models to make the VAT collection system more efficient. Hence, the development and implementation of analytical solutions for tax authorities is nowadays one of the key challenges for every country. As mentioned above, statistical models have been used for years by global corporations in the banking and insurance industries. Banks intensively addressed the problem of model development and of independent model validation after the 2008 financial crisis. Both the Federal Reserve Bank and the EBA (European Banking Authority) supported these efforts by publishing adequate methodology frameworks. They have worked out new standards by implementing stress tests analyses. Currently, financial institutions are well prepared to develop advanced statistical models and possess adequate databases and access to information technology, and employ teams of analysts and software developers who are experts in SAS, R, Python and Statistica. They also have solid historical data, know-how and experience in modeling financial data.

The problem of VAT fraud detection with quantitative methods is not commonly explored in the literature. The researchers usually address it in terms of the financial industry and operational risk management. Anderson (2007) analysed various types of fraud, trying to quantify them in order to apply an appropriate model. Ghosh and Reilly addressed fraud risk among bank customers (Ghosh & Reily, 1994) using a neural network model in order to manage fraud risk. Their research focused on customers who were offered credit cards, and the results revealed that fraud risk can be significantly reduced with the neural network model. Hanagandi, Dhar and Buescher also examined credit card fraud (Hanagandi, Dhar, & Buescher, 1996), and implemented the traditional statistical scoring

model. Dorronsoro, Ginel, Sanchez and Cruz (1997) published their research results based on empirical fraud observations. Carcillo presented an interesting real-time analytical solution for fraud detection which was implemented based on e-commerce data (Carcillo et al., 2017). The method concerned non-integrated data sets, i.e. Big Data. Bogdanov, Jõemets, Siim, and Vaht (2015) addressed the problem of VAT fraud detection on the basis of Estonian regulations noting that sensitive and confidential data require an additional layer of security.

5.3. Multisignature and blockchain in the VAT collection process

This paper focused on a new concept of VAT collection system. The proposed method significantly reduces the VAT fraud risk, as well as cutting down the overall VAT collection costs covered by the state. In the literature there were attempts to define electronic and automated systems; however, the solutions were based on centrally managed nodes governed by tax offices. Unlike the other concepts, the proposed idea leverages a publicly available ledger, where the burden of creating and maintaining the ledger has been shifted to Internet users. Hence, anyone with access to the Internet and with hardware powerful enough can contribute to the tax collection system and be rewarded for it. Such a solution cannot be implemented directly as it is done with the cryptocurrencies, e.g. Bitconi, Etherium. For obvious reasons, not all sensitive information regarding a particular transaction should be publicly disclosed. Similarly to trade secrets, companies are interested in keeping their pricing policies undisclosed. Nevertheless, the tax authority needs to identify every transaction i.e. transaction parties and other details embedded with the invoice. For this reason, the development of the VAT public ledger system is pertinent to meeting the above-mentioned assumptions.

The publicly managed ledger has also one profound advantage; as the transactions are identified and collected by a distributed system, there is no need to spend public funds on developing expensive computing centres, appropriate software and its maintenance. The implemented protocol needs, however, special transaction encryption to protect the data available to authorized parties. The paper also presents an analytical solution that allows to reduce the cost of the VAT collection process, whilst keeping the data confidential despite the use of publicly disclosed public ledger.

Evans (2003) proved that administrative costs are often above 1% of total tax revenues. The OECD analysis for 2000-2009 showed that administrative costs for Poland were around 1.78% of the total tax revenue. The lowest cost was recorded for Switzerland at 0.3%. However, Shaw, Slemrod, and Whiting (2010) showed

that in the UK, income tax collection costs can reach up to 4.5% of total tax revenue. Therefore, assuming that the cost of the VAT collection process in the European Union is within the range of 1% to 3%, it may cost the EU Members[2] between EUR 12.2 bn – 13.7 bn per year. Therefore, any solutions that make this process automatic may save significant amounts of money.

A groundbreaking idea relating to the detection of VAT fraud and its collection was presented by Ainsworth, Alwohaibi, and Cheetham (2016). The authors introduced a new concept of VATCoin cryptocurrency addressed for the Gulf Cooperation Council. They suggested that VATCoin should be implemented by the GCC in conjunction with a Digital Invoice Customs Exchange (DICE) to create a unified system. In this way the solution would be fiscally efficient, technologically advanced, and fraud-proof. The authors noted that taxes should not be paid or held in real currency, but remitted and collected in VATCoin.

The proposed solution (Figure 5.1), as in Ainsworth's concept, is also based on Digital Invoice. Hence, every contract (e.g. between A and B) should be recorded and documented with an electronic invoice, or to be more precise, it should be finalised in the form of a smart contract.

The idea of smart contract is not new. It was first proposed in the early 1990s by N. Szabo[3]. A smart contract is an intelligent contract that has the structure of a computer algorithm. Basically, it is the electronic version of a traditional contract, And its purpose is to legally link two or more parties who want to conclude a contract with each other. Thus each contract has its own block address. Furthermore, the contract should be saved in such a way that the address or some of its details are available only to the authorized parties. These types of a contract offer a number of benefits, one of them is trust existing on both sides of the contract. The code is available only to the participants of a given contract, therefore it ensures the desired security. Smart contracts are also automated and therefore it is difficult to reverse an initiated process, i.e. a result of an agreement. It is also much easier to sign such a contract for all parties due to its efficiency and low costs. Signing the smart contract does not involve any third parties in this process and therefore no payment platform or brokers are needed, which obviously eliminates the transaction commission.

A smart contract can be deemed as a secured stored procedure. Its effects are strictly enforced and cannot be manipulated by unauthorized persons. Furthermore,

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[2]   https://ec.europa.eu/taxation_customs/business/tax-cooperation-control/vat-gap_en
[3]   The original text "Smart Contracts" is available at: http://www.fon.hum.uva.nl/rob/Courses/ InformationInSpeech/CDROM/Literature/LOTwinterschool2006/szabo.best.vwh.net/smart_ contracts_idea.html (29 January 2020).

transactions with specific contract details are stored in a blockchain which keeps the transactions in chronological order. The advantage of this approach is that the execution of all contracts is not controlled by any arbitrary server-side program, but managed by the protocol itself.

As smart contracts cause financial consequences, they also need to be examined from the legal point of view. The US Senate addressed this problem in its report[4] in 2018, noting that the smart contract concept is rooted in basic contract law. The common practice is that the judicial system adjudicates contractual disputes and enforces terms. However, it is also common to have an arbitration method (e.g. international transactions between two or more companies). Therefore, smart contracts can be deemed as a program which enforces the contract built into the code.

In other words, a smart contract can be defined as a computer protocol intended to facilitate the settlement of a contract. Hence it allows the performance of credible transactions without third parties. What is crucial is that these transactions are trackable and irreversible – as required for any tax collection system. Nowadays, it is obvious that many contractual clauses may be made fully self-executing and self-enforcing. Extraordinary security, and the above-mentioned advantages make smart contracts superior to traditional contracts, where legal fees and other costs are usually economically significant.

The proposed system identifies transactions via an electronic invoice protocol. Electronic invoices are generated and authorized in the central tax office system with adequate user interface. This online system provides a unique key to each transaction which is authorized using multi-signature technology. Thus, for its validity, the invoice needs to be submitted and electronically signed by all three parties i.e. seller, buyer and tax authority.

A multisignature is not a new idea. It has been known for thousands of years to protect e.g. the security of crypts holding the most precious relics of saints. The superior of a monastery provided monks only with partial keys for gaining access to the precious relics. In this way a single monk could not gain access to the relics and steal or destroy it. The multisignature method, also known as multisig, requires multiple keys to authorize a transaction. Unlike the traditional approach, where a single signature from one key is required, a multisignature may need two or more signatures for authorization. This technology has a number of

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[4]   The original text "Smart Contracts" is available at: http://www.fon.hum.uva.nl/rob/Courses/ InformationInSpeech/CDROM/Literature/LOTwinterschool2006/szabo.best.vwh.net/smart_ contracts_idea.html (29 January 2020).

applications. For a cryptocurrency like Bitcoin, this allows to divide responsibility for possession and spending currency among multiple users. It also minimizes the threat of a single point of failure by making the wallet more difficult to be compromised.

A multisignature is also used to enhance the security for private keys storage. The private key required to send money (e.g. cryptocurrency) can be spread across multiple machines. An arbitrarily selected number of keys is then needed to send money. It is expected that hackers are unlikely to steal more than one key. It also helps in cases when one of the keys, e.g. stored in smartphone, is lost. Then the other keys can be leveraged simultaneously to authorize the transaction. Therefore, basically the multisig wallet can be of the m-of-n type. This means that any 'm' private keys out of a 'n' possible keys are required to authorize the transaction.

Fig. 5.1. VAT distributed public ledger

Source: own study.

In particular, an electronic invoice should contain the following data:

- invoice identification number,
- seller's tax number,
- buyer's tax number,
- identification number of the good/service sold (PKWIU),
- the number of goods/services sold,
- net good/service value,
- VAT rate,
- payment date,
- delivery date,
- supplier's account number,
- recipient's account number.

A smart contract contains all relevant data including payment and delivery details. Having this information, it will be possible to charge VAT, settle payments in the

banking system, as well as settle inventory at the time of delivery. It is assumed that the banking industry will adapt their systems to retrieve and execute the code contained in smart contracts, and expected that banks will adapt their systems to accept smart contracts to make automatic payments with relevant clearing houses. Hence the banks need to be prepared to settle the contracts with SWIFT SEPA, Elixir, and other popular systems.

The Tax Office multisignature authorization plays a key role in the process of VAT fraud detection. It provides an on-line control over blockchain creation. This is the moment when AI algorithms should be implemented to detect potential fraud. The first of three phases is focused on the detection of outliers, therefore the elliptical homogeneity of the multivariate observations should be examined. The multivariate space is defined not only by contract characteristics, but should also cover a company's balance sheets and P&L data, dynamics of financial ratios or even the personal and capital relations of key shareholders. Hence, if the distance of a particular contract (measured with appropriate metrics, e.g. Mahalanobis distance) is large enough, the transaction should be thoroughly analysed.

Under phase two, the randomness of the fraud process should be examined. It is obvious that criminal organizations will always be trying to extort VAT. Therefore, some random attempts are expected through various regions, industries, countries etc. Any non-random activity detected with statistical tests e.g. the Wald Wolfowitz test, should trigger an appropriate procedure at the Tax Authority to examine potential frauds. The last phase should focus on pattern recognition methods with a training sample. Under this approach the historical fraud schemes should feed the models in order to calculate fraud probability.

All the above-mention phases are meant to detect suspicious transactions which may be a result of illegal activity. Therefore, the Tax Authority should have the ability to refuse transaction authorization and eliminate it before it goes to the blockchain.

Once the transaction is signed by three parties, it will be automatically directed to Nodes to create the next block in the blockchain. Individual Nodes will compete with each other to create the block. The Node which first provides proof of work under the consensus mechanism will have the right to create a new block. Hence the proposed solution is based on a distributed available public ledger. As with the Bitcoin network, it is planned that there will be no restrictions regarding Nodes contributing to the blockchain creation process. A new block will be then propagated to all system participants.

The key challenge is to ensure sensitive data secrecy while it is being processed on public servers. As mentioned earlier, some transaction details should be available

only to the parties involved in the contract and the Tax Authority. To meet these requirements the multisignature procedure and block creation need to be enhanced. It is assumed that the Tax Authority will be responsible for generating a unique DIN (Digital Invoice Number) and encryption of sensitive data such as the Tax Identification Number of the parties engaged in the transaction. To ensure anonymity of the parties in the public ledger, the encrypted TAX ID numbers will be embedded into a transaction block instead of the original tax numbers. Furthermore, to provide a high-level confidentiality, it is necessary to code Tax Identification Numbers in such a way that the encrypted output should change every time the transaction is made, otherwise it would be relatively easy to identify some tax payers based on, e.g. its total turnover, transaction frequency, services type, etc. For this purpose a hashing function can be leveraged, where Tax Identification Number would be merged with one randomly generated by the Tax Authority alphanumeric sequence. This way, only the Tax Authority will have access to full information regarding parties involved in the transaction, even though the transactions are embedded in a public ledger. Hence the Tax Authority needs to implement such an algorithm to identify the parties in the blockchain.

5.4. Conclusions

There is no doubt that the EU VAT collection process is inefficient and costly. It is estimated that more than 50 billion EUR may go to criminals and terrorist organizations. The regulations are being made more and more complex, which also encourages criminals to pursue VAT extortion. The cross-border transaction with 0% VAT rate is commonly used by fraudsters. Additionally, scant communication between Tax Authorities of EU Member States makes fraud easier.

It is obvious that further changes of VAT regulations by making them more complex and case-detailed will not stop criminals from VAT extortion and will make the collection process more expensive. The problem needs groundbreaking solutions based on modern technologies such as AI algorithms, blockchain, multisig and asymmetric encryption. Fully automated data processing according to a defined protocol can minimize VAT fraud, Tax Authority costs and other social costs.

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Summary

This monograph aimed to present issues related to tax avoidance and accounting. The monograph was created thanks to the cooperation of authors from Central and Eastern Europe, i.e. Poland, the Czech Republic and Russia. The authors of individual chapters were distinguished by their various interests related to tax avoidance and accounting. The authors represent various academic centres in Central and Eastern Europe.

The first chapter is devoted to theoretical issues related to various accounting systems and fraud detection in financial reports. The author pointed out that the commonly used methods of detecting fraud in financial statements were developed in the United States, and are suitable in particular for the Anglo--Saxon accounting system. The author also noted that all V4 group countries use Continental accounting systems, and manipulation of financial statements concerns profit smoothing, especially for tax purposes. Despite the differences between the objectives of financial statements manipulation, the areas from possible manipulation were identified, and the standard variables for detection defined. This is an area for further research in modifying methods for use in V4 group countries.

The second chapter covered issues related to GAAR. Its authors presented the effects of introducing the general anti-abuse rules in Poland, and compared the amount of individual interpretation's decline and the amount of securing opinions issued in the studied period. The tax risk has been raised significantly.

The issues related to tax risk are also presented in Chapter 3. The author reveals the main aspects of the influence of uncertainty on the definition of tax risks and the policy of their identification in the Russian Federation. Uncertainty in taxation, as a rule, arises from the impossibility to provide all situations that may occur in practice in the regulatory documents. Therefore, legislative acts define only general principles (directions) of problem-solving in many cases. There may also be occasions when there are no general principles or contradictions in the regulatory framework. In all of these, the accountant is indeed faced with uncertainty. Today the issues of combating tax abuse have gone beyond the framework of national legislation. They are evolving on the basis of international

experience and recommendations of many documents generated by international organizations.

The last two chapters deal with new technologies in tax fraud disclosure. In Chapter 4, the authors focused on using robotics and automation for accounting and tax purposes and identifying potential tax fraud. They aimed to find a solution that would allow automated checks without increasing any taxpayers' paperwork by modelling a fictitious example to analyse four steps from placing an order to paying as part of a standard business transaction. The autghors identified weaknesses that could have a negative effect on taxpayers in the form of liability for any VAT unpaid by their business partners.

In the last, fifth chapter, the authors described the methods of detecting tax fraud related to VAT. As further changes of VAT regulations indicate, making them more complex and case-detailed, will not stop criminals from VAT extortion and make the collection process more expensive. The problem needs groundbreaking solutions based on modern technologies such as AI algorithms, blockchain and asymmetric encryption. Fully automated data processing according to a defined protocol can minimize VAT fraud, Tax Authority costs and other social costs.

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