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DISCOVERING CORPORATE FRAUD AND ACCOUNTANT FAILURE: CAUSES AND SOLUTIONS

DESCOBRINDO FRAUDES CORPORATIVAS E FALHA DO CONTADOR: CAUSAS E SOLUÇÕES*

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Abstract: The main objective of this study was to discovering corporate fraud and accountant failure: causes and solutions. To collect research literature, library and vector methods were used. The method of this research was descriptive and correlation based on synthetic data and used regression statistical method to investigate the independent and dependent variables. The statistical population of this research is the companies listed in Tehran stock exchange during the period from 2008 to 2018. Using the screening sampling method, 97 companies were studied as the statistical sample size. Data analysis and processing were performed using Eviews9 software and statistical tests (logistic regression). The results of the analysis of the data of this study regarding the research hypothesis that "the diversity of business complexities has a significant effect on the probability of the auditor's penalty (audit failure due to fraud in the company)." It showed that the "variety of business complexities" has a positive and significant effect on the probability of the auditor's penalty (audit failure due to fraud in the company). This means that the variety of business complexities leads to audit failure due to fraud in the company. Therefore, the hypothesis of this research cannot be rejected. According to the results of this research based on the effect of variety of business complexity on the probability of auditor fines (failure to audit in the company), auditors should suggested consider risk associated with variety and complexity of business. On the other hand, it is recommended to managers that in monopoly and monopoly markets, the use of diversification policy will not work; Because to achieve a desirable performance, they need to pass on monopolies and rent rents. Therefore, in addition to product diversification, managers should consider using other available tools.

Keywords: Discovering Corporate. Fraud. Accountant Failure.

Resumo: O principal objetivo deste estudo era descobrir fraudes corporativas e falhas contábeis: causas e soluções. Para a coleta de literatura de pesquisa, foram utilizados métodos

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de biblioteca e vetoriais. O método desta pesquisa foi descritivo e correlacionado com base em dados sintéticos e utilizou o método estatístico de regressão para investigar as variáveis independentes e dependentes. A população estatística desta pesquisa são as empresas listadas na bolsa de Teerã durante o período de 2008 a 2018. Usando o método de amostragem de triagem, 97 empresas foram estudadas como o tamanho da amostra estatística. A análise e o processamento de dados foram realizados utilizando o software Eviews9 e testes estatísticos (regressão logística). Os resultados da análise dos dados deste estudo a respeito da hipótese de pesquisa de que "a diversidade de complexidades empresariais tem um efeito significativo sobre a probabilidade de penalidade do auditor (falha na auditoria devido a fraude na empresa)". Mostrou que a "variedade de complexidades empresariais" tem um efeito positivo e significativo sobre a probabilidade de penalidade do auditor (falha na auditoria devido a fraude na empresa). Isto significa que a variedade de complexidades do negócio leva ao fracasso da auditoria devido à fraude na empresa. Portanto, a hipótese desta pesquisa não pode ser rejeitada. De acordo com os resultados desta pesquisa baseada no efeito da variedade da complexidade do negócio sobre a probabilidade de multas do auditor (falha na auditoria na empresa), os auditores devem sugerir considerar o risco associado à variedade e complexidade do negócio. Por outro lado, recomenda-se aos gerentes que nos mercados de monopólio e monopólio, o uso da política de diversificação não funcionará; Porque para alcançar um desempenho desejável, eles precisam repassar monopólios e aluguéis de aluguel. Portanto, além da diversificação de produtos, os gerentes devem considerar o uso de outras ferramentas disponíveis.

Palavras-chave: Descobrindo a Empresa. Fraude. Falha do Contador.

Introduction

Numerous financial crises from the 1930s to the bankruptcy of companies such as Enron and WorldCom and the occurrence of large frauds in many other companies in the 2000s prompted many to fight against fraud through prevention, controlling and monitoring (Pedneault, 2010). Enforcement of laws such as Foreign Corrupt Practices Act 1977 and the Oxley (2002) in the United States and accordingly, allegiance of some countries to follow the same law in order to prevent fraud, not only had increased managers' responsibility for fraud risk management but also created a space within which, in addition to lawsuits and regulations, managers seek to develop and implement strategies for prevention and detection of fraud (Mahdavi and Ghahremani, 2017).

The popular axiom in auditing says most frauds are discovered by chance rather than by auditing or an accounting system (Mahdavi and Ghahremani, 2017). However, many books have been written on fraud auditing which explored auditing after its occurrence. In other words, the auditor detects and confirms the occurrence of fraud either by chance or by routine methods¸ (Bologna and Lindquist, 2006). Auditors play an important role in

protecting investors from receiving incorrect, incomplete and misleading financial information. Therefore, if auditors had been more vigilant and skeptical, they could have prevented some recent audit failures (Rezaei and Cramble, 2007). The main issue of the present study is that given the complexity of the information environment in organizations and especially the accounting information environment and the variety of complexities in today's business, what is the role of auditors in addressing these complexities? And whether auditors' inability can lead to a lack of detection of fraud due to the complexity of the information and business environment? Therefore, the main purpose of the present study is to answer the problem and for this purpose, designs a testable hypothesis and uses the appropriate method to solve the problem.

In the global economy, fraud has a significant impact on auditors' reports; therefore, this has always been one of the biggest challenges facing researchers in the field of fraud; how can they go one step further than white-collar criminals? Economies of many countries undergo severe losses due to the fraud, also because of the growing impact of corporate audit reports on the stability of financial markets, recently, extensive efforts have been made to improve audit operations, tools and techniques in order to enable auditors to do auditing process based on appropriate and accurate information. However, information complexity is one of the main problems in the audit process, which may decrease the detection of corporate fraud. Therefore, the aim of this study is to investigate the role of business diversification and complexity as measures of information complexity on the auditor's failures to detect corporate fraud using auditor analysis. With this in mind, no research has yet examined the impact of a variety of business complexities on the auditor's inability to detect corporate fraud using auditor-level analysis. Therefore, the purpose of this study is to investigate the role of business diversity and complexity as a measure of information complexity on the auditor's inability to detect corporate fraud using auditor level analysis using multivariate logistic regression and real stock company data which tries to fill the gap of research and development of literature in this field.

The next sections of the research, including the theoretical foundations and research background stated in the second section, as well as the research method in the third section, the research findings in the fourth section and then conclusions and discussions.

Theoretical foundations and research background

Theoretical background

Attracting investments and financing and other economic activities depends on the validity or authenticity of the corporate's financial statements. Nevertheless, certified public accountants play a key role in this process. Blazenko and Scott (1986) argued that the certified public accountant (CPA) acts as an overseer who can reduce information asymmetries between the audit of the firm and accreditation investors to help promote the accountability of the firm's financial reports for stakeholders. In these circumstances, independent auditors can be responsible for audits of the audit process that must be properly articulated and disclosed. Previous academic studies on business complexity and diversification have relied heavily on business strategies and firm value, and few studies have focused on the role of auditors. (Bologna and Lindquist, 2006; Rezaei and Crumble, 2007; Mahdavi and Ghahremani, 2018; Kornaz et al., 2019 and Evans, 2020).

The complexity of the system is not caused by complex rules, but arises out of internal organizational relationships, interactions, and reciprocal relationships of factors within and between the system and the environment. Complexity can be analyzed in terms of structural or operational complexity. The cost of the structural complexity relates to predictable production cost, the cost of the manufacturing process, the cost of the raw materials and labors. The cost of the operational complexity relates to the unexpected cost associated with variation in producing the product resulting from the uncertainty in the customer demand. It also results from continuous loss in the organization caused by shortfalls. (Alamoudi and Kumar, 2017).

Complexity is one of the most important issues in financial reporting, and among them, reporting and reporting on financial instruments are more complex. The US Securities and Exchange Commission (2008) defines financial reporting complexity as “the difficulty for users to understand the economic substance of a transaction or event by filling out accounting disclosures in Form 10-k." (Asifer, 2008). Peterson (2012: quoted in Lal, 2014) also described the complexity of accounting information as "the complexity of inherent problems in applying accepted accounting principles and charting a corporate's economic activities to identify and measure the elements of financial statements using accounting rules." He pointed out that the complexity of accounting information is related to understanding income and also failure to complete the annual reporting form to the Securities and Exchange Commission.

In general, information complexities are some problems that, according to the International Accounting Standards Board, are due to the following: a) number and financial instruments; B) hedge accounting; C) the scope of accounting standards for financial instruments and the definition of financial instruments; D) Lack of knowledge about financial instruments; E) presentation and disclosure; F) Other issues (such as accounting unit). For example, to use the correct accounting practice for acquisition of another entity created relatively complex and significant accounting issues, or increasing the number of corporate products can raise the final cost of the product (IASB, International Accounting Standards Board, 2008).

Also, Gort (1962) defined diversification as "output heterogeneity", and argued that two different products servicing different markets, and that the cross elasticity of demand was low in that the resources of one product for short-term usage could not be transferred to the other product. Berry (1975) argued that diversification was the result of increasing contact by business with other industries. Pitts and Hopkins (1982) considered business to replace industries, and defined diversification as the level of simultaneously running multiple businesses by an enterprise.

Thus, studies that have focused on diversity have further discussed the correlation between diversity strategies and operational performance or firm value. However, previous research did not reach a consensus on the correlation between product diversification and business performance (Hoskisson and Hitt, 1990: Ramanujam and Varadarajan, 1989 Hollowell, 2007; Ferreira, 2016 and Omotayo et al., 2020).). Lang and Stulz (1994) showed that indicated companies with business diversification had lower performance than the ones without diversification, and having 13-15% lower corporate values in average. Berger and Ofek (1995) further identified excess investment as the reason why diversified companies had low corporate values. Jiraporn et al. (2008) examined the effect of geographic and industrial business diversity on profit management and found that industrial diversity reduces a firm's profit management. In addition, a company that is simultaneously involved in industrial and global diversity is much less involved in opportunistic activities and profit management. However, absolute global diversity has no effect on profit management. Businesses are increasingly using product diversification as an option for strategy planning (Rumelt, 1974). Diversification in business can bring a corporate many benefit such as lower earnings volatility (Lewellen, 1971), distribution of corporate investment risks (Chatterjee and Lubatkin, 1990), making economic profit using existing resources to enter new businesses, and increased remaining resource usage (Reed and Luffman, 1986). However,

such diversification can lead to higher costs such as organizational communication and coordination, misallocation of resources (Rajan et al., 2000; Scharfstein & Stein, 2000) and greater transaction costs (Hitt & Smart, 1994). According to agency theory, the complicated organizational structures resulting from business diversification can increase operational uncertainty, communication costs and coordination among stakeholders and corporate managers. Because business diversification can have many benefits to managers, such as greater manager compensation which is strongly correlated with the corporate scale, managers endeavor to expand the corporate scale through business diversification to gain more rights and higher compensation (Jensen, 1986: Stulz, 1990: Jensen and Murphy, 1997).

On the other, Francis et al. (2009) showed that businesses with diversified ownership structures, were inclined to hire auditors from large audit firms. Liu and Lai (2012) also found that, according to agency theory, the diversified clients hiring these auditors could decrease information asymmetries between managers and investors. However, Choi et al. (2012) showed that auditors can improve the quality of accruals-based profits only for less diversified customers.

Previous literature on auditor failure focused mainly under process association with audit quality and the characteristics of the audited clients. For example ¸Palmrose (1988) examined auditing and certification quality based on audit failures and lawsuits, and concluded that companies whose financial statements are not audited by large auditing firms have differences in the quality of their auditing with firms audited by large corporations Large audit firms providing high quality audit services attach particular importance to the assumption that higher audit quality is less subject to litigation. Also, Knapp (1991) showed that audit quality assessments by audit committee members could be affected by the accounting firm size and the expertise of the auditors. Regarding the characteristics of audit clients, Stice (1991) used a paired sample approach to study the correlation of the client and the certified accountant characteristics that are relevant to the audit lawsuits and identified these as the corporate's financial status and asset structures and market value. In general, corporate scandals are simply related to information complexity including diversification of business complexity, in which certified accountant plays a vital role; therefore, this study focuses on identifying the associations between the complexity of business diversification and the auditor's punishment for corporate fraud (auditor's penalties). Previous literature on audit problems and shortcomings has focused primarily on the impact of audit conservatism or on the value of clients' stocks by focusing on the judicial environment. These studies have used accounting firms mainly because of specific accounting systems and related legal actions

that imposed penalties on the chartered accountant for auditing fraud. But these studies have not focused on fraud and inadequacy in corporate auditing due to information complexities. Certified public accountants in different countries face different environments of risk and different legal claims and requirements for specific approvals. This study aims to examine these factors for the complexity of company information, such as business diversity, and to determine whether these factors increase the complexity of audit risk that leads to the auditor's inability to detect company fraud. The following is the experimental background of the research.

Experimental background

Review of the literature indicated that less research has discussed the accounting information complexity and audit failure in corporate fraud. Therefore, the researcher is limited in expressing the empirical background of the research, and in this section, only a few of the most relevant studies in this field are described as follows:

Khoshkar et al. (2016) in a study investigated the effect of complexity of accounting information and audit quality on auditor change. Their research findings show that the complexity of accounting information and audit quality has a negative and significant effect on auditor change.

Salehi et al. (2017) investigated the complexity of accounting information delayed presentation of audited financial statements and information asymmetry with an emphasis on the role of audit quality. In this study, information complexity has been measured based on the developed model of Izadinia et al. (2014). To test the research hypotheses, 83 firms listed in the Tehran Stock Exchange during 1389 to 1394 period were investigated through combination of data regression. The findings revealed that the accounting information complexity did not have a significant effect on the timeframe for the preparation of financial statements by companies, but leads to an increase in the delay in the duration of the audit process. On the other hand, the delay in submitting audited financial statements raised the information asymmetry. The auditor's expertise in the industry as a standard of the audit quality reduced the length of the audit report process. Also, the interactive effect of auditor's specialty and the accounting information complexity had a significant negative association with the delay in the audit report process.

Azizkhani et al. (2015) explored "the effect of extensible business reporting language (XBRL) on auditing: opportunities and challenges". According to the program of Iran Securities and Exchange Commission to use XBRL for financial reporting in the capital

market, this study examined the opportunities and challenges related to the use of XBRL in the Iranian capital market for the auditing profession. Using a questionnaire distributed among certified public accountants, the results of this study showed that the use of XBRL in three areas of comparability, accuracy and presenting information for the auditing profession create opportunities and ultimately improve audit quality. Moreover, there was the risk of errors in the XBRL Glossary as well as the need to change the audit processes required for audit XBRL information were introduced as auditing challenges if XBRL was going to use in the capital market.

Jabbarzadeh et al. (2014) examined the relationship between the quality of auditing and filing lawsuits against the auditor in the Tehran Stock Exchange. This research was done using the data of period 1381-1389. Krishan & Zhang (2005) model was used to measure litigation against the auditor and Jones modified model was used to evaluate the quality of the audit. The findings of this study showed that since there was no distinction between the audit quality of large auditing firms and small auditing firms in relation to customers with higher risk of litigation than customers with less litigation risk in companies listed in the stock exchange, auditing firms (small and large) considered their clients similarly (clients at high risk or clients at low risk), and regardless of fact that, they file a lawsuit against them or not, they attempted to provide high quality auditing.

Sirani et al. (2009) in a study examined the effect of experience and complexity of auditing issues on the auditor's judgment. In this study, using Simon decision-making model, structural, semi-structured and unstructured tasks were studied and the subjects were divided into two groups: "experienced" (certified public accountants working in the audit organization) and "inexperienced" (organizational levels). Lower and less experienced auditors working in the audit organization). A separate study conducted with 46 partners and an audit director is the basis for determining the complexity and determination of structured, semi-structured and unstructured tasks and the experience needed to judge to evaluate these tasks. The results indicate that there is a significant difference between the decisions of the test groups and inexperienced auditors are not reliable replacements for auditors, especially in the case of unstructured tasks.

Rososka (2020) in a study on the financial reporting system and the role of auditing to prevent fraud and protect shareholders. The purpose of this study is to discover the reasons for auditing financial scandals and consulting on how to provide emerging technologies to provide a suitable solution for them. In particular, this study seeks to find ways to defraud financial statements and explain the progress that has been made in this area,

which affects the reliability of financial information for investors. Their findings show that new technologies such as blockchains, integrated Internet networks, and the use of smart contracts can reduce complex financial reporting problems to some extent and help auditors detect potential fraud. Also, these findings showed that these tools lead to greater dynamism in financial reporting and in addition to a positive change in financial reporting, also increase the reliability of reports.

Hung and Cheng (2018) examined the impact of information complexity on audit failures due to fraud in the corporate. This study examined the relationship between related-parties transactions, the level of diversification and auditor sanctions arising from corporate fraud. The sample firms were manually collected from the list of auditor partners sanctioned due to corporate fraud according to the securities and exchange act and the certified public accountant act in Taiwan between 1992 and 2010. The findings of this study indicated that increasing complexity of corporate information with increasing the aggregate monetary values of related-party transactions. Especially revenue-based related party transactions (RPTs), increases probability of auditor sanctions. In addition, more complex product diversification raises the likelihood of auditor sanctions.

Hoitash et al. (2017) explored the association of accounting reporting complexity and analyst behavior. In this study, they used scalable financial reporting language as a measure of accounting complexity. The findings of this study show that behavioral economists cover less of the complexity of accounting reporting.

Michael et al. (2017) in a study examined the role of accounting information in public sector financial auditing. Findings of this study were based on semi-structured interviews with 55 senior auditors and international standard auditors. The auditors were from Australia, Canada, New Zealand and the United States. The findings of this study showed that accounting information can affect the performance of auditors.

Lehman and Norman (2006) conducted a study entitled "The Effect of Experience on Presenting Complex Issues and Judgment in Auditing: An Empirical Study". The purpose of this study is to investigate the results of judging the evaluation of continuity of activity at different levels of experience. The auditor's experience is considered as an independent variable and the auditor's judgment is considered as a dependent variable. The results of this study indicate that experienced auditors had fewer problems in responding to the issues raised and presenting the results than less experienced auditors.

Charlie Kalinenen (2004), in a study examining a topic called "Enron as a sign of audit process failure" and asked whether the Sarbanes-Oxley Act could cure the disease. The

Sarbanes-Oxley Act is largely due to Enron's failure and is an attempt to improve the audit process for state-owned companies in the United States. The relationship between the provisions of this law and the process of misdiagnosis and reporting, as well as their potential effectiveness in preventing similar cases of auditing fraud, has been considered. From the analysis of this article, it can be concluded that most of the provisions of the Sarbanes-Oxley audit are related to strengthening the auditor's independence.

Based on the theoretical foundations and research background, the hypothesis of this research is presented as follows:

Hypothesis: The variety of business complexities has a significant effect on the probability of the auditor being fined (audit failure due to fraud in the company).

Methodology

Research method

This research is considered as an applied study. Data for review of literature and research background were collected through library method. Document mining has also been used to collect the data required for testing the hypotheses and data collected annually from the audited financial statements of firms listed in the Tehran Stock Exchange and existing databases in this field, such as Rahavard Novin software. Based on the existent literature, this study took certified public accountants as its object. The punishment data of auditing firms with fraud was sourced from the names listed by the Intelligence and public Securities Department for punishment and violation of these exchange rules and regulations of certified public accountants in Iran. The names were compared one by one with the penalties, and news released to check whether they were of certified companies with fraud and complete financial data. The statistical population of the present study was the firms listed in the Tehran Stock Exchange between 2008-2018. After applying the following filters, 97 accepted companies were selected:

- Their financial period should end at the end of March of each year;
- During the research period, their stocks did not have a trading interval longer than 6 months;
- Their information is available;
- Do not change the fiscal year; And
- Not be part of companies in the investment, financial intermediation, banking and insurance industries.

Considering the requirements of no change in the fiscal year and no interval of trading longer than 6 months during the research period was because of the fact that when the trading symbol of the corporate was closed for a long time and its shares were not traded and also had a change of fiscal year, the companies would not be comparable. On the other hand, a period of less than 6 months may lead to the elimination of a large number of member companies in the statistical sample, and investment and insurance companies were excluded from the study population due to the special nature of their activities. Thus 1067 year-firm observations were used for statistical analysis.

Variables and research model

In this research, the following logistic regression model was used to test the research hypothesis based on previous studies and Hong and Cheng (2018):

Model 1)

$$P(Sanction_t|X) = G(PRT_{i(0r.i-1)}, size_{i,t-1}, Inv_{i,t-1}, AR_{i,t-1}, ZFC_{i,t-1}, Growth_{i,t-1}, Big4_{i,t}, Independent_{i,t}, Tenure_{i,t}, specialist_{i,t}, yearfixed - effect, industryFixed - effect, \varepsilon_{i,t})$$

In above equations:

Auditor failure due to fraud in the corporate (Sanction): To measure the auditor failures due to the corporate fraud, the penalties of the audit firms are used. In the event that sanction is a dummy variable to indicate whether corporate has received punishment per year, where 1 mean yes and 0 mean no. (Hong and Cheng, 2018).

Diversification of business complexities (diversification): In this study, the following model is used to measure the diversification of business (Hong and Cheng, 2018):

Relationship 1)

$$\text{Diversification} = 1 - \sum_{i}^{n} S_i^2$$

Where:

S: sales of the products

N: the Number of industries

Control variables

Company Size: Stacey (1991), Las & Watts (1994), Bonner et al. (1998), showed that the size of the audited company affects the risk of litigation and ultimately the attorney general's attitudes toward the audit of the client company; therefore, one of the control variables of this research is the size of the company. The size of the company is calculated by the natural logarithm of the total assets of the company (Hong and Cheng, 2018).

Inventory (Inv): Stacey (1991) found that the amount of inventory in the commodity is positively related to the risk of the statutory auditor being punished. Therefore, in his research, he used inventory ratios and accounts receivable as a control variable and expected that these two have a positive correlation with the risk of the statutory auditor being punished. In this study, inventory is calculated using the ratio of inventory to total assets (Hong and Cheng, 2018). Accounts Receivable (RA): In this study, accounts receivable will be obtained by the ratios of accounts receivable to the total assets of the company (Hong and Cheng, 2018).

Company Financial Statement (ZFC): Stacey (1991) found that a statutory auditor with financial or client financing issues faces a higher risk or legal claim. Las and Watts (1994) and Bonner et al. (1998) reached similar conclusions. However, Carcello and Palmeroz (1994) concluded that a client with better pre-bankruptcy financial status is more likely to sue, and therefore, there is a negative relationship between financial condition and the auditor's claim. Accordingly, this study adds customer financial condition (ZFC) as a control variable. But there is no direction for it. The financial position of the company in this study will be obtained by dividing the total debts by the total assets of the company (Hong and Cheng, 2018).

Growth: Stacey (1991) showed that sales growth and the auditor's litigation risk are positively correlated, so sales growth in this study will be considered as one of the control variables. In this study, sales growth will be obtained from the difference between sales in year t minus year t-1 and sales in year f-1 as follows (Hong and Cheng, 2018):

Relation 2)

$$\text{Growth}_t = \frac{S_t - S_{t-1}}{S_{t-1}}$$

Auditor Size (Big4): Palmeroz (1988) observed that larger accounting firms were at greater risk of legal action. This indirectly shows that large auditing firms provide the highest quality services. Therefore, the size of the auditing firm was considered as another control

variable. A virtual variable is used to measure the size of the auditor. Thus, if the company is audited by a large auditing company, it is assigned the number 1 and otherwise the number 0 is assigned to it (Hong and Cheng, 2018).

Auditor tenure: Previous studies have shown that a more independent statutory auditor is less likely to receive a penalty and is expected to have a negative correlation with the risk of a statutory auditor's penalty. In addition, studies have shown that a statutory auditor faces a higher risk of litigation in the first three years with a client because he or she is unfamiliar with it (Stacey, 1991; Pierre & Anderson, 1984). Las and Watts (1994) also argued that a stronger relationship with a client increases the auditor's reliance on the client, which in turn increases the risk of litigation. Stacey (1991) found that the auditor's tenure or retention with a particular client, in less than three years, was positively correlated with the auditor's legal claim risk. Therefore, the tenure of the auditor will be another control variable of this research. The auditor's tenure is also based on a virtual variable. In this way, if the auditor has been auditing a company for more than 3 years, it is considered number 1 and otherwise it is considered number 0 (Hong and Cheng, 2018).

Specialist: In this study, the expertise of the auditor is defined and measured as the total assets of all owners of a particular audit firm in a particular industry divided by the total assets of the owners in this industry (Hong and Cheng, 2018).

Results

Descriptive Statistics

The characteristics of descriptive statistics related to the variables used in this study for the studied companies are presented in Table (1).The reported statistics include central tendency measures including mean, median, minimum and maximum of the variables used in this research.

Table 1
Measures describing research variables

Row	Variables	symbol	observations	mean	median	minimum	maximum
1	Audit failure due to corporate fraud	Sanction	1067	0.313	0	0	1

2	Diversification of business complexity	Diversification	1067	0.346	0.275	0.0008	0.960
3	Corporate size	Size	1067	06.365	6.260	0.057	8.353
4	inventory	Inv	1067	0.539	0.549	0.003	0.986
5	Account receivable	RA	1067	0.231	0.147	0.007	0.719
6	Corporate financial condition	ZFC	1067	0.558	0.619	0.006	0.980
7	Sales growth	Growth	1067	0.188	0.134	0.001	0.966
8	Auditing size	Big4	1067	0.597	1	0	1
9	Audit tenure	Tenure	1067	0.388	0	0	1
10	Audit expertise	Specialist	1067	0.249	0.211	0.003	0.610

Table 1 presents descriptive statistics of variables, including mean, median, minimum and maximum. As it can be seen in the table, corporate size value was 6.365, the highest mean and sales growth value was 0.188 the lowest mean; also, relative proximity of the mean and median of indicated that variables were normally distributed. The mean is the most important central tendency, which was 0.313 for the dependent variable. Also, the maximum and minimum values of the variable were 1 and 0, respectively.

Inferential statistics and the final test of the hypothesis

Research Hypothesis: The diversification of business complexity has a significant impact on the probability of the auditor penalties (audit failure due to fraud in the corporate).

Due to the fact that a dummy variable (artificial as 0 and 1) has been adopted to measure the audit failure in corporate fraud, logistic regression has been employed for data analysis. Logistic regression is similar to linear regression, except that the coefficients calculations methods are different. Moreover, in linear regression analysis, to test the goodness-of-fit and significance of each variable in the model, F and t statistics are employed, respectively. In logistic regression, the significance of regression LR (LR) statistics and the significance of the independent variable coefficient in Z statistic at 95% confidence level and McFadden coefficient statistics were employed. It should be noted that in logistic regression analysis, assumptions of linear regression such as linear relationship between independent and dependent variables, homogeneity of dependent and independent variables, normal

distribution of dependent variable and residuals or model measurement error are not required.

Goodness-of-fit test

To evaluate the significance of logistic regression, the research hypothesis was first examined by the goodness-of-fit test of logistic regression and Hosmer-Lemeshow test. The results of these two tests are shown in Tables (2) and (3):

Table2
Results of regression model of goodness-of-fit test using Hosmer- Andrews test

Model	Test title	Test statistic	Statistics probability
1	Andrews	140.938	0.0000

Source: research findings

Considering the probability of Andrews statistic in Table (2), related to the goodness test of the model, which is less than 0.05, it can be concluded that the research model using the Andrews test has a good fit.

Table 3
Results of regression model using Hosmer-Lemeshow test

Row	Test title	Test statistic	Statistics probability
1	Hosmer-lemeshow	19.169	0.0238

On the other hand, the results of the Hassemer-Lemshu test in Table (3), which was also related to the goodness of fit test of regression model, are less than 0.05. It fits well.

Investigating the stationary of the Dependent Variable in Logistic Values

In order to investigate the stationary of the dependent variable in logistic values, autocorrelation with small values was employed. Table (4) presents the test results:

Table 4
Results of autocorrelation test with small logistic values

Stages	AC	PAC	Q statistic	Probability of q statistics
1	-0.072	-0.072	5.5108	0.019
2	-0.048	0.050	14.466	0.043
3	-0.042	-0.042	5.6233	0.020
4	0.046	0.052	6.690	0.046

The results of autocorrelation of q test and the probability of q statistic in Table (4) indicates that in all stages the dependent variable is less than 0.05, therefore it has the required stationary value.

According to these arguments, the final model of the research has been reviewed and estimated: for analysis of data the logistic regression model was used. This regression is a statistical regression model for fictitious dependent variables (0 and 1). In this method, there is a dependent variable that cannot have more than two states. In fact, this generalized model is a linear model of the logit function. This model is as follows.

Relationship 3)

$$Log_{i.t}(P) = In\left[\frac{P}{1-P}\right] = \alpha + \beta_1\chi_{1.i} + \cdots + \beta_K\chi_{K.i}$$

$$i = 1, \dots, n$$

$$P = \Pr\,(Y_{i=1})$$

$$P = \Pr\,(Y_i = 1|X) = \frac{e^{a+\beta_1 X_{1,i}+\beta_k X_{k,i}}}{1+e^{a+\beta_1 X_{1,i}+\beta_k X_{k,i}}}$$

In this study, audit failure due to corporate fraud was considered as a binary variable. Accordingly, the results of logit regression model are presented in Table (5).

Table 5
The result of regression analysis

Independent variable	Coefficient	Standard error	Z statistics	p-value from statistic z	Kind of relation
intercepts	-4.508	0.805	-5.600	0.0000	significant
Diversification of business complexity	2.228	0.259	8.571	0.0000	Positive and significant
Corporate size	0.352	0.095	3.681	0.0002	Positive and significant
Account receivable	1.049	0.470	2.231	0.0257	Positive and significant

Corporate financial condition	1.161	0.524	3.084	0.0020	Positive and significant
Sales growth	0.649	0.429	1.511	0.1306	Non-significant
Audit size	-0.370	0.434	0.8501	0.3948	Non-significant
Auditor tenure	-0.717	0.161	-4.441	0.0000	Negative and significant
Auditor expertise	-0.070	0.165	0.425	0.6708	Non-significant
	McFadden coefficient		LR statistic	LR probability	
Statistic	0.345		315.875	0.0000	

According to Table (5) in estimating the regression model, the McFadden determination coefficient was approximately 0.345. This value shows that 34.5% of the dependent variable changes can be explained by the mentioned independent and control variables. On the other hand, the results in Table (5) show that the significance level of LR statistic is less than 0.05 and since LR statistic shows the overall validity of the model, this model is 95% significant and has a high validity. Therefore, according to the results of data analysis in Table (5), the coefficient of the independent variable of diversification of business complexity which indicates the effect of diversification of business complexity on the probability of the auditor's penalty (audit failure due to fraud) was 2.228 and the significance level of this variable was 0.0000 ;Because it is less than 0.05. As a result, these findings revealed that the diversification of business complexities had a positive and significant effect on the probability of the auditor's penalty (auditing failure due to fraud in the corporate). Therefore, the hypothesis of this research cannot be rejected.

Regarding the effect of control variables on the dependent variable in the regression model, it was found that the size of the corporate with a coefficient of 0.352 and a significance level of 0.0002 had a positive and significant effect on the probability of the auditor punishment (audit failure due to corporate fraud). The results indicated that the stock of assets with a coefficient of 1.049 and a significance level of 0.0257 had a positive and significant effect on the probability of the auditor punishment (audit failure due to fraud in the corporate). On the other hand, it was found that the receivable accounts with a coefficient of 1.161 and a significance level of 0.0020 had a positive and significant effect on the probability of the auditor's penalty (audit failure due to fraud in the corporate). Regarding the size of the auditor, it was found that the size of the auditor with a coefficient of -0.717 and a significance level of 0.0000 had a negative and significant effect on the probability of

the auditor punishment (audit failure due to fraud in the corporate). Other results of this model showed that the auditor specialist with a coefficient of -1.759 and a significance level of 0.0000 also had a negative and significant effect on the probability of the auditor penalty (audit failure due to fraud in the corporate). Finally, the results showed that among the control variables, the corporate's financial situation, sales growth and the auditor's tenure had no significant effect on the auditor punishment (audit failure due to fraud in the corporate).

Regarding the general results of testing hypothesis, the final extracted model of the study is as the following:

Model 2)

$$P(Sanction_t | X) = -4.508 + 2.228\,\text{Diversification}_{i,t} + 0.352 size_{i,t-1} + 1.409 Inv_{i,t-1} + 1.161 AR_{i,t-1}$$
$$+0.649 ZFC_{i,t-1} - 0.370 Growth_{i,t-1} - 0.717 Big4_{i,t} - 0.070 Tenure_{i,t} - 1.759 specialist_{i,t}$$

Discussion

The results of testing research hypothesis that "the diversification of business complexity have a significant impact on the probability of the auditor punishment (audit failure due to corporate fraud)" revealed that the coefficient of the independent variable of diversification business complexity, which indicates the effect of the diversification of business complexity on the probability of the auditor's sanctions (audit failure due to fraud in the corporate) was 2.228 and the significance level of this variable was 0.0000. These findings indicated that the diversification of business complexity had a positive and significant effect on the likelihood of the auditor punishment (audit failure due to fraud in the corporate). Therefore, the hypothesis of this research cannot be rejected. From the results of this hypothesis, it can be concluded that in companies with higher level of business complexity, the probability of the auditor punishment is higher. In other words, the complexity of the business increases the likelihood of the auditor punishment (audit failure due to fraud in the corporate). In general, the findings of this hypothesis are in line with Hong and Cheng, 2018).

The confirmed hypothesis can be explained based on the existing literature on agency theory which showed that business diversification can raise operational uncertainty, communication costs and coordination among departments, resulting in information asymmetry between shareholders and corporate managers (Harris et al., 1982; Myerson, 1982); to increase agency costs. Managers may engage in diversified investments based on

their personal interests rather than maximizing the corporate value because a diversified company faces a higher level of information asymmetry. Therefore, some auditing research has found that more diversified clients are in greater demand for higher quality auditors (Francis et al., 2009: Liu & Lai, 2012).

In addition, the information asymmetry hypothesis suggests that business diversification can increase organizational complexity, therefore, information asymmetry between outside and inside managers increases (Jiraporn et al., 2008). However, auditors limit their ability only to earnings management to more diversified clients. Therefore, it can be argued that higher diversification can complicate the corporate's operations and information and increase audit risk. A corporate that uses sophisticated diversification to validate numbers in its financial statements is more likely to have audit fraud, which increases the likelihood of corporate fraud. Conversely, agency theory shows that for diversified companies, there is a high demand for high-quality auditors to reduce information asymmetry. The auditor choice literature shows that companies with a high level of information complexity can hire higher quality auditors to lower the degree of earnings management (Francis et al., 2009) and to appreciate firm value (Liu and Lai, 2012).

Our results on the impact of the diversification of business complexity on probability of auditor punishment (audit failure due to corporate fraud) suggest that auditors in setting a price for their services should consider the risk related to corporate business complexity and diversification. In an inefficient and monopolistic market, business diversification policies are not effective because managers have to overcome the barrier of monopolies and rents to achieve the desired performance, so in addition to the diversified products, they should consider using other available tools. The findings are of great help to investors since it provides complete information about how to contact with certified public accountants and learn about corporate's strategies and business management. Before investment, investors must make sure whether the certified accountant in the corporate is independent or not? Also, it is recommended that managers of companies listed in Tehran Stock Exchange to reduce the possibilities of auditor's punishment and to contact certified public accountant focus more on transaction with affiliated people and also business complexity and diversification.

Conclusions

According to results of this research we sa that lack of sufficient quantitative and qualitative information on auditors' offenses as well as the detection of fraud are among the limitations of the present study. Also, since the issue of industry expertise is for auditors, it can be said that the inability to differentiate industries in the present study due to the reduction of the research sample is another limitation of the present study.

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