

**MINISTRY OF INDUSTRY AND TRADE
HANOI UNIVERSITY OF INDUSTRY**



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**THE DESERTATION'S NAME
RESEARCH ON ERRORS IN FINANCIAL STATEMENTS
OF LISTED ENTERPRISES ON THE VIETNAMESE
STOCK MARKET**

**Major: Accounting
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INTRODUCTION

1. Reasons for choosing the topic

In the stock market, information, especially financial information on financial statements plays a very important role. This information aims to provide information on the financial situation, business situation and cash flows of enterprises, which is the basis for creating trust for investors so that they can make the right investment decisions. Financial statement violations are a prominent topic in the economic, social and political fields. The seriousness of the impact of financial statement violations in the world and in Vietnam raises the issue of understanding the nature, causes and consequences of violations.

Financial statement violations in the world have become a serious problem, causing great damage to enterprises, governments and investors. In Vietnam, in recent years, there have been many violations in the preparation of financial statements. These companies violated by not publishing information on time and publishing incorrect financial statements, and financial statements that misrepresented indicators due to incorrect accounting. The consequences of violations in the financial statements of listed companies that have been discovered or not discovered have caused suspicion among investors, affecting the operation of the capital market.

There have been many studies on fraud, errors and violations in financial statements with many different approaches. These research projects have proposed measures to prevent and detect fraud to some extent, which is very helpful for investors and those interested in information on financial statements, thereby making effective management and investment choices. In addition, in the past two years, due to the impact of the Covid19 pandemic in the world, the Vietnamese economy has been affected by many multi-dimensional impacts from the international and domestic economic context. Enterprises are in a difficult situation and their interests are intertwined, so they may use tricks to cheat in financial statements to serve their interests, causing investors to gradually lose confidence in the accounting books of listed companies.

From the above context, the author believes that the topic "**Research on errors in financial statements of listed enterprises on the Vietnamese stock market**" is necessary. The research is conducted to determine the factors that affect errors in financial statements, providing more empirical evidence on the influence and importance of factors in predicting errors in financial statements in Vietnam. Thereby, discussing and giving implications, to prevent and detect errors in financial statements, which are currently limited in Vietnam.

The thesis studies errors in financial statements from the researcher's point of view and perspective, with the main goal of providing empirical evidence and forecasting models. Specifically, the data on violations is determined based on the administrative sanctions decisions of the State Securities Commission (SSC) in the period of 2015 - 2023, to ensure objectivity and reflect the practice of law compliance in financial information disclosure. On that basis, the thesis applies the Fraud Triangle, Fraud Diamond and Agency Theory to analyze the groups of pressure - opportunity - attitude factors, and at the same time applies the logistic regression model and machine learning algorithms (Decision Tree, Random Forest) to predict the possibility of violations and assess the level of influence of each factor. This approach helps to link empirical data and the fraud theoretical framework, ensuring the scientific, objective and applied value of the research in identifying and predicting financial reporting violations of listed enterprises. In addition, the research results also support auditors in identifying and preventing violations, while helping businesses improve internal governance and financial transparency.

2. Research objectives

General objective: Identify factors affecting financial statement errors and the importance of factors in predicting financial statement errors of listed enterprises on the Vietnamese stock market.

Specific objectives:

- Identify factors affecting financial statement errors of listed enterprises on the Vietnamese stock market.
- Identify the importance of factors in predicting financial statement errors of listed enterprises on the Vietnamese stock market.

3. Research questions

Question 1: What factors affect, the level of...influence...and the importance of...each factor to...errors in the financial statements of listed enterprises on the Vietnamese stock market?

Question 2: Which method has the most accurate results in predicting financial statement errors of listed enterprises on the Vietnamese stock market?

4. Research object and scope

- *Research object:* Financial statement errors, factors affecting financial statement errors of listed enterprises on the Vietnamese stock exchange.
- *Research period:* Enterprises in the period 2015-2023.
- *Research scope:* The author collects all data of listed enterprises on the Vietnamese stock exchange. In addition, in order to compare the current state of financial statement errors of enterprises, the study uses data of enterprises on the UPCOM and OTC exchanges.

5. Research method

The topic uses a combination of qualitative and quantitative research, the research methods used to answer each research question are presented specifically in the chapters of the thesis.

6. Scientific significance of the study

6.1. Theoretical aspect:

The thesis has established a comprehensive theoretical framework, based on the combination of fundamental theories: Fraud Triangle (explaining motives, opportunities, attitudes leading to violations), Fraud Diamond (explaining motives, opportunities, attitudes leading to violations, capacity) Fraud Scale (adding the integrity factor), Agency Theory (clarifying conflicts of interest between managers and shareholders) and Signaling Theory (explaining the impact of information asymmetry). These theories are applied throughout the entire study to ensure consistency and logic between chapters.

6.2. Practical aspect:

The thesis provides empirical results on the influence of factors on violations in financial statements and the importance of factors in predicting violations in financial statements of listed enterprises on the stock market in Vietnam. The thesis has proposed practical implications to prevent and detect violations in financial statements, which is very helpful for investors and those interested in information on financial statements, thereby making effective management and investment choices. This work provides scientific bases for management agencies to refer to, thereby establishing and adjusting appropriate policies to control and minimize violations in financial statements. Thereby, minimizing and limiting violations in financial statements, improving the transparency and honesty of financial statements, promoting sustainable development of the stock market. The thesis is a useful reference for researchers and managers on violations in financial statements in enterprises.

7. Thesis structure

Chapter 1: Overview of research on errors in financial statements

Chapter 2: Theoretical basis of errors in financial statements

Chapter 3: Research method

Chapter 4: Research results on errors in financial statements

Chapter 5: Discussion and recommendations

CHAPTER 1: OVERVIEW OF RESEARCH ON FRAUD IN FINANCIAL REPORTING

1.1. Overview of studies on identifying fraud in financial reporting

1.1.1. *Studies on identifying fraud in financial reporting.*

(Cressey, 1953) was the first to identify fraud in financial statements, through a survey of more than 200 cases of economic crime. According to Cressey, fraud often arises when three conditions converge: Pressure/motivator, opportunity, attitude/personality.

In Vietnam, there have been some initial studies on identifying fraud in financial statements such as the studies of (Ta Thu Trang, 2018), (Vu Thi Thuc Oanh, 2018).

Based on studies by (ACFE, 2022), (Schilit, 1993), (VAS 240, 2012), (Bonner, Palmrose, & Young, 1998), the summary of violations in financial statements is summarized into 5 groups including: (1) *Recording increases or decreases in expenses*; (2) *Recording increases or decreases in revenue*; (3) *Misvaluation of assets and liabilities*; (4) *Providing incomplete and inaccurate information*; (5) *Other acts*.

1.1.2. *Studies on financial reporting irregularities based on the sanction decisions of competent authorities*

In Malaysia, (Zainudin & Hashim, 2016), (Nasir, Ali, & Ahmed, 2019) used the cases of violating companies announced by the Securities Commission of Malaysia to develop a model for predicting financial reporting irregularities using multivariate statistical methods. In Taiwan, (Lin, Chiu, Huang, & Yen, 2015), (Chen, 2016), (Jan, 2018) also analyzed companies sanctioned by the Securities Commission of Taiwan. These studies are based on the fraud triangle theory and use techniques such as Decision Trees and Artificial Neural Networks to increase the ability to predict financial reporting irregularities. In China, the method of determining financial reporting irregularities based on the administrative sanction notice of the SRC has been accepted by most scholars.

1.1.3. *Studies on financial reporting errors based on pre- and post-audit discrepancies*

International studies such as (Francis, 2004), (Becker, DeFond, Jambalvo, & Subramanyam, 1998), studies in Vietnam (Nguyen Trong Hieu, 2020), (Nguyen Trong Hieu, Nguyen Cong Phuong, & Nguyen Manh Cuong, 2022), (Tran Thi Giang Tan, Nguyen Tri Tri, Dinh Ngoc Tu, Hoang Trong Hiep, & Nguyen Dinh Hoang Uyen, 2015), (Nguyen Cong Phuong & Lam Xuan Dao, 2016) however, there are still many gaps that need to be further explored.

1.1.4. *Financial Reporting Misstatement Studies Based on Predictive Models*

The Beneish M-Score model, developed by (Beneish, 1999), is one of the first quantitative tools to predict the likelihood of profit fraud through financial indicators.

The F-score model, developed by (P. M. Dechow, Ge, & Sloan, 2011), is intended to predict the likelihood of material misstatements in financial statements, not limited to fraud. This model combines traditional financial factors with non-financial factors, reflecting more deeply the motivations and circumstances leading to errors.

The combination of the model is F-Score or M-Score. The combination of the two models helps to compensate for the limitations of each individual model and improve the reliability of fraud risk assessment.

1.1.5. Studies that identify financial reporting fraud based on other approaches

(Skalak, Golden, Clayton, & Pill, 2011) suggest that financial reporting fraud can be carried out in two ways: (1) Creating a better financial statement by recording future period revenues in advance, fictitious revenues, changing accounting policies and understating expenses; or (2) Creating a worse financial statement to create a reserve for future purposes through provisioning, overstating expenses or understating revenues.

(Santoso & Surenggono, 2018) study aims to collect empirical evidence on detecting financial reporting fraud related to earnings management through the discretionary revenue model and the diamond fraud model.

In Vietnam, some studies by (Le Vu Ngoc Thanh, Pham Thi Ngoc Bich, Nguyen Dinh Hoang Uyen, & Nguyen, 2022), (Pham Thi Ngoc Bich, Mai Duc Nghia, Dinh Ngoc Tu, & Le Vu Ngoc Thanh, 2024), focused on studying the pressures leading to fraud in the financial statements of listed enterprises on the Vietnamese stock exchange.

Studies by (Ta Thu Trang & Nguyen Thi Huong, 2013), considered the factors leading to the risk of fraud in preparing corporate financial statements with the aim of assessing the impact and influence of fraud in preparing financial statements on the economy. Research by (Nguyen Duc Dung & Vu Thi Minh Thu, 2013), considered some errors in cash flow statements such as errors in classifying cash flows, errors related to the increase or decrease of receivables, etc.

1.2. Overview of research on factors affecting financial reporting errors

In the study of financial reporting errors, the use of fundamental theories is necessary to create a theoretical basis to explain the motives, pressures and favorable conditions for fraudulent behavior to arise. The fraud triangle theory, the fraud balance theory, the fraud diamond theory, the agency theory, and the signaling theory are the most important theoretical foundation theories today. The above 5 theories are often used for the following main reasons:

1.2.2. Fraud Opportunity

(Cressey, 1953) states that fraud only occurs when an individual perceives an opportunity to commit and conceal the act without being detected. Factors such as weak internal control systems, complexity in organizational structure, and management intervention in the financial reporting process create an environment that is favorable for fraud. (Beasley, 1996) demonstrates that low levels of independent directors on the Board of Directors are associated with the likelihood of fraudulent financial reporting.

1.2.3. Integrity and Professional Ethics

The Fraud Scale Theory (W Steve Albrecht et al., 1986) adds integrity as a counterweight to the incentive to commit fraud.

In addition, research by (Lennox, 2000) also suggests that businesses try to avoid adverse audit opinions by adjusting financial data, leading to increased likelihood of errors in financial statements. In Vietnam, (Le Thi Thu Ha & Bui Thi Thuy, 2021) noted signs of profit manipulation in financial statements that received audit opinions other than unqualified opinions.

1.3 Overview of techniques for forecasting financial statement misconduct

1.3.1 Logistic regression analysis

Logistic regression has been widely applied worldwide to examine determinants of fraud probability and to forecast misconduct, with studies by Persons (1995), Beasley (1996), Summers & Sweeney (1998), and Perols (2011). Kanapickienė & Grundienė (2015) analyzed the effect of financial ratios using logistic regression. Lenard & Alam (2009) combined bankruptcy prediction and fraud forecasting within a quantitative logistic regression framework.

1.3.2 Applications of machine learning and artificial intelligence

Data-mining and machine learning applications in detecting financial statement fraud have been explored by Green & Choi (1997), Feroz et al. (2000), Perols (2011), Sharma & Panigrahi (2013), Kotsiantis et al. (2006), Chen (2016), and Jan (2018).

Recent advancements in AI have expanded the use of machine learning models such as Artificial Neural Networks (ANN) and Decision Trees for fraud detection. Studies by Yao et al. (2019), Craja et al. (2020), Zenzerović & Šajrić (2023), Achakzai & Peng (2023), Ali et al. (2023), and Nemati et al. (2024) all confirm that machine learning models significantly improve forecasting accuracy compared to traditional methods.

1.4 Research gaps

First: In Vietnam, there have been many studies on financial statement violations using different approaches. However, there has been no study in Vietnam that has followed this approach in determining financial statement violations based on decisions to sanction financial statement violations by state agencies (while studies in the world in the US, Taiwan, China, Malaysia... the criteria for determining financial statement violations are based on the conclusions of competent authorities).

Second: The question is which factors are most important in predicting the possibility of financial statement violations? And is it feasible to apply machine learning algorithms in forecasting? Therefore, the research objective is to apply machine learning algorithms to examine the approach according to the fraud triangle theory that affects the possibility of financial statement violations. In many forecasting models, this study will add machine learning algorithms because this is an advanced technology, widely applied in the world but still new in Vietnam in forecasting errors in financial statements.

Third: The Covid19 pandemic has seriously affected all aspects of social life for the economy and businesses. So, how has the impact of the pandemic affected errors in financial statements of businesses? This study to answer this question is very important and necessary for business administrators and managers today to see the impact of the Covid19 pandemic on errors in financial statements?

CHAPTER 2: THEORETICAL BASIS OF ERRORS IN FINANCIAL REPORTING

2.1. Financial statements

2.1.1. Concept of Financial statements

According to the International Accounting Standards (IAS 01) of the International Accounting Standards Board (IASB), According to Clause 1, Article 3, Accounting Law No. 88/2015/QH13, according to Article 97, Circular 200/2014/TT-BTC, Financial statements are a means of presenting the profitability and financial status of an enterprise to interested parties. Financial statements apply to all types of enterprises that comply with the provisions of Vietnamese law.

2.1.2. Purpose of Financial statements

2.1.2.1. According to the International Accounting Standards Board (IASB)

The Conceptual Framework for International Financial Reporting approved by the IASB in September 2010 defines the purpose of general purpose financial statements (hereinafter referred

to as the purpose of financial statements) as “to provide financial information about an enterprise that is useful to current and potential investors, lenders and other creditors in making decisions about providing resources to the enterprise” (IASB, 2010a, p.OB2).

According to IAS 1 - Presentation of Financial Statements (IASB revised in May 2012), the purpose of financial statements is to provide information about the financial position, financial performance and cash flows of an enterprise, meeting the needs of a wide range of users in making economic decisions.

2.1.2.2. *According to the Financial Accounting Standards Board (FASB)*

Financial Accounting Concept No. 8 - (SFAC 8), FASB affirms that the purpose of financial statements is the foundation of the theoretical framework for financial statements. Thus, the purpose of financial statements is to provide useful financial information about the enterprise to users, mainly current and potential investors, lenders and other creditors, in making decisions about providing resources to the enterprise.

2.2. Errors in financial statements

2.2.1. *Concept of errors in financial statements*

- Financial statement errors:

According to International Auditing Standards (ISA 450); International Accounting Standards 08 (IAS 08); Vietnamese Accounting Standards 29 (VAS 29); Vietnam Auditing Standard No. 450 (under Vietnam Auditing Standards issued together with Circular No. 214/2012/TT-BTC dated December 6, 2012 of the Ministry of Finance),... in the author's opinion, *"An error in financial statements is a difference between the value, classification, presentation or explanation of an item on the financial statements compared to the requirements of the applicable financial reporting framework. An error may arise due to (unintentional) mistakes such as miscalculation, omission of information, misapplication of accounting policies or due to (intentional) fraud to distort information. An error is considered material if it is capable of significantly distorting the financial statements, affecting the economic decisions of users".*

- Financial Statement Fraud:

According to (Elliott & Willingham, 1980), financial statement fraud is an intentional act of altering information or materially misrepresenting it, causing harm to investors and creditors. (ACFE, 2022) defines financial statement fraud as the intentional misrepresentation or misrepresentation of a company's financial position, results of operations and cash flows, which is done through intentional misrepresentation or omission of information in the financial

statements to deceive users. The US auditing standards (SAS No. 54: AICPA 1998) define financial statement fraud as “Fraudulent acts that cause material misstatements in the financial statements”. Auditing Standard No. 240 (issued in 2012) emphasizes the fraudulent behavior of fraud in general instead of financial statement fraud: “fraud is an intentional act by one or more people in the Board of Directors, Board of Management, employees or third parties through fraudulent acts to gain illegal or unjust profits”.

- Errors in financial statements

According to Auditing Theory of (Nguyen Quang Quynh & Nguyen Thi Phuong Hoa, 2008), errors are a key factor in verifying the truthfulness of accounting information and financial activities. Errors include fraud and errors. “Fraud is an intentional act of deception, concealment, and distortion of the truth for personal gain”. “Errors are unintentional errors, often understood as mistakes, omissions, or weaknesses in capacity that cause errors”.

According to the author, *Financial Reporting Misconduct is an intentional or unintentional act of misrepresenting, concealing or distorting information in financial statements, leading to financial information not reflecting truthfully and reasonably the financial situation, business performance and cash flow of the enterprise.*

2.2.2. Factors affecting financial reporting misconduct

Based on the actual financial reporting misconduct of enterprises, the author analyzes a number of factors leading to the risk of fraud in financial reporting, typical examples are as follows: *Motive/pressure; Opportunity; Attitude or attitude of justification.*

2.3. Responsibilities and roles of enterprises in preventing errors in financial reporting

2.3.1. Responsibilities of the Board of Directors

The responsibility of the Board of Directors in preventing and detecting fraud is specifically stipulated in Part I, paragraph 4 of VSA 240: “The prevention and detection of fraud is primarily the responsibility of the Board of Directors and the Board of Directors of the audited entity. This responsibility includes a commitment to creating a culture of honesty and ethical behavior, which can be enhanced by the active supervision of the Board of Directors.

2.3.2. Responsibilities of the Auditor

The responsibility of the auditor in detecting financial reporting fraud is clearly stipulated, specifically in Part I, paragraphs 5 to 9 (MOF, 2012): “When conducting an audit in accordance with Vietnamese auditing standards, the auditor is responsible for obtaining reasonable assurance about whether the financial statements, taken as a whole, are free from material misstatement, whether due to fraud or error. Due to the inherent limitations of

auditing, there is an unavoidable risk that the auditor will not detect some errors that materially affect the financial statements, even when the audit has been planned and performed in accordance with Vietnamese auditing standards.

2.3.3. The role of the internal control system in preventing errors in financial statements

The internal control system has the role and responsibility in preventing and detecting financial reporting fraud: Ensuring that the figures in the accounting books and in the company's financial statements honestly, reasonably, and prudently reflect the business production status of the enterprise; Reducing the risk of fraud and theft of the company's assets; Helping the company to properly implement the state's policies and laws, strictly comply with accounting principles, accounting standards, and accounting regimes;

2.4. Forecasting errors in financial statements

2.4.1. Concept, meaning, role of forecasting

Forecasting helps business administrators know the future levels of the phenomenon, thereby helping them to proactively propose plans and make necessary decisions to serve the production and business process, investment, promotion, production scale, product distribution channels, financial sources... and fully prepare the material and technical conditions for development in the coming time.

2.4.2. Forecasting errors in financial statements

Forecasting errors in financial statements has been a topic of interest in recent decades because of its great importance to listed companies, investors, creditors, managers and even the economy of a country. If the prediction of financial statement errors is reliable, company managers can initiate remedial measures to avoid decline before the crisis occurs, and investors can grasp the profitability of listed companies and adjust their investment strategies to optimize investments. With the continuous development of machine learning and artificial intelligence, the application of machine learning algorithms to predict financial statement errors of Vietnamese companies will have a lot of meaning. Through the prediction of financial statement errors, it is possible to consider which financial indicators are most effective in forecasting and determine which model and algorithm are the most effective in forecasting.

2.5. Related theories

2.5.1. Fraud triangle theory

This theory was developed by (Cressey, 1953) - a crime researcher in the 1940s, the model helps identify factors leading to fraudulent behavior. According to Cressey, fraud often arises when three conditions converge: Pressure/motivator, opportunity, attitude/personality.

2.5.2. *Fraud table theory*

(W Steve Albrecht et al., 1986) Based on the fraud table theory, the factors of pressure and opportunity will be considered in the research model of financial statement irregularities in this thesis.

2.5.3. *Fraud Diamond Theory*

The Fraud Diamond Theory was developed by (Wolfe & Hermanson, 2004) as an important extension of the Fraud Triangle theory proposed by (Cressey, 1953). While the Fraud Triangle explains fraudulent behavior based on three core factors – pressure, opportunity and attitude – the Fraud Diamond theory adds a fourth factor, which is ability.

2.5.4. *Agency Theory*

From the agency theory perspective, the board of directors and the board of directors have the responsibility to ensure that the financial statements must provide fair and reasonable information to current shareholders, providing information about the quality of their corporate governance. The role of the board of directors is to monitor the financial accounting process and the risk of unethical behavior through the establishment of agency costs. Based on the agency theory of auditing factors, the board of directors belongs to the opportunity and attitude factors that will be considered in the research model of financial reporting fraud.

2.5.5. *Signaling Theory*

Signaling Theory, developed by (Spence, 1973), focuses on the situation of information asymmetry between two parties: the sender and the receiver. Signaling theory forms the basis for the development of models for detecting financial reporting misconduct.

CHAPTER 3: RESEARCH METHODOLOGY

3.1. Research model and hypothesis

3.1.1. *Research model*

In this study, based on the fraud triangle theory, fraud balance theory, fraud diamond theory, agency theory, signaling theory and studies that have used these theories such as (Skousen, Smith, & Wright, 2009). The author builds a research model on the influence of factors on financial reporting errors that can be represented through equation (3.1) and Figure 3.1:

$$\text{Financial reporting errors} = f(\text{Pressure, Opportunity, Attitude}) + \text{Control variables} \quad (3.1)$$

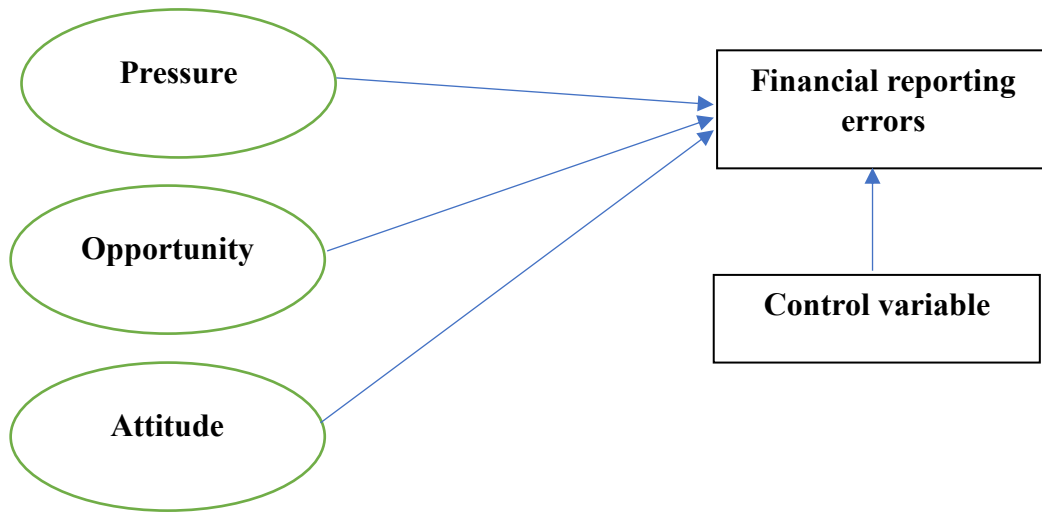


Figure 3.1: Research model

Based on the theory of fraud triangle and an overview of studies, the author builds variables in the research model. In this study, violations in financial statements are determined based on the penalty decisions of the Securities Commission related to violations in financial statements. Decisions on penalties for violations in the securities sector such as securities issuance, securities trading, undisclosed internal transactions, incomplete information disclosure, slow explanation of stock price fluctuations, Board of Directors, etc., will not be included in the scope of collection in this study.

3.1.2 Research hypotheses

Based on the fraud triangle theory of (Cressey, 1953) and the fraud balance theory of (W. S. Albrecht et al., 1986), agency theory, signaling theory and studies that have used these theories such as (Skousen et al., 2009), (Lou & Wang, 2011), (Nakashima, 2021), (Tran Thi Giang Tan, Nguyen Tri Tri, Dinh Ngoc Tu, Hoang Trong Hiep, & Nguyen Dinh Hoang Uyen, 2015). Based on the research model built in section 3.1.1 as well as the contents presented specifically in the previous chapters in section 1.2, section 2.5. The author builds hypotheses for each factor affecting the likelihood of errors in financial statements as follows:

Hypotheses	Content of initial hypothesis	Content of adjusted hypothesis	Expected
H_1	Return on assets	Return on assets	-
H_2	Probability of financial distress	Probability of financial distress	+
H_3	Cash flow from business activities	Cash flow from business activities	+
H_4	Financial leverage	Financial leverage	-
H_5	State ownership	State ownership	-
H_6	Concurrent positions of chairman of the directors and chief executive officer	Concurrent positions of chairman of the directors and chief executive officer	+
H_7	Size of the Board of Directors	Size of the Board of Directors	-
H_8	Ratio of independent members of the Board of Directors	Ratio of independent members of the Board of Directors	-
H_9	Big 4 Auditors	Big 4 Auditors	-
H_{10}	Independent auditor's opinion	Independent auditor's opinion	+

3.2. Analysis method

3.2.1. Logistic regression method

For research topics, to determine the sample size representing the whole, there are two approaches to selection: (1) According to the descriptive statistics method and (2) According to the quantitative selection model of the study.

3.2.2. Decision tree method

The decision tree is a classification model introduced by (Belson, 1959), widely used in many different fields. The decision tree is a classification tree with a structure that classifies objects based on a series of rules. Independent variables and attributes can belong to different data types such as binary, nominal, ordinal, quantitative data. To determine which variable to use for classification first, which variable to use later, the information weight (Entropy) corresponding to each variable is calculated, the higher the information value, the more classification information that variable carries.

3.2.3. Random Forest Method

Random Forest is an attribute classification method developed by Leo Breiman at the University of California, Berkeley. In random forest, a significant improvement in classification accuracy is achieved by growing a set of trees, each tree in the set will "vote" for the most popular class.

3.3. Method of assessing the accuracy of forecasting errors in financial statements

To evaluate and compare the performance of the two research models, the accuracy is calculated according to the following formula:

$$\text{Accuracy} = \frac{TP + TN}{TP + FP + FN + TN}$$

A model with all of the above indexes is higher, the model has better forecasting quality. In this article, the author will use the Accuracy, Precision, Recall, F1 – score indexes as a measure to evaluate the model.

3.4. Research data

3.4.1. Research sample

According to (Yamane, 1967), the basis for selecting a sample from the population in a study can be determined by the following formula:

$$n = \frac{N}{1 + N (e)^2}$$

In which:

n: Number of samples to be determined

N: Total number of samples (total)

e: Desired level of accuracy (Error level 0.05 or confidence level 95%).

In this study, the research sample was collected, synthesizing all listed enterprises on the Vietnamese stock market in the period 2015 - 2023, thus ensuring the data of the population, data collected from FiiGroup Vietnam and Vietstock sources, so the data is guaranteed to be updated and reliable.

3.4.2. Research data on the current situation of violations in financial statements

To conduct this study, the author collected data on listed enterprises with violations in financial statements in the period 2015 - 2023 according to the sanction decision of the State Securities Commission (Securities Commission based on the State's regulations on disclosure of financial statements and administrative sanctions for violations in financial statements) in 9 years, 454 enterprises were sanctioned for violations in financial statements.

3.4.3. Research data on factors affecting violations in financial statements

This study uses data collected on the Vietnamese stock market in the period 2015 - 2023, through the database provided by Finpro-X and <https://vietstock.vn>. Data is collected from audited financial statements of listed enterprises after excluding enterprises in the banking, securities, and insurance sectors. After determining the indicators, the data used to perform analysis and forecasting are 10794 observations, and the data are collected from 9 industries.

CHAPTER 4: RESEARCH RESULTS ON VIOLATIONS IN FINANCIAL REPORTS

4.1. Current status of violations in financial reports of enterprises

Based on the decree on administrative sanctions in the securities sector, based on the level and content of violations, including violations in financial statements with an average fine of 161.1 million VND, with a median of 142.5 million VND. Enterprises listed on the HOSE and HNX exchanges have a higher rate of violations than enterprises in the remaining securities markets. Among 454 violating enterprises, the author examined the content of 150 decisions with violations in the financial statements listed on the HOSE and HNX. Among the violations in the financial statements, violations related to annual financial statements accounted for 83.3%, quarterly reporting violations accounted for 50.7%, and violations related to semi-annual financial statements accounted for 43.3%, with an average delay in handling violations of 2 years.

4.2. Descriptive statistics

Based on the method of measuring financial reporting errors in the period 2015-2023, there are a total of 454 enterprises with initial errors in financial reporting. With the research objective of examining the impact of factors on errors in financial reporting, the data of enterprises is incomplete, with specific characteristics such as financial enterprises, enterprises in the financial, banking, and insurance industry systems. Continuing to exclude enterprises where data is not found, or the variable data is incomplete, the final sample has 201 enterprises with errors in financial reporting and 10,593 enterprises with NO errors in financial reporting.

In the context of the Covid19 pandemic, the author examines errors in financial statements in 2 periods before Covid 19 and the Covid19 period. The results show that business performance during the Covid 19 period has increased financial reporting errors compared to the pre-Covid19 period. The test results show that there is a difference in financial reporting errors during the pre-Covid19 period and the Covid19 period up to now.

Correlation between the dependent variable and 10 independent variables:

The correlation coefficient matrix shows that the explanatory variables listed above (independent variables) are mostly closely correlated with the dependent variable financial reporting errors. At the same time, the Sig. values for the simple correlation coefficients between the dependent variable and the independent variables are quite small, ensuring that the overall correlation coefficients are statistically significant at the 5% or 1% level. However, to specifically examine how these variables affect financial reporting errors, regression and testing are required.

Correlation between 10 independent variables

In general, the results of the correlation test between independent variables in the model show that there are no pairs of variables that are correlated with each other with correlation coefficients that are too large to be statistically significant. Thus, it is unlikely that there will be a high multicollinearity phenomenon between variables when running the research model.

4.3. Logistic regression results

The research results will be considered according to each group of factors Pressure, opportunity and attitude. *First*, for the pressure factor group, all 5 variables have an impact on financial reporting errors and are statistically significant, of which 3 factors have an inverse impact on financial reporting errors. On the contrary, there is a factor that has a positive impact on financial reporting errors. *Second*, for the opportunity factor group, the results show that the variable has almost no impact on financial reporting errors. Third, for the group of attitudinal factors, both factors affect financial reporting errors.

When examining the factors affecting financial reporting errors, the author performed regression according to each factor, and the results were similar.

In the research period from 2015-2023, businesses were greatly affected by the Covid-19 pandemic from 2020 to present. For the pressure factor, all factors affected financial reporting errors in the period before the Covid-19 pandemic, however, during the Covid-19 pandemic, only 2/5 factors affected financial reporting errors. For the opportunity factors, 2/3 factors affected financial reporting errors (with a significance level of 10%), while during the Covid-19 pandemic, no factors affected. In contrast to the opportunity factors, in the pre-Covid19 pandemic period, no factor had an impact, while in the Covid19 pandemic period, both factors had an impact and were statistically significant.

4.4. Forecasting errors in financial statements

4.4.1. Forecasting errors in financial statements without processing imbalanced data

To forecast errors in financial statements, the author uses 3 methods including logistic regression, random forest and decision tree. The results of examining the accuracy of the models, the algorithms of logistic regression, random forest and decision tree, have a very high average aggregate forecast result of 98% and 96%. However, for the prediction of errors in financial statements, it is very low, the prediction rate is 5% (for the decision tree method). Although the average prediction result is high, the low prediction rate of errors is due to the serious imbalance in the data ratio between enterprises with errors in financial statements and enterprises without errors in financial statements with a rate of 1.86% errors and 98.14% no errors, so when the prediction rate of no errors in financial statements reaches 99%, the average prediction rate will reach 98% and 96%.

4.4.2. Predicting errors in financial statements when processing imbalanced data

To overcome the limitation of imbalanced data, the author uses the SMOTE technique, the results show that the prediction results of errors in financial statements of enterprises have changed greatly, with very good prediction results. In which, the Random Forest method is an algorithm belonging to the ensemble model class, the results of the algorithm show that the accuracy according to the Precision, Recall, F1-score measures are all above 98%. Specifically, the Precision forecast level is 99%, Recall is 98% and F1-score is 98%, the overall forecast level is 98%. To examine the impact of factors on the ability to predict errors in financial statements due to the impact of the Covid19 pandemic, the author divides the data set into 2 periods, the period before Covid19 (the period from 2015-2019) and the period of Covid19 impact (the period from 2020-2023).

The results of the study of factors affecting the likelihood of financial statement errors are the visual results of a decision tree trained to classify between two classes: “Financial Statement Errors” and “No Financial Statement Errors”. Based on input variables such as STATE, BSIZE, OPION, ROA, BDIND, DZSCORE... each node represents a split condition on a specific variable, and each branch represents the next direction based on whether that condition is true or false.

CHAPTER 5: DISCUSSION AND RECOMMENDATIONS

5.1. Discussion of research results

5.1.1. Discussion of violations in financial statements

Based on the database of 454 enterprises with violations in financial statements in the period 2015-2023 presented in section 3.2 and section 4.1, it shows that the development of the stock market in recent years has been quite vibrant, with listed non-financial companies operating on a large scale. With many business fields and many different industries, contributing a large part to the total value of national products and the economic development of the country. However, in addition to the above strong development, violations in financial statements and non-disclosure of information have also become common in recent years, in which the most violations are related to violations in disclosing information on financial statements.

Compliance with regulations on financial management and accounting still has shortcomings and errors due to non-compliance with regulations on revenue and cost

management associated with factors such as raw materials, fuels, wages, and other costs, so adjustments and handling are required; regulations on prices, management of supplies and materials, exploitation and use of mineral resources, land, and determination of norms are required, so financial information and financial reports must be handled and adjusted. Research results show that violations in revenue and costs are quite common.

This shows very worrying things about compliance with the law on financial management and accounting. That is, the shortcomings and limitations that occur are still regular, continuous, and repetitive in nature, but have not been thoroughly corrected and overcome. The shortcomings, errors, and need to adjust data show that it is necessary to strengthen management organization as well as rectify compliance with regulations on financial management, assets, standards, and accounting regimes.

5.1.2. Discussion of factors affecting financial reporting errors

With a data sample of 10,794 observations in the period 2015 - 2023, the research results show that the model is built on two factors: Pressure and Attitude, which affect financial reporting errors of enterprises.

In the research model, the control variable is Enterprise Size (SIZE), measured as Logarithm (Total Assets), the results show that the size of the enterprise has a positive and statistically significant relationship with errors in the financial statements of the enterprise. Thus, the larger the enterprise size, the more complex its business activities and structure. Especially companies operating under the parent company - subsidiary model, must prepare consolidated financial statements, leading to a higher possibility of errors in the financial statements.

5.1.3. Discussion on forecasting financial reporting errors

Accuracy of algorithms in forecasting financial reporting errors

Using 11 indicators in the research model, after processing imbalanced data, the results show that the Random Forest algorithm has the highest prediction results for financial reporting errors with an accurate prediction rate of 98%, followed by the Decision Tree algorithm with 96%. However, the Logistic Regression algorithm has a quite low prediction result of only 68%. Specifically, with the Random Forest algorithm, the prediction level according to the criteria of the prediction accuracy level (Precision), (Recall) and (F1-score) all reach 98%. In summary, with the use of all 10 factors according to the factors of pressure, opportunity and attitude to predict the possibility of financial reporting errors using the Random Forest algorithm, the prediction result is very good, reaching over 98%. The results of this study are similar and the prediction accuracy is better than the studies of (Green & Choi, 1997), (Beneish, 1999), (Chen,

2016), (Jan, 2018), (Yao et al., 2019), (Craja et al., 2020), (Zenzerović & Šajrić, 2023), (Achakzai & Peng, 2023), (Ali et al., 2023), (Nemati et al., 2024).

In this study, the ability to predict financial statement errors is evaluated by comparing the performance of three machine learning models: logistic regression, decision trees, and random forests. The ROC (Receiver Operating Characteristic) chart is used to illustrate the classification performance of each model, in which the area under the curve (AUC) is an important indicator reflecting the ability to discriminate between observations with and without misconduct in the financial statements.

Importance of factors in predicting misconduct in financial statements

To examine the importance of factors to the ability to accurately predict misconduct in financial statements. The author uses the random forest method and the decision tree method. For the random forest method, the 3 most important factors of each impact on the ability to predict are the Ratio of Independent Members of the Board of Directors (BDIND), Enterprise Size (SIZE) and Financial Leverage (LLEV). Meanwhile, when using the decision tree method, the 3 most important factors affecting the ability to predict are the Ratio of Independent Members of the Board of Directors (BDIND), State Ownership (STATE) and Financial Leverage (LLEV).

When considered in the context of the Covid19 pandemic, the importance of factors to the forecasting ability also changed before the Covid19 period and the period from Covid19 to 2023. Thus, in different contexts, the importance of each factor may change, however, the forecasting results in both periods gave accurate forecasting results reaching 99% when using the Random Forest method.

5.2. Recommendations

- For state agencies

+ The National Assembly, the Government, the Securities Commission, and the Ministry of Finance need to develop a system of legal documents to control and minimize violations in financial statements. It is possible to refer to the Sarbanes-Oxley Act (USA).

+ Strengthen inspection and handling of violations related to the transparency and honesty of financial statement information of listed enterprises.

+ Strengthen control of accounting and auditing quality of financial statements of listed companies through the establishment of an organization specializing in controlling accounting and auditing activities.

- + Strengthen supervision by issuing documents to enhance the role and clearly define the responsibilities of the Vietnam Securities Commission and the stock exchange in the process of supervising information disclosure activities of listed enterprises.

- + Apply heavier penalties for acts of delay in disclosing financial statements, and do not accept the extension of the disclosure period for unjustified reasons

- + Strictly manage information, avoid the spread of inaccurate unofficial information on the stock market.

- + Propose many methods of propaganda and dissemination of legal regulations on the disclosure of fake information, false information, falsified data, etc. to increase clarity and transparency in the management of the quality of disclosed information, avoiding negative impacts on the stock market in general and investors in particular.

- + Strengthen management and improve the quality of independent auditors and auditing companies.

- For auditing companies

- + With the factors of motivation and pressure, auditors need to pay attention to the indicators showing the company's ability to generate profits, the company's ability to generate revenue and the actual cash flow generated from the company's production and business activities. Auditors analyze this indicator based on the comparison with the average level or with the company's audited data from the previous year.

- + With the factor of attitude, auditors can rely on the results of past audits to evaluate the attitude and ethics of the board of directors. If there are signs that the board of directors is not honest (has been discovered to have committed profit fraud in the past, has received an unqualified opinion from the auditor), then the possibility of fraud in the financial statements is higher.

- + Continuously improve the quality of audits for clients, especially listed enterprises.

- + Promote consulting activities for listed enterprises during and after the audit. Coordinate with professional associations and regulatory agencies to improve accounting policies and legal documents.

- + Auditors can use random forest algorithms and decision trees to predict possible errors in financial statements, helping auditors identify businesses at high risk of committing fraud. However, in different stages and contexts (for example, the impact of the Covid19 pandemic), the importance of each factor may change according to different methods and algorithms.

- For enterprises

+ Improve the quality of accounting human resources, the mistakes that financial statement preparers make are also partly due to subjective reasons such as the weak professional qualifications of accountants, lack of objectivity and honesty, as well as the ability to observe and analyze.

+ The Board of Directors must strengthen supervision activities to ensure that the actions of the Board of Directors do not violate the interests of shareholders.

+ Enterprises need to unify the time and process of preparing consolidated financial statements for units within the enterprise.

+ Enterprises need to perfect the means of information disclosure from basic sources such as the electronic information page, the electronic database of the enterprise and implement security measures, ensure safety and security of information within the enterprise, avoid information leakage and distortion.

+ Shareholders should fully demonstrate their roles and obligations in supervising the responsibilities of listed companies, and require enterprises to provide complete and accurate information to meet their interests, contribute to attracting investment, and improve the position of enterprises.

- For investors

Individual and institutional investors can build a model to assess the risk of financial statement fraud based on financial indicators, cash flow and audit information. In particular, integrating indicators such as ROA, operating cash flow, financial leverage and audit opinions can improve the accuracy in detecting enterprises with high potential for violations. In addition, market management agencies need to strengthen their supervisory role over enterprises with state ownership and high financial leverage, and at the same time, improve the requirements on audit quality to protect investors and the market.

5.3. Contributions of the thesis to theory and practice

5.3.1. Contributions to theory

First, for the fraud triangle theory, the study has reinforced the central role of the pressure factor. Variables such as low ROA, weak cash flow from operating activities (NCFO), high financial leverage (LLEV), and financial distress probability (DZSCORE) are positively correlated with the probability of financial reporting errors, indicating that when enterprises are under great financial pressure, the motivation to commit fraud increases significantly. At the same time, the study found that variables belonging to the opportunity group, such as board size, independent member ratio, and duality of positions, are not statistically significant, suggesting that fraud opportunities in some contexts in Vietnam depend not only on structure

but also on enforcement effectiveness. In addition, the presence of Big4 auditors has the effect of reducing financial reporting fraud, suggesting the impact of attitude/reason and professional standards in limiting financial reporting fraud.

Second, the results of the fraud balance theory show that in state-owned enterprises (STATE), where power is concentrated or there is a lack of effective monitoring mechanisms, fraud still occurs - implying the possibility of exploiting personal power to commit financial reporting fraud.

Third, the study adds empirical evidence to the agency theory, showing that conflicts of interest between managers and shareholders can lead to financial reporting fraud. The fact that management faces financial pressure or profit targets can encourage them to commit financial reporting fraud to achieve personal benefits, especially in the context of a lack of effective monitoring from the Board of Directors or insufficiently independent auditors.

5.3.2. Contribution to practice

The research results on factors affecting the possibility of financial statement fraud have made significant contributions to the practice of management agencies, enterprises, auditing companies and investors. The empirical findings can be applied in improving the effectiveness of financial control, designing appropriate governance policies and supporting stakeholders in assessing the risk of financial reporting fraud.

First of all, from the investor perspective, the research provides a set of early warning indicators of the possibility of financial reporting fraud. Financial variables such as return on assets (ROA), financial distress probability (DZSCORE), operating cash flow (NCFO) and financial leverage (LLEV) all show a close relationship with financial reporting fraud. Investors can use these indicators as a risk analysis tool before making a decision to buy, sell or hold stocks, especially during periods of market volatility or when the business is facing liquidity difficulties.

For corporate leaders, research shows that financial pressure is one of the factors that stimulate misconduct in financial statements. This requires the establishment of an effective financial risk management system, while focusing on financial transparency and ethical governance to enhance the trust of shareholders and the market. In addition, the results of rejecting the statistical significance of the variables on board structure (DUAL, BSIZE, BDIND) suggest that businesses need to pay attention not only to the form of governance, but also to ensure the implementation capacity and actual effectiveness of internal control mechanisms.

For management and policy-making agencies, the study provides an important database to help identify enterprises at risk of financial reporting errors, thereby orienting the development of financial monitoring criteria more suitable to practice. Management agencies can consider the financial risk indicators that have been tested in the study to build an early warning system, supporting the inspection and examination of listed enterprises more effectively. At the same time, there should be a mechanism to encourage the use of reputable auditors to improve the quality of financial reporting in the whole market. In short, the study is not only valuable in theory but also has many practical implications, especially in enhancing financial transparency, minimizing the risk of financial reporting errors and improving the efficiency of the financial market in Vietnam.

5.4. Limitations and future research directions

First, the research model uses secondary data, mainly based on financial statements and audit reports of listed companies. This may cause bias due to limited availability and transparency of information. Some misconduct in financial statements may not have been detected by the Securities Commission, leading to mismeasurement of the dependent variable. Therefore, future studies need to supplement qualitative data through surveys and in-depth interviews with auditors, investors or regulators to increase the reliability and depth of the data.

Second, the opportunity measurement variables (DUAL, BSIZE, BDIND) do not give statistically significant results, although the theory suggests that these are factors that have a clear influence on misconduct in financial statements. This result may reflect the problem of corporate governance quality in practice, or the inappropriateness of the current quantitative measurement. Therefore, further studies may consider alternative indicators that better reflect the effectiveness of the governance apparatus, such as the meeting attendance rate, or the relationship network between board members.

Third, the study was only conducted on a sample of listed companies in Vietnam, with specific legal and institutional characteristics. Therefore, the ability to generalize to other countries or jurisdictions is limited. Comparative studies between emerging and developed markets would be a useful direction to assess the universality and consistency of the research model.

Finally, in the context of digital transformation and the application of artificial intelligence in the field of accounting and auditing, future research needs to expand the theoretical framework to integrate technological factors, including the level of use of risk analysis tools using deep learning artificial intelligence or combined with text language analysis to increase the ability to predict errors in financial statements with higher accuracy.

GENERAL CONCLUSION

Faults in financial statements are a prominent topic in the economic, social and political fields. The prevalence of errors in financial statements in the world and in Vietnam raises the issue of understanding the nature, causes and consequences of errors. This study is valuable when applied to assessing the status of financial reporting errors of enterprises with the ability to forecast with high accuracy. Through the study, the author achieved the following results:

- First, pointing out the current status of errors in financial statements through data from the Securities Commission on administrative sanctions for errors in financial statements of listed enterprises on the stock market in Vietnam in the period 2015-2023.

- Second, identifying influencing factors based on the fraud triangle theory and the most important in forecasting errors in financial statements. In which, the factors belonging to the pressure and attitude factors have an impact on financial statement errors

- Third, determine the importance of factors in applying machine learning algorithms in predicting the possibility of errors in financial statements of companies listed on the Vietnamese stock exchange with an accuracy of over 98%.

- Fourth, consider the ability to predict the possibility of errors in financial statements of companies listed on the Vietnamese stock exchange in the context of the impact of the Covid19 pandemic, when dividing the research data into 2 periods before Covid19 and the period from Covid19 to 2023. The results show that the ability to predict with accuracy does not change, but the importance of each factor changes with each other.

- Fifth, recommendations and measures have been proposed to prevent and detect violations to some extent, which is very helpful for investors and those interested in information on financial statements, thereby making effective management and investment choices. The author also believes that the results of this research will have both research and practical significance for relevant parties. Although the author has made efforts to research and solve the research objectives, the thesis cannot avoid certain limitations. The author hopes to receive valuable comments from scientists to improve the thesis.

SCIENTIFIC PUBLICATION

1. **Dang Ngoc Hung, Pham Thi Hong Diep, Cao Thi Nhlen** *"Research on Financial Reporting Fraud using Random Forest Algorithm Approach"*, Journal of Science and Technology, Vol. 58 No. 2, April 2022.
2. **Cao Thi Nhlen, Dang Ngoc Hung, Hoang Thi Viet Ha** *"Research on financial reporting errors at listed enterprises on the Vietnamese stock market"*, Journal of Financial and Accounting Research (Academy of Finance) Issue 2, June (No. 266) - 2024.
3. **Cao Thi Nhlen, Dang Ngoc Hung, Vu Thi Thanh Binh** *"Using random forest and artificial neural network to detect fraudulent financial reporting: Data from listed companies in Vietnam"*, Journal of Quality - Access to Success Vol. 25, No.202/Sep 2024 DOI: 10.47750/QAS/25.202.17 SCOPUS
4. **Cao Thi Nhlen, Dang Ngoc Hung, Vu Thi Thuy Van, Hoang Thi Viet Ha** *"Financial statement fraud overview reached by directory and content bibliometric analysis"* Journal of Finance & Accounting Research No. 06 (31) – 2024, page 55 – 60
5. **Cao Thi Nhlen, Dang Ngoc Hung, Hoang Thi Viet Ha, Pham Thi Hong Diep** *"Factors affecting financial reporting errors of listed enterprises on the Vietnamese stock market"*, Journal of Science & Technology (Hanoi University of Industry), Vol. 60 No. 11, November 2024, 301-308