Ferdowsi University of Mashhad Press (FUMP)

Volume 8, Issue 4, Autumu 2024

IJAAF

IRANIAN JOURNAL OF ACCOUNTING, AUDITING and FINANNCE

Volume 8, Issue 4, Autumu 2024

Serial Number: 29

Print - ISSN: 2717-4131
Online - ISSN: 2588-6142

https://ijaaf.um.ac.ir

IRANIAN JOURNAL OF ACCOUNTING, AUDITING and FINANNCE

In the Name of God, the Compassionate, the Merciful

Ferdowsi University of Mashhad

Iranian Journal of Accounting, Auditing & Finance (IJAAF)

Volume 8, Number 4, Autumn 2024, Serial 29

ISSN (Print): 2717-4131, ISSN (Online): 2588-6142

Editorial Office: Faculty of Economics and Administrative sciences, Ferdowsi University of Mashhad, Azadi Sq., Mashhad; IRAN; P.O. Box: 1793; Postal Code: 9177948974; Tel: +98 51 38803742; Fax: +98 51 38763852
http://ijaaf.um.ac.ir E-mail: ijaaf@um.ac.ir

Table of Contents

Editorial Board

Received articles will be published after professional referee, and being approved by the editorial board. Submission to this Journal is required to send at least two files include: an "Article cover" and an "Anonymous file of the main article", through systems, http://ijaaf.um.ac.ir/ .Submission of a manuscript implies that the paper has not been published before and it is not under consideration for publication elsewhere. Please pay attention to the following:

1-Article Cover

The file should be typed in Word software (office), and A4 sized page which include:

- Full title of the paper centered in Times New Roman 16.
- Author's name centered in Times New Roman 12 (Bold),
- Author's characteristics centered in Times New Roman 11 (italics), including the authors' name (the name of correspondence author should be marked with an asterisk), academic rank and the name of the institution or university (do not use pseudonym and nickname), complete address, telephone number and fax of correspondence author and e-mail address of all authors.

2- Anonymous file of the main article

The main article should be typed in Word software (office), A4 sized page and utmost in 7500 words (including references), and numbered pages while page margins are as follows: margin from the above 4 cm, from the below 5/6 cm, from the left 5/4 and from the right 5 cm. The line spacing should be set at 1 cm and the beginning of each paragraph indented about 0.3 cm, the entire text should be Justified and include the following:

The first page:

- Full title of the paper, centered in Times New Roman 16.
- Abstract in Times New Roman 11 and utmost 165 words, including four issues: (1) Subject and purpose of the paper, (2) methodology, (3) findings, and (4) conclusions, and Contribution (maximum).
- Utmost 5 keywords in Times New Roman
- Subject classification code in Times New Roman This coding is designed for subject classification in economic literature and how to use it in detail is available on the following website:www.aeaweb.org/journal/jel_class_system.html
- The main titles in manuscript (including abstract, introduction, literature review, methodology, findings and Conclusion) left aligned in Times New Roman 12(Bold) and sub-titles (such as Keywords, subject classification code and other necessary(important) titles) left aligned in Times New Roman 11(bold) and in the left alignment, content of main manuscript in Times New Roman
- As far as possible, do not use any image in the text and if used, it should be high- quality black and white photos.

Structure of second page until the end of manuscript is as follow:

- *Introduction* Some paragraphs contain explaining the problem, literature review, object (purpose), importance and necessity of it.
- *Literature review* a review of the literature investigates only related researches chronologically and the results exploit at the end of the section theory matrix or conceptual model that document research variables and Formulate research hypotheses.
- *Methodology* including Methods, data collection tools, population, sample size and sampling methods, analysis and model testing hypothesis, definition of study variables and operational definition of them can be in presented the same section that model testing is represented and there is no need to repeat.
- *Results* including the findings compare it with the findings of previous and interpretation of compliance or inconsistency of findings with research findings and theories.*Conclusion* includes a summary of the problem, provide a summary of the results and overall conclusion and

recommendations based on the results (policy recommendations is necessary only in applied research and, if necessary, recommendations for future research accordant with the research limitations or how development of current research;
- *References* are as Section 3-2 and
- *Endnotes* terminology and some necessary explanations provide in the endnote (no footer) and as a two-column table (contains the endnote number and content of endnote with invisible lines (No Border). Numbering the endnotes are as text and doing without the use of EndNote technique.

3- Other important points in the original file

3-1- References inside the text

- In order to reference within the text (APA) method should be used; so the author's last name with the year of publication it is presented in the text respectively. If there are two authors, last names' will be separated by "and" and if more than three people, "et al." will be used
- After the last name of the first author. If the number of resources is more than one, a semicolon (;) will be used to separate them.
- Any reference which is mentioned in the article, must be included in references part.
- If it is required to explain more about terms or words within the text, endnote can be used.

3-2- References

To set the reference list, use the (APA) method, as follows:
Books: Author, A.A. (Year of Publication). *Title of work*. Publisher City, State: Publisher.
When citing a book in APA, keep in mind:

- Capitalize the first letter of the first word of the title and any subtitles, as well as the first letter of any proper nouns.
- The full title of the book, including any subtitles, should be stated and *italicized*.
- Magazines: Author, A.A. (Year of Publication). Title of the Article. *Journal Title*, *Volume* (Issue), pp.-pp.
- When citing a magazine in APA, keep in mind:
- You can find the volume number with the other publication information of the magazine.
- You can typically find page numbers at the bottom corners of a magazine article.
- If you cannot locate an issue number, simply don't include it in the citation.
- Online magazine article: Author, A.A. (Year). Title of the Article. *Magazine Title*, *Volume* (Issue), Retrieved from http://xxxx
- When creating an online magazine citation, keep in mind:
- The volume and issue number aren't always on the same page as the article. Check out the other parts of the website before leaving it out of the citation.
- List of references should not be numbered. If there are 2 or more authors alike, in addition to alphabetical order, the publisher year also should be ordered. In order to avoid the pitfalls of the various sources listed, the beginning of each reference is 0/5 cm protrusion.
- If there are two authors, last names' will be separated by "and" and if more than three people, last names' will be separated by a comma (,) and the last one with "and".

3-3- Charts, Tables and Formulas

Charts' title should be writhen below and tables' title on the top centered in Times New Roman 11 and Bold. Charts and tables render within the text and immediately place after the explaining paragraph. The content of charts and tables in Times New Roman 10

- Tables and images number from No. (1) To refer to the content of the images and diagrams in the text, use the number and appropriate referral.
- Inserting decimal numbers, instead of using slash (/), and show negative numbers by using the minus sign.
- Tables include variables, should contain a column for the symbols used for variables.

- Formulas represent centered in Times New Roman11and render in a two column table with no border and number with figure in parentheses.

3-4- Other notes

- There is no need to spaces before dot, comma, semicolon, colon, question mark, exclamation mark and, but after these signs shall be placed a spaces.
- Use spaces before opening and after the closing parenthesis.
- Articles should not be sent to Persian/English journal or another language at home and/or abroad simultaneously.
- If the format and structure of submitted articles are not same as what mentioned in this guide, it won't be accepted.
- Journal can edit and delete some sections, without any change in its content and received journals will not bring.
- Responsibility for the accuracy of the article is the author.
- The file should be named in English. This name should include the first author's last name and sending date. Articles will be received only by Journal Website.
- In order to expedite the referee process and publishing an article, we will ask respected professors and researchers to ensure technical and literary editing and enforce this guide.

The journal is devoted to research papers. Research paper is extracted from the research project, master's dissertation or thesis.

Receiving the papers is only possible electronically.

Editor's Note

I am pleased to announce that the Ferdowsi University of Mashhad is publishing Iranian Journal of Accounting, Auditing & Finance (IJAAF). On behalf of the board of the IJAAF and my co-editors, I am glad to present the Volume 1, Issue 1 of the journal in December 2017; the journal will publish four issues in a year. The board includes experts in the fields of accounting, finance and auditing, all of whom have proven track records of achievement in their respective disciplines. Covering various fields of accounting, *IJAAF* publishes research papers, review papers and practitioner oriented articles that address significant issues as well as those that focus on Asia in particular. Coverage includes but is not limited to:

- Financial accounting
- Managerial accounting
- Auditing
- Taxation
- Accounting information systems
- Accounting education

Perspectives or viewpoints arising from regional, national or international focus, a private or public sector information need, or a market-perspective are greatly welcomed. Manuscripts that present viewpoints should address issues of wide interest among accounting scholars internationally and those in Asia in particular.

Yours faithfully,
Mahdi Moradi
Editor in Chief

IJAAF; Vol. 8, No. 4, Autumn 2024, Serial 29

Ferdowsi University of Mashhad

Iranian Journal of
Accounting, Auditing & Finance

Quarterly

RESEARCH ARTICLE

A Hybrid Decision-Making Model for Optimal Portfolio Selection under Interval Uncertainty

Mohsen Zahmati Iraj, Meysam Doaei*

Department of Finance, Esfarayen Branch, Islamic Azad University, Esfarayen, Iran

How to cite this article:
Zahmati Iraj, M., & Doaei, M. (2024). A Hybrid Decision-Making Model for Optimal Portfolio Selection under Interval Uncertainty. Iranian Journal of Accounting, Auditing and Finance, 8(4), 1-24. doi: 10.22067/ijaaf.2024.43648.1255
https://ijaaf.um.ac.ir/article_43648.html

ARTICLE INFO

Article History
Received: 2023-10-26
Accepted: 2024-01-10
Published online: 2024-10-25

Keywords:
Fuzzy EDAS, Iranian Capital Market, Multi-objective Optimization, Robust Optimization, SWARA

Abstract

This paper proposes a hybrid approach that integrates fuzzy multi-criteria decision-making with multi-objective mathematical optimization to address the investment management problem in the Iranian capital market under interval uncertainty. To achieve this, we first employ the fuzzy SWARA method to assess the global importance of the criteria weights. Subsequently, we develop a fuzzy EDAS method to rank the active industries in the Iranian capital market, including basic metals, chemical products, investment services, metal ore mining, financing, insurance, pension funds, and social security. Next, we present a mathematical model to determine the optimal investment amount for each ranked alternative. According to the numerical results, the most critical criteria for evaluating different investment areas are access to financial resources, distribution networks, and raw materials. The highest optimal share of investment is associated with Fars 1, while the lowest value pertains to Gharn 1. When solving the model under conditions of uncertainty, we observe that increasing parameter Γ_1 from small to large values decreases the value of the first objective function for the most efficient Pareto member. However, when Γ_1 exceeds 10, the value of the first objective function stabilizes. Additionally, the third objective function shows an increasing trend as the parameter Γ_3 decreases. The results obtained can serve as a managerial tool for stakeholders involved in research participation.

https://doi.org/10.22067/ijaaf.2024.43648.1255

NUMBER OF REFERENCES
51

NUMBER OF FIGURES
4

NUMBER OF TABLES
8

Homepage: https://ijaaf.um.ac.ir
E-Issn: 2717-4131
P-Issn: 2588-6142

*Corresponding Author: Meysam Doaei
Email: me.doaei@iau.ac.ir
Tel: 09128475884
ORCID: 0000-0003-2276-2973

1. Introduction

Generally, production and trade play an important role in the economic environment and can be considered engines of the economy that contribute to the country's survival in domestic and foreign markets. Accordingly, properly strengthening and utilising productive and commercial capacities and creating new capacities while paving the way for development, production and provision of services also provide the basis for sustainable economic development (Thoumi, 2009). Therefore, the role of the government as a supporter of guidance programs in production and trade needs to be more colorful. Creating a common ideal between those in charge makes supporting production, employment, and productive and commercial investments possible to achieve self-sufficiency. On the other hand, by supporting products with export development potential with the cooperation and participation of the private sector, it is possible to take advantage of the existing capacities and improve productivity while achieving self-sufficiency to enter and penetrate global markets (Khodaverdizadeh & Mohammadi, 2016).

It should be noted that the investment problem in domestic production has always been considered one of the most important criteria for economic development societies (Thoumi, 2009). Some significant advantages include creating sustainable employment, developing industry and increasing GDP, reducing dependency on imported industries, developing exports and currency appreciation, and creating a suitable platform for developing other service sectors (Allcott & Keniston, 2018). The history of industrial development in Japan and Germany in the 19th century can be called a successful world experience. During World War II, Germany and Japan, due to global sanctions, were unable to meet their industrial needs and were forced to produce needed products based on domestic capabilities. Due to the achievements of these countries, this issue has gradually grown as a culture of national development and has been considered by many researchers in the industrial development literature (Liza & Morales Anaya, 2018). Today, domestic industry development is known as a model of progress in many countries, including Iran, but its implementation requires long-term planning based on scientific knowledge. This issue has wide dimensions and cannot be achieved with a short-term view of the intended goals. Therefore, there is a need for planning in various industrial and commercial sectors. As a desirable goal, it should be imagined that all the products that are needed by society and the potential for their production are available domestically, and they should be provided with the help of internal forces. This issue can be achieved more appropriately with the help of transferring technical knowledge from other countries (Popkova et al., 2018). It should be noted that the development of a country is not possible in isolation and requires interaction with other countries. Therefore, in the development of the national economy, the situation of the world market, international relations and trade relations should also be considered.

According to the literature, the paper's research gap is related to investigating sustainable development in stock markets with the help of quantitative models. Organizations responsible for promoting sustainable production have to create suitable opportunities that safeguard financial and human resources domestically, resulting in the movement of economic cycles. Despite the crucial role of sustainable development in the stock market, there has been no investigation of this issue in the literature. In Iran, the lack of budget and economic sanctions is causing a decline in investment incentives and an increase in unproductive employment, leading to future difficulties. One of these problems is the country's heavy reliance on imported goods due to a lack of enthusiasm for domestic production, which needs to be addressed by conducting both theoretical and practical research to safeguard existing capital in the production sector.

This study investigates the investment management problem in the Iranian capital market using a

hybrid approach based on fuzzy-MCDM and optimization model under interval uncertainty. In the first phase, with the help of a fuzzy-SWARA and a fuzzy-EDAS, the importance of the criteria and evaluation of different investment areas are determined. The fuzzy-EDAS method prioritized each of the selected alternatives. Then, using a multi-objective optimization model under interval uncertainty, the optimal investment amounts in each company are determined. Finally, various numerical analyses are performed to perform managerial analysis and provide decision-making policies.

In the remaining parts of the paper, the research literature is first investigated in section 2. Then, the proposed methods, including fuzzy-MCDM and optimization model, are stated in section 3. Numerical results are described in section 4 and quantitative analysis is performed to present managerial insights. Finally, in section 5 a conclusion and some future suggestions are described.

2. Literature review

The continuous growth of the world's population, lack of resources and environmental pressures are important factors in the transition to greener and more sustainable planets. Over the past decade, governments around the world have addressed climate change issues by revitalizing the national economy through sources of sustainable economic, social, and environmental growth (Kisman & Krisandi, 2019). In the 2015 Paris Agreement, countries agreed to strengthen the global response to climate change threats by maintaining global temperatures (Arif et al., 2020). To move towards low-carbon economies and to reduce poverty and sustainable livelihoods, investment in green employment, biodiversity conservation, renewable energy, sustainable water management and waste management must be implemented nationally. However, advanced economies have recently suffered from a lack of investment in public infrastructure, while developing economies do not have access to modern services for their growing populations (Caplan et al., 2013). Accordingly, raising the right type of investment for the infrastructure sector is crucial. Climate policymakers are therefore responsible for creating incentives to promote green growth and encouraging private sector investment in sustainable projects (Shabbir & Wisdom, 2020). The growing importance of sustainable and environmental investments in financial markets also has implications. Financial markets are responding to the growing demand for global low-carbon projects to meet climate change challenges. New financial instruments have been developed to direct capital to green projects. Mathematical optimization can be used to finance low carbon and healthy climate resistant infrastructures (Arif et al., 2020). The following are some of the most recent studies in sustainable investment management.

Cesarone et al. (2020) examined the issue of stock portfolio selection by considering risk management criteria. In order to solve the problem, they presented a hybrid approach based on simulation and optimization methods. In this approach, a greedily classical single-discipline innovative algorithm is used that can produce appropriate solutions. According to the numerical results, it has been observed that the criteria related to risk management had a much greater impact on the final output than the economic criteria. Castilho et al. (2019) proposed a method based on the classical mean-variance analysis using machine learning in order to optimize the stock portfolio selection problem in stock exchange networks. Uncertain future returns and PER ratios of each asset are approximated using fuzzy L-R numbers and budget, scope, and cardinality constraints. Rahiminezhad Galankashi et al. (2020) used the fuzzy analytical network process method to evaluate and select a stock portfolio on the Tehran Stock Exchange. First, a literature review was performed to determine the main criteria for selecting the portfolio, and then a Likert questionnaire was used to finalize the list of criteria. Final criteria were applied in the fuzzy analytical network process to rank 10 portfolios. The results showed that profitability, growth, market and risk are the most important criteria for choosing a portfolio. Vuković et al. (2020) compared stock portfolio selection using a

combination of multi-criteria decision making and modern portfolio theory, which includes only Croatian capital market indicators. The results show that there was a significant difference in stock rankings. However, stocks not included in any portfolio in the selection of the modern portfolio theory were ranked lowest due to the MCDM hybrid approach, which confirmed that these stocks were for investment in the worst-case scenario. Rezaei Nokandeh et al. (2020) presented a hybrid model consisting of three steps: 1) coverage analysis (for initial stock revision), 2) multi-criteria decision making (TOPSIS) in conditions of uncertainty and 3) presentation of planning model. In order to select the best stock portfolio according to the priorities and constraints of the organization, they provided a line to achieve the highest compatibility between the final selection and the initial ranking of each share. Xu et al. (2020) selected a portfolio of renewable energy desalination systems with a sustainable perspective within a multi-criteria decision-making framework under data uncertainty. A mathematical framework was proposed to deal with data uncertainty. A fuzzy network analysis method was used to assign weight to related criteria. Finally, the logical ranking of the options was done. Stanković et al. (2020) stated that despite the widespread use of modern stock portfolio theory and Markowitz's approach for optimization, which is based on quadratic planning and the distribution of probability returns as key parameters, these approaches have been criticized. The standard mean variance has been modified using more appropriate risk criteria in the optimization algorithm, which has been tested in portfolio management on the Belgrade Stock Exchange. Doaei et al. (2021) predicted the daily Tehran Exchange Dividend Price Index (TEDPIX) via the hybrid multilayer perceptron (MLP) neural networks and metaheuristic.

Algorithms. The results showed that grey wolf optimization has superior performance in training MLPs for predicting the stock market in metaheuristic-based. Yoshino et al. (2021) examined the impact of the Covid virus 19 and the achievement of sustainability goals on the stock portfolio issue. This article theoretically shows that the current allocation of investors by considering sustainability goals based on different consulting firms would change the investment portfolio. The allocation of stocks can be done globally by taxing pollution and waste such as CO2, NOx and plastics at the same tax rate, and the global pollution tax would lead to the allocation of stocks. Doaei and Saberfard (2021) investigated stock portfolio selection in Iran's capital market by uncertainty conditions. They found that both multi-objective and single-objective situations can be implemented in real-world conditions and that the computational results of this study can be used as an operational tool. Mostafae and Doaei (2022) optimized the portfolio in listed companies on Tehran Stock Exchange and Iran Farabours as a multi-objective optimization problem. The numerical results showed that the grey wolf algorithm is more efficient than the genetic algorithm in all examples. According to the above description, one of the obligations of the organizations in charge of sustainable production development is to create appropriate opportunities to protect human and financial resources at home, which leads to the movement of economic cycles. Currently, in Iran, due to the lack of budget and existing sanctions, the incentive to invest is decreasing daily and the tendency to invest in unproductive employment is strengthening. This will cause many problems in the future. Among them, we can mention the strong dependence of the country's consumer market on imported products due to the loss of the spirit of the production boom. Therefore, it is necessary to conduct theoretical and practical studies to protect existing capital in the production sector. Therefore, this research proposes a hybrid model based on multi-criteria decision making and multi-objective optimization for accurate investment in different production sectors. The main aim of this study is to improve the current investment situation using mathematical decision-making and optimization tools. The main contributions of this research are as follows.

1. Providing a hybrid model of multi-criteria decision making and multi-objective optimization
2. Determining high priority companies for the gradual transfer of capital from the private sector

3. Using mathematical planning methods to determine the volume of investment by considering multiple goals

4. Using fuzzy programming in decision making and robust optimization in mathematical modeling

5. Considering the conditions of uncertainty in some input parameters of the problem

3. Research methodology

The global and international markets' economic and financial situation, which are often due to the outbreak of COVID-19 in 2020, have left private sector investors with many problems directing capital to financial markets (Ferneini, 2020). The decision-making criteria that investors have considered in previous years for the optimal selection of stock portfolios cannot now lead to highly reliable answers (Talan & Sharma, 2019). In general, the criteria to measure the performance of manufacturing and investment companies can include attention to economic trends, employment infrastructure and criteria related to the social dimension. However, the question that needs to be answered in the first stage is how to limit the scope of decision-making when choosing the right companies to invest in so that the optimal composition of the stock portfolio can be created with more focus. It is very important to conduct an initial screening to eliminate weaker companies before thoroughly analysing companies operating in the financial markets to direct capital to them. This is precisely a decision based on a set of management criteria and sub-criteria, the output of which leads to limiting the number of potential companies to invest in (Ho et al., 2011). The level of need to examine the issue of this research can be found in the turmoil in the Iranian financial markets. At present, the use of the former analysis methods does not meet the needs of investors to provide reliable answers. In other words, some numerical analyzes may show the conditions for a company to grow in the future, but what actually happens is the opposite, and the directed investment in that company is virtually lost. One of the main reasons for this problem is the consideration of some criteria for evaluating investment in various areas active in the capital market. Therefore, providing a suitable approach to consider a wider range of information and criteria in order, to obtain final answers can to a large extent lead to high-reliability answers. Some of the benefits of conducting this research can be considered in providing highly reliable answers to determine the share of investment in different companies. Implementing this research will create a broader view of decision-making criteria in this area and the use of new tools. In addition, the high flexibility of the proposed approach can pave the way for its improvement and the introduction of more criteria and sub-criteria.

The proposed framework of this research consists of two phases. In the first phase, using a multi-criteria decision-making model, various industries of the Iranian capital market, including basic metals, chemical products, investment, metal ore extraction, financing papers, social security insurance, and pension funds, are evaluated. Then, a mathematical optimization model is developed to determine each company's investment amount according to different objective functions. Therefore, the final outputs can be provided to research beneficiaries as investment management decisions. In order to ensure the solutions are obtained, the necessary sensitivities are analyzed to examine the behavior of the proposed framework in different situations. Figure 1 shows the flowchart of the research method used in the paper.

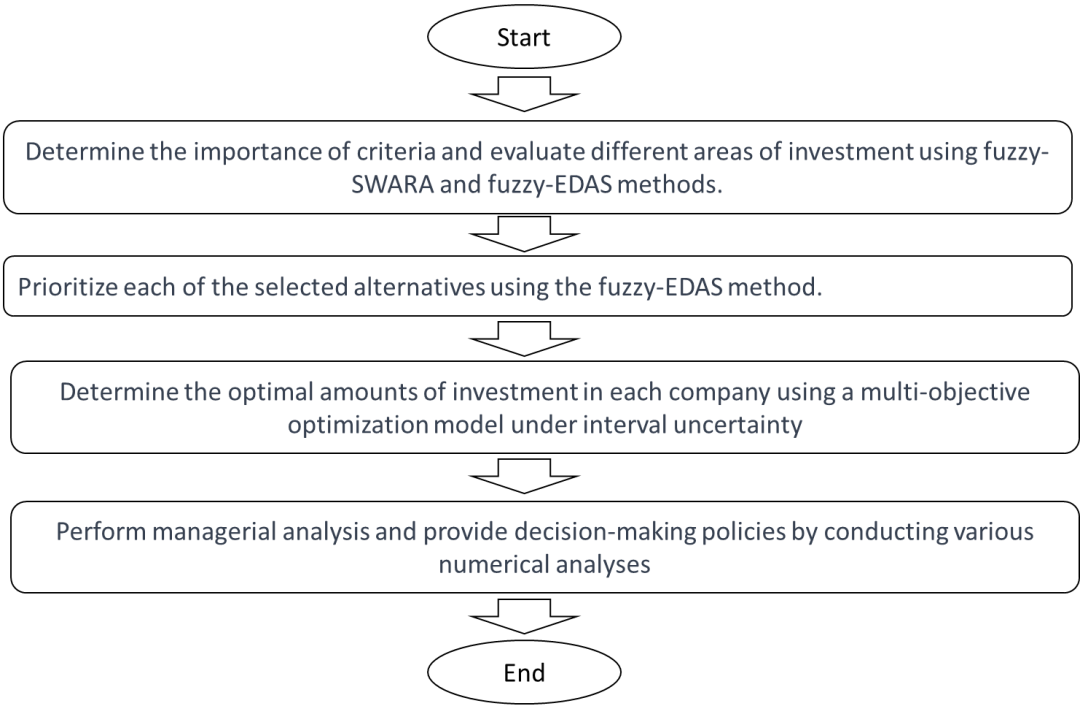


Figure 1. Flowchart of the research paper

3.1 The first phase: multi-criteria decision making

In most MCDM processes, the decision-makers provide indefinite responses rather than exact and precise solutions (Farughi & Mostafayi, 2017; Li & Zhao, 2016). Every decision-making problem comes with particular uncertainties and ambiguities that arise from the subjective judgments performed by the decision-makers. Such uncertainties are even more likely in problems where the criteria are dominantly expressed in qualitative terms. On the other hand, the decision-making models based on the decision-makers' subjective judgments are often rendered inaccurate since they need a great deal of relevant knowledge, experience, and expertise (Banaeian et al., 2018). Therefore, to treat such problems appropriately, utilising the fuzzy set theory and linguistic terms makes more sense than traditional methods to score various preferences. This section explains the fundamental definitions of the fuzzy set theory before introducing the fuzzy methods of SWARA and EDAS in separate subsections. Finally, the provided definitions are compiled to develop a hybrid SWARA-EDAS MCDM model in a fuzzy domain.

3.1.1 Fuzzy SWARA method

Researchers have used different multi-criteria decision-making methods to determine the weight of criteria in recent years, such as Analytic Hierarchy Process (AHP), Analytical Network Process (ANP), Decision-Making Trial and Evaluation Laboratory (DEMATEL), Simple Multi-Attribute Rating Technique (SMART), Weighted Sum Method (WSM), the best-worst method (BWM) and others (Ansari et al., 2020). Step-wise weight assessment ratio analysis (SWARA) is one of the multi-criteria decision-making methods based on determining the weight of criteria (Keršuliene et al., 2010). The main advantage of SWARA is its ability to evaluate experts' opinions and estimate the relative importance of each criterion. The importance of criteria is also often judged by the weight priorities derived from the pairwise comparison matrix (Kou et al., 2016 and 2014). In the SWARA method, experts can freely evaluate criteria without a scale. One feature of the SWARA method is the number of pairwise comparisons with AHP, ANP or BWM methods. In fact, in this method, the

number of pairwise comparisons when n criteria are ranked in descending order according to their importance is equal to $n-1$ (Keršuliene et al., 2010). While in the AHP method, $n\ (n-1)$ (Mardani et al., 2017) and in BWM, $2n-3$ pairwise comparisons are performed (Rezaei, 2015, 2016). Also, the SWARA method ranks the criteria in descending order, so there is no need to examine the consistency of the judgments. SWARA can be easily organized in complex or abnormal situations to control inaccurate and ambiguous information using a fuzzy approach. The procedure for achieving the relative weights of the criteria using the fuzzy SWARA method is presented in section (b) of the article appendix.

3.1.2 Fuzzy EDAS method

Based on the Distance from Average Solution (EDAS) method, the evaluation is a multi-criteria decision-making method introduced by (Keshavarz et al., 2015). This method was first used to classify inventory items by several criteria. However, they showed that the EDAS method is also effective in dealing with multi-criteria decision-making problems in a general context (Ghorabaee et al., 2018). The evaluation of alternatives in this method is based on the distance of each alternative from the average solution to each criterion. The mean solution in this method is a practical solution that includes the average of the elements obtained in each criterion. The desirability of solutions (alternatives) in the EDAS method is calculated based on the positive and negative distances of the mean solution. Each alternative has a positive and a negative distance with the mean solution for each criterion and these distances are calculated according to the nature of the criteria. The alternative with a more positive and less negative distance from the mean solution is the best. Due to the ambiguity in decision making, applying fuzzy concepts in MCDM can lead to more reliable decision results. The fuzzy EDAS method is a new and efficient method for dealing with multi-criteria decision problems in an uncertain environment with fuzzy information (Ghorabaee et al., 2016). In order to evaluate the alternative for each criterion, the fuzzy rating range presented in Table 1 has been used. The process of solving the fuzzy EDAS method includes the steps presented in section (c) of the article appendix, which is based on research (Polat & Bayhan, 2020; Stević et al., 2018).

Table 1. Linguistic expressions to determine the priority of alternatives

Linguistic terms	Very low (VL)	Low (L)	Medium (M)	High (H)	Very High (VH)
TFNs	(1, 1, 1)	(2, 3, 4)	(4, 5, 6)	(6, 7, 8)	(8, 9, 9)

3.2 The proposed mathematical model

Choosing an investment alternative is a complex decision that requires optimal solutions to achieve the goals of investors (Couture & Gagnon, 2010). Therefore, the development of mathematical models can be used as the best decision-making tool (Darmian & Farughi, 2022). It should be noted that entering data in raw form reduces the speed and accuracy of the solution method. To avoid this situation and equalise the data's value, the input data must be normalized before the test. All data must be normalized between 1 and -1. In this research, the data are normalized before testing the model, and then the solution algorithm is examined using MATLAB software.

$$Y_i = \frac{y_i - y_{\min}}{y_{\max} - y_{\min}}(h_i - L_i) + \mathrm{L}_i$$

Y_i Normalized input values in the middle of the equation
y_i Main input values
y_{min} The smallest amount of input
y_{max} The largest amount of input

h_i High value at normalization interval (+1)
L_i Low value at normalization interval (-1)

Finally, the formulation of this problem is described as follows.

Sets and indices

$i \in \{1, \dots, I\}$ set of potential companies

Input parameters

P_i Priority of each company i
L_i Minimum percentage of desired investment in company i
U_i Maximum percentage of desired investment in company i
$Budget$ The total budget available for the allocation of financial incentives
$Income_i$ Annual income from investing in company i
$cost_i$ Annual investment cost in company i
β_i Investment risk in company i
N Maximum number of companies to invest
M Positive numerical and large enough

Decision variables

y_i Amount of financial incentives allocated by the government to companies i
x_i Amount of investment in company I
w_i equal to 1 if the company i is selected for investment and otherwise equal to zero.

$$Max\ Z \qquad 1$$

$$Max\ Z_2 = \sum_{i \in I} \frac{(Income_i + y_i) - cost_i}{cost_i} \times x_i \qquad 2$$

$$Min\ Z_3 = \sum_{i \in I} \beta_i \times x_i \qquad 3$$

$$s.t.$$

$$Z \le P_i \times x_i \qquad 4$$

$$L_i \le x_i \le U_i \qquad i \in I \qquad 5$$

$$\sum_{i \in I} y_i = Budget \qquad 6$$

$$y_i \le M \times w_i \qquad i \in I \qquad 7$$

$$w_i \le M \times y_i \qquad i \in I \qquad 8$$

$$x_i \le M \times w_i \qquad i \in I \qquad 9$$

$$w_i \le x_i \qquad i \in I \qquad 10$$

$$\sum_{i \in I} x_i = 1 \qquad 11$$

$$\sum_{i \in I} w_i \le N \qquad 12$$

$$w_i \in \{0,1\}\ and\ 0 \le x_i \le 1 \qquad i \in I \qquad 13$$

$$y_i \ge 0 \qquad i \in I \qquad 14$$

The first objective function maximizes the minimum investment made in companies. In fact, according to constraint (4), the variable Z represents the minimum investment commensurate with

the market value, which is maximized in the objective function. The second objective function is to maximize the revenue-to-cost ratio in companies. Function: Since many banking financial systems are based on annual intervals, this function calculates the target return annually. The third objective function minimizes the investment risk in companies. The amount of investment risk can be calculated based on the geometric mean of the deviation from the criterion of the amount of stock returns of active companies. Constraint (5) ensures that the level of investment must be within the government's range. Constraint (6) ensures that the total amount of financial incentives allocated to each company equals the total available budget. Constraints (7) and (8) ensure that financial incentives can be assigned to a company when that company has been selected for investment. Constraints (9) and (10) guarantee that if a company is selected for investment, a percentage of private sector capital must be invested in it. Constraint (11) ensures that the total investment in companies equals 1. Constraint (12) ensures that the maximum number of companies selected for investment is limited to N. Constraints (13) and (14) indicate the range of decision variables.

3.2.1 The mathematical model under uncertainty

Based on the literature, various methods have been proposed to control the level of uncertainty to estimate the exact value of some parameters. Robust programming is one of the most effective approaches (Darmian et al., 2021).

Interval Robust Optimization (IRO) is a type of optimization technique designed to handle uncertainty or imprecision in the input data of a model. In traditional optimization, the input parameters are assumed to be precise, which is not always true in real-world applications. Interval uncertainty arises when the values of input parameters are known only to lie within some known interval or range rather than being known exactly. IRO is a methodology that allows for optimization under interval uncertainty by considering a set of possible values for each input parameter. These possible values are called "uncertainty sets," IRO seeks to optimize the worst-case outcome over all possible values of the input parameters. In other words, the objective is to find a feasible solution for all possible values of the input parameters within their respective uncertainty sets. IRO can be particularly useful when there is significant uncertainty about the input parameters, such as in financial modeling, supply chain management, or environmental management. By accounting for interval uncertainty, IRO can provide decision-makers with more robust and reliable solutions that are less sensitive to variations in input parameters (Farughi & Mostafayi, 2016).

One of IRO's main challenges is finding an appropriate uncertainty set for each input parameter. The choice of uncertainty set can significantly impact the optimisation results, and finding an appropriate set requires domain-specific knowledge and expertise (Farughi et al., 2017). In this study, a robust optimization tool based on the Bertsimas model is developed to face the uncertainty in the risk parameter.

Since the parameter β_i always has inherent uncertainty; in this study, the robust programming method is used to deal with the uncertainty in these parameters (Bertsimas & Sim, 2004). The structure of this method is such that each parameter is set in an interval with specified upper and lower bounds. However, there is no information on how to distribute the data at this interval. The parameters of the problem change as follows.

$$\widetilde{\beta_i} = \left[\beta_i - \widehat{\beta_i}, \beta_i + \widehat{\beta_i}\right] \quad 15$$

where $\widetilde{\beta_i}$ is the value of the parameter under uncertainty, β_i is the mean value of the parameter in the defined interval, and $\widetilde{\beta_i}$ is the mean deviation of the mean for the parameter. From a mathematical programming point of view, it is possible to transform an uncertain problem into a certain one through

a nonlinear polynomial function, as shown below (Bertsimas & Sim, 2004).

$$\max_{X_i \in f(X)} \left(\sum_{i=1}^{I} \beta_i X_i - \overbrace{\max_{\substack{\{S:S\subseteq I,|S|\leq \Gamma\} \\ (i_t \in I\setminus S)}} \left(\sum_{(i)\in S} \widehat{\beta}_i X_i + (\Gamma_1 - \lfloor \Gamma_1 \rfloor)\widehat{\beta_{i_t}} X_{i_t} \right)}^{\theta} \right) \quad 16$$

Given that the above equation is nonlinear, this equation cannot be solved accurately, so it needs to be converted to a linear one. In the method presented by (Bertsimas & Sim, 2004), a constant parameter Γ is defined which is set in the interval $[0, |I|]$. This parameter is a kind of controller of uncertainty limits in equations where uncertainty parameters are present. If $\Gamma = 0$, there is no uncertainty in the problem and the same state of input parameters is obtained. But if $\Gamma = |I|$, it means that the problem has the highest level of uncertainty and is similar to Soyster's problem-based programming problem (Soyster, 1973). Therefore, it is necessary to analyze the different levels of uncertainty in the values $0 < \Gamma < |I|$. In order to linearize the above equation, a mathematical theory is presented and the steps of its proof are described.

Theory: the presented mathematical model, considering equation (16) as objective functions, is compatible with the formulations provided for the Robust Model.

Robust Model

$$Min\ Z = CVaR(x) - \Gamma_1\, U_0^1 + \sum_{i=1}^{I} UR_i^1 \quad 17$$

$s.t.$

Constraints 6 to 8		18
$U_0^1 + UR_{ij}^1 - \widehat{r_i}\, X_i \geq 0,$	$i \in I, j \in J$	19
$UR_{ij}^1 \geq 0,$	$i \in I, j \in J$	20
$U_0^1 \geq 0,$		21

Proof: For a given value of $(X_i)_{i=1,\dots,I}$, the θ part of Equation (16) can be linearized using the definition of the variable Z_i^1 with a range of $0 \leq Z_i^1 \leq 1$. Thus, the nonlinear structure of Equation (16) can be considered equivalent to Model 1.

Model 1

$$min \sum_{i=1}^{I} \widehat{r_i}\, X_i Z_i^1 \quad 22$$

$s.t$

$Z_i^1 \leq \Gamma_1$	$i \in I$	23
$0 \leq Z_i^1 \leq 1$	$i \in I$	24

The optimal solution for each of these formulations must have $\lfloor \Gamma \rfloor$ variable $Z_i^{obj} = 1$ and a $Z_i^{obj} = \Gamma - \lfloor \Gamma \rfloor$ which is equivalent to the optimal solution in part θ. Using a strong duality for the given values $(X_i)_{i=1,\dots,I}$, Model 1 can be rewritten linearly equivalent to Model 4.

Model 4

$$Min\ Robust_1 = \Gamma_1\, U_0^1 + \sum_{i=1}^{I} UR_i^1 \quad 27$$

$$s.t$$

$$U_0^1 + UR_i^1 - \hat{r}_i X_i \geq 0, \quad i \in I \quad 28$$

$$UR_i^1 \geq 0, \quad i \in I \quad 29$$

$$U_0^1 \geq 0, \quad 30$$

Combining Model 4 with Equation (16) results in the Robust Model, and thus, the proof is obtained.

Table 2. Criteria and sub-criteria related to the evaluation of industries active in the capital market

Criteria	Sub criteria	Reference
Resources and ability of the organization to create a competitive advantage (C1)	Price competitiveness (C11)	(Mkwanazi, 2018), (Balali et al., 2015)
	Dedicated access to finance (C12)	(Balali et al., 2015), (Ali et al., 2021)
	Access to suitable distribution networks (C13)	(Mkwanazi, 2018)
	Efficient R&D (C14)	(Ali et al., 2021)
	Financial strengths (C15)	(Ram & Montibeller, 2013), (Gudo et al., 2020)
External Environment Opportunities (C2)	Potential customers (C21)	(Mkwanazi, 2018) (Gudo et al., 2020; Rais et al., 2013)
	Use of new technologies (C22)	(Mkwanazi, 2018)
	Reducing legal restrictions (C23)	(Gudo et al., 2020)
	Removing barriers to world trade (C24)	(Ram & Montibeller, 2013), (Rais et al., 2013)
	Potential competitors (C25)	(Mkwanazi, 2018)
Key and strategic inadequacies (C3)	Being unknown among customers (C31)	(Gudo et al., 2020)
	Raw material access problem (C32)	(Mkwanazi, 2018), (Ali et al., 2021)
	Instability in production (C33)	(Balali et al., 2015)
	Weak industrial relations (C34)	(Balali et al., 2015), (Ali et al., 2021)
	Consecutive management problems (C35)	Expert's opinion
Environmental hazards and constraints on industries (C4)	Ability to change products to suit customer tastes (C41)	(Ram & Montibeller, 2013), (Rais et al., 2013)
	Ability to produce high-power alternative products (C42)	Expert's opinion
	Increasing trade restrictions (C43)	(Ram & Montibeller, 2013), (Rais et al., 2013)
	Government and Administrative Bureaucracy (C44)	(Ali et al., 2021), (Ram & Montibeller, 2013)
	Lack of skilled labor in the environment (C45)	(Mkwanazi, 2018)
	Technology update capability (C46)	(Gudo et al., 2020)
	Growing costs of raw material supply (C47)	(Balali et al., 2015), (Gudo et al., 2020)
	Existence of foreign investors (C48)	(Ali et al., 2021)
	Ability to compete in the market (C49)	Expert's opinion

4. Numerical results of the multi-criteria decision phase

This section describes the numerical results of implementing the proposed multi-criteria decision model. For this purpose, first, the results of the Fuzzy SWARA method are expressed to determine

the score of each criterion and sub-criterion. The final prioritization of alternatives is then determined using the EDAS method. In Table 2, the set of research criteria and sub-criteria is determined.

4.1 Results of the fuzzy SWARA method

As mentioned before, the final list of criteria and sub-criteria related to evaluating industries active in the stock market is first presented to the decision-making board (experts). This committee includes five experts in the field of capital markets who have been active in the field of university teaching for more than 10 years. In the next step, the experts determine the relative weight for the main criteria and the relevant sub-criteria. The process is such that after several rounds of discussion, the Board of Experts formed a common consensus and arranged the main criteria from the most important to the least important. In the following, the relative importance of the mean value ($\tilde{S}_j$) Each criterion examined by experts is evaluated using a fuzzy verbal scale. Then the fuzzy coefficient $\tilde{k}_j$ for each criterion is calculated through Equation 9. As can be deduced from the results, the most important criteria belong to the organisation's resources and ability to create a competitive advantage, followed by others.

Table 3. Local weight of main criteria

Criteria	$\tilde{S}_j$	$\tilde{k}_j$	$\tilde{q}_j$	$\tilde{w}_j$
C_1		(1, 1, 1)	(1, 1, 1)	(0.358, 0.377, 0.404)
C_3	(0.283, 0.333, 0.408)	(1.283, 1.333, 1.408)	(0.710, 0.750, 0.779)	(0.254, 0.283, 0.315)
C_2	(0.377, 0.467, 0.613)	(1.377, 1.467, 1.613)	(0.440, 0.511, 0.566)	(0.158, 0.193, 0.229)
C_4	(0.260, 0.300, 0.354)	(1.260, 1.300, 1.354)	(0.325, 0.393, 0.449)	(0.116, 0.148, 0.181)

Similarly, the decision-making board evaluates the sub-criteria related to each main criterion. The local weight of each sub-criterion can be seen in the tables provided in section (d) of the appendix, respectively.

Finally, the global weights of sub-criteria are shown in Table 4. For example, the local weight of sub-criterion (C11) in its own group is equal to (0.067, 0.084, 0.101), and also the weight of criterion (C1) is equal to (0.358, 0.377, 0.404). As a result, the global weight for the C11 sub-criterion obtained by multiplying these weights is (0.024, 0.032, 0.041). In the same way, the global optimal weight for other sub-criteria is determined. As can be deduced from the results, the sub-criteria (C12) (0.135), (C13) (0.102) and (C32) (0.101) are the three main indicators for evaluating organizational strategies. In addition, (C48) is the least important of all indicators. Table 4 uses the relative weights in the fuzzy EDAS model.

4.2 Results of fuzzy EDAS method

The results of implementing the fuzzy EDAS method are expressed in this section. Initially, each decision-maker presents his or her mental preferences for evaluating each alternative over each criterion using defined verbal expressions. As mentioned before, the alternatives of this research include 6 different industry categories as follows.

Table 4. Final weight of criteria and sub-criteria

Criteria	Criteria fuzzy local weight	Sub-criteria	Sub-criteria fuzzy local weights	Global fuzzy weights	Global weights	Rank
C_1	(0.358, 0.377, 0.404)	C_{11}	(0.067, 0.084, 0.101)	(0.024, 0.032, 0.041)	0.032	13
		C_{12}	(0.342, 0.356, 0.375)	(0.122, 0.134, 0.151)	0.135	1
		C_{13}	(0.247, 0.270, 0.295)	(0.088, 0.102, 0.119)	0.102	2
		C_{14}	(0.104, 0.119, 0.135)	(0.037, 0.045, 0.055)	0.045	9
		C_{15}	(0.153, 0.171, 0.189)	(0.055, 0.064, 0.076)	0.065	5
C_2	(0.158, 0.193, 0.229)	C_{21}	(0.314, 0.334, 0.363)	(0.049, 0.064, 0.083)	0.065	6
		C_{22}	(0.153, 0.183, 0.216)	(0.024, 0.035, 0.049)	0.036	11
		C_{23}	(0.103, 0.133, 0.164)	(0.016, 0.026, 0.037)	0.026	16
		C_{24}	(0.073, 0.099, 0.128)	(0.012, 0.019, 0.029)	0.020	18
		C_{25}	(0.223, 0.251, 0.283)	(0.035, 0.048, 0.065)	0.049	8
C_3	(0.254, 0.283, 0.315)	C_{31}	(0.224, 0.255, 0.290)	(0.057, 0.072, 0.091)	0.073	4
		C_{32}	(0.333, 0.353, 0.383)	(0.085, 0.100, 0.121)	0.101	3
		C_{33}	(0.097, 0.124, 0.153)	(0.025, 0.035, 0.048)	0.035	12
		C_{34}	(0.147, 0.174, 0.203)	(0.037, 0.049, 0.064)	0.050	7
		C_{35}	(0.069, 0.093, 0.119)	(0.018, 0.026, 0.037)	0.027	15
C_4	(0.116, 0.148, 0.181)	C_{41}	(0.261, 0.290, 0.332)	(0.030, 0.043, 0.060)	0.044	10
		C_{42}	(0.170, 0.204, 0.247)	(0.020, 0.030, 0.045)	0.031	14
		C_{43}	(0.082, 0.111, 0.146)	(0.010, 0.016, 0.026)	0.017	19
		C_{44}	(0.119, 0.151, 0.191)	(0.014, 0.022, 0.035)	0.023	17
		C_{45}	(0.055, 0.080, 0.111)	(0.006, 0.012, 0.020)	0.012	20
		C_{46}	(0.039, 0.060, 0.086)	(0.005, 0.009, 0.016)	0.009	21
		C_{47}	(0.018, 0.032, 0.050)	(0.002, 0.005, 0.009)	0.005	23
		C_{48}	(0.014, 0.025, 0.041)	(0.002, 0.004, 0.007)	0.004	24
		C_{49}	(0.029, 0.046, 0.068)	(0.003, 0.007, 0.012)	0.007	22

Alternative 1) Basic metals
Alternative 2) Chemical products
Alternative 3) Investment
Alternative 4) Extraction of metal ores
Alternative 5) Financing papers

Alternative 6) Insurance and pension fund, including social security

Using the results of the previous steps and applying the equations related to the prioritization method, the matrices of positive and negative distances are averaged based on the following tables. For these calculations, utility and non-utility criteria must first be determined. For this purpose, the weighted sum of positive and negative distances of each alternative ($\widetilde{sp}_i$ $\widetilde{sn}_i$) is obtained. Then the normalized values ($\widetilde{nsp}_i$ $\widetilde{nsn}_i$) as well as the fuzzy evaluation score ($\widetilde{as}_i$) of all alternatives are calculated. It is worth noting that the best non-fuzzy $\widetilde{as}_i$ performance is also obtained by applying the graded averaging method to the integrated display. Based on the results obtained, alternative A_2 has the highest evaluation score and is ranked first. In general, the final priority of the options is $A_2 \succ A_5 \succ A_6 \succ A_1 \succ A_3 \succ A_4$. Details of numerical calculations of the fuzzy EDAS method are available in section € of the appendix.

Table 5. Total weight of distance and final weight

	$\widetilde{sp}_i$	$\widetilde{sn}_i$	$\widetilde{nsp}_i$	$\widetilde{nsn}_i$	$\widetilde{as}_i$	$k(\widetilde{as}_i)$	Rank
A_1	(-0.103,0.043,0.19)	(-0.093,0.063,0.223)	(-0.541,0.225,1.003)	(-0.797,0.491,1.748)	(-0.669,0.358,1.375)	0.357	4
A_2	(-0.094,0.192,0.463)	(0.007,0.015,0.022)	(-0.493,1.013,2.439)	(0.821,0.882,0.943)	(0.164,0.948,1.691)	0.941	1
A_3	(-0.071,0.057,0.186)	(-0.064,0.11,0.28)	(-0.374,0.299,0.98)	(-1.26,0.114,1.516)	(-0.817,0.207,1.248)	0.210	5
A_4	(-0.067,0.047,0.161)	(-0.03,0.125,0.273)	(-0.353,0.246,0.846)	(-1.206,-0.008,1.239)	(-0.779,0.119,1.043)	0.123	6
A_5	(-0.07,0.051,0.172)	(-0.118,0.065,0.245)	(-0.369,0.269,0.905)	(-0.975,0.478,1.952)	(-0.672,0.373,1.429)	0.375	2
A_6	(-0.066,0.061,0.187)	(-0.114,0.073,0.256)	(-0.348,0.321,0.988)	(-1.07,0.41,1.918)	(-0.709,0.366,1.453)	0.368	3

4.3 Sensitivity analysis

In this section, sensitivity analysis is performed to monitor the stability of the results per the instructions presented by (Kahraman, 2002). Analyzing the proposed fuzzy SWARA-fuzzy EDAS decision model is to generate new weight vectors and investigate their effect on changes in the ranking of alternatives. New weight coefficients are calculated based on changes in the most effective (sensitive criterion) criterion. In the following, the weight ratios of other criteria are concluded according to the proportions of the weights in the sensitivity analysis process. New sets of weight vectors in the scenarios are also created with respect to the elastic weight coefficient so that the relative compensation of other values of the weight coefficients relative to the given weight changes explains the most important criterion (Behzad et al., 2020). Based on what was described above, the elastic weight coefficient for criterion C12 has been estimated and the range of changes in criterion C12 weight coefficient has also been obtained. Threshold values for the C12 criterion are calculated as intervals [-0.135, 0.878]. After defining the limit values of C12 criterion, the new weight coefficient vectors for 15 scenarios are obtained according to the table 6 below.

Table 6. Weights of criteria based on each scenario

	w_{S_1}	w_{S_2}	w_{S_3}	w_{S_4}	w_{S_5}	w_{S_6}	w_{S_7}	w_{S_8}	w_{S_9}	$w_{S_{10}}$	$w_{S_{11}}$	$w_{S_{12}}$	$w_{S_{13}}$	$w_{S_{14}}$	$w_{S_{15}}$
C_{11}	0.037	0.035	0.033	0.032	0.030	0.028	0.026	0.024	0.022	0.021	0.019	0.017	0.015	0.013	0.012
C_{12}	0.000	0.050	0.099	0.149	0.198	0.248	0.297	0.347	0.396	0.446	0.495	0.545	0.594	0.644	0.693
C_{13}	0.118	0.112	0.106	0.100	0.095	0.089	0.083	0.077	0.072	0.066	0.060	0.054	0.049	0.043	0.037
C_{14}	0.052	0.049	0.047	0.044	0.042	0.039	0.037	0.034	0.032	0.029	0.027	0.024	0.021	0.019	0.016
C_{15}	0.075	0.071	0.068	0.064	0.060	0.057	0.053	0.049	0.046	0.042	0.038	0.035	0.031	0.027	0.024
C_{21}	0.075	0.071	0.068	0.064	0.060	0.057	0.053	0.049	0.046	0.042	0.038	0.035	0.031	0.027	0.024
C_{22}	0.042	0.040	0.037	0.035	0.033	0.031	0.029	0.027	0.025	0.023	0.021	0.019	0.017	0.015	0.013
C_{23}	0.030	0.029	0.027	0.026	0.024	0.023	0.021	0.020	0.018	0.017	0.015	0.014	0.012	0.011	0.009
C_{24}	0.023	0.022	0.021	0.020	0.019	0.017	0.016	0.015	0.014	0.013	0.012	0.011	0.010	0.008	0.007
C_{25}	0.057	0.054	0.051	0.048	0.045	0.043	0.040	0.037	0.034	0.032	0.029	0.026	0.023	0.021	0.018
C_{31}	0.084	0.080	0.076	0.072	0.068	0.064	0.060	0.055	0.051	0.047	0.043	0.039	0.035	0.031	0.027
C_{32}	0.117	0.111	0.105	0.099	0.094	0.088	0.082	0.077	0.071	0.065	0.060	0.054	0.048	0.042	0.037
C_{33}	0.040	0.038	0.036	0.034	0.032	0.031	0.029	0.027	0.025	0.023	0.021	0.019	0.017	0.015	0.013
C_{34}	0.058	0.055	0.052	0.049	0.046	0.044	0.041	0.038	0.035	0.032	0.029	0.027	0.024	0.021	0.018
C_{35}	0.031	0.030	0.028	0.027	0.025	0.024	0.022	0.020	0.019	0.017	0.016	0.014	0.013	0.011	0.010
C_{41}	0.051	0.048	0.046	0.043	0.041	0.038	0.036	0.033	0.031	0.028	0.026	0.023	0.021	0.018	0.016
C_{42}	0.036	0.034	0.032	0.031	0.029	0.027	0.025	0.024	0.022	0.020	0.018	0.017	0.015	0.013	0.011
C_{43}	0.020	0.019	0.018	0.017	0.016	0.015	0.014	0.013	0.012	0.011	0.010	0.009	0.008	0.007	0.006
C_{44}	0.027	0.025	0.024	0.023	0.021	0.020	0.019	0.017	0.016	0.015	0.014	0.012	0.011	0.010	0.008
C_{45}	0.014	0.013	0.012	0.012	0.011	0.010	0.010	0.009	0.008	0.008	0.007	0.006	0.006	0.005	0.004
C_{46}	0.010	0.010	0.009	0.009	0.008	0.008	0.007	0.007	0.006	0.006	0.005	0.005	0.004	0.004	0.003
C_{47}	0.006	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.002	0.002	0.002
C_{48}	0.005	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.001
C_{49}	0.008	0.008	0.007	0.007	0.006	0.006	0.006	0.005	0.005	0.005	0.004	0.004	0.003	0.003	0.003

According to the results presented in Table 6, when the weight of criterion C12 changes, no significant change occurs in the final rank of option A2, and in all scenarios, A2 remains the dominant alternative. Therefore, it can be concluded that the final result for choosing the best industry among the six available alternatives is so robust against changing the most important criterion's weight. However, the final rank of other alternatives is sensitive to changing the weight of the most important criterion. Therefore, gaining the weight of each criterion logically and scientifically plays an important role in choosing the optimal industry.

4.4 Numerical results of the optimization phase

After prioritizing the industries active in the capital market by a multi-criteria decision model, this section optimally solves the investment amount in each alternative.

4.4.1 Determination of the input parameters

The mathematical model's objective functions include maximising each company's priority based on market value, maximizing the revenue-to-profit ratio, and ultimately minimizing risk. Therefore, determining the parameters related to each objective function is controversial. In this study, each potential company's investment priority is based on relation (32).

$$P_i = \frac{Value_i}{\sum_{i=1} Value_i} \qquad \forall i \in potential\ firms \qquad 32$$

Another important challenge is determining the revenue and cost parameters to calculate the value of the second objective function. This information is available separately on the *Codal website* and can be extracted directly for each company. Finally, to determine the amount of investment risk in

each company, the data available on the Codal website are used in relation to the adjusted price with the increase of capital and the adjusted price with the increase of capital and cash profit. However, this data is limited to the price adjusted by increasing capital and cash dividends and does not yield returns. Therefore, it is necessary to calculate each company's return in each period through the following equation.

$$Return_t = \frac{A_t}{A_{t-1}} \times 100$$

Where A_t represents the adjusted price with increased capital and cash dividend in year *t*. To calculate the risk, it is sufficient to calculate each company's standard variance of returns. After performing the necessary calculations in the Excel software environment, the final data related to each company is available in the following table. After solving the mathematical model, the input parameters of the Pareto front are presented in Figure 2.

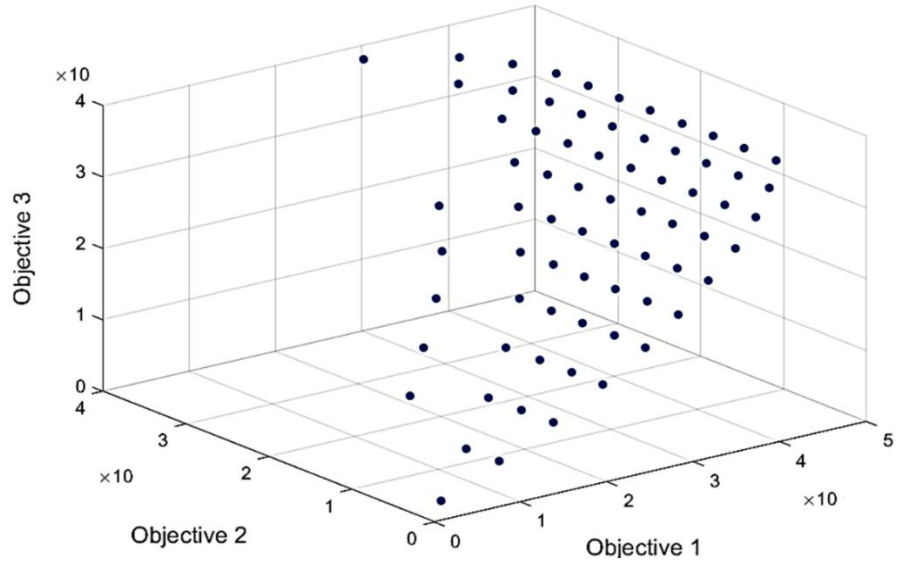


Figure 2. Pareto front resulting from solving the mathematical model

According to Figure 2, it can be seen that the produced Pareto front has 71 members, which changes from 22.284 to 402.982 for the first objective function, 15.475 to 391.33 for the second objective function, and 15.579 to 412. 38 for the third objective function. Also, the corner points of the Pareto front include (40.98,15.47,38.41), (29.56,39.33,38.41) and (22.28,15.47,16.57), in each of which one of the objective functions is at its best. One of the most important problems in solving multi-objective problems is choosing a Pareto member as the final answer to implement in real-world conditions since the members of the produced front are non-dominated and have no superiority over each other. In this study, to solve this problem, a method for calculating the efficiency level of each Pareto member based on proximity to the ideal solution (the solution in which all objective functions have the best value) is presented.

4.4.2 Selection of the best performing Pareto member

In this method, the mathematical model is first solved for each objective function, and the optimal value of the objective function is calculated separately. Then, the Euclidean distance of each Pareto member to the ideal point is calculated and the Pareto member with the shortest distance to the ideal

point is selected as the final answer. The steps of this method are as follows.

Step 1: Solve the mathematical model for each of the objective functions separately and store the optimal values in Z_1^* ،Z_2^* *and* Z_3^*

Step 2: Solve the mathematical model using the Epsilon constraint method and store the solutions in the optimal set PS^*

Step 3: Calculate the Euclidean distance of the members of the set PS^* with (Z_1^*, Z_2^*, Z_3^*) based on Equation (80) and produce the MID set

Step 4: Select the Pareto member with the lowest MID value as the final solution

The following equation for calculating MID is presented.

$$MID_i = \sqrt{\sum_{j=1}^{n_{obj}} \left(Z_j^* - Z_{ij}\right)^2} \qquad i \in PS^* \qquad 33$$

Where n_{obj} equals the number of objective functions and Z_{ij} equals the value of the j function for the i Pareto member. Based on this relationship, a Pareto member with the highest efficiency can be selected. After performing numerical calculations to calculate MID_i, the best Pareto member, with the first objective function value of $Z_1^{MID} = 32.99$, the second objective function value of $Z_2^{MID} = 22.41$ and the third objective function value of $Z_3^{MID} = 23.71$, has a value of MID = 279.02. In this solution, the optimal investment amount in each company is as follows.

Table 7. The optimal amount of investment (percentage) in each company

Code	Investment percentage	Code	Investment percentage
Shrak1	0.015	Petrol1	0.020
Parsan1	0.063	Jem Pilen1	0.012
Shefen1	0.022	Khorasan1	0.010
Kermasha1	0.010	Noori1	0.042
Shekhark1	0.020	Pars1	0.069
Shapdis1	0.045	Pakshoo1	0.023
Shiraz1	0.021	Jam1	0.049
Shiran1	0.020	Fars1	0.220
Buali1	0.011	Tapko1	0.076
Gharn1	0.005	Shghadir1	0.007
Shegooya1	0.017	Aria1	0.059
Shekabir1	0.024	Maroon1	0.093
Shelord1	0.005	Zagros1	0.039
Shejem1	0.005		

According to the information in Table 7, 27 companies have been selected for investment, which, according to the constraints of the mathematical model, is less than 30 and is completely justified. Figure 3 graphically shows the optimal amount of investment in each company.

As can be seen, the highest share of investment is related to Fars 1 with a value of 22.2% and the lowest amount is related to Gharn1 with a value of 0.05%.

4.4.3 Numerical analysis in uncertainty conditions

In this section, to investigate the sensitivity level of the proposed model to the uncertainty of input parameters, different combinations of robustness parameters are considered and the Pareto member is determined with the best MID value for each combination.

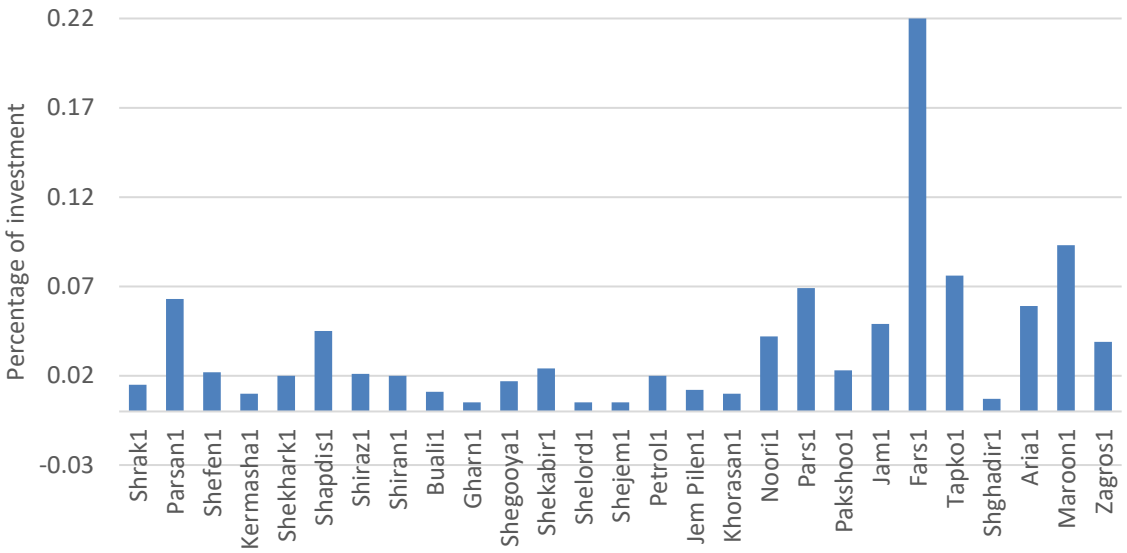


Figure 3. Percentage of investment in each company

Table 8. The sensitivity of the mathematical model to changes in the robustness parameters

Instance	Γ_1	Γ_2	Γ_3	$\min_{i \in PS^*}(MID_i)$	Z_1^{MID}	Z_2^{MID}	Z_3^{MID}
1	5	20	34	245.659	40.224	1.547	38.413
2	8	18	32	278.550	34.194	5.325	38.413
3	10	16	30	293.650	29.724	9.104	38.413
4	12	14	28	233.425	25.910	12.883	38.413
5	14	12	26	244.935	20.970	16.661	38.413
6	16	10	24	280.932	15.220	20.440	38.413
7	18	8	22	279.625	11.768	24.219	34.737
8	20	5	20	286.151	9.591	27.997	31.062
9	22	34	18	282.212	9.020	31.776	27.386
10	24	32	16	264.204	8.815	18.471	20.035
11	26	30	14	257.123	8.815	20.347	16.359
12	28	28	12	249.839	8.815	23.654	12.684
13	30	26	10	245.643	8.815	24.987	9.008
14	32	24	8	235.719	8.815	26.841	5.332
15	34	22	5	256.106	8.815	27.441	1.657

According to Table 8, it can be seen that the value of $\min_{i \in PS^*}(MID_i)$ varied in the range of 233.42 to 293.65, which indicates the dispersion level of 19.73% of Pareto members in the optimal space based on different robustness parameter values. Changes in levels of uncertainty in the model cause the Pareto set to change by about 20%, which is a high amount for strategic level decisions and requires managers to pay attention to increasing the accuracy in determining the exact amount of input parameters. In addition, it can be seen that by changing Γ_1 from small to large values, the first objective function in the most efficient Pareto member is in descending order. However, in $\Gamma_1 > 10$, the changes are eliminated and the value of the first objective function is fixed. The third objective function also has an ascending trend with the descending changes of parameter Γ_3. This indicates that the higher the level of uncertainty, the lower the quality of the solutions generated, and managers must develop tools to predict the input data. The following figure shows the sensitivity of different objective functions to changing robustness parameters.

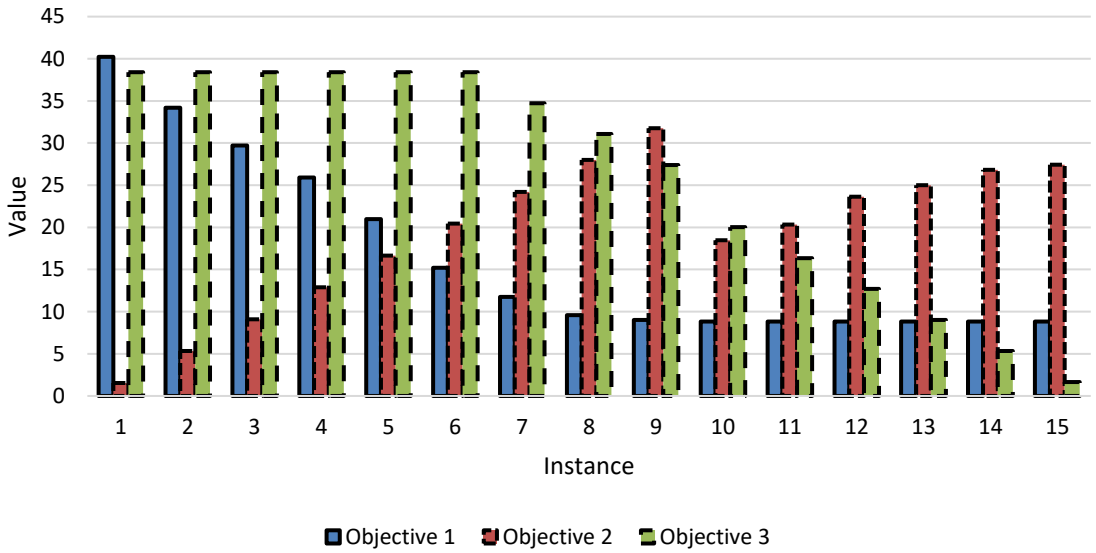


Figure 4. The sensitivity of the triple objective functions to the robustness parameters

According to Figure 4, the first objective function has a downward trend by changing the robustness parameter in the range $5 < \Gamma_1 < 20$, which indicates the negative effect of increasing the level of uncertainty in obtaining the final solutions. But for $\Gamma_1 > 22$ the value of the objective function has not changed, which indicates the creation of bad conditions in the model for the first objective function. The sensitivity threshold of the first objective function is equal to $\Gamma_1 = 22$. Changes in the robustness parameter for the third objective function in the range of $24 < \Gamma_3 < 34$ did not cause any changes in its value, which indicates the sensitivity threshold Γ_3 = 24 for this objective function. But at values $5 < \Gamma_3 < 22$ by decreasing the value of this parameter, the value of the third objective function decreases because the model can produce a higher quality solution for this objective function. Regarding the sensitivity of the second objective function, it can be said that it behaves similarly to the first function. In fact, by increasing the value of the robustness parameter, the model produces lower quality solutions and the value of this objective function decreases. However, if the level of uncertainty decreases, the value of this objective function also increases, and higher quality solutions are obtained. As can be observed, the combination $\Gamma_1 = 12$, $\Gamma_2 = 14$ and $\Gamma_3 = 28$ provides the best value of MID for the Pareto members produced in different cases where $Z_1^{MID} = 25.910$, $Z_2^{MID} = 12.883$ and $Z_3^{MID} = 38.413$.

According to the obtained results, some details and explanations of the paper's implications are as follows. First, investment managers in the Iranian capital market can use the proposed hybrid approach of fuzzy-MCDM and optimization models under interval uncertainty to optimize their investment decisions. Considering multiple criteria and alternative evaluations, this approach can help them make more informed decisions that reflect their investment goals. Moreover, fuzzy-SWARA and fuzzy-EDAS methods have demonstrated their usefulness in investment management. However, their application can be extended to areas beyond investment management, such as project management or risk assessment, where decision-making is complex and uncertain. In addition, multi-objective optimization models incorporating interval uncertainty are relevant in many contexts. The proposed model in the paper can be adapted and applied in other fields, such as supply chain management, environmental management, or public policy, where trade-offs between multiple objectives and interval uncertainty are relevant. The managerial analysis and decision-making policies resulting from the proposed approach can be useful for policymakers and investors. The

study's findings can help guide the development of investment strategies that balance risk and return, which can be used to inform investment policies and attract foreign investors. Finally, the study's focus on the Iranian capital market highlights the importance of considering regional or country-specific factors when designing investment management approaches. As such, this approach can be valuable for other researchers or practitioners working in other emerging markets or developing economies, as it emphasizes the need to consider context-specific factors when designing investment management approaches.

5. Conclusion

This research proposes a hybrid approach based on multi-criteria decision making and mathematical optimization to investigate investment management problems in Iran's stock market. For this purpose, some active industrial companies are evaluated using a set of criteria and sub-criteria extracted from the literature. Using historical financial data, a mathematical model is designed to optimize each company's investment amount. Finally, a robust programming method to face interval uncertainty has been developed because it is difficult to determine the exact value of some input parameters. Based on the obtained results, the sub-criteria (C12) with a global weight equal to (0.135), (C13) with a worldwide weight equal to (0.102) and (C32) with a global weight equal to (0.101) are selected as the highest score criteria to evaluate the alternatives. The prioritization of industries also shows that the chemical industry has the highest priority for investment. After solving the multi-objective optimization model in deterministic conditions, it is observed that the generated Pareto front has 71 members with a boundary in the range of (22.284-402.982) for the first objective function, (15.475-39.331) for the second objective function and (15.579-38.412) for the third objective function. Also, the corner points of the Pareto front include (40.98,15.47,38.41), (29.56,39.33,38.41) and (22.28,15.47,16.57), in each of which one of the objective functions is at its best.

One of the most important problems in solving multi-objective problems is choosing one of the Pareto members as the final solution to implement in real-world conditions. In this study, a heuristic method is developed to calculate the efficiency of each Pareto member based on the ideal solution to solve this problem. After performing numerical calculations to calculate MID_i, the best Pareto member, with the first objective function value of $Z_1^{MID} = 32.99$, the second objective function value of $Z_2^{MID} = 22.41$, and the third objective function value of $Z_3^{MID} = 23.71$, has MID = 279.02. In the selected optimal solution, 27 companies were selected for investment, which, according to the constraints of the mathematical model, is less than 30 and is completely justified. The highest share of investment is related to Fars 1 with a value of 22.2% and the lowest amount is related to Gharn1 with a value of 0.05%. In solving the model under conditions of uncertainty, it is observed that the value of $\min_{i \in PS^*}(MID_i)$ varies in the range of 233.42 to 293.65, which indicates the level of dispersion of 19.73% of Pareto members based on different values of robustness parameters. Changes in uncertainty levels in the model cause the Pareto set to change by about 20%, which is a high amount for strategic level decisions and requires managers to pay more attention to determine the exact amount of input parameters. In addition, it can be seen that by changing Γ_1 from small to large values, the first objective function in the most efficient Pareto member is in descending order. However, in $\Gamma_1 > 10$ the changes are eliminated and the value of the first objective function is fixed. The third objective function also has an ascending trend with the descending changes of parameter Γ_3. This indicates that the higher the level of uncertainty, the lower the quality of the solutions generated, and managers must develop tools to predict the input data.

References

1. Ali, E. B., Agyekum, E. B., & Adadi, P. (2021). Agriculture for sustainable development: A SWOT-AHP assessment of Ghana's planting for food and jobs initiative. *Sustainability*, 13(2), p. 628. https://doi.org/10.3390/su13020628
2. Allcott, H., & Keniston, D. (2018). Dutch disease or agglomeration? The local economic effects of natural resource booms in modern America. *The Review of Economic Studies*, 85(2), pp. 695-731. https://doi.org/10.1093/restud/rdx042
3. Ansari, Z. N., Kant, R., & Shankar, R. (2020). Evaluation and ranking of solutions to mitigate sustainable remanufacturing supply chain risks: a hybrid fuzzy SWARA-fuzzy COPRAS framework approach. *International Journal of Sustainable Engineering*, 13(6), pp. 473-494. https://doi.org/10.1080/19397038.2020.1758973
4. Arif, A., Sadiq, M., Shabbir, M. S., Yahya, G., Zamir, A., & Bares Lopez, L. (2020). The role of globalization in financial development, trade openness and sustainable environmental-economic growth: evidence from selected South Asian economies. *Journal of Sustainable Finance & Investment*, 1(1), pp. 1-18. https://doi.org/10.1080/20430795.2020.1861865
5. Balali, H., Saadi, H., & Ghazvineh, S. (2015). Investment prioritizing of food and agricultural processing industries (case study: Hamedan County). *Journal of Research and Rural Planning*, 4(1), pp. 149-159. https://doi.org/10.22067/jrrp.v4i9.34997
6. Banaeian, N., Mobli, H., Fahimnia, B., Nielsen, I. E., & Omid, M. (2018). Green supplier selection using fuzzy group decision making methods: A case study from the agri-food industry. *Computers & Operations Research*, 89, pp. 337-347. https://doi.org/10.1016/j.cor.2016.02.015
7. Behzad, M., Zolfani, S. H., Pamucar, D., & Behzad, M. (2020). A comparative assessment of solid waste management performance in the Nordic countries based on BWM-EDAS. *Journal of Cleaner Production*, 266, A. 122008. https://doi.org/10.1016/j.jclepro.2020.122008
8. Bertsimas, D., & Sim, M. (2004). The price of robustness. Operations research, 52(1), pp. 35-53. https://doi.org/10.1287/opre.1030.0065
9. Caplan, L., Griswold, J. S., & Jarvis, W. F. (2013). From SRI to ESG: The Changing World of Responsible Investing. *Commonfund Institute*, 1(1), pp. 1-22. https://doi.org/10.1111/beer.12588
10. Castilho, D., Gama, J., Mundim, L. R., & de Carvalho, A. C. (2019). Improving portfolio optimization using weighted link prediction in dynamic stock networks. *In Computational Science–ICCS 2019: 19th International Conference*, Faro, Portugal, June 12–14, 2019, Proceedings, Part III 19 (pp. 340-353). Springer International Publishing.
11. Cesarone, F., Scozzari, A., & Tardella, F. (2020). An optimization–diversification approach to portfolio selection. *Journal of Global Optimization*, 76(2), pp. 245-265.
12. Couture, T., & Gagnon, Y. (2010). An analysis of feed-in tariff remuneration models: Implications for renewable energy investment. *Energy policy*, 38(2), pp. 955-965.
13. Darmian, S. M., & Farughi, H. (2022). An optimization-based approach for managing downstream logistic operations: A real application in pandemic outbreak conditions. *Computers & Industrial Engineering*, 171, A. 108495. https://doi.org/10.1016/j.cie.2022.108495
14. Darmian, S. M., Fattahi, M., & Keyvanshokooh, E. (2021). An optimization-based approach for the healthcare districting under uncertainty. *Computers & Operations Research*, 135, A. 105425. https://doi.org/10.1016/j.cor.2021.105425
15. Doaei, M., & saberfard, M. (2021). A chance constrained recourse approach for the portfolio selection problem in the Iran capital market. *Financial Engineering and Portfolio Management*, 12(46), pp. 667-690

16. Doaei, M., Mirzaei, S. A., & Rafigh, M. (2021). Hybrid Multilayer Perceptron Neural Network with Grey Wolf Optimization for Predicting Stock Market Index. *Advances in Mathematical Finance and Applications*, 6(4), pp. 883-894. https://doi.org/10.22034/amfa.2021.1903474.1452
17. Farughi, H., & Mostafayi, S. (2016). Robust Optimization Approach for Design for a Dynamic Cell Formation Considering Labor Utilization: Bi-objective Mathematical Model. *International Journal of Supply and Operations Management*, 3(1), pp. 1143-1167.
18. Farughi, H., & Mostafayi, S. (2017). A hybrid approach based on ANP, ELECTRE and SIMANP metaheuristic method for outsourcing manufacturing procedures according to supply chain risks-Case study: A medical equipment manufacturer company in Iran. *Decision Science Letters*, 6(1), pp. 77-94.
19. Farughi, H., Dolatabadiaa, M., Moradi, V., Karbasi, V., & Mostafayi, S. (2017). Minimizing the number of tool switches in flexible manufacturing cells subject to tools reliability using genetic algorithm. *Journal of Industrial and Systems Engineering*, 10 (special issue on Quality Control and Reliability), pp. 17-33.
20. Ferneini, E. M. (2020). The financial impact of COVID-19 on our practice. *Journal of Oral and Maxillofacial Surgery*, 78(7), pp. 1047-1048.
21. Ghorabaee, M. K., Amiri, M., Zavadskas, E. K., & Antucheviciene, J. (2018). A new hybrid fuzzy MCDM approach for evaluation of construction equipment with sustainability considerations. *Archives of Civil and Mechanical Engineering*, 18, pp. 32-49.
22. Ghorabaee, M. K., Zavadskas, E. K., Amiri, M., & Turskis, Z. (2016). Extended EDAS method for fuzzy multi-criteria decision-making: an application to supplier selection. *International Journal of Computers Communications & control*, 11(3), pp. 358-371.
23. Gudo, A. J. A., Deng, J., Belete, M., & Abubakar, G. A. (2020). Estimation of Small Onshore Wind Power Development for Poverty Reduction in Jubek State, South Sudan, Africa. *Sustainability*, 12(4), A. 1483.
24. Ho, W.-R. J., Tsai, C.-L., Tzeng, G.-H., & Fang, S.-K. (2011). Combined DEMATEL technique with a novel MCDM model for exploring portfolio selection based on CAPM. *Expert systems with applications*, 38(1), pp. 16-25.
25. Kahraman, Y. R. (2002). Robust sensitivity analysis for multi-attribute deterministic hierarchical value models. Biblioscholar.
26. Keršuliene, V., Zavadskas, E. K., & Turskis, Z. (2010). Selection of rational dispute resolution method by applying new step-wise weight assessment ratio analysis (SWARA). *Journal of Business Economics and Management*, 11(2), pp. 243-258.
27. Keshavarz Ghorabaee, M., Zavadskas, E. K., Olfat, L., & Turskis, Z. (2015). Multi-criteria inventory classification using a new method of evaluation based on distance from average solution (EDAS). *Informatica*, 26(3), pp. 435-451.
28. Khodaverdizadeh, M., & Mohammadi, S. (2016). Determination of Market Structure and Ranking Target Markets of Iran's Export of Medicinal Plants. *Journal of Applied Economics Studies in Iran*, 5(20), pp. 201-220.
29. Kisman, Z., & Krisandi, D. (2019). How to predict financial distress in the wholesale sector: Lesson from Indonesian Stock Exchange. *Journal of Economics and Business*, 2(3), pp. 1-22.
30. Kou, G., Ergu, D., Lin, C., & Chen, Y. (2016). Pairwise comparison matrix in multiple criteria decision making. *Technological and economic development of economy*, 22(5), pp. 738-765.
31. Kou, G., Peng, Y., & Wang, G. (2014). Evaluation of clustering algorithms for financial risk analysis using MCDM methods. *Information Sciences*, 275, pp. 1-12.
32. Li, N., & Zhao, H. (2016). Performance evaluation of eco-industrial thermal power plants by using fuzzy GRA-VIKOR and combination weighting techniques. *Journal of Cleaner*

Production, 135, pp. 169-183.
33. Liza, M., & Morales Anaya, J. A. (2018). Export boom and economic performance: Bolivia 2004-2015. Universidad Católica Boliviana, La Paz, Bolivia
34. Mardani, A., Nilashi, M., Zakuan, N., Loganathan, N., Soheilirad, S., Saman, M. Z. M., & Ibrahim, O. (2017). A systematic review and meta-Analysis of SWARA and WASPAS methods: Theory and applications with recent fuzzy developments. *Applied Soft Computing*, 57, pp. 265-292.
35. Mkwanazi, S. (2018). Evaluating factors of government investment in new industrial parks. *Journal of Emerging Trends in Economics and Management Sciences*, 9(6), pp. 350-355.
36. Polat, G., & Bayhan, H. G. (2020). Selection of HVAC-AHU system supplier with environmental considerations using Fuzzy EDAS method. *International Journal of Construction Management*, 1(1), pp. 1-9.
37. Popkova, E. G., Bogoviz, A. V., Ragulina, Y. V., & Alekseev, A. N. (2018). Perspective model of activation of economic growth in modern Russia Management of Changes in Socio-Economic Systems (pp. 171-177): Springer.
38. Rahiminezhad Galankashi, M., Mokhatab Rafiei, F., & Ghezelbash, M. (2020). Portfolio selection: a fuzzy-ANP approach. *Financial Innovation*, 6(1), p. 17. https://doi.org/10.1186/s40854-020-00175-4
39. Rais, M., Acharya, S., & Sharma, N. (2013). Food processing industry in India: S&T capability, skills and employment opportunities. *J Food Process Technol*, 4(9), pp. 1-13.
40. Ram, C., & Montibeller, G. (2013). Exploring the impact of evaluating strategic options in a scenario-based multi-criteria framework. *Technological Forecasting and Social Change*, 80(4), pp. 657-672.
41. Rezaei, J. (2015). Best-worst multi-criteria decision-making method. *Omega*, 53, pp. 49-57.
42. Rezaei, J. (2016). Best-worst multi-criteria decision-making method: Some properties and a linear model. *Omega*, 64, pp. 126-130.
43. Shabbir, M. S., & Wisdom, O. (2020). The relationship between corporate social responsibility, environmental investments and financial performance: evidence from manufacturing companies. *Environmental Science and Pollution Research*, 1(1), pp. 1-12.
44. Soyster, A. L. (1973). Convex programming with set-inclusive constraints and applications to inexact linear programming. *Operations Research*, 21(5), pp. 1154-1157.
45. Stanković, J. Z., Petrović, E., & Denčić-Mihajlov, K. (2020). Effects of applying different risk measures on the optimal portfolio selection: The case of the Belgrade stock exchange. *Facta Universitatis, Series: Economics and Organization*, pp. 017-026. https://doi.org/10.22190/FUEO191016002S
46. Stević, Ž., Vasiljević, M., Zavadskas, E. K., Sremac, S., & Turskis, Z. (2018). Selection of carpenter manufacturer using fuzzy EDAS method. *Engineering Economics*, 29(3), pp. 281-290.
47. Talan, G., & Sharma, G. D. (2019). Doing well by doing good: A systematic review and research agenda for sustainable investment. *Sustainability*, 11(2), p. 353.
48. Thoumi, F. E. (2009). Necessary, sufficient and contributory factors generating illegal economic activity, and specifically drug-related activity, in Colombia. *Iberoamericana (2001-)*, 9(35), pp. 105-126.
49. Vuković, M., Pivac, S., & Babić, Z. (2020). Comparative analysis of stock selection using a hybrid MCDM approach and modern portfolio theory. *Croatian review of economic, business and social statistics*, 6(2), pp. 58-68.
50. Xu, D., Ren, J., Dong, L., & Yang, Y. (2020). Portfolio selection of renewable energy-powered desalination systems with sustainability perspective: A novel MADM-based framework under

data uncertainties. *Journal of Cleaner Production*, 275, A. 124114. https://doi.org/10.1016/j.jclepro.2020.124114

51. Yoshino, N., Taghizadeh-Hesary, F., & Otsuka, M. (2021). COVID-19 and optimal portfolio selection for investment in sustainable development goals. *Finance research letters*, 38, A. 101695. https://doi.org/10.1016/j.frl.2020.101695

IJAAF; Vol. 8, No. 4, Autumn 2024, Serial 29

Ferdowsi University of Mashhad

Iranian Journal of
Accounting, Auditing & Finance

Quarterly

RESEARCH ARTICLE

Identifying the Effective Components in Validating the Declared Taxable Income of Companies: Using the Structural Equation Model

Ali Asghar Mottaghi *, Nabi Najafi, Ahmad Mohammadi

Department of Accounting, Tabriz Branch, Islamic Azad University, Tabriz, Iran

How to cite this article:
Mottaghi, A. A., Najafi, N., & Mohammadi, A. (2024). Identifying the Effective Components in Validating the Declared Taxable Income of Companies: Using the Structural Equation Model. Iranian Journal of Accounting, Auditing and Finance, 8(4), 25-49. doi: 10.22067/ijaaf.2024.43284.1260
https://ijaaf.um.ac.ir/article_43284.html

ARTICLE INFO

Article History
Received: 2023-09-15
Accepted: 2024-02-01
Published online: 2024-10-25

Keywords:
Declared Taxable Income, Information Credibility, Tax audit, Trust Theory

Abstract

In recent years, the country's tax administration has adopted an approach emphasizing trust in taxpayers and the assumption of the accuracy of the information they provide. Consequently, it has reviewed and enhanced its systems and directives. This paper presents a comprehensive model for validating companies' taxable income through the lenses of trust theory, information validity theory, the law of truthfulness, and theories of truth, including correspondence, coherence, and pragmatism. By conducting semi-structured interviews with experts in 2021 and 2022, the components and indicators influencing the declared taxable income of companies were identified. Using the structural equation modeling method, a proposed research model was developed. In order of importance, the factors affecting the credibility of the taxable income declared by companies are auditing, technical, systemic, environmental, company-specific, and financial and accounting factors. The tax administration should consider these factors when assessing income credibility, and companies subject to taxation should give appropriate attention to them. The components identified in this research can assist in determining the validity of declared taxable income and assessing companies' credit risk. Additionally, this framework provides a solid foundation for selecting taxpayers for audits before initiating the tax audit process. Furthermore, the research findings contribute to developing theoretical support in accounting and tax research.

https://doi.org/10.22067/ijaaf.2024.43284.1260

NUMBER OF REFERENCES
40

NUMBER OF FIGURES
2

NUMBER OF TABLES
11

Homepage: https://ijaaf.um.ac.ir
E-Issn: 2717-4131
P-Issn: 2588-6142

*Corresponding Author: Ali Asghar Mottaghi
Email: Aliasghar.mottaghi@yahoo.com
Tel: 09141166712
ORCID:

1. Introduction

Taxation has always been an essential and fundamental issue in the economy because it is one of the primary operations of all governments and a prerequisite for everything that governments undertake (Simon and Lukason, 2021; Kiser and Karceski, 2017). Governments provide essential security services to their people by collecting taxes from people and providing resources to rich and poor people. Tax revenues are the primary source of government budget financing for investment in public infrastructure (Barbu et al., 2022). In underdeveloped countries, tax evasion is a big challenge to collecting tax revenues (Al-Rahamneh and Bidin, 2022; Umar et al., 2019). Fighting tax evasion is one of the goals of all tax systems in the world, and there are two basic strategies. One is creating and developing sustainable tax self-declaration systems, and the second uses risk-based tax audits (Dehghani, 2019). The self-declaration system allows taxpayers to determine and pay the amount of tax payable each year by the applicable tax laws and provides a lot of freedom and responsibility to fulfill taxpayers' tax obligations (Masrullah et al., 2021). Since this system requires the voluntary compliance of taxpayers, it creates great opportunities for them. Tax collection with the self-declaration system will be done well if the taxpayers have high tax knowledge and discipline, and the features of the self-declaration system (ensuring the simplicity of the law, accessible, fair, and just implementation of the tax) well done by the taxpayers (Wahyudin et al., 2022; Batrancea et al., 2019; Gechert and Heimberger, 2022). In other words, the success of the self-declaration tax system is voluntary compliance with tax laws (Pui Yee et al., 2017).

Among the characteristics of the tax system of developing countries are the non-compliance of tax structures with international standards, lack of tax policy management, low tax compliance, and inappropriate capacities. The most critical component in the improper management of the tax system is an ineffective audit program, which reduces the ability of tax audits and the possibility of identifying and prosecuting tax criminals. Tax audit performance in developing and transition countries is generally feeble (Gupta and Nagadevara, 2007; Belay, 2017).

According to the above, the self-declaration system is generally based on the fact that the taxpayer is more aware of his financial and income situation than anyone else. Therefore, if the tax system reaches a position where the taxpayers will make the correct tax diagnosis, it will improve tax collection in various ways. In this system, the role of tax officials will be to control and check whether the taxpayer has declared his income correctly and whether the applied exemptions and deductions have been legal. If the work is not done correctly, what is the amount of tax that can be collected? However, the important thing is that control and review, considering cost-benefit compliance, are not possible for all taxpayers, so it is better to do it in a sample form (Barzegari Khangah and Feizpour, 2012). On the other hand, since choosing a taxpayer based on risk criteria and planning for tax audit requires identifying the level of risk and credit of each taxpayer, and identifying the risk and credit of each taxpayer also requires identifying components that can be based on these components, before the implementation of the tax audit process, it is necessary to select a taxpayer for a tax audit. Therefore, the present research, based on the insights obtained from the experts and its comparison and validation with existing theories, seeks to find a suitable answer to the question of what are the influential factors in determining the credibility of expressed taxable income of companies and how is the comprehensive model of assessing the credit of taxable income of companies? For this purpose, the theoretical foundations and experimental background, research methodology, findings, and results from the structural equations of the discussion and the proposed model are presented in the following.

2. Theoretical principles

2.1 Expressed taxable income credit

The importance and special position of the tax system in the economy of any country are not hidden from any of the specialists and experts in the economic field. Audit strategy is a vital tool in

empowerment management through the Tax Affairs Organization. The tax affairs organization cannot audit all taxpayers, and the continuous investigation of low-risk and empowering taxpayers is a waste of resources by the organization (World Bank, 2011). In other words, it can be said that the cost of the lost opportunity for such investigations is very high, so resources should be spent on taxpayers who have the potential to generate more income and profit. The tax affairs organization should manage taxpayers' tax compliance through its own methods and techniques in order to identify and prevent criminal behavior and help taxpayers with tax compliance and payment of their tax obligations by providing appropriate services and training. Such a written system is based on self-declaration and voluntary empowerment by taxpayers, and the risk assessment function is separated from the audit execution function (Khwaja et al., 2011). The problems in Iran's tax system caused new arrangements to be made regarding the tax system.

A coherent tax information system that is optimally designed and planned is an effective factor in improving tax detection and collection methods, reducing tax evasion, reducing administrative corruption, eliminating discrimination, and increasing efficiency, as well as a factor for more accurate budget regulation. Therefore, most countries have tried to achieve such a tax information system, and many advanced countries have also achieved it. In our country, the lack of a coherent, coordinated, and mechanized tax information system has caused a gap between the potential tax capacity of the economy and its actual capacity. The deprivation of tax revenues has increased while the collection of the same amount of tax has also brought enormous costs in all dimensions, including material, social and economic costs for the country (Adam et al., 2015). On the other hand, relying on traditional methods makes it impossible to intercept information related to economic activities and exchanges in today's world. Also, the tax system in the absence of a unified view of taxpayers, the weakness of tax information, and the lack of information elites on taxpayers were not able to properly perform the legal duties assigned to them and also provide appropriate services to taxpayers, which in turn led to issues such as dissatisfaction of taxpayers, non-compliance of taxpayers, tax evasion and reduction of tax revenues (Bryce et al., 2016). Hence, the deficiencies and shortcomings in the information, processes, implementation, and existing laws of the tax system have necessitated the implementation of a comprehensive tax plan. In recent years, in the country's tax affairs organization, the risk-based audit selection project has been seen as a subset of the integrated tax system in the comprehensive tax plan. Still, it has not yet been fully operationalized. If this project is implemented, the auditors of the Tax Affairs Organization will not be involved in processing the tax return, and this work will be done automatically.

2.2 Contributing factors to the expressed taxable income credit

The promulgation of the new tax law was approved in July 2014, except for some parts of it, including the implementation of Article 97, which came into effect at the beginning of 2015, the removal of Articles 152 and 153 of the Direct Taxes Law approved in February 2000, and to put it better, the removal of tax assessment using the ex officio method and the replacement of the procedure based on reasons and objective evidence, which should be made efficient by adopting appropriate mechanisms, will help tax justice. Based on this, by removing the ex officio method from the tax system, proceedings will be more disciplined and more transparent, and cooperation and interaction between trade unions and economic enterprises; in other words, taxpayers with the Tax Administration will increase. By trusting the people and the criterion of taxpayers' information, we can hope that the tax collection time will be reduced. In such conditions, the interaction between taxpayers and tax auditors increases, the satisfaction of taxpayers increases, and the tax system becomes closer to realizing tax justice (Barzegari et al., 2021). Despite the expectation for the cooperation of taxpayers and their financial information holders, in many cases, the information

available to prepare financial statements containing taxpayers' income and expenses is still incomplete. Some methods should be used, including a comprehensive tax plan that can complete and summarize the available information acceptably. In this regard, Dastgir et al. (2015) presented a selection model for tax audits based on the risk of legal entities in Iran. In this study, the factors affecting the taxpayer risk are the quality of corporate governance (the variables of CEO duality, the percentage of the number of non-executive directors, the percentage of shares in the hands of managers, the power of shareholders, the percentage of institutional shareholders, the presentation of financial and tax audit reports), the characteristics of legal taxpayers (Variables of type of ownership, type of company, type of activity, concentration, the life of activity, size, membership in the stock exchange), and tax history of the company were identified. Also, Heyrani et al. (2019) identified the factors affecting the risk of a tax audit with a combined exploratory method and showed that exchange with fake and uncredited companies, the use of partners' current accounts in carrying out expenses, and a high ratio of end-of-period inventory to sales are among the most critical indicators of tax audit risk. Inasius (2019) proved that the possibility of an audit, tax knowledge, and understanding of justice and fairness significantly affect tax compliance and the provision of reliable and correct information by taxpayers. Abdulhamid et al. (2019) consider tax knowledge, the complexity of tax rules and regulations, the difficulty of understanding them, and the high current tax rate to be the factors affecting the tax support of businesses. Green et al. (2022) investigate whether public financial statement information is incrementally useful in forecasting confidential taxable income and suggest that macroeconomic forecasts of taxable income may be further improved by aggregating firm-level forecasts generated using financial statement information.

2.3 Assessing the validity of declared taxable income

Considering the need to trust the information expressed by taxpayers in the comprehensive tax plan, which is based on the information expressed by taxpayers, the discussion of the validity of this information and the creation of a suitable mechanism to measure this to ensure reasonable assurance by the relevant institutions is considered one of the most vital issues. In line with the theoretical support of measuring the credibility of taxpayers' (voluntarily) expressed information, the following scientific theories can provide a suitable platform to support the model of assessing the validity of taxable income expressed by taxpayers.

2.3.1 Trust theory

James Coleman, one of the theorists in the field of trust, believes that based on the theory of rational choice, actors are purposeful agents who take actions that are more likely to succeed and thus increase their interests. However, the point is that making many exchanges requires trust between the parties. According to Coleman, information plays an important and decisive role in trust. Based on this, the existence of information can strengthen the trust between the parties (Moradi and Bayat, 2018; Coleman, 1994). It seems that in our country's tax system, the culture of voluntary tax payment based on self-declaration is low, and according to the people, the tax system is not efficient and effective. There is no mutual trust between the tax system and the taxpayers (Qaranjik et al., 2021). Therefore, it is necessary to determine the valid and acceptable components to establish mutual trust between the tax system and taxpayers in light of the trust theory. In this regard, De Neve et al. (2021) concluded that simplifying communication between taxpayers and the tax administration increases tax compliance, and deterrence messages will positively affect tax compliance. On the other hand, tax ethics and spirit do not increase or improve tax compliance. Also, Da Silva et al. (2019) investigated the two policies of compulsory and voluntary tax in Brazil's sliding slope framework. Their research showed that trust-based interaction between taxpayers and tax auditors would lead to voluntary tax

payments. This is because the policy based on pressure and force will not lead to the payment of compulsory taxes, and the taxpayers will not be willing to pay taxes.

2.3.2 Validity theory

Undoubtedly, the move towards trusting the taxpayers and the orientation of the tax system based on the taxpayers' self-declaration will require appropriate confidence about the validity of the declared information. The validity of information is a prerequisite for moving towards the realization of the country's comprehensive tax plan goals. The theory of the validity of information about the statement's truth is based on its validity. It is one of the theories presented about the truth and the nature of the statement of words (Liu, 2010 and the dictionary of principles of jurisprudence). In other words, it is assumed that the more the provided information represents the truth of the matter, the more reliable it is. This article has been consolidated in the form of the truth expression law. Many different theories have been expressed regarding the truth. The most important theories are correspondence, coherence and pragmatism, which are explained in the following section (Moloudi and Hamze Howeyda, 2013; Johnson, 2006).

2.3.3 Truth theories

Correspondence theory: Following a realist point of view, the truth is the agreement and correspondence of the statement with reality. This theory can be used as a definition of truth due to its defensible logical foundations and wide consensus in its acceptance.

Coherence theory: due to turning away from the tradition of realism regarding the truth and the difficulties judges face in accessing facts, it can be a standard for discovering the truth in some judicial issues.

Pragmatic theory: interpret the truth in the light of the concepts of benefit and expediency and consider something worthy of this title if it is useful in practice. With the clarification of the meaning of truth, the judge should seek to verify this concept; various conditions regarding truth, such as judicial and relative truth, should not cause transformation and change in the concept of truth.

Nyarkpoh (2018) also showed in a study that trust in the government positively and significantly affects the probability of tax compliance. In addition, other variables such as a high level of education, government employment, low corruption, and a sense of security affect the probability of tax compliance. Kenno (2020) also examined the factors affecting taxpayers' understanding of tax evasion. It showed that tax evasion is caused by a lack of knowledge about taxes, an understanding of tax evasion as a culture, the tax audit process, and the degree of realization, understanding tax evasion as a minor crime and issues related to tax fairness and justice. Bani-Khalid et al. (2022) identified taxpayers' attitudes, subjective criteria, perceptual behavior, and patriotism as determinants of tax compliance. Perera et al. (2020) investigated confirmation bias in accounting judgments. Their research showed that accountants act biased toward recognition and measurement principles. This bias can be reduced by informing accountants about the requirements of correct judgment. In addition, Tilahun (2019) considers taxpayers to be under the influence of various factors such as punishment, justice in the tax system, tax rate, the possibility of discovery and audit, etc. and suggests that the tax-collecting institution should establish tax justice (not with the stick policy), maintain the appropriate level of punishment, and consider concessions for responsible citizens. Gechert and Heimberger (2022) show evidence for publication selectivity in favor of reporting the growth-enhancing effects of corporate tax cuts. Several factors influence reported estimates, including researcher choices concerning the measurement of growth and corporate taxes and controlling for other budgetary components. Wahyudin et al. (2022) show that The results of the study indicate that the tax audit is quite effective as an act of monitoring the self-assessment system.

The above theoretical and empirical bases show that, so far, no research has been done to

comprehensively identify the effective components in validating companies' taxable income. Based on this, the current research aims to identify and explain these components through interviews until a comprehensive model for assessing the validity of companies' taxable income is presented in the current situation, so the following research questions are based on theoretical foundations: literature review in the field. The related issues and research objectives have been tested.

1- What effective factors determine companies' taxable income validity?

2- What is the prioritization and weight of each effective factor in determining the validity of companies' taxable income?

3- How is the comprehensive model for determining companies' validity of taxable income explained?

3. Research methodology

The research method of the present study is an exploratory combination based on the collection, analysis, and combination of two types of qualitative and quantitative data, which are divided into three categories: interwoven, descriptive, and exploratory (Creswell and Plano-Clark, 2007). In the qualitative part, the statistical population of the research consists of auditors of the Tax Affairs Organization with at least 10 years of auditing experience in companies. Using the qualitative research method of thematic analysis, 15 semi-structured interviews were conducted to identify primary indicators. The research's time domain is 2021 and 2022; the geographical domain is the country's Tax Affairs Organization.

In the quantitative part, the research questions are compiled based on the concepts obtained from the qualitative part, and the research basics and background are reviewed. To test the questions, a questionnaire based on the concepts of the qualitative part of design research and its information is completed by different groups. The questionnaire items were designed based on a 9-point Likert spectrum, from very little (1) to very much (9). The impact of the conceptual model's implicit and explicit components was evaluated using the structural equation modelling approach. Also, all the mentioned processes have been done in SPSS55 and Smart PLS3 software. This section's statistical population consists of 310 accounting department academic staff members, financial managers, independent auditors, and tax auditors. Using the Cochran formula, 171 questionnaires were distributed and collected among the interviewed panel members. Among the collected questionnaires, 159 usable items were evaluated, and 15 of the interviewees of the first part were also among the statistical population of the second part. Table (1) is the demographic information of the research participants.

Table 1. Demographic characteristics

	Description	Frequency	Percentage
Gender	Man	134	84
	Female	25	16
Age	Less than 30 years	21	13
	Between 31 and 40 years	69	44
	Between 41 years and 50 years	64	40
	More than 50 years	5	3
Records	Less than 10 years	11	7
	Between 11 and 20 years	98	62
	Between 20 and 30 years	48	30
	More than 30 years	2	1
Education	bachelor's degree	27	17
	Master's degree	79	50
	PhD.	53	33
Major	Accounting, auditing, finance	135	85
	Economy	16	10
	other	8	5

In Table (2), descriptive statistics indices (central and dispersion indices) are presented to summarize the data to get a general picture of the sample under investigation and the relationships between the research variables.

Table2. Descriptive statistics of research variables (source, research findings)

Research variable	Mean	Minimum	Maximum	Standard deviation
Income factors	50.83	27	69	7.324
Cost factors	49.17	27	62	7.845
Balance sheet factors	67.53	40	94	9.409
Other financial and accounting factors	42.85	26	57	5.049
Auditor type	16.73	7	27	3.567
Audit fees	9.45	3	18	2.909
Providing an audit report	18.19	9	26	3.938
Auditor's opinion type	17.56	8	25	3.37
Economical	19.79	7	31	4.994
Political	15.62	8	24	3.224
Legal	52.16	25	70	6.418
Cultural	23.23	5	34	4.425
Management features	32.24	16	51	5.217
Performance and operational characteristics	45.4	28	71	6.499
Comparing the company's information with the systems available to the organization	27.96	7	36	3.775
The existence of a standard two-way accounting system	19.69	10	27	3.724
Number of specialist staff	18.77	6	25	3.834
Number and complexity of products	22.03	8	32	5.325

4. Research findings

4.1 Testing the first question

The first question of the research states what the effective components are in determining the validity of companies' taxable income. In other words, can the sub-themes extracted from the qualitative part of the research be the approved factors for the main themes? The confirmatory factor analysis method was used to answer this question. For this purpose, we first check whether the questionnaire items can explain the sub-themes of the research. After confirming this step, we will examine the above question. It is necessary to explain that this method used Smart PLS software version 3. The confirmatory factor analysis model results are presented in table (3). Criterion values are usually between 0.5 and 0.7 for factor loads; the lowest declared limit is 0.4. This means that the questions with the absolute value of factor loadings less than 0.4 are insufficient to remain in the model and should be removed and the model run again.

According to the results, the absolute value of the standardized factor loading for all the items except item Q23 (0.101) is greater than 0.5. Therefore, this non-standard item was removed, and the confirmatory factor analysis model was implemented again. The results of the second implementation of the model indicate that the absolute value of the standardized factor loading for all items is greater than 0.5. Therefore, it can be concluded that the remaining questionnaire items explain the sub-themes of the research well.

Table 3. Results of standardized factor loadings

Code	Concept (item)	Standard factor load
Q1	The existence of exports and their ratio to the company's domestic sales	0.772
Q2	The high quality of expressed interest	0.532
Q3	Major changes in income compared to previous years	0.676
Q4	Proportionality of gross profit margin and net profit compared to the industry average	0.789
Q5	Items that do not affect taxable income, such as profit from the sale of investments, dividends, etc.	0.773
Q6	The existence of incidental income	0.518
Q7	Existence of income with withholding tax	0.675
Q8	Absence of declared losses for at least two consecutive years	0.785
Q9	High rial ratio of manufactured goods inventory to sales for at least two consecutive years	0.800
Q10	The amount of manufactured goods and its relationship with the type of company's activity in terms of expiration date and storage conditions	0.823
Q11	The presence of a product in the process of manufacturing and its relationship with the subject of the company's activity to an appropriate extent	0.787
Q12	Despite its low amount and ratio to the volume and quantity of manufactured goods, there is no major change in auxiliary materials and packaging.	0.800
Q13	Comparing the components of the total cost (materials, wages and overhead) to sales	0.816
Q14	No major change in the ratio of waste to production	0.504
Q15	The optimal percentage of the cost of salaries and wages and its ratio with sales in production, commerce	0.540
Q16	The ratio of some imported materials to the total raw materials used in production	0.552
Q17	The existence of financial facilities and their relationship with the financial cost and the company's income	0.501
Q18	Optimum return on assets	0.552
Q19	Absence of significant fluctuation in financial statement items in at least 2 consecutive years	0.690
Q20	The high amount of working capital compared to the industry average	0.635
Q21	The low turnover period of receivables and its ratio to the company's sales	0.504
Q22	No major changes in accounts receivable and their ratio to sales	0.554
Q23	The ratio of inventory to the volume and amount of sales	**Omitted**
Q24	Increase in fixed assets and its effect on the company's sales	0.725
Q25	The amount of orders and prepayments and their relationship with the purchase amount	0.696
Q26	The amount of the fee and reserve of the graduate and its relationship with the number of employees	-0.565
Q27	The amount of advances and its relationship with sales and facilities received	-0.550
Q28	The low share of partners' current accounts compared to sales or purchases	0.539
Q29	Absence of sales to fake and uncredited companies	-0.549
Q30	The relatively low number and variety of customers	0.640
Q31	Having legal offices and writing them	-0.589
Q32	The existence of annual adjustments, especially if the income increaser is taxable	0.697
Q33	Bank information of taxpayers (circulation of bank accounts and its connection with company sales)	0.742
Q34	Buying or selling in the commodity exchange	-0.615
Q35	The number of employees and their ratio to the subject of the company's activity	0.718
Q36	Being a government auditor	0.830
Q37	The size of the audit institute	0.577
Q38	The rank of the auditor's institution (A, B, C)	0.889
Q39	Higher amount of audit fees	0.571
Q40	Existence of non-audit service fees	0.938
Q41	Mandatory submission of audit report	0.737
Q42	Submitting the audit report along with the declaration	0.797
Q43	Quality of financial audit performed by independent auditors	0.642
Q44	Conditional / rejection of the audit report	0.513
Q45	A provision about the continuity of the company's activity in the audit report	0.853
Q46	Existence of ambiguity about the legal claims of the company in the audit report	0.597

Q47	Increase in GDP	0.615
Q48	Balanced inflation rate	0.716
Q49	Appropriate employment rate	0.663
Q50	Appropriate bank interest rate	0.543
Q51	Being a member of the government board	0.607
Q52	The presence of institutional shareholders in the composition of shareholders	0.546
Q53	The presence of major shareholders in the composition of shareholders	0.672
Q54	The existence of tax exemptions and incentives and their relationship with the subject of the company's activity	0.594
Q55	Legal permits such as exploitation license, mining license, nominal and actual capacity check	0.629
Q56	Matching the declaration information with the information registered in customs, banks, insurance companies, etc.	0.513
Q57	Knowledge of tax and accounting laws and regulations (having a financial and tax advisor)	0.564
Q58	Company's tax history - Article 189 BC (three consecutive years)	0.654
Q59	Being subject to value-added tax	0.543
Q60	Offering seasonal deals	0.565
Q61	Submission of tax returns on legal dates	0.578
Q62	The absence of the company in the list of polluting companies (including pollution charges)	0.551
Q63	The attitude of the manager or the financial officers of the company about the tax system	0.661
Q64	The attitude of the manager or the financial officers of the company regarding taxes and the necessity of paying them	0.801
Q65	The state of the country's tax culture and willingness to pay taxes among taxpayers	0.602
Q66	Company type (public shares, private shares, partnership, etc.)	0.573
Q67	The number of board members	0.794
Q68	The existence of a female member in the composition of the board of directors	0.867
Q69	Having a foreign shareholder	0.602
Q70	The type of ownership of the company (government or joint stock)	0.794
Q71	The percentage of non-executive board members	0.793
Q72	Having multiple branches or affiliated companies (domestic and foreign)	0.574
Q73	Nature of activity (production, service, trade, contracting)	0.765
Q74	The company's activity locations (multiple or far from the office, located in decentralized spaces)	0.514
Q75	Firm age (the criterion is the date of obtaining the operating license)	0.581
Q76	Taxpayer size (small, medium, and large)	0.701
Q77	The amount of registered capital compared to the volume of its operations	0.600
Q78	Membership in the stock exchange	0.568
Q79	Type of industry (non-sanctioned)	0.568
Q80	The possibility of validating the data provided with information systems within the organization	0.761
Q81	The possibility of matching the information of sellers and buyers	0.637
Q82	The possibility of matching the declaration information with the information registered in customs, banks, insurance companies, etc.	0.597
Q83	Non-conformity of Riyal salary list of the tax system and social security organization	0.812
Q84	The existence of an integrated system in the company (financial/non-financial)	0.705
Q85	Up-to-date system (financial/non-financial)	0.785
Q86	The existence of software approved by the Tax Affairs Organization	0.644
Q87	The existence of employees with degrees related to their duties	0.677
Q88	Having employees with a long experience	0.710
Q89	The existence of employees with technical training related to the duties	0.758
Q90	Production of branded products	0.501
Q91	Production of exclusive products	0.766
Q92	Product innovation	0.757
Q93	There is a variety in the number of products	0.852

Source: research findings

4.2 Theoretical summarization and development of the findings of the first question

In coding the previous sections, categories were systematically improved, developed, and linked with subcategories. However, these categories should be integrated to form a larger theoretical framework. For this purpose, the comprehensive model of effective components in determining the validity of companies' taxable income is presented in Figure (1). In the previous section, it was also stated that all identified factor loadings are significant at the 95% confidence level and explain the sub-themes of the research appropriately. Besides, the coefficients of factor loadings related to the factors "income", "cost", "balance sheet" and "other financial and accounting factors" which are assigned to "financial and accounting" factors are respectively equal to 0.882, 0.908, 0.645 and 0.615, the coefficients of factor loadings related to audit factors including "auditor type", "audit fee", "audit report presentation" and "auditor opinion type" are equal to 0.651, 0.779, 0.817 and 0.972 respectively, factor loading coefficients related to including "economic factors", "political factors", "legal factors" and cultural and social factors" are respectively equal to 0.778, 0.615, 0.747 and 0.677, factor loading coefficients related to " Company-specific factors" including "management characteristics" and "performance and operational characteristics" equal to 0.826 and 0.804, respectively, and finally, factor loading coefficients related to "technical factors" including "Comparison of company information with the system" "Existence of two-way standard accounting system", "Number of expert employees" and "Number and complexity of products" are equal to 0.968, 0.739, 0.790 and 0.793, respectively. Because all factors have a factor load of more than (0.5) with their related hidden variable; the above factors are approved for "assessing the credibility of taxable income of companies". Figure (1) shows the confirmatory factor analysis model.

4.3 Testing the second question

The second question of the research states that what is the prioritization and weight of each effective factor in determining the validity of the companies' taxable income? First, the main effective factors in measuring the validity of the companies' taxable income (main themes) and the sub-factors effective in it (sub-themes) have been tested using the Friedman ranking test and the sameness of priority. The results of this test for the main factors are shown in table (4). Since the value of Sig is smaller than 0.01, with 99% confidence, the same priority of "the main effective factors in determining the validity of the declared taxable income of companies" is rejected.

Table 4. Friedman test results

Indicator	Value
Sample size	115
Chi-square statistic	451.59
Degrees of freedom	4
a probability value (Sig)	<0.01

Source: research findings

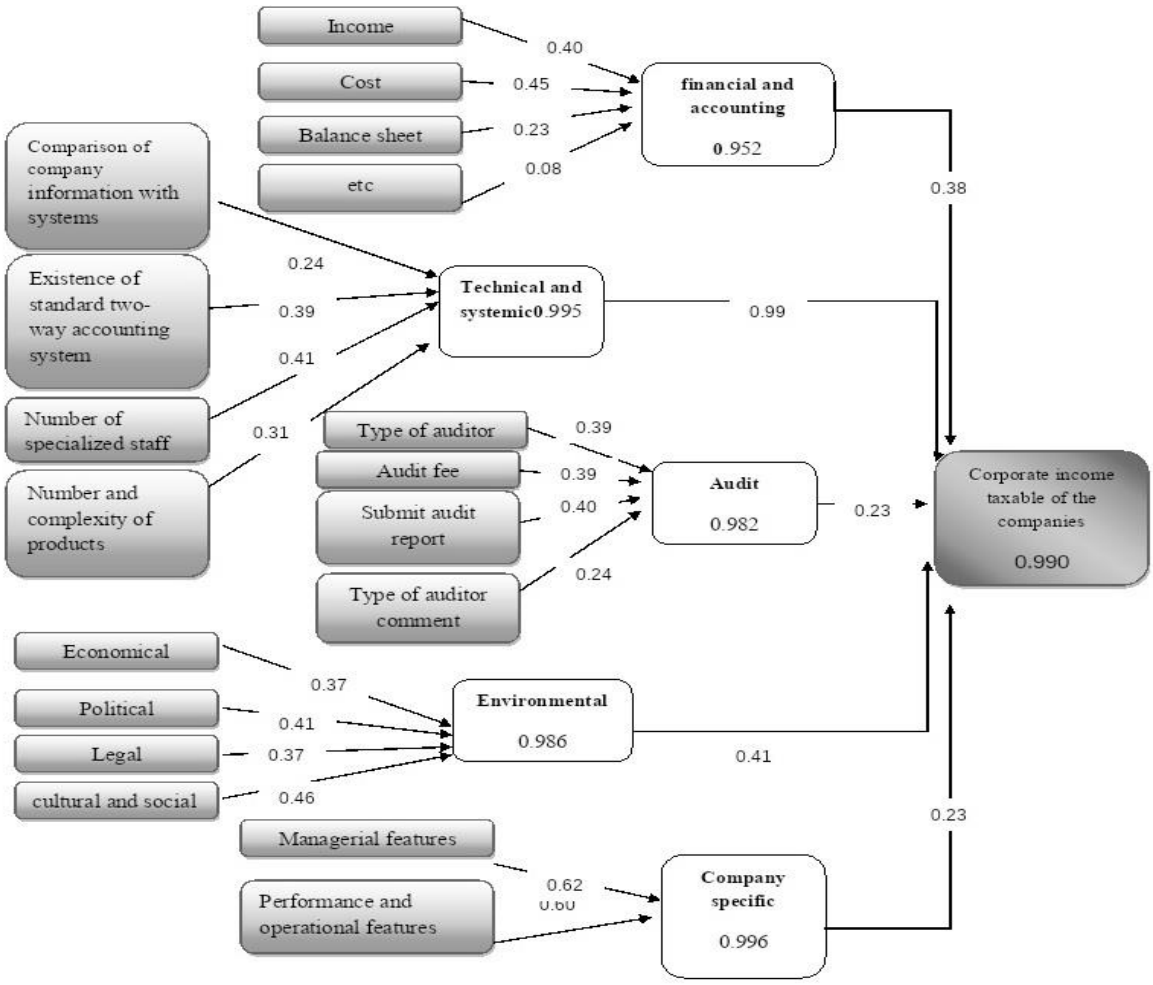


Figure 1. Tested model of research based on path coefficients

4.4 Theoretical summarization and development of the findings of the second question

In order to prioritize each of the components that are effective in measuring the credibility of the declared taxable income, the rank average is used. Table (5) shows the averages of the main factors and their priority order. In ranking these factors, the lowest rank is given to the highest score, and the highest rank is given to the lowest score; therefore, a smaller average rank indicates a better priority. As can be seen, in terms of being effective in determining the validity of taxable income of companies, audit, technical and systemic, environmental, company-specific and financial and accounting factors are the first to fifth priorities, respectively.

Table 5. The results of the rank average test, along with the order of priority

Main factors	Rank average	Priority order
Audit agents	1.030	1
Technical and systemic factors	1.990	2
Environmental factors	2.990	3
Company-specific factors	4.030	4
Financial and accounting factors	4.960	5

Source: research findings

Friedman's test was used to test the equality of the priority of the sub-factors effective in determining the validity of the declared taxable income of the companies. Table (6) shows the results of the Friedman test, including the sample size, chi-square statistic, degree of freedom and probability value (Sig). Because the value of Sig is smaller than 0.01, With 99% certainty, the same priority of "sub-factors effective in determining the validity of the taxable income of companies" is rejected. The rank average was used to prioritize these factors.

Table 6. Friedman test results

Indicator	Value
Sample size	115
Chi-square statistic	492.75
Degrees of freedom	17
a probability value (Sig)	<0.01

Source: research findings

Also, the average test and the priority order of the sub-factors are stated in Table (7). In terms of the effectiveness of each of the effective factors in determining the validity of the taxable income of companies, the factors related to audit fees (5.25), economic (5.50), political (6.28), management factors (7.03), type of auditor (7.81), balance sheet factors (7.96), performance and operational characteristics (8.24), number and complexity of products (8.58), cultural and social factors (9.16), auditor's opinion type (9.43), presentation of the audit report (10.52), other financial and accounting factors (10.66), other cost factors (10.91), the number of expert employees (11.51), other income factors (11.87), the existence of standard two-way accounting system (12.55), legal factors (12.94) and comparison of company information with systems (14.79) are in the first to eighteenth priorities, respectively.

Table 7. Rank average along with priority order of sub-factors

Sub-factors	Rank average	Priority order
Audit fees	5.250	1
Economic factors	5.500	2
Political factors	6.280	3
Management characteristics	7.030	4
Auditor type	7.810	5
Balance sheet elements	7.960	6
Performance and operational characteristics	8.240	7
Number and complexity of products	8.580	8
Cultural and social	9.160	9
Auditor's opinion type	9.430	10
Providing an audit report	10.520	11
Other financial and accounting factors	10.660	12
Other cost factors	10.910	13
The number of specialist employees	11.510	14
Other income factors	11.870	15
The existence of a standard double-sided accounting system	12.550	16
Legal factors	12.940	17
Comparison of company information with systems	14.790	18

Source: research findings

4.5 Testing the third question

The research's third question states, how is the comprehensive model in determining the validity of companies' taxable income explained? In order to answer this question and draw a comprehensive pattern in determining the validity of the declared taxable income of companies, a suitable pattern was drawn using the research literature in related fields and the results of interviews with specialists.

This model has been tested using real data collected from the statistical population of the research and using structural equation modeling software with partial least squares (Smart-PLS); the significance and effect coefficient of each of the relationships has been determined, and ineffective relationships have been reviewed and modified in several stages to calculate the final model of the research. Using the hypothetical model of the research, the communication path of the items to the sub-themes, then the communication path of the sub-themes to the main themes, and finally, the relationship between the main themes and the taxable income variable of the companies was drawn to show the means to determine the effect of each factor. Before doing this, the degree of collinearity of the model factors should be tested. For this purpose, the Variance Inflation Factor (VIF) test is used, which evaluates the intensity of multiple collinearities in ordinary least squares regression analysis. If the VIF test statistic was close to 1, it indicates the absence of collinearity. As an empirical rule, If the VIF value is greater than 5, the possibility of multiple collinearities is high. The results of this test are shown in table (8). According to the results of this table, the VIF value of none of the items is greater than 5. As a result, there is no multiple collinearity problem when testing the research model.

Modeling of structural equations deals with the model test in two stages, which include the measurement and structural model test. In PLS modeling, the measurement model is called the external model and the structural model is called the internal model. The measurement model examines the reliability and validity of the measurement tools and research structures and tests the hidden variables' structural model, hypotheses, and relationships. Frenell and Locker (1981) suggest three criteria to check the validity of structures: 1- the reliability of each item, 2- the composite reliability of each of the constructs, and 3- the average variance extracted (Average Variance Extracted).

Regarding the validity of each item, the absolute factor loading value of 0.4 and more in the confirmatory factor analysis is defined as a good construct. A common criterion for establishing convergent validity at the construct level is average variance extracted (AVE). As seen in Table (8), the values of the model's hidden components' factor loadings are more than 0.4, which is statistically significant. On average, the construct explains more than half of the variance of the corresponding indicators. Also, each component's average extracted variance (AVE) is more than 0.4. This result indicates that the fitted model has good convergent validity and confirms the confirmatory factor analysis.

Table 8. Results of factor analysis of questionnaire questions

Code	Concept (item)	Standard factor load	t statistic	VIF
Q1	The existence of exports and their ratio to the company's domestic sales	0.734	14.438	1.536
Q2	The high quality of expressed interest	0.551	3.360	1.822
Q3	Major changes in income compared to previous years	0.703	11.675	3.103
Q4	Proportionality of gross profit margin and net profit compared to the industry average	0.793	18.213	1.632
Q5	Items that do not affect taxable income, such as profit from the sale of investments, dividends, etc.	0.734	14.540	1.568
Q6	The existence of incidental income	0.538	3.238	1.326
Q7	Existence of income with withholding tax	0.702	12.046	3.722
Q8	Absence of declared losses for at least two consecutive years	0.791	18.063	2.357
Q9	High rial ratio of manufactured goods inventory to sales for at least two consecutive years	0.800	20.149	3.306
Q10	The amount of manufactured goods and its relationship with the type of company's activity in terms of expiration date and storage conditions	0.829	21.106	3.661
Q11	The presence of a product in the process of manufacturing and its	0.771	19.791	2.019

	relationship with the subject of the company's activity to an appropriate extent			
Q12	Despite their low amount and ratio to the volume and quantity of manufactured goods, there is no major change in auxiliary materials and packaging.	0.801	19.613	2.344
Q13	Comparing the components of the total cost (materials, wages and overhead) to sales	0.821	20.896	2.971
Q14	No major change in the ratio of waste to production	0.520	5.845	1.282
Q15	The optimal percentage of the cost of salaries and wages and its ratio with sales in production, commerce	0.532	6.799	1.421
Q16	The ratio of some imported materials to the total raw materials used in production	0.550	4.650	1.172
Q17	The existence of financial facilities and their relationship with the financial cost and the company's income	0.507	3.461	1.200
Q18	Optimum return on assets	0.577	7.923	1.138
Q19	Absence of significant fluctuation in financial statement items in at least 2 consecutive years	0.733	11.861	2.982
Q20	The high amount of working capital compared to the industry average	0.649	7.967	1.696
Q21	The low turnover period of receivables and its ratio to the company's sales	0.560	7.077	1.534
Q22	No major changes in accounts receivable and their ratio to sales	0.597	6.270	2.405
Q23	The ratio of inventory to the volume and amount of sales	Omitted		
Q24	Increase in fixed assets and its effect on the company's sales	0.764	14.459	1.615
Q25	The amount of orders and prepayments and their relationship with the purchase amount	0.711	12.078	1.598
Q26	The amount of the fee and reserve of the graduate and its relationship with the number of employees	-0.594	2.800	2.738
Q27	The amount of advances and its relationship with sales and facilities received	0.501	6.264	2.335
Q28	The low share of partners' current accounts compared to sales or purchases	-568	2.603	1.436
Q29	Absence of sales to fake and uncredited companies	-0.529	5.788	1.090
Q30	The relatively low number and variety of customers	0.820	4.550	2.638
Q31	Having legal offices and writing them	-0.529	4.925	4.905
Q32	The existence of annual adjustments, especially if the income increaser is taxable	0.889	5.525	4.444
Q33	Bank information of taxpayers (circulation of bank accounts and its connection with company sales)	0.873	6.565	2.701
Q34	Buying or selling in the commodity exchange	-0.504	4.327	4.863
Q35	The number of employees and their ratio to the subject of the company's activity	0.938	5.322	2.841
Q36	Being a government auditor	0.859	24.493	1.871
Q37	The size of the audit institute	0.555	4.320	1.023
Q38	The rank of the auditor's institution (A, B, C)	0.879	23.759	1.879
Q39	Higher amount of audit fees	0.653	7.918	1.019
Q40	Existence of non-audit service fees	0.840	18.666	1.019
Q41	Mandatory submission of audit report	0.761	15.865	1.191
Q42	Submitting the audit report along with the declaration	0.795	21.277	1.247
Q43	Quality of financial audit performed by independent auditors	0.615	7.878	1.101
Q44	Conditional / rejection of the audit report	0.973	7.908	1.045
Q45	A provision about the continuity of the company's activity in the audit report	0.513	3.056	1.039
Q46	Existence of ambiguity about the legal claims of the company in the audit report	-0.540	5.778	1.025
Q47	Increase in GDP	0.528	2.753	1.091
Q48	Balanced inflation rate	0.677	2.590	1.201
Q49	Appropriate employment rate	0.683	3.956	1.283
Q50	Appropriate bank interest rate	0.711	2.716	1.185
Q51	Being a member of the government board	0.537	3.337	1.017
Q52	The presence of institutional shareholders in the composition of	0.591	3.682	1.027

	shareholders			
Q53	The presence of major shareholders in the composition of shareholders	0.698	8.713	1.011
Q54	The existence of tax exemptions and incentives and their relationship with the subject of the company's activity	0.507	3.716	1.591
Q55	Legal permits such as exploitation license, mining license, nominal and actual capacity check	0.602	4.519	2.096
Q56	Matching the declaration information with the information registered in customs, banks, insurance companies, etc.	0.436	3.214	1.140
Q57	Knowledge of tax and accounting laws and regulations (having a financial and tax advisor)	0.555	4.553	1.650
Q58	Company's tax history - Article 189 BC (three consecutive years...)	0.628	5.505	2.066
Q59	Being subject to value added tax	0.508	4.512	1.254
Q60	Offering seasonal deals	0.508	4.226	1.225
Q61	Submission of tax returns on legal dates	0.518	3.577	1.112
Q62	The absence of the company in the list of polluting companies (including pollution charges)	0.567	3.028	1.086
Q63	The attitude of the manager or the financial officers of the company about the tax system	0.671	7.462	1.193
Q64	The attitude of the manager or the financial officers of the company regarding taxes and the necessity of paying them	0.787	14.752	1.340
Q65	The state of the country's tax culture and willingness to pay taxes among taxpayers	0.692	10.235	1.271
Q66	Company type (public shares, private shares, partnership, etc.)	0.522	2.782	1.116
Q67	The number of board members	0.916	48.496	1.036
Q68	The existence of a female member in the composition of the board of directors	0.879	33.067	2.697
Q69	Having a foreign shareholder	0.526	5.118	1.209
Q70	The type of ownership of the company (government or joint stock)	0.925	52.476	3.614
Q71	The percentage of non-executive board members	0.916	46.962	2.593
Q72	Having multiple branches or affiliated companies (domestic and foreign)	0.609	6.199	7.497
Q73	Nature of activity (production, service, trade, contracting)	0.756	10.326	2.816
Q74	The company's activity locations (multiple or far from the office, located in decentralized spaces)	0.629	5.694	2.711
Q75	Firm age (the criterion is the date of obtaining the operating license)	0.611	6.138	7.772
Q76	Taxpayer size (small, medium, and large)	0.692	7.720	2.472
Q77	The amount of registered capital compared to the volume of its operations	0.572	5.156	1.223
Q78	Membership in the stock exchange	0.587	4.965	3.806
Q79	Type of industry (non-sanctioned)	0.518	3.858	1.135
Q80	The possibility of validating the data provided with information systems within the organization	0.865	5.741	3.621
Q81	The possibility of matching the information of sellers and buyers	0.537	3.920	1.049
Q82	The possibility of matching the declaration information with the information registered in customs, banks, insurance companies, etc.	0.575	2.938	1.078
Q83	Non-conformity of Riyal salary list of the tax system and social security organization	0.910	7.208	3.769
Q84	The existence of an integrated system in the company (financial/non-financial)	0.700	10.352	1.130
Q85	Up-to-date system (financial/non-financial)	0.766	15.586	1.164
Q86	The existence of software approved by the Tax Affairs Organization	0.673	7.638	1.098
Q87	The existence of employees with degrees related to their duties	0.755	12.504	1.206
Q88	Having employees with a long experience	0.641	7.215	1.135
Q89	The existence of employees with technical training related to the duties	0.756	17.026	1.118
Q90	Production of branded products	0.611	7.510	1.113
Q91	Production of exclusive products	0.742	6.786	2.401
Q92	Product innovation	0.716	12.690	1.268
Q93	There is a variety in the number of products	0.827	9.053	2.974

Source: research findings

4.6 Theoretical summarization and development of the findings of the third question

Composite reliability is the ratio of the total factor loadings of the dependent variables to the total factor loadings plus the error variance, the values of which are between 0 and 1, and it is an alternative to Cronbach's alpha. As seen in Table (9), the standard factor loadings and their t-statistics, composite reliability, Cronbach's alpha and AVE index of all the items and the calculated variables and the obtained values represent the convergent validity and correlation of the constructs.

The requirement to confirm the separate validity is that the value of the average explained variance (AVE) square root is greater than all the correlation coefficients of the relevant variable with the rest of the variables. Pearson's correlation test results showed that the values on the main diameter have the highest column value, indicating the structures' appropriate validity. Providing audit report, economic factors, balance sheet elements, number and complexity of products and audit factor by 0.73; The number of specialist employees, cultural and social factors, financial and accounting factors by 0.72; audit fees, income sources, other financial and accounting factors and performance and operational characteristics 0.75; company-specific 0.82; expressed taxable income of companies, technical and system, comparing company information with systems and management characteristics have a correlation of 0.77, which express the main diameter, the square root of the average explained variance (AVE).

Table 9. The results of checking the validity of research variables

Variables	Composite reliability	Cronbach's Alpha	(AVE)
Providing an audit report	0.870	0.753	0.530
Economic factors	0.847	0.753	0.527
Balance sheet elements	0.845	0.753	0.532
Number and complexity of products	0.717	0.704	0.530
Number of specialist staff	0.762	0.737	0.517
audit agent	0.821	0.730	0.536
Audit fees	0.820	0.742	0.566
Company specific	0.848	0.795	0.664
Taxable income declared by companies	0.916	0.747	0.585
Other income factors	0.870	0.827	0.564
Other financial and accounting factors	0.886	0.765	0.567
political	0.740	0.781	0.575
cultural and social	0.832	0.710	0.521
Technical and systemic	0.784	0.727	0.590
Legal factors	0.749	0.717	0.575
financial and accounting	0.793	0.746	0.522
Environmental factors	0.787	0.789	0.574
Comparing company information with systems	0.783	0.718	0.598
Auditor's opinion type	0.743	0.701	0.549
Auditor type	0.790	0.733	0.573
Other cost factors	0.884	0.845	0.599
The existence of a standard two-way accounting system	0.757	0.718	0.510
Performance and operational characteristics	0.818	0.745	0.567
Management features	0.889	0.829	0.599

Source: research findings

After checking the reliability and validity of the measurement tools and research structures (external model), testing the relationships of the underlying variables (internal model) is necessary. For this purpose, the path coefficients and t-statistics are presented in Figure (2).

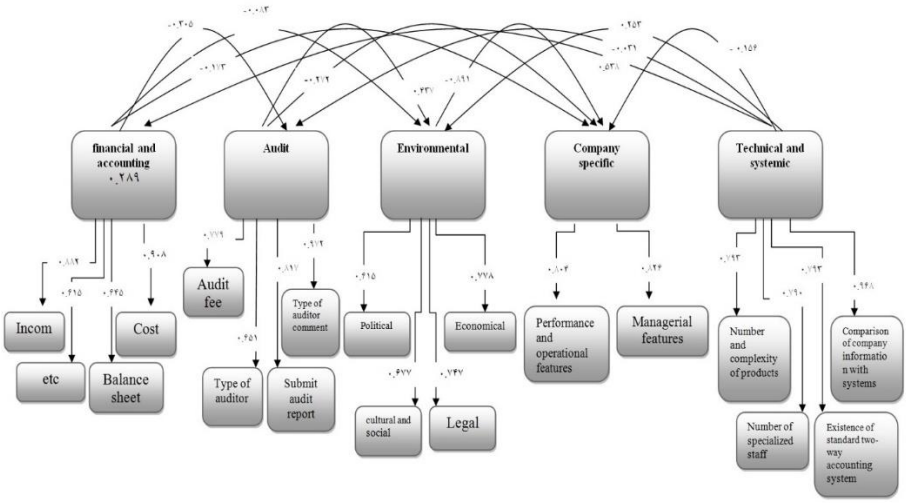


Figure 2. Path coefficients of each of the main components of the research

According to the above figure, the relationship between independent variables and dependent variables is examined. Table (10) shows the results of these relations based on modeling structural equations using the partial least squares method. According to the results listed in the table, all relationships except "the effect of other financial and accounting factors on financial and accounting factors" are significant, at least at the significance level of 0.05, since their t-statistic value is greater than 1.96. Since all the factors have a higher factor load (greater than 0.05) with their related hidden variable, the above factors are approved for "Validating the taxable income of companies".

The model's validity is determined using the coefficient of determination (R^2), which measures an endogenous variable's explanatory variance by exogenous variables. The coefficient of determination for dependent variables - "financial and accounting factors", "auditing factors", "environmental factors", "company-specific factors", "technical and system factors" and "taxable income declared by companies" is equal to 0.952, 0.982, 0.986, 0.996, 0.995 and 0.990, respectively. This means that 95.2% of the changes in the variable "financial and accounting factors" are explained by the changes in "income", "cost", "balance sheet" and "other financial and accounting factors". Also, 98.2% of the changes in the variable "audit factors" are explained by the changes in the variables "type of auditor", "audit fee", "presentation of audit report" and "type of auditor's opinion". In order to test the overall model and the ability to predict the dependent variables from the independent variables, Stone-Geisser's Q2 coefficient was used. The positive values of this coefficient indicate predictability (Vinzi et al., 2010). Table (11) shows the calculations of the Q2 index for "taxable income of companies" and all its main and secondary factors. According to the table results, the model has good predictive ability.

In structural equation modeling using the PLS method, unlike the covariance-based method (CB-SEM), there is no index to measure the whole model. Still, an index called goodness of fit (GOF) was proposed by Tenenhaus et al. (2004). This index considers both measurement and structural models and is used as a criterion to measure the model's overall performance. The average of R2 and the average of shared values manually calculate this index:

$$GOF = \sqrt{Communality * R^2}$$

formula (1)

Table 10. Path coefficients, t-statistics and model relationship results

Model relationship paths	Path coefficient	t statistic	Coefficient of determination	Result
The impact of "income factors" on "financial and accounting factors."	0.406	12.659**		Confirmed
"cost factors" affect "financial and accounting factors."	0.457	10.675**	0.952	Confirmed
The "balance sheet factors" impact "financial and accounting factors."	0.231	4.796**		Confirmed
The effect of "other financial and accounting factors" on "financial and accounting factors."	0.086	1.129		Confirmed
The effect of "auditor type" on "audit factors."	0.393	13.490**		Confirmed
The effect of "audit fees" on "audit factors."	0.394	8.100**		Confirmed
The effect of "audit report presentation" on "audit factors."	0.406	9.393**	0.982	Confirmed
The effect of "type of auditor's opinion" on "audit factors."	0.242	2.331*		Confirmed
The impact of "economic factors" on "environmental factors."	0.376	2.950**		Confirmed
The effect of "political factors" on "environmental factors."	0.412	8.168**	0.986	Confirmed
The effect of "legal factors" on "environmental factors."	0.370	6.175**		Confirmed
"cultural and social factors" affect "environmental factors."	0.461	10.434**		Confirmed
The effect of "management characteristics" on "company-specific factors."	0.624	12.669**	0.996	Confirmed
"performance and operational characteristics" affect "company-specific factors."	0.608	12.610**		Confirmed
"comparing company information with organizations" affects "technical and system factors."	0.246	3.254**		Confirmed
The effect of "the existence of standard two-way accounting system" on "technical and system factors."	0.399	18.103**	0.995	Confirmed
The effect of "number of expert employees" on "technical and system factors."	0.416	16.448**		Confirmed
The effect of "number and complexity of products" on "technical and system factors."	0.315	4.818**		Confirmed
The effect of "financial and accounting factors" on "reported taxable income of companies."	0.382	8/482**		Confirmed
The effect of "audit factors" on "taxable income declared by companies."	0.231	4.791**		Confirmed
The impact of "environmental factors" on "taxable income of companies."	0.418	13.210**	0.990	Confirmed
"company-specific factors" affect "taxable income declared by companies."	0.238	3.079**		Confirmed
The effect of "technical and systemic factors" on the "taxable income of companies."	0.400	10.800**		Confirmed

Source: research findings

This index is the square root of the product of two common values (Community) and the average coefficient of determination (R Square Average). Since this value depends on the mentioned two indices, the range of these two indices is between zero and one. Wetzles et al. (2009) introduced three values of 0.01, 0.25, and 0.36 as a weak, medium, and strong values for GOF.

The average value of the shared value index is calculated according to the following formula:

$$\text{Communality} = \frac{1}{n}\sum_{1}^{n} \text{Communality}_i$$

formula (2)

The Communality value calculated for the research model is equal to 0.257 and the average value

of the determination coefficient index is calculated according to the number of endogenous variables of the model according to the following formula:

$$R^2 = \frac{1}{n}\sum_{1}^{n} R_i^2$$ (3) formula

The value of R2 calculated for the research model is equal to 0.984.
The GOF index of this model is approximately 0.503. As a result, the model has strong utility.

Table 11. The value of Q2 for the factors affecting the declared taxable income and its dimensions and components

Variables	Q^2 (=1-SSE/SSO)
Financial and accounting factors	0.339
Income factors	0.308
Cost factors	0.357
Balance sheet factors	0.179
Other financial and accounting factors	0.341
Audit agents	0.287
Auditor type	0.288
Audit fees	0.197
Providing an audit report	0.231
Auditor's opinion type	0.332
Environmental factors	0.208
Economic factors	0.188
Political factors	0.188
Legal factors	0.262
Cultural and social factors	0.201
Company specific factors	0.284
Management features	0.393
Performance and operational characteristics	0.194
Technical and systemic factors	0.228
Comparing company information with organizations	0.197
The existence of a standard two-way accounting system	0.284
Number of specialist staff	0.199
Number and complexity of products	0.219
Declared taxable income of companies	0.252

5. Discussion and conclusion

This research aimed to identify and prioritize the effective components of measuring the validity of the declared taxable income of companies and to provide a comprehensive model in this field. To achieve this goal, three questions were raised. Thus, in the qualitative section, 15 interviews were conducted with experts in tax affairs using the theme analysis method, and the primary components of the factors affecting the declared taxable income of the companies were extracted. After the analysis, 93 indicators were identified in the form of 18 sub-themes and 5 main themes, and in the quantitative part to weigh the main and sub-factors, determine the intensity of the relationship between these factors and prioritize them using confirmatory factor analysis and Friedman's test. The structural equation modeling method was used to draw a comprehensive model to determine the validity of the declared taxable income of companies.

The first question of the research was about identifying the factors affecting the validity of the declared taxable income of companies. In order to find the right answer to this question, five main categories were identified: financial and accounting, auditing, environmental, technical and systemic, and company-specific factors.

Financial and accounting factors are some of the most important factors in measuring companies'

credibility in expressing taxable income. This factor has been identified in the current research as income, cost, balance sheet, and other financial and accounting sub-components. Heyrani et al. (2019) examined the financial and accounting factors identified in the above research as reporting and accounting functions and indicated that 14 indicators (themes) had been emphasized as tax audit risk indicators. In the current research, 35 indicators (themes) have been identified; in addition to the majority of the above research, factors such as taxpayers' bank information, annual adjustments, incidental income, etc., have been introduced as factors affecting the validity of the taxable income declared by companies. Due to the conflict of interest between the taxpayer and the tax auditor, the concepts identified in the accounting reports prepared by the taxpayer may lead to tax evasion and ultimately tax evasion, which can be minimized through the development of tax culture and it is in line with the research of Perera et al. (2020). None of the indicators of financial and accounting factors identified in this research has been introduced in the studies of Dastgir et al. (2015), Wahyudin et al. (2022), De Neve et al. (2021), Abdulhamid et al. (2019), which are in line with the present research.

Another important factor identified in measuring the credibility of companies' taxable income is the audit factor. In the current research, these factors have been identified as sub-components of the type of auditor, audit fee, presentation of the audit report, and the type of auditor's opinion. Auditing is a mechanism for crediting companies' financial statements and accounting information, which is the basis for completing taxpayers' tax returns. According to Heyrani et al.'s results (2019), only the quality index of a financial audit performed by independent auditors and the index of providing financial and tax audit reports in the results of Dastgir et al. (2015) and Wahyudin et al. (2022) has been introduced as audit factors. In the current research, 9 other indicators (themes) have been introduced as auditing factors in addition to those mentioned. In other studies, which align with the present research, no index has been introduced as an audit factor.

The environmental factor is one of the other factors that have been identified in determining the validity of the declared taxable income of companies. Current research identifies this factor as legal, cultural, social, economic, and political sub-components. From the point of view of tax auditors, it is expected that taxpayers who comply more with their legal duties have less risk and present information related to their performance to users in a timely and accurate manner; therefore, failure to provide timely and correct information is considered as bad news and indicates a higher risk for the taxpayer. This is in contradiction with the theory of information validity and the theory of trust and causes a decrease in the validity of information expressed by taxpayers. Environmental factors have been introduced as environmental conditions, and factors in Heyrani et al.'s research (2019) and economic factors in the research of Green et al. (2022) are consistent with the present study's results. The index of the presence of institutional shareholders in the research of Dastgir et al. (2015), indicators of tax culture, knowledge of tax laws and regulations, and the attitude of the manager or financial officers of the company regarding the tax system in the research of Gechert and Heimberger (2022), Kenno (2020), Da Silva et al. (2019), Inasius (2019), Nyarkpoh (2018) and AbdulHamid et al. (2019) have been taken into consideration. The environmental factors identified in the current research contradict the results of De Neve et al. (2021).

As for the company-specific factors, the performance, managerial, and operational characteristics sub-components have been identified to determine the companies' taxable income validity. Since the above items significantly impact the credibility of taxpayers' tax returns, environmental factors and variables extracted from interviews with experts have been presented to evaluate their role and importance in the credibility of the declared taxable income by companies. The identified indicators of specific factors such as the company's membership in the stock exchange, whether it is public or private, the number of board members, having a foreign shareholder due to the requirement to provide more transparent financial information and stricter regulations can be effective in determining the

validity of the declared taxable income. In the research of Heyrani et al. (2019), specific factors are defined under the title of sub-component of the general characteristics of the taxpayer in 5 indicators (themes), and the research of Dastgir et al. (2015) under the title of characteristics of legal taxpayers and in 6 indicators (themes). The above is consistent with the results of the present study. In other mentioned studies in the previous parts, which align with the current research, no indicators have been introduced as specific company factors.

Technical and systemic factors in this research include the items related to the company's information in the systems at the organization's disposal, the accounting system used by taxpayers and employees, and the type of taxpayers' products. Technical and systemic factors allow the taxpayer's data to be validated with internal and external information systems. The more comprehensive and extensive this possibility is, the less information asymmetry between the tax auditor and the taxpayer. In addition, the taxpayer's awareness of the possibility of matching the data is an obstacle in expressing false information. Data reconciliation will be done through external information systems (such as customs, social security, and banks), internal information systems (such as quarterly transaction statements and salary lists), and information from similar companies. The taxpayer has an informational advantage over the tax auditors due to his knowledge and access to his information and industry. The greater this information advantage is, the taxpayer's failure to provide information that is inaccessible to the tax auditor leads to the incorrect selection of the auditor, which is in contradiction with the theory of information validity and the law of truthfulness and reduces the validity of the expressed information and trust to the taxpayers. In Heyrani et al.'s research (2019), technical and system factors have been identified in 8 indicators (themes) under the main component of data adaptability and the sub-component of customer and product characteristics. In the current research, technical and systemic factors have been identified in 14 indicators (themes), and the results of the Nyarkpoh (2018) research align with the current research. In other studies mentioned in the previous parts, which align with the current research, no index has been introduced as a technical and systemic factor.

Most of the indicators presented in this research are consistent with the existing literature. Still, despite many similarities, this model has introduced and emphasized many special components and factors. In other words, although each of the previous studies has identified a part of the effective factors in determining the validity of declared taxable income and tax audit risk, the current research can be considered comprehensive research considering all the factors affecting the validity of the declared taxable income of the companies. It should be noted that there is a possibility that the indicators introduced in this research have been identified according to the specific conditions in Iran.

The second research question was about the prioritization and weight of each effective factor in determining the validity of companies' taxable income. The relevant results are shown under the title of main factors in Table (5) and sub-components in Table (7). The prioritization and weight of each factor in the current research are contrary to the results of Heyrani et al. (2019). In other studies mentioned in the previous parts, which are in line with the present research, variable prioritization and weighting have not been done.

The third question of the research was about the comprehensive model for determining the validity of the declared taxable income of companies, the model of which is presented in figure (1). One of the achievements of this paper is the model presented for determining the validity of the declared taxable income of companies; according to the studies conducted in the literature, the researcher has not dealt with cases that have been addressed to this concept; therefore, it has led to increased knowledge in the field of accounting and taxation.

Therefore, according to the explanations above, it can be said that the assessment of the validity of the taxable income declared by companies has a very important effect on the system of self-

declaration of taxes by companies and the easy collection of taxes by the tax administration. However, with the correct application of the model presented in this research, it can be said that the self-declaration of companies to pay taxes on time will increase. Therefore, based on the obtained results, the following suggestions are provided:

6. Research implications

It is suggested that the Tax Affairs Organization complete the companies' tax returns as public information. If companies know their tax information is public and available to everyone, they lose motivation to hide their incomes and activities.

Expanding the tax culture in light of the truth-telling law in society can help the tax affairs organization obtain highly reliable information. On the other hand, it is suggested that the Tax Affairs Organization, following the theory of trust, have a more appropriate direction toward developing laws, regulations, and tax mechanisms.

One of the most important factors that experts think is effective in improving the tax culture is providing information related to tax issues in line with the expansion and institutionalization of the theory of trust and the law of telling the truth. Although it is not a sufficient condition, it is a necessary condition. In the textbooks, social centers, cinemas and television films or radio programs of the country, there is almost no sign of the tax issue, which is the most vital issue of a healthy economy (if there is, it is very weak). At the same time, correcting the existing situation and creating fundamental changes through advertising and awareness through radio and television is possible. Also, the inclusion of a lesson on the importance and place of taxes in the programs of different educational levels, the promotion of the idea of an abundant land by paying taxes in the press and mass media, emphasizing the increasing importance of public benefits from paying taxes, and increasing the share of citizens and the lower classes of society is recommended.

In order to overcome the country's tax system from the current unfavorable situation, it is necessary to carry out fundamental reforms in each of its pillars. In other words, having an efficient tax system will depend on improving the weaknesses of the mentioned pillars, so it is necessary to amend the tax laws and regulations, especially the amendment of the direct taxes law, expand the tax base and carry out fundamental reforms. In the tax affairs organization, in light of the expansion of the theory of trust in the tax system, they should be considered as the basic strategies for reforming the tax system. Also, in parallel with doing these things, improving the society's general culture should be placed on the agenda of the institutions in charge of the country's culture as a long-term issue.

Change the declaration form for the country's tax affairs organization to facilitate the submission of taxpayers' information. All over the world, tax affairs organizations prepare default declarations based on the information in the database. It provides it to the taxpayer, and the taxpayer submits the changes. The information the organization can receive from other authorities will not be collected from the taxpayer again. This has not been done in Iran, and all information is obtained from the taxpayer.

7. Further to the study

Considering the lack of sufficient and comprehensive studies in identifying the factors affecting the validity of taxable income declared by taxpayers in the country, it is suggested to the researchers that to develop the subject and enrich it, the following subjects should be included in the focus.:

Providing a suitable model to explain the factors affecting the validity of the declared taxable

income of natural persons.

Compilation and presentation of training packages on factors affecting the credibility of taxpayers' information for tax auditors of the Tax Affairs Organization according to their organizational level.

Examining how to use big economic data or data from different organizations to evaluate the factors affecting the validity of the declared taxable income.

Considering that the implementation of any scientific research will face limitations, the possible limitations of the current research can be stated as follows:

Non-cooperation of some members of the determined statistical society

The statistical population of the current research only included auditors of the Tax Affairs Organization as interviewed experts, and therefore, the use of another statistical population, such as academics, independent auditors, certified accountants, etc., may lead to different results.

The structural equation method was used to extract the research pattern; previous research shows that different results will be obtained if other methods, such as non-linear decision-making patterns, are used.

Using the questionnaire tool in a part of the research may have caused some inherent limitations to the results, which was unavoidable.

References

1. AbdulHamid, N., Ibrahim, N. A., Ibrahim, N. A., Ariffin, N., Taharin, R., and Jelani, F. A. (2019). Factors affecting tax compliance among Malaysian SMEs in e-commerce business. *International Journal of Asian Social Science*, 9(1), pp. 74-85. https://doi.org/10.18488/journal.1.2019.91.74.85
2. Adam, A., Kammas, P., and Lapatinas, A. (2015). Income inequality and the tax structure: Evidence from developed and developing countries. *Journal of Comparative Economics*, 43(1), pp. 138-154. https://doi.org/10.1016/j.jce.2014.05.006
3. Al-Rahamneh, N.M., and Bidin, Z. (2022). The Effect of Tax Fairness, Peer Influence, and Moral Obligation on Sales Tax Evasion among Jordanian SMEs. *Journal of Risk and Financial Management*. 15(9), p. 407. https://doi.org/10.3390/jrfm15090407
4. Bani-Khalid, T., Alshira'h, A.F. and Alshirah, M.H. (2022). Determinants of Tax Compliance Intention among Jordanian SMEs: A Focus on the Theory of Planned Behavior. *Economies*, 10(2), p. 30. https://doi.org/10.3390/economies10020030.
5. Barbu, L., Mihaiu, D.M., S, erban, R.-A. and Opreana, A. (2022). Knowledge Mapping of Optimal Taxation Studies: A Bibliometric Analysis and Network Visualization. *Sustainability*. 14(1), A. 1043. https://doi.org/10.3390/su14021043
6. Barzegari Dehaj, M., Keyghobadi, A., Yaghoobnezhad, A., and Jahanshad, A. (2021). Providing a Model for Preparing an Estimated Tax Return with the Provisions of Article 97 of the Direct Taxes *Act. J Tax Res*, 29(49), pp. 61-82 (In Persian). https://doi.org/10.52547/taxjournal.29.49.61
7. Barzegari Khanqah J, and Faizpour, M.A. (2012). Risk-based tax audit: Experiences from developed and developing countries. *Journal of Envy Research*, 1(8), pp. 123-142 (In Persian). https://doi.org/10.22051/ijar.2013.424
8. Batrancea, L., Nichita, A., Olsen, J., Kogler, C., Kirchler, E., Hoelzl, E., Weiss, A., Torgler, B., Fooken, J., Fuller, J., Schaffner, M., Banuri, S., Hassanein, M., Alarcón-García, G., Aldemir, C., Apostol, O., Bank Weinberg, D., Batrancea, I., Belianin, A., ... Zukauskas, S. (2019). Trust and power as determinants of tax compliance across 44 nations. *Journal of Economic Psychology*. 74, A. 102191. https://doi.org/10.1016/j.joep.2019.102191
9. Belay, M. (2017). Challenges of Tax Audit Administration in Addis Ababa: evidence from Small

Taxpayer Branches (Doctoral dissertation, St. Mary's University). San Antonio, TX. http://hdl.handle.net/123456789/3173
10. Bryce, L. A., Bonfatti, R. and Luigi, P. (2016). Tax policy and the financing of innovation. *Journal of Public Economics*, 135, pp. 32-46. https://doi.org/10.1016/j.jpubeco.2015.12.010
11. Coleman, J. S. (1994). Foundations of social theory. Harvard University Press. Cambridge, Massachusetts, United States
12. Creswell J. W. and Plano Clark V. L. (2007). Designing and conducting mixed methods research. Thousand Oaks, CA: Sage. California
13. Da Silva, F. P., Guerreiro, R. and Flores, E. (2019). Voluntary versus enforced tax compliance: the slippery slope framework in the Brazilian context. *International Review of Economics*, 66(2), pp. 147-180. https://link.springer.com/article/10.1007/s12232-019-00321-0.
14. Dastgir, M., Izadinia, N., Askari, A., and Ramezani, M. M. (2015). Providing a Model for Corporate Risk-based Audit Selection in Iran. *J Tax Res*. 23(25), pp. 9-44 (In Persian). https://taxjournal.ir/article-1-222-fa.html
15. De Neve, J.E., Imbert, C., Spinnewijn, J., Tsankova, T. and Luts, M. (2021). How to improve tax compliance? Evidence from population-wide experiments in Belgium. *Journal of Political Economy*, 129(5), pp.1425-1463. https://doi.org/10.1086/713096
16. Dehghani Doyle, M. (2019). Investigating the obstacles and capabilities of the tax affairs organization's audit system for implementing risk-based tax audit (case study: tax departments of Ardabil province) by Delphi method. Master Thesis. Islamic Azad University of Ardabil Branch, Iran. (In Persian)
17. Gechert, S., and Heimberger, P. (2022). Do corporate tax cuts boost economic growth? *European Economic Review*, 147, A. 104157. https://doi.org/10.1016/j.euroecorev.2022.104157
18. Green, D.H., Henry, E., Parsons, S.M. and Plesko, G.A. (2022). Incorporating Financial Statement Information to Improve Forecasts of Corporate Taxable IncomeFinancial Statements and Forecasting Corporate Taxable Income. *The Accounting Review*, 97(7), pp. 169–192. https://doi.org/10.2308/TAR-2020-0074
19. Gupta M., and Nagadevara V. (2007). Audit selection strategy for improving tax compliance: application of data mining techniques. In Foundations of E-Government, ed. A Agarwal, VV Ramana. 378–87. New Dehli: Gift Publ, Dehli
20. Heyrani, F., Zareian, H. and moeinadin, M. (2020). Identification of Effective Indicators on Tax Audit Risk by Mixed Explanatory Method, *Journal of Management Accounting and Auditing Knowledge*, 9(33), pp. 120-140 (In Persian). https://jmaak.srbiau.ac.ir/article_15638.html?lang=en
21. Inasius, F. (2019). Factors influencing SME tax compliance: Evidence from Indonesia. *International Journal of Public Administration*, *42*(5), pp. 367-379. https://doi.org/10.1080/01900692.2018.1464578
22. Johnson, Lawrence, E. (2006). focusing on truth, London: Routledge. London, U.K.
23. Kenno, B. G. (2020). Factors Affecting Perception of Taxpayers towards the Seriousness of Tax Evasion in Bale Robe Town Administration, Oromia, Ethiopia, *International Journal of Finance and Accounting*, 9(2), pp. 21-30. https://doi.org/10.5923/j.ijfa.20200902.01
24. Khwaja, M.S., Awasthi, R. and Loeprick, J. eds. (2011). Risk-Based Tax Audits- Approaches and Country Experiences, The International Bank for Reconstruction and Development/The World Bank, 1818 H Street NW, Washington DC 20433.
25. Kiser, E., Karceski, S.M. (2017). Political Economy of Taxation. Annu. Rev. Polit. Sci. 20(1), pp. 75–92. https://doi.org/10.1146/annurev-polisci-052615-025442
26. Liu, B. (2010). Uncertainty Theory. In: Uncertainty Theory. Studies in Computational

Intelligence, vol 300. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-13959-81
27. Masrullah, M., Asriati, A., and Alfiah S, N. R. (2021). Implementation of self assessment system in paising compliance awareness paying tax in Gowa district. *Amnesty: Jurnal Riset Perpajakan*, 4(1), pp. 23–33. https://doi.org/10.26618/jrp.v4i1.5304
28. Moloudi, M., and Hamze Howeyda, M. (2012). 'Theories of Truth and their Application in Civil Procedures', *The Judiciary Law Journal*, 76(79), pp. 73-98 (In Persian). https://doi.org/10.22106/jlj.2012.11047.
29. Moradi M. and Bayat, N. (2018). Advanced Auditing, Marandiz Publications, Mashhad, Iran (In Persian).
30. Nyarkpoh, M. F. (2018). Trust in Government and Tax Compliance: An Empirical Evidence from Ghana. Doctoral dissertation, University Of Ghana. Accra, Ghan. http://ugspace.ug.edu.gh/handle/123456789/30323
31. Perera, D., Chand, P., and Mala, R. (2020). Confirmation bias in accounting judgments: the case for International Financial Reporting Standards for small and mediumsized enterprises. *Accounting & Finance*, 60(4), pp. 4093-4119. https://doi.org/10.1111/acfi.12523.
32. Pui Yee, C., Moorthy, K. and Choo Keng Soon, W. (2017). Taxpayers' perceptions on tax evasion behaviour: an empirical study in Malaysia, *International Journal of Law and Management*, 59(3), pp. 413-429. https://doi.org/10.1108/IJLMA-02-2016-0022
33. Qaranjik, E., ZiaaDdini, M. and Hadavinejad, M. (2021). Cognitive mapping of Influencing factors on participation in tax payments, *Public Administration Perspective*, 12(3), pp. 57-76 (In Persian). https://doi:1052547/jpap.2021.214014.0.
34. Simon ÕR, Lukason O. (2021). A Decision Support System for Corporate Tax Arrears Prediction. *Sustainability*. 13(15), A. 8363. https://doi.org/10.3390/su13158363
35. Tilahun, M. (2019). Determinants of tax compliance: a systematic review. *Economics*, 8(1), pp. 1-7. https://doi.org/10.11648/j.eco.20190801.11
36. Tenenhaus, M., Amato, S. and Esposito Vinzi, V. (2004). A global goodness-of-fit index for PLS structural equation modelling. In Proceedings of the XLII SIS scientific meeting (Vol. 1, No. 2, pp. 739-742).
37. Umar, M.A., Derashid, C., Ibrahim, I. and Bidin, Z. (2019). Public governance quality and tax compliance behavior in developing countries: The mediating role of socioeconomic conditions, *International Journal of Social Economics*. 46(3), pp. 338-351. https://doi.org/10.1108/IJSE-11-2016-0338
38. Vinzi, V.E., Chin, W.W., Henseler, J. and Wang, H. (2010). Handbook of partial least squares (Vol. 201, No. 0). pp. 82-47 . Berlin: Springer.
39. Wahyudin, D., Tyas, I.R., Atmojo, A., Andrayanti, I. and Julina, F., (2022). The Effectiveness of Tax Audit as a Self Assessment System Supervision Measures and Tax Revenue Support (Study at the Large Tax Office 4). *Ilomata International Journal of Tax and Accounting*, 3(3), pp. 258-271. https://doi.org/10.52728/ijtc.v3i3.501
40. World Bank. (2011). Supporting the development of more effective tax systems. Report to the G-20 development-working group.

IJAAF; Vol. 8, No. 4, Autumn 2024, Serial 29

Ferdowsi University of Mashhad

Iranian Journal of
Accounting, Auditing & Finance

Quarterly

RESEARCH ARTICLE

The Impact of Professional Ethics, Social Structure, and Religious Attitude on Auditors' Judgments: A Comparison of the Environments in India and Iran

Mahdi Filsaraei*, Mohammad Sadegh Sadeghi

Department of Accounting, Hakim Toos Higher Education Institute, Mashhad, Iran

How to cite this article:
Filsaraei, M., & Sadeghi, M. S. (2024). The Impact of Professional Ethics, Social Structure, and Religious Attitude on Auditors' Judgments: A Comparison of the Environments in India and Iran. Iranian Journal of Accounting, Auditing and Finance, 8(4), 51-69. doi: 10.22067/ijaaf.2024.45130.1425
https://ijaaf.um.ac.ir/article_45130.html

ARTICLE INFO

Article History
Received: 2023-09-29
Accepted: 2024-02-22
Published online: 2024-10-25

Keywords:
Auditors' Judgments; Professional Ethics; Religious Attitude; Social Structure

Abstract

This paper proposes a hybrid approach that integrates fuzzy multi-criteria decision-making with multi-objective mathematical optimization to address the investment management problem in the Iranian capital market under interval uncertainty. To achieve this, we first employ the fuzzy SWARA method to assess the global importance of the criteria weights. Subsequently, we develop a fuzzy EDAS method to rank the active industries in the Iranian capital market, including basic metals, chemical products, investment services, metal ore mining, financing, insurance, pension funds, and social security. Next, we present a mathematical model to determine the optimal investment amount for each ranked alternative. According to the numerical results, the most critical criteria for evaluating different investment areas are access to financial resources, distribution networks, and raw materials. The highest optimal share of investment is associated with Fars 1, while the lowest value pertains to Gharn 1. When solving the model under conditions of uncertainty, we observe that increasing parameter Γ_1 from small to large values decreases the value of the first objective function for the most efficient Pareto member. However, when Γ_1 exceeds 10, the value of the first objective function stabilizes. Additionally, the third objective function shows an increasing trend as the parameter Γ_3 decreases. The results obtained can serve as a managerial tool for stakeholders involved in research participation.

https://doi.org/10.22067/ijaaf.2024.45130.1425

NUMBER OF REFERENCES
20

NUMBER OF FIGURES
3

NUMBER OF TABLES
11

Homepage: https://ijaaf.um.ac.ir
E-Issn: 2717-4131
P-Issn: 2588-6142

*Corresponding Author: Mahdi Filsaraei
Email: filsaraei@yahoo.com
Tel: 09155169217
ORCID: 0000-0002-3303-8510

1. Introduction

In today's world, most issues are presented to individuals for judgment; it has various dimensions and comes with several criteria. In other words, most of the judgments of individuals are influenced by various quantitative and qualitative factors, most of which are in conflict with each other, and they try to choose the best option between several available options. Mistakes and inaccuracies in judgment require error payment (Barrier, 2003). Judgment is one of the main elements of auditing. Auditors should constantly use their professional judgment both about the proper use of accounting standards by the client and how to do their job according to auditing standards; therefore, it is necessary to identify the factors influencing audit decisions. Judging people is one of the most important issues in behavioral studies and credible research has been done in accounting. In the auditing profession, the principles of professional conduct influence the performance of the professional services provided by its members, and failure to enforce the rules and principles will result in disciplinary action. Therefore, auditing, like other professions, must follow certain behavioral principles. However, success in the profession may depend on the personality traits of individuals that facilitate adherence to the principles of professional behavior (Zairi and Peters, 2012).

There are many theories about ethics. One of these theories is the moral ideology proposed by Forsyth in 1980 which has two dimensions: idealism and relativism. According to this theory, Forsyth states that those who are idealists believe that moral action is an action that does not harm others. At the same time, relativists claim that judgments and decisions are conditional, such as culture, place, and time (Craft, 2013). The category of ethics and practicing professional ethics is one of the serious and important topics in accounting and auditing, which directly affects auditors' independence, impartiality, competency and honesty to gain public trust. In a way, it is necessary to have an independent attitude to be free from the interests and pressures of each party so that the existence of fraud can be easily identified. According to the third paragraph of ethical principles in the code of professional conduct of the American Association of Certified Public Accountants, to maintain and expand public trust, members of the profession must perform all their professional responsibilities with the highest degree of honesty and integrity (Alizadegan et al., 2022). Honesty, as one of the core values in professional growth and ethics, is the basis of proceedings and comments. Honesty is a basic principle based on public trust and the ultimate criterion that every member of the profession must measure his decisions based on (Sarlak, 2007). The religious beliefs and convictions of professionals are very important, and based on the evidence obtained, they are related to the relationship between religion and the use of accounting tricks to hide the violation. Also, attending religious and spiritual places leads to less manipulation of accounting information and makes auditors' judgment healthier. Suppose we accept that human intention is effective in the value of action, religion and religion because it considers the highest intentions (closeness to God) in moral action. Therefore, moral action should be more valuable (Kargarkamvar et al., 2020). Socialization is a process that enables people to understand and predict the behavior of others, control their own behavior and finally interact with others. Accordingly, social growth means recognizing one's own and others' responsibilities, making friends, working with a group, making moral judgments, and gaining independence. The personality characteristics of auditors are effective in the type and manner of their work in discovering deviations and the type of judgment, and they ultimately affect the audit quality. The personality characteristics of auditors are effective in the type and manner of their work in discovering deviations and the type of their judgment, and they ultimately affect the quality of the audit. One of the prevailing challenges in the profession is the priority of individual interests over collective interests (Heirani et al., 2018).

The judgment of auditors all over the world has attracted more attention due to recent audit defects and audit institute proceedings. Professional accounting bodies have developed ethical codes that include issues related to internal pressures to help their members navigate difficult ethical dilemmas.

The American Institute of Certified Public Accountants states that if qualified auditors believe that superior status is legally false, they should direct their concerns to upper management. Nevertheless, although the Institute of Certified Public Accountants and auditing standards for fraud risks emphasize the principle of maintaining the integrity and objectivity of auditors, no discussion has been presented on the effect of internal pressures so far. In addition, the recent accounting scandals in relation to audit institutions show that the breakdown of ethical behavior among managers and auditors is also a major concern in this profession. Regarding the causes of audit failures, most previous studies have focused on external pressures (for example, by clients), while few have focused on the influence of social pressures.

Knowing how people judge improves the quality of the information provided to decision makers. Achieving a factor model for decision making is not possible by studying and judging the judgment process of each individual because it is difficult to unify the mental interests of individuals regarding the importance and place of information in their decisions. Research in the process of judging people can improve the quality of decisions. The best way to improve the quality of decisions is to examine the components that affect judgment. Therefore, the present study examines the impact of professional ethics, social structure and religious attitude on auditors' judgments and compares the results in India and Iran using theories and theoretical foundations. Therefore, the main question of this research is whether professional ethics, social structure and religious attitude significantly affect auditors' judgments. Is there a noticeable difference in the societies of Iran and India regarding these relations?

The statistical population of the study is all members of the Association of Certified Public Accountants of Iran and India, including certified public accountants working in partner institutions, certified public accountants working in the auditing organization, certified public accountants working in member institutions, certified public accountants and non-employed certified public accountants. In this research, a questionnaire was used as a data collection tool. For this purpose, according to the subject of the research, the questionnaires were distributed among the members of IACPA and the Association of Certified Public Accountants of India in absentia through Telegram and WhatsApp groups inside Iran and through Gmail for Indian auditors through intermediaries in Indian universities and their public accountants. For this reason, there may be suspicions about non-members of the certified public accountants. However, the respondents were requested to answer the questionnaire if they were certified public accountants. For this reason, the interview method seems more appropriate, but this was not possible due to time constraints and difficult access for people. It is worth noting that the research data was analyzed using SmartPLS software.

In most studies, the effect of professional ethics, social structure, and religious attitude on auditors' judgments was discussed separately. Firstly, no study has considered the simultaneous effect of the factors influencing auditors' judgment from the cultural and religious dimensions. Secondly, in most countries, the study of the effects on auditors' judgment has been done only in one country. Less research can be found that compares the effects of professional ethics, social structure, and religious attitudes between two countries. Perhaps it can be said that considering that various religions in India have more attraction for different people, the present study is innovative and contributes to the development of theoretical literature and helps to improve knowledge.

2. Theoretical foundations and research hypotheses

There are many theories about ethics. One of these theories is the moral ideology proposed by Forsyth in 1980 which has two dimensions: idealism and relativism. Flanagan and Clarke (2007) argue that decision-making practices go beyond the standards and practice of professional accounting

and auditing behavior. It is an internal decision-making process that is always outside the control of prescriptive external rules and ultimately determines the professional status of auditors and accountants. Accounting and auditing institutions will never be able to formulate rules that lead to good decisions. Many behavioral science studies have provided decision models. Rest (1986) proposed a four-component model for describing ethical behaviors. Involved in making a moral decision) and 4- Moral character (moral qualities and courage a person has when making a moral decision). Jones (1991) developed the Rest model (1986) and stated that moral intensity influences moral decisions and behavior in addition to the above. Etzioni (1989) provided a decision-making model that portrays individuals as rational actors deeply influenced by their moral and emotional values.

The category of organizational ethics in developed societies has been institutionalized over the past century and a half as part of management science. Proper application of ethical management in the distribution company not only leads to good direct and intra-organizational results such as increasing productivity, strengthening the collective work conscience, institutionalizing ethical values and the evolution of organizational culture but also one of its blessings is overcoming the social responsibilities of the organization, which is highly emphasized today (Salehi Kamamardakhi et al., 2023).

Many audit failures are due to ethical slips and unethical behaviors, and auditors' understanding of the ethical climate can affect auditors' behavior and attitudes. The most fundamental constructs influencing auditors' professional ethics are ethical climate, economic conditions, social culture, ethical ideology, organizational structure, management and leadership, policy and policy-making, monitoring and evaluation, skills and potentials, personal characteristics, recruitment and retention, Professional commitments and job ethics (Bahari Sejahrood et al., 2023).

Organizational attributes collectively have a positive and significant influence on ethical attitudes. Moreover, ethical codes of conduct moderate the positive relationship between personal and organizational attributes and ethical attitudes of accountants. In light of the social contingent theory, the findings imply that personal and organizational attributes, when interacting with the professional code of conduct strengthen the ethical attitudes of accountants (Onumah et al., 2022).

Establishing a code of professional conduct for auditors is among the steps the profession has taken to encourage members to serve the public interest. Many studies indicate that the code of professional conduct plays an important role in improving the professional behavior of members of the profession. Still, the problem is that various factors affect professional ethical decision-making and adherence to the code of professional conduct. It is not the only factor influencing this decision. According to experts, people are faced with the issue of what is most important in making decisions. In this regard, it is argued that the most important is largely the internal controversy between the values one adheres to and what society expects from the profession. Based on this, it can be argued that various factors affect the ethical behavior of individuals that can influence the decision of auditors. From the views expressed above, it can be hypothesized that:

H1: Professional ethics affects the auditors' judgment (Iran and India environment).

The decision-making model Jones (1991) presented is the most comprehensive moral judgment model. According to this definition, the structure of moral intensity includes the six elements of importance: consequence, social agreement, proximity, focus of the work, urgency, and probability of the effect. However, according to Sweeney and Costello (2015), the construct of moral intensity is one of the key structures in moral judgment on which little research has been done so far. The intrinsic Islamic religiosity theoretical construct examined is the Islamic Worldview (IW), which represents

deeply held enduring and stable values likely to influence professionals' judgments. Understanding the potential impact of cultural factors on auditors' acceptance of client-provided information is essential for improving audit quality (Adeel et al., 2022). Addressing this issue, however, will help increase understanding of ethical judgment processes. From the above perspectives, it can be hypothesized that:

H2: Social structure affects auditors' judgment (Iran and India environment).

Theoretically, prominent psychologists have had relatively different orientations towards religion. People like Freud, the founder of the school of psychoanalysis, and Ellis, the founder of rational-emotional therapy, have had a negative assessment of the role and effect of religion on mental health and human behavior. However, others, such as James, Jung, Allport, Maslow, Adler, and Fram, have spoken positively about religion and the beneficial effects of religious beliefs. At the research level, relatively contradictory results have been presented. Although most research studies have acknowledged the beneficial role of beliefs in human behavior, in some cases the negative effects of religion on life have been pointed out; but what can be deduced from the review of various research indicates the positive role of religion on different aspects of human life.

Religion seeks to play a role in creating and disseminating spiritual and moral instruction through religious teachings and providing practical guidance for those involved in the business of moral conduct. For example, the Interfaith Statement on Business Ethics develops the moral and spiritual values of Christianity, Islam, and Judaism in order to set out a number of principles that may be used as guidelines for international business conduct given the important role of religion in the behavior of individuals; it can be assumed that:

H3: Religious attitude affects auditors' judgment (Iran and India environment).

3. Research methodology

The present study is applied research in terms of purpose and semi-experimental post-event research regarding the data collection method in the field of positive accounting and auditing research. In this research, from the deductive method, the theoretical foundations of the studied variables have been studied to calculate the variables' values based on appropriate methods, and then in the inductive method, to examine the significance of the relationship between independent variables and dependent variables. According to the goals and hypotheses of the research, a sample should be selected that, while representing the statistical community, helps the research to achieve accurate and reliable results.

The statistical population of the study is all members of the Association of Certified Public Accountants of Iran and India, including certified public accountants working in partner institutions, certified public accountants working in the auditing organization, certified public accountants working in member institutions, certified public accountants and non-employed certified public accountants. Since it was not possible to study the whole population (up to 3100 participants), the sample was randomly selected using Cochran's formula at an error level of 5%. For this purpose, the following equation has been used.

$$n = (z \wedge 2 * p * (1-p)) / e \wedge 2$$

Where in:

n: sample size,

Z: Normal distribution statistic at 95% confidence level equals 1.96.

P: The success rate is equal to 0.5
e: Sample estimation error equal to 5%
Due to the high sample volume, it is equal to 385 participants from each of the countries of India and Iran.

3.1 Research variables

The variables studied in this study are measured as follows:

Audit Judgment

Auditing requires judgment. In other words, judgment is a duty on which auditors perform their other duties. Because in auditing, auditors gather evidence, think, and decide on aspects of the issue being decided, and such action is a judgment. In order to make this variable operational, the standard Scott et al.'s (2017) questionnaire was used. In order to answer each of the above questions, the 5 options are very low, low, medium, high and very high, with numbers from one to five, respectively. The method of ranking the auditors' decision variable after collecting the completed questionnaires is described in Table (1).

Table 1. Ranking of the auditor's judgment variable

Decision ranking	Classification
In this case, the rating is judged by the auditor. The desired will be one.	If the sum of the numbers related to the answers provided by each auditor scores more than the average of all the answers provided by the sample members.
In this case, the auditor judges the rating; the desired rating will be zero.	If the sum of the numbers related to the answers provided by each auditor is less than the average score of all the answers provided by the sample members.

Ethics

In the present study, professional ethics refers to the approach of moral relativism. Psychologists believe that the individual approach to moral judgments is related to two factors that express moral ideology. These two factors are idealism and relativism. Ethical ideology is a system of ethics used to make moral judgments and provide guidelines for judging and resolving behavioral problems that may be morally questionable. Relativism encompasses the area in which a person avoids socialist ethical principles by relying on and analyzing his or her personal views of situations. In other words, a person with a relativistic moral orientation evaluates his decisions based on circumstances and then based on existing and accepted laws. Relativists avoid socialist ethics based on their personal values and perspectives on situations. In other words, a person with a moral orientation of relativism weighs his decisions based on circumstances and existing accepted laws. Relativists rely on judgments based on their personal values and perspectives, while people with idealism, it is assumed that the best results are achieved by following the universal moral laws. Social psychologists believe that the ideological position maintained by an individual significantly affects the values, judgments, beliefs and behaviors of individuals. In this regard, the Forsyth Ethical Approach Questionnaire (1980) will measure the professional ethics variable.

Social structure

The focus of social constructs is on the concepts of reality, knowledge, and learning. The main idea of this school is to emphasize the dependence of social concepts on possible behaviors as opposed to essential social behaviors of human beings. Everyone is part of the structure of human life and has

no meaning apart from it. In Jones's (1991) model, social structures include the level of education and field of study. Experts believe that increasing education improves individuals' moral awareness in decision-making. Compared to other Business-related disciplines, students and graduates of accounting and auditing have different learning patterns and will therefore use different behavioral patterns in decision-making. In the present study, information about the variables of education level and field of study will be collected from the general questions section of the questionnaire and the variables of confidence, appropriate social behavior and social skills will be collected from Matson's (1998) questionnaire.

Religious attitude

According to the definitions provided, religiosity is defined as having the knowledge and belief in the one God, the prophets, the hereafter and the divine commandments, having feelings for God, the saints and servants of God, and committing and performing religious duties to approach God. A questionnaire presented by Khodayari Fard (2017) was used to measure the religiosity variable. In this questionnaire, which contains 102 statements, the respondents will be asked to express their agreement with each statement based on a 5-point Likert scale. This questionnaire will classify people into two categories: people with more religious orientation. And people with less religious leanings.

3.2 Conceptual model

The conceptual model framework of the present study in Figure 1 is based on the structural equation modeling approach. In this model, according to statistical analysis of structural equations, the shape of a circle or ellipse represents the hidden variables of behavioral and value accounting that have several structures (opportunistic behavior, short-sightedness and overconfidence, book value and profit relevance). The rectangular or square shape also represents the observable variables.

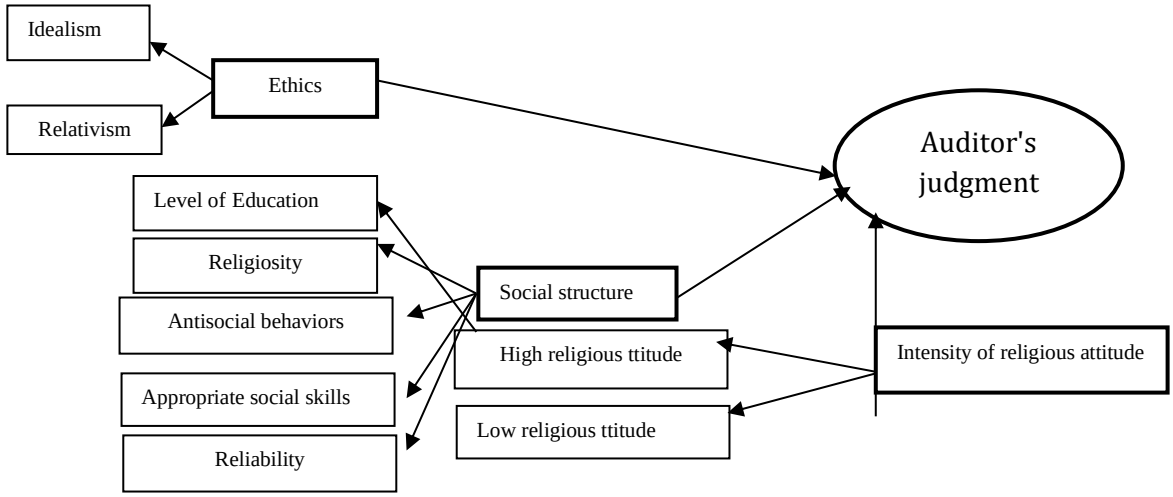


Figure 1. Conceptual model of research

4. Research findings

4.1 Descriptive Statistics

At this stage, the research variables are classified into 5 groups to examine the fit of the proposed research model over a year. According to Tables (2) and (3), the descriptive statistics of all research variables in terms of statistical indicators are as follows:

Table 2. Descriptive statistics of research variables in Iran

Symbol	Number of views Statistics	Max Statistics	Min Statistics	Mean Statistics	Variance Statistics	Standard deviation Statistics
AJ	237	1.000	0.000	0.843	0.929	0.964
PA	237	91.000	83.000	88.130	1.109	1.053
SOS	237	147.000	132.000	139.250	1.180	1.086
IOR	237	423.000	398.000	411.170	1.177	1.085

Table 3. Descriptive statistics of research variables in India

Symbol	Number of views Statistics	Max Statistics	Min Statistics	Mean Statistics	Variance Statistics	Standard deviation Statistics
AJ	148	1.000	0.000	0.825	0.687	0.829
PA	148	86.000	76.000	81.230	0.899	0.948
SOS	148	135.000	123.000	128.520	0.626	0.791
IOR	148	392.000	365.000	373.140	1.175	1.084

4.2 Testing research hypotheses

This section reviews the theoretical model proposed in the research using PLS software.

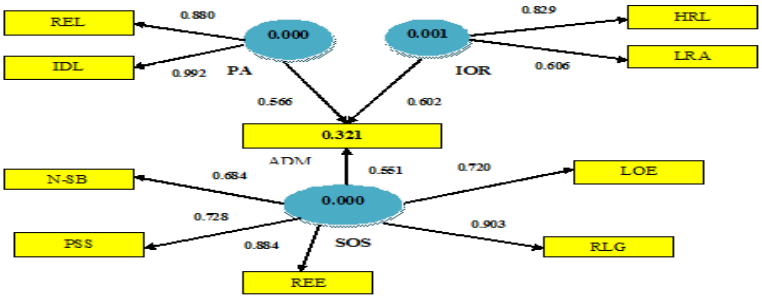


Figure 2. Structural model of research with coefficients of factor loads

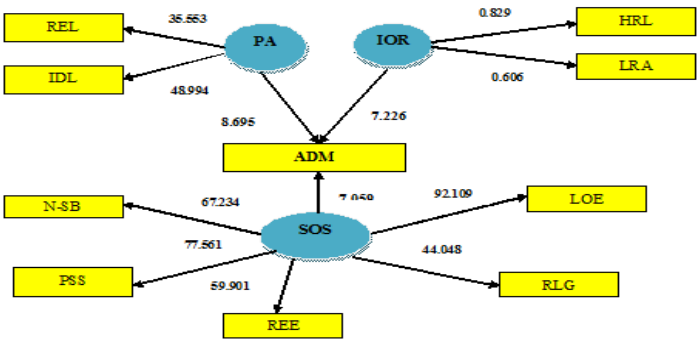


Figure 3. Structural model of research with significant coefficients

4.3 Model fit

To examine the model fit, we use the measurement model fit, the structural model fit, and the overall model fit.

4.3.1 Fitting of measurement models

Reliability

In order to evaluate the reliability of the research measurement model, we examine the factor load

coefficients, Cronbach's alpha coefficients and the combined reliability.
Measuring factor loads:

Table 4. Factor load coefficients

Factor	Index	Factor load
Ethics	REL	0.880
	IDL	0.884
Religious attitude	HRL	0.952
	LRA	0.953
Social structure	LEO	0.720
	RLG	0.093
	REE	0.882
	PSS	0.728
	N-SB	0.684

The criterion for the suitability of the factor load coefficients is 0.4. In the above table, all the numbers of factor load coefficients of the groups are more than 0.4, which indicates the appropriateness of this criterion.

4.3.2 Cronbach's alpha, combined reliability

According to the data analysis algorithm in PLS, after measuring the group's factor loads, it is time to calculate and report Cronbach's alpha coefficients and combined reliability, shown in the table below.

Table 5. Cronbach's alpha standard results and combined reliability of latent research variables

	(**CR>0.7**)	(**Alpha>0.7**)
PA	0.924	0.879
SOS	0.952	0.898
IOR	0.977	0.783
ADM	0.863	0.921

Considering that the appropriate value for Cronbach's alpha and combined reliability is 0.7 and that the findings of the table above show that these criteria have adopted a suitable value for latent variables, it can be confirmed that the reliability of the research is appropriate.

4.3.3 Convergent validity

The second criterion for examining the fit of measurement models is convergent validity, which examines the degree of correlation of each structure with its groups (indicators).

Table 6. Convergent validity results of latent research variables

	(AVE>0.5)
PA	0.802
SOS	0.908
IOR	0.876
ADM	0.791

Considering that the appropriate value for AVE is 0.5 and in accordance with the findings of Table 6, this criterion has adopted a suitable value for latent variables, thus confirming the suitability of the convergent validity of the research.

4.3.4 Structural model fit

Significance coefficients (t_values values)

According to Figure (2), since the coefficients of t are greater than 1.96, their significance is confirmed at the 95% confidence level.

4.3.5 Criterion R Squares or R2

The second criterion for examining the fit of a structural model in research is the R2 coefficients related to the endogenous (dependent) latent variables of the model. R2 is a criterion that indicates the effect of an exogenous variable on an endogenous variable and three values of 0.19, 0.33 and 0.67 are considered as the criterion values for weak, medium and strong values of R2. According to Figure (3), the value of R2 has been calculated for the endogenous structures of the research, and according to the three values of the criterion, the appropriateness of the fit of the structural model can be confirmed.

Table 7. Results of criterion R2 for endogenous structure

Symbol	R^2
ADM	0.321

4.4 Overall model fit

4.4.1 GOF criteria

To evaluate the fit of the general model, the GOF criterion is used and the result is present in Tables 8 and 9, and three values of 0.01, 0.25, and 0.36 are introduced as weak, medium, and strong values for GOF.

This criterion is calculated using the following formula:

$$GOF = \sqrt{\overline{communalities} \times \overline{R^2}}$$

(Communalities) is obtained from the average of the shared values of the hidden variables of the research.

Table 8. Communality rate and R2 of research variables

symbol	R^2	Communality
PA	0.001	0.802
SOS	0.321	0.908
IOR	0.000	0.876
ADM	0.000	0.791

Table 9. General model fit results

GOF	$\overline{R2}$	$\overline{Communality}$
0.524	0.322	0.845

Given the value obtained for GOF of 0.524, a very good fit of the overall model is confirmed.

4.4.2 Results of the auditors' judgment model test in Iran and India

After reviewing and approving the theoretical model, the present study proposes the auditors' judgment model with a religious, social, and professional approach.

$$A_J = \beta_0 + \beta_1 PA + \beta_2 SOS + \beta_3 IOR + \varepsilon_{it}$$

The results of estimating the proposed research model in Iran and India are described in Tables (10) and (11).

Table 10. Summary of statistical results of auditors' judgment model test in Iran

Variable	Coefficients	t	Standard deviation	(P-VALUE)	VIF
β_0	0.258	0.128	2.022	0.898	-
PA	0.523	3.122	0.168	0.001	1.000
SOS	0.249	3.848	0.065	0.001	1.000
IOR	3.688	23.815	0.155	0.000	1.000
F(fisher)	413.924	F		0.000	
R^2	0.69	Durbin-Watson	Statistics	2.177	

Table 11. Summary of statistical results of auditors' judgment model test in India

Variable	Coefficients	t	Standard deviation	(P-VALUE)	VIF
β_0	0.194	0.179	2.001	0.867	-
PA	0.540	2.561	0.179	0.001	1.010
SOS	0.233	3.779	0.034	0.001	1.000
IOR	0.655	21.942	0.112	0.000	1.010
F(fisher)	452.783	F		0.000	
R^2	0.43	Durbin-Watson	Statistics	2.106	

4.4.3 Determining the existence of several alignments (VIF test)

Linearity is a condition that indicates that an independent variable is a linear function of other independent variables. Suppose the alignment in a regression equation is high. In that case, there is a high correlation between the independent variables and the model may not have high validity despite being high. According to the last column of tables (10) and (11), the VIF value for all independent variables is less than 5 (VIF <5). Therefore, no alignment between the independent variables and the fitted model is valid.

4.5 Durbin Watson Test

One of the common problems in a regression model is the correlation between residual sentences. Violation autocorrelation is one of the standard assumptions of the regression model. In this way, the characteristics of the best linear estimator without bias are impaired, and statistical inference is not reliable. Durbin-Watson statistic is used to check the specification error in the model. In other words, if the regression residues show a systematic and significant pattern, there will be a specification error. Simply put, this correlation reflects that some of the variables that belong to the real model are disturbed and must be removed and entered into the model as a valid explanatory variable. In general, if this statistic is in the range of 1.5-2.5, it can be said that the problem of autocorrelation between waste sentences (error) is not observed. After estimating the coefficients, Durbin-Watson statistics show a value of 2.1059 for India and 2.1770 for Iran, which means there is no continuous correlation in the disturbance component. Consequently, the problem of serial autocorrelation is not observed in this hypothesis.

4.6 Fisher statistic

Before testing the research hypothesis based on the obtained results, the accuracy of the results should be ensured. For this purpose, the F test was used to evaluate the significance of the whole model. According to the level of significance of the calculated F statistic (0.000), it can be claimed that the fitted regression model is significant in both countries.

4.7 Determination coefficient (R2)

According to the coefficient of determination of the fitted model, it can be claimed that about 43% of the changes in the model's dependent variable in India and about 69% in Iran are explained by independent variables.

5. Conclusion

This study investigated the effect of professional ethics, social structure, and religious attitude on auditors' judgments (comparing the environments of India and Iran). Research variables in India and Iran are discussed. The present study is an applied research in terms of purpose. This research is descriptive in terms of research classification according to the method. Descriptive research describes and compares what is, without interference.

Among the types of descriptive research, this research is correlational because it examines the relationship between dependent and independent variables.

This research is also quasi-experimental in terms of control. Finally, the current study is theoretically positive research and inductive reasoning. Because of this assumption, research has been done that shows that concepts and facts exist objectively in the outside world and can be observed and measured by various statistical methods. This research uses a set of questionnaire information converted into fake data to confirm or reject the hypotheses.

The time domain of this research is 2023. In order to collect information and theoretical foundations of the research, the library method, research done in this regard, observation, tables, databases and computer networks are used.

Professional accountants and auditors in today's society have a key and undeniable role. The accounting profession has a distinct and significant role among other professions because it has a tremendous direct or indirect impact on the lives of individuals in society and the life and survival of private and public organizations.

The sensitivity of this role clarifies the need to formulate and explain the code of professional behavior for the accounting and auditing profession and the professional behavior of its activists. The public should observe good morals in all aspects and adhere to a coherent rite of professional conduct to gain the acceptance of social prestige and respect necessary for working in any specialized profession. In the meantime, raising knowledge and awareness and increasing the level of education of men and women accountants and auditors will help to achieve this goal.

It seems that accountants and auditors need to follow the changes and developments and not fall behind the caravan, have sufficient awareness and insight, have knowledge of the ethical values prevailing in the environment, and have flexibility in the face of forthcoming changes. Creating and applying ethics management in the organization. The focus of business units on maximizing profits, meeting competitive challenges, emphasizing short-term results, and providing various accounting and auditing services has placed accountants in an environment of conflict and pressure that has led to unethical consequences for them.

The increasing complexity of organizations and the increase in the number of unethical, illegal and irresponsible work in the workplace has drawn the attention of experts to the discussion of ethics and its various effects. Therefore, male and female accountants and auditors must first know the ethics and then, according to the conditions and atmosphere of each profession, learn and apply the professional ethics specific to that profession.

Professional judgment is the main result and essence of the audit. Therefore, the quality of the audit depends on the quality of the auditors' professional judgment. Achieving a more desirable professional judgment requires identifying the key factors influencing auditors' judgment and decision-making. This study explained some key concepts related to auditors' judgment and decision by considering different decision models' individual characteristics and behavioral, religious, and social patterns. We believe that paying attention to these concepts and using and considering decision models improves the quality of judgment in stages.

In the present study, professional, social and religious ethics models were given special attention to explain the auditors 'decision-making model based on the auditors' judgment. It was suggested and

the study of the relationships between the research variables in the initial models showed the theoretical and the proposed regression models' high validity.
In the next stage, the final research model was statistically tested separately to compare the two societies of Iran and India in the analysis of the proposed general model of the research. Independent variables explain The dependent model in India and about 69% in Iran.

As observed, there is a positive and significant effect between the research variables. Professional ethics in both countries have a close impact on audit judgment. This indicates that auditing standards in all countries are approved and implemented as a principle. The effect of social structure on audit judgment has also been shown to be an effective component, so it can be said that with the improvement of social structure in both India and Iran, auditors will tend to improve audit judgment.

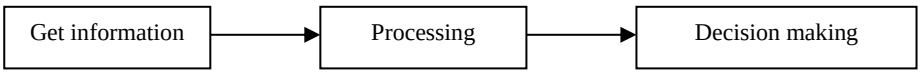
According to the research results, evidence showed that in Iran, the impact of religious attitude on auditors' judgment is more than in India, and increasing the intensity of religious attitude leads to better judgment in both countries. Iran's religious attitude can have a greater impact on people's work and moral obligations in the workplace.

Understanding that some people are more successful in decision-making than others has created great attention to the variables that affect decision-making.

Decision making is a vital part of accounting and auditing systems. Some people are more successful at making decisions than others. Understanding this fact over the past twenty years has attracted considerable attention to the variables that influence individuals' decisions.

These variables range from physiological variables to psychological variables. Paying attention to individual differences based on the interrelationship model of the characteristics of the subject to be decided and the individual characteristics of the decision-maker has led to the formation of decision-making behavior.

Research shows the impact of accounting information on the decision-making process, including auditors' comments. Evidence shows the influence of gender, personality type, cognitive style, accounting and auditing environment on judgments and decisions. These factors have received less attention in accounting and auditing research. A review of the decision literature suggests the following process for reaching a decision or problem solving:



If everyone obtains and processes information similarly, they will reach the same decisions and solutions. However, various psychology, accounting, management, marketing, and auditing studies show that people do not achieve the same results when acquiring and providing information. Therefore, it is suggested that experts do more research in these areas.

References

1. Adeel, N., Patel, C., Martinov-Bennie, N., and Ying, S. X. (2022). Islamic religiosity and auditors' judgments: Evidence from Pakistan. *Journal of Business Ethics*, 179(2), pp. 551-572. https://link.springer.com/article/10.1007/s10551-021-04829-w.
2. Alizadegan, L., SamadiLargani, M., and Imeni, M. (2022). The Effect of Personality Type and Professional ethics on Auditors' Ability to Detect Fraud Using the Theory of Planned Behavior by the role of Professional Skepticism. *Financial Accounting and Auditing Research*, 14(54), pp. 49-78. (In Persian). 10.30495/faar.2023.699788.
3. Aras, G. and Muslumov, A. (2001). The analysis of factors affecting ethical judgments: The Turkish evidence, *Department of Business Administration*, 1(1), pp. 1-12.

https://papers.ssrn.com/sol3/papers.cfm?abstract_id=890075.
4. Bahari Sejahrood, M. A., Khozain, A., Gorganli Doji, J., and Naderian, A. (2023). Provide a model of auditors' professional ethics behaviour with emphasis on ethical climate using interpretive structural modelling from the professional experts' perspective. *International Journal of Nonlinear Analysis and Applications*, 14(1), pp. 1509-1523. (In Persian). 10.22075/IJNAA.2022.26804.3414
5. Barrier, M. (2003). One right path: Cynthia Cooper: MCI vice president of internal audit Cynthia Cooper believes that where ethics are concerned, you have to obey your conscience and accept the consequences. *Internal Auditor*, 6(6), pp. 52-57.
6. Craft, J. (2013). A review of the empirical ethical decision-making-literature: 2004-2011. *Journal of Business Ethics*, 117(2), pp. 221-259. https://link.springer.com/article/10.1007/s10551-012-15189
7. Etzioni, O. (1989). Tractable Decision-Analytic Control. *KR*, 89, 114-125.
8. Flanagan, J. and Clarke, K. (2007). Beyond a code of professional ethics: A holistic model of ethical decision-making for accountants. *Abacus*, 43(4), 488-518.
9. Heirani, F., Vakili Fard, H.R., Bani Mahd, B. and Rahnama Rudpashti, F. (2018). The influence of social characteristics of auditors on their judgment in resolving conflict between the auditor and the management of selected characteristics: Overconfidence and Machiavellian personality, *Audit knowledge*, 17(67), pp. 71-98. (In Persian). http://danesh.dmk.ir/article-1572-1-fa.html
10. Jones, T. (1991). Ethical decision making by individuals in organizations: An issue-contingent model. *Academy of Management Review*, 16(2), pp. 231-248. https://doi.org/10.5465/amr.1991.4278958
11. Kargarkamvar, N., Khanmohammadi, M. H., yazdani, S., and Moradi, Z. (2020). Investigating the Effect Of Orientation Of Religion On Financial Decision Makers' Ethical Approaches, *Journal of Investment Knowledge*, 9(34), pp. 127-147. (In Persian).http://www.jik-ifea.ir/article_16202_en.html
12. Khodayari Fard, Mohammad, Mansouri, Ahmad, Basharat, Mohammad Ali, ... and Massoud. (2017). Religiously and spiritually integrated treatments and generalized anxiety disorder. *Journal of Research in Behavioural Sciences*, 15(1), pp. 126-134.
13. Matson, J. L., Carlisle, C. B. and Bamburg, J. W. (1998). The convergent validity of the Matson evaluation of social skills for individuals with severe retardation (MESSIER). *Research in Developmental Disabilities*, 19(6), pp. 493-500. https://doi.org/10.1016/S0891-4222(98)00020-1
14. Onumah, R. M., Simpson, S. N. Y., and Kwarteng, A. (2022). The effects of personal and organizational attributes on ethical attitudes of professional accountants: evidence from Ghana. *Journal of Global Responsibility*, 13(3), pp. 245-267. https://doi.org/10.1108/JGR-04-2021-0041
15. Rest, J. R. (1986). Moral development: Advances in research and theory. New York:Praeger
16. Salehi Kamamardakhi, S. S., Azadi, K., and Vatanparast, M. (2023). The Impact of Organizational Ethics and Culture on the Auditor's Professional Judgment with respect to Corporate Social Responsibility Using Structural Equation Modeling. *International Journal of Finance & Managerial Accounting*, 8(30), pp. 259-274. (In Persian). 10.30495/IJFMA.2022.64510.1761
17. Sarlak, N. (2007) Accounting Ethics, *Ethics in Science and Technology*, 3(1,2), pp. 35-62. (In Persian). https://ethicsjournal.ir/search.php?slc_lang=fa&sid=1
18. Scott Asay, H., Brown, T., Nelson, M. W. and Jeffrey Wilks, T. (2017). The effects of out-of-regime guidance on auditor judgments about appropriate application of accounting standards. *Contemporary Accounting Research*, 34(2), pp. 1026-1047.
19. Sweeney, B. and Costello, F. (2015). (2009). Moral Intensity and Ethical Decision-making: An

Empirical Examination of Undergraduate Accounting and Business Students. In Accounting Education Research (pp. 443-465). Routledge.
20. Zairi, M., and Peters, J. (2012). The impact of social responsibility on business performance, *Managerial auditing Journal*, 17(4), pp. 422-456. https://doi.org/10.1108/02686900210424312

Appendices

Judgment questionnaire

1. I pay attention to personal insight (inner intuition) when making decisions.
2. I am able to make decisions without asking the opinions of others.
3. When making a decision, it is more important for me to feel that the decision is right than to have a logical reason for being right.
4. I can double-check all my sources of information to ensure I have the right facts before making a decision.
5. In making important decisions, I act based on what others say.
6. I avoid making decisions because thinking about them makes me anxious.
7. All decisions can be made in a completely logical and systematic way.
8. When making a decision, I do what I think is right at the moment.
9. I make spontaneous decisions.
10. When faced with important decisions, I like to have someone to guide me in the right direction.
11. My emergency decisions require careful thought.
12. I trust my gut feelings and reactions when making decisions.
13. When making a decision, I can identify and check all the different options by myself.
14. I refuse to make important decisions unless there is a compulsion in this field.
15. I make decisions without prior background.
16. I rely on my intuition when making decisions.
17. I make decisions that I feel are right.
18. I need help from others when making decisions.
19. I postpone making decisions as long as possible.
20. I make decisions without prior background, especially the moment I encounter problems.
21. I avoid making important decisions.
22. I feel that I cannot make decisions without the support of others.
23. I make important decisions at the last minute.
24. When making a decision, I make my decision quickly.
25. In critical and important situations, I make decisions completely based on logic (rationally).

Professional ethics questionnaire

1. I do not do an act that causes harm to another.
2. I never tolerate danger and risk for others.
3. I believe that it is wrong to endanger others even if there is a benefit.
4. I will never harm anyone mentally or physically.
5. I believe that I should not perform an action that may limit the welfare and dignity of others.
6. If an action harms others, then I will not do it.
7. I believe that the decision to do or not to do an action depends on its negative and positive consequences.

8. People's dignity and welfare are my most important concern.
9. I believe that the welfare of others should never be limited.
10. I believe that an action is moral that conforms to moral ideals.
11. I believe it is unimportant to observe all moral aspects in life.
12. I believe that adherence to ethics is different in every situation.
13. I believe that moral frameworks should be considered individually (for example, an action is considered moral from the point of view of one person and the same action is considered immoral from the point of view of another person.)
14. I believe that no moral behavior is perfect.
15. I believe that the morality of anything depends on one's own point of view.
16. I believe that the moral standards of each person are determined based on their behavior and not the judgment of others.
17. I believe that moral principles in relationships between people are so complex that it can be said that each person's moral principles are unique.
18. I believe that each person should define moral principles for himself to prevent him from doing actions that could negatively affect his relationships and judgment.
19. I believe it is never acceptable to lie (whether lying is allowed or depending on the situation).
20. I believe that lying is moral or immoral depending on the circumstances.

Social structure questionnaire

1. I look at other people when I talk to them.
2. I help a friend who is suffering.
3. I comfort a friend who is sad.
4. I feel happy when someone else is doing well.
5. I tell others how good they are.
6. I reach out to others and open up to them.
7. When someone does something for me, I feel happy and thank them.
8. I comfort my friends.
9. I look at others when they speak.
10. I share what I have with others.
11. I care for other people's things as if they were mine.
12. I ask people around me if they want help.
13. I enjoy helping others.
14. When I talk to others, I also ask them questions.
15. When I hurt someone, I regret it later.
16. I do well to those who are good to me.
17. I greet the people around me and inquire about their work and issues.
18. I laugh at other people's jokes and their funny stories.
19. When someone is talking, I jump in and interrupt them.
20. I touch or take things that do not belong to me without permission.
21. I feel angry or jealous when someone else is doing well.
22. I break my promise.
23. I lie to get what I want.
24. I make fun of others.
25. I make noises that make other people uncomfortable (such as burping nose picking)
26. I speak very loudly.

27. I am jealous of others.
28. I stay with the people around me so much and take their time that they get tired of me coming.
29. I over-explain a subject.
30. I always like to be the first in everything.
31. I think I know everything.
32. I act as if I am better than others.
33. I try to be better than everyone else.
34. I like to be the boss.
35. In my opinion, winning means everything.

Religious Attitude Questionnaire

1. All matters of life are in God's power.
2. Prophets guide people to God.
3. The existence of resurrection is necessary for the implementation of God's justice.
4. God is aware of all hidden motives.
5. Religion directs the individual and social life of man.
6. Life without communication with God is meaningless.
7. Islam has provided the most complete plan for human happiness.
8. Expressing anger against oppressors is a religious duty.
9. Imam Hussain (peace be upon him) is a model of free manhood and freedom.
10. On the Day of Judgment, God may waive his rights and not waive the rights of the people.
11. All divine laws have wisdom and benefit.
12. My experience has shown that there is good in unanswered prayers.
13. Everything necessary for human happiness is mentioned in the Quran.
14. My best religious experiences were when I had a special spiritual feeling during worship and prayer.
15. Religion is a guide to human happiness in life.
16. Every good that befalls man is from God, and every evil that befalls him is from man himself.
17. The religion of Islam responds to the social needs of human societies.
18. With the appearance of the savior of humanity, the world will be filled with justice.
19. Death is not the end of life but another stage of eternal life.
20. I believe in the unseen world.
21. When I pray, I feel that God pays special attention to me.
22. Man can reach complete happiness only by using the instructions of the prophets.
23. Appealing to divine saints is one of the most important ways of communicating with God.
24. Remembrance of God creates peace in my heart.
25. I respect the rights of religious minorities.
26. I thank God for the blessings he has given me.
27. I spend my money performing divine duties.
28. I increase my religious awareness.
29. For God's sake, I ignore the mistakes of others.
30. I know my religious duties.
31. After supplicating to God, I feel lighter.
32. I respect my teachers.
33. I control myself when I get angry with the people around me.

34. In terms of food and drinks, I pay attention to their halal and haram status.
35. I encourage people around me to do their religious duties.
36. I try to please God in solving family disputes.
37. The Holy Quran has been a good guide for my life.
38. I feel good about shy people.
39. I try to pray early.
40. I consider myself bound to pay Khums.
41. I tolerate people for God's sake.
42. I dislike breaking tree branches for no reason.
43. I believe in the Day of Judgment.
44. I want God to help me to do things.
45. I try to pray my obligatory prayers in the congregation.
46. If jihad is ordered, I will participate in it.
47. I am always honest.
48. I consider treating animals well as my moral duty.
49. I like watering plants and trees around the house.
50. I hate those who insult the Prophet of Islam (PBUH).
51. I believe in the existence of divine angels.
52. I respect my parents.
53. Praying prevents me from doing ugly and sinful acts.
54. I try to tell the truth.
55. I consider it necessary to observe Islamic limits in socializing with the opposite sex.
56. Based on religious orders, I avoid excesses.
57. I feel God's grace and love in my life.
58. I am ready to sacrifice my life to defend my religious beliefs.
59. Despite the adversities in my life, I am grateful to God.
60. I put myself at risk to preserve my religious beliefs.
61. I respect religious minorities.
62. I try to solve people's problems.
63. If I don't have a religious excuse, I will fast in Ramadan.
64. I am good-natured with others.
65. Whoever asked me for any help, I helped him.
66. I extinguish unextinguished firewood next to trees or nature.
67. I feel sad to hear the news about the oil spill in the sea
68. I trust God in doing things.
69. I try to go to the mosque to perform obligatory prayers.
70. I prefer solving other people's problems to solving my own problems.
71. I try to do things according to God's instructions.
72. I have a special interest in believers.
73. I consider it necessary to leave taboos.
74. I prevent animals from being bothered by children.
75. I consider it my duty to improve the relationship between others.
76. I consider it my duty to participate in charity affairs.
77. I feel that God will make me achieve my desires.
78. When listening to different musical songs, I consider the Shari'a rulings.
79. I dislike throwing garbage in the street.
80. I have not spoken evil behind anyone's back.

81. I am satisfied with what God has given me.
82. I try not to miss my prayer.
83. If I bring a bird home, I will take good care of it.
84. I forgive the mistakes of people who hurt me.
85. I feel enmity with the enemies of God's saints.
86. I am bound to fulfill the qadha of the fasts that I have not taken.
87. I have participated in the Friday prayer.
88. I prefer sightseeing trips to pilgrimage trips.
89. I study religious books.
90. I wish to visit the shrine of Imam Reza (PBUH).
91. I am interested in going on a pilgrimage.
92. I leave seeds and food for the birds around the house.
93. I bear the hardships of life.
94. I don't consider reading religious books a waste of time.
95. Viewing the pictures of the shrine of the Prophet (PBUH) creates a spiritual feeling in me.
96. I have read the obligatory prayers early.
97. I am grateful to God for His blessings.
98. I cope with life's failures.
99. I consider it a great sin to pollute rivers.
100. I will command the known and forbid the denial if there are conditions.
101. I feel sad when I hear the news of forest fires in any country.
102. I would like to visit the Holy Prophet's (PBUH) shrine.

IJAAF; Vol. 8, No. 4, Autumn 2024, Serial 29

Ferdowsi University of Mashhad

Iranian Journal of
Accounting, Auditing & Finance

Quarterly

RESEARCH ARTICLE

The Impact of Company Characteristics on Return Volatility in Sorted Portfolios: A Hybrid Asymmetric Conditional Variance Approach

Seyed Kazem Ebrahimi, Mahnaz Khorasani, Mina Saba*

Financial Engineering, Faculty of Economics, Management and Administrative Sciences, Semnan University, Semnan, Iran

How to cite this article:
Ebrahimi, S. K., Khorasani, M., & Saba, M. (2024). The Impact of Company Characteristics on Return Volatility in Sorted Portfolios: A Hybrid Asymmetric Conditional Variance Approach. *Iranian Journal of Accounting, Auditing and Finance*, *8*(4), 71-88. doi: 10.22067/ijaaf.2024.45105.1433
https://ijaaf.um.ac.ir/article_45105.html

ARTICLE INFO

Article History
Received: 2023-11-21
Accepted: 2024-03-06
Published online: 2024-10-25

Keywords:
Firm Value; Financial Leverage; Hybrid Asymmetric Conditional Variance; Return Volatility

Abstract

The primary objective of this study is to investigate how various stock portfolio strategies affect the volatility of returns among companies listed on the Tehran Stock Exchange (TSE). A systematic elimination method selected 185 companies from 2011 to 2022. The return volatility of these companies, along with the stability of fluctuations, was analyzed across 16 sorted portfolios based on three characteristics: size, book-to-market (B/M) ratio, and financial leverage. Additionally, considering the leveraged structure of companies' balance sheets, the extent of the leverage effect was examined in relation to the impact of positive and negative news on return fluctuations. The hybrid model ARMA(p, q)-GJR-GARCH(1, 1)-M was utilized to investigate this. The findings indicate that the volatility of returns and the stability of fluctuations within sorted portfolios vary across different groups. Furthermore, the influence of positive news on stock return volatility appears to be more pronounced in two specific portfolios: one consisting of large companies with a high B/M ratio and the other comprised of large companies with a low B/M ratio, compared to the impact of negative news. This disparity may be attributed to the dissemination of positive news within the market, wherein larger companies with low B/M ratios, due to their higher growth potential, and larger companies with high B/M ratios, due to their substantial capital and stable financial performance, have a greater impact on market expectations, thereby enhancing investor confidence.

https://doi.org/10.22067/ijaaf.2024.45105.1433

NUMBER OF REFERENCES
49

NUMBER OF FIGURES
0

NUMBER OF TABLES
7

Homepage: https://ijaaf.um.ac.ir
E-Issn: 2717-4131
P-Issn: 2588-6142

*Corresponding Author: Mina Saba
Email: saba6970@semnan.ac.ir
Tel: 09147993577
ORCID:

1. Introduction

The growing body of financial literature has increasingly focused on stock return volatility (Chen et al., 2010; Vo, 2015, 2016) due to its potential influence on firms' financial stability as well as the financial system (Vuong et al., 2024). Understanding and managing stock return volatility is crucial for firms, investors, and regulatory entities. Hence, surveying stock return volatility in stock markets is an attractive topic for economic researchers because it is relevant to stock investors' behaviors and corporate managers' decisions. High levels of volatility can lead to increased uncertainty, higher risk premiums demanded by investors, and potentially destabilize financial markets. Moreover, excessive volatility can hinder firms' ability to plan and execute long-term strategies (Kashyap, 2023). Generally, portfolio managers aim to design strategies that achieve higher returns than risk-adjusted returns. Many investors construct investment portfolios based on size, B/M, etc. (Otaify, 2020). Forming an investment portfolio is a paramount concern for managers and investors, who endeavor to construct the optimal investment portfolio to achieve maximum returns from the market (Nourahmadi and Sadeqi, 2023). Given that the fluctuation patterns in various assets differ, portfolios constructed based on distinct fundamental characteristics are anticipated to exhibit different returns and risk levels. Several studies have presented evidence highlighting the success of portfolio management strategies concerning factors such as size and the B/M.

Furthermore, empirical evidence indicates that negative shocks to financial time series lead to a more pronounced increase in the volatility of returns than positive shocks of equivalent magnitude. In the context of stock return, this asymmetry is termed the leverage effect, and one of the pivotal models for investigating these effects is the Glosten, Jagannathan, and Runkle (*GJR*) model. Additionally, many financial models assume that investors demand higher returns in exchange for taking on more risk. The GARCH-M model can be applied to explore this concept (Brooks, 2014). Thus, the main objective of the research is to employ a heterogeneous hybrid model of asymmetric conditional variance, ARMA (p, q)-GJR-GARCH (1, 1)-M, to assess the success rate of various portfolio management strategies based on three crucial characteristics: size, B/M and financial leverage. What distinguishes this study from others is that it investigates the impact of these variables in the form of sorted portfolios in the Iranian stock market, a facet not explored in previous research. Furthermore, the econometric model utilized in this research represents the first hybrid model used in this field. This advanced economic model, combining the capabilities of ARMA and GARCH, provides the best forecast for stock return fluctuations.

2. Research background

2.1 Theoretical Background

In the era of the global economy and dynamic financial markets, analyzing the factors influencing stock market fluctuations holds particular significance. One key influential factor in these fluctuations is the company's size and value (Asyik et al., 2023). One crucial aspect of analyzing the influence of company size on stock market fluctuations is the company's capacity to adapt to market changes. Research indicates that while large companies may possess greater financial and operational capabilities, they are more likely to experience heightened market volatility. Company size is recognized as an indicator of a company's significance and impact on the economy. Due to their broader economic effects, market movements, and business diversification, large companies may be significantly affected by market fluctuations (Rutkowska-Ziarko, 2015). On the other hand, small companies may experience market fluctuations due to their higher sensitivity to various factors. The company's size can influence several aspects of its financial performance and largely depends on market and industry conditions (Tahir et al., 2013).

Large companies, endowed with abundant resources, often can enhance the stability of their

financial performance. This capability can lead to a reduction in return volatility. Moreover, increased transparency in the disclosure practices of large companies can boost investor confidence and mitigate return volatility (Ahmed and Hla, 2019). On the other hand, large companies may face challenges related to flexibility. This limited flexibility can result in these companies experiencing higher return volatility when confronted with market changes and economic conditions. In addition, the large size of a company may lead to a greater focus on diversification across various economic sectors. This diversification could have both positive and negative effects, as the impacts of different segments may balance each other, potentially reducing the overall return volatility of the company (Bhowmik and Wang, 2020). Overall, it can be said that the impact of company size on stock return volatility is dependent on various factors, including management, market conditions, and corporate policies. Generally, an increase in company size may sometimes reduce return volatility. In contrast, the opposite may be true in other cases, and an increase in size may result in higher return volatility. An increase in the firm's market value is related to a rise in volatility (Shin and Stulz, 2000). High growth could cushion the negative effects of stock return volatility on firm value. If a company is experiencing significant growth, investors might be more willing to accept higher levels of stock return volatility because they anticipate future returns from the company's expansion. In such cases, high growth modifies by reducing the adverse impact of stock volatility on firm value. Conversely, low growth could amplify the detrimental effects of stock return volatility on firm value. When a company is experiencing limited growth prospects, investors might perceive high stock volatility as an uncertainty indicator. This situation could lead to a greater decline in firm value (Vuong and Nguyen, 2024).

Furthermore, the price-to-book ratio is identified as a significant indicator in determining the financial health of companies and can directly influence stock market fluctuations. The price-to-book ratio of the market value is a fundamental variable in the analysis of stock market fluctuations. This ratio can reflect the relative value of a company compared to the total market value. A high P/B ratio may indicate overvaluation or misinformation about the company's equity value, potentially contributing to market fluctuations (Pontiff and Schall, 1998). The impact of the book-to-market value ratio on stock return volatility is dependent on various factors. The P/B ratio typically plays a role in determining systematic risk. For example, an increase in the P/B ratio may indicate investors' expectations of improved profitability for the company, leading to increased stock sensitivity to market changes. In some cases, an increase in the P/B ratio may indicate a higher increase in market value compared to book value, possibly signaling a mismatch between market and true company value. This could result in increased stock return volatility. Additionally, an increase in the P/B ratio may be driven by an increase in market value surpassing the increase in book value, indicating a potential mismatch between market and true company value and consequently increasing stock return volatility (Nugroho, 2020). The effects of the P/B ratio on stock return volatility also depend on economic and industry factors. In some industries, this ratio is considered a more reliable indicator of book value, while in others, due to industry-specific characteristics, this relationship may be less significant. For a precise analysis of the effects of the P/B ratio on stock return volatility, an examination of the company's specific conditions, industry, and economic conditions is required (Park, 2019).

Corporate financial leverage is considered one of the most significant factors influencing stock market fluctuations. According to the Trade-off theory (TOT), firms with higher volatility may face a greater risk of financial distress; therefore, they are cautious about using debt ratios in their capital structure (Modigliani and Miller, 1958). Stock return volatility is a concern for stakeholders, particularly when it can exert significant pressure on the overall economy. Moreover, economic, political, or financial shocks are more pronounced in emerging equity markets. The volatility of cash

flows generated by a firm's existing assets and potential growth options affects its market value. This volatility increases external financing costs (Ahmed and Hla, 2019), impeding managers from utilizing debt due to heightened bankruptcy risks. Companies benefit from tax shields by employing debt but incur financial distress costs (Ghasemzadeh et al., 2021). Listed firms can respond to equity volatility by reducing their debts to mitigate bankruptcy risk (Krause and Tse, 2016).

When a company finances its capital through debt, its sensitivity to economic and financial changes increases. Companies with higher debt levels may face more pronounced stock return fluctuations in different economic conditions (Nukala and Prasada Rao, 2021). Companies utilizing financial leverage in their capital structure may experience the leverage effect in response to positive or negative news (Al-Slehat et al., 2020). According to the leverage effect model, shocks are divided into positive (good news) and negative (bad news), with the same absolute magnitude potentially having different effects on conditional volatility. The theoretical argument suggests that the debt portion of the firm's financial structure increases as stock prices decrease. Consequently, shareholders assume higher risks and expect future stock return fluctuations to increase. Many empirical studies, such as Christie (1982), Nelson (1991), Engle and Ng (1993), Friedmann and Sanddorf-Köhle (2002), have demonstrated that negative shocks (bad news) have a greater impact on stock return fluctuations compared to positive shocks (good news) of the same magnitude. As a result, market fluctuations in stock markets are asymmetric (Mehrara and Abdoli, 2006).

In this research, considering that the complex relationships among these variables affecting stock return volatility may change over time, simultaneous examination of the impact of these variables in constructed portfolios enables better analysis of market dynamics and changes. Therefore, using the hybrid model proposed in this research, the impact of various stock portfolio strategies based on company size, firm value, and financial leverage on the volatility of returns and the degree of stability in fluctuations is examined. In addition, given the use of financial leverage in the capital structure of companies, the leverage effect is examined in the context of the impact of good and bad news on the volatility of stock returns in portfolios.

2.2 Empirical Background

Lam (2002) investigated the relationship between stock returns and beta, size, B/M, leverage, and price-to-earnings ratio (P/E) in the Hong Kong stock market using the Fama and French model from 1980 to 1997. The results indicated that the beta coefficient could not explain the average returns of the examined companies. However, size, B/M, P/E ratio, and company leverage could capture cross-sectional variations in monthly average returns over the period. Additionally, Ehrmann and Fratzscher (2004) argue that low financially leveraged firms have the largest effect on monetary policy, perhaps because they currently face financial constraints that prevent them from borrowing more debt. Moreover, Li et al. (2009) estimate the volatility properties of value, growth, and HML portfolios in the context of the GARCH model and convey interesting results. Firstly, the volatility of the value portfolio is more (less) sensitive to recent (older) information than the growth portfolio. Secondly, the volatilities of both the value and the HML portfolios are indifferent to good or bad news. Still, the volatility of the growth portfolio increases after the announcement of bad news. Finally, using the GJR-GARCH (1,1)- M model, the authors document a positive, significant relation between the excess return of the value portfolio and the time-varying volatility. In contrast, the excess return of the growth portfolio is negatively related to volatility. Therefore, the expected return of the value premium (HML portfolio) is positively associated with its time-varying volatility. Consequently, the authors argue that the return on the value portfolio is more sensitive to its volatility than the growth portfolio.

Cenesizoglu et al. (2011) demonstrated that the returns of different portfolios respond to different

news and exhibit different reactions to similar news. The results show that returns on various portfolios respond differently to different news and react diversely to the same news. Furthermore, the response of portfolios to macroeconomic news also varies across the business cycle. Large and growth firms exhibit distinct reactions to employment news at daily and monthly frequencies compared to small and value firms during expansions but not recessions. Furthermore, Kontonikas et al. (2013) indicated that value stocks, small-cap stocks, and past loser stocks are more exposed to monetary policy shocks than growth stocks, large-cap stocks, and past winner stocks. Moreover, Vithessonthi and Tongurai (2015) showed that the extent of the impact of financial leverage on operational performance is contingent upon the firm's size. While the regression results of combined data suggested a negative effect of financial leverage on the performance of companies, cross-sectional regression results indicated a positive effect of leverage on performance for small companies and a negative effect for large companies. Additionally, Ibhagui and Olokoyo (2018) examined the empirical relationship between financial leverage and firm performance using the Hansen threshold regression and considering firm size as the threshold variable. They sought to answer whether there is an optimal firm size where the relationship between leverage and firm performance is not negative. The results indicated that the negative impact of leverage on firm performance is significant for small companies and diminishes with company growth. Ultimately, when the firm size exceeds its estimated threshold level, this impact disappears, and the obtained result holds irrespective of the debt ratios employed.

Otaify (2020), using the AR(1)-GJR-GARCH(1,1)-M model, examined the volatility characteristics of portfolios sorted based on three features: firm size, B/M, and financial leverage in the Egyptian stock market. The findings indicate that sorted portfolios with these characteristics exhibit various degrees of clustering in terms of volatility and stability. Additionally, the results suggest that bad news has a greater impact on these portfolios' volatility than good news, regardless of their size. Furthermore, Ramezani Sharif Abadi et al. (2022) investigated the impact of combining size, value, and idiosyncratic risk anomalies with tail risk on stock excess returns. Using two tail risk measures, Aggregate Tail Risk and Hybrid Tail Covariance Risk, they applied the Five-Factor Fama and French model (2015) to test their hypotheses. Their findings revealed that combining size or value with tail risk decreased excess returns, whereas combining idiosyncratic risk with tail risk resulted in higher excess returns. Additionally, Vuong and Nguyen (2024) estimated the relationship between firm value, stock return volatility, and growth opportunity in the framework of the GGM model and presented interesting results. Firstly, they shed light on the effect of stock return volatility on corporate value in the Vietnamese equity market after experiencing the primitive stage. A deep understanding of this link becomes necessary for an opening and young equity market in the ASEAN area. Secondly, their research shows that Vietnamese-listed firms with higher stock return volatility have a lower value. This finding hints at Vietnamese corporate managers needing to enact controlling policies for stock return volatility, thereby improving corporate value. Thirdly, further investigation shows that a positive nexus between stock return volatility and firm value is more prominent in growth companies and technology firms. Put differently, a negative association between firm value and stock return volatility is less pronounced in tech and growth enterprises.

Recent studies have generally overlooked the effect of stock portfolio strategies in the Iran stock market, particularly those based on size, B/M, and financial leverage. To address this gap, this study proposes employing a hybrid model approach. Additionally, this research introduces the use of the hybrid econometric model ARMA (p, q)-GJR-GARCH (1,1)-M, which allows for a simultaneous examination of firm characteristics' influence on stock return volatility, fluctuations' stability, and the impact of shocks. This innovative approach offers a significant improvement in understanding the behavior of financial asset markets, considering complexities and temporal variations, thus providing

a more comprehensive analysis.

3. Data and methodology

3.1 Sample selection and data sources

Our sample covers all companies listed on the TSE from 2011 to 2022. All company data was extracted from Rahvard Navin software. The variables include monthly total returns, size, B/M, and financial leverage. Because volatility analysis requires active stocks, the testable stocks must meet the following criteria:

1. They should have been traded annually for at least 80% of all trading days.
2. Their financial statements should conclude at the end of December each year.
3. Exclude stocks belonging to financial companies and institutions.
4. Exclude stocks with a negative book value of equity.

Based on the mentioned criteria, 185 companies have been selected as samples for this research.

3.2 Variables

Size: The size is measured as the logarithm of the firm's total assets (Vuong and Nguyen, 2024).

Book Value to Market Value (B/M): The B/M ratio is calculated by dividing the book value of equity at the end of the financial year by the market value of equity at the end of June (Fama and French, 2018)

Financial Leverage: Financial leverage is the ratio of total long-term debt to total stockholders' equity. In order to prevent the look-ahead bias, this study followed previous studies (e.g., Fama and French, 2015, 2018; Otaify, 2020) and utilized the 6-month lagged values of financial leverage and book value to ensure that financial statements were accessible to investors in the market while constructing portfolios.

Monthly Stock Return: Monthly stock return is defined as the difference between the price of each share at the end of two consecutive months (adjusted for dividends and capital increases), divided by the price per share at the end of the previous month（Pätäri et al., 2023).

3.3 Construction of the characteristics-sorted portfolios

Following the literature, we utilized 50% -50% breakpoints to sort stocks based on their size into big (top 50%) and small (bottom 50%) portfolios. Additionally, we applied breakpoints (30-40-30) to sort stocks based on their B/M into value (top 30%), medium (middle 40%), and growth (bottom 30%) portfolios. Subsequently, we employed 50%-50% breakpoints to sort stocks based on their financial leverage into high (top 50%) and low (bottom 50%) financial leverage portfolios. These portfolios are denoted by two letters. The first letter represents the Size group, small (S) or big (B); the second letter represents the B/M group, indicating growth stock (G), Medium value stock (M), or value stock (V); and the third letter indicates the financial leverage group, high (H) or low (L) financial leverage. These seven portfolios jointly constructed 16 portfolios as shown in Table 1.

3.4 Research model

In this study, we follow Otaify (2020) and apply the ARMA (p, q)-GJR-GARCH (1,1)-M model to examine the impact of various stock portfolio allocation strategies on stock return volatility. This section begins with an explanation of the ARMA-GARCH model methodology, followed by a description of the hybrid model ARMA (p, q)-GJR-GARCH (1,1)-M.

Table 1. Characteristics-Sorted Portfolios

Portfolio	Abbreviation symbol
Big Size, Low Leverage	BL
Small Size, Low Leverage	SL
Small Size, High Leverage	SH
Big Size, High Leverage	BH
Small Size, Growth Stock	SG
Small Size, Medium Value Stock	SM
Small Size, Value Stock	SV
Big Size, Growth Stock	BG
Big Size, Medium Value Stock	BM
Big Size, Value Stock	BV
Low Leverage, Growth Stock	LG
Low Leverage, Medium Value Stock	LM
Low Leverage, Value Stock	LV
High Leverage, Growth Stock	HG
High Leverage, Medium Value Stock	HM
High Leverage, Value Stock	HV

3.4.1 ARMA-GARCH Model

Financial institutions commonly use the ARMA-GARCH predictive model to model the returns and volatility of financial assets. The first part of these models, the Autoregressive Moving Average (ARMA) model, is one of the most common models for modeling the returns of financial assets. Introduced by Box et al. (1976), this model was designed to forecast time series data of a single variable. This model is formed by combining an Autoregressive (AR) process and a Moving Average (MA) process. The second part of the ARMA-GARCH model is the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model, specifically designed for modeling the volatility of financial assets. The GARCH model consists of two equations: the conditional mean equation and the conditional variance equation. By representing the conditional mean equation as an ARMA process, we can combine the concepts of ARMA and GARCH to obtain an ARMA-GARCH model suitable for predicting returns. To better understand the ARMA-GARCH model, it is essential to differentiate between unconditional and conditional mean and variance. The unconditional mean and variance are simply the mean and variance of the return distribution considered over the entire period, assumed to be constant. It can be regarded as the long-term mean and variance for that period. On the other hand, conditional mean and conditional variance will vary at each point in time. Conditional mean and conditional variance depend on the past behavior of returns up to that time, and the conditional mean equation specifies the behavior of returns (Grachev, 2017).

3.4.2 Conditional Mean Equation

The conditional mean equation in a GARCH model can take various forms, and in this research, it is assumed that the return series follows an Autoregressive Moving Average (ARMA) model. The ARMA is defined as follows (Liu and Shao, 2016):

$$r_{i,t} = c_i + \sum_{j=1}^{p} k_{i,j}\, r_{i,t-j} + \sum_{j=1}^{q} \mu_{i,j}\, \varepsilon_{i,t-1} + \varepsilon_{i,t} \qquad (1)$$

Where:

- c_i the constant term
- $r_{i,t}$ is the observed realized return at the time
- k_{ij} represents the autoregressive terms
- $\varepsilon_{i,t-1}$ is the realized error at the time t

- $\mu_{i,j}$ is the moving average coefficient
- $\varepsilon_{i,t}$ is the white noise

3.4.3 Conditional Variance Equation

In 1982, Engle proposed the Autoregressive Conditional Heteroskedasticity (ARCH) model as a method for examining fluctuations in a variable. The idea behind the ARCH approach is that the current period's variable volatility depends on information from previous periods. In other words, considering data from the previous period will make the volatility estimation more accurate (Mirzaei et al., 2019). This model assumes that the random term has a mean of zero and is serially uncorrelated, but its variance is conditional on its past information. In other words, the Autoregressive Conditional Heteroskedasticity (ARCH) model can explain the conditional variance trend using its past information (Manzoor and Yadi-Poor, 2016). The conditional variance equation presented by Engle (1982) is defined as follows:

$$\sigma_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 \qquad (2)$$

In the above equation σ_t^2 represents the conditional variance for the current period (t), where α_0 and α_1 are constant coefficients and ε_{t-1}^2 is the squared error term at the previous period (t-1). In this equation, to ensure the positivity of the variance, it is considered that $\alpha_0 \geq 0$, and for stability, α_1 should be between 0 and 1 ($0 \leq \alpha_1 \leq 1$). For higher-order interruptions, the ARCH equation will be as follows.

$$\sigma_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \cdots + \alpha_P \varepsilon_{t-P}^2 \qquad (3)$$

The above relation represents an ARCH model of order p (Mirzaei et al., 2019). According to what has been observed in empirical studies, the order of ARCH is often large, leading to an increase in the model parameters. To address this issue, Bollerslev (1986) proposed the following model:

$$\sigma_t^2 = \alpha_0 + \sum_{i=1}^{p} \alpha_i \, \varepsilon_{t-i}^2 + \sum_{j=1}^{q} \beta_j \, \sigma_{t-j}^2 \qquad (4)$$

In the above equation, to ensure the positivity of the variances, α_i and β_j are assumed to be positive. This model is the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model (p, q), essentially an extended version of the ARCH model. If q equals zero in this model, it will be the same as the ARCH (p) model (Zabol and Abounoori, 2020).

3.4.4 The ARMA (p, q)-GJR-GARCH (1,1)-M model

The GJR-GARCH model is one of the conditional heteroskedasticity models within the GARCH family, introduced by Glosten et al. (1993). The primary advantage of the GJR-GARCH model lies in its ability to model leverage effects, such as good and bad shocks in financial markets. The GJR-GARCH model includes a single extra leverage parameter in the conditional variance equation. Using an indicator function, this extra parameter is formulated to augment the asymmetric response only by negative market shocks. Furthermore, the conditional mean equation and relation (1) are now enhanced by including the conditional volatility term to model volatility feedback. Collectively, we obtain the ARMA (p, q)-GJR-GARCH (1,1)-M model, represented by the following expressions (Rønold and Hausken, 2018):

$$r_{i,t} = c_{i,s,t} + \sum_{j=1}^{P} k_{i,s,j} r_{i,t-j} + \sum_{j=1}^{q} \mu_{i,s,j} \epsilon_{i,s,t-j} + \eta_{i,s,j} \sigma_{i,t} + \epsilon_{i,s,t} \qquad (5)$$

$$\sigma_{i,t}^2 = \omega_{i,s,t} + \alpha_{i,s,t}\epsilon_{i,s,t-1}^2 + \lambda 1_{\{\epsilon_{i,s,t-1}<0\}}\epsilon_{i,s,t-1}^2 + \beta_{i,s,t}\sigma_{i,t-1}^2 \quad (6)$$

4. Empirical analysis and interpretation of the results

Given that the random trend of time series variables in econometrics may lead to misinterpretation or pose challenges in selecting the type of estimation and validating results, the first step in addressing this issue is to examine whether or not there is a unit root in the time series. This step is of particular importance. In this regard, two generalized Dickey-Fuller tests and the Phillips-Perron test were employed to examine the existence or absence of a unit root in the variables' trends. Based on the results of both unit root tests in Table 2, the probability values for all research variables within their sorted portfolios are less than one percent. Therefore, all variables are stationary at the level.

Table 2. Stationary Test of Formed Portfolios

Variables	Dickey-Fuller Test	Phillips- Perron Test
BL	-43.011	-43.751
	(0.000)	(0.000)
SL	-45.391	-45.767
	(0.000)	(0.000)
SH	-46.439	-47.123
	(0.000)	(0.000)
BH	-40.170	-41.124
	(0.000)	(0.000)
SG	-34.548	-35.248
	(0.000)	(0.000)
SM	-37.937	-38.570
	(0.000)	(0.000)
SV	-39.329	-39.448
	(0.000)	(0.000)
BG	-35.860	-36.559
	(0.000)	(0.000)
BM	-32.656	-33.116
	(0.000)	(0.000)
BV	-33.395	-33.945
	(0.000)	(0.000)
LG	-40.654	-41.407
	(0.000)	(0.000)
LM	-33.224	-33.768
	(0.000)	(0.000)
LV	-34.046	-34.127
	(0.000)	(0.000)
HG	-29.282	-29.877
	(0.000)	(0.000)
HM	-37.740	-38.440
	(0.000)	(0.000)
HV	-38.829	-39.371
	(0.000)	(0.000)

Now, after checking the absence of unit root to ensure the results of ARMA (p, q)-GJR-GARCH (1, 1)-M models, it is necessary to check the presence or absence of homogeneity of variance in the portfolios. The ARCH test has been employed for this purpose, and the results of this test are presented in Table 3.

Table 3. ARCH Test

Variables	**ARCH** Test	P-Value
BL	41.368	0.000
SL	0.000	0.987
SH	34.769	0.000
BH	69.457	0.000
SG	5.917	0.015
SM	18.804	0.000
SV	0.000	0.992
BG	27.024	0.000
BM	40.259	0.000
BV	49.604	0.000
LG	18.370	0.000
LM	5.083	0.024
LV	0.000	0.984
HG	11.848	0.000
HM	58.186	0.000
HV	20.578	0.000

Based on the results obtained from the ARCH test, the null hypothesis of homoskedasticity is not rejected for three portfolios, SL, SV, and LV, out of the 16 portfolios studied. Therefore, the ARMA (p, q)-GJR-GARCH (1, 1)-M model does not apply to these three portfolios, and the model estimation is carried out for the remaining 13 portfolios. These 13 portfolios are divided into three sections: portfolios sorted by size and financial leverage, portfolios sorted by size and B/M, and portfolios sorted by B/M and financial leverage. This division is done to achieve better result differentiation.

Table 4 presents the results of the ARMA (p, q)-GJR-GARCH (1,1)-M models based on size and financial leverage. According to the results in Table 4, it can be stated that the constant term (C), the GARCH coefficient (β), and the mean coefficient in the estimated model (SQRT) for the portfolio of small-sized and high-leverage companies (SH) are significantly higher than those for big-sized and low-leverage companies (BL) and big-sized and high-leverage companies (BH). These findings indicate that the returns, variance, and average volatility of small-sized and high-leverage companies, compared to other portfolios in Table 4, have the highest level of volatility. Moreover, the stability of each portfolio can be obtained by calculating the sum of the two ARCH and GARCH coefficients ($\alpha + \beta$). In this regard, the results show that the stability of the portfolio of big-sized and high-leverage companies (BH) is higher than that of the other portfolios. This implies that the shocks entering these companies will impact these portfolios in the long term. Another significant result emphasized in the analysis of these models is the leverage effect coefficient (η).

The positive or negative nature of this coefficient has different interpretations. If the leverage effect coefficient is positive, it indicates a greater impact of positive news compared to negative news on the variable trend and vice versa. In this regard, in the estimated model for all three portfolios, the leverage effect coefficient is negative and significant, indicating that negative news has a greater impact than positive news on the trend of these portfolios. Additionally, the estimated ARMA coefficients in the models are also statistically significant.

Table 4. Estimation Results for Portfolios Sorted by Size and Financial Leverage

Variables	Model	$SQRT$	AR	MA	C	α	η	β
BL	ARMA(1,2)-GJR-GARCH(1,1)-M	0.274 (0.038)	AR(1) -0.976 (0.000)	MA(1) 1.176 (0.000) MA(2) 0.188 (0.000)	16.611 (0.000)	0.299 (0.000)	-0.166 (0.000)	0.518 (0.000)
SH	ARMA(4,4)-GJR-GARCH(1,1)-M	0.537 (0.001)	AR(1) -0.002 (0.973) AR(2) 0.016 (0.858) AR(3) -0.291 (0.000) AR(4) -0.777 (0.000)	MA(1) 0.062 (0.464) MA(2) -0.053 (0.517) MA(3) 0.308 (0.000) MA(4) 0.809 (0.000)	83.449 (0.000)	0.196 (0.000)	-0.175 (0.000)	0.642 (0.000)
BH	ARMA(3,4)-GJR-GARCH(1,1)-M	0.319 (0.000)	AR(1) 0.488 (0.000) AR(2) 0.124 (0.493) AR(3) -0.816 (0.000)	MA(1) -0.354 (0.011) MA(2) -0.193 (0.208) MA(3) 0.825 (0.000) MA(4) 0.083 (0.024)	44.470 (0.000)	0.480 (0.000)	-0.344 (0.000)	0.513 (0.000)

In Table 5, portfolios are sorted based on size and B/M. The results of this table indicate that in two portfolios, the ones consisting of big-sized companies with high B/M (BV) and the portfolio of big-sized companies with low B/M (BG), the obtained GARCH leverage coefficients (η) are positive and significant, contrary to the sign direction of other portfolios. The positivity of the GARCH leverage effects suggests that positive shocks (good news) cause more volatility in these portfolios than negative shocks (bad news). In contrast, for other portfolios, the leverage effect of negative shocks (news) on the volatility of portfolio returns is more pronounced than positive shocks. Furthermore, in line with theoretical expectations, the results show that the stability (α + β) of the BV portfolio (big size and big value) is higher than other portfolios. Therefore, it is evident that as the company's value increases, it undoubtedly possesses a higher level of assets. Moreover, a bigger size will contribute to better stability in crisis conditions than other investment companies. Additionally, among the portfolios, the mean coefficient in the estimated model (SQRT) for the SG portfolio (small size and low B/M) is higher than that of other portfolios, indicating that the average volatility change in this type of portfolio from companies is higher. Also, the high intercept coefficient in the SG portfolio suggests a higher return for this type of company than other companies. The estimated ARMA coefficients in the models are also statistically significant.

Table 5. Estimation Results for Portfolios Sorted by Size and B/M

Variables	Model	$SQRT$	AR	MA	C	α	η	β
SG	ARMA(1,1)-GJR-GARCH(1,1)-M	1.678 (0.035)	AR(1) 0.822 (0.000)	MA(1) -0.776 (0.000)	291.773 (0.000)	0.026 (0.000)	-0.124 (0.000)	0.048 (0.000)
SM	ARMA(1,2)-GJR-GARCH(1,1)-M	-0.302 (0.325)	AR(1) 0.802 (0.000)	MA(1) -0.562 (0.000) MA(2) -0.092 (0.008)	115.539 (0.000)	0.216 (0.000)	-0.353 (0.000)	0.574 (0.000)
BG	ARMA(3,1)-GJR-GARCH(1,1)-M	1.538 (0.000)	AR(1) 0.563 (0.008) AR(2) -0.073 (0.170) AR(3) 0.006 (0.008)	MA(1) -0.336 (0.116)	31.929 (0.000)	0.045 (0.000)	0.062 (0.000)	0.036 (0.000)
BM	ARMA(3,3)-GJR-GARCH(1,1)-M	-0.064 (0.744)	AR(1) 1.419 (0.000) AR(2) -0.060 (0.289) AR(3) -0.370 (0.000)	MA(1) -1.215 (0.000) MA(2) -0.213 (0.000) MA(3) 0.436 (0.000)	98.107 (0.000)	0.410 (0.000)	-0.314 (0.000)	0.313 (0.000)
BV	ARMA(3,3)-GJR-GARCH(1,1)-M	0.444 (0.000)	AR(1) 1.535 (0.000)	MA(1) -1.396 (0.000)	6.649 (0.000)	0.401 (0.000)	0.063 (0.000)	0.545 (0.000)

In Table 6, companies' portfolios are sorted based on financial leverage and B/M to better distinguish portfolio results. According to the results of this table, the return rate (C) in the portfolio of companies with low financial leverage and medium value (LM) is the highest compared to other portfolios. Additionally, the stability of companies with high financial leverage and medium value (HM) is better than that of other portfolios, especially in critical and unfavourable financial conditions. This may be because companies with high leverage, presumably, can better cope with financial challenges and experience greater stability by having a strong ability to finance. Furthermore, the results indicate that, in line with theoretical expectations, the mean coefficient in the estimated model (SQRT) for companies with high financial leverage and B/M (HV) is higher than other portfolios. This is because, obviously, the higher a company's financial leverage, the greater the likelihood of discontinuous return changes. However, a noteworthy point in the classification results of this group is that the GARCH leverage coefficient for the return of the entire group of these companies is negative and significant. This suggests that negative news effects outweigh positive news effects, leading to changes in the trend of this group of portfolios. Additionally, the estimated coefficients of the ARMA models are also significantly meaningful.

Now, one of the ways to ensure the adequacy of the fitted models is to perform goodness-of-fit tests. In this regard, the fitted models for portfolios with variance homogeneity should exhibit no variance after the model estimation. Based on this, the ARCH test has been conducted to investigate this matter, and the results indicate that this test's null hypothesis has not been rejected for all 13 portfolios. The results of this test are presented in Table 7 based on the sorted portfolios. Therefore,

the fitted models do not exhibit variance homogeneity; thus, the model estimation results can be relied upon.

Table 6. Estimation Results for Portfolios Sorted by **Financial Leverage and B/M**

Variables	Model	$SQRT$	AR	MA	C	α	η	β
LG	ARMA (1,2)-GJR-GARCH(1,1)-M	0.345 (0.041)	AR (1) -0.768 (0.004)	MA (1) 0.986 (0.000) MA(2) 0.153 (0.068)	78.647 (0.000)	0.277 (0.000)	-0.230 (0.000)	0.556 (0.000)
LM	ARMA(1,1)-GJR-GARCH(1,1)-M	-0.728 (0.002)	AR (1) 0.329 (0.000)	MA (1) -0.011 (0.874)	188.479 (0.000)	0.290 (0.000)	-0.431 (0.000)	0.224 (0.000)
HG	ARMA(3,3)-GJR-GARCH(1,1)-M	-1.775 (0.000)	AR (1) -0.906 (0.000) AR (2) 0.017 (0.876) AR (3) 0.603 (0.000)	MA (1) 1.307 (0.000) MA (2) 0.582 (0.000) MA (3) -0.255 (0.001)	182.853 (0.000)	0.207 (0.000)	-0.330 (0.000)	0.300 (0.000)
HM	ARMA(1,1)-GJR-GARCH(1,1)-M	0.397 (0.005)	AR (1) -0.398 (0.001)	MA (1) 0.563 (0.000)	59.810 (0.000)	0.298 (0.000)	-0.264 (0.000)	0.621 (0.000)
HV	ARMA(1,2)-GJR-GARCH(1,1)-M	0.536 (0.000)	AR (1) 1.062 (0.000)	MA (1) -0.980 (0.000)	77.215 (0.000)	0.292 (0.000)	-0.129 (0.000)	0.570 (0.000)

Table 7. ARCH Test

Variables	ARCH Test	P-Value
BL	0.898	0.334
SH	0.053	0.817
BH	0.500	0.479
SG	1.974	0.160
SM	0.510	0.820
BG	0.339	0.560
BM	0.914	0.339
BV	0.254	0.613
LG	0.810	0.775
LM	0.370	0.542
HG	0.766	0.381
HM	0.021	0.883
HV	1.153	0.282

5. Conclusion

In the context of the expanding significance of financial markets, any fluctuations in these markets have considerable impacts on the economy. Given the role of a diversified and appropriate portfolio

in risk reduction and considering investors' uncertainty about the future, taking measures to mitigate risk becomes crucial. Formulating a diverse portfolio can significantly decrease overall risk. While numerous strategies for selecting portfolios with desirable returns and minimal risk have been explored in existing research, the efficacy of these selections depends on diverse factors and parameters influencing the risk and return of the portfolio. This study examines the impact of different equity portfolio strategies on stock return volatility and the stability of fluctuations from three perspectives: financial leverage, company value, and size. This investigation employs a hybrid model, ARMA (p, q)-GJR-GARCH (1, 1)-M. Furthermore, given the leverage structure of companies' balance sheets, the impact of leverage on the volatility of stock returns in the context of both positive and negative news has been investigated. To this end, a systematic elimination method was employed, and 185 active companies listed on the TSE from 2011 to 2022 were selected:

1. Classification Based on Size and Financial Leverage: When ranking companies in portfolios based on size and financial leverage, smaller-sized companies with bigger financial leverage exhibit higher returns, variance, and average volatility compared to other portfolios. Moreover, greater stability is observed in portfolios with big size and leverage, and negative news has a more significant impact on the trend of these portfolios compared to positive news.

2. Classification Based on Size and B/M: In portfolios categorized by size and B/M, positive news has a greater effect than negative news in portfolios with big size and low B/M, as well as big size and high B/M. Conversely, for other portfolios, the impact of negative news is greater than positive news. The stability of portfolios with big size and big value is also higher than other portfolios. The mean coefficient in the estimated model (SQRT) indicates that the average changes in portfolios with small size and low B/M are greater than those of other companies.

3. Classification Based on Financial Leverage and B/M: Regarding portfolios categorized by financial leverage and B/M, portfolios with low leverage and medium B/M have the highest returns among other classifications. Companies with big leverage and medium value demonstrate greater stability than other portfolios, and the mean coefficient in the estimated model (SQRT) in portfolios with high leverage and high B/M is higher than in other portfolios. However, a crucial result in this classification is that the effects of negative news, compared to positive news, cause more changes in the trend of all companies in this portfolio group.

Based on the findings of the research and utilizing the hybrid ARMA (p, q)-GJR-GARCH (1, 1)-M model, it is recommended that investors and market participants incorporate intelligent strategies based on this model into their decision-making processes. This hybrid model, combining ARMA and GARCH components, provides potential capability for predicting market fluctuations and optimizing risk management. Employing this model as a powerful analytical tool enhances the guidance of investors in their decision-making processes, contributing to accuracy and efficiency in predicting and managing market fluctuations. Investors are advised to diversify their investment portfolios using broad and diverse strategies to optimize investment performance. Selecting balanced strategies, considering factors such as financial leverage, B/M, and size, is crucial. Additionally, developing a news management system to reduce the impact of market changes and price fluctuations can lead to sustainable improvement in investment performance. It is recommended that the stability of companies be given sufficient importance in investment selection so that factors affecting yield fluctuations are properly considered.

Based on the current research findings, it is recommended that more advanced models such as hybrid models like ARIMA-ANN, GARCH-ANN, VAR-MLP, LSTM-SVR, LSTM -XGBOOST and ARIMA-SVR be employed in the analysis of financial markets in future studies. The application of neural network models, considering their deep learning capabilities and more complex interaction with information, can contribute to improving prediction accuracy and interpreting market

complexities. Additionally, advancing sophisticated mathematical models and systemic analysis, taking into account various factors and their interactive effects, can aid in interpreting study results and enhance the accuracy of the analysis. Furthermore, improving analyses by considering new variables, such as economic indicators or other market variables, and incorporating more data as model inputs will assist in conducting more extensive and precise analyses. Finally, the development of hybrid models by integrating diverse approaches and utilizing time-series data can offer broader insights into market behaviors, providing effective assistance to investors and organizations in their decision-making processes.

References

1. Ahmed, Z. and Hla, D. T. (2019). Stock return volatility and capital structure measures of nonfinancial firms in a dynamic panel model: Evidence from Pakistan. *International Journal of Finance & Economics*, 24(1), pp. 604-628. https://doi.org/10.1002/ijfe.1682
2. Al-Slehat, Z. A. F., Zaher, C. and Fattah, A. (2020). Impact of financial leverage, size, and assets structure on firm value: Evidence from industrial sector, *Jordan. International Business Research*, 13(1), pp. 109-120. DOI:10.5539/ibr.v13n1p109
3. Asyik, N. F., Agustia, D. and Muchlis, M. (2023). Valuation of financial reporting quality: is it an issue in the firm's valuation?. *Asian Journal of Accounting Research*, (ahead-of-print). https://doi.org/10.1108/AJAR-08-2022-0251
4. Bhowmik, R. and Wang, S. (2020). Stock market volatility and return analysis: A systematic literature review. *Entropy*, 22(5), p. 522. https://doi.org/10.3390/e22050522
5. Bollerslev, T. (1986). Generalized autoregressive conditional heteroskedasticity. *Journal of Econometrics*, 31(3), pp. 307-327. https://doi.org/10.1016/0304-4076(86)90063-1
6. Box, G. E., Jenkins, G. M., Reinsel, G. C. and Ljung, G. M. (2015). Time series analysis: forecasting and control. John Wiley & Sons, U.S. https://www.scirp.org/reference/ReferencesPapers?ReferenceID=1969833
7. Brooks, C. (2014), *Introductory econometrics for Finance (3rd.)*, New York: Cambridge University Press, New York. https://doi.org/10.1017/CBO9781139540872
8. Cenesizoglu, T. (2011). Size, book-to-market ratio and macroeconomic news. *Journal of Empirical Finance*, 18(2), pp. 248-270.
9. Chen, J., Chollete, L. and Ray, R. (2010). Financial distress and idiosyncratic volatility: An empirical investigation. *Journal of Financial Markets*, 13(2), pp. 249-267. https://doi.org/10.1016/j.finmar.2009.10.003
10. Christie, A. A. (1982). The stochastic behavior of common stock variances: Value, leverage, and interest rate effects. *Journal of Financial Economics*, 10(4), pp. 407-432.https://doi.org/10.1016/0304-405X(82)90018-6
11. Ehrmann, M. and Fratzscher, M. (2004). Taking stock: Monetary policy transmission to equity markets. *Journal of Money, Credit and Banking*, 36, pp. 719-737. https://www.jstor.org/stable/3839039
12. Engle, R. F. (1982). Autoregressive conditional heteroscedasticity with estimates of the variance of United Kingdom inflation. Econometrica: *Journal of the econometric society*, 987-1007. https://doi.org/10.2307/1912773
13. Engle, R. F. and Ng, V. K. (1993). Measuring and testing the impact of news on volatility. *The Journal of Finance*, 48(5), pp. 1749-1778. https://doi.org/10.1111/j.15406261.1993.- tb05127.x
14. Fama, E. F. and French, K. R. (2015). A five-factor asset pricing model. *Journal of financial economics*, 116(1), pp. 1-22. https://doi.org/10.1016/j.jfineco.2014.10.010

15. Fama, E. F. and French, K. R. (2018). Choosing factors. *Journal of financial economics*, 128(2), 234-252. https://doi.org/10.1016/j.jfineco.2018.02.012
16. Friedmann, R. and Sanddorf-Köhle, W. G. (2002). Volatility clustering and nontrading days in Chinese stock markets. *Journal of Economics and Business*, 54(2), pp. 193-217. https://doi.org/10.1016/S0148-6195(01)00062-5
17. Ghasemzadeh, M., Heydari, M., and Mansourfar, G. (2021). Earning volatility, capital structure decisions and financial distress by SEM. *Emerging Markets Finance and Trade*, 57(9), pp. 2632-2650. https://doi.org/10.1080/1540496X.2019.1663729
18. Glosten, L. R., Jagannathan, R. and Runkle, D. E. (1993). On the relation between the expected value and the volatility of the nominal excess return on stocks. The Journal of Finance, 48(5), pp. 1779-1801. https://doi.org/10.1111/j.1540-6261.1993.tb05128.x
19. Grachev, O. Y. (2017). Application of time series models (ARIMA, GARCH, and ARMA-GARCH) for stock market forecasting. Northern Illinois University, DeKalb, United States. https://huskiecommons.lib.niu.edu/studentengagement-honorscapstones/177
20. Ibhagui, O. W. and Olokoyo, F. O. (2018). Leverage and firm performance: New evidence on the role of firm size. *The North American Journal of Economics and Finance*, 45, pp. 57-82. https://doi.org/10.1016/j.najef.2018.02.002
21. Kashyap, S. (2023). Review on volatility and return analysis including emerging developments: evidence from stock market empirics. *Journal of Modelling in Management*, 18(3), pp. 756-816. https://doi.org/10.1108/JM2-10-2021-0249
22. Kontonikas, A. and Kostakis, A. (2013). On monetary policy and stock market anomalies. *Journal of Business Finance & Accounting*, 40(8), pp. 1009-1042. https://doi.org/10.1111-/jbfa.12028
23. Krause, T. A. and Tse, Y. (2016). Risk management and firm value: recent theory and evidence. *International Journal of Accounting and Information Management*, 24(1), pp. 56-81. https://doi.org/10.1108/IJAIM-05-2015-0027
24. Lam, K. S. (2002). The relationship between size, book-to-market equity ratio, earnings–price ratio, and return for the Hong Kong stock market. *Global finance journal*, 13(2), pp. 163-179. https://doi.org/10.1016/S1044-0283(02)00049-2
25. Li, X., Brooks, C. and Miffre, J. (2009). The value premium and time-varying volatility. *Journal of Business Finance & Accounting*, 36(9-10), pp. 1252-1272. https://doi.org/10.1111/j.1468-5957.2009.02163.x
26. Liu, H. and Shao, S. (2016). India's tea price analysis based on ARMA model. *Modern Economy*, *7*(2), pp. 118-123. https://doi.org/10.4236/me.2016.72014
27. Manzoor, D. and Yadi-Poor, M. (2016). Evaluation and Prediction of Price Fluctuations in the Iranian Electricity Market Using the ARMAX-GARCH Model. *Quantitative Economics Quarterly*, 13(1), pp. 97-117. (In Persian). https://doi.org/10.22055/jqe.2016.12328
28. Mehrara, M. and Abdoli, G. (2006). The Asymmetry of Stock Market Volatility: The Case of Iran. *Iranian Journal of Economic Research*, 8(26), pp. 25-40. https://ijer.atu.ac.ir/article_3706.html?lang=fa
29. Mirzaei, K., Fotouh Abadi, V. and Nosratabadi, J. (2019). Investigating the Factors Affecting Bitcoin Fluctuations and the Inherent Financial Risks in Cryptocurrencies Using the GARCH Model (1,1). *Defense Economics*, 3(10), pp. 131-148. (In Persian). https://doi.org/20.1001.1.25382454.1397.3.10.6.6
30. Modigliani, F., and Miller, M. H. (1958). The cost of capital, corporation finance and the theory of investment. *The American Economic Review*, 48(3), pp. 261-297.

https://www.jstor.org/stable/1809766
31. Nelson, D. B. (1991). Conditional heteroskedasticity in asset returns: A new approach. Econometrica: *Journal of the econometric society*, 59(2), pp. 347-370. https://doi.org/10.2307/2938260
32. Nourahmadi, M. and Sadeqi, H. (2023). Portfolio Diversification Based on Clustering Analysis. *Iranian Journal of Accounting, Auditing and Finance*, *7(*3), pp. 1-16. https://doi.org/10.22067/ijaaf.2023.43078.1092
33. Nugroho, B. Y. (2020). The effect of book to market ratio, profitability, and investment on stock return. *International Journal Of Economics And Management Studies*, 7(6), pp. 102-107. https://doi.org/10.14445/23939125/IJEMS-V7I6P114
34. Nukala, V. B. and Prasada Rao, S. S. (2021). Role of debt-to-equity ratio in project investment valuation, assessing risk and return in capital markets. *Future Business Journal*, *7*(1), p. 13. https://doi.org/10.1186/s43093-021-00058-9
35. Otaify, M. (2020). Modeling volatility of size, value and financial leverage-sorted portfolios: Evidence from Egyptian stock exchange. *Journal of Public Affairs*, 22(2), A. e2369. https://doi.org/10.1002/pa.2369
36. Park, H. (2019). An intangible-adjusted book-to-market ratio still predicts stock returns. *Critical Finance Review*, 25(1), pp. 207-236. https://cfr.pub/forthcoming/papers/park2019intangible.pdf
37. Pätäri, E., Ahmed, S., Luukka, P. and Yeomans, J. S. (2023). Can monthly-return rank order reveal a hidden dimension of momentum? The post-cost evidence from the US stock markets. *The North American Journal of Economics and Finance*, 65, A. 101884. https://doi.org/10.1016/j.najef.2023.101884
38. Pontiff, J. and Schall, L. D. (1998). Book-to-market ratios as predictors of market returns. *Journal of financial economics*, 49(2), pp. 141-160. https://doi.org/10.1016//S0304-405X(98)00020-8
39. Ramezani Sharif Abadi, M., Aliahmadi, S., Aghabeikzadeh, M. (2022). The effect of Size, Value and Idiosyncratic Risk Anomalieson the Relationship between Tail Risk and Stock Excess Returns. *Iranian Journal of Accounting, Auditing and Finance*, 6(1), pp. 77-90. https://doi.org/10.22067/ijaaf.2022.41544
40. Rønold, A. H. and Hausken, F. O. H. (2018). *A Dynamic ARMA-GARCH Model: Forecasting Returns and Trading at the Oslo Stock Exchange*, Master's thesis, NTNU, Trondheim, Norway. http://hdl.handle.net/11250/2573100
41. Rutkowska-Ziarko, A. (2015). The influence of profitability ratios and company size on profitability and investment risk in the capital market. *Folia Oeconomica Stetinensia*, 15(1), pp. 151-161.https://doi.org/10.1515/foli-2015-0025
42. Shin, H. H. and Stulz, R. M. (2000). Firm value, risk, and growth opportunities. Dice Center Working Paper No. 2000-8, Available at SSRN. https://dx.doi.org/10.2139/ssrn.234344
43. Tahir, S. H., Sabir, H. M., Alam, T. and Ismail, A. (2013). Impact of firm's characteristics on stock return: a case of non-financial listed companies in Pakistan. *Asian Economic and Financial Review*, 3(1), pp. 51-61. https://archive.aessweb.com/index.php/5002/arti-article/view/972
44. Vithessonthi, C. and Tongurai, J. (2015). The effect of firm size on the leverage–performance relationship during the financial crisis of 2007–2009. *Journal of Multinational Financial Management*, 29, pp. 1-29. https://doi.org/10. 1016/j.mulfin. 2014.11.001
45. Vo, X. V. (2015). Foreign ownership and stock return volatility–Evidence from Vietnam. *Journal of Multinational Financial Management*, 30, pp. 101-109. https://doi.org/10.1016/j.mulfin.2015.03.004

46. Vo, X. V. (2016). Does institutional ownership increase stock return volatility? Evidence from Vietnam. *International Review of Financial Analysis*, 45, pp. 54-61. https://doi.org/10.1016/j.irfa.2016.02.006
47. Vuong, G. T. H. and Nguyen , M. H. (2024). Firm value, stock return volatility, and growth opportunity: Insight from an emerging market, *The International Conference on Accounting and Financial Economics.*14(1), pp. 100-118. https://www.researchgate.net/publication/378179986
48. Vuong, G. T. H., Van Nguyen, P., Barky, W. and Nguyen, M. H. (2024). Stock return volatility and financial distress: Moderating roles of ownership structure, managerial ability, and financial constraints. *International Review of Economics & Finance*, 91, pp. 634-652. https://doi.org/10.1016/j.iref.2024.01.054
49. Zabol, M. A. and Abounoori, E. (2020). Evaluation of RGARCH Model to Estimate the Conditional Variance of Tehran Stock Exchange Index. *Journal of Investment Knowledge*, 9(33), pp. 129-145 (In Persian). https://jik.srbiau.ac.ir/article_12379.html?lang=fa

IJAAF; Vol. 8, No. 4, Autumn 2024, Serial 29

Ferdowsi University of Mashhad

Iranian Journal of
Accounting, Auditing & Finance

Quarterly

RESEARCH ARTICLE

Guilt Aversion and the Financial Behavior of Individuals: The Moderating Role of Ethical Ideologies

Mahsa Esmaeili, Alireza Fazlzadeh*, Vahid Ahmadian, Sajad Nagdi

Department of Economics, Management and Accounting, University of Tabriz, Tabriz, Iran

How to cite this article:
Esmaeili, M., Fazlzadeh, A., Ahmadian, V., & Nagdi, S. (2024). Guilt Aversion and the Financial Behavior of Individuals: The Moderating Role of Ethical Ideologies. *Iranian Journal of Accounting, Auditing and Finance*, *8*(4), 89-105. doi: 10.22067/ijaaf.2024.45035.1435
https://ijaaf.um.ac.ir/article_45035.html

ARTICLE INFO

Article History
Received: 2023-08-08
Accepted: 2024-01-12
Published online: 2024-10-25

Keywords:
Experimental Economics, Ethical Ideologies Financial Behavior, Guilt Aversion, Social Effects

Abstract

In the rapidly advancing economic and technological landscape, the importance of ethical considerations in individual decision-making has gained unprecedented attention. The absolute authority held by one party in certain business contexts, such as participatory budgeting and financial consulting, emphasizes the significance of ethical decision-making. This research aims to investigate how individuals' guilt aversion influences their financial behavior while also considering the moderating role of their ethical ideologies. This approach addresses the research gap regarding the oversight of individuals' personal attitudes toward ethics when studying guilt aversion. The study population was comprised of undergraduate students at the University of Tabriz, and a sample of 52 participants was selected using a random sampling method. The sample was then divided into two groups, dictators and receivers, and their behavior was examined. A combination of active observation and questionnaire methods was employed to collect data. The results suggest that while guilt aversion does not significantly impact individuals' financial behavior, ethical ideologies moderate the relationship between guilt aversion and financial behavior.

https://doi.org/10.22067/ijaaf.2024.45035.1435

NUMBER OF REFERENCES
25

NUMBER OF FIGURES
0

NUMBER OF TABLES
7

Homepage: https://ijaaf.um.ac.ir
E-Issn: 2717-4131
P-Issn: 2588-6142

*Corresponding Author: Alireza Fazlzadeh
Email: fazlzadeh_acc@yahoo.com
Tel: 09144042925
ORCID:

1. Introduction

Technology has empowered us to conduct virtual transactions that often occur without direct communication between the involved parties. Consequently, the importance of ethical behavior in transactions and agreements is greater than ever before. Numerous factors influence ethical behavior among individuals, Including social preferences.

In recent years, researchers have examined social preference models extensively, which, to some extent, can cultivate a sense of responsibility in individuals toward their transaction counterparts. These models often investigate individual behavior at the crossroads of personal gains without necessarily accounting for the interests of others, considering both personal gains and social status. Social preference models assume that people, while pursuing their own interests, also concern themselves with the benefits or interests received by others (Charness and Rabin, 2002). People with social preferences believe that other's gains might have far-reaching consequences for them (Fehr and Charness, 2023). Researchers have provided various reasons to explain the attention paid to social status by different individuals. Some studies attribute guilt aversion to be impactful on ethical behavior and behavior based on social preferences. However, other researchers refute the impact of guilt aversion on individuals' behavior, highlighting factors such as group dependence and the effect of false consensus. On the other hand, some studies report a limited effect of guilt aversion, observed only in specific conditions, such as reduced social distances and the allocated share for the transaction parties.

In economics, guilt aversion is considered a significant factor affecting the level of trust between transaction parties and their ethical behavior. Guilt aversion is based on the idea that people avoid feeling guilty (disappointing others who have trusted them makes people feel guilty). (Fehr and Charness, 2023). As individuals experience higher levels of guilt aversion, they tend to behave more ethically. Therefore, it might be possible to leverage this fact to ensure ethical behavior (Rasmußen, 2015).

Amidst these investigations, guilt aversion has garnered more attention and emphasis compared to other factors influencing individuals' social behavior. According to the research by Balafoutas and Sutter (2017), guilt aversion has been identified as a significant factor impacting social behavior, drawing considerable attention in economic studies. The sense of guilt and the necessity to pay heed to guilt aversion arise within an individual when they perceive that their actions have diverged from the expectations of their transaction counterpart regarding potential gains (Charness and Dufwenberg, 2006).

In the absence of complete contracts, guilt aversion is considered a factor in reducing unethical risks. Therefore, assuming that interaction and reduced social distance intensify the effect of guilt aversion on individuals' behavior, successful communication within companies will not only convey information and strengthen individuals' sense of responsibility but also help them obtain a clearer image of others' expectations (Balafoutas and Sutter, 2017). Thus, determining an appropriate social distance among individuals and identifying and considering other factors influencing guilt aversion is of utmost importance to create suitable conditions for eliciting guilt aversion among individuals.

Although guilt aversion may significantly affect financial behavior (especially in specific societies and circumstances), an individual's ethical characteristics may influence guilt aversion. Individuals possess diverse ethical characteristics and, consequently, varying ethical ideologies. It is evident that individuals' moral judgment on what constitutes an unethical action and the consequent degree of guilt they could feel about the projection of an unethical action can differ among them based on their ethical ideology. That is why this study will incorporate the ethical ideology variable in examining guilt aversion's effect on individuals' financial behavior within the Iranian society to further refine the results.

This research aims to investigate how people with varying ethical ideologies react to a business-related topic. Understanding individuals' ethical traits seems essential in predicting their decisions. Thus, the study will examine how guilt aversion affects peoples' choices. Additionally, by examining the role of social distance, the research will explore how individuals' ethical ideologies impact the results.

Considering the challenges businesses face today, the main question of this research is whether individuals with dissimilar ethical ideologies display different responses to a business-related topic. Examining individuals' ethical characteristics is crucial for predicting their financial behavior. That is why this study will first examine the impact of guilt aversion on financial behavior and, subsequently, taking into account the effects of social distance, explore the influence of individuals' ethical ideologies on this relationship.

We must take into account the research conducted by Ellingsen et al. (2010), who deemed the results of Charness and Dufwenberg (2006) unreliable due to the creation of false consensus effects for the participants. In light of this research, we aimed to eliminate the potential issues by employing the dictator game in our experiment. This choice serves two purposes: firstly, it eliminates the false consensus effect as the dictator game will not allow for strategic responses; and secondly, according to Cason and Mui (1998), in other games, such as trust games, it is not entirely clear whether the change in behavior of the first mover is due to social effects or simply a strategy for obtaining higher gains.

In conclusion, the study of guilt aversion and its influence on financial behavior is highly relevant in the modern business landscape. Understanding the intricate relationships between guilt aversion, ethical ideologies, and financial behavior could potentially enable us to devise better processes and regulations. This research aims to contribute to behavioral economics and business ethics.

2. Literature review

Today, greater than ever before, the rapidly advancing landscape of economics, politics, and technology amplifies the importance of ethical considerations in individuals' decision-making (Rasmußen, 2015). These considerations are paramount in certain businesses, such as participatory budgeting (Brown et al., 2009), accounting reporting (Rasmußen, 2015), and financial consulting (Angelova and Regner, 2013). The discretionary power held by one of the parties involved (the principal decision-maker) can be considered as the main reason behind the said significance. Thus, examining individuals' behavior and the ability to predict it in such circumstances carries significant implications.

Classical economic theories emphasize the rationality of human behavior in decision-making and do not validate behavior based on beliefs (Dufwenberg, 2008). For instance, traditional game theory, as an extension of the classical view, envisions humans as rational beings making entirely logical decisions to maximize personal gain. They tend to ignore that human behavior is not always grounded in logic, and emotions sometimes drive decisions. Consequently, contemporary economists introduced a new branch of game theory called Behavioral Game Theory (Stevens, 2008). According to this theory and the subset of economic behavior theory known as Behavioral Finance, individuals' emotions sometimes influence their behaviour. The behavior also impacts society, and the decisions of others influence their decisions (Cartwright, 2018). The theories of fairness and the observer effect further emphasize that people take into account the well-being of others and what is considered as socially acceptable behavior and look to strike an optimal balance between personal interests and societal interests when making a decision (Cason and Mui, 1998).

Social interests necessitate that individuals, in decisions that impact others besides themselves,

consider the expectations of others and exhibit socially positive behavior (Balafoutas and Sutter, 2017). People with social preferences may ignore their own payoff to receive other people's satisfaction or for potential long-term achievements (Fehr and Charness, 2023).

2.1 Guilt aversion and financial behavior

In 2007, Batigalli and Dufwenberg proposed two theories for guilt aversion. Their first theory was based on disrupting the counterparty's expectations, suggesting that individuals lacking precise information about the first-order beliefs of others will be influenced by second-order beliefs. In other words, guilt-averse individuals will take into account their counterparty's expectations and make utmost efforts to fulfill them. Their second theory was based on simple guilt, implying that people consider the extent of disruption of their counterparty's expectations important. According to these theories, if guilt aversion is established in a society, there would not be a significant need to enforce strict regulations to control the behavior.

Ellingsen et al. (2010) argued that the examination of guilt aversion theory in previous research was incomplete. They named the presence of a false consensus effect as the culprit responsible. In their investigation, they developed a method to assess guilt aversion while mitigating the problem. Their method was based on eliciting first-order beliefs of the responder about the decision-maker's behavior in a dictator game. They achieved this by asking participants to guess the amount of money allocated by the dictator and establishing a reward for accurate guesses. The information showing the guesses was available to the dictator (the responder's first-order beliefs), but they themselves were unaware of this fact. The experiment was conducted through two trust games, and it was concluded that there was no correlation between the responder's guesses and the amount of money allocated by the decision-maker (dictator), thus rejecting the guilt aversion theory. According to their research, the false consensus effect is responsible for a significant portion of the relationship between second-order beliefs and behaviors, and the actual level of guilt aversion in previous studies is much less than measured.

Contrary to the previous theories regarding guilt aversion, Kawagoe and Narita (2014) proposed that guilt aversion does not affect individuals' decision-making. They defined guilt aversion as follows: People feel guilty when they betray the expectations of others, expectations that are often influenced by the behavior and promises of others. According to Kawagoe and Narita's theory, internal barriers within individuals are not powerful enough to maintain ethical behavior.

Balafoutas and Sutter (2017) investigated the effects of guilt aversion on individuals' decision-making under two conditions: the presence and absence of pre-game communication. Their hypothesis posited that if the parties interacted before the game commenced, the effects of guilt aversion would be more pronounced. This hypothesis stemmed from their belief that communication and interaction reduce social distance, leading to a heightened sense of responsibility for the decision-maker. To examine this, they utilized the dictator game to mitigate false consensus effects and strategic decision-making. These two scholars, critical of Ellingsen et al.'s approach in utilizing first-order beliefs of the responder, devised a novel method to assess guilt aversion, which involved revealing the previous transaction history of the second party to the decision-maker. They provided the decision-maker with a number portraying the average amount for the previous transactions of the second party. This number played the role of first-order beliefs for the participants and functioned as a mediator for the decision-makers' second-order beliefs. The variables employed in this study included the dictator's level of generosity, the average of previous transactions of the responder, the individuals' gender, and the period. Using regression analysis, Balafoutas and Sutter examined the impact of independent variables on the dependent variable, namely the dictator's level of generosity, and concluded that guilt aversion only influences individuals' behavior and level of generosity under

conditions of pre-game interaction and communication. In this study, individuals' gender and the period did not significantly affect the dictator's level of generosity and consequently, neither did the individual's guilt aversion. Cartwright et al. 2023 conducted an experiment using the public good game to examine individuals' guilt aversion. They categorized individuals into two groups: pro-social and pro-self. The results of their study confirmed guilt aversion. They sought the optimal conditions for ethical behavior and concluded that pro-social individuals exhibit the best behavior in a complete network (when individuals are aware of others' Social Value Orientation) while pro-self individuals demonstrate optimal behavior in an empty network (when individuals are only aware of their own Social Value Orientation).

According to research conducted so far, guilt aversion varies across different societies. While some studies have accepted the presence of guilt aversion and its impact on individuals' financial behavior (Rasmußen, 2015; Dufwenberg, 2008; Khalmetski, 2016; Attanasi et al., 2019; Cartwright et al., 2023), others have reported different interpretations (Güth et al., 2009; Kawagoe and Narita, 2014), attributing changes in behavior to factors such as the false consensus effect and group dependence. Furthermore, some researchers have confirmed the effect of guilt aversion on behavior only in specific conditions and with reduced social distance (Brosig et al., 2003; Beck et al., 2013; Bellemare et al., 2018).

This research falls under the category of applied studies in terms of its objective and belongs to the descriptive-correlational research approach. The current study aims to identify relationships between several variables, including guilt aversion, financial behavior, and ethical ideology.

This research aims to study guilt aversion's impact on individuals' financial behaviour within Iranian culture and society. To this end, the first hypothesis of the research is formulated as follows:

Hypothesis 1: Guilt aversion significantly impacts individuals' financial behavior.

By investigating the role of guilt aversion in financial decision-making in the particular society of Iran, this study looks to deepen our understanding of ethical decision-making and its implications in diverse social and cultural settings.

2.2 Ethical ideology and guilt aversion

Financial psychology emphasizes the influence of personality, culture, and investors' judgment on behavior. An important characteristic that shapes differences in ethical judgment is the variance in individuals' ethical ideologies (Forsyth and Berger, 1982). Forsyth introduced ethical ideology and its types in 1980 in light of the theories presented. Forsyth categorized individuals' ethical ideologies into four groups based on their idealism or relativism and their being idealistic or pragmatistic. These groups were named situationists, absolutists, subjectivists, and exceptionists. Forsyth also designed the EPQ questionnaire to measure the ethical position of individuals and determine which ethical groups they belong to. He argued that people’s ethical judgments might be influenced by their ethical ideologies, and individuals in different ideological groups might have different judgments about the ethicality of a behavior (Forsyth, 1981). Although ethical ideology did not lead to differences in ethical behavior in Forsyth and Berg's (1982) experiments, individuals' ethical judgments of their unethical actions differed based on their ethical ideologies. Depending on their idealism and relativism levels, individuals had varying self-evaluations (Forsyth and Berger, 1982).

Incorporating the concepts of ethical ideology and different ethical philosophies into the study of guilt aversion and financial behavior provides a richer understanding of the complexities underlying individuals' decision-making processes.

The primary reason for investigating ethical ideology is its ability to distinguish individual differences in ethical judgment. According to theory, individuals with different ethical ideologies will apply different logic to ethical judgments. Similar to skeptics, situationists base their ethical

judgments on the situation and different conditions. Subjectivists reject all presented theories and judge ethical behaviors based on their personal interests. Absolutists consider both the outcomes of actions and global ethical laws. Their behavior aligns more with deontologists. Exceptionists also consider global ethical laws but differ from absolutists in that they believe that under certain circumstances, it's permissible to prioritize the interests of some individuals over others (Barnett et al., 1994).

Exploring ethical ideologies sheds light on how people with various ethical beliefs might approach an ethical dilemma. This substantially influences their financial decisions and behavior. Understanding the interplay between ethical ideology, guilt aversion, and financial choices is critical for comprehending the complexity of human decision-making processes in financial contexts.

Because different ethical ideologies cause variations in judgments about the ethical nature of the behavior, it was inferred that the influence of different ethical ideologies could also be observable in people's business behavior. Barnett et al. (1994) was the first study on the impact of different ethical ideologies on business behavior. According to these scholars, as differing ethical ideologies lead to variations in individuals' reasoning about ethical issues, these differences will manifest in diverse business behaviors.

The ethical behavior of business students can serve as an indicator of their future behavior in the business world. In other words, if business students cheat or make specific behaviour judgments, their tendencies could symbolize their future business conduct (Allmon et al., 2000). Therefore, studying the behavior of business students can be utilized for further research.

In previous research, the role of various ethical ideologies of individuals (which can potentially moderate the outcomes of their behavior and the influence of behavior due to guilt aversion) has not received sufficient attention. The current study aims to incorporate the variable of individuals' ethical ideologies, examine the effect of guilt aversion on financial behavior in different situations, and consider various types of ethical ideologies. Based on this, the second hypothesis of the research is formulated as follows:

Hypothesis 2: Ethical ideology has a moderating role in the impact of guilt aversion on the financial behavior of individuals.

3. Methodology

Population: The statistical population of the current study consists of undergraduate students of the Faculty of Economics and Management at Tabriz University. According to the university's website statistics, the total number of these students is 440.

Sample Selection: The study sample was selected using random sampling, and a sample size of 52 individuals was chosen. The research sample was divided into two groups: dictators and recipients. Only the behavior of 26 dictator individuals was studied.

Data Collection Method: A library research method was employed to collect theoretical information and prevailing theories related to the research variables. Primary data was collected using a combination of active observation and questionnaires. The study was conducted in a laboratory environment, and the first data collection stage utilized the Z-tree software. The second stage was defining an individual's ethical ideology. The Forsyth Ethical Position Questionnaire (EPQ) was used to classify individuals based on their ethical ideologies. A 9-point Likert scale ranging from "Strongly Agree" to "Strongly Disagree" was used.

Validity and Reliability: Content validity and Cronbach's alpha were employed to establish the validity and reliability of the questionnaire.

Use of z-tree: The z-tree program aimed to ensure a safe social distance for participants. This was done to ensure that participants were not aware of the decisions made by the other party, maintaining

their anonymity. The z-tree program's design ensured that individuals had no knowledge of others' roles (dictator or recipient) and were unaware of their counterpart's identity. This design decision aimed to minimize participants' tendency to conform to societal norms and instead make decisions based on personal inclination and level of ethical sensitivity.

3.1 Conceptual Definitions of Variables

Guilt aversion is the sensation an individual feels when they perceive that they have deviated from another person's expectations about something they would gain. For example, in a financial transaction, when an individual is aware of their counterparty's expectations, guilt aversion might prevent them from giving less money than what is expected. Guilt-averse individuals feel unhelpful when others are dissatisfied with them (Ellingsen et al., 2010).

Financial Behavior: Any behavior related to money is considered financial behavior. Common financial behaviors include handling cash, credit, and savings behaviors.

Ethical Ideology: The ethical ideology of individuals is divided into four groups based on two components: idealism and relativism (Forsyth and Berger, 1982):

1) Idealistic and Non-Relativistic.
2) Pragmatic and Non-Relativistic.
3) Idealistic and Relativistic.
4) Pragmatic and Relativistic.

3.2 Operational Definitions of Variables

Guilt Aversion: This variable in the current study indicates how much the decision-making individual pays attention to the other party's expectations. In this research, the transaction history of the recipient person will be used as their expectation, and it will be provided to the decision maker or dictator. Using transaction history as a substitute for directly asking the second party about their expectations reduces the possibility of misrepresenting expectations. This means that the likelihood of the recipient person unrealistically presenting their expectations to influence the ethical sensitivity of the decision-making person is eliminated.

Financial Behavior: In this study, this variable is considered the decision maker's behavior. Its extent is measured based on the degree of monetary concession that the decision maker offers to the other party, taking into account the probability of considering the interests of others alongside their own interests.

Ethical Ideology: Using the EPQ questionnaire, the ethical ideology variable will be categorized into four distinct groups. Individuals will be classified into a group based on the level of idealism or relativism the questionnaire uncovers. The first ten questions (questions 1 to 10) examine idealism, and the rest (questions 11 to 20) will measure relativism.

3.3 Research method

In the first part of the study, a computer-based game was designed to collect data following the Balafoutas and Sutter (2017) methodology. The sample was divided into three groups, and participants engaged in the experiment on three separate days. Each day, 20 (or 12) participants played the game in four different stages.

We prearranged for the random division of the participants in the study using the Z-tree software. They were divided into two groups: dictators and recipients. The random selection operated in each stage of the experiment to select half of the individuals (10 or 6) and assign them to the first group to play the dictator role, while the rest of the participants were assigned to the second group and became recipients in the game. It should be noted that through the experiment, only the behaviors of the

members of the dictators' group were analyzed, and the data gathered from the behavior of the recipients had no effect on the outcome of the study.

Stage One: In this stage, consisting of 10 (or 6) rounds, each dictator had to divide 100 units of money between themselves and a randomly assigned recipient in each round. After the game, this 100-unit money was converted to a common currency using a specific coefficient, which participants knew. However, the coefficient value was not disclosed to prevent dictators from anticipating the impact of the allocated money on them. Each dictator interacted with each recipient only once in this stage, and all participants were aware of this.

Stage Two: Similar to the first stage, dictators had to divide 100 units of money with the recipient in each round. The only difference was that the average transactions of the recipient's earnings became apparent to the dictators from the second round onwards. Dictators could learn the average amount received by the recipient in previous rounds before making decisions. This average amount represented the recipient's expectations (first-order beliefs) and the dictator's second-order beliefs. If a dictator attempted to deviate from these expectations, it indicated their guilt aversion.

Stages Three and Four: These stages were similar to the first two stages, but with the addition that in stage four, starting from the second round, some dictators were allowed to engage in electronic chat communication with their respective recipients. This was designed to investigate the effect of actual and anticipated chats on participants' behavior.

In the second part of the research, the Forsyth Ethical Position Questionnaire (EPQ) was implemented within the Z-tree software to assess the ethical ideologies of the participants. People answered the 20 questions in the questionnaire, and the collected data was analyzed in relation to the outcomes of the first part of the game. This approach aimed to ensure that the questionnaire's questions did not influence participants' decision-making during the game.

3.4 Data Analysis and Models

Instead of directly questioning participants about their expectations from their counterparts, this experiment provided a history of the participant's transactions with their counterparts (dictators). This history served as an intermediary to assess the level of guilt aversion. Furthermore, the ethical ideology questionnaire divided participants into four groups based on their ethical ideologies. The impact of guilt aversion on participants' behavior with different ethical characteristics was examined.

Descriptive statistics and the Spearman correlation coefficient were employed to describe the characteristics of the population. Considering the binomial nature of the dependent variable and the presence of both continuous and categorical independent variables, logistic regression was employed to test the research hypotheses,

In the data analysis phase of our study, three different models were defined to study the behavioral changes in the participants. The first model aimed to investigate any changes in financial behavior, the second focused specifically on positive changes, and the third examined only negative changes in financial behavior. Next, A dependent variable was defined for each of these changes, which could take values between 0 and 1 (“1” if the desired change of the respected model was observed and “0” otherwise). Ultimately, the logistic regression analysis treated this defined variable as the virtual dependent variable.

4. Research findings and data

4.1 Validity and reliability of research instruments

The questionnaires must be tested for validity and reliability in any research to ensure their credibility. This study assessed content validity using the Content Validity Index (CVI) and the Content Validity Ratio (CVR). Initially, the questionnaire was provided to experts who confirmed its content validity. Lawshe's Content Validity Ratio was used to validate the questions, resulting in a

CVI score above 0.79 for all questions, indicating their content validity.

CVR, on the other hand, assesses the importance and correctness of the questions. It evaluates whether each question is essential or not. To determine the CVR, the questionnaire was reviewed by 10 expert individuals. The reliability of the questionnaire is another crucial aspect that needs to be evaluated for the questions to be considered accurate. The questionnaires used in this study include standardized ones, and since their reliability hasn't been previously tested within the Iranian sample, it was necessary to examine their reliability. The Cronbach's alpha method assessed the questionnaire's reliability, yielding acceptable results (0.74).

4.2 Results of hypothesis testing

In this study, a binary virtual variable was created to detect changes in the behavior of dictators. This variable was constructed based on four stages of the experiment:

a. No information is available to the dictator.
b. Making the average amount received transparent to the decision-maker (dictator).
c. No information is available.
d. Revealing the transaction history and the potential for chat and communication between the parties involved.

Relative to the baseline (first stage), the differences in the dictator's financial behavior in each stage were calculated using three different models:

1) The first model sought to determine the likelihood of changes in the dictator's financial behavior.
2) The second model aimed to examine the specific chance of positive changes.
3) The third model aimed to determine the probability of negative changes.

For each model, a binary virtual variable was defined. Firstly, a "diff1" was formed for the first model, where diff1 = 0 indicated no change in the dictator's behavior (relative to the baseline), and diff1 = 1 indicated the presence of a change. Likewise, the "diff2" variable was defined for the second model of our study, with diff2 = 1 meaning positive behavioral change and diff2 = 0 indicating other conditions (no change or negative change). Finally, in our third model, a "diff3" was created following the pattern, diff3 = 1 only if a negative change in a dictator’s behavior was identified and diff3 = 0 for else.

In this step, logistic regression was performed using the backward stepwise method to assess the likelihood of changes in individuals' financial behavior. The model included 8 main predictor variables (baseline proposal, chat, ethical ideology, gender, birthplace, field of study, age, and trading history) and 2 interaction variables (product of chat and trading history and product of ethical ideology and trading history). The logistic regression was applied step by step to the model, removing variables that were not influential in each step. The impact of other variables was evaluated without the presence of non-influential variables.

Table 1. Statistics of Financial Behavior Differences

Variable Name	Data Count	Minimum (Number of Observations)	Maximum (Number of Observations)	Mean	Standard Deviation	Variance	Skewness	Kurtosis
Diff1	708	0 (219)	1 (489)	0.69	0.463	0.214	0.827-	1.320-
Diff2	708	0 (439)	1 (269)	0.38	0.486	0.236	0.496	1.759-
Diff3	708	0 (488)	1 (220)	0.31	0.463	0.214	0.820	1.332-

Source: Researcher's calculations

The overall model, which included all variables, was statistically significant ($P < 0.001$, $\chi 2 = 35.73$), indicating that the model was able to recognize participants who experienced changes in their financial behavior. Based on the obtained results shown in Table 2, 3, the overall model described between 20.60% (Cox and Snell R-squared) and 29.00% (Nagelkerke R-squared) of the variance in financial behavior and correctly predicted the outcome in 75.60% of the cases. Moreover, it is noteworthy to point out the high sensitivity of this model, where there was a 91.82% accuracy in identifying the proportion of changes in individuals' financial behavior. Additionally, the specificity of the designed model was recorded to be 39.27%, demonstrating its capability to accurately identify the proportion of cases with no change in the behavior.

Table 2. Logistic Regression Results for Model 1 (diff1 as the dependent variable without main predictor variables)

Dependent Variable: diff1 / Logistic Regression

Variable Name	Variable Coefficient	Standard Error	Wald Statistic	Significance	Marginal Effect	Likelihood Ratio	95% Confidence Interval	
							Lower limit	Upper limit
1/boffer	06.34**	14.10	28.11	00.0	46.6	06.34**	1.45E+06	2.65E+23
1.boffer^2	52.33-**	91.9	46.11	00.0	36.6-	52.33-**	00.0	00.0
Chat2	92.4**	12.2	38.5	02.0	93.0	92.4**	14.2	79.8760
Ideology2	96.1-**	36.0	04.29	00.0	37.0-	96.1-**	07.0	29.0
City1	42.0*	24.0	05.3	08.0	08.0	42.0*	95.0	41.2
Field1	67.1**	51.0	89.10	00.0	32.0	67.1**	97.1	36.14
Field2	65.3**	84.0	80.18	00.0	69.0	65.3-**	41.7	50.201
age	44.0-**	01.0	05.23	00.0	08.0-	44.0-**	54.0	77.0
Transaction history*chat1	01.0-*	01.0	01.3	08.0	00.0-	01.0-*	98.0	00.1
Transaction history*chat2	11.0-**	05.0	57.5	02.0	02.0-	11.0-**	81.0	98.0
Transaction history*ideology 2	03.0**	01.0	62.6	01.0	00.0	03.0**	01.1	05.1
Transaction history*ideology 3	02.0**	01.0	17.5	02.0	00.0	02.0**	00.1	03.1
Intercept	61.8**	75.1	20.24	00.0	00.0	61.8**	_	_

*and ** indicate significance at 5% and 10% levels, respectively.

The values obtained for PPV (Positive Predictive Value) and NPV (Negative Predictive Value) indicate that if the likelihood of changes in financial behavior is high for a specific sample, the model can substantially confirm these probabilities at 77.15%. Even if the likelihood of ant changes is low, the model can confirm the probability to 68.25%. These findings highlight the model's ability to

predict changes and non-changes in individuals' financial behavior based on specific probabilities.

Table 3. Logistic Regression Model 1 in Details

Cox & Snell R Square	Nagelkerke R Square	Percentage correct	PPV	NPV	sensitivity	specificity
60.20%	00.29%	60.75%	15.77%	25.68%	82.91%	27.39%

The results obtained from Model 1 indicate that the main predictor variables, including base offer, chat, ethical ideology, field of study, and age, had a statistically significant contribution to the model. The interaction variables, chat1past, chat2past, pastideology2, and pastideology3, also played a significant role in the model. Based on the findings of Model 1, the final model is represented as follows:

Log(P(diff1=1)/(1-P(diff1=1))) = 13.333 + 35.129*(1/boffer) - 34.269*(1/boffer^2) + 4.498chat2 - 0.873ideology1 - 2.046ideology2 + 1.11ideology3 + 2.739field1 + 4.38field2 - 0.692age – 0.01(chat1past) - 0.101(chat2past) + 0.023(ideology2past) + 0.017(idelogy3*past)

Logistic regression was again applied to the dependent variable diff2 in this stage. The regression was conducted in a stepwise manner, similar to Model 1, and included 8 main predictor variables (base offer, chat, ethical ideology, gender, birthplace, field of study, age, and transaction history), along with 2 interaction variables (chat*transaction history and ideology*transaction history). Non-significant variables were gradually removed from the model, and the coefficients for the remaining variables were calculated. The overall model in this stage was statistically significant ($P<0.001$, $\chi2 =162.488$), indicating its ability to distinguish between participants who experienced positive behavioral changes in their financial behavior and those who did not.

Based on the results shown in Tables 4 and 5, the overall model explains between 20.50% (Cox and Snell R Square) and 27.90% (Nagelkerke R Square) of the variance in financial behavior. It correctly predicts 71.90% of cases. The sensitivity of the model is 43.49%, meaning it can accurately detect 43.49% of positive behavioral changes. Additionally, the model's specificity is 89.29%, demonstrating its ability to correctly predict 89.29% of no positive behavioral changes (negative or no change). The values of PPV and NPV show that if, for a specific sample, the probability of positive behavioral change is high, the model can confirm this with an accuracy of 71.34%. Moreover, the precision of the model would similarly be at 72.06% if the probability of positive behavioral change is low.

The results obtained from Test (2) indicate that six main predictor variables, namely base offer, chat, ethical ideology, birthplace, field of study, and age, along with two interaction variables (transactions history * chat2 and transactions history* ideology2), have shown statistically significant effects in the regression. Taking these influential variables and their coefficients into account, the final model can be represented by the following equation:

Log(P(diff2=1)/(1-P(diff2=1))) = 4.981 + 68.68*(1/boffer) - 62.47*(1/boffer^2) + 5.015chat2 - 1.506ideology2 - 0.435city1 + 1.508field1 + 1.666field2 - 0.368age - 0.128*(chat2past) + 0.038(ideology2*past)

Table 4. Logistic Regression Results for Model 2

Dependent Variable: diff1 / Logistic Regression								
Variable Name	**Variable Coefficient**	**Standard Error**	**Wald Statistic**	**Significance**	**Marginal Effect**	**Likelihood Ratio**	**95% Confidence Interval**	
							Lower limit	**Upper limit**
1.boffer	68.65**	01.9	16.52	00.0	71.15	35.3	6.08E+20	1.84E+36
1.boffer^2	47.62-**	85.8	80.49	00.0	95.14-	00.0	00.0	00.0
Chat2	02.5**	91.1	92.6	00.0	20.1	71.150	59.3	90.6322
Ideology2	51.1-**	44.0	56.11	00.0	36.0-	22.0	09.0	53.0
City1	44.0-**	21.0	18.4	04.0	10.0-	65.0	43.0	98.0
Field1	51.1**	45.0	18.11	00.0	36.0	52.4	87.1	94.10
Field2	67.1**	48.0	93.11	00.0	40.0	29.5	06.2	62.13
age	37.0-**	08.0	03.23	00.0	08.0-	69.0	60.0	80.0
Transaction history*chat2	13.0-**	05.0	98.7	00.0	03.0-	88.0	80.0	96.0
Transaction history*ideology2	04.0**	01.0	23.10	00.0	00.0	04.1	01.1	06.1
Intercept	98.4**	44.1	89.11	00.0	19.1	67.145	_	_

*and ** indicate significance at 5% and 10% levels, respectively.

Table 5. Logistic Regression Model 2 in Details

Cox & Snell R Square	Nagelkerke R Square	Percentage correct	PPV	NPV	sensitivity	specificity
50.20%	90.27%	90.71%	34.71%	06.72%	49.43%	29.89%

Finally, logistic regression was once again repeated backwards stepwise, but in this case, the dependent variable was the negative change in individuals' financial behavior (diff3). Similar to previous stages, the main predictor and interaction variables were considered (including 8 main predictor variables: base offer, chat, ethical ideology, gender, birthplace, field of study, age, and transaction history, along with 2 interaction variables: chat * past and ideology * past). The overall model in this stage was statistically significant ($P<0.001$, $\chi 2 = 151.312$), indicating its ability to distinguish between participants whose financial behavior changed negatively and others.

According to the results demonstrated in Table 6, 7, the overall model explains between 17.80% (Cox and Snell R Square) and 25.10% (Nagelkerke R Square) of the variance in individuals' financial behavior. It correctly predicts 70.90% of cases. The sensitivity of the third model is 36.36%, which indicates its ability to accurately detect 36.36 percentage of negative behavioral changes. Additionally, the model's specificity is 86.47%, demonstrating its ability to correctly predict this percentage of no negative behavioral changes (positive or no change). The values obtained for PPV and NPV show that if the probability of negative behavioral change is high for a specific sample, the model can confirm this with an accuracy of 54.79%. Similarly, if the probability of negative behavioral change is low, the model can confirm this with an accuracy of 75.09%.

The text discusses the results obtained from Model (3) analysis and their implications. It starts by mentioning that due to the possibility of the receiver's transaction history shaping their second-order beliefs about the dictator's expectations, the variable "transaction history" is considered a second-order belief in the model. If these second-order beliefs positively change individuals' financial behavior, it can be inferred that risk aversion has significantly impacted their behavior. However, since the transaction history variable did not significantly impact any of the three presented models

at a 90% confidence level, the null hypothesis of no effect of risk aversion on financial behavior cannot be rejected, and the proposed claim is not acceptable.

Table 6. Logistic Regression Results for Model 3

Dependent Variable: diff1 / Logistic Regression								
Variable Name	**Variable Coefficient**	**Standard Error**	**Wald Statistic**	**Significance**	**Marginal Effect**	**Likelihood Ratio**	**95% Confidence Interval**	
							Lower limit	**Upper limit**
1/boffer	61.46-**	09.9	28.26	00.0	74.5-	00.0	00.0	00.0
1.boffer^2	63.36**	89.15	31.5	02.0	51.4-	8.07E+15	85.240	2.70E+29
City1	01.1**	20.0	81.25	00.0	13.0	75.2	86.1	06.4
Field2	90.0**	37.0	97.5	02.0	11.0	46.2	20.1	07.5
Transaction history*chat2	02.0**	00.0	22.7	00.0	00.0	02.1	00.1	03.1
Transaction history*ideology2	03.0-**	00.0	01.11	00.0	00.0	97.0	96.0	99.0
Intercept	07.6**	60.2	45.5	02.0	80.0	82.431	_	_

*and ** indicate significance at 5% and 10% levels, respectively.

Table 7. Logistic Regression Model 3 in Details

Cox & Snell R Square	Nagelkerke R Square	Percentage correct	PPV	NPV	sensitivity	specificity
80.17%	10.25%	90.70%	79.54%	09.75%	36.36%	47.86%

Furthermore, considering the relationship between the parties prior to the dictator's decision, the following results are obtained: The interaction variable chat1*past showed a significant role in Model (1), indicating that the transaction history in the presence of a chat before the decision has a negative effect on changing individuals' financial behavior. In other words, when individuals know their transaction history and chat with the other party, they are less likely to change their proposed offer in the baseline stage. However, this variable did not significantly affect Models (2) and (3). Thus, because second-order beliefs did not result in a positive change in individuals' behavior, the null hypothesis regarding the absence of risk aversion's effect on financial behavior in the presence of pre-game communication remains unrefuted, and the proposed claim is not accepted.

It was observed that this variable had a negative effect in Models (1) and (2) and a positive effect in Model (3). Therefore, it can be concluded that the anticipation of chat before the game did not positively influence the second-order beliefs of the decision maker and, in turn, their behavior. As a result, the null hypothesis regarding the absence of risk aversion's effect on financial behavior remains unrefuted, and the proposed claim is not accepted.

Regarding the role of moral ideology as a moderator in the impact of risk aversion on individuals' financial behavior, considering that the interaction variable "ideology*transaction history" is significant in relation to the subjectivists d and exceptions groups, it can be concluded that the effect of transaction history in these groups differs from the baseline group. Therefore, moral ideology is accepted as a moderator in the relationship between risk aversion and financial behavior.

Furthermore, the results indicate that the interaction variable "ideology1*transaction history" did not significantly affect any of the presented models. Thus, absolutists are not expected to differ in risk aversion compared to situations. On the other hand, the results show that the interaction variable "moral ideology2*transaction history" had a positive effect in Models (1) and (2) and a negative effect

in Model (3). Therefore, it is observed that transaction history, when considering moral ideology oriented towards the subjectivists, has played a significant role in positive changes in individuals' behavior. The relationship between risk aversion and financial behavior among these individuals is stronger than the baseline or situationist groups.

5. Conclusion

The current study's primary objective was to investigate guilt aversion's impact on individuals' financial behavior while considering the role of ethical ideology as a moderating variable. Initially, based on traditional economic theories, it seemed that individuals would demonstrate selfish behavior, focusing solely on their own interests. Accordingly, if they were asked to divide a specified amount of money between themselves and the other party, they would allocate the entire amount to themselves. However, the results of previous research did not confirm this assumption. According to prior research, individuals' behavior does not align entirely with traditional economic theories. Instead, individuals consider social preferences in their choices (Rasmußen, 2015).

In this study, individuals did not allocate a minimum of 0 and a maximum of 100 to the counterparty, indicating that their behavior is not completely rational (based on traditional economic theories that benefit themselves) or completely honest (benefiting the counterparty). Therefore, it is observed that individuals, in addition to economic interests, consider their social interests in the financial distribution between themselves and others. Among the potential factors influencing individuals' financial behavior, guilt aversion is examined in this study, which looks at the financial behavior of individuals influenced by guilt aversion. The study employed logistic regression to analyze the changes in individuals' financial behavior based on the research variables to achieve this.

In this regard, three models were utilized for research goals. The first model related to the overall change in individuals' financial behavior, the second referred to positive change, and the third concerned the negative changes. The research goals were divided into two main categories: primary and secondary goals. Taking into account the primary goal of investigating guilt aversion's impact on individuals' financial behavior, the results demonstrated that guilt aversion would not influence individuals' financial behavior. Because the awareness of the counterparty's expectations before decision-making did not lead to any difference in the dictator's decision making. The result indicates that guilt aversion does not affect financial behavior without communication. This finding is similar to previous studies such as those of Kawagoe and Narita (2014) and Balafoutas and Sutter (2017). Still, it differs from the findings of Charness and Dufwenberg (2006) and Khalimetski (2016), confirming guilt aversion's impact even without communication between parties.

In light of the secondary objectives of the research, it was observed that in cases where there is a connection between the transaction parties, awareness of the counterparty's expectations leads to a negative change in the decision-maker's behavior. This observation contradicts the definition of guilt aversion. Therefore, it can be concluded that in the current sample, individuals' decisions are not influenced by guilt aversion, even in the presence of interactions and reduced social distance with the counterparty. Additionally, it was observed that ethical ideology moderates the relationship between guilt aversion and financial behavior. Chatting among subjectivists positively influenced decision-making, and they made more moral decisions after chatting with the other party. Given that none of the previous studies has examined the impact of individuals' ethical ideology on the connection between guilt aversion and financial behavior, the results obtained are not comparable with any past studies.

Many human behaviors in financial relationships and preference-based decisions adhere to the theory of guilt aversion. Awareness of the level of guilt aversion among individuals in a society can play a crucial role in managing that society. Managers should determine their relationships with

members of the community and the nature of interactions among community members based on the level of individuals' guilt aversion. For example, in a company where employees are selected from a community whose guilt aversion has been determined based on past research, the extent of the impact of guilt aversion on individuals depends on their awareness of the counterpart. It is advisable to enhance communication between individuals, and employees should establish stronger connections with their managers, colleagues, and supervisors.

Moreover, in a company where employees do not exhibit guilt aversion-based behavior, managers should establish stricter and more rigorous regulations regarding employees' tasks to control their behavior and prevent unethical conduct. They should also exercise increased supervision over their behavior.

In conclusion, understanding guilt aversion can have significant implications for managing social relationships and making informed decisions. Managers should tailor their strategies based on the guilt aversion tendencies of individuals, fostering better communication and enhancing ethical behavior in organizations.

Similar to other research, the current study has certain limitations regarding research methodology and data collection. The study was conducted in a laboratory environment within the university. Despite the attempt to keep the parties unaware of each other and the experiment organizers, individuals may have been somewhat concerned about negative social judgments related to their decision-making, causing their behavior to not purely reflect the extent of their sense of responsibility and guilt aversion. Another limitation was the number of participants in each stage, as the relatively smaller number of participants in each stage might have made individuals doubt the confidentiality of their identity in front of others. Additionally, the selected sample only comprised a limited segment of the overall population (consisting of undergraduate students from the Faculty of Economics and Management). Therefore, the results of this study can only be applied to societies where the characteristics of individuals in that community are similar to the characteristics of the current research sample.

In conclusion, it is recommended that, in addition to replicating this study to confirm the results in different environments and conditions, further research should explore the nature and scope of the impact of other potential variables.

Based on the current study's findings, which indicated that the impact of guilt aversion was not confirmed in the overall sample and this impact differed concerning individuals' ethical ideology, it can be stated that in cases where company managers are not aware of their employees' ethical ideologies or when the community of employees consists of individuals with varying ethical ideologies, they should establish stricter rules and standards for their employees' financial decisions. Reducing the social distance between the parties will not positively influence their behavior in such communities. However, if most individuals in a group were subjectivist, communications before the financial decision making would positively affect the decision makers' ethical behaviour.

References

1. Allmon, D. E., Page, D. and Rpberts, R. (2000). Determinants of perceptions of cheating: Ethical orientation, personality and demographics. *Journal of Business Ethics*, 23(4), pp. 411-422. http://dx.doi.org/10.1023/A:1006087104087
2. Angelova, V. and Regner, T. (2013). Do voluntary payments to advisors improve the quality of financial advice? An experimental deception game. *Journal of Economic Behavior & Organization*, 93, pp. 205-218. https://doi.org/10.1016/j.jebo.2013.03.022
3. Attanasi, G., Rimbaud, C. and Villeval, M. C. (2019). Embezzlement and guilt aversion. *Journal of Economic Behavior & Organization*, 167, pp. 409-429.

https://doi.org/10.1016/j.jebo.2019.02.002
4. Balafoutas, L. and Sutter, M. (2017). On the nature of guilt aversion: Insights from a new methodology in the dictator game. *Journal of Behavioral and Experimental Finance*, 13, pp. 9-15. https://doi.org/10.1016/j.jbef.2016.12.001
5. Barnett, T., Bass, K. and Brown, G. (1994). Ethical ideology and ethical judgment regarding ethical issues in business. *Journal of Business Ethics*, 13(6), pp. 469-480. https://doi.org/10.1007/BF00881456
6. Beck, A., Kerschbamer, R., Qiu, J. and Sutter, M. (2013). Shaping beliefs in experimental markets for expert services: Guilt aversion and the impact of promises and money-burning options. *Games and Economic Behavior*, 81, pp. 145-164. https://doi.org/10.1016/j.geb.2013.05.002
7. Bellemare, C., Sebald, A. and Suetens, S. (2018). Heterogeneous guilt sensitivities and incentive effects. *Experimental Economics*, 21(2), pp. 316-336. https://doi.org/10.1007/s10683-017-9543-2
8. Brosig, J., Weimann, J. and Ockenfels, A. (2003). The effect of communication media on cooperation. *German Economic Review*, 4(2), pp. 217-241. https://doi.org/10.1111/1468-0475.00080
9. Brown, J. L., Evans III, J. H. and Moser, D. V. (2009). Agency theory and participative budgeting experiments. *Journal of Management Accounting Research*, 21(1), pp. 317-345. 10.2308/jmar.2009.21.1.317
10. Cartwright, E. (2018). Behavioral economics. Routledge. (3rd ed.). London, U.K.
11. Cartwright, E., Chai, Y. and Xue, L. (2023). Are My Team Members Pro-Social? Information About Social Value Orientation Influences Cooperation in Public Good Games. Information About Social Value Orientation Influences Cooperation in Public Good Games. https://dx.doi.org/10.2139/ssrn.4628488
12. Cason, T. N. and Mui, V. L. (1998). Social influence in the sequential dictator game. *Journal of Mathematical Psychology*, 42(2-3), pp. 248-265. https://www.sciencedirect.com/science/article/abs/pii/S0022249698912135
13. Charness, G. and Dufwenberg, M. (2006). Promises and partnership. *Econometrica*, 74(6), pp. 1579-1601. http://hdl.handle.net/10.1111/j.1468-0262.2006.00719.x
14. Charness, G. and Rabin, M. (2002). Understanding social preferences with simple tests. *The Quarterly Journal of Economics*, 117(3), pp. 817-869. https://doi.org/10.1162/003355302760193904
15. Dufwenberg, M. (2008). Psychological games. *The New Palgrave Dictionary of Economics*, 6, pp. 714-717. http://dx.doi.org/10.1057/978-1-349-95121-5_2116-1
16. Ellingsen, T., Johannesson, M., Tjøtta, S. and Torsvik, G. (2010). Testing guilt aversion. *Games and Economic Behavior*, 68(1), pp. 95-107. https://doi.org/10.1016/j.geb.2009.04.021
17. Fehr, E. and Charness, G. (2023). Social preferences: fundamental characteristics and economic consequences. Available at SSRN 4464745. University of California, Santa Barbara. https://dx.doi.org/10.2139/ssrn.4464745
18. Forsyth, D. R. (1980). A taxonomy of ethical ideologies. *Journal of Personality and Social Psychology*, 39(1), pp. 175. https://psycnet.apa.org/doi/10.1037/0022-3514.39.1.175
19. Forsyth, D. R. (1981). Moral judgment: The influence of ethical ideology. *Personality and Social Psychology Bulletin*, 7(2), pp. 218-223. https://psycnet.apa.org/doi/10.1177/014616728172006
20. Forsyth, D. R. and Berger, R. E. (1982). The effects of ethical ideology on moral behavior. *The Journal of Social Psychology*, 117(1), pp. 53-56. https://doi.org/10.1080/00224545.1982.9713406
21. Güth, W., Ploner, M. and Regner, T. (2009). Determinants of in-group bias: Is group affiliation mediated by guilt-aversion?. *Journal of Economic Psychology*, 30(5), pp. 814-827. https://doi.org/10.1016/j.joep.2009.07.001
22. Kawagoe, T. and Narita, Y. (2014). Guilt aversion revisited: An experimental test of a new

model. *Journal of Economic Behavior & Organization*, 102, pp. 1-9. 10.2139/ssrn.1704884
23. Khalmetski, K. (2016). Testing guilt aversion with an exogenous shift in beliefs. *Games and Economic Behavior*, 97, pp. 110-119. https://doi.org/10.1016/j.geb.2016.04.003
24. Rasmußen, A. (2015). Reporting behavior: a literature review of experimental studies. *Central European Journal of Operations Research*, 23(2), pp. 283-311. https://doi.org/10.1007/s10100-014-0379-y
25. Stevens, S. P. (2008). Games people play: Game theory in life, business, and beyond. *Great course*.

IJAAF; Vol. 8, No. 4, Autumn 2024, Serial 29

Iranian Journal of
Accounting, Auditing & Finance

Ferdowsi University of Mashhad

Quarterly

RESEARCH ARTICLE

The Effect of Managers' Delta and Vega on the Asymmetric Cost Behavior of Companies

Sana Forsat, Ali Ashtab*, Parviz Piri

Department of Accounting, Faculty of Economics and Management, Urmia University, Urmia, Iran

How to cite this article:
Forsat, S., ashtab, A., & piri, P. (2024). The Effect of Managers' Delta and Vega on the Asymmetric Cost Behavior of Companies. *Iranian Journal of Accounting, Auditing and Finance*, *8*(4), 107-123. doi: 10.22067/ijaaf.2024.45029.1439
https://ijaaf.um.ac.ir/article_45029.html

ARTICLE INFO

Article History
Received: 2023-09-30
Accepted: 2024-02-16
Published online: 2024-10-25

Abstract

This paper examines the impact of managers' stock incentives on changes in sales and selling, general, and administrative (SG&A) costs, which can help determine whether SG&A costs are sticky or non-sticky. This study employs two criteria for assessing managers' incentives: managers' wealth sensitivity to stock price changes (Delta) and managers' wealth sensitivity to stock returns (Vega). The first hypothesis posits that Delta influences cost stickiness, leading to a more significant cost increase in response to rising sales compared to decreasing sales. Conversely, the second hypothesis suggests that Vega directly affects non-sticky costs, whereby costs increase less in response to growing sales than decreasing ones. The statistical sample for this study comprises 138 companies from 2008 to 2023. A panel regression model was utilized to test the hypotheses, revealing that Delta significantly positively affects cost stickiness, while Vega has a significant negative effect.

Keywords:
Asymmetric Cost Behavior, Delta and Vega, Managers' Incentives, Managerial Stock

https://doi.org/10.22067/ijaaf.2024.45029.1439

NUMBER OF REFERENCES
29

NUMBER OF FIGURES
0

NUMBER OF TABLES
10

Homepage: https://ijaaf.um.ac.ir
E-Issn: 2717-4131
P-Issn: 2588-6142

*Corresponding Author: Ali Ashtab
Email: a.ashtab@urmia.ac.ir
Tel: 09144470787
ORCID: 0000-0002-7339-2100

1. Introduction

Recent empirical research shows that some costs, including SG&A costs, are asymmetrical in behavior. It is defined as the increase in costs due to the increase in activity level being more significant than the decrease in costs due to the decrease in activity level. Therefore, costs do not always change in proportion to activity level and some cases, it behaves asymmetrically, which is also referred to as stickiness (Anderson et al., 2003). One of the reasons that can create cost stickiness is the adjustment of resources by managers (Chen et al., 2012). To be more precise, managers keep unused resources to avoid the adjustment costs that lead to the consumption of these resources. Especially when activity levels are measured by sales revenue and declines are expected to be temporary. In contrast, managers facing a decline in sales levels delay decisions to cut supplies until demand falls permanently. Resource retention ranges from reducing production volumes to resource adjustment decisions causing cost stickiness (Brisker et al., 2022). This paper investigates the effect of two factors, Delta and Vega, on asymmetric cost behavior.

Cost stickiness is one of the most critical issues related to cost behavior and is one of the main topics of management accounting. Generally, the standard definition of cost behavior in financial and management accounting is expressed as management incentives of short-term earnings. Resource adjustment strategies based on cost behaviors can affect financial reporting choices. In particular, asymmetric cost responses to sales changes should increase revenue volatility (Hartlieb and Loy, 2022). Managers' understanding of asymmetric cost behavior improves their performance and future predictions. In general, wiser decisions can be made when costs are reduced or decreased (Hasani and Lal Bar, 2021). Therefore, managers' capabilities and strategies can affect the performance of the economic unit. Cost behavior also depends on management decisions associated with management's expectations about a future product or service demand or managers' incentives. Moreover, when sales decline, managers' ability to reduce surplus operating assets and unused resources is limited due to the resource adjustment of costs, such as layoffs. Managers' optimistic expectations about future demand, managerial incentives based on self-interest, and avoidance of adjustment costs are three key factors that encourage managers to maintain unused resources when sales decline. Therefore, the tendency of managers not to reduce some resources in the condition of decreasing sales leads to cost stickiness (Parsaei and Sohrabi, 2022).

In this study, managers' incentives on asymmetric behavior of cost using the effect of managerial stocks on the stickiness of SG&A costs have been studied, and the main difference between this study and previous studies is the criteria for measuring managers' incentives, which is based on Delta and Vega. Delta shows the changes in managers' wealth in stock changes and Vega in stock returns. Therefore, this study aims to determine whether Delta significantly positively affects cost stickiness and Vega's non-stickiness of costs.

Delta, which shows the wealth sensitivity of company executives to its share price changes, is used to align the interests of directors with shareholders. Thus, high Delta improves managers' performance because directors share dividends and losses with shareholders in Delta portfolios. However, directors are more exposed to unsystematic risk than the company's common shareholders and thus become risk-averse when making management decisions (Brisker et al., 2022). In contrast, Vega, which shows the wealth sensitivity of the company's management to its stock returns, has a direct relationship with managers' risk-taking. Due to the convergent return structure, the higher the Vega, the more the manager's willingness to take risks (Shirafkan et al., 2017). In the following, theoretical foundations and related research are presented. In the following section, hypotheses and empirical models are presented. Also, these hypotheses are examined. Finally, the conclusion is discussed after reviewing the descriptive statistics and findings.

2. Theoretical foundations

2.1 Theories Backing Assumptions

2.1.1 Managers' incentives

Separating ownership and management leads to a significant conflict of interest between directors and shareholders. Ownership of company shares by directors is critical to eliminate this problem and increase the motivation of managers. Managers who own the company's shares are less likely to do things that lead to a reduction in the company's value. Equity has two different effects on management incentives about risk. The first effect is the wealth sensitivity of management to the stock price, called Delta (Brisker et al., 2022), which means ownership of shares. The second effect is the sensitivity of managers' wealth to stock returns, which is referred to as Vega (Brisker et al., 2022), and mainly this effect is done through granting equity discretion (Low, 2009; Lewellen, 2006; Coles et al., 2006). Delta encourages managers to make decisions that may increase the company's value, which also may increase managers' wealth. For example, managers are more inclined to accept high-risk projects, leveraged decisions and cost of management policies. However, Delta could also dissuade managers from making risky decisions because it increases the effect of change in stock prices on managers' wealth portfolios (Risk Effect). As a result, Delta may provide an incentive for risk-averse managers to reject high-risk projects with positive net present value (Brisker et al., 2022).

On the other hand, Vega provides managers with risk-taking incentives for operational, investment, and financial decisions. The portfolio value of a manager's stock option increases the volatility of stock returns due to the convex return structure of options (Heidari and Shirinbakhsh, 2018). Hence, sensitivity to stock return volatility motivates managers to make higher-risk trading decisions (Guay, 1999). Recent research also shows that managers with higher Vega take riskier projects, have higher leverage, and focus more on fewer lines of business. Because these managers directly benefit from stock price fluctuations related to the company's risk levels due to the structure of the convex return on the stock option associated with Vega (Coles et al., 2006).

2.1.2 Asymmetric cost behavior

Many researchers have studied the relationship between activity levels and cost changes, and several theories exist. Costs are divided into fixed and variable categories concerning the level of activity. According to the old Model of cost behavior, when the activity level changes, the cost variable changes proportionally and the managers' decision about resource adjustment is not considered. When the income level increases, the rate of increase in costs is greater than when costs decrease due to the reduction of income level. Therefore, costs increase in proportion to the increase in sales, but costs do not decrease in proportion to the decrease in sales. This asymmetric behavior of cost that follows decreases and increases in sales is called cost stickiness (Calleja et al., 2006). For example, the SG&A costs examined in this study are sticky. Based on research by Anderson et al. (2003), when revenue increases by 1%, SG&A costs increase by 0.55%, but when sales decrease by 1%, SG&A costs decrease by 0.35% (Hosseinipour et al., 2019). Generally, cost stickiness is a feature of cost behavior about changes in activity level. It suggests that the cost increase when the activity level increases is more significant than the decrease in cost when the activity level decreases.

2.1.3 Factors affecting cost stickiness

The delay in adjusting costs and the length of the forecast period of management reflect management's view of the company's future state. Because managers believe that the future state of the company depends on their decisions, management predictions are expected to be one of the factors affecting cost stickiness. The second factor that impacts cost stickiness is the information managers

get from the economic environment. This information affects resource adjustment decisions. For example, the economic situation of the company's products (such as demand stagnation for consecutive periods) assures managers that this recession is sustainable (Mansourfar et al., 2017). In addition, the economic growth of the country where the company is operating in its market significantly impacts management's predictions. Also, the amount of assets and the number of employees are the practical features of the company that can affect cost stickiness. Because of the complexity of the manufacturing process and the machinery used by companies, managers consider resource re-acquisition costs in decisions related to resource adjustment. Also, a trained workforce, a vital asset today, impacts the company's success. Hence, management should consider the costs of losing a part of the human resources when deciding. In addition, when there is an increase in activity level, the rate of increase in costs is greater than the rate of reduction in costs, and when the volume of activity decreases, it is called cost stickiness (Banker and Chen, 2006). In general, cost stickiness is one of the features of cost behavior related to changes in activity level. This definition indicates that the increase in costs when the level of activity increases is more significant than the reduction in costs when the activity level decreases (Calleja et al., 2006). Understanding the importance of cost stickiness is vital, not only for managers but also for other groups as well. For example, understanding cost stickiness is also applicable to analysts, investors, and the implementation of audit procedures.

2.2 Literature review

Many studies have been done to understand the importance of sticky costs, including Restuti et al. (2023), which study cost stickiness behavior and uncertainty of environmental information in different strategies. Their research studies the effect of these two factors on managers' decision making. The study used data from companies in East Asian countries between 2013 and 2019. The results represent that the cost stickiness created by environmental information uncertainty is higher in companies with poor management in terms of different strategies. Just as managers' ability is practical regarding the stickiness of costs, weakness in company management increases the effect of environmental uncertainty on cost stickiness.

Hashemipour et al. (2023) realize that political decisions, government ownership structure, GDP growth, political communication and the amount of inflation that exists for the company affect the stickiness of corporate costs. Managers rely on information for future planning and budgeting, and the more accurate the information is, the fewer deviations there will be and the more accurate the future budgeting and planning will be.

Wu and Wilson (2022), in a study on analysts' understanding of asymmetric cost behavior, state that a lack of adequate understanding of asymmetric cost behavior (cost stickiness) causes this behavior to be not accurately considered in reports and predictions. Also, cost asymmetric behavior has nothing to do with prediction errors in companies with high-cost stickiness. The results provide analysts with a significant understanding of asymmetric cost behavior and cross-sectional differences in the probability of its occurrence.

Kim et al. (2022) found that firms with weak internal controls cannot provide managers with extensive and sufficient information about the company's internal resources. Uncertainty in the accuracy of information causes managers to postpone adjustment reforms in times of resource shortages until they have received complete information to make decisions. The results show that companies with weak internal control have more cost stickiness than others.

Brisker et al. (2022) state that costs change asymmetrically with increases and decreases in sales. The main cause for the asymmetrical behavior of costs is managers' decisions. Also, the results indicate that the ratio of changes in managers' stock to the stock price has a positive effect and the ratio of managers' stock to the stock return has a negative and significant effect on the stickiness of

costs. These results show that when the first ratio increases, cost stickiness increases and when the second ratio increases, the stickiness of costs decreases.

Parsaei and Sohrabi (2022) found that knowing the cost behavior against changes in sales and investigating the factors affecting the asymmetric behavior of costs leads to more awareness about managers' incentives and decisions. Also, the results of this research indicate that business debt has a significant inverse effect on the stickiness of corporate costs. In addition, the agency problem reinforces the inverse link between business debt and corporate cost stickiness.

Nekoueizade (2022) shows that cost stickiness cannot be separated from managers' incentives. The results also show a significant relationship between earnings management and cost stickiness; however, corporate governance does not affect the stickiness of costs. In addition, there was no significant relationship between the moderating effect of good corporate governance and the relationship between earnings management and cost stickiness.

Vadiei and Salehi (2022) examined the relationship between labor costs and cost stickiness. The research results indicate that the more employees there are, the stickier the labour force cost will be.

Karimzadeh et al. (2021) examined the moderating effect of agency problems on the relationship between business credit and stickiness of costs and found that using the three criteria in this study, there was no significant relationship between business credit and stickiness of costs. However, among the indicators of agency problem, the effect of capital expenditure on the relationship between the third criterion of business credit (ratio of accounts payable to purchase) and the stickiness of costs is confirmed. In contrast, there was no evidence of the effect of equity acquisition ratio on the relationship between the first criterion of commercial credit (ratio of accounts paid per cost of goods sold) and the second criterion of commercial credit (the ratio of accounts paid by sales) and the stickiness of costs.

2.3. Hypothesis development

As stated, the primary purpose of this study is to examine the effect of managers' incentives on asymmetric cost behavior. Delta and Vega criteria were used to measure managers' incentives. Delta defines the sensitivity of managers' wealth to stock price changes. According to this definition, the number of shares that the directors of a company have can be an influential factor in the management decisions of that company. Moreover, Vega shows the sensitivity of managers' wealth to stock returns, which is precisely calculated by multiplying the number of managerial shares in the stock price of the same year. Price changes are calculated from the difference in the stock price of the last year and the year under review. The stock return is considered to fluctuate returns. In order to examine the stickiness of the cost, SG&A costs will be the sample because these costs are the most considerable part of the costs in a company. Therefore, to examine the effect of Delta and Vega on the stickiness of the SG&A costs, the following hypotheses are proposed:

H1: *Managers' wealth Delta has a significant positive effect on sticky costs.*

Based on agency theory, equity incentives can align the interests of managers and shareholders in the long run. Managers with higher Delta make more effort to improve long-term performance since they share profits with shareholders in the future. However, Delta could dissuade risk-averse managers from adopting high-risk policies that could intensify the impact of stock price fluctuations on managers' entire wealth portfolios. These Delta-related incentives are considered in developing the first hypothesis about Delta's relationship to sticky costs.

When sales decline, such as in a poor economic condition, high Delta incentivizes managers to make risk-averse decisions (risk effect). So, when it is unclear whether the decline in sales is because of temporary market conditions or constant changes in the market, managers with high Delta are more likely to wait and postpone resource adjustments until they understand the permanent nature of

declining sales. Thus, the high Delta motivates managers to delay decisions to reduce resources intentionally; as a result, it causes cost stickiness. Moreover, when sales declines are temporary, managers with higher Deltas hesitate to reduce resources to avoid inefficient future adjustment costs that return sales to higher levels. In other words, managers with high Deltas are expected to maintain slack resources and accept lower profits in the short term to maximize the company's long-term value (reward effect).

When sales are rising in the current period, such as good economic conditions, high Delta managers are more likely to add resources to gain a first-mover advantage, increase market share and raise barriers to entry, thereby strengthening the company's competitive position and promoting the long-term value of the company as well as their wealth portfolio. Thus, when sales increase, the reward effect is overcome by the risk effect, which leads to cost stickiness. Overall, it is predicted that the Delta of managers' wealth portfolios is positively associated with asymmetric spending behavior. The second hypothesis of the research, which relates to the Vega effect, is presented as follows:

H2: *Manager's wealth Vega has a significant negative (positive) effect on sticky costs (anti-sticky).*

Since the portfolio value of a manager's stock option increases with volatility in the company's stock returns, Vega increases the CEO's tendency to make riskier operational and financial decisions (Coles et al., 2006). In order to decrease agency costs related to Vega's debts, creditors are likely to strengthen debt monitoring using short-term debt and related financial contracts (Brockman et al., 2010). Banker and Fung (2016) state that careful monitoring of debt through short-term debt and financial contracts creates anti-sticky (sticky) cost behavior because managers with high Vega should focus on short-term rather than long-term performance. When sales fall, intense monitoring by creditors forces top Vega executives to cut back on slack resources immediately after seeing a decline in sales, reduce slack resources to avoid a breach of the contract and pay off short-term debts. Top Vega managers facing financial constraints are also likely to be limited in the upward adjustment of resources when sales rise.

In addition, when there is more uncertainty in demand changes, high-Vega managers are more likely to reduce their resources immediately rather than using stock options and waiting to learn more about permanent demand reductions to reduce the potential risk of resource adjustment decisions. In addition, downward adjustment of resources to increase the company's short-term value may increase the company's risk. Panagopoulos et al. (2018) state that staff cuts are associated with more significant investor uncertainty, which is indicated by increased individual risk. Zorn et al. (2017) also found that downsizing firms were more likely to go bankrupt because these studies show that downward adjustment of resources may increase the risk and volatility of stock prices. According to Coles et al. (2006), Vega forces managers to focus on having fewer lines of business and increasing their wealth through volatility in stock returns. The company's increasing risks resulting from the downward adjustment of resources incentivize high-Vega managers to reduce committed resources immediately after sales decline. As a result, Vega incentivizes managers to make immediate downward adjustments for resources, which creates anti-sticky (sticky) cost behavior. Overall, it is predicted that the wealth portfolio of managers with high Vega directly affects anti-sticky cost behavior.

3. Research methodology

In order to verify the hypotheses of this paper, the correlation and regression between Delta and Vega with the stickiness of SG&A costs are investigated. The research methodology is ex post facto research (using past information) and in terms of purpose-based classification, it is applied research. EViews, Stata and Spss are used to analyze data. The statistical population of this study includes 138

companies listed on the Tehran Stock Exchange from 2008 to 2023. In this statistical population, the companies listed after 2008, those in the banking, insurance and investment industry, and companies whose financial year ends differently are ignored. Also, companies that are faced with non-trading in some years of the research period or have a trading interruption for more than six months are not included in the statistical population of this study due to incomplete information.

Before examining the effect of managers' incentives on cost stickiness, the stickiness of SG&A costs is estimated based on previous research models (Chen et al., 2012). The first Model is the base model for the study of cost stickiness and the second Model is estimated by considering economic control variables.

$$\Delta lnSG\&A_{it} = \beta_0 + \beta_1 \Delta lnsale_{it} + \beta_2 Decreasedummy_{it} \times \Delta lnsale_{it} + \varepsilon_{it} \quad (1)$$

$$\begin{aligned}\Delta lnSG\&A_{it} = {} & \beta_0 + \beta_1 \Delta lnsale_{it} + \beta_2 Decreasedummy_{it} \times \Delta lnsale_{it} \\ & + \beta_3 Decreasedummy_{it} \times \Delta lnsale_{it} \times Successivedecrease_{it} \\ & + \beta_4 Decreasedummy_{it} \times \Delta lnsale_{it} \times Aassetintensity_{it} \\ & + \beta_5 Decreasedummy_{it} \times \Delta lnsale_{it} \times Employeeintensity_{it} \\ & + \beta_6 Decreasedummy_{it} \times \Delta lnsale_{it} \times Stockperformance_{it} \\ & + Successivedecrease_{it} + Assetintensity_{it} + Employeeintensity_{it} \\ & + Stockperformance_{it} + \acute{\varepsilon}_{it} \quad (2)\end{aligned}$$

The dependent variable of these two models is ΔlnSG&A, which is defined as long-term changes in SG&A costs. ΔlnSale describes long-term changes in sales, and the binary variable Decreasedummy is defined as if sales decrease in a specific year compared to the previous year; the number is 1 otherwise 0 (if sales in year t decrease comparing to t-1,1otherwise 0). The successive decline is also a binary variable; if sales had decreased in the previous year compared to sales in the previous two years, it would be 1; otherwise 0 (If sales in the year t-1 decrease compared to t-2, 1, otherwise 0). Asset intensity represents the ratio of total assets to sales revenue. Employee intensity represents the ratio of employees to sales revenue in the current year and stock performance describes stock returns of the current year.

To examine the research hypotheses, we implement the following Model once with the Delta variable to examine the first hypothesis and again with the Vega variable to examine the second hypothesis.

$$Sticky_{it} = \beta_0 + \beta_1 Delta_{it} + \beta_2 \sum \Theta\ Governance_{it} + \acute{\varepsilon}_{it} \quad (3)$$

$$Sticky_{it} = \beta_0 + \beta_1\ Vega_{it} + \beta_2 \sum \Theta\ Governance_{it} + \acute{\varepsilon}_{it} \quad (4)$$

The dependent variable in this Model is the sticky variable, which is the criterion of stickiness and is calculated according to Sajjadi et al.'s research (2014):

$$Sticky_{it} = SG\&Aratio_{it} \times D_{it}^{SALES} \times D_{it}^{SG\&A} \quad (3\text{-}1)$$

In this formula, the SG&A ratio is calculated as follows:

$$SG\&Aratio = \frac{SG\&A_t}{SALES_t} - \frac{SG\&A_{t-1}}{SALES_{t-1}} \quad (3\text{-}1\text{-}1)$$

SG&A shows sales and general and administrative costs in years t and t-1. The Sales variable

shows sales in the same years. D_{it}^{SALES} is defined as if $\frac{SALES_t}{SALES_{t-1}} < 1$ it would be 1 and if $\frac{SALES_t}{SALES_{t-1}} \geq 1$ it would be 0 and also $D_{it}^{SG\&A}$ is defined as if SG&Aratio > 0, 1 and if SG&Aratio ≤ 0 , 0 will be assigned.

The independent variables of this Model are Delta and Vega, where Delta shows changes in the wealth of managers in the company (management stock) to changes in the share price of the same company. Vega is defined as changes in the wealth of managers of a company (management stock) to the volatility of shares (stock returns) of the same company. The governance variable is also obtained through factor analysis from the following three variables:

$$\sum\Theta \text{ Governance}_{it} = \Theta_0 + \Theta_1 \text{Productmarketcompetition}_{it} + \Theta_2 \text{Auditor}_{it} + \Theta_3 \text{ Creditrating}_{it} \quad (3\text{-}2)$$

Product market competition is the Herfindahl-Hirschman Index (HHI) calculated as the sum of squared market share using firm sales, based on two-digit (SIC) industry classification in year t. Auditor is a variable defined as, if the audit organization audits the company, is 1; otherwise, it gets 0. Finally, the credit rating variable of companies is determined based on Jafari and Ahmadvand's (2015) calculation of Z and its domain.

$$Z = 3.25 + 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4$$

$$X_1 = \frac{working\ capital}{total\ assets} \qquad X_2 = \frac{retained\ earnings}{total\ assets}$$

$$X_3 = \frac{gross\ profit}{total\ assets} \qquad X_4 = \frac{total\ market\ value\ of\ equity}{book\ value\ of\ total\ liabilities}$$

The ranking of companies based on the specified numerical domains can be determined depending on the number obtained from Z that can be calculated for each year-company. If z is less than 4.15, the year-company is in the financial distress range; if z is between 4.15 and 5.58, it is in the financial uncertainty zone; if Z is greater than 5.58, the year-company is in the financial health zone.

In addition to these two models, the following models that have additional criteria to examine the effect of Delta and Vega on the SG&A cost stickiness have also been examined. According to the first hypothesis, β_3 is expected to be positive and β_5 negative (Brisker et al., 2022).

$$\begin{aligned}\Delta\ln SG\&A_{it} &= \beta_0 + \beta_1 \text{ Decreasedummy}_{it} + \beta_2 \Delta\text{lnsale}_{it} \\ &+ \beta_3 \Delta\text{lnsale}_{it} \times \text{Delta}_{it} + \Delta\text{lnsale}_{it} \times \sum\lambda \text{ Economic}_{it} \\ &+ \Delta\text{lnsale}_{it} \times \sum\mu \text{ Agency}_{it} + \Delta\text{lnsale}_{it} \times \sum\Theta \text{ Governance}_{it} \\ &+ \beta_4 \text{ Decreasedummy}_{it} \times \Delta\text{lnsale}_{it} + \beta_5 \text{ Decreasedummy}_{it} \\ &\times \Delta\text{lnsale}_{it} \times \text{Delta}_{it} + \text{Decreasedummy}_{it} \times \Delta\text{lnsale}_{it} \\ &\times \sum\lambda \text{Economic}_{it} + \text{Decreasedummy}_{it} \times \Delta\text{lnsale}_{it} \times \sum\mu \text{ Agency}_{it} \\ &+ \text{Decreasedummy}_{it} \times \Delta\text{lnsale}_{it} \times \sum\Theta \text{Governance}_{it} + \text{Delta}_{it} \\ &+ \sum\lambda \text{ Economic}_{it} + \sum\mu \text{ Agency}_{it} \\ &+ \sum\Theta \text{ Governance}_{it} + \acute{\varepsilon}_{it} \quad (5)\end{aligned}$$

A model similar to the previous Model is examined with the Vega variable for the second hypothesis, and β3 is expected to be negative and β5 positive (Brisker et al., 2022).

$$\begin{aligned}\Delta\ln SG\&A_{it} &= \beta_0 + \beta_1 \text{ Decreasedummy}_{it} + \beta_2 \Delta\text{lnsale}_{it} \\ &+ \beta_3 \Delta\text{lnsale}_{it} \times \text{Vega}_{it} + \Delta\text{lnsale}_{it} \times \sum\lambda \text{ Economic}_{it} + \Delta\text{lnsale}_{it} \\ &\times \sum\mu \text{ Agency}_{it} + \Delta\text{lnsale}_{it} \times \sum\Theta \text{ Governance}_{it} + \beta_4 \text{Decreasedummy}_{it} \times \Delta\text{lnsale}_{it} + \beta_5 \text{ Decreasedummy}_{it} \\ &\times \Delta\text{lnsale}_{it} \times \text{Vega}_{it} + \text{Decreasedummy}_{it} \times \Delta\text{lnsale}_{it}\end{aligned}$$

$\times \sum\lambda \text{ Economic}_{it} + \text{Decreasedummy}_{it} \times \Delta\text{lnsale}_{it} \times \sum\mu \text{ Agency}_{it}$
$+ \text{Decreasedummy}_{it} \times \Delta\text{lnsale}_{it} \times \sum\Theta \text{ Governance}_{it} + \text{Vega}_{it}$
$+ \sum\lambda \text{ Economic}_{it} + \sum\mu \text{ Agency}_{it} + \sum\Theta \text{ Governance}_{it} + \acute{\varepsilon}_{it}$ (6)

In these two models, the agency and the economy variables are calculated through the factor analysis approach by the following variables:

$\sum\lambda \text{ Economic}_{it} = \lambda_0 + \lambda_1 \text{ Successivedecrease}_{it} + \lambda_2 \text{ Assetintensity}_{it} + \lambda_3 \text{ Employeeintensity}_{it} + \lambda_3 \text{ stockperformance}_{it}$ (5-1)

$\sum\mu \text{ Agency}_{it} = \mu_0 + \mu_1 \text{ Freecashflow}_{it} + \mu_2 \text{ CEOtenure}_{it} + \mu_3 \text{CEOhorizon}_{it}$ (5-2)

For calculating free cash flow, common and preferred stock profits are deducted from operating activities' cash flows, and the final number is divided by the total assets. CEO Tenure represents the number of years the CEO has been in that position. The CEO horizon is defined as the year the CEO changes or the year before the CEO changes, the number 1; otherwise, 0 would be assigned.

4. Research findings

Tables (1) to (4) show descriptive statistics. Table (1) describes quantitative variables' mean, median, standard deviation, maximum and minimum. For instance, the sticky variable with a mean of 0.001 and median of 0.000 shows a normal distribution. Table (2) includes the count and percentage of the binary variables used in the research; for example, for the decrease dummy, value 1 is 440, which means there are 440 year-company that experienced a decrease in their sales compared to the last year. Table (3) reports the credit rating variable of the companies. Number 3 represents the company's financial health; based on the results, around 90% of all year-companies are in the financial health zone. Table (4) shows the number of years the CEO has been in office, which varies between 1 to 18 years.

Table 1. Descriptive Statistics of Quantitative Variables of Research

variables	Mean	Median	Std. Dev.	Maximum	Minimum
Delta	2.040	70749195	3.120	9.310	-97585053
Vega	2.420	4.130	8.180	2.090	-9.200
Sticky	0.001	0.000	0.004	0.014	0.000
Δlnsale	0.221	0.207	0.273	0.752	-0.290
ΔlnSG&A	0.214	0.208	0.274	0.773	-0.337
SG&A ratio	0.000	0.000	0.022	0.048	-0.050
Economic	-0.052	-0.264	0.726	1.615	-0.965
Agency	-0.026	0.158	0.939	1.577	-1.357
Governance	-0.040	-0.293	0.872	2.244	-0.925
Asset intensity	1.387	1.238	0.691	3.160	0.496
Employee intensity	0.000	0.000	0.000	0.002	3.560
Stock performance	0.616	0.257	1.053	3.680	-0.415
Free cash flow	0.028	0.030	0.100	0.213	-0.178
Product market competition	0.168	0.154	0.105	0.366	0.036

Table 2. Descriptive Statistics of Binary Variables of Research

Variables	count			Percent		
	Value 0	Value 1	Total	Value 0	Value 1	Total
Decrease dummy	1768	440	2208	80.070	19.930	100
CEO horizon	1534	674	2208	69.470	30.530	100
Auditor	1719	489	2208	77.850	22.150	100
Successive decrease	1752	456	2208	79.350	20.650	100
Dsale	1768	440	2208	80.070	19.930	100
DSG&A	1134	1074	2208	51.360	48.640	100

Table 3. Descriptive statistics of Credit rating

Value	Count	Percent
1	116	5.250
2	118	5.340
3	1974	89.400
Total	2208	100

Table 4. Descriptive statistics of CEO Tenure

Value	Count	Percent
1	674	30.530
2	483	21.880
3	344	15.580
4	224	10.140
5	142	6.430
6	95	4.300
7	67	3.030
8	48	2.170
9	37	1.670
10	27	1.220
11	19	0.860
12	16	0.720
13	11	0.500
14	7	0.320
15	4	0.180
16	4	0.180
17	3	0.140
18	3	0.140
Total	2208	100

In Table (1), which is related to descriptive statistics of quantitative variables, there is the Sticky variable with an average of 0.001. also, a 0.000 median is reported for this variable. In general, all data in this variable ranges from 0 to 0.014. In Tables (2), (3) and (4), descriptive statistics for multimodal variables are reported. In Table (4), all-year companies are classified into three categories. Based on the credit rating variable, in the 1974 year company, about 90% of all-year companies are in the financial health zone.

The examination results for evaluating the existence of SG&A cost stickiness show an asymmetric behavior in these costs. The results of Models (1) and (2) that are shown in tables (5) and (6) show that the Chi2 of the first Model is 529.69 and for the second Model is 1085.29 and since the significance level of both models is zero, SG&A costs are sticky.

Table 5. Results of the Model (1): Examination of SG&A Costs

variables	Coefficient	Std. err	Sig	VIF
lnsalesΔ	**0.5008**	**0.257**	**0.00**	**1.06**
Decreasedummy × Δlnsales	**-0.3346**	**0.0887**	**0.00**	**1.06**
Chow	F		3.886	
	Sig		0.000	
Hausman	Chi2		5.943	
	Sig		0.051	
Wiggins and Poi	Chi2		305.350	
	Sig		0.000	
Wooldridge	F		3.901	
	Sig		0.0503	
Wald	Chi2		529.690	
	Sig		0.000	

Table 6. Results of the Model (2); Examination of SG&A Costs with Economic Variables

variables	Coefficient	Std. err	Sig	VIF
lnsalesΔ	**0.376**	**0.017**	**0.000**	**2.200**
Decreasedummy × Δlnsales	-0.256	0.122	0.035	6.540
Decreasedummy × Δlnsale × Successive decrease	-2.896	1.868	0.121	1.740
Decrease dummy × Δlnsale × Asset intensity	-0.097	0.129	0.453	8.960
Decrease dummy × Δlnsale × Employee intensity	-274.558	414.694	0.508	8.030
Decrease dummy × Δlnsale × Stock performance	-0.288	0.381	0.450	1.080
Successive decrease	-0.073	0.020	0.000	5.800
Asset intensity	0.002	0.005	0.639	3.210
Employee intensity	-50.751	7.021	0.000	2.170
Stock performance	-0.001	0.003	0.728	1.510
Chow	F		3.856	
	Sig		0.000	
Hausman	Chi2		12.791	
	Sig		0.235	
Wiggins and Poi	Chi2		334.590	
	Sig		0.000	
Wooldridge	F		3.238	
	Sig		0.074	
Wald	Chi2		1085.290	
	Sig		0.000	

Fisher statistics of Chow test model (1) and model (2) are equal to 3.886 and 3.8561, respectively. Both are significant (0.00); both models are in the form of a panel. The Chi2 statistics of the Hausman test for model (1) is 5.943 with a significance level of 0.0512, which indicates that the variables are random. In model (2), the Chi2 statistics of the Hausman tests is 12.7911 and the significance level is 0.2356, which indicates that the variables of this Model are also random. According to Wiggins and Poi test information about models (1) and (2), both models have variance heterogeneity problems. The data related to these two models in Tables (1) and (2) show that the significance level of the Wooldridge test is above 5% and these two models have no problem with autocorrelation of error terms. In addition, the VIF of all variables in these two models is below 9, which indicates the absence of collinearity between variables.

In both models, the coefficient of Δlnsale represents long-term sales changes; more specifically, it shows the increased percentage in SG&A costs per 1% increase in sales. For example, in Table (5), this coefficient is 0.5008, representing a 0.5% increase in SG&A costs for a 1% increase in sales. The total coefficients of Δlnsale and decrease-dummy × Δlnsale represent the reduction percentage in SG&A costs per 1% reduction in sales, which in Model (1) is 0.1664 and in Model 2 it is 0.1197. In other words, according to the Model (1), for a 1% reduction in SG&A costs is reduced by 0.16%. In

general, in Models (1) and (2), the coefficient of Δlnsale and the coefficient of decrease dummy × Δlnsale are expected to be negative. The results of models (1) and (2) show that the changes in SG&A costs are not proportional to the changes in sales ،which proves the existence of cost stickiness.

Tables (7) and (8) show the results of the models (3) and (4). These results examine the decrease and increase of stickiness according to Delta and Vega, which measures managers' incentives. Table (7) results are used to prove the first hypothesis and Table (8) is used to prove the second hypothesis.

Fisher's statistic Chow test models (3) and (4) are 12.99 and 10.36 and also are significant (0.00), which shows that both of these models are also in the shape of the panel. Hausman Chi2 test measures whether the Model is random or fixed. Based on Tables (7) and (8) the statistics for the models (3) and (4) are 1.42 and 3.65 and the significance levels of both of them are higher than 5%, which indicates the randomness of both of these models. According to the Wiggins Poi and Wooldridge test data in Table (7), the Model (3) has no heterogeneity of variance and no autocorrelation problem. According to Table (8), the significance level of the Wiggins and Poi test shows that there is no heterogeneity problem but an autocorrelation problem based on the significance level of the Wooldridge test. The VIF of all variables in these two models is around 1, indicating no collinearity problem.

Table 7. Results of the Model (3), Examination of Stickiness with Delta Variable

variables	Coefficient	Std. err	sig	VIF
Delta	**-2.030**	**6.010**	**0.001**	**1.000**
Governance	**0.0008**	**0.0001**	**0.000**	**1.000**
Chow	F		12.990	
	Sig		0.000	
Hausman	Chi2		1.420	
	sig		0.233	
Wiggins and Poi	Chi2		-5616.250	
	sig		1.000	
Wooldridge	F		0.000	
	Sig		0.995	
Wald	Chi2		22.120	
	Sig		0.000	

Table 8. Results of the Model (4), Examination of Stickiness with Vega Variable

Variables	Coefficient	Std. err	Sig	VIF
Vega	**3.430**	**1.730**	**0.048**	**1.000**
Governance	**0.0011**	**0.0008**	**0.190**	**1.000**
Chow test	F		10.360	
	Sig		0.000	
Hausman test	Chi2		3.650	
	sig		0.056	
Wiggins and Poi test	chi2		-10528.130	
	sig		1.000	
Wooldridge test	F		8.562	
	Sig		0.004	
Wald	Chi2		1.720	
	Sig		0.000	

The (3) and (4) models can be implemented with and without the governance variable. In both cases, the results show the negative coefficient for Delta and the positive coefficient for Vega. Delta's coefficient is negative, meaning Delta increases the degree of stickiness. The positive coefficient of Vega indicates that Vega reduces stickiness, so the first and second hypotheses are confirmed generally.

In order to reconfirm the research hypotheses, models (5) and (6) that include more variables were

also estimated. The results of the Model (5) in Table (9) confirm the first hypothesis and the results of the Model (6) in Table (10) confirm the second hypothesis of the research.

Table 9. Results of Model (5), Examination for Stickiness of SG&A Costs with Delta and Other Related Factors

variables	Coefficient	Std. err	Sig	VIF
Δlnsale × Delta	4.440	9.790	0.000	4.590
Decreasedummy × Δlnsales × Delta	-2.160	6.910	0.002	4.590
Decreasedummy	-0.053	0.029	0.068	5.350
Δlnsale	0.130	0.020	0.00	1.640
Δlnsale × economic	-0.141	0.032	0.00	2.600
Δlnsale × agency	-0.002	0.033	0.932	3.640
Δlnsale × governance	-0.051	0.028	0.066	1.510
Decreasedummy × Δlnsale	0.271	0.134	0.043	4.710
Decreasedummy × Δlnsale × economic	6.852	3.467	0.048	3.960
Decreasedummy × Δlnsale × agency	0.066	0.300	0.825	2.880
Delta	-1.100	3.080	0.00	4.350
Economic	-0.056	0.012	0.00	2.930
agency	-0.008	0.011	0.443	3.990
governance	-0.002	0.007	0.755	1.460
Chow	F		3.918	
	Sig		0.000	
Hausman	Chi2		3.9181	
	Sig		0.000	
Wiggins and Poi	Chi2		322.720	
	Sig		0.000	
Wooldridge	F		3.615	
	Sig		0.594	
Wald	Chi2		278.680	
	Sig		0.000	

Tables (9) and (10) represent the results of models (5) and (6). These two models are in panel form based on their Fisher statistic of the Chow test. The Chi2 statistics of the Hausman test in Tables (9) and (10) are equal to 3.9181 and 2.3232, respectively. According to their significance level, the variables of these two models are fixed. Both models have the problem of heterogeneity variance, based on the results of Wiggins and Poi's test. However, these two models have no autocorrelation problem because their significance levels are above 5%. There is no collinearity problem among variables, given that VIF is lower than 9.

The coefficient of Δlnsale represents a percentage increase in SG&A costs for a 1% increase in sales. In contrast, the total coefficient of Δlnsale and decrease dummy × Δlnsale represents a percentage reduction in SG&A costs for a 1% reduction in sales. When the cost behavior is sticky, the coefficient of Δlnsale is expected to be positive and the coefficient of decreasing dummy × Δlnsale is negative. In addition, the coefficients of Δlnsale × Delta and Δlnsale × Vega indicate a percentage increase in SG&A costs followed by a 1% increase in sales based on Delta and Vega levels.

Table 10. Results of the Model (6), Examination of Stickiness SG&A Costs with Vega and Other Related Factors

variables	Coefficient	Std. err	Sig	VIF
Δlnsale × Vega	-1.090	2.790	0.000	6.460
Decreasedummy × Δlnsales × Vega	8.320	3.050	0.006	1.020
Decreasedummy	0.055	0.031	0.078	2.050
Δlnsale	0.464	0.054	0.000	1.250
Δlnsale × Economic	-0.044	0.018	0.018	2.130
Δlnsale × Agency	0.019	0.039	0.490	2.820
Δlnsale × Governance	-0.064	0.046	0.167	2.740
Decreasedummy × Δlnsale	-0.212	0.121	0.080	4.160
Decreasedummy × Δlnsale × Governance	0.091	0.098	0.355	3.220
Decreasedummy × Δlnsale × Agency	-0.035	0.084	0.672	2.690
Vega	6.810	6.520	0.296	6.460
Economic	-0.056	0.015	0.000	1.300
Agency	-0.015	0.014	0.299	2.500
Governance	0.016	0.019	0.830	2.390
Chow	F		2.323	
	Sig		0.000	
Hausman	Chi2		2.323	
	Sig		0.000	
Wiggins and Poi	Chi2		1635.090	
	Sig		0.000	
Wooldridge	F		0.855	
	Sig		0.356	
Wald	Chi2		127.010	
	Sig		0.000	

Also, the coefficients of Decreasedummy×Δlnsale×Delta and Decreasedummy×Δlnsale×Vega in both models indicate a percentage reduction in SG&A costs followed by a 1% decrease in sales based on Delta and Vega levels. In Model (5), due to the sticky costs, the coefficient sign of Δlnsale×Delta is positive and the coefficient sign of Decreasedummy×Δlnsale×Delta is negative, indicating the research's first hypothesis is correct. Moreover, in Model (6), the coefficient sign Δlnsale×Vega is negative and the coefficient sign Decreasedummy×Δlnsale×Vega is positive, considering that costs are anti-sticky. They are proving the second hypothesis of the research, indicating that the second hypothesis is also correct.

5. Conclusion

This paper examined the relationship between managers' incentives and asymmetric cost behavior, and the sensitivity of managers' wealth to the changes in stock price (Delta) and stock return (Vega) was used as measures of managers' incentives. This study showed that Delta has a significant direct effect on sticky costs. Managers in companies with higher Deltas increase SG&A costs quickly in response to rising sales. Still, they will lower these costs in response to delays in declining sales, so the first hypothesis of this research is confirmed. In contrast, Vega has a significant inverse effect on sticky costs, and the research results show that high-Vega managers avoid increasing SG&A costs in response to increased sales. Still, in response to decreased sales, they cut the costs quickly. This conclusion proves the second hypothesis of the research, which represents the negative and significant

effect of Vega on the cost stickiness. Managers with high Deltas are generally more inclined to manage SG&A costs to increase the company's long-term costs. In contrast, high-Vega managers try to manage SG&A costs by monitoring credits. An adequate understanding of the effect of managers' incentives on cost stickiness will reduce conflicts of interest caused by agency problems. In addition, understanding asymmetric cost behavior contributes to more efficient reporting. The results of this research conform to the studies of Brisker et al. (2022) and Anderson et al. (2003). According to the confirmation of the effect of Delta and Vega, which represents managers' incentives on the asymmetric behavior of costs, information about the stickiness of costs is used by managers for making decisions about planning, budgeting, pricing and generally predicting how costs behave based on changes in activity level or sales level. Also, the results of this research provide helpful information for managers, financial analysts, researchers and students; by considering the phenomenon of cost stickiness, decisions can be made based on facts; moreover, the decision outcome will be more reliable.

References

1. Anderson, M. C., Banker R. D. and Janakiraman, S. N. (2003). Are selling, general, and administrative costs "sticky"? *Journal of Accounting Research* 41(1), pp. 47-63. https://doi.org/10.1111/1475-679X.00095
2. Banker, R. D. and Chen, L. (2006). Predicting earnings using a model based on cost variability and cost stickiness. *The accounting review* 81(2), pp. 285-307. https://doi.org/10.2308/accr.2006.81.2.285
3. Banker, R. D., and Fang, S. (2016). Real cost management around loan financing. Working paper, Temple University, Philadelphia, PA
4. Brisker, E. R., Park, J. C. and Song, H. (2022). Managers' equity incentives and asymmetric cost behavior. *Journal of Management Accounting Research* 34(2), pp. 43-69. https://doi.org/10.2308/jmar-17-029
5. Brockman, P., Martin, X.and Unlu, E. (2010). Executive compensation and the maturity structure of corporate debt. *The Journal of Finance* 65(3), pp. 1123-1161. https://doi.org/10.1111/j.1540-6261.2010.01563.x
6. Calleja, K., Steliaros, M. and Thomas, D. C. (2006). A note on cost stickiness: Some international comparisons. *Management Accounting Research* 17(2), pp. 127-140. https://doi.org/10.1016/j.mar.2006.02.001
7. Chen, C. X., Lu, H. and Sougiannis, T. (2012). The agency problem, corporate governance, and the asymmetrical behavior of selling, general, and administrative costs. *Contemporary Accounting Research* 29(1), 252-282. https://doi.org/10.1111/j.1911-3846.2011.01094.x
8. Coles, J. L., Daniel, N. D. and Naveen, L. (2006). Managerial incentives and risk-taking. *Journal of Financial Economics* 79(2), pp. 431-468. https://doi.org/10.1016/j.jfineco.2004.09.004
9. Guay, W. R. (1999). The sensitivity of CEO wealth to equity risk: an analysis of the magnitude and determinants. *Journal of Financial Economics* 53(1), pp. 43-71. http://dx.doi.org/10.1016/S0304-405X(99)00016-1
10. Hartlieb, S. and Loy, T. R. (2022). The impact of cost stickiness on financial reporting: evidence from income smoothing. *Accounting & Finance* 62(3), pp. 3913-3950. https://doi.org/10.1111/acfi.12910
11. Hasani, M, and Lal Bar, A. (2021). The Impact of Competitive Strategies (Cost Leadership and Differentiation) and Management Ability on Earnings Quality and Cost Adhesion in Stock

Companies. *National Defense Strategic Management Studies* 5(18), pp. 229-262 (In Persian) https://dorl.net/dor/20.1001.1.74672588.1400.5.18.8.2

12. Hashemipour, Z., Mansouri, F., Gholami, R. and Safa, M. (2023). The effect of factors arising from the country's political-economic structure on the stickiness of corporate costs. *Financial Accounting and Auditing Research* 15(1), pp. 239-258 (In Persian) https://www.doi.org/10.30495/faar.2023.699792
13. Heidari Haratmeh, M. & Shirinbakhsh, Sh. (2018). Investigating the Effect of Flexibility on Stock Returns. *Financial knowledge of Securities Analysis* 11(39), pp. 49-67 (In Persian) https://journals.srbiau.ac.ir/article_13077_cdb3b5e7e5e7bf3f015e3a71b2c2262b.pdf
14. Hosseinipour, R, Nasirizadeh, F, and Abbaszadeh, M. (2019). Determinants of Sticky Cost Behavior. *Accounting knowledge* 39(10), pp. 177-214 (In Persian) https://www.doi.org/10.22103/jak.2019.12747.2797
15. Jafari, S.M. and Ahmadvand, M. (2015). Credit Ranking of Listed Companies in Tehran Stock Exchange Using Emerging Market Rating Approach. *Journal of Economics and Business* 10(6), pp. 37-56. (In Persian) https://journals.iau.ir/article_526598_f8f0b1089d94e2146319f579300cbda9.pdf
16. Karimzadeh, A., Rezaei, N., Hajiha, Z. and Abdi, R. (2022). Investigating the moderating effect of agency issues on the relationship between business credit and stickiness of costs. *Quarterly Capital Market Analysis* 1(3), pp. 124-151. (In Persian) https://dorl.net/dor/20.1001.1.27833488.1400.1.3.6.8
17. Kim, J.-B., J. J. Lee and Park J. C. (2022). Internal control weakness and the asymmetrical behavior of selling, general, and administrative costs. *Journal of Accounting, Auditing & Finance* 37(1), pp. 259-292. https://doi.org/10.1177/0148558X19868114
18. Lewellen, K. (2006). Financing decisions when managers are risk averse. *Journal of Financial Economics* 82(3), pp. 551-589. https://doi.org/10.1016/j.jfineco.2005.06.009
19. Low, A. (2009). Managerial risk-taking behavior and equity-based compensation. *Journal of Financial Economics* 92(3), pp. 470-490. https://doi.org/10.1016/j.jfineco.2008.05.004
20. Mansourfar, Gh., Heydari, M. and Koolani, T. (2017). The Impact of Real Profit Management and Management Incentives on Cost Adhesion. *Quarterly Journal of Asset Management and Financing* 5(1), pp. 1-16. (In Persian) https://doi.org/10.22108/amf.2017.21149
21. Nekoueizade, Sh (2022). Investigating the Moderating Effect of Corporate Governance on the Relationship between Earnings Management and Cost Stickiness in Companies Listed in Tehran Stock Exchange. *Journal of Research in Accounting and Economic Sciences* 6(4), pp. 1-11. (In Persian). https://civilica.com/doc/1657927
22. Panagopoulos, N. G., R. Mullins and P. Avramidis (2018). Salesforce downsizing and firm-idiosyncratic risk: The contingent role of investors' screening and firm's signaling processes. *Journal of Marketing* 82(6), pp. 71-88. http://dx.doi.org/10.1177/0022242918805059
23. Parsaei, M, and Sohrabi, S. (2022). Business Debt and Stickiness of Costs with Emphasis on Problem of Agency and Customer Focus. *Empirical Research of Accounting* 12(44), pp. 65-90 (In Persian). https://doi.org/10.22051/jera.2022.39783.2989
24. Restuti, M. D., L. Gani, E. R. Shauki and L. Leo (2023). Cost stickiness behavior and environmental uncertainty in different strategies: Evidence from Southeast Asia. *Business Strategy & Development*, 6(1), pp. 972–985 http://dx.doi.org/10.1002/bsd2.291
25. Sajjadi, S.H., Hajizad, S. and Nikkar, J. (2014). The effect of cost stikiness on the time symmetry of profit with an emphasis on the relationship between cost stickiness and conditional conservatism. *Journal of Accounting Knowledge* 5(16), pp. 81-99 (In Persian). https://ensani.ir/fa/article/download/334197

26. Shirafkan Lemso, M., Masoumzadeh Soureh, S. and Sayareh, M. (2017). Investigating the convergence of stock markets returns in Iran: Inder lunch approach and beta convergence. *Applied Economics* 7 (No. 23), pp. 77-87. (In Persian). https://journals.srbiau.ac.ir/article_13367_67ddf10a61c7f6ae040e069350050697.pdf
27. Vadiei, M. and Salehi, M. (2022). Investigating the relationship between labor force adjustment costs and stickiness of costs. *Ethics and Behavior Studies in Accounting and Auditing* 2(1), pp. 7-28. (In Persian). https://sanad.iau.ir/fa/Journal/sebaa/DownloadFile/868159
28. Wu, M. and Wilson, M. (2022). How well do analysts really understand asymmetric cost behavior? *Accounting & Finance*, 62(3), pp. 3951-3985. https://doi.org/10.1111/acfi.12911
29. Zorn, M. L., P. M., Norman, Butler, F. C. and Bhussar, M. S. (2017). Cure or curse: Does downsizing increase the likelihood of bankruptcy? *Journal of Business Research*, 76, pp. 24-33. http://dx.doi.org/10.1016/j.jbusres.2017.03.006

IJAAF; Vol. 8, No. 4, Autumn 2024, Serial 29

Ferdowsi University of Mashhad

Iranian Journal of
Accounting, Auditing & Finance

Quarterly

RESEARCH ARTICLE

The Effect of Audit Quality, Corporate Governance and CSR on Real Earning Management: Indonesian Evidence

Mahmudi Mahmudi*, Arief Bahtiar, Afvia Diyun Duhita

Accounting Department, Faculty of Business and Economics, Universitas Islam Indonesia, Indonesia

How to cite this article:
Mahmudi, M., Bahtiar, A., & Duhita, A. (2024). The Effect of Audit Quality, Corporate Governance and CSR on Real Earning Management: Indonesian Evidence. *Iranian Journal of Accounting, Auditing and Finance*, *8*(4), 125-138. doi: 10.22067/ijaaf.2024.45131.1452
https://ijaaf.um.ac.ir/article_45131.html

ARTICLE INFO

Article History
Received: 2023-07-31
Accepted: 2024-02-05
Published online: 2024-10-25

Keywords:
Audit, Earnings Management, Governance

Abstract

This study investigates the effect of audit quality, corporate governance, and Corporate Social Responsibility (CSR) on real earnings management. This study proxies corporate governance by audit committee size, independent commissioner proportion, managerial ownership, and institutional ownership. The population in this study is the manufacturing companies listed on the Indonesia Stock Exchange (IDX) from 2019-2021. The sampling method was carried out using a purposive sampling approach. This study obtained 236 observation data from 82 companies in Indonesia. The data was analyzed using regression analysis. The results of this study indicate that audit quality, managerial ownership and institutional ownership positively affect real earnings management. At the same time, the audit committee has a negative significant effect on real earnings management. However, the proportion of independent boards of commissioners and Corporate Social Responsibility disclosure does not affect real earnings management. This research shed light on the role of corporate governance mechanisms and CSR in real earnings management practices of Indonesian public companies.

https://doi.org/10.22067/ijaaf. 10.22067/ijaaf.2024.45131.1452

NUMBER OF REFERENCES
46

NUMBER OF FIGURES
0

NUMBER OF TABLES
4

Homepage: https://ijaaf.um.ac.ir
E-Issn: 2717-4131
P-Issn: 2588-6142

*Corresponding Author: Mahmudi Mahmudi
Email: mahmudi@uii.ac.id
Tel:
ORCID:

1. Introduction

Earnings management is a deliberate management effort to create a positive impression of a company's performance through accounting policies or real activities that influence reported profits to achieve certain goals (Schipper, 1989; Scott, 2015; Wahyono et al., 2019). Merchant (1989) defines earnings management as an action management takes to influence reported profits. This action can provide information about economic profits that do not reflect the actual conditions experienced by the company and can even be detrimental to the company in the long term. Earnings management practices create concerns about the quality of financial information and long-term corporate sustainability performance (Nguyen, 2024).

Earnings management practices themselves are generally carried out through accrual and real earnings management. Accrual earnings management is earnings management using the flexibility of accrual accounting policy (Boedhi and Ratnaningsih, 2017). Accrual-based earnings management consists of discretionary accruals and nondiscretionary accruals. Nondiscretionary accrual is an earnings management activity performed through the accounting process. In contrast, discretionary accrual is a technique for selecting accrual policies, which are the authority and control of managers.

Discretionary accruals take the form of choosing accounting policies, for example, by choosing the method of depreciation of fixed assets, determining the economic age and residual value of fixed assets, choosing inventory valuation methods, determining reserves for losses on receivables, policies on revenue recognition, policies on provisions for credit losses, changes in the percentage of costs for losses on receivables, changes warranty cost estimation, inventory valuation, receivable write-off policies, and provisions for restructuring (Scott, 2015; Cohen and Zarowin, 2010). Detection of earnings management activities through accrual manipulation cannot be observed directly from the financial reports. The existence of accrual manipulation can only be estimated through a model. Several researchers have modeled the detection of earnings management through accrual manipulation (Jones, 1991; Dechow et al., 1995; Gomez and Okumura, 2001; Dechow et al., 2011; Healy and Wahlen, 2016; Nguyen et al., 2023).

Apart from accrual management, earnings management can be done through real activities. Roychowdhury (2006) explains that real earnings management is carried out by managing cash flow, volume of production, and discretionary costs. Real activity based earnings management is carried out in various ways, for example, delaying or accelerating sales and/or costs into a different accounting period, managing the amount of marketing costs, research and development costs, travel costs, employee recruitment and development costs, maintenance, asset sales, investment, discount policies, easing credit terms, product pricing policies, and excess production to reduce the cost of goods sold.

Much research has been related to earnings management, but most of this research focuses on accrual earnings management (Kliestik et al., 2021). In fact, after the Sarbanes-Oxley Act (SOX) period, management switched the focus from accrual earnings management to real earnings to avoid findings by auditors and regulators. Managers prefer real earnings management to accrual earnings management (Graham et al., 2005). Several factors, such as the auditor's ability to detect errors and irregularities in the client's accounting system, the effectiveness of corporate governance, and corporate social responsibilities, may become the major factors that influence real earnings management practices. However, few studies have investigated these issues, especially in emerging economies such as Indonesia. Previous research has not provided conclusive results so further research is still needed.

This research examines whether audit quality, corporate governance, and CSR can mitigate real earnings management. Does the higher audit quality increase the company's tendency to carry out earnings management through real activities? Furthermore, whether corporate governance

mechanisms can reduce real earnings management practices and whether companies with higher CSR disclosure have a lower tendency to carry out real earnings management. This research provides theoretical contributions by showing empirical evidence regarding the relevance of agency theory and signaling theory in the context of the impact of audit quality, corporate governance, and CSR on real earnings management practices. This study is also useful for policymakers regarding the efforts to produce high quality financial information and minimize earnings management practices.

2. Literature review

2.1 Agency theory

Jensen and Meckling (1976) proposed the existence of agency theory. When one or more people, such as the principals, employ other people as the agents and give decision-making authority to the agents, an agency relationship will occur. This can trigger a conflict of interest between the agent and the principal because both want to maximize their utilities. Management as an agent has opportunistic behavior and adverse selection.

Conflicts of interest occur due to information asymmetry between agents and principals. Managers know more about the company's condition than owners. To overcome agency problems, managers are responsible for providing information to owners such as financial reports. However, differences in interests between agents and principals mean managers sometimes do not provide complete information to the owners. In this case, management can take actions such as earnings management that are not communicated to owners.

2.2 Signaling theory

Signaling theory describes behavior between two parties that have access to different information. In the business context, management will choose information as the signal to other parties outside the company, i.e. investors regarding the current and future performance of the company (Connelly et al., 2010). Signal theory encourages a company to provide information to users of financial reports or external parties because of information asymmetry. To minimize the occurrence of information asymmetry, companies need to disclose comprehensive information, both financial and non-financial information. Signaling theory emphasizes that company value can increase through disclosure or reporting.

Signal theory generally relates to how a signal has value or benefits while other signals do not (Gumanti, 2009). Signal theory tries to carefully understand the relationship between the signal and the qualities within it and what factors make the signal remain attractive and convincing. Signal theory also looks at the consequences when a signal is not completely convincing until it has no meaning. In relation to earnings management, Scott (2015) shows that some companies carry out earnings management as a signal to investors that the company has profit prospects in the future. Chhillar and Lellapalli (2022) found that earnings management could signal an early stage of company financial distress.

Bartov et al. (2002) show that managers carry out earnings management to meet market expectations or exceed earnings forecasts made by analysts (see also: Keung et al., 2010). Earnings management is also carried out to form the perception of external parties that the company has low risk. Another motivation for earnings management is to influence various contracts based on reported accounting numbers (Healy and Wahlen, 2016). Earnings management is also carried out to increase company value ahead of management buyouts (MBO), initial public offerings (IPOs), seasoned public offerings (SEOs), stock-for-stock mergers, and open market repurchase (Gong et al., 2008; Scott, 2015).

2.3 Hypothesis development

2.3.1 Audit quality

Public companies must publish audited financial reports. Audit towards financial reports is intended to increase the value of the financial reports and the trust of the users (Nurdiniah and Pradika, 2017). To ensure that there are no material misstatements in the financial statements, it is necessary to carry out an audit by an external auditor or an auditor from outside the company with high competence and independence.

If competent and independent people carry out the audit, the quality of the audit will also be high. High audit quality can minimize accrual earnings management practices. The study conducted by Le and Moore (2023) confirmed that audit quality decreases income-increasing discretionary accrual. However, because management knows that engaging in accrual-based earnings management is easily detected by auditors, then management will move to real earnings management because accounting regulators and auditors scrutinize real earnings management less than accrual earnings management (Enomoto et al., 2015).

Umar et al. (2021) show audit quality negatively affects real earnings management. However, the study of Sitanggang et al. (2019) and Hoang and Vinh (2018) found that audit quality positively affects real earnings management. Meanwhile, research by Astuti and Pangestu (2019) provides results that audit quality does not influence real earnings management. We predict that the higher the audit quality, the greater the tendency for management to carry out real earnings management.

H1: Audit quality has a positive effect on real earnings management.

2.3.2 Audit committee

An audit committee is a committee tasked with assisting the board of commissioners in supervising and creating harmony within the company. The audit committee is also seen as a bridge between the board of commissioners, shareholders, and management regarding control issues. The audit committee is one of the corporate governance mechanisms that can encourage the creation of transparency and accountability. The existence of an audit committee can minimize fraudulent practices due to the audit committee's ability to measure the transparency and honesty of the information contained in the financial reports (Parinduri et al., 2019). Mardessi and Fourati (2020) found that audit committees decrease the likelihood of engaging in real earnings management. This research predicts that the existence of an audit committee can reduce management's tendency to engage in real earnings management.

H2: Audit committee has a negative effect on real earnings management.

2.3.3 Independent commissioner

An independent board of commissioners is a member of the board of commissioners who is independent or has no relationship with management, other members of the board of commissioners, controlling shareholders, businesses, or the like that can influence his/her independence. An independent board of commissioners is appointed to oversee company policies and management and assist the board of directors by providing advice. The existence of supervision by an independent board of commissioners makes managers more careful in managing the company. Indarti et al. (2021) found that the existence of an independent commissioner decreases the tendency of real earnings management practice. A recent study conducted by Fitrasari (2023) also provides evidence that a larger independent board of commissioners can mitigate earnings manipulation. Thus, we predict that an independent board of commissioners can minimize real earnings management practices.

H3: Independent commissioner has a negative effect on real earnings management.

2.3.4 Managerial ownership

Managerial ownership is the total number of shares owned by the company's management, both by directors and/or commissioners. Management ownership influences company operations. High management ownership allows managers to make all kinds of efforts to increase profits for shareholders, including the manager himself. Rahman et al. (2021) found that managerial ownership positively affects real earnings management. However, the study conducted by Tran and Dang (2021) did not find the effect of managerial ownership on earnings management in Vietnamese public companies. Thus, the effect of managerial ownership on earnings management is still unclear. We predict high managerial ownership will increase real earnings management.

H4: Managerial ownership has a positive effect on real earnings management.

2.3.5 Institutional ownership

Institutional ownership is the total number of shares owned by institutional shareholders, namely the government, foreign institutions, legal institutions, financial institutions, representative funds and other institutions. Institutional ownership and earnings management have different relationships depending on the institutional investor. If institutional investors are long-term, then company managers focus on long-term profitability rather than being busy with earnings management because these investors intend to hold shares for the long term and have high share ownership. Kałdoński et al. (2020) show a different influence of institutional ownership on real earnings management in companies with different levels of market pressure on management and ownership stability. Firms with more stable ownership have a negative association with real earnings management. However, several studies do not find a significant effect of institutional ownership on real earnings management (Widagdo et al., 2021). This study predicts high institutional ownership tends to increase real earnings management practices.

H5: Institutional ownership has a positive effect on real earnings management.

2.3.6 Corporate Social Responsibility (CSR)

CSR is information disclosed by the company to third parties in company reports. This disclosure can give the company a good impression to the public and investors. However, it does not rule out the possibility that this will actually encourage management to carry out earnings management to create a good company image. Likewise, people tend to think that companies that disclose CSR will not carry out unethical actions such as earnings management. From a signaling theory perspective, companies disclose CSR programs as a signal to external parties that the company has implemented ethical and responsible business practices. Therefore, CSR is expected to be negatively related to earnings manipulation. Chouaibi and Zouari (2022) show that firms with higher CSR have less real earnings management. Nguyen (2024) and Gaio et al. (2022) also provide evidence that companies with higher corporate sustainability performance tend to engage in earnings management less. Thus, we predict higher CSR can result in lesser real earnings management.

H6: CSR disclosure has a negative effect on real earnings management.

3. Method

3.1 Data

The data in this research are manufacturing sector companies listed on the Indonesia Stock Exchange (BEI) during 2019-2021. The purposive sampling method underlies determining the

research sample. Purposive sampling is a technique for determining samples by considering and determining criteria according to the research objectives. The sample criteria in this research include (1) Manufacturing sector companies listed on the Indonesia Stock Exchange (BEI) and are consistent and complete in publishing financial reports resulting from audits for the 2019-2021 period. (2) Companies that experienced profits during the 2019-2021 period. (3) Financial reports with complete data as required. (4) Companies that were not delisted or moved sectors during the 2019-2021. (5) Financial reports are presented in rupiah.

3.2 Research variable and measurement

3.2.1 Dependent variable

In this research, the dependent variable is real earnings management. According to Roychowdhury's (2006) approach, real earnings management is measured by abnormal cash flow operation (CFO), abnormal production costs, and abnormal discretionary expense. The results of each proxy are then added up so that they cover all real earnings management proxy effects. The calculation of Abnormal Cash Flow Operation (CFO) for company i in year t is as follows:

$$\frac{CFO_{i,t}}{A_{t-1}} = \alpha_0 + \alpha_{1,t}\left(\frac{1}{A_{i,t-1}}\right) + \alpha_{2,t}\left(\frac{S_{i,t}}{A_{i,t-1}}\right) + \alpha_{3,t}\left(\frac{\Delta S_{i,t}}{A_{i,t-1}}\right) + e_{i,t}$$

Where:

$CFO_{i,t}$: Cash flow from the operation of company i in year t

$A_{i,t-1}$: Total assets of company i in year t-1

$S_{i,t}$: Sale of company i in year t

$\Delta S_{i,t}$: Subtraction of company i's sales in year t from sales in year t-1

Calculation of company i's abnormal production costs in year t:

$$\frac{PROD_{i,t}}{A_{i,t-1}} = \alpha_0 + \alpha_{1,t}\left(\frac{1}{A_{i,t-1}}\right) + \alpha_{2,t}\left(\frac{S_{i,t}}{A_{i,t-1}}\right) + \alpha_{3,t}\left(\frac{\Delta S_{i,t}}{A_{i,t-1}}\right) + \alpha_{4,t}\left(\frac{\Delta S_{i,t-1}}{A_{i,t-1}}\right) + e_{i,t}$$

Where:

$PROD_{i,t}$: Production cost of company i in year t

$PROD_{i,t} = COGS_t + \Delta INV_t$

$A_{i,t-1}$: Total assets of company i in year t-1

$S_{i,t}$: Sales of company i in year t

$\Delta S_{i,t-1}$: Subtraction of company i's sales in year t from sales in year t-1

Calculation of company i's abnormal discretionary expense in year t:

$$\frac{DISEXP_{i,t}}{A_{t-1}} = \alpha_0 + \alpha_{1,t}\left(\frac{1}{A_{i,t-1}}\right) + \alpha_{2,t}\left(\frac{S_{i,t}}{A_{i,t-1}}\right) + e_{i,t}$$

Where:

$DISEXP_{i,t}$: Discretionary expenses, which include research and development expenses, advertising expenses, sales expenses, and administrative and general expenses in company i in year t.

$A_{i,t-1}$: Total assets of company i in year t-1

$S_{i,t}$: Total sales of company i in year t-1

3.2.2 Independent variable

Audit Quality

One of the audit quality factors is the size of the public accounting firm. Audit quality is measured in this research using dummy variables. Public accounting firms affiliated with the big four are given the number 1, while accounting firms not affiliated with the Big Four are given the number 0.

Audit Committee

The audit committee supervises and creates harmony within the company and assists the board of commissioners. The company's total number of audit committees measures the audit committee variable.

Independent Commissioner

An independent board of commissioners is a member of the board of commissioners with no relationship with management, other members of the board of commissioners, controlling shareholders, or any business or similar that could affect their independence. The independent commissioner variable is measured by the proportion of independent commissioners to the total number of boards of commissioners.

Independent commissioner = $\frac{Total\ number\ of\ Independent\ commissioner}{Total\ number\ of\ board\ of\ commissioner}$ x 100%

Managerial Ownership

Managerial ownership is the total number of shares owned by management by directors and/or commissioners.

Managerial Ownership = $\frac{Shares\ owned\ by\ Management}{Total\ company's\ hare}$ x 100%

Institutional Ownership

Institutional ownership is the total number of shares owned by institutional shareholders, namely the government, foreign institutions, legal institutions, financial institutions, representative funds and other institutions.

Institutional Ownership = $\frac{Shares\ owned\ by\ Institution}{Total\ company's\ shares}$ x 100%

Corporate Social Responsibility (CSR)

CSR is information disclosed by the company to third parties in company reports. CSR disclosure uses the Corporate Social Responsibility Index (CSRI) based on ISO 26000. Issues that are disclosed will be given a value of 1, while those that are not disclosed will be given a value of 0. Then, the scores will be added up and divided by the total number of issues.

CSRI = $\frac{\sum xi}{n}$

3.3 Empirical model

In this research, the regression analysis used is multiple linear regression. The following is the multiple linear regression equation in this research:

REM = α + β1**AudQual* + β2**AudComm* + β3**IndepCom* + β4**ManOwn* + β5**InstOwn* + β6**CSR* + e

4. Results

The data used in this research is secondary data, namely companies listed on the Indonesia Stock

Exchange (BEI). The population in this study is manufacturing sector companies listed on the Indonesia Stock Exchange (BEI) for the 2019-2021 period. This research took the following samples:

Table 1. Sample

Description	Total Firms
Companies registered on the IDX for the 2019-2021 period	167
Companies experiencing losses	(52)
Companies that present financial reports in currencies other than rupiah	(29)
Companies with incomplete data	(4)
Samples that meet the criteria	82
Number of sample periods 2019-2021 (82×3)	246
Data outlier	(10)
Total final sample	236

4.1 Descriptive statistics

The following are the results of descriptive statistical tests on the company data studied:

Table 2. Descriptive Statistics

Variable	Min	Max	Mean	Std. Deviation
Audit Committee	0,000	5,000	2,915	0,678
Independent Commissioner	0,000	0,667	0,396	0,119
Managerial Ownership	0,000	0,894	0,073	0,166
Institutional Ownership	0,000	0,997	0,629	0,273
CSR Disclosure	0,286	1,000	0,721	0,161
Real Earnings Management	0,056	3,445	1,121	0,523
N	236			

Based on Table 2, it is known that the highest number of audit committees is 5 and the average is 2 people. The average proportion of independent commissioners is 39,6%. The highest managerial ownership is 89,4% and the average is 7,3%. Institutional ownership is the highest at 99,7% and the average is 62,9%. CSR disclosure has an average of 72% of the total items used as disclosure criteria.

Of the 236 companies, 80 of them are companies audited by Audit Firm affiliates of the big four, namely KAP Tanudiredja, Wibisana, Rintis and Rekan (PwC Affiliate), KAP Purwantono, Suherman and Surja (EY Partners), KAP Satrio Bing Eny and Rekan (Delloite Affiliate), KAP Siddharta Widjaja and Partners (KPMG Affiliate), and 156 other companies were audited by KAP not affiliated with the big four.

4.2 Classical assumption test

4.2.1 Normality test

Based on the results of the Kolmogorov-Smirnov non-parametric statistical test, a significant value of 0.079 was obtained, so it was stated that the residual data was normally distributed.

4.2.2 Multicollinearity

Table 3. Collinearity Statistics

Model	Collinearity Statistics	
	Tolerance	VIF
Audit Quality	0,929	1,076
Audit Committee	0,964	1,037
Independent Commissioner	0,963	1,039
Managerial Ownership	0,690	1,450
Institutional Ownership	0,721	1,387
CSR Disclosure	0,968	1,033

Based on the multicollinearity test, it is known that audit quality, audit committee size, proportion of independent board of commissioners, managerial ownership, institutional ownership, and CSR disclosure have a tolerance value of more than 0.10 and a VIF value of less than 10.00. This means that there is no multicollinearity in the research data.

4.2.3 Heteroscedasticity

Based on the results of the Glejser test, the results showed that the significance value (Sig.) for audit quality, audit committee size, proportion of independent commissioners, managerial ownership, institutional ownership, and CSR disclosure more than 0.05. Thus, it is stated that in this study there was no heteroscedasticity.

4.2.4 Autocorrelation

Based on the autocorrelation test, the Durbin-Watson (d) value was 1.892. Meanwhile, based on the Durbin-Watson value distribution table, it is obtained at 1,740. So, it is known that 1.740 is less than d of 1.892, and d of 1.892 is less than 4-1.740, namely 2.260. Based on these results, it can be stated that this research is free from autocorrelation.

4.3 Regression analysis results

Table 4. Regression Analysis

Independent Variable	Hypothesis	Coefficient (β)	T	Sig.
Audit Quality	H_1 (+)	0,288	4,015	0,000
Audit Committee	H_2 (-)	-0,098	-1,985	0,048
Independent Commissioner	H_3 (-)	-0,458	-1,640	0,102
Managerial Ownership	H_4 (+)	0,496	2,093	0,037
Institutional Ownership	H_5 (+)	0,351	2,486	0,014
CSR Disclosure	H_6 (-)	-0,274	-1,330	0,185
Constant		1,430	5,718	0,000
F = 4,431; p = 0,000				
R^2 = 0,104; Adjusted R^2 = 0,081				

4.4 Hypothesis test results

This research predicts that audit quality positively influences real earnings management. Based on the regression results, the audit quality has a positive and significant effect on real earnings management ($\beta = 0.288$; $t = 4,015$; $p < 0,01$). This significance value is smaller than the significance level of 0.05, meaning that the audit quality variable significantly influences real earnings management. Meanwhile, the positive value of β means that audit quality has the same direction as real earnings management as predicted. Thus, the hypothesis 1 is supported. This result can be inferred from the fact that managers tend to choose to carry out real earnings management, not accrual manipulation when audited by auditors from high-quality audit firms. This strategy is conducted to avoid audit findings related to accrual-based manipulation that could reduce investor confidence. Managers prefer to carry out real earnings management because it has lower risks and is still under management discretion, which does not violate accounting standards.

Hypothesis 2 of this study states that the audit committee negatively influences real earnings management. Based on the test results, the β value for audit committee size is -0.098 and the significance value is 0.048 ($p < 0,05$). This significance value is smaller than the significance level of 0.05, meaning that the audit committee size significantly influences real earnings management. Meanwhile, the negative value of the audit committee's regression coefficient (β) means that the audit committee size has the opposite direction to real earnings management. These results indicate that

the existence of an audit committee can reduce the tendency of managers to carry out real earnings management. This research's results align with those of Mardessi and Fourati (2020), who also found evidence of a significant negative relationship between the number of audit committees and real earnings management. Thus, the hypothesis 2 is supported.

The existence of an independent board of commissioners is predicted to have a negative influence on real earnings management. Based on the test results, the β value for the proportion of independent commissioners is -0.458 and the significance value is 0.102. This significance value is greater than the significance level of 0.05, meaning that the variable proportion of independent board of commissioners does not have a significant influence on real earnings management. Meanwhile, the β value of the proportion of independent board of commissioners means that the proportion of independent board of commissioners has the opposite direction to real earnings management. Thus, the hypothesis 3 is not supported. This result confirms Auliana et al's (2023) research finding that independent commissioners do not have a significant effect on earnings management. These findings indicate that the existence of independent commissioners in public companies in Indonesia has not been effective (Pratama and Suryani, 2020). The appointment of independent commissioners in public companies in Indonesia is more of a political decision and is just a formality to comply with regulations. The selection of independent commissioners is often not based on competence but on popularity or political connections with the government. Based on Revised I-A Regulation No. 00183/BEI/12-2018, since December 26, 2018, the Indonesian Stock Exchange has omitted the requirements for the company to have an independent commissioner. This regulation is resealed to attract companies to list on the Indonesian Stock Exchange.

Hypothesis 4 states that managerial ownership positively influences real earnings management. Based on the test results, the β value of managerial ownership is 0.496 and the significance value is 0.037 ($p < 0,05$). This result means that managerial ownership has a positive significant influence on real earnings management. Thus, the hypothesis 4 is supported. Higher managerial ownership tends to increase real earnings management because managers get benefits in several aspects, including bonuses and dividends at the same time; on the other hand, it is safer from scrutiny by external auditors and regulators.

This research predicts that institutional ownership positively influences real earnings management. Based on the test results, the β value of institutional ownership is 0.351 and the t value is 2,486 ($p < 0.05$). This result means that institutional ownership positively and significantly influences real earnings management. Based on this result, hypothesis 5 is supported. Institutional investors are more concerned with long-term profits and lower risks. Therefore, institutional investors tend to prefer real earnings management over accrual manipulation. The higher the institutional ownership, the higher the manager's tendency to carry out real earnings management. The institutional ownership type also influences institutional ownership's influence on the level of real earnings management. Sakaki et al. (2017) show that companies owned by more stable institutional ownership have lower levels of real earnings manipulation. However, different results were shown in the research of Ali et al. (2024) who examine companies in the Chinese capital market which displays that companies with higher levels of institutional ownership tend to have lower levels of real earnings management.

Hypothesis 6 of this research states that CSR disclosure negatively influences real earnings management. Based on the regression test results, the CSR disclosure variable has a regression coefficient (β) of -0.274 and a significance value of 0.185. This significance value is greater than the significance level of 0.05, meaning that the CSR disclosure variable does not significantly influence real earnings management. Meanwhile, the negative value of β means that CSR disclosure has the opposite direction to real earnings management. Even though the results of this study show a direction that is in line with predictions, the significant value is above 0.05, so hypothesis 6 of the study is not

supported. The absence of CSR influence on real earnings management shows that the current implementation of CRS has not yet become a strong pressure tool for management to reduce earnings manipulation through real activities. CSR programs and CSR disclosures are currently used as a gimmick to attract investors and comply with capital market regulations. Previous research examining the influence of CSR on management earnings in companies in Indonesia has provided varying results. Setiawan et al. (2019) found a positive influence of CSR on earnings management in banking companies in Indonesia. However, research by Zaman et al. (2024) found that CSR disclosure significantly negatively affected earnings management. The existence of conflicting results regarding the influence of CSR on earnings management indicates the need for further exploration regarding the possible interaction effect of CSR with other variables in influencing earnings management.

5. Conclusion

This study found that audit quality, managerial ownership, and institutional ownership have a positive association with real earnings management. As expected, this study found that audit committees can mitigate real earnings management practices. However, the proportion of independent boards of commissioners and CSR disclosure does not influence real earnings management. This research provides insight for investors, regulators, and academicians that management tends to choose earnings management through real activities, especially if management and institutional ownership are high. Using a highly qualified audit firm will lead management to avoid engaging in accrual-based earnings management and move to real earnings management. Therefore, auditors need to be more careful and thorough in conducting audits, especially detecting earnings manipulation practices through real activities. Meanwhile, the proportion of independent commissioners does not significantly influence real earnings management. It could be interpreted that the existence of independent commissioners is not yet optimal but is still just a formality to fulfill regulatory requirements.

This research provides a practical and theoretical contribution for auditors, policymakers, investors, and academicians regarding the phenomenon of real earnings management in public companies in Indonesia. Investors need to pay more attention and caution to the companies that carry out earnings management to avoid losses in their investments. For academics, the results of this research can be used to add empirical data regarding real earnings management literature.

Reference

1. Ali, M. J., Biswas, P. K., Chapple, L. and Kumarasinghe, S. (2024). Institutional Ownership and Earnings Quality: Evidence from China. *Pacific-Basin Finance Journal*, 84, A. 102275. https://doi.org/10.1016/j.pacfin.2024.102275
2. Astuti, C. D. and Pangestu, N. (2019). Kualitas Audit, Karakteristik Perusahaan Dan Manajemen Laba Riil. *Media Riset Akuntansi, Auditing & Informasi,* 19(2), pp. 191–208. https://doi.org/10.25105/mraai.v19i2.5442
3. Auliana, R. A., Subroto, B. and Subekti, I. (2023). The Effect of Corporate Governance on Earnings Management Moderated by Political Connection. *Journal of Accounting and Investment* 24(3), pp. 654-675. DOI: http://dx.doi.org/10.18196/jai.v24i3.17390
4. Bartov, E., Givoly, D. and Hayn, C. (2002). The rewards for meeting or beating earnings expectation. *Journal of Accounting and Economics* 33(2), pp. 173-204. https://doi.org/10.1016/S0165-4101(02)00045-9
5. Boedhi, N. R. and Ratnaningsih, D. (2017). Pengaruh Kualitas Audit Terhadap Manajemen Laba Melalui Aktivitas Riil. *Kinerja*, 19(1), pp. 84–98. https://doi.org/10.24002/kinerja.v19i1.536

6. Chhillar, P. and Lellapalli, R. V. (2022). Role of Earnings Management and Capital Structure in Signalling Early Stage of Financial Distress: A Firm Life Cycle Perspective. *Cogent Economics & Finance* 10, A. 2106634. https://doi.org/10.1080/23322039.2022.2106634.
7. Chouaibi, Y. and Zouari, G. (2022). The Effect of Corporate Social Responsibility Practices on Real Earnings Management: Evidence from a European ESG Data. *International Journal of Disclosure and Governance* 19, pp. 11-30. https://doi.org/10.1016/j.irfa.2019.01.009
8. Cohen, D. A. and Zarowin, P. (2010). Accrual-Based and Real Earnings Management Activities Around Seasoned Equity Offerings. *Journal of Accounting and Economics*, 50(1), pp. 2–19. https://doi.org/10.1016/j.jacceco.2010.01.002
9. Connelly, B. L., Certo, S. T., Ireland, R. D. and Reutzel, C. R. (2010). Signaling Theory: A Review and Assessment. *Journal of Management* 37(1), pp. 39-67. https://doi.org/10.1177/0149206310388419
10. Dechow, P. M., Huton, A. P., Kim, J. H. and Sloan, R. G. (2011). Detecting Earnings Management: A New Approach. Available at SSRN: http://ssrn.com/abstract=1735168
11. Dechow, P. M., Sloan, R. G. and Sweeney, A. P. (1995). Detecting Earnings Management. *The Accounting Review*, 1(1), pp. 193-225. https://www.jstor.org/stable/248303
12. Enomoto, M., Kimura, F. and Yamaguchi, T. (2015). Accrual-Based and Real Earnings Management: An International Comparison for Investor Protection. *Journal of Contemporary Accounting & Economics*, 11(3), pp. 183-198. https://doi.org/10.1016/j.jcae.2015.07.001
13. Fitrasari, R. (2023). The Effect of Board Size, Board Independence, and the Composition of Board Independence on Accrual and Real Earnings Management. *Jurnal Akuntansi dan Keuangan Indonesia* 20(2), pp. 222-241. https://doi.org/10.21002/jaki.2023.12
14. Gaio, C., Gonçalves, T. and Sousa, M.V. (2022). Does Corporate Social Responsibility Mitigate Earnings Management? *Management Decision*, 60(11), p. 2972-2989. https://doi.org/10.1108/MD-05-2021-0719
15. Gomez, X. Z. and Okumura, M. (2001). Discretionary Accruals Models and the Accounting Process. *Kobe Economics & Business Review*, Nagoya City University, Nagoya, Japan
16. Gong, G., Louis, H. and Sun, A. X. (2008). Earnings Management and Firm Performance Following Open-Market Repurchases. *The Journal of Finance*, LXIII(2), pp. 947-986.
17. Graham, J. R., Harvey, C. R. and Rajgopal, S. (2005). The Economic Implications of Corporate Financial Reporting. *Journal of Accounting and Economics*, *40*(1–3), pp. 3–73. https://doi.org/10.1016/j.jacceco.2005.01.002
18. Gumanti, T. A. (2009). Teori sinyal dalam manajemen keuangan. *Manajemen Usahawan Indonesia*, 38(6), pp. 4-13.
19. Healy, P. M. and Wahlen, J. M. (2016). A Review of the Earnings Management Literature and Its Implications for Standard Setting. *Accounting Horizons*, 30(4), pp. 525–528. https://doi.org/10.2308/1558-7975-30.4.525
20. Hoang, K. and Vinh, K. N. (2018). Audit Quality, Firm Characteristics and Real Earnings Management: The Case of Listed Vietnamese Firms. *International Journal of Economics and Financial Issue*, 8(4), pp. 243-249.
21. Indarti, M. G. K., Faisal, F., Yuyetta, E. N. A. and Widiatmoko, J. (2021). Corporate Governance Mechanisms and Real Earnings Management: Evidence from Indonesia. In ICEBE 2020: Proceedings of the First International Conference of Economics, Business & Entrepreneurship, ICEBE 2020, 1st October 2020, Tangerang, Indonesia (p. 311). European Alliance for Innovation.
22. Jensen, C. J. and Meckling, W. H. (1976). Theory of the Firm: Managerial Behavior, Agency

Costs and Ownership Structure, *Journal of Financial Economics* 3(4), pp. 305-360.
23. Jones, J. J. (1991). Earnings Management During Import Relief Investigations. *Journal of Accounting Research* 29(2), pp. 193-228.
24. Kałdoński, M., Jewartowski, T. and Mizerka, J. (2020). Capital Market Pressure, Real Earnings Management, and Institutional Ownership Stability – Evidence from Poland. *International Review of Financial Analysis*, 71, A. 101315. https://doi.org/10.1016/j.irfa.2019.01.009
25. Keung, E., Lin, Z. X. and Shih, M. (2010). Does the Stock Market See a Zero or Small Positive Earnings Surprise as a Red Flag? *Journal of Accounting Research* 48(1), pp. 105-135. https://doi.org/10.1111/j.1475-679X.2009.00354.x
26. Kliestik, T., Belas, J., Valaskova, K., Nica, E. and Durana, P. (2021). Earnings management in V4 countries: the evidence of earnings smoothing and inflating. *Economic Research-Ekonomska Istraživanja*, 34(1), pp. 1452-1470. https://doi.org/10.1080/1331677X.2020.1831944
27. Le, B. and Moore, P.H. (2023). The Impact of Audit Quality on Earnings Management and Cost of Equity Capital: Evidence from a Developing Market. *Journal of Financial Reporting and Accounting*, 21(3), pp. 695-728. https://doi.org/10.1108/JFRA-09-2021-0284
28. Mardessi, S. M. and Fourati, Y. M. (2020). The Impact of Audit Committee on Real Earnings Management: Evidence from Netherlands. *Corporate Governance and Sustainability Review* 4(1), pp. 33-46.
29. Merchant, K. A. (1989). Ethics Testfor Everyday Managers. *Harvard Busniness Review*, pp. 220-221.
30. Nguyen, L. T. (2024). The relationship between corporate sustainability performance and earnings management: evidence from emerging East Asian economies. *Journal of Financial Reporting and Accounting*, 22(3), pp. 564-582. https://doi.org/10.1108/JFRA-09-2021-0302
31. Nguyen, T.T.H., Ibrahim, S. and Giannopoulos, G. (2023). Detecting Earnings Management: A Comparison of Accrual and Real Earnings Manipulation Models. *Journal of Applied Accounting Research*, 24(2), 344-379. https://doi.org/10.1108/JAAR-08-2021-0217
32. Nurdiniah, D. and Pradika, E. (2017). Effect of Good Corporate Governance, KAP Reputation, Its Size and Leverage on Integrity of Financial Statements. *International Journal of Economics and Financial Issues*, *7*(4), pp. 174–181.
33. Parinduri, A. Z., Pratiwi, R. K. and Purwaningtyas, O. I. (2019). Analysis of Corporate Governance, Leverage and Company Size on the Integrity of Financial Statements. *Indonesian Management and Accounting Research*, 17(1), pp. 18–35. https://doi.org/10.25105/imar.v17i1.4666
34. Pratama, I. and Suryarini, T. (2020). The Role of Independent Commissioners in Moderating the Effect of Capital Intensity, Inventory Intensity, and Profitability on Tax Aggressiveness. *Accounting Analysis Journal*, *9*(3), pp. 208-214. https://doi.org/10.15294/aaj.v9i3.42687
35. Rahman, R. A., Suffian, M. T. M., Ghani, E. K., Said, J. and Ahmad, I. (2021). Managerial Ownership and Real Earnings Management: A Study on Interaction Effect of Religiosity. *Journal of Management Information and Decision Sciences* 24(6), pp. 1-10.
36. Roychowdhury, S. (2006). Earnings Management Through Real Activities Manipulation. *Journal of Accounting and Economics*, 42(3), pp. 335–370. https://doi.org/10.1016/j.jacceco.2006.01.002
37. Sakaki, H., Jackson, D. and Jory, S. (2017). Institutional Ownership Stability and Real Earnings Management. *Rev Quant Finan Acc* 49, pp. 227–244. https://doi.org/10.1007/s11156-016-0588-7
38. Schipper, K. (1989). Earning Management, *Accounting Horizon*, 1(1), pp. 91-102.
39. Scott, W. R. (2015). *Financial Accounting Theory*, 7th Ed. Toronto: Pearson

40. Setiawan, D., Prabowo, R., Arnita, V. and Wibawa, A. (2019). Does Corporate Social Responsibility Affect Earnings Management? Evidence from the Indonesian Banking Industry. *Verslas: Teorija ir praktika / Business: Theory and Practice, ISSN 1822-4202, Vilnius Gediminas Technical University, Vilnius*, 20, pp. 372-378. https://doi.org/10.3846/btp.2019.35
41. Sitanggang, R. P., Karbhari, Y., Matemilola, B. T. and Ariff, M. (2019). Audit Quality and Real Earnings Management: Evidence from The UK Manufacturing Sector. *International Journal of Managerial Finance*, 16(2), pp. 165–181. https://doi.org/10.1108/IJMF-03-2018-0095
42. Tran, M. D. and Dang, N. H. (2021). The Impact of Ownership Structure on Earnings Management: The Case of Vietnam. *Sage Open*, 11(3), pp. 1-22. https://doi.org/10.1177/21582440211047248
43. Umar, H., Ayu, R. and Indriani, A. (2021). The Effect of Audit Quality, Leverage, and Voluntary Disclosure on Real Earnings Management. *Budapest International Research and Critics Institute – Journal*, 4(4), pp. 9193–9208.
44. Wahyono, W., Novianto, A. N. and Putri, E. (2019). The Effect of CSR Disclosure, Corporate Governance Mechanism, Auditor Independence, Auditor Quality, and Firm Size on Earning Management. *Riset Akuntansi dan Keuangan Indonesia*, 4(3), pp. 156–170. https://doi.org/10.23917/reaksi.v4i3.9339
45. Widagdo, A. K., Rahmawati, D. and Ratnaningrum (2021). Institutional Ownership, Family Firms, Leverage, and Earnings Management, *Jurnal Akuntansi dan Bisnis (JAB),* 21(2), pp. 252-266.
46. Zaman, M. Z. A., Supriyono, E., Sumarta, N. H. and Joseph, C. (2024). The Effect of Corporate Social Responsibility on Earnings Management and Investors' Response to Non-Financial Companies in Indonesia. *AKRUAL: Jurnal Akuntansi*, 15(2), pp. 1-22. Retrieved from https://journal.unesa.ac.id/index.php/aj/article/view/27547