Ferdowsi University of Mashhad Press (FUMP)

IJAAF

IRANIAN JOURNAL OF
ACCOUNTING, AUDITING and FINANNCE

Volume 7, Issue 4, Autumn 2023

Serial Number: 25

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

https://ijaaf.um.ac.ir

In the Name of God, the Compassionate, the Merciful

Ferdowsi University of Mashhad

Iranian Journal of Accounting, Auditing & Finance (IJAAF)

Volume 7, Number 4, Autumn 2023, Serial 25

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 with no border and number with figure IV New Roman11and render in a two column table 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 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:

Ferdowsi University of Mashhad is publishing

- 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. 7, No. 4, Autumn 2023, Serial 25

Iranian Journal of
Accounting, Auditing & Finance

Ferdowsi University of Mashhad

Quarterly

RESEARCH ARTICLE

Inventory Effectiveness and Nigeria Manufacturing Companies: Analysis with Return on Equity

Adegbite Tajudeen Adejare*

Department of Accounting, Al-Hikmah University, Ilorin, Kwara State, Nigeria

Ajagbe Surajdeen Tunde

Department of Banking and Finance, Al-Hikmah University, Ilorin, Kwara State, Nigeria

How to cite this article:
Adegbite, T., & Ajagbe, S. (2023). Inventory Effectiveness and Nigeria Manufacturing Companies: Analysis with Return on Equity. Iranian Journal of Accounting, Auditing and Finance, 7(25), 1-12. doi: 10.22067/ijaaf.2023.43618.1291
https://ijaaf.um.ac.ir/article_43618.html

ARTICLE INFO

Article History
Received: 2023-02-25
Accepted: 2023-05-16
Published online: 2023-10-15

Keywords:
Inventory, Profitability, Manufacturing Companies, Equity, Turnover, Non-current Asset

Abstract

This study examined the impact of inventory management on the profitability of selected manufacturing companies in Nigeria. Specifically, the study determined the effect of inventory management on return on equity. The data were sourced from annual published reports of ten selected companies. The data sourced were inventory, asset, revenue, equity, turnover, and profit after tax. The data collected were analyzed with panel data using random effect, fixed effect, regression, and correlation. The result showed that return on equity has a good correlation with inventory. Also, it was discovered from the analysis that according to the Fixed effect result, inventory positively affects return on equity. Still, the asset has a negative effect on Profitability. Turnover and equity have a significant positive effect on return on equity. Conclusively, inventory positively impacts return on equity in Nigerian manufacturing companies. It recommended that Nigerian manufacturing companies should not trivialize inventories but put more effort into the management of inventory so that the profitability of the company will be efficiently enhanced and increased at an increasing rate so that investors' investment will be multiplied because rational investors discard unproductive company to accept the profitable companies.

https://doi.org/10.22067/ijaaf.2023.43618.1291

NUMBER OF REFERENCES
27

NUMBER OF FIGURES
-

NUMBER OF TABLES
4

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

*Corresponding Author:
Adegbite Tajudeen Adejare
Email: adetajud@yahoo.com
Tel: +2348035793148
ORCID:

1. Introduction

Inventory management cannot be underestimated because opening and closing inventory is vital to an effective and efficient organization. It is considered a vital activity in organizational logistics that leads to a firm's growth and survival. Inventory management is principally and specifically concerned with placement and the size of stocked goods and raw materials. Inventory management is required at any location in an organization to safeguard production against running out of inputs, materials and goods (Cannon, 2018). Effective and efficient inventory management determines profit maximization, which depends on cost minimization and revenue maximization. According to Stephenson and Vracheva (2015), profit maximization is an efficient concept that dispenses profit enhancement without increasing the resources employed in an organization. Inventories kept adequately in manufacturing companies smooth the production process in any manufacturing company. Proactive organization management provides good customer service and achieves a noble and public image by stocking sufficient inventories. Inventory levels are seen as one of the vital and motivating areas for organization materials management improvement and attainment of equilibrium between high return on investment and low inventory (Yankah et al., 2022)

The process and the inventory management procedure are difficult matters and delicate tasks in every organization. Inventories are pertinent to prosperous manufacturing organizations. It consists of work-in-progress, raw materials, and finished goods. Inventory represents a vital capital component, and business prospect and failure depends on the inventory management performance since inventory management eradicates liquidity problems, upsurges the company's profitability and invariably determines the financial positions of organizations (Gebisa and Ram, 2021). It represents one of the key elements and the largest value in current assets of the financial position. However, any defect in evaluating and determining its stock cost invariably negatively affects production, thereby downplaying the company's profitability (Yankah et al., 2022).

Since inventory is the major segment of the company's investment, effective inventory management ensures organizational profitability. According to Athumani and James (2019), inventory management goes a long way in determining and facilitating manufacturing companies' success and failure. Ineffective and inefficient inventory management leads to stock out in the organization, which invariably gives birth to goodwill and customer loss, which downplay the profit and ultimately cause the organization to collapse. Organizational failures and inefficiency have been ascribed to the inability to effectively control, plan properly and strategize on the inventory conversion period and the inventory levels. This has bred divergent dispositions among the researchers that inventory, a single component in current assets, cannot determine the profitability of the manufacturing companies (Nwakaego et al., 2014; Ahmad, 2018; Lwiki et al., 2013; Musau et al., 2017). But Ikechukwu and Nwakoby (2020), Lwiki et al. (2013), Orga and Mbah (2017), and Salahudeen and Abraham (2018) advocated that inventory, a single component of the current assets, determines the faith of the organization. In line with the divergent dispositions of the extant researchers, this study intends to effectively determine the potency of the inventory in determining the profit and the performance of the manufacturing companies in Nigeria. Therefore, the disposition of this study is to determine the impact of inventory on manufacturing companies' profitability in Nigeria.

2. Literature Review

2.1 Profitability

Profitability refers to the income the companies realize from effectively and efficiently utilizing all the resources within their custody. The resources are split into human and material

resources. Human resources is the labour employed, saddled with the responsibilities of planning, managing, controlling, and utilizing all the material resources for attaining organizational goals. But material resources are the inputs and equipment bought or acquired for input conversion into a finished product. Profitability can be determined through returns on the investment invested by the equity holders in the company. All rational equity holders expect their investment to be multiplied at the end of the accounting or financial year. This can either come as a dividend or a share bonus. Hence, it is measured through return on equity (ROE). ROE of any company decides its capability to utilize effectively and efficiently the equity engaged in an organization to generate good returns (Olatunji and Adegbite, (2014) and Akanbi and Adegbite, (2016). ROE ratio measures the percentage of profits declared by the organization and the equity employed; it is one ratio that measures company efficiency in making profits on equity. A higher ratio specifies the company's capacity to maximize shareholders' wealth effectively.

2.2 Inventory

Inventories are vital to the progress and effective operation of manufacturing companies. This consists of raw materials, work-in-progress, and finished goods. Inventory can be effectively managed through Inventory systems, Inventory control and Inventory management. Inventory systems refer to the policies that monitor and control inventory levels and determine the inventory level to be compulsorily maintained, stock to be replenished and ordered, and ordering time. Inventory control also refers to storage supervision, supply supervision and item accessibility to ensure adequate supply without undue oversupply. Inventory management comprises organizing, controlling and planning the inflow and outflow of materials from the initial procurement unit to internal operations or usage to finished products and distribution (Ali and Ali, 2012). Manufacturing companies don't need to possess all classes of inventory. Still, the most important is that efficient management is absolutely needed, whatever the classes of the inventory items. Since inventory represents a vital major fragment investment, it is fundamental that good and effective inventory management dispenses manufacturing companies' growth and profitability. Inventory management determines organizational success and failure. Ineffective inventory management, according to Chebet and Kitheka (2019) and Ikechukwu and Nwakoby (2020), ignites stock out, loss of goodwill and customers, which invariably affect profit inversely and results in the ultimate breakdown of the company. With their submission, inventories are considered a vital and significant component of current assets, which are indispensable for manufacturing companies.

H_1: Inventory has an indispensable significance on the profitability of manufacturing companies

2.3 Noncurrent asset

Noncurrent asset refers to company property with an organization's future or current economic value. Basically, noncurrent assets include all properties owned and controlled by the manufacturing companies that are currently and monetarily valuable, which dispense future benefits to the organization. Noncurrent assets include but are not limited to investments, patents, and machinery (Akinlabi, 2021). According to Adegbite (2019), an asset refers to a resource embedded with monetary and economic value owned by an individual, country or corporation with the absolute expectation that it will bring in future benefit to the organization, which is reported in the statement of financial position of the organization. Noncurrent assets are classified into intangible and tangible. It is bought or produced to enhance the firm's benefit or value to the organization's operations which invariably generate future cash flow, improve sales, and reduce expenses.

H_2: Noncurrent has an indispensable significant effect on the profitability of manufacturing companies

2.4 Turnover

Turnover refers to the organization's sales in monetary terms within a year, month, day, and week. This displays the organization's effectiveness and efficiency in gauging how quickly it realizes cash inflow from accounts receivable and disposal of its inventory and finished goods. It is also referred to as the company revenue globally because the products made by the organization are expected to sell out to their customers for revenue realization. This means that the company exchange its products for revenue realization from its customers. Turnover ratios display how rapidly an organization turns its accounts receivable investments and inventory into cash. It is expected that when manufacturing companies produce their finished products at an increasing rate, turnover is expected to upsurge the profit of the company.

H_3: Turnover possesses a significant influence on the profitability of manufacturing companies

2.5 Equity

Equity Shares refer to ordinary shares of the manufacturing company. The owner of the equity is known as the real owner of the manufacturing company. This type of finance contributed extensively to the company by issuing shares to the public. The equity owners in any manufacturing company have control and involvement in the company management. Equity shareholders possess voting rights and are eligible for the company's dividend after all the other stakeholders have been settled. It is known that the equity shareholder collects dividends corresponding to the shareholding number and the company's profit at the end of the accounting and reporting period, usually a year. According to Agu (2016), Akinlabi (2021), and Ikechukwu and Nwakoby (2020), equity, when effectively managed, increases the profitability of the company, which shows that the higher the equity management, the higher the increment in organization profit which invariably increases the returns on their investment. It is hypothesized that:

H_4: Equity possesses a significant influence on the profitability of manufacturing companies

2.6 Theoretical review

This study is affixed with the Economic Order Quantity (EOQ) inventory management model, which opined that the organization employs inventory control to minimize costs between holding stock and ordering stock. According to Ikechukwu and Nwakoby (2020), the EOQ model entails that ordering quantity must be determined where stock ordering costs (SOC) and stock holding costs (SHC) are equal. Saleemi (1993) propounded this theory with the view that optimal inventory size is where SOC and SHC are equal. This model supports an organization's management in using an effective and productive stock management system to ensure that the production stock need is fulfilled and effective sales forecasts are employed for effective ordering purposes. Several assumptions have been put into consideration by the EOQ model. One of the assumptions is that stored product usage is presumed to be stable while ordering costs are presumed to be constant. This model is relevant to this study because the inventory availability for production invariably dispenses organizational outputs, which determines profitability. This means that the more effectively the use of inventory, the more profit is realized by the company, which invariably serves as the determinant for the company's performance. EOQ considers various costs merely and easily extended to fixed assets. The only constraint of EOQ is that its assumption is major on a

single product in which the demands of the single product are equally spread throughout the year.

2.7 Empirical review of related studies

Agu (2016) established an inventory control effect on selected manufacturing firms' productivity in Nigeria. Primary data was collected through interviews and questionnaires from two hundred and eighty-five respondents who served as population sampled respondents out of 996. Pearson product moment correlation coefficient and simple linear regression were employed to test the study's hypotheses. The findings indicated that inventory control positively, significantly and statistically improved manufacturing companies' productivity. According to the study, inventory management is indispensable to the organization's operation. However, the study employed a questionnaire to examine the inventory control effect on productivity, which is different from the current study that sourced data from annual reports of selected Nigerian manufacturing companies. Another study by Orga and Mbah (2017) determined an effective inventory management system effect on departmental store performance in South East Nigeria. The data were collected through questionnaires from the staff of twenty-seven (27) departmental stores (Management, Stores, and Finance) in South East Nigeria. Simple linear regression was engaged for hypothesis testing. The study concluded that inventory management impacted department store growth positively and significantly in South East Nigeria. Nevertheless, the study made use of questionnaire which absolutely against this methodology of this study.

Ahmad (2018) empirically examined the effect of inventory management on micro enterprises' performance in Malaysia. The study employed a hundred (100) questionnaires administered to Malaysian owners/managers in micro-enterprises. The findings from regression analysis showed that inventory management impacted the firm's performance positively and significantly. However, the study was conducted in Malaysia, and policy implications were restricted to Malaysia, which is inappropriate for Nigeria. Salahudeen and Abraham (2018) analyzed the effect of inventory management on manufacturing firms' operational performance. The study was restricted to May and Baker manufacturing company, where 60 staff were randomly sampled through the questionnaire. The result from the chi-square analysis displayed that a significant relationship existed between organizational performance and inventory management. However, the study examined inventory management's effect on manufacturing firms' operational performance, which was restricted to a single company- May and Baker manufacturing company- but not panel data of more than one organization as against this study. Similarly, Athumani and James (2019) determined the impact of inventory management on Tanzania's organizational performance. Data were ultimately collected through questionnaires from 40 respondents. The findings from the descriptive analysis revealed that inventory management through technology had a significant positive impact on Tanzania's organizational performance.

Elsheikh and Hassanin (2019) employed secondary data garnered through fifty (50) Egyptian listed companies to determine the impact of inventory management on Egyptian firms' financial performance from 2012 to 2019. The data collected were from the top 50 non-financial companies in the Egyptian Stock Exchange. The results from the panel data analysis revealed that inventory had an insignificant effect on firms' financial performance. This study is limited to the performance of Egyptian listed companies but was not in line with the current study done by Nigerian manufacturing companies.

Muchaendepi et al. (2019) assessed the impact of inventory management strategies on the Harare manufacturing sector in Zimbabwe. The study encompassed the population of Gleview complex, Kuwadzana, Magaba, Gazaland and Siya-So Mbare industrial sites. Respondents were justifiably selected from each company, which was selected purposely. The outcome of qualitative

research design and descriptive analysis showed that inventory management strategies significantly impacted the Harare manufacturing sector in Zimbabwe. The study was conducted in Zimbabwe's Harare manufacturing sector but not Nigeria. Geographically, the outcome is not compatible with Nigeria.

Olaniyan et al. (2020) focused on the inventory management system (IMS) effect on organization performance in Osogbo, where supermarkets and stores were randomly selected for the study. The study's outcome, gathered from the questionnaire analyzed through cross-sectional descriptive research design, showed that efficient IMS practices positively impacted organizational growth, sales turnover, and profitability of firms in Osogbo, Osun States. However, the study only covered one single state out of 36 states in Nigeria and also focused on the profitability of supermarkets but not manufacturing companies. In line with Olaniyan et al. (2020), the questionnaire was also employed by Ikechukwu and Nwakoby (2020) to gauge the inventory management impact on Nigeria firm performance using ten (10) sampled organizations with seven hundred and ten (710) populations. The OLS regression and Pearson Correlation findings showed that inventory management positively influenced Nigeria firm performance. Nonetheless, the study employed questionnaire as against the current study.

Ernest et al. (2020) examined the effect of inventory management on Accra's manufacturing firm performance. The study employed a cross-sectional survey to collect data for hypotheses testing from 165 Accra-based manufacturing companies, which were analyzed with Factor Analysis and Pearson's correlation. Results discovered that inventory management positively affected marketing and operational performance. It was also discovered in the study that capital size and firm size had a positive influence on inventory management in Accra-based manufacturing companies. The study, however, was done in Accra. The methodology engaged was not in tandem with the methodology of this study.

Ezeocha and Daniel (2020) examined the impact of inventory management practices (IMP) on small-scale enterprises' (SSEs') performance in Abuja, Nigeria. Data were collected and analyzed using descriptive and content analysis, respectively. Qualitative results revealed that IMP had a significant impact on SSEs' performance. The study was purely qualitative, unlike the current study, which is quantitative. Gebisa and Ram (2021) empirically investigated information sharing and the IMP effect on Ethiopian firms' performance. Data collected from one hundred and seventy (170) respondents, including the company's employees, distributors, and suppliers, were analyzed with structural equation modelling (SEM) to realize the motive of the study. Results showed that IMP and information sharing had a direct significant and statistical effect on firm's performance. The study finally concluded that information sharing directly and indirectly impacted firm's performance significantly but IMP only significantly impacted firm's performance directly. The study was done in Ethiopia not in Nigeria, and the scope was limited to IMP and firms' performance in Ethiopia.

Akinlabi (2021) examined the IMP effect on the operational performance of selected Nigerian flour mills. The study targeted a population of 2,237 staff aggregately in all flour mills selected, in which 776 were randomly selected to attain the motive of the study. A structured questionnaire was used, validated, and analyzed with Cronbach's alpha, PPMC, and regression analysis. Findings discovered that Inventory record accuracy, automated inventory system, and Inventory turnover, except for Inventory shrinkage, were found to have a positive, significant and statistical influence on operational performance. The study invariably concluded that IMP significantly influenced Nigeria's flour mills' operational performance. However, the study examined Nigeria's flour mills' operational performance, but its scope was not elongated to the current year.

Mbugi and Lutego (2022) investigated the effect of inventory control management (ICM)

systems on Tanzania organization performance concerning Mwanza City food and beverage companies. The study adopted a qualitative approach using content analysis methods for data collection through annual published industry reports and documentary reviews to attain accomplished objectives. The findings publicized that food and beverage companies had numerous inventories of raw materials, finished goods and work-in-progress for production efficiency and cost reduction management under the FIFO system. The study concluded that the ICM system positively influenced and significantly impacted Tanzania's organizational performance. The study focused on Tanzania's organizational performance, not Nigeria's manufacturing companies.

Yankah et al. (2022) investigated how manufacturing enterprises' performance was affected by inventory management in Kumasi Metropolis of Ghana. Descriptive, which is embedded with research demography, was involved in the investigation. Target demography was comprised of all staff in all essential departments with a total population and sampled size of 62 and fifty-four, respectively. The instrument for data collection and sample size formula employed were questionnaires and Yamane sample size, respectively. It was discovered that manufacturing enterprises' performance significantly and positively influenced manufacturing companies in Kumasi Metropolis, Ghana. The study further advocated that stock management is a crucial factor for the success of Kumasi Metropolis manufacturing companies. However, the study was invented in Ghana with a questionnaire for data sources, which quietly deviated from the current study.

The existing studies such as Agu (2016), Ahmad (2018), Elsheikh and Hassanin (2019), Ezeocha and Daniel (2020), Olaniyan et al. (2020); Akinlabi (2021); Gebisa and Ram (2021) and Yankah et al., (2022) restricted their studies to the questionnaire as the only ways of collecting data for analysis. However, Mbugi and Lutego (2022) were done and limited to Tanzania and the year 2019, which is different from this study. This study created a gap with the extension of scope to the year 2022 in Nigeria manufacturing companies and the involvement of panel data analysis such as random, fixed effect, and hausman test to examine the effect of inventory management on profitability in Nigeria manufacturing companies.

3. Research Methodology

This study adopted an ex-post facto method of research design to investigate the effect of inventory management on return on Equity (ROE) in Nigerian manufacturing companies. Companies selected randomly are ten (10) from listed consumer goods manufacturing companies. The data collected were from the annual financial reports of selected companies from 2011 to 2021. Panel data, which is cross sectional and time series data, were employed to analyze the data source because of the nature of the study. The models are:

3.1 Model specification

Inventory was considered an independent variable to examine the effect of inventory on ROE, while ROE is the dependent variable. Noncurrent Assets, Equity, and Turnover are the control variables.

The econometric model is stated as

ROE = f(INV)

ROE= f(INV, ASSET, EQUITY, TURNOV)

$$ROE = a_0 + B_1INV + B_2ASSET + B_3EQUITY + B_4TURNOV + U_2$$

3.1.1 Fixed Effect Model

$Y_{it} = \beta_0 + \beta X_{it} + u_{it}$

$ROE_{it} = \beta_0 + \beta_1 INV_{it} + \beta_2 ASSET_{it} + \beta_3 EQUITY_{it} + \beta_4 TURNOV_{it} + y_2 E_2 + \ldots + y_n E_n + u_{it}$

$ROE_{it} = \beta_0 + \beta_1 INV_{it} + \beta_2 ASSET_{it} + \beta_3 EQUITY_{it} + \beta_4 TURNOV_{it}\ \ y_2 E_2 + \ldots + y_n E_n + \delta_2 T_2 + \ldots + \delta t T_{t-1} + u_{it}$

3.1.2 Random Effect Model

$Y_{it} = \beta_0 + \beta X_{it} + u_{it} + \varepsilon_{it}$

$ROE_{it} = \beta_0 + \beta_1 INV_{it} + \beta_2 ASSET_{it} + \beta_3 EQUITY_{it} + \beta_4 TURNOV_{it} + + \gamma_2 E_2 + \ldots + \gamma_n E_n + u_{it} + \varepsilon_{it}$

Where:
ROE= Profitability
INV= Inventory
ASSET= Noncurrent Assets
EQUITY= Equity
TURNOV= Turnover

4. Results and Discussion

Table 1. The Correlation Matrix

	ROE	INV	ASSET	EQUITY	TURNOV
ROE	1.000				
INV	0.358*	1.000			
ASSET	0.1192	0.656*	1.000		
EQUITY	0.342*	0.303*	0.208*	1.000	
TURNOV	0.441*	0.373*	0.255*	0.183	1.000

Source: Researcher's Computation (2022)

A correlation matrix was tested to examine the multicollinearity among the variables. It was discovered that ROE has a good correlation with INV, with a value of 0.3581. This shows that there is an absence of multicollinearity between ROE and INV. It was also discovered from Table 1 that ASSET also possessed a cordial relationship with ROE on the value of 0.1192. However, EQUITY has a positive relationship with ROE but lacks multicollinearity. Also, TURNOV, with a correlation matrix value of 0.4412, possessed a positive relationship with ROE. Because the value (0.4412) is less than 0.7, this shows no element of multicollinearity among ROE and all variables involved. Therefore, the outcome of the correlation matrix calls for a VIF test.

Table 2. Variance Inflation Factor

Variable	VIF	1/VIF
TURNOV	11.220	0.089
INV	5.590	0.178
ASSET	4.520	0.221
EQUITY	1.200	0.830
Mean VIF	5.630	

Source: Researcher's Computation (2022)

VIF was tested in order to check the presence of multicollinearity. All the variables employed in this study have no element of multicollinearity because the values in Table 2 are less than 10, except for TURNOV, which is 11.22. This shows that TURNOV possessed multicollinearity. This called for Robust Regression in order to eradicate the multicollinearity in TURNOV.

Table 3. Effects of inventory management on return on equity using different models

ROE	(1) Regression	(2) Robust Regression	(5) Fixed-effects (within) regression	(6) Random-effects GLS regression
INV	2.33e-10*	2.33e-10	4.42e-11	5.67e-11
	(0.066)	(0.034)	(0.028)	(0.021)
ASSET	-1.41e-10***	-1.41e-10***	-7.85e-11***	-8.24e-11***
	(0.000)	(0.000)	(0.000)	(0.000)
EQUITY	8.08e-10***	8.08e-10***	2.71e-10**	3.14e-10**
	(0.000)	(0.000)	(0.036)	(0.014)
TURNOV	1.84e-10***	1.84e-10***	9.89e-11***	1.06e-10***
	(0.000)	(0.000)	(0.000)	(0.000)
CONS	4.155***	4.155***	2.733*	2.761
	(0.003)	(0.009)	(0.077)	(0.301)
N	99	99	99	99
R^2	0.603	0.603	0.404	
adj. R^2	0.586	0.586	0.321	

p-values in parentheses

*p< 0.10, **p< 0.05, ***p< 0.01. Source: Researcher's Computation (2022)

Table 4. Hausman Test

ROE	(b) Fixed Effect	(B) Random Effect	(b-B) Difference	Sqrt (diag(V_b-V_B)) S.E
INV	4.42e-11	5.67e-11	-1.25e-11	2.72e-11
ASSET	-7.85e-11	-8.24e-11	3.94e-12	8.52e-12
EQUITY	2.71e-10	3.14e-10	4.36e-11	-
TURNOV	9.89e-11	1.06e-10	-6.64e-12	4.56e-12
chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)				
= 53.080				
Prob>chi2 = 0.000				

Source: Researcher's Computation (2022)

In Table 3, different analytical tools were used to determine the effect of inventory management on ROE. The first column is the pooled regression outcomes of the analytical model. This model was rejected because of the discovery of multicollinearity in TURNOV, which called for Linear Regression (Robust), and this negated Pool Regression. According to Robust Regression, INV has a significant positive effect on ROE. Also, the asset has a significant negative effect on ROE, which invariably displays that the higher the ASSEST, the lesser the ROE. This result is per Agu (2016), and Akinlabi (2021), but ASSET and TURNOV positively impact ROE because of a probability value of 0.0000, which is less than 0.05 significant level.

The fixed effect regression model was also tested, and the Random effect model was also involved. Hausman test was done to pick the appropriate model between fixed and random effect models. According to the Hausman test in Table 4, the fixed effect was considered appropriate because Prob>chi2 = 0.0000, which is the yardstick to reject the null hypothesis, that the fixed effect is inappropriate. According to the Fixed effect, a percentage increase in INV increases ROE

by 4.4 percent but is significant. ASSET significantly negatively impacts ROE at 0.05 and 0.1 levels of significance; a percent increase in ASSET reduces ROE by 7.8 percent. On the contrary, EQUITY possesses a positive effect, which is significant on ROE. Also, TURNOV has a positive and significant effect on ROE; a percentage upsurge in TURNOV increases ROE positively and significantly in Nigerian manufacturing companies. Finally, a percent increment in TURNOV also positively increases ROE by 9.8 percent with a significant level of 0.001.

5. Discussion of Findings

This study examined the effect of inventory management on the profitability of manufacturing companies using ROE as a proxy of profitability in Nigeria. Secondary data were sourced through annual publication reports of financial statements of the selected manufacturing companies in Nigeria from 2011 to 2021. The data collected were analyzed through panel data analysis embedded with a fixed effect model, random effect model, and Hausman test. It also discovered from the analysis that, According to the Fixed effect, a percentage increase in INV increases ROE by 4.42 percent but is insignificant. That is, INV has a positive but significant effect on ROE. This result supports the view of Ahmad (2018), Elsheikh and Hassanin (2019), and Ernest et al. (2020) but disapproves of the view of Chebet and Kitheka (2019), Agu (2016) and Turginbayeva et al. (2022). It was also realized that EQUITY has a significant positive effect on ROE, which invariably displays that the higher the equity, the higher the ROE. This result aligns with Agu (2016) and Akinlabi (2021). On the other hand, ASSET has a significant negative impact on ROE; this indicates that the additional procurement of noncurrent assets reduces the profitability of the companies. This result supports the view of Chebet and Kitheka (2019), Mbugi and Lutego (2022), Muchaendepi et al. (2019), and Olaniyan et al. (2020) but declines the view of Nwakaego et al. (2014); Olatunji and Adegbite, (2014) and Salahudeen and Abraham, (2018). In addition, TURNOV has a positive and significant effect on ROE; a one percent increase in TURNOV increases INV by 9.8 percent. This shows that the sales revenue also impacted ROE positively and significantly in Nigerian manufacturing companies. This study is in line with the advocacy of Gebisa and Ram (2021), Muchaendepi et al. (2019), Musau et al. (2017), Turginbayeva et al. (2022), Yankah et al. (2022) and Gołaś, (2020), with the submission that for any organization to be profitable the turnover must be increasing at an increasing rate but disapproved the view of Athumani and James, (2019).

6. Conclusion

This study statistically evaluated the impact of inventory management on the profitability of selected manufacturing companies in Nigeria. Specifically, the study determined the impact of inventory management on return on equity. The data were sourced from annual published reports of ten selected companies. The data sourced were inventory, asset, revenue, equity, and profit after tax. The data collected were analyzed with panel data using random effect, fixed effect, regression, and correlation. The result showed that return on equity has a good correlation with inventory. Also, it was discovered from the analysis that, according to fixed effect, inventory has a positive effect on return on equity, but Asset has a negative effect on profitability. Turnover and equity have a significant positive effect on return on equity. Conclusively, inventory has a significant positive impact on profitability in Nigerian manufacturing companies. Inventory is considered the rock layer and pertinent structure for the survival and profitability of Nigerian manufacturing companies. Effective and efficient inventory management emits effectiveness in organizational control and survival. It recommended that Nigerian manufacturing companies should not trivialize inventories but put more effort into managing inventory so that the company's profitability will be efficiently

enhanced and increased at an increasing rate so that investors' investment will be multiplied because rational investors discard unproductive companies to accept the profitable companies.

References

1. Adegbite, T. A. (2019). Does Taxation Has Impact on Investment? An Empirical Response from Co-Integration Analysis. Annals of Spiru Haret University. Economic Series, 19(4), pp. 57-74.
2. Agu, O. A., Obi-Anike, H. O. and Eke, C. N. (2016). Effect of inventory management on the organizational performance of the selected manufacturing firms. *Singaporean Journal of Business Economics, and Management Studies*, 5(4), pp. 56-69.
3. Ahmad, K. and Zabri, S. M. (2018). The mediating effect of knowledge of inventory management in the relationship between inventory management practices and performance: The case of micro retailing enterprises. *Journal of Business and Retail Management Research*, 12(2), pp. 1-12.
4. Akanbi, T. A. and Adegbite, T. A. (2016). Analysis of the effect of financing on profitability of Small and Medium Enterprises (SMEs) in Nigeria: Lagos state Outlook. *International Journal of Marketing and Technology*, 6(8), pp. 1-13.
5. Akinlabi, B. H. (2021). Effect of inventory management practices on operational performance of flour milling companies in Nigeria. *International Academy Journal of Management, Marketing and Entrepreneurial Studies*, 8(2), pp. 137-174.
6. Ali, A. and Ali, S. A. (2012). Working capital management: Is it really affects the profitability? Evidence from Pakistan. *Global Journal of Management and Business Research*, 12(17), pp. 74-78.
7. Athumani, H. I. and James, S. (2019). The Impact of Inventory Management on Organization Performance of Tanzania Public Sectors: A Case of National Food Reserve Agency (NFRA). *International Journal of Economics, Commerce and Management*, 7(12), pp. 843–851.
8. Chebet, E. and Kitheka, S. (2019). Effects of inventory management system on firm performance–an empirical study. *International Journal of Innovative Science and Research Technology*, 4(9), pp. 34-242.
9. Elsheikh, L. and Hassanin, I. (2019). The Impact of Inventory Management on Firms' Financial Performance: Case Study Egypt. *In International Conference on Management and Industrial Engineering*, 9(1), pp. 612-618
10. Ernest, O., King, B. D., Esther, A. and Michelle, A. (2020). The Effect of Inventory Management on Firm Performance: Controlling For Key Confounding Variables. *International Journal of Management and Commerce Innovations*, 7(2), pp. 383–392.
11. Ezeocha, J. and Daniel, C. O. (2020). Impact of Inventory Management Practices on the Performance of Small Scale Enterprises in Gwarimpa District, Abuja Nigeria. *International Journal of Management Studies and Social Science Research*, 2(3), pp. 146–150.
12. Gebisa, D. A. and Ram, T. (2021). The Effect of Information sharing and Inventory Management in the Supply Chain Practices on Firms' Performance: Empirical Evidence from Some Selected Companies of Ethiopia. *International Journal of Industrial Engineering*, 3(1), pp. 1–15.
13. Gołaś, Z. (2020). The effect of inventory management on profitability: Evidence from the Polish food industry: Case study. *Agricultural Economics*, 66(5), pp. 234-242.
14. Ikechukwu, U. V. and Nwakoby, N. P. (2020). Impact of Inventory Management on Firm

Performance in Nigeria: Using Grass Roots Opinion. *International Journal of Engineering and Information Systems (IJEAIS)*, 4(11), pp. 34–46.

15. Lwiki, T., Ojera, P. B., Mugenda, N. G. and Wachira, V. K. (2013). The impact of inventory management practices on financial performance of sugar manufacturing firms in Kenya. *International Journal of Business, Humanities and Technology*, 3(5), pp. 75-85.
16. Mbugi, I. O. and Lutego, D. (2022). Effects of inventory control management systems on organization performance in Tanzania manufacturing industry-A case study of food and beverage manufacturing company in Mwanza city. *Internation al Journal of Engineering, Business and Management*, 6(2), pp. 56–69.
17. Muchaendepi, W., Mbohwa, C., Hamandishe, T. and Kanyepe, J. (2019). Inventory management and performance of SMEs in the manufacturing sector of Harare. *Procedia Manufacturing*, 33, pp. 454-461. https://doi.org/10.1016/j.promfg.2019.04.056
18. Musau, E. G., Namusonge, G., Makokha, E. N. and Ngeno, J. (2017). The effect of inventory management on organizational performance among textile manufacturing firms in Kenya. *International Journal of Academic Research in Business and Social Sciences*, 7(11), pp. 1032-1046. https://doi.org/10.6007/IJARBSS/v7-i11/3543
19. Nwakaego, D. A., Dorathy, O. C. and Ikechukwu, O. (2014). Inventory Management on the Profitability of Building Materials and Chemical and Paint Companies in Nigeria, Journal of *Management and Behavioral Studies*, 2(2), pp. 21–27. https://doi.org/10.5829/idosi.wjmbs.2014.2.1.1307
20. Olaniyan, H. I., Onyi, A. B., Adegboola, M. M., Aladesoun, C. B. and Ayoade, A. A. (2020). Impacts of Inventory Management Practices on Organization Performance. *International Journal of Academic Accounting, Finance & Management Research (IJAAFMR)*, 4(8), pp. 95–105.
21. Olatunji, T. E. and Adegbite, T. A. (2014). Investment in fixed assets and firm profitability: Empirical evidence from the Nigerian banking sector. *Asian Journal of Social Sciences and Management Studies*, 1(3), pp. 78-82.
22. Orga, C. C. and Mbah, C. C. (2017). Analyzing effect of inventory management practices on organizational performance of departmental stores in South-East, Nigeria. *International Journal of Advanced Research in Management and Social Sciences*, 6(3), pp. 147-174.
23. Salahudeen, L. A. and Abraham, O. A. (2018). Effect of Inventory Management System on Operational Performance in Manufacturing Firms: Study of May and Baker Manufacturing Industry Nig Ltd, Lagos. *IRE Journals*, 2(5), pp. 156–171.
24. Turginbayeva, A. N., Shaikh, A. A. and Zhakupbekova, G. E. (2022). Examining Consumer Behavior on the Development of Green Hotels in Kazakhstan. *Farabi Journal of Social Sciences*, 8(1), pp. 57-62.
25. Yankah, R., Osei, F., Owusu-Mensah, S. and Agyapong, P. J. (2022). Inventory management and the performance of listed manufacturing firms in Ghana. *Open Journal of Business and Management*, 10(5), pp. 2650-2667. https://doi.org/10.4236/ojbm.2022.105132
26. Stephenson, D., and Vracheva, V. (2015). Corporate social responsibility and tax avoidance: A literature review and directions for future research. (November 13, 2015). Available at SSRN 2756640. https://dx.doi.org/10.2139/ssrn.2756640
27. Saleemi N. A. (1993). Business Finance Simplified. Nairobi: Saleemi Publications Limited, 3rd ed, Kenya

IJAAF; Vol. 7, No. 4, Autumn 2023, Serial 25

Iranian Journal of
Accounting, Auditing & Finance

Quarterly

Ferdowsi University of Mashhad

RESEARCH ARTICLE

The Aggregate of Earnings and Announcement Returns with the Help of Twitter Using "Wisdom of Crowds" Theory and "Macro Accounting" Theory: Evidence from NYSE and Nasdaq

Vahid Bekhradi Nasab*

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

How to cite this article:
Bekhradi Nasab, V. (2023). The Aggregate of Earnings and Announcement Returns with the Help of Twitter Using "Wisdom of Crowds" Theory and "Macro Accounting" Theory: Evidence from NYSE and Nasdaq. Iranian Journal of Accounting, Auditing and Finance, 7(4), 13-27. doi: 10.22067/ijaaf.2022.42642.1172
https://ijaaf.um.ac.ir/article_42642.html

ARTICLE INFO

Article History
Received: 2023-03-30
Accepted: 2023-06-12
Published online: 2023-10-15

Keywords:
Twitter, Aggregate of Earnings, Aggregate of Announcement Returns, Wisdom of Crowds, Macro Accounting

Abstract

This study aims to predict the aggregate of earnings and announcement returns with the help of this purpose, by a selection of Twitter social media as a media approved by the US Stock Exchange and Securities Organization, data related to 345 companies selected from the list of top 500 companies in the United States, for the four years 2016-2019 (Market participant tweets about sample companies from October 2015 to March 2020), extracted and used Was analyzed from Stata software. The results showed that the volume of earnings news published by companies on Twitter could predict earnings surprises, and the content of earnings news published by companies on Twitter can predict earnings surprises. The results also showed that the volume of earning news published by companies on Twitter could predict announcement returns and the content of earning news published by companies on Twitter can predict announcement returns. The results can also be considered a strategy in content analysis of market-quality news based on a list of specialized financial words.

https://doi.org/10.22067/ijaaf.2022.42642.1172

NUMBER OF REFERENCES
36

NUMBER OF FIGURES
-

NUMBER OF TABLES
3

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

*Corresponding Author: Vahid Bekhradi Nasab
Email: vahid.bekhradinasab@gmail.com
Tel: 09137880527
ORCID: 0000-0001-7601-7915

1. Introduction

Accounting earnings and stock returns are among the essential information influencing investors' decisions in the capital market. With the advancement of information technologies, in addition to quantitative accounting earning information, it is essential to pay attention to the published news and quality information about accounting earnings and stock returns (Watts and Zimmerman, 1978). With the development of information technologies, users of accounting information have gained access to complementary information resources. Investors can access multiple sources to reduce their information gap with companies and other stakeholders, but they may not consider all information sources due to time constraints. Thus, despite the vast amount of data in popular publishing environments such as databases, websites, the press, financial advisory channels, and analysts, there is the potential for significant and sometimes influential information on various aspects of decision-making to be overlooked (Richins et al., 2017). investors have long relied on information intermediaries (e.g., financial analysts, financial advisors, the business press, credit rating agencies, short sellers, and auditors) to acquire timely and value-relevant information regarding the prospects of stocks. However, the past decade has witnessed an explosion in new sources of information that are easily accessible to capital market participants. With the rise of the Internet, individual investors increasingly rely on each other as peer-to-peer sources of information (e.g., Yahoo! Finance, Silicon Investor, and Raging Bull). By far, however, the biggest revolution in disseminating information on the Internet has been the advent of social media platforms such as Twitter, which allow users to post their views about stocks instantaneously to a wide audience (Bartov et al., 2018).

The last decade has seen the emergence of new information sources, such as social media, making it easier for market participants to access information. The main difference that can be made between popular publishing channels and social media is that in the approach of publishing by popular media such as the press, the company does not know when investors will receive the information. The press also tends to cover the news of more visible companies, which attracts more readers (Miller, 2006). In contrast, a company using social media can:

1-Publish information to followers directly and without intermediaries.

2-Control the release schedule.

3-Send multiple, duplicate (or similar) messages related to similar information events over several days.

4-Also, know the exact number of followers.

While Twitter undoubtedly is an exciting and emerging new source of information to the capital market, it is unclear whether it will be useful to investors. On the one hand, Twitter allows users to tap into the Wisdom of Crowds, where the aggregation of information provided by many (non-expert) individuals often predicts outcomes more precisely than experts. Further, Twitter users, who come from diverse backgrounds, are less likely to herd, a phenomenon that plagues traditional information intermediaries (e.g., financial analysts), as well as social media platforms (e.g., blogs, investing portals) where a central piece of information is posted, and users comment on it. Finally, Twitter's short format (up to 140 characters) and ease of information search make it an ideal medium to share opinions and information in a timely fashion, in contrast to the longer format and potentially reduced timeliness of research reports or articles.

With the advent of Twitter in March 2006, many companies considered Twitter to be a communication channel for transmitting financial information to investors. As the communication channel mentioned, it changed the methods of publishing company news and the processing of news by users. Following a post from the CEO of Netflix on his personal Facebook page, the company's stock price rose 6.2% in just one day (Bloomberg, 2013). This prompted the Securities and Exchange Commission (SEC) to consider the impact of social media. The Securities and Exchange Commission

(SEC), in a statement issued on April 2, 2013, allowed companies to use social media, especially Twitter, to convey information to investors (Securities and Exchange Commission, 2013; Bartov et al., 2018). The statement provides a formal form of corporate information dissemination, and corporate executives will be directly responsible for the content of Twitter news. The Securities and Exchange Commission's statement on social media reassures investors that corporate tweeting is relevant (Al Guindy, 2017).

On the other hand, with the increasing importance of Twitter in the stock market, the symbol of "cashtag ($)" was introduced by the mentioned social media and made it possible for market participants to tweet about the shares of each company. Twitter has allowed its users to use the slaughter symbol to convey their views on the stock to a wide range of users. Discussions of tweets and interactions between market participants are important in several ways. First, according to the voluntary disclosure theory, companies often spread positive news on social media While tweeting to market participants. It shows a greater variety of tweet content because it conveys collective opinions and not just company opinions and neutralizes companies' strategic dissemination of news (Al Guindy, 2017). Second, gathering participants' opinions on Twitter can be interpreted as a measure of the " Wisdom of crowds" theory. The theory of Wisdom of crowds refers to the phenomenon that the aggregation of information from individuals with diverse and independent views and opinions will lead to better predictions than the predictions of any member of the group or even experts. Thus, the possibility of multidimensional communication on Twitter allows the participants' tweets and comments, including positive, negative and neutral comments, to be transferred to the market. Twitter allows market participants to express their opinions freely. The aggregation of information provided by a wide range of market participants will provide stakeholders with even more accurate information from the opinions of experts and analysts. This is because information intermediaries such as the press and financial analysts often seek to impose their views on others, and the mere reliance of investors on these channels will lead to inaccurate forecasts in capital markets (Stevens and Williams, 2004). In contrast, contributors' tweets provide the opinions of a diverse and broad group of independent users on a timely basis (Bartov et al., 2018).

On the other hand, the information from tweets may be uninformative or even intentionally misleading because Twitter is an unregulated platform with potentially anonymous users. For example, in two days in January 2013, a series of damning but false tweets on two stocks— Audience Inc. (ticker symbol: ADNC) and Sarepta Therapeutics, Inc. (ticker symbol: SRPT)— sent their prices plunging by 28 percent and 16 percent, respectively.

The academic literature has begun studying the role Twitter plays in the capital market only recently, perhaps because Twitter was created in March 2006 and launched in July 2006. One strand of this literature examines how companies exploit this new channel to communicate with investors; another investigates whether information from Twitter predicts the overall stock market; and a third analyzes the relation between Twitter activity and investor response to earnings news.

However, the intriguing question of whether firm-specific information from Twitter is useful in predicting a firm’s earnings and stock returns has not been addressed. In this paper, we fill this gap in the literature by examining whether information from individual tweets about a firm can help investors predict the firm’s earnings and announcement returns. Specifically, we explore the following three research questions: (1) Does the aggregate opinion from individual tweets pertaining to a firm predict its quarterly earnings? (2) Does the aggregate opinion from individual tweets predict the stock price reaction to the firm’s earnings realizations? (3) Does the information environment quality of a company explain the cross-sectional variation in the predictive ability of the aggregate opinion from individual tweets (if it exists)? Gaps and contributions included in the present study relationship between the function of the mass media, with emphasis on two main elements of

awareness and information, play an important role in speculating on changes in stock prices and investment decisions. Nowadays, everyone knows the importance and status information for investment decisions. Thus, the function of the mass media, emphasizing two main elements of awareness and information, plays an important role in speculating on changes in stock prices and investment decisions. Researchers in various countries pay less attention to this subject. This study attempts to influence the media to examine the investment decision in stock. In this study, the mass media, including Twitter, investment decision criteria, participation in the stock, and stock options have been adopted. The theoretical foundations, research method, findings, discussion, and conclusion are stated in the research.

2. Literature Review

2.1 Twitter and predicts the overall stock market

In recent years, academic literature has begun to study the role Twitter plays in the capital market. One strand of this literature investigates how companies exploit this new channel to communicate with investors. Blankespoor et al. (2014) show that firms can reduce information asymmetry among investors by broadly disseminating their news using Twitter to send market participants links to press releases and other traditional disclosures. Jung et al. (2018) find that roughly half of S&P 1500 firms have created either a corporate Twitter account or a Facebook page, with a growing preference for Twitter. Lee et al. (2015) show that firms use social media channels like Twitter to interact with investors to attenuate negative price reactions to consumer product recalls.

Another strand of this literature investigates whether information from Twitter predicts the overall stock market. Bollen et al. (2011) show that aggregate mood inferred from textual analysis of daily Twitter feeds can help predict changes in the Dow Jones Index. Similarly, Mao et al. (2012) find that the daily number of tweets that mention S&P 500 stocks is significantly associated with the levels, changes, and absolute changes in the S&P 500 Index. A third strand of this literature analyzes how Twitter activity influences investors' response to earnings. Curtis et al. (2014), who focus on the overall social media (Twitter and Stock Twits) activity over 30-day rolling windows, find that high levels of activity are associated with greater sensitivity of earnings announcement returns to earnings surprises, while low levels of social media activity are associated with significant post-earnings-announcement drift.

In addition to the literature on Twitter, a broad stream of research has examined investors' use of Internet search engines, financial websites, forums, and other social media platforms. This research has provided mixed evidence on whether this information helps predict future earnings and stock returns. Using Google search volume as a proxy for investors' demand for financial information, Da et al. (2011) find that increases in Google searches predict higher stock prices in the near term followed by a price reversal within a year, while Drake et al. (2012) show that the returns-earnings relation is smaller when Google search volume prior to earnings announcements is high. Examining Internet bulletin boards, Hirschey et al. (2000) find that investment reports in Motley Fool predict stock returns. In contrast, Tumarkin and Whitelaw (2001) find no link between message board activity on Raging Bull and stock returns. Antweiler and Frank (2004) and Das and Chen (2007) find that the volume of messages on message boards, such as Yahoo! or Raging Bull, is associated with stock return volatility, not stock returns. More recently, Jame et al. (2016) show that crowdsourced earnings forecasts on the Estimize platform provide incrementally value relevant information to the capital market to predict earnings and calibrate the market's earnings expectation. Finally, Chen et al. (2014) demonstrate that information in user generated research reports and commentaries on the SeekingAlpha portal helps predict earnings and long-window stock returns following the report posting date. However, unlike investing portals such as SeekingAlpha that publish paid, full-length

reports from registered users after verifying their credentials and vetting the quality of the submissions, there is little control or monitoring on an open platform like Twitter.

However, What this literature left unexplored is whether firm-specific information from individual tweets is useful in predicting the firm's earnings and stock returns, the very question we examine in our paper.

2.2 Wisdom of Crowds Theory

The Wisdom of the Crowds concept goes back over a century and refers to the phenomenon that the aggregation of information provided by many individuals often results in predictions that are better than those made by any single member of the group or even experts. Surowiecki (2004) presents numerous case studies and anecdotes to illustrate the Wisdom of Crowds. One classic example from the turn of the 20th century is Sir Francis Galton's surprising finding that the crowd at a county fair accurately predicted the weight of an ox when their individual guesses were averaged. The crowd's average (or median) prediction was closer to the ox's true weight than most crowd members' estimates and even closer than any of the estimates made by cattle experts. Similarly, a trial by jury can be understood as a manifestation of the Wisdom of Crowds, especially when compared to a trial by a judge, the single expert. Berg et al. (2008) analyze the ability of the Iowa Electronic markets to predict election results and find that the markets' prediction shows no bias and a remarkable ability to predict high-profile elections, outperforming polls conducted by experts. Recent papers that build on the Wisdom of Crowds notion show that user-generated research reports and commentaries posted on the SeekingAlpha portal help predict stock returns in several long-term intervals following the report posting date (Chen et al. 2014) and that the content of tweets can be used to predict future returns around Federal Open Market Committee (FOMC) meetings (Azar and Lo 2016).

In related work, Hong and Page (2004) show analytically that a diverse group of intelligent decision-makers reach reliably better decisions than a less diverse group of individuals with superior skills and conclude that under certain conditions, "diversity trumps ability" (p. 16386).

Building on this, Moldoveanu and Martin (2009), by collecting heterogeneous problem solvers, will always beat out a single expert problem solver." This is relevant to the research questions of this paper because anecdotal evidence suggests that Twitter has the most diverse set of users among social media platforms. In contrast, traditional information intermediaries such as financial analysts tend to "herd" to the consensus viewpoint (Jegadeesh and Kim 2010) and produce inefficient earnings forecasts (see, e.g., Abarbanell 1991; Abarbanell and Bernard 1992; Stevens and Williams 2004), perhaps because they belong to a rather small and homogenous group (see, e.g., Welch, 2000; Hong et al., 2000).

To summarize, if the Wisdom of Crowds and the value of diversity and independence apply to the information on the Twitter platform, this information may help predict a firm's earnings and announcement returns.

2.3 Macro accounting theory

a severe wave of accounting research under the heading of macro accounting seeks to use accounting information and data in financial statements to forecast Indicators. Macroaccounting emphasizes economists' view of seasonal accounting (Bekhradi Nasab et al., 2020). The emergence of a new theory of "macro accounting" with a new wave of accounting research over the last decade tries to explain and use the Aggregate information of interim accounting statements in economic forecasts. Macroaccounting theory suggests that economists and macroeconomic forecasters use Aggregate accounting information at the macroeconomic level. For example, accounting earnings are used to predict GDP, cost stickiness is used to predict unemployment, and the ratio of book value to

market value is used to predict inflation. Earnings growth dispersion contains information about trends in labor reallocation, unemployment change, and aggregate output (Bekhradi Nasab et al., 2022). using macro accounting theory and numerous types of research by Bekhradi Nasab et al. (2020, 2022), aggregate accounting information is used to predict accounting earnings and stock returns.

2.4 Aggregate opinion and predict earnings surprises

Our first research question asks, can the aggregate opinion from individual tweets regarding a company, expressed by individuals just before its earnings announcement, predict its earnings? An implication of the Wisdom of Crowds and the value of diversity and independence concepts is that the aggregation of opinions derived from individual tweets may help in predicting earnings. This would be the case when individual tweets reflect the opinions of a large and diverse group of people making independent and timely assessments of a company's future earnings. Specifically, positive aggregate opinion may suggest company performance that exceeds prior expectations, while negative aggregate opinion may suggest company performance that disappoints prior expectations (Bartov et al., 2018).

As an example of direct-access information technology (DAIT), social media uses web-based approaches to create an interactive communication platform, enabling individuals and communities to share and refine their opinions. The company's decision to disseminate information through social media channels is a developed perspective on the disclosure strategy (Jung et al., 2018). In the disclosure strategy, the nature and different levels of disclosure, as well as publication channels, are examined. Thus, the multiplicity of publishing channels can improve public awareness of company disclosures and, by reducing the existing information gap, create a better understanding for the investor. Suppose the company expects to improve its information environment by increasing the level of disclosure. In that case, it can be expected that increasing the channels of publishing and transmitting news from such channels, such as Twitter, as a source of complementary awareness will reduce information asymmetry. In the first post-US Securities and Exchange Statement, Blankespoor et al. (2014) examined "The Role of Publishing in Market Liquidity: Evidence for Companies' Use of Twitter" and found that Publishing Company News Through Twitter reduces information asymmetry and increases liquidity. Al Guindy (2017) considered the role of social media in financial markets. He also examined the relationship between companies' use of social media and cost reduction of capital, as well as the role of Twitter in improving the information environment. Comparative results before and after the US Securities and Exchange Commission statement show that companies have become more inclined to spread the news via Twitter after the announcement. The results show that Twitter is a complementary source of information for investors and that using Twitter reduces information asymmetries between companies and investors, thus reducing the cost of capital. Jung et al. (2018) examined the relationship between news releases via Twitter and market reaction and concluded that the number of followers of news via Twitter and republishing news by followers affects market reaction. As companies tweet about earnings announcements and more followers receive the tweet, the abnormal difference between the buying and selling prices decreases, indicating a reduction in information asymmetry. In the first hypothesis of the research, the volume and content of earning news published by companies on Twitter social media is considered and its relationship with earnings surprises is examined:

H1. The volume of earnings news published by companies on Twitter can predict earnings surprises.

H2. The content of earnings news published by companies on Twitter can predict earnings surprises.

2.5 Aggregate opinion and predict announcement returns

Our second research question examines the relation between the aggregate opinion from individual tweets written just prior to the earnings announcement and the market response to earnings. The presence of complementary information in the capital market improves the market information environment and, ultimately, improves stakeholder decision-making (Warren et al., 2015). From a theoretical point of view, given that Twitter has the most user diversity among social media, the concept of collective insight into Twitter becomes relevant. The theory of collective insight refers to the phenomenon that the aggregation of information from individuals with diverse and independent views and opinions will lead to better predictions than the predictions of any member of the group or even experts. On the importance of informing the Twitter social media environment in terms of increasing market participants Wisdom crowd, Bollen et al. (2011) found that the Wisdom crowds inferred from the textual analysis of participants' daily tweets could predict changes in the Dow Jones index. Mao et al. (2012) found that the number of daily tweets of market participants about the top 500 Standard & Poor's (S&P500) stocks was significantly related to the level of change in the stock index. Curtis et al. (2014) examined the tweets posted by market participants in the Stock twit environment and found that tweeting at the social media level had a significant relationship with earnings. Al Guindy (2017) considers the role of Twitter in improving the information environment by increasing the Wisdom crowd of investors. The results showed that if Twitter news caused a positive feeling in investors, stock returns would be higher; otherwise, stock returns would be lower. This effect is especially pronounced when there is no consensus among financial analysts. Bartov et al. (2018) examined the opinions of people who follow corporate tweets and found that aggregating their opinions predicts future quarterly earnings and corporate earnings returns. In the second hypothesis of the research, the volume and content of earning news published by companies on Twitter social media are considered and its relationship with earnings surprises is examined:

H3. The volume of earnings news published by companies on Twitter can predict announcement returns.

H4. The content of earning news published by companies on Twitter can predict announcement returns.

3. Research Methodology

This research used Excel software to collect and classify raw data and Stata software for multivariate regression analysis. To collect data on the theoretical framework of the research and its background, articles published on the website of the American Accounting Association (www.aaa.com) between 2014 and 2019 have been used. The statistical knowledge used includes descriptive statistics to describe and present statistical characteristics of variables and parameters and inferential statistics include estimation and estimation of coefficients.

Twitter data, including the volume and text of tweets posted on the corporate Twitter page and the number of corporate Twitter followers on the date of each tweet, was used to modify the content variable of the tweets using the Python language and " Application Programming Interface (API)" and Web scraping techniques. Has been extracted. These techniques automatically collect data. There are also tweets related to market participants' opinions about each sample company, which are extracted by adding the slash symbol ($) to the beginning of the companies' Twitter IDs. This data also includes the volume and text of the participants 'tweets and the number of participants' followers on the history of each tweet. In order to extract data related to the measurement of independent variables (volume and content of tweets), the total tweets of the sample companies from the beginning of October 2015 to March 2020, including 550,000 tweets, were extracted in the first stage. In the

second stage, the tweets published in the research estimation period, i.e. the 58 days before the earning announcement (2-to-60), were filtered and the number of tweets reached 179495. In the last step, the tweets were re-filtered to separate the tweets containing the earning announcement information, in which the number of tweets reached 9145. Also, to extract market participant tweets, in the first stage, the total market participant tweets about sample companies from the beginning of October 2015 to March 2020, including 450,000 extracted tweets. In the second stage, the tweets posted in the research estimation period were filtered. At this stage, the number of tweets reached 130,905. In the last step, the separation of tweets containing news of earnings announcements was done, and the number of tweets reached 20,037. It should be noted that the identification of tweets containing earning announcement information has been done based on the analysis of the content of the tweets and using the word list introduced by Bartov et al. (2018). The necessary condition is the presence of at least one of the words representing the earning announcement news in the desired tweet. Market data in this study were the maximum and minimum three-day stock prices to measure the dependent variable and were extracted manually from the relevant website (www.investing.com). To collect market data by referring to the mentioned site, first, identify the date of the earnings announcement of each company and separately for each financial period and then, based on it, estimate the period of 60 calendar days before the announcement of earnings to 2 days before the date It is an earning announcement, it has been specified. Market data are then extracted for the estimated and event periods (the three days around the earnings announcement). The estimation period is based on a calendar because the basis for extracting Twitter data is also the estimation period, and the basis for tweeting companies and other Twitter users is not based on the working days of the stock market. On the other hand, the three days around the earnings announcement are the stock exchange's working days. Control variable data were manually extracted from corporate financial statements and websites (www.gurufocus.com, www.investing.com, www.fortune.com, www.siccode.com, www.sec.gov).

The statistical population consists of the top 500 companies in the US stock market from 2016 to 2019. These companies account for 80% of the value of the US stock market and include 500 large and active companies. This is one of the most important indicators of the overall performance of the US stock market. In the first step to determine the sample size, the companies on the list of the top 500 companies on the US stock exchange were selected at least once during the research period (from November 2015 to March 31, 2019). At this stage, the number of companies was 642. The initial list of companies was extracted from the relevant website. In the next step to select a statistical sample, the following items were considered:

1 company that has an official Twitter page.

2- Companies that joined Twitter in early November 2015 or earlier.

3-Companies listed on the New York Stock Exchange and the Nasdaq Stock Exchange.

It should be noted that companies with basic information and incomplete companies were excluded from the statistical sample. These companies numbered 21; Also 8 companies that the ratio of market value to negative book value (negative property rights)

They were also left out. With this selection, the final statistical sample reached 345 companies.

Regression model of hypotheses following the research Bartov et al. (2018) As follows:

Equation (1)

$$ESURP = \alpha + \beta_1 \sum OPI_{[-10:-2]} + \beta_2 PRIOR\_ESURP + \beta_3 EXRET_{[-10:-2]} + \beta_4 RP\_OPI + \beta_5 SIZE + \beta_6 MB + \beta_7 ANL + \beta_8 INST + \beta_9 Q_4 + \beta_{10} LOSS + \varepsilon$$

Equation (2)

$$EXRET_{[-1:+1]} = \alpha + \beta_1 \sum OPI_{[-10:-2]} + \beta_2 EXRET_{[-10:-2]} + \beta_3 RP\_OPI + \beta_4 ANL + \beta_5 INST + \beta_6 Q4 + \beta_7 LOSS + \varepsilon$$

In these models:

ESURP: In Equation (1), the dependent variable, ESURP, is the earnings surprise, measured using either

EXRET: In Equation (2), the dependent variable, EXRET [-1; +1], is Carhart's (1997) buy-and-hold abnormal stock returns for the firm over the three-day window, [-1; +1], multiplied by 100. OPI [-10; -2], the test variable in Equation (2), captures the aggregate opinion at the firm-quarter level extracted from individual tweets written in days -10 to -2.

OPI: The primary challenge underlying our research design is the estimation of OPI. Along with prior research, we use textual analysis to quantify the opinions expressed in individual tweets. Since performing textual analysis using any word classification scheme is inherently imprecise (Loughran and McDonald, 2011), we measure OPI using Several alternatives and considerably different textual analysis methodologies. Independent research variables include the publication, number and content of earnings news published by companies and market participants.

1-Firms Earnings Announcement Tweets (FEAT): This variable is two-digit. So, if the company has at least one earning announcement tweet in the estimation period, it is equal to one and otherwise zero (Jung et al., 2018).

2-Firms Earnings Announcement Tweets Frequency (FEAT-F): This variable is logarithmically one plus the number of earning Tweets posted by each company on Twitter during the estimation period (Jung et al., 2018).

3-Firms-TONE (FTONE): Textual analysis was used to measure the content of the companies' earnings announcement tweets. For this purpose, after selecting the tweets containing earning announcement news based on the dictionary list[1] of Bartov et al. (2018), the content analysis of the tweets was performed using the word list provided by Loughran and McDonald[2] in 2011. According to the textual analysis based on the list of words mentioned in previous studies, content analysis based on the negative words in this list is more accurate (Bartov et al., 2018). Therefore, content analysis is based on the number of negative words in each tweet. First, we identify the number of negative words in each tweet and assign a weight to each tweet. The weighting method for each tweet is based on the number of followers of the company's Twitter page and multiplying the number of negative words in each tweet by one plus the logarithm of one plus the number of followers on the earning announcement date. Then, the total number of weighted negative words in the tweets during the estimation period is multiplied by -1 and divided by one plus the total number of positive and negative words in the tweets (Bartov et al., 2018).

Equation (3)

$$FTONE = -1 \times \frac{\left(\sum[Tweets\ for\ Each\ Negative\ Number\ of\ Words \times [1 + (log1 + Number\ of\ Followers)]\right)}{(1 + Negative\ and\ Positive\ Number\ of\ Words)}$$

4-Individuals Earnings Announcement Tweets (IEAT): earning Posting on Twitter: This variable is defined as a two-value variable; So that if the company in the estimation period has at least one earning announcement tweet from the market participants, it is equal to one and otherwise it is equal to zero.

1- Adjusted, earning, ebit, ebitda, eps, expense, fiscal, gaap, gain, in the black, in the green, in the red, income, loss, noi, nopat, normalized, oibda, operating, per share, pro forma, erning, proforma, pro-forma, results, revenue, sales, yearend, year-end.

2- The LM Vocabulary was introduced in 2011 by Loughran and McDonald to analyze k-10 reports, which is a modification of the Harvard Vocabulary. This dictionary is specifically related to the language of finance and has been tested in capital market research to evaluate the content of reports, the text of calls, as well as tweets.

5-Individuals Earnings Announcement Tweets Frequency (IEAT-F): The variable is logarithmically one plus the number of earning announcement tweets posted by market participants on Twitter during the estimation period.

6-Individuals-TONE (ITONE): The content variable of the messages posted by market participants on Twitter is measured the same way as the content variable of the earning tweets posted by companies.

The control variables are as follows.

INST: Number of shares held by institutional investors scaled by total shares outstanding as of the quarter end date.

LOSS: Indicator variable equal to one if earnings before extraordinary items (IBQ) is strictly negative in the prior quarter, zero otherwise.

MB: Ratio of market value to book value of equity ([CSHOQ*PRCCQ]/CEQQ).

MVE is the market value of equity (CSHOQ*PRCCQ).

RP_OPI: Total number of traditional news events classified as positive less total number of traditional news events classified as negative during the nine-trading-day window [-10; -2], where day zero is the quarterly earnings announcement date, using the RavenPack database. Each positive or negative traditional news event is weighted by RavenPack's ESS (Event Sentiment Score), rescaled to range between 0 and 1, where higher values indicate the sum of the ESS scales stronger sentiment, and the measure rescaled.

SIZE: Natural logarithm of MVE.

SUE: Standardized unexpected earnings are measured using quarterly diluted earnings per share excluding extraordinary items (EPSFXQ) and applying a seasonal random walk with drift model.

ANL: Natural logarithm of one plus the number of analysts in the latest I/B/E/S consensus analyst quarterly earnings per share forecast prior to the quarter-end date.

Q4: The indicator variable is equal to one if the quarter is the fourth fiscal quarter or zero otherwise.

3.1 Research findings

Table (1) presents our sample's descriptive statistics on Twitter activity and variables.

Then, in order to choose between panel regression models and OLS, the F-Limer test was used, and finally, the panel regression model was selected as the appropriate model. After selecting the panel regression model as a suitable model, the choice between fixed effects panel regression models and random effects panel regression was made using the Hausman test.

The results of the Hausman test showed that the panel was selected with random effects. The merger test was used to test the integrated data model against random effects, which showed that there is no ability to integrate temporal and spatial effects in the model.

Table 1. Descriptive statistics of quantitative variables used in the panel regression

Variables	Mean	Max	Min	S.d
FEAT-F	0/532	1/69	0	0/5
FTONE	-1/19	0	-4/809	1/406
IEAT_F	0/92	1/78	0	0/47
ITONE	-1/57	0	3/37	0/95
ESURP	0/01	0/04	-0/007	0/01
EXRET	45/33	81/29	3/63	14/4
SIZE	4/33	5/58	3/18	0/48
ANL	0/07	0/92	-0/29	0/15

MB	5/9	96/43	0/55	11/63
LEVE	0/3	0/81	0/01	0/17
Q4	67	1	0	48/66

After selecting the appropriate model, the stability of variance and serial autocorrelation of the model residues have been investigated using the parent test. The results of the parent test showed that the assumption of variance homology of the remaining models was not established. Also, the serial autocorrelation study results between the rest of the models showed that the underlying assumptions of variance homogeneity and lack of serial autocorrelation are not established for the above models. Therefore, the least generalized quadratic regression model is used to solve the problems of variance inequality and serial autocorrelation. The following are the results of testing the hypotheses in Tables (2) and (3).

Table 2. The results of the first and second Hypotheses test

$$ESURP = \alpha + \beta_1 \sum OPI_{[-10:-2]} + \beta_2 PRIOR\_ESURP + \beta_3 EXRET_{[-10:-2]} + \beta_4 RP\_OPI + \beta_5 SIZE + \beta_6 MB + \beta_7 ANL + \beta_8 INST + \beta_9 Q_4 + \beta_{10} LOSS + \varepsilon$$

Variable	Coefficient (t-statistic)			
	ESURP			
	FEAT-F	FTONE	IEAT_F	ITONE
	Model I	Model II	Model III	Model IV
Intercept	-1.0683*** (-14.12)	-1.4254*** (-15.36)	-0.3678*** (-6.78)	-0.5426*** (-6.63)
OPI	0.0235 (0.02)	0.1547*** (7.63)	0.0254 (1.67)	0.0365* (1.86)
PRIOR_ESURP	0.3624*** (46.52)	0.9784*** (54.47)	0.1648*** (11.73)	0.1657*** (11.89)
$EXRET_{[-10;-2]}$	0.0126*** (5.87)	0.0248*** (5.58)	0.0125*** (5.71)	0.0247*** (5.47)
RP_OPI	0.5698*** (5.76)	0.4985*** (5.47)	0.1745*** (2.74)	0.5269*** (2.89)
SIZE	0.4985*** (8.86)	0.4896*** (11.76)	0.7589*** (4.75)	0.5963*** (4.01)
MB	-0.1564** (-2.11)	-0.7598 (-0.16)	0.2596 (0.76)	0.2657 (1.11)
ANL	-0.5968*** - (-3.16)	0.6512** (-2.57)	0.5496 (0.45)	0.4785 (0.88)
INST	0.8965** (2.64)	0.7319 (0.93)	0.8164*** (5.54)	0.7518*** (5.12)
Q4	0.8569*** (7.11)	0.8753*** (8.25)	- 0.1547*** (-4.67)	- 0.2658*** (-4.89)
LOSS	0.5677*** (16.88)	0.5932*** (16.77)	-0.4587** (-2.13)	-0.5789** (-2.11)

The results of Table 5 show a significant difference between companies that do not have earnings tweets and companies that do not, and there is a positive relationship between the number of earnings announcement tweets published by companies earning surprise. And there is meaning. In other words, with the increase in the number of earnings tweets posted by companies on the Twitter page, earning surprise increases. There is also a significant positive relationship between the negative content of earning tweets published on each company's official Twitter page and earning surprises. In other words, with the increase in the level of positivity of corporate earning tweets, earning surprise increases.

Table 3. The results of the third and fourth Hypotheses test

$$EXRET_{[-1:+1]} = \alpha + \beta_1 \sum OPI_{[-10:-2]} + \beta_2 EXRET_{[-10:-2]} + \beta_3 RP\_OPI + \beta_4 ANL + \beta_5 INST + \beta_6 Q4 + \beta_7 LOSS + \varepsilon$$

Variable	Coefficient (t-statistic)			
	ESURP			
	FEAT-F	FTONE	IEAT_F	ITONE
	Model I	Model II	Model III	Model IV
Intercept	-1.6354*** (-11.45)	- 1.5987*** (-11.65)	- 0.6958*** (-6.65)	-0.1267*** (-6.59)
OPI	0.26987*** (4.44)	0.5987*** (9.56)	0.2957** (2.89)	0.6587* (2.01)
$EXRET_{[-10;-2]}$	0.2654*** (8.56)	0.3651*** (8.77)	0.5987*** (5.21)	0.1658*** (5.11)
RP_OPI	0.5698*** (6.25)	0.4563*** (6.26)	0.2514*** (3.14)	0.4584*** (3.33)
ANL	-0.5265*** - (-3.06)	0.6598** (-2.17)	0.2471 (0.36)	0.5624 (0.67)
INST	0.6528** (2.63)	0.2651 (0.85)	0.9531*** (5.45)	0.8569*** (5.49)
Q4	0.5987*** (7.77)	0.5698*** (8.54)	-0.6257*** (-5.85)	-0.4598*** (-5.43)
LOSS	0.0698*** (19.58)	0.0596*** (19.09)	-0.2657** (-3.59)	-0.3659** (-3.15)

The results of Table (6) show that announcement returns in companies with earning announcement tweets are significantly different from companies that do not have earning announcement tweets. A positive relationship exists between the number of earning announcement tweets companies publish and announcement returns. Further, there is meaning. In other words, as the number of earning tweets posted by companies on the Twitter page increases, the earning of earnings announcements increases. A positive and significant relationship exists between the negative content of earning tweets published on each company's official Twitter page and the announcement returns. In other words, with the increase in the level of positivity of corporate earning tweets, the announcement returns increase.

4. Conclusion

The dramatic increase in the use of social media these past few years had a significant impact on the capital market. Firms use social media to communicate with their investor base and increasingly, individual investors use social media to share information and insights about stocks. We examine whether the aggregate opinion from individual tweets prior to a quarterly earnings announcement (a recurring, price-moving event scrutinized closely by market participants) is useful in predicting a company’s quarterly earnings and announcement returns. We analyze a broad sample of individual tweets written in the nine-trading-day period leading up to the firms’ quarterly earnings announcements in the four years 2016–2019 (Market participant tweets about sample companies from October 2015 to March 2020). Two alternative measures of aggregate opinion from individual tweets serve as our test variables. We find that the aggregate Twitter opinion helps predict quarterly earnings after controlling for other determinants of earnings, including aggregate opinion from traditional media sources. We also find that the aggregate Twitter opinion predicts abnormal returns around earnings announcements.

The overall results show that differences in the source of earning news on Twitter will positively affect earning surprise and announcement returns. Also, the existence of a significant relationship between the volume and content of tweets containing earning news from companies and earning surprise and announcement returns shows that social media, as a multidimensional communication channel, is a source for disseminating information with wide coverage. In other words, publishing

additional news through social media channels can be considered as a complementary source of information to improve the information content of earning or strategic publication of news by companies. Accordingly, investors active in the web environment are advised to consider social media as a channel for disseminating information with wide coverage and to benefit from the benefits of this communication channel, along with other sources of information, to increase their awareness of investment decisions. On the other hand, in order to eliminate the negative effects of social media, it is recommended that users use caution and vigilance when using social media as a source of information. Companies that use social media to publish news are also advised to use a uniform policy to publish information on social media to maintain their credibility; otherwise, the credibility of the news will be challenged. The research results show the great importance of publishing information (general market and economy information and financial and accounting information of companies) on the intention of real investors to invest in the stock market. Therefore, the development of information and information technology and transparency in the stock exchange will play an effective role in encouraging more segments of society to invest in the stock exchange and, consequently, increase the country's market efficiency and economic development. On the other hand, with the development of information technology in the stock market, it will be possible to predict future market behaviors. Therefore, there is a need for more appropriate information for stock market investors to make decisions through television, newspapers and the Internet (in the fields of education, marketing communications and providing political, economic and financial news to companies) as well as providing real news and information, timely and up to date. Access to investors is emphasized through a variety of mass media. The results of testing the hypotheses are consistent with the results of research by Jung et al. (2018) and Bartov et al. (2018).

Finally, considering the importance of social media in financial markets worldwide, it is suggested that in future research, the role of social media on various aspects of the market, improving information transparency and information quality characteristics in the form of empirical research and comparing the results. Also, the effects of each social media in the financial markets will be compared by comparing popular media and social networks in the country and social media worldwide. Comparing the information environment inside the country with abroad, in terms of related field characteristics and common mechanisms for publishing information through social media channels can be more informative about the existing differences.

REFERENCES

1. Abarbanell, J. (1991). Do analysts' earnings forecasts incorporate information in prior stock price changes? *Journal of Accounting and Economics*, 14(2), pp. 147–165. https://doi.org/10.1016/0165-4101(91)90003-7.
2. Abarbanell, J. S., and Bernard, V. L. (1992). Tests of analysts' overreaction/underreaction to earnings information as an explanation for anomalous stock price behavior. *Journal of Finance*, 47(3), pp. 1181–1207. https://doi.org/10.1111/j.1540-6261.1992.tb04010.x.
3. Al Guindy, M. (2017). The role of social media in financial markets. Queen University. Kingston, Canada.
4. Antweiler, W., and Frank, M. Z. (2004). Is all that talk just noise? The information content of Internet stock message boards. *Journal of Finance*, 59(3), pp. 1259–1294. https://doi.org/10.1111/j.1540-6261.2004.00662.x.
5. Azar, P. D., and Lo, A. W. (2016). The wisdom of Twitter crowds: Predicting stock market reactions to FOMC meetings via Twitter feeds. *Journal of Portfolio Management*, 42 (5), pp. 123–134.

6. Bartov, E., Faurel, L., and Mohanram, P. S. (2018). Can Twitter Help Predict Firm-Level Earnings and Share Returns? *Journal of Accounting Review*, 93(3), pp. 25-57. http://dx.doi.org/10.2139/ssrn.2782236.
7. Bekhradi Nasab, V., Kamali, E., and Ebrahimi Kahrizsangi, K. (2020). Scheme of Recent Advances in the Field of Accounting and Economics: Application of Macro Accounting Theory in Economic Forecasting. *Iranian Journal of Accounting, Auditing and Finance*, 4(1), pp. 79-97. doi: 10.22067/ijaaf.2020.39260. (In Persian).
8. Bekhradi Nasab, V., Kamali, E., and Ebrahimi kahrizsangi, K. (2022). A VAR Model for the Macroeconomic Indicators Restatements Predicting : Introduction to Macroaccounting Theory. *Advances in Mathematical Finance and Applications*, 7(4), pp. 1099-1112. doi: 10.22034/amfa.2021.1921151.1550. (In Persian).
9. Berg, J., Forsythe, R., Nelson, F., and Rietz, T. (2008). Results from a dozen years of election futures markets research. *Handbook of Experimental Economic Results*, 1, pp. 742–751. https://doi.org/10.1016/S1574-0722(07)00080-7.
10. Blankespoor, E., Miller, G. S., and White, H. D. (2014). The role of dissemination in market liquidity: Evidence from firms' use of Twitter™. *The Accounting Review*, 89(1), pp. 79–112. https://doi.org/10.2308/accr-50576
11. Bloomberg. (2013). Netflix CEO Hastings Faces SEC Action over Facebook Post. Available at: http://www. bloomberg.com/news/2012-12-06/netflix-CEO-hastings-faces-sec-action-over-Facebook-post.html
12. Bollen, J., Mao, H., and Zeng, X. (2011). Twitter mood predicts the stock market. *Journal of Computational Science*, 2 (1), pp. 1–8. https://doi. org/10.1016/j.jocs.2010.12.007.
13. Carhart, M. M. (1997). On persistence in mutual fund performance. *Journal of Finance*, 52(1), pp.57–82. https://doi.org/10.2307/2329556.
14. Chen, H., De, P., Hu, Y., and Hwang, B. H. (2014). Wisdom of crowds: The value of stock opinions transmitted through social media. *The review of financial studies*, 27(5), pp. 1367-1403. https://doi.org/10.1093/rfs/hhu001.
15. Curtis, A., Richardson, V. J., and Schmardebeck, R. (2014). Investor attention and the pricing of earnings news. *Handbook of Sentiment Analysis in Finance*, Forthcoming. London, U.K, http://dx.doi.org/10.2139/ssrn.2467243.
16. Da, Z., J. Engelberg, and P. Gao. (2011). In search of attention, *Journal of Finance*, 66, pp. 1461–1499.
17. Drake, M. S., Roulstone, D. T., & Thornock, J. R. (2012). Investor information demand: Evidence from Google searches around earnings announcements, *Journal of Accounting Research*, 50, pp. 1001– 1040.
18. Hirschey, M., V. Richardson, and S. Scholz. (2000). Stock price effects of Internet buy-sell recommendations: The Motley Fool case, *Financial Review*, 35, pp. 147–174.
19. Hong, H., J. Kubik, and A. Solomon. (2000). Security analysts' career concerns and herding of earnings forecasts, *Rand Journal of Economics*, 31, pp. 121–144.
20. Hong, L., and S. Page. (2004). Groups of diverse problem solvers can outperform groups of highability problem solvers, *Proceedings of the National Academy of Science*, 101(46), pp. 16385– 16389.
21. Jame, R., Johnston, R., Markov, S., and M. Wolfe. (2016). The value of crowdsourced earnings forecasts, *Journal of Accounting Research*, 54 (4), pp. 1077-1110.
22. Jegadeesh, N., and Kim, W. (2010). Do analysts herd? An analysis of recommendations and market reactions. *Review of Financial Studies*, 23 (2), pp. 901–937. https://doi.org.10.1093.rfs.hhp093.

23. Jung, M. J., Naughton, J. P., Tahoun, A., and Wang, C. (2018). Do firms strategically disseminate? Evidence from corporate use of social media. *The Accounting Review*, 93(4), pp. 225-252. https://doi.org/10.2308/accr-51906.
24. Lee, F., A. Hutton, and S. Shu. (2015). The role of social media in the capital market: Evidence from consumer product recalls, *Journal of Accounting Research*, 53 (2), pp. 367–404.
25. Loughran, T., and B. McDonald. (2011). When is a liability not a liability? Textual Analysis, Dictionaries, *Journal of Finance*, 66, pp. 35–65.
26. Mao, Y., Wei, W., Wang, B., and Liu, B. (2012). Correlating S&P 500 stocks with Twitter data. In Proceedings of the first ACM international workshop on hot topics on interdisciplinary social networks research, pp. 69-72. https://doi.org/10.1145/2392622.2392634.
27. Miller, G. (2006). The press as a watchdog for accounting fraud. *Journal of Accounting Research*, 44 (5), pp. 1001-1033. https://doi.org/10.1111/j.1475-679X.2006.00224.x.
28. Moldoveanu, M., and R. Martin. (2009). Diaminds: Decoding the mental habits of successful thinkers. University of Toronto Press.
29. Richins, G., A. Stapleton., T. C. Stratopoulos., and C. Wong. (2017). Big Data Analytics: Opportunity or Threat for the Accounting Profession?. *Journal of Information Systems*, 31(3), pp. 63-79. https://doi.org/10.2308/isys-51805.
30. Securities and Exchange Commission (SEC). (2013). Report of investigation pursuant to section 21(a) of the Securities Exchange Act of 1934: Netflix, Inc., and Reed Hastings. Available at: https://www.SEC.gov.litigation.investreport.34-69279.pdf
31. Stevens, D. E., and Williams, A. W. (2004). Inefficiency in earnings forecasts: Experimental evidence of reactions to positive vs. negative information. *Experimental Economics*, 7(1), 75-92. https://doi.org.10.1023.A:1026214106025.
32. Surowiecki, J. (2004). The wisdom of crowds: Why the many are smarter than the few and how collective wisdom shapes business, economies, societies and nations. Anchor Books.
33. Tumarkin, R., and R. Whitelaw. (2001). News or noise? Internet postings and stock prices, *Financial Analysts Journal*, 57, pp. 41–51.
34. Warren, J. D., Moffitt, K. C., and Byrnes, P. (2015). How big data will change accounting. *Accounting Horizons*, 29(2), pp. 397-407. https://doi.org/10.2308/acch-51069
35. Watts, R. L., and Zimmerman, J. L. (1978). Towards a positive theory of the determination of accounting standards. *The Accounting Review*, 53(1), pp. 112–134.
36. Welch, I. (2000). Herding among security analysts, J*ournal of Financial Economics*, 58, pp. 369–396.

IJAAF; Vol. 7, No. 4, Autumn 2023, Serial 25

Ferdowsi University of Mashhad

Iranian Journal of
Accounting, Auditing & Finance

Quarterly

RESEARCH ARTICLE

Managerial Ability Concept and Measurement Models in Accounting: A Systematic Literature Review

Ghasem Blue*, Manuchehr Roosta

Department of Accounting, Allameh Tabataba'i University, Tehran, Iran

How to cite this article:
Blue, G., & Roosta, M. (2023). Managerial Ability Concept and Measurement Models in Accounting: A Systematic Literature Review. Iranian Journal of Accounting, Auditing and Finance, 7(4), 29-56. doi: 10.22067/ijaaf.2023.43789.1290
https://ijaaf.um.ac.ir/article_43789.html

ARTICLE INFO

Article History
Received: 2023-06-30
Accepted: 2023-08-10
Published online: 2023-10-15

Keywords:
Managerial Ability, Managerial Talent, CEO Ability, CEO Talent, Managerial Impact

Abstract

This study aims to systematically review all studies on managerial ability in accounting and identify the gaps between them. The breadth and variety of recent studies highlight the significance of this literature review. We identified 110 relevant studies published from 1990 to 2022 through multiple international scientific search engines, which we reviewed and categorized into ten thematic classes: performance, capital market, reporting quality, audit, investment, dividend policy and cash management, tax, corporate social responsibility, COVID-19, and miscellaneous. Our review shows that a considerable number of studies (43 out of 110) have focused on the relationship between firm performance, capital markets, and managerial ability due to the complex results in this field and various market perceptions of high-ability managers. However, few studies have explored the link between managerial ability, going concern, conservatism, and family firms. Moreover, most studies use Demerjian et al.'s (2012) model to measure managerial ability, which is an indirect method. Finally, we provide possible areas for improvement in the Demerjian et al. (2012) model and identify research gaps for future studies.

https://doi.org/10.22067/ijaaf.2023.43789.1290

NUMBER OF REFERENCES
129

NUMBER OF FIGURES
3

NUMBER OF TABLES
5

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

*Corresponding Author: Ghasem Blue
Email: blue@atu.ac.ir
Tel: 09124991168
ORCID:

1. Introduction

Two different points of view have been formed about the importance of the manager's role (Bertrand and Schoar, 2003). First, according to neoclassical economics, two firms with similar technologies, factors and market conditions will make the same choices regardless of the characteristics of their managers. In other words, a firm's performance depends on the competitive environment, product quality, corporate governance mechanisms, and other controls its shareholders apply. Industry and firm-specific factors play more important roles than managers. Second, based on agency theory, managers have special discretion to make decisions and reach their goals as agents of different stakeholders. Although differences in firms' behavior can be attributed to heterogeneity in governance mechanisms across firms, these differences cannot just be attributed to the different characteristics of their managers. However, heterogeneity is observed in models that explicitly allow managers to be different in their preferences, risk aversion, skill levels, or opinions (Bertrand and Schoar, 2003). Additionally, stewardship theory (Davis et al., 1997) and contract theory (Sunder and Cyert, 1997) share the same viewpoint as the agency theory. Accordingly, managerial contribution to firm performance and investment decisions has been studied for years with concepts like corporate governance, investment judgments, and cross-country productivity differences (Demerjian et al., 2012).

The current review shows that the characteristics of managers affect firm performance. Specifically, there is a significant share of heterogeneity in decisions, investment methods and practices of firms rooted in managerial traits (Andreou et al., 2017). Characteristics such as ability, talent, reputation, style, efficiency, narcissism and myopia are the most widely used criteria to measure the influence of managers on firm performance. For instance, Barr and Siems (1997) and Leverty and Grace (2012) demonstrated that efficient managers could reduce the likelihood of insolvency. Using four variables to measure reputation, Milbourn (2003) showed a positive relationship between stock-based pay sensitivities and CEO reputation. This relationship became stronger after controlling for age, firm size, dollar variability of the stock returns, and industry. Rajgopal et al. (2006) also found a positive relationship between outside opportunities and managers' talent.

Between various measurements of a manager's role, "managerial ability" has attracted significant attention among accounting and management researchers. There are different definitions and descriptions for the word "ability". Compared to other managers in the same industry, more-able managers are more efficient (Demerjian et al., 2012) and more accurate in forecasting earnings (Baik et al., 2011; Lee et al., 2012). Furthermore, more-able managers have higher expected stock returns (Mishra, 2014) and lower real earnings management (Huang and Sun, 2017). The multiple definitions and descriptions of managerial ability have led to the emergence of various models and variables to measure managerial ability. Consequently, different results have emerged around managerial ability.

The present study intends to systematically review the thematic connections and measurement models and identify gaps among related studies. We try to answer the following main questions: What studies have been conducted around managerial ability? What themes emerge out of these related studies? And what are the most frequently used models and variables to measure managerial

ability?

We have reviewed 110 studies published between 1990 and 2022 in this paper. These studies have been classified into 10 categories: performance, capital market, reporting quality, audit, investment, dividend policy and cash management, tax, corporate social responsibility, COVID-19, and miscellaneous. A large number of studies (43 out of 110) have been conducted around the relationship between firm performance, capital market, and managerial ability. Corporate governance, firm performance, firm value, information asymmetry, and real earning management were the most frequently used keywords with managerial ability. Moreover, the model proposed by Demerjian et al. (2012) was the most frequently used to measure managerial ability. The analysis of the studies over time also illustrates that a few studies have been implemented before 2017, while the Demerjian et al. (2012) model was developed five years earlier. Generally, studies have shown that different groups affect or are affected by managerial ability. Investors react to switching able managers (Hayes and Shaffer, 1999; Demerjian et al., 2012); financial analysts revise their predictions based on managerial ability (Gao et al., 2020); creditors assess credit rate and risk of firms under the influence of managerial ability (Chen et al., 2017; De Franco et al., 2017); auditors determine their fees according to managerial ability (Krishnan and Wang, 2015). Additionally, managerial ability affects the financial reporting environment (Lou and Zhou, 2017; Yan et al., 2021), information environment (Baik et al., 2018), investment activities (Chen et al., 2015; Yung and Chen, 2018), dividends (Sarwar et al., 2019), tax avoidance (Park et al., 2016), and social responsibility (Sun, 2017).

Our study has several important contributions. First, studies around managerial ability have been presented in an integrated and classified manner. Second, the evolution of variables and models used and developed to measure managerial ability has been narrated. Third, the existing gaps among related studies and improvable points in measurement models of managerial ability have been presented.

The present research is organized as follows. First, the concept of managerial ability and related theories will be introduced. Then, the research methodology, the analysis based on the thematic classification, the number of citations, the measurement model, keywords, and results will be examined. Finally, the conclusion and suggestions for future research will be provided.

2. Literature Review

2.1 The concept of managerial ability

The concept of managerial ability has different definitions and descriptions. Managerial ability can be defined from a human capital and a strategic perspective. Primarily, managerial ability was defined from the human capital perspective as managers' knowledge, skill and experience. The human capital perspective differentiates between the general and specific abilities of managers. Custódio et al. (2013) define the general managerial abilities of CEOs as skills acquired through a lifetime of work experience, particularly experiences gained in a number of functional areas, in firms and industries and from past CEO positions at other firms and conglomerates. The skills gained through CEO experience are not specific to an entity or sector and readily transferable across

firms and industries. Specialist managerial abilities are not readily transferable across firms or industries but may be highly valuable within a particular firm or industry (e.g., May, 1995; Murphy and Zabojnik, 2007; Kaplan et al., 2012). Studies show that managers with higher general abilities have more job opportunities with higher salaries compared to managers with specific abilities (Murphy and Zabojnik, 2004; Holcomb et al., 2009).

According to the strategic perspective, on the other hand, two main sources construct managerial ability: domain expertise and resource expertise. Domain expertise refers to managers' understanding of the industry context and the firm's strategies, products, markets, task environments and routines (Boeker, 1989; Kor, 2003; Spreitzer et al., 1997). Resource expertise represents the ability of managers to select and configure a firm's resource portfolio, bundle resources into distinctive combinations, and deploy them to exploit opportunities in specific contexts (Holcomb et al., 2009). Furthermore, in the accounting framework, Baik et al. (2011) consider the ability to evaluate and forecast changes in the firm's economic outlook to be the definition of a high-ability manager. Besides, managers with executive experience and skills are considered more able (Mishra, 2014; Andreou et al., 2017; Cheng et al., 2020; Gounopoulos et al., 2021; Lin et al., 2021). Finally, Demerjian et al. (2012) presented a definition of managerial ability that met with great success: "more-able managers to generate higher revenue for a given level of resources or, conversely, to minimize the resources used for a given level of revenue" (Demerjian et al., 2012). In summary, a more able manager in a certain industry can more efficiently use resources for others.

We can learn from the evolution of definitions and descriptions of managerial ability over time that the year 2012 and the study of Demerjian et al. can be considered a turning point. Although there were varied definitions for managerial ability before Demerjian et al. (2012), most researchers have accepted their definition, and various descriptions have been created around the concept of managerial ability.

As mentioned above, there are various descriptions of the managerial ability concept. For instance, more-able managers are those who have a positive tone in their earnings announcements (Luo and Zhou, 2017), have less likelihood to engage in opportunistic financial reporting (García-Meca and García-Sánchez, 2018; Krishnan, Wang and Yu, 2021), have a more accurate estimate of capital expenditures (Chen and Chen, 2020), have lower levels of real earnings management (Huang and Sun, 2017), or have higher shareholders' expected return (Mishra, 2014).

2.2 Theories around the managerial ability

As mentioned earlier and discussed by Demerjian and Lev (2021), the neo-classical model of the firm states that the manager has no role except in implementing the objectives of the firm owners. Therefore, the managers do not have opinions independently; they only make decisions that efficiently maximize investors' wealth. Although it has long been established that managers are heterogeneous in their preferences, beliefs, and styles, the literature was largely silent on how differences in managers manifested in various firm policies and outcomes. Agency, stewardship, contracts and signalling theories also highlight the role of managers in firm policies and outcomes.

Bertrand and Schoar (2003) started a line of studies on the role of individual managers. Their study identifies a set of managers who switch firms at some point during their sample period. This "switching" sample allows Bertrand and Schoar to identify the effects of managers incremental to firm effects. Their evidence shows that manager fixed effects provide incremental explanatory power for a variety of corporate policies, such as investment and dividend policies. Bertrand and Schoar also identify various regularities in managerial characteristics, linking age and educational

background to aggressiveness in firm policies. Following Bertrand and Schoar (2003), several studies examine the impact of managerial style using a fixed effects framework. Although the fixed effects methodology of Bertrand and Schoar (2003) has been influential, it is not without limitations. First, its identification relies on a relatively small and idiosyncratic set of managers who switch jobs. So, the generalizability of the model is questionable. Second, the tests of effects are relatively abnormal; the joint effects of individual managers are assessed using F-tests and incremental adjusted R2s. Although this provides evidence of an aggregate or collective effect, it is impossible to determine the direction of the effect or the role of individual managers. On the other hand, the initial objective of Demerjian et al. (2012) model is to expand Bertrand and Schoar's (2003) model. They developed a measure that could be measured for a broad cross-section of firms and provide a directional measure of a manager's influence.

3. Research Methodology

Following the methodology used by Shields (1997), Chenhall and Smith (2011), Hesford et al. (2006) and Hoque (2014), the present research goes through six steps to conduct a systematic review of the research studies. These steps are presented in Figure 1.

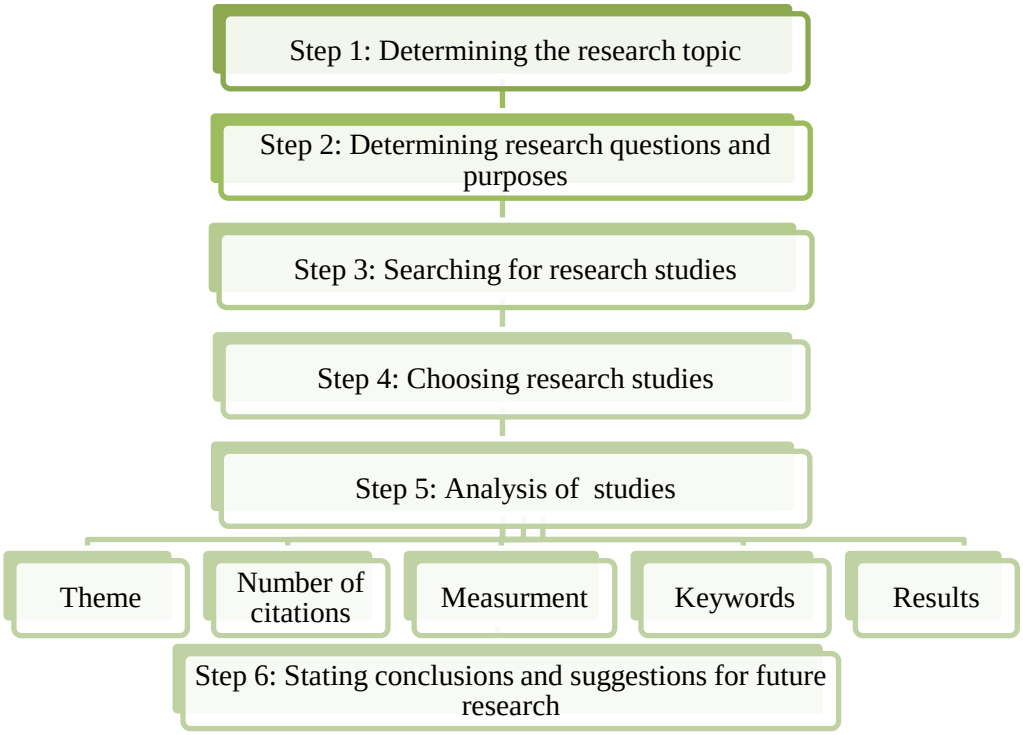

Figure 1. Process and steps of the systematic literature review

The first and second steps were discussed above in the introduction. Concerning the third and fourth steps, four keywords were used to search in the international scientific search engines to identify research studies on managerial ability published between 1990 and 2022 (see Table 1). The abstracts and the article texts were also examined to ensure the accuracy of searches and the relevance of the studies. In the fifth step, the text of the identified articles was analyzed and presented based on the thematic classification, number of citations, measurement models, keywords and results. In the sixth step, the conclusions and suggestions for future research were provided,

considering the answers to the research questions. More details are provided in Table 1.

Table 1. The details of the research steps

Title	Details
Keywords	Managerial Ability Managerial Talent CEO Ability CEO Talent
Field of study	Accounting and Management
Search field	Title and keywords
Period	1990–2022
Search engine	www.sciencedirect.com www.emerald.com www.wiley.com www.aaahq.org www.springer.com
Classification basis	Content analysis of the obtained results as well as the analysis of their keywords

4. Analysis of Studies

We found 110 studies published between 1990 and 2022. The frequency of the research studies searched on www.scimagojr.com is presented in Table 2 according to the journal and the journal ranking.

Table 2. Frequency of the analyzed articles according to journals and their ranking

Journal title	Number of researches	Scientific journal ranking
Journal of Corporate Finance	6	Q1
Review of Quantitative Finance and Accounting	6	Q1
Journal of Contemporary Accounting & Economics	4	Q2
Advances in Accounting	4	Q2
The Accounting Review	3	Q1
Journal of Business Finance and Accounting	3	Q1
Journal of Business Research	3	Q1
Asia-Pacific Journal of Financial Studies	3	Q2
Asian Review of Accounting	2	Q2
Contemporary Accounting Research	2	Q1
Corporate Social Responsibility and Environmental Management	2	Q1
Global Finance Journal	2	Q2
International Journal of Auditing	2	Q1
International Journal of Emerging Markets	2	Q2
International Journal of Finance & Economics	2	Q2
International Journal of Productivity and Performance Management	2	Q2
International Review of Economics and Finance	2	Q2
Journal of Accounting, Auditing & Finance	2	Q2
Managerial and Decision Economics	2	Q3
Review of Accounting and Finance	2	Q3
Sustainability Accounting, Management and Policy Journal	2	Q2
The Journal of Finance	2	-
Other journals	50	Q1 to Q4
Total	**110**	-

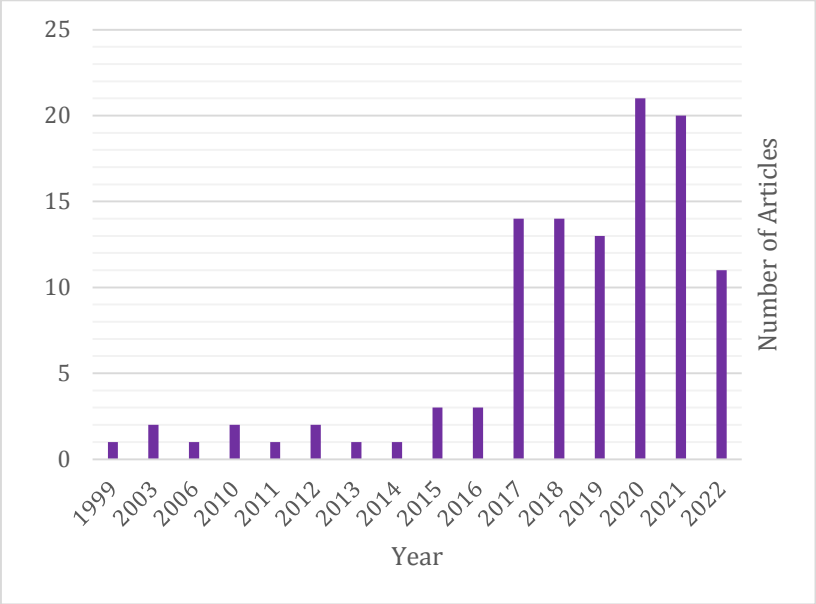

Figure 2. Frequency of the research in the field of managerial ability according to publication year

Figure 2 illustrates that the research conducted on managerial ability has grown significantly over the last 5 years. Only a few studies were done due to the belief in neoclassical economics. According to Bertrand and Schoar (2003), empirical studies were focused on concepts such as firm, industry and market factors until 2003, with only a few studies focusing on managers and their role in the firms. Furthermore, the studies in the management science field concentrated on analyzing factors affecting managerial decision-making, which were criticized for using non-economic variables and relying on laboratory experiments (Bertrand and Schoar, 2003). The lack of a model to measure managerial ability reliably is also one of the main reasons a few studies were done up to 2003. Researchers have favoured the model Demerjian et al. (2012) proposed recently due to its high applicability and operationalizability. This model had a tremendous effect on developing and implementing related studies. Despite the design of the measurement model in 2012, the impact of more-able managers on various research fields occurred with a delay. Only a few studies (10) addressed the issue during 2012–2017.

4.1 Theme

By examining the content of the results as well as keywords in the analyzed research studies, we classified 110 studies into 10 categories: performance, capital market, reporting quality, audit, investment, dividend policy and cash management, tax, corporate social responsibility, COVID-19, and miscellaneous. The frequency of the studies in each category is presented in Table 3. The largest number of studies were done in performance and capital market categories.

Table 3. Thematic frequency in the field of managerial ability

Thematic Category	Number of Studies
Performance	20
Capital market	23
Reporting quality	16
Investment	16
Audit	9
Corporate social responsibility	6
Dividend policy and cash management	6
Tax	4
Covid 19	6
Other	12
Total	**114***

***Some articles thematically belong to more than one category; therefore, the total number of the studies in this table is larger than the number of the reviewed ones (i.e., 110).

4.2 Number of citations

Based on Google Scholar, the number of citations is presented in Table 4.

Table 4. The number of citations

No.	Researcher(s)	Year	Number of citations
1	Bertrand and Scholar	2003	4.142
2	Kaplan et al.	2012	971
3	Demerjian et al.	2013	954
4	Milbourn	2003	739
5	Rajgopal et al.	2006	467
6	Baik et al	2011	453
7	Hayes and Schaefer	1999	276
8	Chang et al.	2010	269
9	Krishnan and Wang	2015	225
10	Lee et al.	2012	209
11	Wang et al.	2017	130
12	Chen et al.	2015	124
13	Demerjian et al.	2020	119
14	Mishra	2014	118
15	Andreou et al.	2017	117
16	Yuan et al.	2019	113
17	Huang and Sun	2017	107
18	Cornaggia et al.	2017	97
19	Habib and Hasan	2017	95
20	Andreou et al.	2016	79
21	Park et al.	2016	71
22	Baik et al.	2020	68
23	García-Meca and García-Sánchez	2018	67
24	Gul et al.	2018	64
25	Lee et al.	2018	63
26	Yung and Chen	2018	62
27	Choi et al.	2015	58
28	García-Sánchez and Martínez-Ferrero	2019	58
29	Sun	2016	57
30	De franco et al.	2017	52
31	Khurana et al.	2018	49
32	Cheung et al.	2017	48
33	Chemmanur et al.	2010	48

34	Abernathy et al.	2018	46
35	García-Sánchez et al.	2019	46
36	Bui et al.	2018	46
37	Baik et al.	2018	44
38	Gan	2019	41
39	García-Sánchez et al.	2020	40
40	Mitra et al.	2019	37
41	Fernando et al.	2020	36
42	Cui and Leung	2020	28
43	Akbari et al.	2019	25
44	Huang et al.	2017	23
45	Luo and Zhou	2017	21
46	Gan and Park	2017	20
47	Cheng et al.	2020	20
48	Phan et al.	2020	20
49	Petkevich and Prevost	2018	19
50	Hesarzadeh and Bazrafshan	2019	19
51	Doukas and Zhang	2020	19
52	Salehi et al.	2020	18
53	Haider et al.	2021	17
54	Akbari et al.	2018	17
55	Kumar and Zbib	2022	17
56	Jebran and Chen	2022	16
57	Li and Luo	2017	16
58	Cox	2017	16
59	Sun	2017	15
60	Chen et al.	2017	15
61	Cho et al.	2018	15
62	Uygur	2018	13
63	Berglund et al.	2018	12
64	Doukas and Zhang	2021	11
65	Gounopoulos et al.	2021	11
66	Oskouei and Sureshjani	2021	11
67	Dong and Doukas	2021	10
68	Sarwar et al.	2019	10
69	Salehi et al.	2019	10
70	Curi and vivas	2020	9
71	Chen et al.	2020	9
72	Mishra	2019	9
73	Yung and Nguyen	2020	8
74	Salehi et al.	2021	8
75	Safiullah et al.	2022	7
76	Khoo	2022	7
77	Lin et al.	2021	6
78	Ujah et al.	2021	6
79	Truong et al.	2020	5
80	Naheed et al.	2021	5
81	Cheng and Cheung	2021	4
82	Cao et al.	2019	4
83	Nadeem et al.	2021	4
84	Krishnan, Wang and Yu	2020	4
85	El Mahdy	2020	4
86	Gong et al.	2021	4
87	Abdesslem et al	2022	4
88	Shang	2021	3
89	Kim	2021	3
90	Bradley and sun	2021	3
91	Chen and Chen	2020	3
92	Harper et al.	2019	3

93	Magerakis	2022	3
94	Xu et al.	2021	2
95	Liu and Lei	2021	2
96	Yan et al.	2021	2
97	Wu et al.	2022	2
98	Driouchi et al.	2022	2
99	Cho et al.	2021	2
100	Wang et al.	2020	2
101	Khan et al	2022	2
102	Putra et al.	2021	1
103	Simamora	2021	1
104	Hwang et al.	2018	1
105	Gao et al.	2020	1
106	Westfall and Myring	2022	1
107	Biswas et al	2022	1
108	Mishra	2022	1
109	Fu et al	2022	0
110	Kim	2022	0

Table 4 demonstrates that rows 1 to 10 show studies with more than 200 citations.

4.3 Measurement

The analysis shows that the model proposed by Demerjian et al. (2012) is the most widely used model to measure managerial ability. This model indirectly measures managerial ability. According to this model, the firm's impact is distinct from the managerial impact and the contribution of the managerial impact on the corporate performance is known as managerial ability. This model initially calculates the firm efficiency using the Data Envelopment Analysis (DEA) technique. However, the calculated efficiency cannot entirely be attributed to managers. Therefore, the regression model is used in the next step. In this regression, efficiency is the dependent variable and the variables representing the firm's effect are placed as independent variables. By implementing this regression model, the model's residual value is recognized as managerial ability (Demerjian et al., 2012).

Measuring managerial ability based on the executive experience of managers, the model proposed by Custódio et al. (2013) is another model. As a kind of general measurement model, the measurement of this model is not based on accounting structures. Another model is proposed by Bertrand and Schoar (2003), which is based on the extent to which the observed variation in firm policies can be attributed to managers' fixed effects. Since the managers' effects can be correlated with the effects of the firm, they constructed a panel data set that enabled them to track the top managers across different firms over time. This model has no generalizability due to the limited sample used (Demerjian and Lev, 2021). Multiple variables have also been used for measuring managerial ability, including industry-adjusted ROA (Return on Asset), industry-adjusted stock return, CEO press citations, and CEO compensation. Yet, these variables have limitations. For instance, achieving a higher (stocks or assets) return is also influenced by other factors in addition to managerial ability. Consequently, it does not seem plausible to attribute all the achieved excess returns to the managers. Furthermore, the size of the firms, the type of products they produce, the strategic nature of the products and environmental conditions as external factors influence the focus point of media and press. Compensation as a variable, determined based on firm performance, also includes factors beyond managers' control. Therefore, compensation is not an accurate criterion for measuring managerial ability (Demerjian et al., 2012).

The point that we can learn from the evolution of the measurement of managerial ability over time is that prior to Demerjian et al. (2012) model, managerial ability was limited to some

rudimentary measures. According to Demerjian and Lev (2021), some studies were forced to use "best company" lists reported in Fortune magazine, which are inherently subjective and often lack methodological transparency. Some studies also applied Bertrand and Schoar's (2003) model, which required managers to switch firms, which leads to small and idiosyncratic samples. After the development of the Demerjian et al. (2012) model, however, it has been accepted widely as an easily and broadly available measure of managerial ability. Managerial ability measurements have moved from variables that measure managerial ability directly (e.g., industry-adjusted ROA) toward models that measure managerial ability indirectly (the residual value of a regression model). The reasons that the indirect model has succeeded over the past decade probably include two main things: (1) increasing the variety of firm-related information in publicly available databases and, subsequently, (2) the popularity of statistical techniques among researchers. Demerjian and Lev (2021) argued that the managerial score is available for approximately 200,000 firm years from 1980 to 2016.

4.4 Keywords

As diagrams and shapes are more understandable, the analysis of keywords based on the frequency of use and their relationship with managerial ability is shown in Figure 3. The size of nodes in this figure indicates the frequency of the keywords used in the title or abstracts of the searched studies alongside managerial ability. Moreover, the density of the curves indicates the number of joint studies between each keyword and managerial ability.

As illustrated in Figure 3, managerial ability is highly studied in relation to firm performance, corporate governance, firm value, real earning management, and information asymmetry. As Demerjian and Lev (2021) argued, while on the surface, a direct and positive correlation between managerial ability and firm performance shows that characteristics of managers with high ability led to better firm performance, it can be reasoned that managers with superior ability use their skill opportunistically. These dual reasonings have led to contradictory results around managerial ability and firm performance relationships (e.g., Cheungh et al., 2017; Hwang et al., 2018). Therefore, it can be inferred that a high concentration of studies on the relationship between managerial ability and keywords like firm performance, corporate governance, firm value, real earning management and information asymmetry is probably due to the mentioned dual reasonings.

The density of curves in figure 3 also illustrates that only a few studies focused on the relationship between managerial ability and going concern, accounting conservatism and family firms, which provides a suitable road map for future research.

4.5 Results

As mentioned earlier, the studies were classified into 10 thematic categories. In this section, the results of each research will be presented based on each category. This section presents a variety of results around managerial ability that can be interesting and probably open up new avenues for future research.

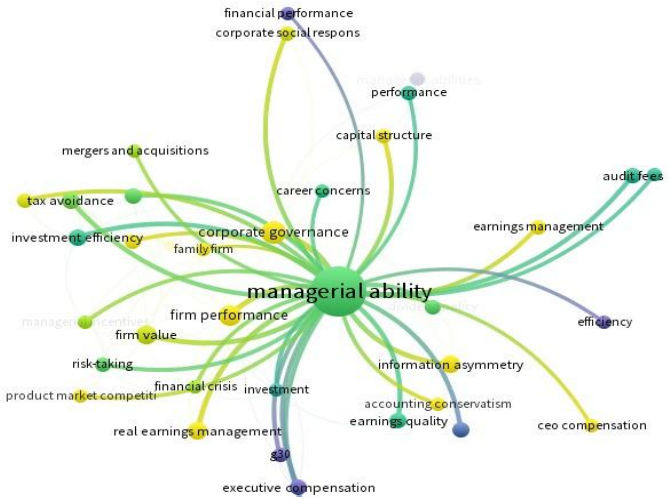

Figure 3. The use and link between managerial ability and keywords

4.5.1 Performance

It is presumed that there is a direct and positive relationship between managerial ability and the firm's performance. In other words, high-ability managers provide higher firm performance with foresight and a better understanding of economic activities and investment decisions (Demerjian and Lev, 2021). The results of Bertrand and Schoar (2003) showed that managers' styles and attitudes can influence constructive decisions (including research and development expenditures) and firm performance. By examining and identifying the manager-specific performance, they found that managers have about a 3% influence on Return on Assets (ROA). Khan et al. (2022) reveal that CEO management ability is positively related to sustainability performance. Chang et al. (2010) and Salehi et al. (2021) indicated that managerial ability influences firm performance. The relationship between managerial ability and firm performance can face a serious challenge when managers are opportunistic (Demerjian and Lev, 2021). Cheung et al. (2017) indicated that managerial ability improves performance only when accompanied by managerial discretion. A high level of managerial discretion requires examinations and supervision in the form of corporate governance structures. Hwang et al. (2018) showed that managerial ability in private firms causes an improvement in firm performance. However, opportunistic behaviors also exist in such firms without monitoring mechanisms.

Some studies have addressed the moderating role of managerial ability. Having investigated the moderating role of the CEO's ability regarding corporate social responsibility and performance, García-Sánchez and Martínez-Ferrero (2019) showed that managerial ability is important in protecting the shareholders' interests. Wang et al. (2020) proved that managerial ability influences the relationship between the asset-light strategy and firm performance in the Asian telecommunications industry. Cheng et al. (2020) indicated that the type of business strategy and general and specialized managerial ability are important success factors that influence firm performance. Phan et al. (2020) showed that managerial ability moderates the negative relationship between crude oil price uncertainty and firm performance.

A number of studies have addressed the role of managerial ability in the performance of acquired and merged firms. For example, Cui and Leung (2020) showed that acquired firms with higher managerial ability achieve higher long-term operating performance and stock returns. This issue is more obvious when the acquirer and the target firm belong to the same industry. To put simply, managers with high ability are more successful in creating synergy in same-industry firms. Doukas

and Zhang (2020) showed that acquirers led by high-ability managers engage in more pre-acquisition earnings smoothing and experience more significant announcement abnormal returns and operating performance in post merge and acquisition periods than their low-ability counterparts. Dong and Doukas (2021) investigated the impact of managerial ability on mergers and acquisitions of US firms. After merging and acquiring, they showed a significant positive relationship between managerial ability and firm performance. Their findings also showed that managerial ability influences the identification and selection of target firms. Moreover, firms with strongly ingrained growth potential low financial constraints and bankruptcy risks are highly favoured by high-ability managers as targets. Xu et al. (2021) showed that the average impact of managerial ability on the likelihood of completing cross-border mergers and acquisitions is positive. Several studies also investigated the role and success of high-ability managers in the initial public offerings (Chemmanur et al., 2010; Cox, 2017; Gounopoulos et al., 2021).

Gender and managers' risk-taking are two important concepts researchers in managerial ability have considered. Fernando et al. (2020), by focusing on gender and managerial ability, showed that the presence of women at top levels of management not only has a positive effect on performance (in times of stability and crisis) but also on the enhancement of managerial abilities. Moreover, managerial ability has a high moderating role in the relationship between gender diversity and firm performance. Addressing the simultaneous effects of managerial ability and risk-taking, Simamora (2021) concluded that managerial ability and a manager's risk-taking behavior improve firm performance.

4.5.2 Capital market

Various managerial ability studies have been conducted related to capital markets, which can be classified into the stock and debt markets. Some studies focused on the market's reaction to the turnovers of high-ability managers. This reaction shows that the market recognizes managerial ability. Hayes and Shaffer (1999) investigated the negative stock price reaction to high-ability managers' turnovers. Their research results indicated that firms' market value changes ranging from 12.6 to 53.3 million dollars due to high-ability managers' turnovers. Considering the market's reaction to CEO turnover as a test of their designed model, Demerjian et al. (2012) found that the market reaction accompanies these changes. Cho et al. (2021) refer to the market perceptions of high-ability managers. They showed that the market value of firms would not be adjusted for firms with high-ability managers and firms with deviations from the target capital structure.

Some studies also investigated the tone of managers with high-ability in earnings announcements and its impact on the stock market. For instance, Luo and Zhou (2017) showed that more-able managers use a positive tone in their earnings announcements. Furthermore, the stock market reacts positively to this type of announcement. According to Yan et al. (2021), managers with low ability manipulate the tone of the earnings announcements and firm disclosures to avoid losing their labour market—the stance faced with a negative market reaction. Fu et al. (2022) found a negative relationship between managerial ability and stock price synchronicity. Kim (2022) revealed that the quality of non-GAAP earnings is greater for high-ability managers than for low-ability managers.

Other studies concentrated on the impact of managerial ability on the information environment. Baik et al. (2018) showed that highly capable managers impact the quality of a firm's information environment. In addition, managers' equity incentives can improve the quality of the information environment. According to the findings of Chen et al. (2020), managerial ability can reduce the negative impact of uncertainty in macro-political and economic environments on analysts' forecasts. The research conducted by Gao et al. (2020) indicated that financial analysts are attracted to firms with highly-skilled managers so that they can provide more accurate forecasts. Cao et al.

(2019) showed that open market repurchase program completion rates increase with managerial ability and that the quality of management earnings forecasts further moderates the association. Habib and Hasan (2017) indicated that more-able managers lead to future stock price crash risk through over-investing. According to Liu and Lei (2021), managerial ability is positively associated with stock price crash risk only when managerial overconfidence is high.

Among studies in the debt market category, Petkevich and Prevost (2018) concluded that managerial ability improves the information environment and reduces risk and information asymmetry. Other studies investigated the effect of managerial ability on firms' credit risk and loan terms. Cornaggia et al. (2017) and Harper et al. (2019) indicated that more-able managers are considered positive factors for measuring firms' credit ratings. High-ability managers will improve firms' credit ratings. According to Chen et al. (2017), managerial ability increases credit ratings but decreases credit risk. Several studies investigated the effect of managerial ability on negotiation about loan terms, such as maturity date. For instance, De Franco et al. (2017) concluded that higher managerial ability is associated with lower bank-loan prices. Bui et al. (2018) found that firms with high-ability managers are more likely to continue their prior lower loan spread. The spread-reduction effect of managerial ability is stronger for firms with weak governance structures or poor stakeholder relationships, corroborating the notion that better managerial ability alleviates borrowers' agency and information risks. Shang (2021) showed the effect of managerial ability on debt maturity. Specifically, high-ability managers prefer short-term debt, amplified for firms with greater growth opportunities and attenuated for firms with refinancing risk. Abdesslem et al. (2022) revealed that both risks significantly affect the likelihood of bank default and that the high skill of managers does not attenuate this effect. Khoo (2022) documents that firms with highly capable managers are associated with more short-term debt financing.

4.5.3 Reporting quality

Two viewpoints have emerged from studies in this category. First, high-ability managers improve reporting quality. Second, the reporting quality of high-ability managers is low. Most of the studies are in line with the first point of view. According to the first view, García-Meca and García-Sánchez (2018) and Krishnan, Wang and Yu (2021) showed that high-ability managers are less engaged with opportunistic financial reporting. Demerjian et al. (2013) investigated managerial ability and earnings quality. The results of their research indicated that managerial ability is associated with fewer subsequent restatements, higher earnings, accruals persistence and lower errors in bad debt provision. Moreover, more-able managers can estimate accruals more accurately. The research findings of Huang and Sun (2017) indicated that higher-ability managers use less real earnings management and reduce the negative impact of earnings management on future firm performance. According to Oskouei and Sureshjani (2021), managers with higher abilities use less real earnings management in crisis conditions. Putra et al. (2021) found that managers with higher abilities in family firms engage less in real earnings management. Choi et al. (2015) revealed the significance of managerial ability in the informativeness of current accruals for future cash flows. Baik et al. (2020) found that managerial ability positively affects income smoothing. Moreover, the earnings informativeness and stock price are higher in firms with highly capable managers. Wang et al. (2017) investigated the relationship between managerial ability, political connections and financial reporting fraud. The results of their research showed that managerial ability reduces financial reporting fraud. Furthermore, this relationship is stronger in firms without political connections. Abernathy et al. (2018) showed a positive effect of managerial ability on financial reporting timeliness. Uygur (2018) and Wu et al. (2022) concluded that higher-ability managers have higher information transparency. According to Bradley and Sun (2021), there is a positive

relationship between managerial ability and Level 1 and Level 2 fair value inputs usage.

In the second point of view, Demerjian et al. (2020) suggested that more-able managers use intentional income smoothing. Intentional income smoothing directly relates to firms' future performance, which can benefit both the manager and the shareholders. Gul et al. (2018) found that more-able managers in financial distress situations present low-quality accruals and high restatements.

4.5.4 Audit

The main focus of studies in this category is the relationship between managerial ability and audit fees. For example, Krishnan and Wang (2015) indicated that managerial ability influences audit fees. Simply put, it is justified that auditors' risk is reduced by reducing the risk of bankruptcy or improving the quality of information; therefore, conditions for reducing the audit fee are provided. Extending the work done by Krishnan and Wang (2015), Li and Luo (2017) showed a non-linear relationship between managerial ability and audit fees. They believed that factors such as litigation risk, the post-Sarbanes–Oxley Act (SOX) era and the auditor's familiarity with the manager impacted this relationship. Salehi et al. (2019) found a significant positive relationship between managerial ability and the quality of internal controls, but they observed a negative relationship between managerial ability and audit fees. Inferring a negative relationship between managerial ability and audit fee may change according to the conditions of each firm. Gul et al. (2018) observed a positive relationship between managerial ability and the auditor fee in financially distressed firms, which is caused by the opportunistic financial reporting of managers, hence an increase in audit risk. Following a different method, Berglund et al. (2018) showed that managerial ability decreases the risk of Type I errors in auditing and increases the risk of Type II errors. Westfall and Myring (2022) find that IPO registrants with higher managerial ability are more likely to disclose internal control weaknesses voluntarily than other registrants.

Some studies refer to the moderating role of managerial ability. Mitra et al. (2019) showed that the positive relationship between managerial overconfidence and audit fees is moderated by managerial ability. According to Truong et al. (2020), managerial ability moderates the relationship between political alignment and audit pricing. Kim (2021) showed that overconfident and incompetent managers are more likely to receive an opinion related to the going concern.

4.5.5 Investment

In this category, some studies addressed the attitude and behavior of high-ability managers regarding capital expenditures and research and development expenses. According to Yung and Chen (2018), high-ability managers take higher risks, cut capital expenditures and increase research and development expenses and firm value. Chen and Chen (2020) showed that managers with high ability make more accurate estimates of capital expenditures. Yung and Nguyen (2020) suggested that managerial ability is positively associated with market share growth. Moreover, managers who face competitive threats concentrate on research and development rather than capital expenditures.

A number of studies investigated the relationship between managerial ability and investment efficiency/inefficiency. Investment efficiency is achieved when a firm only invests in positive net present value projects. Since the markets are not complete in terms of efficiency, investment inefficiency which probably is reduced by managerial ability, is possible. However, the results of the studies in this area are incompatible. For example, Habib and Hassan (2017) demonstrated that high-ability managers create investment inefficiency by over-investment. Andreou et al. (2017) revealed that managers with a high ability to mitigate under-investment problems during a crisis increase firm value. According to Khurana et al. (2018), firms with high managerial ability exhibit

higher tax avoidance and investment efficiency. Gan (2019) showed that the decisions of high-ability managers enhance investment efficiency. On the other hand, Salehi et al. (2020) showed no relationship between managerial ability, investment efficiency and risk taking. Naheed et al. (2021) found that managerial ability influences investment decisions in both favourable and unfavourable financial conditions.

Several studies focused on the relationship between managerial ability, investment opportunities and innovative activities. Chen et al. (2015) suggested that managerial ability is positively associated with innovative activities, followed by the capital market's positive reaction. Lee et al. (2018) showed a positive relationship between managerial ability and investment opportunities in firms with strong financial positions and those with financial constraints. Mishra (2019) suggested that innovative activities in firms are associated with strategic and operational managerial ability. According to Driouchi et al. (2022), there is a positive relationship between managerial ability and growth opportunities. A number of studies examined the relationship between managerial ability and a specific area of investment. For example, Ujah et al. (2021) found a positive relationship between managerial ability and working capital management. Finally, Nadeem et al. (2021) indicated a significant positive relationship between managerial ability and intellectual capital.

4.5.6 Dividend policies and cash management

Magerakis (2022) examined the role of managerial discretion in the relation between managerial ability and the level of corporate cash. Their findings revealed that the positive association between the ability of chief executive officers and corporate cash savings is weakened by firm-level managerial discretion. Gan and Park (2017) investigated managerial ability and the marginal value of cash. Their study showed that managerial ability significantly increases the marginal value of cash and free cash flow. They also found that the effect of managerial ability on the marginal value of cash is generally greater for firms with stronger corporate governance and financial constraints. Cho et al. (2018) found that managerial ability is negatively related to the adjustment speed of cash holdings toward the target, particularly when the firm has excess cash. Sarwar et al. (2019) considered a positive relationship between managers' ability and dividend payouts to be influenced by factors such as a firm's ownership, financial constrain and emerging markets. Safiullah et al. (2022) and Andreou et al. (2016) showed that the ability of Islamic bank managers and Shariah supervisory board governance increase cash flows and liquidity of banks.

4.5.7 Tax

Considered an important strategy in firms, tax avoidance is strongly influenced by managers' viewpoints. Park et al. (2016) showed that the relationship between managerial ability and tax avoidance is negative, which Akbari et al. (2018) did not confirm in Tehran Stock Exchange and the Over-the-counter market. Some studies were concerned with the moderating role of managerial ability. According to Akbari et al. (2019), managers' ability has a moderating role in the negative relationship between tax avoidance and firm value. Huang et al. (2017) also indicated that managerial ability moderates the positive relationship between environmental uncertainty and tax avoidance.

4.5.8 Corporate social responsibility

Sun (2017) showed that more-able managers consider environmental risks. According to Yuan et al. (2019), a positive relationship exists between social responsibility and managerial ability. Gong et al. (2021) found that managerial ability impacts corporate social responsibility and firm

performance in the energy industry. García-Sánchez et al. (2019) found that focusing on corporate governance mechanisms can be a more suitable alternative for less able managers to improve corporate social responsibility. García-Sánchez et al. (2020) showed that managerial ability, directly and indirectly, affects corporate social responsibility information disclosure. Doukas and Zhang (2021) indicated that in acquired firms, more talented managers significantly shape corporate social culture among US firms. These firms were more inclined to engage in corporate social responsibility activities.

4.5.9 COVID-19

After 2019 and the outbreak of COVID worldwide, some researchers have focused on its effect on managerial ability. Jebran and Chen (2022) showed that firms with higher ability managers reduce their investments, financing, and cash holdings yet increase their dividend payouts during the COVID-19 crisis. Kumar and Zbib (2022) also found a positive and significant association between the CEO's managerial ability and cumulative raw and abnormal returns.

4.5.10 Miscellaneous

Sun (2016) found a negative relationship between managerial ability and goodwill impairment. Hesarzadeh and Bazrafshan (2019) showed a negative relationship between managerial ability and regulatory review risk, which is not economically significant. The agency costs and quality of corporate governance mechanisms also influence this relationship. Lee et al. (2012) concluded that the accuracy of management forecasts can be used as an alternative measure of managerial ability. Moreover, CEO turnover is positively related to the magnitude of absolute forecast errors when the firm performance is weak. El Mahdy (2020) revealed that higher-ability managers voluntarily adopt the clawback rule. According to Haider et al. (2021), high ability managers use accounting conservatism to preserve stakeholders' interests. Lin et al. (2021) indicated that firms directed by inventor managers with greater general abilities provide more innovations that fit product market needs. Cheng and Cheung (2021) indicated that managerial ability positively moderates the negative relationship between using derivatives and firm risk. In addition, this positive moderating effect is stronger in firms with weak monitoring, dispersed ownership, weak corporate governance and high information asymmetry. Biswas et al. (2022) examined whether managerial ability moderates the association between product market competition and real earnings management. They argued that this association is different depending on the level of managerial ability and that able managers negatively moderate the association between competition and real activity manipulation. Mishra (2022) found the strategic ability positively influences exploration and exploitation activities, while operational ability positively influences exploitation activities but negatively influences exploration activities unless the managers are provided high risk incentives.

Concerning the bank industry, several studies illustrated that managers with high abilities affect banks' risk-taking levels (Andreou et al., 2016; Curi and Vivas, 2020).

5. Conclusion and Further to the Study

In recent years, the role of managers in firms and their influence has been challenged by numerous studies (Bertrand and Schoar, 2003; Demerjian et al., 2012; Andreou et al., 2017; Demerjian and Lev, 2021; Jebran and Chen, 2022; Kumar and Zbib, 2022; Kim: 2022). Among

managers' measurable characteristics, a large extent of related literature is dedicated to managerial ability. The international scientific search engines were searched to identify the studies published between 1990 and 2022 (110 studies). Studies have shown that many were implemented over the last six years, during 2017–2022. The analysis revealed that a large part of studies focused on the relationship between managerial ability and corporate governance, firm performance and firm value. Furthermore, content analysis classified related studies into 10 categories: performance, capital market, reporting quality, audit, investment, dividend policies and cash management, tax, corporate social responsibility, COVID-19 and miscellaneous. The summary of the results of each category was then presented separately. The analysis also revealed that the largest number of studies (43) has concentrated on the relationship between managerial ability, firm performance and capital market. The methods used in the studies were also examined in each category and research gaps were identified for future studies.

Various topics have been investigated around the relationship between firm performance and managerial ability. Most studies used the Demerjian et al. (2012) model to measure managerial ability. Given that managerial ability through the Demerjian et al. (2012) model is derived from firm performance figures, it is not appropriate to use this model to test the relationship between managerial ability and firm performance or the moderating role of managerial ability in this field. We suggest that researchers use other variables and models to measure managerial ability to examine related topics.

In another category, studies have considered the importance of markets' understanding of managerial ability. Further studies can concentrate on the length of time that it takes for the market to recognize managers with high abilities. Most related studies around the debt market focused on managerial ability's impact on reducing credit risk, increasing credit ratings and facilitating loan terms. Future research can investigate the effects of high-ability managers in reducing credit risk and raising credit in firms with financial constraints.

Most studies in the reporting quality category showed that managers with higher ability use less real earnings management. The current accruals they report have higher informativeness for estimating future cash flows. As mentioned earlier, the majority of studies used the Demerjian et al. (2012) model to measure managerial ability. This is while earnings management effects are not included in this model. So, the effects related to earnings management exist in measured managerial ability via the Demerjian et al. (2012) model. Hence, investigating the relationship between managerial ability measured via this model and earnings management and income smoothing includes statistical errors. Future research can be directed toward designing a model to measure managerial ability considering the effects of earnings management.

The studies addressed the relationship between managerial ability and audit fees in the audit category. Future research can investigate the effect of factors such as corporate governance mechanisms, managers’ myopia, managers’ risk-taking and the firm’s life cycle on the relationship between managerial ability and audit fees and audit reports.

The research results in the investment category depend on two basic factors: market efficiency and managers' characteristics and traits. Studies can be followed in markets with different levels of efficiency. Factors like managers' political connections, tenure, industry and myopic behaviors

probably influence the relationship between managerial ability and investment.

Investigating the role of managerial ability in different dividend policy theories in the dividend policies and cash management category can provide different results.

Research has focused on tax avoidance and its relationship with managerial ability in the tax category. Applying Schwab et al. (۲۰۲۲) model to measure effective tax planning and investigating its relationship with managerial ability is probably the new direction for future research.

The concept of culture and the rules and regulations of different countries suggest new topics for future research in corporate social responsibility. A comparative study in several countries with different cultures and regulations can be attractive. Moreover, factors such as management tenure and industry can influence the relationship between managerial ability and corporate social responsibility based on their effects on society.

Studies in the COVID-19 category signal that economic, political, and social challenges can affect future studies around managerial ability. For instance, as Russia's War Against Ukraine may affect the economies of other countries, investigating the role of high-ability managers in such a condition can be attractive. Table 5 summarizes suggestions related to each category for future research.

Table 5. Summary of the study

No.	Category	Suggestions
1	performance	Studying the relationship between managerial ability and firm performance via other variables and models to measure managerial ability because Demerjian et al. (2012) model derives managerial ability measure from firm performance
2	capital market	Studying the length of time that it takes for the market to recognize managers with high abilities
3	reporting quality	Adjusting Demerjian et al. (2012) model to measure managerial ability considering the effects of earnings management
4	audit	Studying managerial ability with Audit fees and the moderator role of factors like corporate governance mechanisms, managers' myopia, managers' risk-taking and the firm's life cycle
5	investment	Studying managerial ability in markets with different levels of efficiency
6	dividend policy and cash management	Studying managerial ability with different theories of dividend policy
7	tax	Studying managerial ability with effective tax planning, which is measured with Schwab et al. (۲۰۲۲) model
8	corporate social responsibility	Studying managerial ability in several countries with different cultures and regulations comparatively
9	COVID-19	Studying managerial ability similar crises like Russia's War Against Ukraine

In the current review, we found that although multiple studies used models proposed by Custódio et al. (2013) and Bertrand and Schoar (2003) and variables such as industry-adjusted ROA (Return on Asset), industry-adjusted stock return, CEO press citations and compensation to measure managerial ability, Demerjian et al. (2012) was found to be the most frequently used model in reviewed studies. According to Demerjian and Lev (2021), the primary goal of the output variable designed in the first stage of the model was to find a general variable that would influence the result of all managerial decisions and attitudes. It can be useful and effective to develop different models from the point of view of majority and minority shareholders or even creditors. It is also possible to

improve the model through different methods of grouping firms (e.g., grouping firms based on year-industry instead of industry) and compare the results with the original model.

We confront two main limitations in the current study. First, we may not have searched other keywords in international academic search engines. Second, most studies have been published in accounting and management journals. The journals in other disciplines may include more related studies.

Declaration of interest

The authors report there are no competing interests to declare.

References

1. Abdesslem, R. B., Chkir, I. and Dabbou, H. (2022). Is managerial ability a moderator? The effect of credit risk and liquidity risk on the likelihood of bank default. *International Review of Financial Analysis*, 80(11), A. 102044. https://doi.org/10.1016/j.irfa.2022.102044
2. Abernathy, J. L., Kubick, T. R. and Masli, A. (2018). Evidence on the relation between managerial ability and financial reporting timeliness. *International Journal of Auditing*, 22(2), pp. 185-196. https://doi.org/10.1111/ijau.12112
3. Akbari, F., Salehi, M. and Bagherpour Vlashani, M. A. (2018). The effect of managerial ability on tax avoidance by classical and Bayesian econometrics in multilevel models: Evidence of Iran. *International Journal of Emerging Markets*, 13(6), pp. 1656-1678. https://doi.org/10.1108/IJoEM-09-2017-0367
4. Akbari, F., Salehi, M. and Vlashani, M. A. B. (2019). The relationship between tax avoidance and firm value with income smoothing: A comparison between classical and Bayesian econometric in multilevel models. *International Journal of Organizational Analysis*, 27(1), pp. 125-148. https://doi.org/10.1108/IJOA-09-2017-1235
5. Andreou, P. C., Karasamani, I., Louca, C. and Ehrlich, D. (2017). The impact of managerial ability on crisis-period corporate investment. *Journal of Business Research*, 79(19), pp. 107-122. https://doi.org/10.1016/j.jbusres.2017.05.022
6. Andreou, P. C., Philip, D. and Robejsek, P. (2016). Bank liquidity creation and risk-taking: Does managerial ability matter?. *Journal of Business Finance & Accounting*, 43(1-2), pp. 226-259.
7. https://doi.org/10.1111/jbfa.12169
8. Baik, B. O., Farber, D. B. and Lee, S. A. M. (2011). CEO ability and management earnings forecasts. *Contemporary Accounting Research*, 28(5), pp. 1645-1668. https://doi.org/10.1111/j.1911-3846.2011.01091.x
9. Baik, B., Brockman, P. A., Farber, D. B. and Lee, S. (2018). Managerial ability and the quality of firms' information environment. *Journal of Accounting, Auditing & Finance*, 33(4), pp. 506-527. https://doi.org/10.1177/0148558X17742820
10. Baik, B., Choi, S. and Farber, D. B. (2020). Managerial ability and income smoothing. The Accounting Review, 95(4), pp. 1-22. https://doi.org/10.2308/accr-52600
11. Barr, R. S. and Siems, T. F. (1997). Bank failure prediction using DEA to measure management quality. In Interfaces in Computer Science and Operations Research: Advances in Metaheuristics, Optimization, and Stochastic Modeling Technologies (pp. 341-365). Boston, MA: Springer US.
12. Berglund, N. R., Herrmann, D. R. and Lawson, B. P. (2018). Managerial ability and the accuracy of the going concern opinion. *Accounting and the Public Interest*, 18(1), pp. 29-52. https://doi.org/10.2308/apin-52125

13. Bertrand, M. and Schoar, A. (2003). Managing with style: The effect of managers on firm policies. *The Quarterly Journal of Economics*, 118(4), pp. 1169-1208. https://doi.org/10.1162/003355303322552775
14. Biswas, P. K., Ranasinghe, D. and Tan, E. K. (2022). Impact of product market competition on real activity manipulation: Moderating role of managerial ability. *Accounting & Finance*, 63(1), pp. 247-275. https://doi.org/10.1111/acfi.13040
15. Boeker, W. (1989). Strategic change: The effects of founding and history. *Academy of Management journal*, 32(3), pp. 489-515. https://doi.org/10.5465/256432
16. Bradley, W. and Sun, L. (2021). Managerial ability and fair value accounting: evidence from nonfinancial firms. *Journal of Financial Reporting and Accounting*, 19(4), pp. 666-685. https://doi.org/10.1108/JFRA-08-2020-0229
17. Bui, D. G., Chen, Y. S., Hasan, I. and Lin, C. Y. (2018). Can lenders discern managerial ability from luck? Evidence from bank loan contracts. *Journal of Banking & Finance*, 87, pp. 187-201. https://doi.org/10.1016/j.jbankfin.2017.09.023
18. Cao, J., Cheng, Y., Golden, J. and Zhang, J. H. (2019). Managerial ability, forecasting quality, and open-market repurchase program completion. *Review of Quantitative Finance and Accounting*, 53(3), pp. 871-894. https://doi.org/10.1007/s11156-018-0769-7
19. Chang, Y. Y., Dasgupta, S. and Hilary, G. (2010). CEO ability, pay, and firm performance. *Management Science*, 56(10), pp. 1633-1652. https://doi.org/10.1287/mnsc.1100.1205
20. Chemmanur, T. J., Paeglis, I. and Simonyan, K. (2010). Management quality and equity issue characteristics: a comparison of SEOs and IPOs. *Financial Management*, 39(4), pp. 1601-1642. https://dx.doi.org/10.2139/ssrn.1589130
21. Chen, J. and Chen, J. (2020). Does managerial ability affect the quality of environmental financial disclosure?. *Sustainability Accounting, Management and Policy Journal*, 11(6), pp. 1055-1073. https://doi.org/10.1108/SAMPJ-09-2018-0248
22. Chen, M., Ruan, L., Zhu, Z. and Sang, F. (2020). Macro uncertainty, analyst performance, and managerial ability. *Eurasian Business Review*, 10(3), pp. 333-353. https://doi.org/10.1007/s40821-020-00148-8
23. Chen, T. K., Liao, H. H. and Chen, W. H. (2017). CEO ability heterogeneity, board's recruiting ability and credit risk. *Review of Quantitative Finance and Accounting*, 49(4), pp. 1005-1039. https://doi.org/10.1007/s11156-017-0615-3
24. Chen, Y., Podolski, E. J. and Veeraraghavan, M. (2015). Does managerial ability facilitate corporate innovative success?. *Journal of Empirical Finance*, 34, pp. 313-326. https://doi.org/10.1016/j.jempfin.2015.08.002
25. Cheng, L. and Cheung, A. W. (2021). Is there a dark side of managerial ability? Evidence from the use of derivatives and firm risk in China. *Journal of Contemporary Accounting & Economics*, 17(2), A. 100258. https://doi.org/10.1016/j.jcae.2021.100258
26. Cheng, T. Y., Li, Y. Q., Lin, Y. E. and Chih, H. H. (2020). Does the fit of managerial ability with firm strategy matters on firm performance. *Journal of Asian Finance, Economics and Business*, 7(4), pp. 9-19. https://doi.org/10.13106/jafeb.2020.vol7.no4.9
27. Chenhall, R. H. and Smith, D. (2011). A review of Australian management accounting research: 1980–2009. *Accounting & Finance*, 51(1), pp. 173-206. http://dx.doi.org/10.1111/j.1467-629X.2010.00371.x
28. Cheung, K. T. S., Naidu, D., Navissi, F. and Ranjeeni, K. (2017). Valuing talent: Do CEOs' ability and discretion unambiguously increase firm performance. *Journal of Corporate Finance*, 42, pp. 15-35. https://doi.org/10.1016/j.jcorpfin.2016.11.006
29. Cho, H., Choi, G. Y. and Choi, S. (2021). Is managerial ability associated with capital

structure adjustment speed?. *Asia-Pacific Journal of Financial Studies*, 50(3), pp. 308-333. http://dx.doi.org/10.1111/ajfs.12329
30. Cho, H., Choi, S. and Kim, M. O. (2018). Cash holdings adjustment speed and managerial ability. *Asia-Pacific Journal of Financial Studies*, 47(5), pp. 695-719. http://dx.doi.org/10.1111/ajfs.12235
31. Choi, W., Han, S., Jung, S. H. and Kang, T. (2015). CEO's operating ability and the association between accruals and future cash flows. *Journal of Business Finance & Accounting*, 42(5-6), pp. 619-634. http://dx.doi.org/10.1111/jbfa.12118
32. Cornaggia, K. J., Krishnan, G. V. and Wang, C. (2017). Managerial ability and credit ratings. *Contemporary Accounting Research*, 34(4), pp. 2094-2122. https://dx.doi.org/10.2139/ssrn.2541699
33. Cox, J. S. (2017). Managerial ability, growth opportunities, and IPO performance. *Managerial Finance*, 43(4), pp. 488-507. https://doi.org/10.1108/MF-07-2016-0218
34. Cui, H. and Leung, S. C. M. (2020). The long-run performance of acquiring firms in mergers and acquisitions: Does managerial ability matter?. *Journal of Contemporary Accounting & Economics*, 16(1), A. 100185. https://doi.org/10.1016/j.jcae.2020.100185
35. Curi, C. and Lozano-Vivas, A. (2020). Managerial ability as a tool for prudential regulation. *Journal of Economic Behavior & Organization*, 174, pp. 87-107. https://doi.org/10.1016/j.jebo.2020.03.023
36. Custódio, C., Ferreira, M. A. and Matos, P. (2013). Generalists versus specialists: Lifetime work experience and chief executive officer pay. *Journal of Financial Economics*, 108(2), pp. 471-492. https://doi.org/10.1016/j.jfineco.2013.01.001
37. Davis, J. H., Schoorman, F. D. and Donaldson, L. (1997). Toward a stewardship theory of management. *The Academy of Management Review*, Vol. 22(1), pp. 20-47. https://doi.org/10.4236/psych.2016.712140
38. De Franco, G., Hope, O. K. and Lu, H. (2017). Managerial ability and bank-loan pricing. *Journal of Business Finance & Accounting*, 44(9-10), pp. 1315-1337. https://doi.org/10.1111/jbfa.12267
39. Demerjian, P. R., Lev, B., Lewis, M. F. and McVay, S. E. (2013). Managerial ability and earnings quality. *The Accounting Review*, 88(2), pp. 463-498. https://doi.org/10.2308/accr-50318
40. Demerjian, P. and Lev, B. (2021). Measuring managerial ability: a retrospective and review of the literature. *Data Envelopment Analysis Journal*, 5(1), pp. 1-25. http://dx.doi.org/10.1561/103.00000037
41. Demerjian, P., Lev, B. and McVay, S. (2012). Quantifying managerial ability: A new measure and validity tests. *Management Science*, 58(7), pp. 1229-1248. https://doi.org/10.1287/mnsc.1110.1487
42. Demerjian, P., Lewis-Western, M. and McVay, S. (2020). How does intentional earnings smoothing vary with managerial ability?. *Journal of Accounting, Auditing & Finance*, 35(2), pp. 406-437. https://dx.doi.org/10.2139/ssrn.2426313
43. Dong, F. and Doukas, J. (2021). The effect of managers on M&As. *Journal of Corporate Finance*, 68, A. 101934. https://dx.doi.org/10.1016/j.jcorpfin.2021.101934
44. Doukas, J. A. and Zhang, R. (2020). Corporate managerial ability, earnings smoothing, and acquisitions. *Journal of Corporate Finance*, 65(1), A. 101756. https://dx.doi.org/10.2139/ssrn.3854243
45. Doukas, J. A. and Zhang, R. (2021). Managerial ability, corporate social culture, and M&As. *Journal of Corporate Finance*, 68(1), A. 101942. https://dx.doi.org/10.2139/ssrn.3854246

46. Driouchi, T., Chen, M., Lyu, Z., Bennett, D. J. and So, R. H. (2022). Ambiguity, managerial ability, and growth options. *British Journal of Management*, 33(3), pp. 1323-1345. https://doi.org/10.1111/1467-8551.12534
47. Fernando, G. D., Jain, S. S. and Tripathy, A. (2020). This cloud has a silver lining: Gender diversity, managerial ability, and firm performance. *Journal of Business Research*, 117(12), pp. 484-496. https://doi.org/10.1016/j.jbusres.2020.05.042
48. Fu, J., Chen, X., Liu, Y. and Chen, R. (2022). Managerial ability and stock price synchronicity. *Research in International Business and Finance*, 60(1), A. 101606. https://doi.org/10.1016/j.ribaf.2021.101606
49. Gan, H. (2019). Does CEO managerial ability matter? Evidence from corporate investment efficiency. *Review of Quantitative Finance and Accounting*, 52(4), pp. 1085-1118. https://doi.org/10.1007/s11156-018-0737-2
50. Gan, H. and Park, M. S. (2017). CEO managerial ability and the marginal value of cash. *Advances in Accounting*, 38, pp. 126-135. http://dx.doi.org/10.1016/j.adiac.2017.07.007
51. Gao, K., Wang, C., Su, Q. and Shen, H. (2020). Do analysts follow firms with able managers?. *Managerial and Decision Economics*, 41(8), pp. 1602-1612. https://doi.org/10.1002/mde.3206
52. García-Meca, E. and García-Sánchez, I. M. (2018). Does managerial ability influence the quality of financial reporting?. *European Management Journal*, 36(4), pp. 544-557. https://doi.org/10.1016/j.emj.2017.07.010
53. García-Sánchez, I. M. and Martínez-Ferrero, J. (2019). Chief executive officer ability, corporate social responsibility, and financial performance: The moderating role of the environment. *Business Strategy and the Environment*, 28(4), pp. 542-555. https://doi.org/10.1002/bse.2263
54. García-Sánchez, I. M., Aibar-Guzmán, B., Aibar-Guzmán, C. and Azevedo, T. C. (2020). CEO ability and sustainability disclosures: The mediating effect of corporate social responsibility performance. *Corporate Social Responsibility and Environmental Management*, 27(4), pp. 1565-1577. https://doi.org/10.1002/csr.1905
55. García-Sánchez, I. M., Hussain, N. and Martínez-Ferrero, J. (2019). An empirical analysis of the complementarities and substitutions between effects of CEO ability and corporate governance on socially responsible performance. *Journal of Cleaner Production*, 215, pp. 1288-1300. https://doi.org/10.1016/j.jclepro.2019.01.130
56. Gong, Y., Yan, C. and Ho, K. C. (2021). The effect of managerial ability on corporate social responsibility and firm value in the energy industry. *Corporate Social Responsibility and Environmental Management*, 28(2), pp. 581-594. https://doi.org/10.1002/csr.2070
57. Gounopoulos, D., Loukopoulos, G. and Loukopoulos, P. (2021). CEO education and the ability to raise capital. *Corporate Governance: An International Review*, 29(1), pp. 67-99. https://doi.org/10.1111/corg.12338
58. Gul, F. A., Khedmati, M., Lim, E. K. and Navissi, F. (2018). Managerial ability, financial distress, and audit fees. *Accounting Horizons*, 32(1), pp. 29-51. https://doi.org/10.2308/acch-51888
59. Habib, A. and Hasan, M. M. (2017). Managerial ability, investment efficiency and stock price crash risk. *Research in International Business and Finance*, 42(3), pp. 262-274. https://doi.org/10.1016/j.ribaf.2017.07.048
60. Haider, I., Singh, H. and Sultana, N. (2021). Managerial ability and accounting conservatism. *Journal of Contemporary Accounting & Economics*, 17(1), A. 100242. https://doi.org/10.1016/j.jcae.2020.100242
61. Harper, J., Kemper, K. J. and Sun, L. (2019). Managerial ability and bond rating changes.

Financial Markets, Institutions & Instruments, 28(5), pp. 381-401. https://doi.org/10.1111/fmii.12123
62. Hayes, R. M. and Schaefer, S. (1999). How much are differences in managerial ability worth?. *Journal of Accounting and Economics*, 27(2), pp. 125-148. https://doi.org/10.1016/S0165-4101(99)00007-5
63. Hesarzadeh, R. and Bazrafshan, A. (2019). CEO ability and regulatory review risk. *Managerial Auditing Journal*, 34(5), pp. 575-605. https://doi.org/10.1108/MAJ-08-2018-1958
64. Hesford, J. W., Lee, S. H. S., Van der Stede, W. A. and Young, S. M. (2006). Management accounting: a bibliographic study. *Handbooks of management accounting research*, 1(1), pp. 3-26. https://doi.org/10.1016/S1751-3243(06)01001-7
65. Hoque, Z. (2014). 20 years of studies on the balanced scorecard: Trends, accomplishments, gaps and opportunities for future research. *The British Accounting Review*, 46(1), pp. 33-59. https://doi.org/10.1016/j.bar.2013.10.003
66. Holcomb, T. R., Holmes Jr, R. M. and Connelly, B. L. (2009). Making the most of what you have: Managerial ability as a source of resource value creation. *Strategic Management Journal*, 30(5), pp. 457-485. https://psycnet.apa.org/doi/10.1002/smj.747
67. Huang, H., Sun, L. and Zhang, J. (2017). Environmental uncertainty and tax avoidance. *Advances in Taxation*, 24, pp. 83–124. https://doi.org/10.1108/S1058-749720170000024002
68. Huang, X. S. and Sun, L. (2017). Managerial ability and real earnings management. *Advances in Accounting*, 39, pp. 91-104. http://dx.doi.org/10.1016/j.adiac.2017.08.003
69. Hwang, L. S., Jung, T., Yang, S. and Yu, K. (2018). Does Managerial Ability Matter in Private Firms? Evidence from Korea. *Asia-Pacific Journal of Financial Studies*, 47(2), pp. 213-247. https://doi.org/10.1111/ajfs.12209
70. Jebran, K. and Chen, S. (2022). Corporate policies and outcomes during the COVID-19 crisis: Does managerial ability matter?. *Pacific-Basin Finance Journal*, 73, A. 101743. https://doi.org/10.1016%2Fj.pacfin.2022.101743
71. Kaplan, S. N., Klebanov, M. M. and Sorensen, M. (2012). Which CEO characteristics and abilities matter?. *The Journal of Finance*, 67(3), pp. 973-1007. http://dx.doi.org/10.1111/j.1540-6261.2012.01739.x
72. Khan, M. K., Naeem, K. and Xie, M. (2022). Does managerial ability transform organization from the inside out? evidence from sustainability performance of financially constrained firms in an emerging economy. *Borsa Istanbul Review*, 22(5), pp. 897-910. https://doi.org/10.1086/260866
73. Khoo, J. (2022). Managerial ability and debt maturity. *Journal of Contemporary Accounting & Economics*, 18(1), A. 100295. https://doi.org/10.1016/j.jcae.2021.100295
74. Khurana, I. K., Moser, W. J. and Raman, K. K. (2018). Tax avoidance, managerial ability, and investment efficiency. *Abacus*, 54(4), pp. 547-575. https://doi.org/10.1111/abac.12142
75. Kim, M. H. J. (2021). Effects of managerial overconfidence and ability on going-concern decisions and auditor turnover. *Advances in Accounting*, 54(C), pp. 1-1. https://doi.org/10.1016/j.adiac.2021.100549
76. Kim, R. (2022). Do more able managers provide better non-GAAP earnings?. *Accounting & Finance*, 63(2), pp. 1983-2012. https://doi.org/10.1111/acfi.12941
77. Kor, Y. Y. (2003). Experience-based top management team competence and sustained growth. *Organization Science*, 14(6), pp. 707-719. https://doi.org/10.1287/orsc.14.6.707.24867
78. Krishnan, G. V. and Wang, C. (2015). The relation between managerial ability and audit fees and going concern opinions. *Auditing: A Journal of Practice & Theory*, 34(3), pp. 139-160. https://doi.org/10.2308/ajpt-50985

79. Krishnan, G. V., Wang, C. and Yu, W. (2021). Do High Ability Managers Mitigate Litigation Related to Financial Reporting?. *Journal of Management Accounting Research*, 33(1), pp. 171-196. https://doi.org/10.2308/jmar-18-034
80. Kumar, S. and Zbib, L. (2022). Firm performance during the Covid-19 crisis: Does managerial ability matter?. *Finance Research Letters*, 47, A. 102720. https://doi.org/10.1016/j.frl.2022.102720
81. Lee, C. C., Wang, C. W., Chiu, W. C. and Tien, T. S. (2018). Managerial ability and corporate investment opportunity. *International Review of Financial Analysis*, 57, pp. 65-76. https://doi.org/10.1016/j.irfa.2018.02.007
82. Lee, S., Matsunaga, S. R. and Park, C. W. (2012). Management forecast accuracy and CEO turnover. *The Accounting Review*, 87(6), pp. 2095-2122. https://doi.org/10.2308/accr-50220
83. Leverty, J. T. and Grace, M. F. (2012). Dupes or incompetents? An examination of management's impact on firm distress. *Journal of Risk and Insurance*, 79(3), pp. 751-783. https://doi.org/10.1111/j.1539-6975.2011.01443.x
84. Li, Y. and Luo, Y. (2017). The contextual nature of the association between managerial ability and audit fees. *Review of Accounting and Finance*, 16(1), pp. 2-20. https://doi.org/10.1108/RAF-01-2016-0012
85. Lin, Z., Patel, P. and Oghazi, P. (2021). The value of managerial ability and general ability for inventor CEOs. *Journal of Business Research*, 135, pp. 78-98. https://doi.org/10.1016/j.jbusres.2021.06.014
86. Liu, J. and Lei, D. (2021). Managerial ability and stock price crash risk–the role of managerial overconfidence. *Review of Accounting and Finance*, 20(2), pp. 167-193. https://doi.org/10.1108/RAF-05-2020-0111
87. Luo, Y. and Zhou, L. (2017). Managerial ability, tone of earnings announcements, and market reaction. *Asian Review of Accounting*, 25(4), pp. 454-471. https://doi.org/10.1108/ARA-07-2016-0078
88. Magerakis, E. (2022). The importance of managerial discretion on managerial ability–firm cash holding nexus. *Management Decision*, 60(12), pp. 3275-3303. https://doi.org/10.1108/MD-07-2021-0991
89. El Mahdy, D. (2020). The unintended consequences of voluntary adoption of clawback provisions on managerial ability. *Accounting & Finance*, 60(4), pp. 3493-3526. https://doi.org/10.1111/acfi.12528
90. May, D. O. (1995). Do managerial motives influence firm risk reduction strategies?. *The Journal of Finance*, 50(4), pp. 1291-1308. https://doi.org/10.2307/2329353
91. Milbourn, T. T. (2003). CEO reputation and stock-based compensation. *Journal of Financial Economics*, 68(2), pp. 233-262. https://doi.org/10.1016/S0304-405X(03)00066-7
92. Mishra, C. S. (2019). Does managerial ability drive firm innovativeness?. *IEEE Transactions on Engineering Management*, 68(4), pp. 1139-1154. https://doi.org/10.1109/TEM.2019.2923892
93. Mishra, D. R. (2014). The dark side of CEO ability: CEO general managerial skills and cost of equity capital. *Journal of Corporate Finance*, 29, pp. 390-409. https://doi.org/10.1016/j.jcorpfin.2014.10.003
94. Mishra, C. S. (2022). Managerial ability and strategic orientation. *Review of Managerial Science*, 17(4), pp. 1333-1363. https://doi.org/10.1007/s11846-022-00561-5
95. Mitra, S., Jaggi, B. and Al-Hayale, T. (2019). Managerial overconfidence, ability, firm-governance and audit fees. *Review of Quantitative Finance and Accounting*, 52, pp. 841-870. https://doi.org/10.1007/s11156-018-0728-3

96. Murphy, K. J. and Zabojnik, J. (2007). Managerial capital and the market for CEOs. http://dx.doi.org/10.2139/ssrn.984376
97. Nadeem, M., Zaman, R., Suleman, T. and Atawnah, N. (2021). CEO ability, career concerns, firms' lifecycle and investments in intellectual capital. *International Review of Economics & Finance*, 75, pp. 237-251. https://doi.org/10.1016/j.iref.2021.04.023
98. Naheed, R., Jawad, M., Naz, M., Sarwar, B. and Naheed, R. (2021). Managerial ability and investment decisions: Evidence from Chinese market. *Managerial and Decision Economics*, 42(4), pp. 985-997. https://doi.org/10.1002/mde.3287
99. Oskouei, Z. H. and Sureshjani, Z. H. (2021). Studying the relationship between managerial ability and real earnings management in economic and financial crisis conditions. *International Journal of Finance & Economics*, 26(3), pp. 4574-4589. https://doi.org/10.1002/ijfe.2031
100. Park, J., Ko, C. Y., Jung, H. and Lee, Y. S. (2016). Managerial ability and tax avoidance: evidence from Korea. *Asia-Pacific Journal of Accounting & Economics*, 23(4), pp. 449-477. https://doi.org/10.1080/16081625.2015.1017590
101. Petkevich, A. and Prevost, A. (2018). Managerial ability, information quality, and the design and pricing of corporate debt. *Review of Quantitative Finance and Accounting*, 51(4), pp. 1033-1069. https://doi.org/10.1007/s11156-017-0696-z
102. Phan, D. H. B., Tran, V. T., Nguyen, D. T. and Le, A. (2020). The importance of managerial ability on crude oil price uncertainty-firm performance relationship. *Energy Economics*, 88, A. 104778. https://doi.org/10.1016/j.eneco.2020.104778
103. Putra, A. A., Mela, N. F. and Putra, F. (2021). Managerial ability and real earnings management in family firms. *Corporate Governance: The International Journal of Business in Society*, 21(7), pp. 1475-1494. https://doi.org/10.1108/CG-02-2021-0083
104. Rajgopal, S., Shevlin, T. and Zamora, V. (2006). CEOs' outside employment opportunities and the lack of relative performance evaluation in compensation contracts. *The Journal of Finance*, 61(4), pp. 1813-1844. https://doi.org/10.1111/j.1540-6261.2006.00890.x
105. Safiullah, M., Hassan, M. K. and Kabir, M. N. (2022). Corporate governance and liquidity creation nexus in Islamic banks—Is managerial ability a channel?. *Global Finance Journal*, 51, A. 100543. https://doi.org/10.1016/j.gfj.2020.100543
106. Salehi, M., Bazrafshan, A. and Hosseinkamal, M. (2021). The relationship between supervision quality, CEO's ability and authority with firm performance. *Journal of Facilities Management*, 19(2), pp. 150-173. https://doi.org/10.1108/JFM-08-2020-0056
107. Salehi, M., Daemi, A. and Akbari, F. (2020). The effect of managerial ability on product market competition and corporate investment decisions: Evidence from Iran. *Journal of Islamic Accounting and Business Research*, 11(1), pp. 49-69. https://doi.org/10.1108/JIABR-10-2016-0113
108. Salehi, M., Mousavi Shiri, M. and Hossini, S. Z. (20۱۹). The relationship between managerial ability, earnings management and internal control quality on audit fees in Iran. *International Journal of Productivity and Performance Management*, 69(4), pp. 685-703. https://doi.org/10.1108/IJPPM-07-2018-0261
109. Sarwar, B., Kutan, A., Ming, X. and Husnain, M. (20۱۹). How do talented managers view dividend policy? Further evidence from Chinese equity market. *International Journal of Emerging Markets*, 15(3), pp. 559-586. https://doi.org/10.1108/IJOEM-03-2019-0179
110. Schwab, C. M., Stomberg, B. and Williams, B. M. (2022). Effective tax planning. *The Accounting Review*, 97(1), pp. 413-437. https://doi.org/10.2308/TAR-2019-0020

111. Shang, C. (2021). Dare to play with fire? Managerial ability and the use of short-term debt. *Journal of Corporate Finance*, 70, A. 102065. https://doi.org/10.1016/j.jcorpfin.2021.102065
112. Shields, M. D. (1997). Research in management accounting by North Americans in the 1990s. *Journal of Management Accounting Research*, 9(1), pp. 3-62.
113. Spreitzer, G. M., McCall, M. W. and Mahoney, J. D. (1997). Early identification of international executive potential. *Journal of applied Psychology*, 82(1), pp. 6-18. https://psycnet.apa.org/doi/10.1037/0021-9010.82.1.6
114. Simamora, A. J. (2021). Firms performance, risk taking and managerial ability. *International Journal of Productivity and Performance Management*, 72(3), pp. 789-808. https://doi.org/10.1108/IJPPM-03-2021-0172
115. Sun, L. (2016). Managerial ability and goodwill impairment. *Advances in Accounting*, 32(4), pp. 42-51. https://doi.org/10.1016/j.adiac.2016.02.002
116. Sun, L. (2017). Managerial ability and chemical releases. *Sustainability Accounting, Management and Policy Journal*, 8(3), pp. 281-306. https://doi.org/10.1108/SAMPJ-09-2016-0062
117. Sunder, S., and Cyert, R. M. (1997). *Theory of Accounting and Control*. South-Western College Publishing. Michigan, United States
118. Truong, C., Garg, M., Adrian, C., Pham, A. V. and Shane, P. (2020). Political alignment and audit pricing. *International Journal of Auditing*, 24(2), pp. 205-231. https://doi.org/10.1111/ijau.12189
119. Ujah, N. U., Tarkom, A. and Okafor, C. E. (2021). Working capital management and managerial talent. *International Journal of Managerial Finance*, 17(3), pp. 455-477. https://doi.org/10.1108/IJMF-12-2019-0481
120. Uygur, O. (2018). CEO ability and corporate opacity. *Global Finance Journal*, 35, pp. 72-81. https://doi.org/10.1016/j.gfj.2017.05.002
121. Wang, W. K., Lu, W. M., Ting, I. W. K. and Kao, H. R. (2020). Asset-light strategy, managerial ability, and corporate performance of the Asian telecommunications industry. *Managerial and Decision Economics*, 41(8), pp. 1568-1579. https://doi.org/10.1002/mde.3203
122. Wang, Z., Chen, M. H., Chin, C. L. and Zheng, Q. (2017). Managerial ability, political connections, and fraudulent financial reporting in China. *Journal of Accounting and Public Policy*, 36(2), pp. 141-162. http://dx.doi.org/10.1016%2Fj.jaccpubpol.2017.02.004
123. Westfall, T. J. and Myring, M. (2022). Are voluntary internal control weakness disclosures in initial public offerings associated with managerial ability and subsequent financial reporting quality?. *Advances in Accounting*, 59(C), pp. 100617. https://doi.org/10.1016/j.adiac.2022.100617
124. Wu, X., Tong, X. and Wang, Y. (2022). Managerial ability and idiosyncratic volatility. *International Journal of Finance & Economics*, 27(2), pp. 2566-2581. https://doi.org/10.1002/ijfe.2287
125. Xu, X., Wang, F., Chen, X. and Yang, G. (2021). Does managerial ability matter for cross-border M&As: Evidence from Chinese listed firms. *Journal of Asian Economics*, 74(C), A. 101302. https://doi.org/10.1016/j.asieco.2021.101302
126. Yan, B., Arslan-Ayaydin, Ö., Thewissen, J. and Torsin, W. (2021). Does managerial ability affect disclosure? Evidence from earnings press releases. *Asian Review of Accounting*, 29(2), pp. 192-226. https://doi.org/10.1108/ARA-03-2020-0036
127. Yuan, Y., Tian, G., Lu, L. Y. and Yu, Y. (2019). CEO ability and corporate social responsibility. *Journal of Business Ethics*, 157(2), pp. 391-411. https://doi.org/10.1007/s10551-017-3622-3

128. Yung, K. and Chen, C. (2018). Managerial ability and firm risk-taking behavior. *Review of Quantitative Finance and Accounting*, 51(4), pp. 1005-1032. https://doi.org/10.1007/s11156-017-0695-0
129. Yung, K. and Nguyen, T. (2020). Managerial ability, product market competition, and firm behavior. *International Review of Economics & Finance*, 70(C), pp. 102-116. https://doi.org/10.1016/j.iref.2020.06.027

IJAAF; Vol. 7, No. 4, Autumn 2023, Serial 25

Iranian Journal of
Accounting, Auditing & Finance

Ferdowsi University of Mashhad

Quarterly

RESEARCH ARTICLE

The Relationship between Performance-based Budgeting Characteristics with the Integrated Reporting Approach in the Public Sector

Javad Pourghaffar, Heydar Mohammadzadeh Salteh *
Department of Accounting, Marand Branch, Islamic Azad University, Marand, Iran
Mehdi Zeynali
Department of Accounting, Tabriz Branch, Islamic Azad University, Tabriz, Iran
Sasan Mehrani
Department of Accounting, Faculty of Management, Tehran University, Tehran, Iran

How to cite this article:
Pourghaffar, J., Mohammadzadeh Salteh, H., Zeynali, M., & Mehrani, S. (2023). The Relationship between Performance-based Budgeting Characteristics with the Integrated Reporting Approach in the Public Sector. Iranian Journal of Accounting, Auditing and Finance, 7(4), 57-75. doi: 10.22067/ijaaf.2022.42760.1173
https://ijaaf.um.ac.ir/article_42760.html

ARTICLE INFO

Article History
Received: 2023-07-01
Accepted: 2023-08-26
Published online: 2023-04-30

Keywords:
Performance-based Budgeting, Integrated Reporting, Public Sector

Abstract

This research explains the relationship between performance-based budgeting characteristics and the integrated reporting approach in Iran's public sector. This research is applied research in terms of its purpose, quantitative research in terms of methodology, and descriptive and survey research in terms of data collection and analysis. The statistical population includes all experts related to planning and budgeting in the public sector and expert university professors. The determination sampling method is that 250 questionnaires were distributed among the community members and 64 questionnaires were analyzed due to the presence of complete information. Therefore, the data collection tool is a researcher-made questionnaire based on the model provided by Pourghaffar et al. (2021 and 2022) with a 5-point Likert scale. The current research includes 6 hypotheses. SPSS and PLS software and structural equation analysis were used to analyze the hypotheses. The results showed 6 indicators in the hypotheses: legal requirements with the approach of government administration in the style of the private sector, strategic planning system, accounting and auditing system of management performance, information technology infrastructure with the perspective of organizational architecture and integrated systems, attention Human capital and incentive policies, the process approach and process management are directly related to the establishment of performance-based budgeting with an integrated reporting approach in the public sector of Iran. In other words, the government can use these indicators to achieve performance-based budgeting goals.

https://doi.org/10.22067/ijaaf.2022.42760.1173

NUMBER OF REFERENCES
31

NUMBER OF FIGURES
4

NUMBER OF TABLES
5

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

*Corresponding Author:
Heydar Mohammadzadeh Salteh
Email: salteh2008@gmail.com
Tel: 09143160853
ORCID: 0000000253142542

1. Introduction

To propose a definition of performance-based budgeting, It is believed that such a budgeting method has as many definitions as the number of governments that applied it. Each government has its own approach, definition, and different methods for entering performance information into the budgeting process. Different views can be classified within a spectrum of the strictest concepts to the easiest ones, and different types can be placed between these two limits (Schick, 2007). Performance-based budgeting (PBB) has been developed in many countries within the frame of a new administrative mentality based on the performance of the public sector as of the 1980s, which included primary objectives such as increasing the quality of public services, reinforcing decision-making processes by getting more information about the activities of the state and ensuring accountability and fiscal transparency. With the objectives above, governments focused on the effective and productive use of public funding and, within this context, tended toward allocating resources in line with the results reached through goods and services produced rather than information regarding the input in budget processes. Although it does not have only one accepted model in the world, performance-based budgeting, which is defined as a type of budgeting that associates resources with measurable objectives in the widest sense, has found an area of implementation in many developed countries in various forms with its outcome (Erkutlu et al., 2017).

New Zealand and Australia at the end of the 1980s, Canada, Denmark, Finland, France, the Netherlands, Sweden, England and the United States of America in the 1990s and Austria, Germany and Switzerland at the beginning of the 2000s started various management methods based on performance-based budgeting. Among the reasons for turning to the performance-based budgeting system are public financial crises, ineffective use of public resources, increasing the amount and quality of public expenditures, rapid changes in information technology, and the new way of public administration (Bal, 2015).

With the development of democratic systems in the world, public services are performed in line with the needs of society. Accordingly, there has been an increase and variety in demands from administrators directed at public services. The increase in society's expectations for public services has led to an increase in public spending and tax load, which in turn made it imperative to ensure efficiency in the use of resources. Strategic planning-oriented PBB model: The model makes it imperative for public institutions to prepare strategic plans, which constitute the basis of preparing the budgets of public institutions.

Performance agreement-oriented PBB model: In this model, in which it is not imperative to prepare strategic planning in terms of public institutions, performance agreements have to be made with the institution's top executives to maximize the performance of employees.

Budget format PBB model: Unlike the other two models, no document is prepared to measure performance except the budget text in this model. Thus, the budget only has information about performance and allowance. In addition, there is no independent performance report.

Performance programs bring an output and result-oriented budgeting system to the forefront by making performance information available as well as fiscal information in the budget documents and thus bring fiscal transparency and accountability principles into force, which our new public financial administration system depends on (Erkutlu et al., 2017).

Budgeting is a key pillar of policy development and accountability in any country or region. Performance budgeting is the systematic use of information about the outputs and results; and/or impacts of public policies in order to inform, influence and/or determine the level of public funds allocated towards those policies in the budgetary context.

The experience illustrates that performance budgeting can serve a number of purposes:

Transparency: The OECD Recommendation on Budgetary Governance (2015) notes that the systematic use of performance information helps parliament and citizens "to understand not just what is being spent but also what is being bought on behalf of citizens – i.e. what public services are actually being delivered, to what standards of quality and with what levels of efficiency". Transparency is, in turn, an important underpinning of public trust and assurance regarding how public funds are used.

Accountability: Making explicit the performance objectives and targets helps the public, parliamentarians and senior managers to hold the public administration account for the proper use of public funds and for the achievement of goals.

Efficiency: Consistent, comparable indicators of outputs and impact in different areas, alongside the corresponding financial allocations, can facilitate an assessment of efficiency by reference to benchmarking unit costs and improvements over time.

Evidence-based policy-making: A clear linking of budgets with results and impacts, drawing on findings from different sectors and from comparable countries and regions, helps to lay the basis for an evidence-based approach to policy-making (Downes et al., 2017).

In this regard, budgeting is based on integrated reporting performance. Integrated Reporting (IR) is an innovation in accounting that advocates linking financial and non-financial information in a single report to provide a holistic view of how firms create value. The IR framework, issued at the end of 2013, explains IR, compared with more traditional reporting, as "a more cohesive and efficient approach to corporate reporting that draws on different reporting strands and communicates the full range of factors that materially affect the ability of an organization to create value over time", to enhance "accountability and stewardship for the broad base of capitals and promote understanding of their interdependencies" (Vesty et al., 2018).

In the present era, reforming the budgeting process and human and financial resources requires significant investment in information technology, particularly management information systems (Mcnab and Millis, 2003). According to Belfo and Trigo (2013), accounting information systems move towards business process-based accounting. Thus, performance-based budgeting, as an organization's strategic plan, converts measurable data into meaningful information about program outcomes (Melkers and Willoughby, 2001). Using integrated reporting in the public sector with a sustainable development approach improves the responsibility of public sector accountability to respondents (Biondi and Brasi, 2018). Iacuzzi et al. (2020) showed that moving towards integrated reporting and changes in Italian national universities requires integrating thinking and shared value creation in the public sector. Andrews (2004) considers the factors influencing the reform of public sector budgeting structure to performance-based budgeting to include the three elements of ability, acceptance, and authority. In its annual report, the Chartered Institute of Management Accountants (CIMA) has pointed to the tendency of governments to use an integrated reporting approach within the model presented in the internal and external environment. In the intra-organizational dimension, emphasis is placed on operational inputs, processes, strategies and plans, outcomes, and finally on performance management and value creation flow, along with six main capitals, including financial, operational (technical), intellectual, human, natural, social and communicative capital are considered. External factors such as politicians, legislators, stakeholders, and the economy are also considered (CIMA, 2014).

In Iran, governmental organizations can reach such plans based on an integrated reporting approach. Performance-based budgeting with an integrated reporting approach indicates the establishment of all required systems of executive devices in management in the private sector. Therefore, assessing the infrastructural barriers of the country to compete on the international stage

shows that the use of performance-based budgeting is a leading need, the prerequisite of which is integrated reporting. Integrated reporting displays an event in which the performance-based budgeting system can only be applicable in economic environments since the presence of information is the basis of budgeting, and the more accurate and updated the provided information, the more extensive the scope of strategy determination the government national and international competition. According to the issues raised, budgeting and reporting are necessary because information plays a major role in budgeting, and taking into account technological advances and the main need of the present century, which is the century of information, timely reporting using information technology tools, it can provide the grounds for accountability and transparency of the government and legislative institutions against the demands of society. Therefore, governmental organizations are highly recommended to implement this budgeting system (Sarraf, 2019).

2. Literature Review

Some of the national and international literature studies about performance-based budgeting practices and research and the key findings of these are explained below.

In Egeli et al.'s (2007), titled "Analysis of Critical Control Points of Strategic Planning Oriented Performance Based Budgeting System: The Applications of Turkey's Public Institutions," a general conclusion was reached that the system may not be effectively applied before the completion of all steps toward the performance-based budgeting within the framework of the results obtained from the critical control points and analysis of public institutions in Turkey.

According to Kim and Park's (2007) study titled "Performance budgeting in Korea," Korea is in the initial stages of implementing performance-based budgeting; it is, therefore, too early to form an assessment. However, it has been concluded that it should be noted that having introduced performance-based budgeting as one component within a broader range of comprehensive reforms has helped to lower resistance and resolve institutional problems.

Jordan and Hackbart's study (2005), titled "The goals and implementation success of State Performance-Based Budgeting," concluded that accountability can be seen as a goal rather than budget allocation, making a stronger foundation for determining performance-based budget success.

In Childir's study titled "An assessment of United Kingdom's Performance Based Budgeting System," since the application of the Public Service Agreement started in England in 1998, a lot of changes have occurred. Each expenditure analysis underwent some changes in terms of its structure. Ever since it began to be applied, the Public Services Agreement framework has guided the government in terms of increases in public expenditures. The Public Services Agreement places importance on focusing on the data that create a problem for those who make use of management inputs and public services, prioritizing public services that should specifically be conducted and providing more flexibility.

Celebi and Kovancilar (2012) stated that the advantages of a performance-based budget system in terms of public fiscal management were effective in being preferred by other countries. However, it was also stated that the system above included some theoretical and practical problems and difficulties within the system's structure.

Badem et al. (2013) concluded that if the performance-based budgeting system is fully applied in Turkey, an awareness of transparency and calling to account will be developed in the society; everyone will evaluate policies and strategic goals, and the performances and policies of top executives in both the government and the public institutions will become questionable. In addition, through PBB, institutions' expenditures will be questioned through performance auditing, and it will be possible to determine whether public resources are used economically and effectively. In Turkey, time, interest, care, raising awareness of questioning in public, and increasing the legal

sanctions are evaluated as needed for full implementation of PBB.

Demokaan (2015) aimed to ensure fiscal transparency and accountability through performance-based budgeting. Performance-based budgeting, indispensable in popularizing performance-based practices in public administration, is also closely related to many concepts. One of these concepts, strategic planning, contributes to the preparation process of performance-based budgeting through missions that reveal the institution's duties and functions with future visions. Performance programs and indicators reveal the adaptation capacity of an institution to specified strategies. Activity report announcements prepare the basis for a healthy comparison of past and future results.

Karacan and Yazici (2015) stated that the Law No. 5018 brought radical changes in the financial management and control system, the findings, evaluations, and suggestions related to the ownership, coordination, role of the parliament, capacity, calendar, reporting, and budget connections in Turkey undergone during the 10 years. They stated that the public management sector is a sector where the outputs and results are seen in the long term. They also added that the best practices are experienced for many years in planning and nearly 30 years in management and PBB. As a result, when the best practices and other applications in the world are considered, they concluded that we can be optimistic about the future of the PBB in Turkey.

Ciubotaru and Hincuy (2016) stated that the analysis of performance indicators shows the linkages between the policies, budgeting, and budgeting performance in compliance with European principles in this area.

Bogsnes (2016) believes that with the advancement of technology and the integration of other sciences, the evolution of the budgeting system seems vital. This requires applying a performance-based budgeting system with an integrated reporting approach. As a result, budgeting, one of the organization's management systems, is not the only way to allocate resources optimally. Still, in this system, employees, managers, stakeholders, the organizational environment, and various cultural, political and environmental factors play a role. They present a complex set to the decision-maker.

Mirzaei Nasirabad et al. (2021) showed that the cost of education and research services was calculated with a process approach. In addition to calculating the cost of school services, the cost of 384 processes was also calculated. The necessary suggestions on process management, cost reduction, and creating a performance-based budgeting system with an integrated reporting approach were also calculated.

Pourghaffar et al. (2022) by analyzing the data, 133 initial codes for timely performance-based budgeting were identified, 38 codes in the main categories of causal conditions, 35 codes in the context, 15 codes in the interventionist section, 4 central phenomenon codes, 21 codes in Strategies and 20 codes in consequences. Finally, based on the codes extracted from the interviews, a performance-based budgeting model with a real time reporting approach was presented using the grounded theory.

Pourghaffar et al. (2021) showed; In terms of environmental factors; Legal requirements, political acceptance and rules and regulations (transparency and accountability), reform of the structure and duties of the program and budget organization and attention to social and communication capital in terms of human factors; Motivational and managerial policies and organizational factors; Existence of a comprehensive database, infrastructure and information technology (such as organizational design and the existence of integrated systems with an integrated reporting approach) from the perspective of information technology, elimination of valueless activities, value- chain reform, optimal use of organizational resources from a process perspective and the establishment of strategic planning system, accounting and auditing system (management performance and from the point of view of performance planning and management, it is the main effective factors in establishing real time reporting performance-based budgeting.

Mirzaei Nasirabad et al. (2020) dealt with the documentation of 384 faculty processes with the BPMN2 approach using DPTSCO software. This applied research performed standard process timing using fuzzy logic and compared it with real-time and unused capacity calculation. Further, mechanizing standardized processes in the future provides the groundwork for implementing processes with an integrated approach.

Mehrani et al. (2018) reviewed the role of accountants in the performance-based budgeting system. The statistical tests on four indicators (including structure, rules and regulations, financial oversight and government management) showed that with the implementation of the new budgeting system, the necessary changes should be made in the role of the accountants of the executive organizations.

Daneshmand and Sanati (2016) presented new terms such as business process management, mobile devices, cloud computing, business intelligence, enterprise architecture, and organizational systems integration as the challenges of real-time reporting in accounting information systems.

In a comparative study of performance-based budgeting in Iran and Canada, Babajani and Osta (2015), due to the similar conditions of these two countries, consider the lack of relationship between strategic plans of organizations with performance-based budgeting, lack of a strong trustee to use this budgeting method, environmental and political factors, lack of strategy and systemic thinking and weakness in factors related to human resource systems as the main factors of non-use of performance-based budgeting.

Larry (2014) introduced business process management, cloud computing, mobile devices, business intelligence, and organizational systems integration as real-time reporting components.

Abbasi and Ahmadi (2012) examined the IT infrastructure for establishing performance-based budgeting. The results of their study indicated that the more IT infrastructure is developed, the easier the process of establishing performance-based budgeting will be.

Azar et al. (2010) pointed out that several factors are involved in successfully implementing performance-based budgeting, among which the scientific and technical capacity of employees and personnel to implement, information technology, supporting laws and regulations, and legislators' willingness to implement are more important.

Compared to previous studies, the main innovation in this research is using the structural equation method to explain 28 effective indicators of performance-based budgeting with an integrated reporting approach in Iran's public sector.

3. Research Methodology

This research is applied research in terms of its purpose, qualitative and quantitative research in terms of methodology, and descriptive and survey research in terms of data collection and analysis. The statistical population includes all experts related to planning and budgeting in the public sector and expert university professors. The determination sampling method is that 250 questionnaires were distributed among the community members and 64 questionnaires were analyzed due to the presence of complete information. Therefore, the data collection tool is a researcher-made questionnaire based on the model provided by Pourghaffar et al. (2021 and 2022) with a 5-point Likert scale. The current research includes 6 hypotheses. SPSS and PLS software and structural equation analysis were used to analyze the hypotheses.

It should be noted that the primary basis of this research is qualitative and the grounded theory method was used to collect data. The 28 variables extracted from the interviews conducted with

experts were the basis of the questionnaire design. In the second stage, after completing the questionnaires, using exploratory factor analysis, indicators affecting performance-based budgeting were identified with an integrated reporting approach. Finally, in this article, which is quantitative research, the structural equation test was used to explain the relationship between performance-based budgeting indicators and an integrated reporting approach in Iran's public sector. Therefore, 6 hypotheses were designed to test and explain the relationship between the observed and latent variables. Finally, this article used the structural equation method to explain the relationship between the indicators affecting performance-based budgeting and an integrated reporting approach. The 6 hypotheses have been designed according to the result of exploratory factor analysis with high weights of these factors. The 6 hypotheses selected for the test are based on the weights obtained from the exploratory factor analysis method. Therefore, it is necessary to formulate at least 6 hypotheses using the structural equations method to achieve the research objectives.

3.1 Hypotheses

1- Legal requirements with the approach of government administration in the private sector style are among the factors affecting integrated performance-based budgeting.

2- Paying attention to human capital and incentive policies are effective factors in performance-based budgeting on time.

3- Information technology infrastructures based on enterprise architecture and integrated systems are effective factors in integrated performance-based budgeting.

4- Process attitude and process management are effective factors in integrated performance-based budgeting.

5- A strategic planning system is one of the effective factors in integrated performance-based budgeting.

6- The accounting and auditing system of management performance is one of the factors affecting integrated performance-based budgeting.

4. Findings

To formulate the above hypotheses, the following concepts were identified according to the studies of Pourghafffar et al. (2021 and 2022) and formed the basis of the questionnaire questions.

Table 1. Performance-based budgeting factors with an integrated reporting approach

Sub-categories	Concepts	Sub-categories	Concepts	Sub-categories	Concepts	Sub-categories	Concepts
Enterprise Architecture	Preparing a customized integrated map for each device	Process-orientation	Re-engineering of processes	Auditing and accounting system	Lack of financial audit system	Performance-based budgeting with an integrated reporting approach	integrated and automated performance-based budgeting
	Implementing enterprise architecture		Designing processes fitting duties		Lack of performance auditing		integrated performance management
	Using an adaptive architecture project		Documentation of business processes		Strengthening the public sector accrual accounting system		Expenditure real time management
	Preparing enterprise architecture map		Standardization of processes		Modeling based on modern public sector management		Real time cost
	The architecture of strategic plans		Allocating resources to processes		Organizational culture		Creating a unified data bank
Corporate governance programs	Preparing organizational map		Changing hierarchical structure into a process-based structure		Observing the effects of optimal allocation on outputs		Establishing and strengthening IT-based auditing
	Eliminating valueless processes		Preparing modules appropriate to the processes		macro policies of the fifth plan		Generating real time information system
	Good governance		Using custom integrated modules for processes	Managers' policies and attitudes	Annual and long-term planning		Using cloud computing space
	Changing the performance-based budgeting process by the PBO		Using activity-based costing		Managers' belief in changing the current situation		Using mobile applications
	Increasing the accuracy of revenue identification and collection		Modifying value chain		Reforming accounting system	business intelligence	Automated and real time registrations
Organizational and group structure	Flexible management		Software problems in executive organs		Using real time systems		Moving towards the smart treasury
	The need for teamwork and multi-skilled people		Creating infrastructures and tools		Failure of the traditional bargaining system		Using business intelligence

	Using the participation of different specialities	Infrastructure and information technology and technical and communication problems	Modernizing reporting and budgeting		Systemic and strategic thought	Creating enterprise integration systems
	Lack of support from program and budget experts		Modernizing tax systems		Considering available means	Creating a comprehensive treasury system
	Lack of attention to training human resources		Centralized transparency system of other government revenues		Realistic attitude toward the establishment	Using integrated systems
	Employing unmotivated people in the budget sections of the organs		Lack of intelligent systems for identifying government assets		Failure to set up a costing system	Preparing real time system maps
Human resources	Failure to use expert human resources		Lack of interaction between the man and subcategories		Insufficient recognition of the cost by the trustees	Creating customized systems
	Lack of commitment and belief of employees in planning		Imposition of budget and development laws on performance budgeting		Formal attention to the costing system	Increasing the speed of organizations' response to environmental changes
	The weak monitoring role of program and budget		The emphasis of the Organization for Economic Cooperation and Development	Cost calculating	Lack of accounting relationship with the final cost	Transparency of the activities of organizations and reduction of corruption
	Lack of objectivity in operational supervision		Changing the approach of regulatory bodies to performance auditing		Lack of cost reliability	Dissemination of free flow of information
Monitoring	The superiority of financial auditing and compliance over performance auditing	requirements	Strict implementation of upstream laws and monitoring their implementation			Paying attention to the micro and macro levels of the organization

The researchers designed a questionnaire according to the studies of Pourghafffar et al. (2021 and 2022) with 28 items to identify the key factors and provided them to the research population

according to the mentioned factors. The views of four respondents, who were experts, and the views of supervisors and consultants were used to evaluate the validity of the research questions. In the present study, Cronbach's alpha was calculated to determine the reliability of the questionnaire, and its value (0.859) was obtained. The closer the Cronbach's alpha index is to one, the greater the internal correlation between the questionnaires and, as a result, the more homogeneous the questions.

After the descriptive analysis of the data, the inferential analysis was conducted. In inferential analysis, research hypotheses are evaluated and tested.

4.1 Confirmatory factor analysis of research variables

Before performing any analysis on the collected data and statistical inference, the reliability and validity of the measurement tool must first be ensured. Cronbach's alpha test measured the reliability of the questionnaire. The test results showed that the questionnaire was reliable and accurate. There are various methods to assess the validity; the confirmatory factor analysis test has been used in this study. In performing factor analysis, it must be ensured that the available data can be contracted for analysis. In other words, is the number of data required for factor analysis appropriate? For this purpose, the KMO index and Bartlett test were used.

Table 2. KMO and Bartlett test for questionnaire questions

KMO test		0.670
Bartlett's test	$\chi 2$	760.855
	Degree of freedom	378
	Sig	0.000

Based on these two tests, the data are suitable for factor analysis when the KMO index is more than (0.6) and close to one, and the sig Bartlett test is less than (0.05). The output of these tests is presented in the following tables.

According to Table 2, the value of the KMO index is 0.670 (more than 0.6), so the number of samples (number of respondents) is sufficient for factor analysis. Further, the sig value of the Bartlett test is less than 0.05, which indicates that factor analysis is appropriate to identify the structure of the factor model and the assumption that the correlation matrix is known is rejected.

In exploratory factor analysis, the principal component method is used to extract the factors, and the Varimax method is used to rotate the factors by Kaiser normalization. Their commonalities extraction is the criteria for deciding whether to survive or exclude questionnaire questions from factor analysis. Thus, if the value of the extracted share of each question is less than (0.5), we exclude that question from factor analysis. Further, the criterion for deciding on the classification of

questions is the specific values higher than (1) and the factor scores higher than (0.4). The results of the exploratory analysis test are shown in Tables (2) and (3). In order to show in which factor each questionnaire question is located, the most common factor of that question is specified with a different color in the exploratory factor analysis tables.

4.2 Exploratory factor analysis of the questionnaire

Table 3. Matrix of rotated factors with principal component analysis method and varimax rotation method with Questionnaire Kaiser normalization

Questions	1st factor	2nd factor	3rd factor	4th factor	5th factor	6th factor	Commonalities extraction
1	0.425	0.202	0.458	0.074	0.162	0.026	0.463
2	0.654	0.081	0.029	0.161	-0.075	0.126	0.482
3	0.461	-0.300	0.399	0.317	-0.011	0.131	0.580
4	0.516	0.098	0.466	-0.005	0.240	-0.170	0.579
5	0.189	-0.050	0.115	0.197	0.788	0.074	0.717
6	0.026	0.056	0.411	0.147	0.164	0.601	0.583
7	0.346	0.341	0.081	0.192	0.273	0.410	0.523
8	0.258	0.582	0.133	0.112	0.341	0.125	0.568
9	-0.094	0.411	0.018	-0.054	0.769	0.143	0.793
10	0.585	0.337	0.116	-0.040	0.130	-0.242	0.546
11	0.247	0.127	0.065	0.649	0.156	0.195	0.566
12	0.089	0.303	0.101	0.774	-0.128	0.067	0.730
13	0.026	0.342	0.233	0.715	0.236	-0.071	0.745
14	0.372	0.355	0.206	0.165	0.221	-0.200	0.423
15	0.035	-0.119	0.710	0.305	0.202	0.054	0.657
16	0.173	0.366	0.530	0.223	0.115	-0.168	0.536
17	0.236	0.798	0.012	0.189	0.013	0.061	0.731
18	0.505	0.397	0.075	0.176	0.053	0.208	0.495
19	0.244	0.062	0.065	0.027	0.089	0.784	0.691
20	0.561	-0.056	0.118	0.222	0.307	0.203	0.517
21	0.654	0.238	0.145	0.034	-0.123	0.352	0.645
22	0.703	0.273	0.099	0.102	0.196	0.029	0.628
23	0.680	0.138	0.051	-0.068	-0.127	0.453	0.710
24	0.107	0.250	0.729	-0.059	-0.193	0.181	0.679
25	0.110	0.525	-0.061	0.453	0.226	-0.067	0.553
26	0.111	0.058	0.774	-0.002	0.039	0.229	0.668
27	0.034	0.591	0.377	0.327	-0.096	0.054	0.612
28	0.264	0.574	0.123	0.172	0.029	0.178	0.477

According to Table 3, the extracted subscriptions for all questions are more than (0.5), and no questionnaire question should be left out. According to the table, six factors with a specific value higher than one have been extracted, and all questions related to this variable are included in these six factors. Further, concerning the factor loads of the questions, each question has the most factor in the predetermined factor. Thus, each question measures exactly the factor it was designed for, so the questions have the necessary validity.

4.3 Measurement pattern

The diagrams in the following section show the model of the dimensions of factor analysis in a standard and meaningful way.

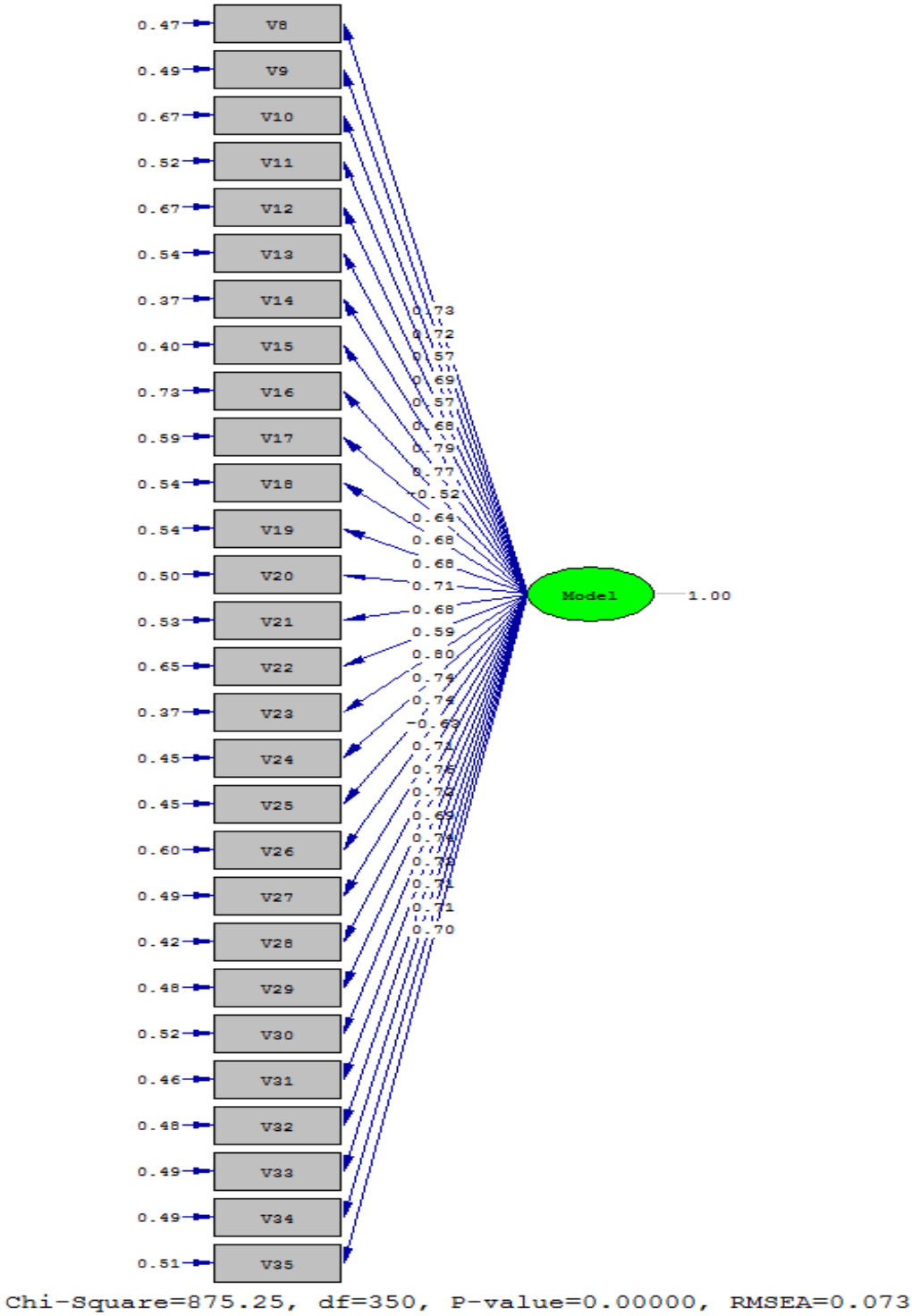

Figure 1. Model for measuring the dimensions of factor analysis using factor analysis in standard mode

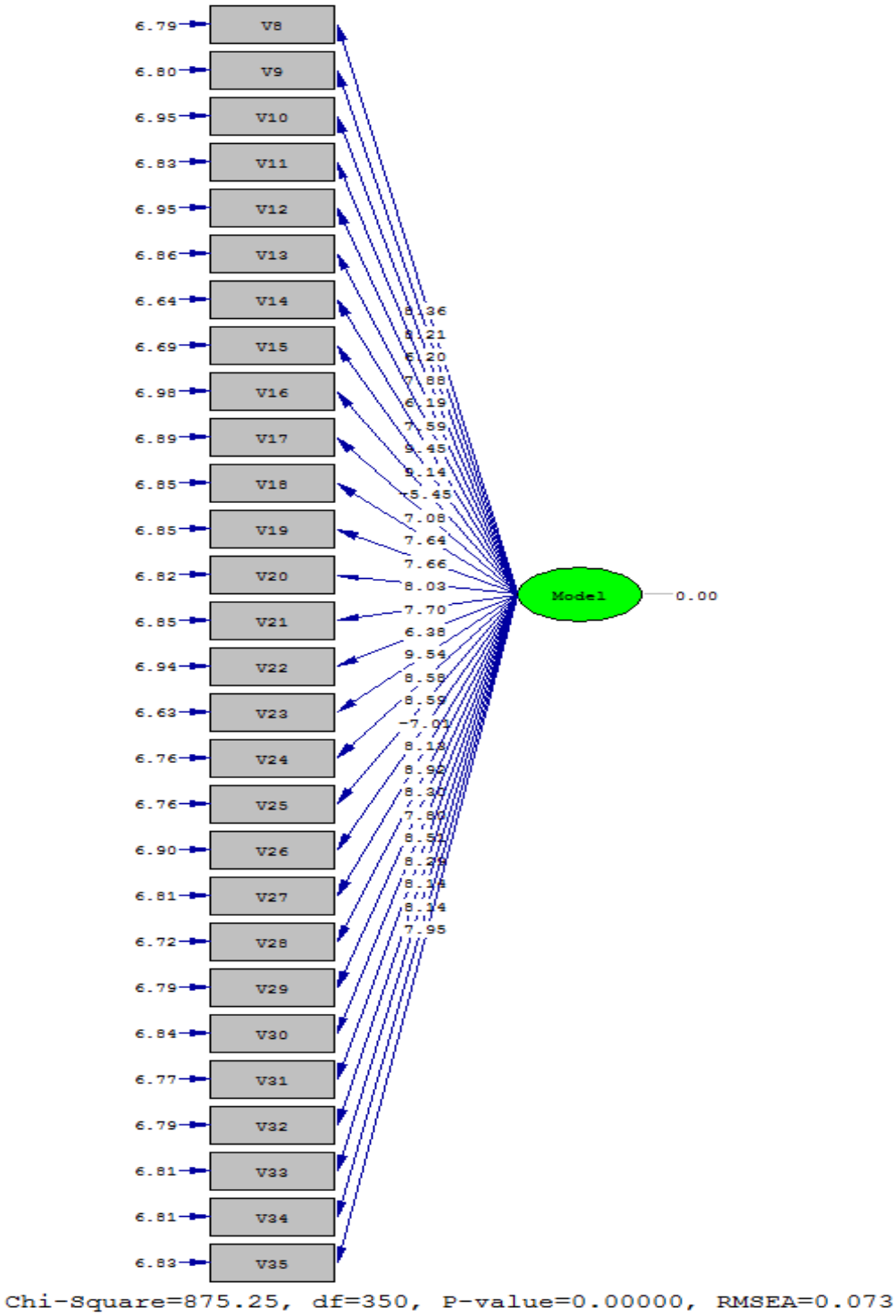

Figure 2. Model for measuring the dimensions of factor analysis using factor analysis in a significance mode

4.4 Hypothesis testing using structured linear equations

After determining the measurement models to evaluate the research model, the research hypotheses were tested using the structural equation model. The test results of the hypotheses are reflected in the graph.

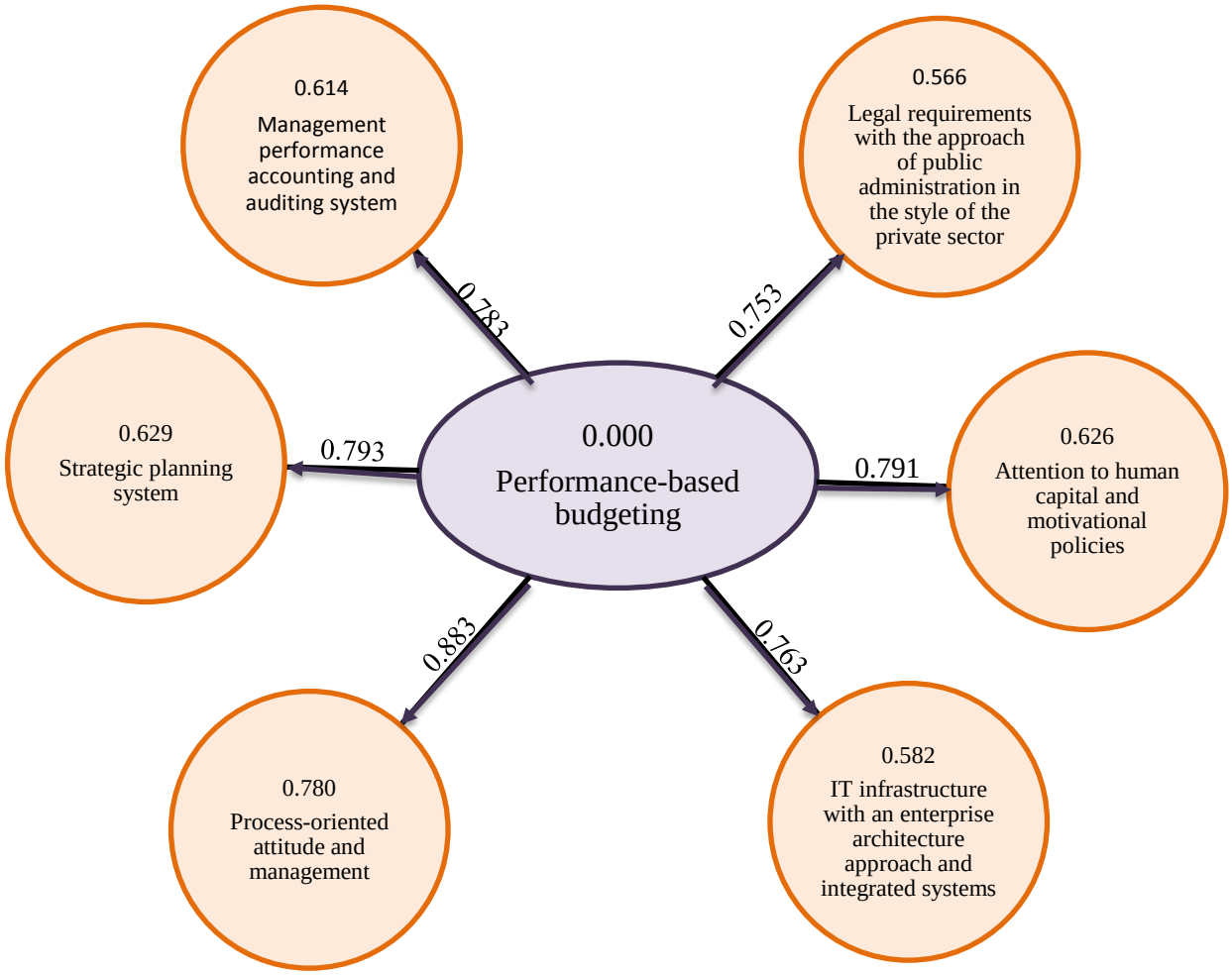

Figure 3. Measurement of the general model and the results of the hypotheses in the standard mode

4.5 Hypotheses reliability, validity and fitting

Cronbach's alpha and combined reliability were used to measure reliability, convergent validity was used to measure validity, and the GOF index was used to measure model fit:

Table 4. Cronbach's alpha coefficients

	AVE	Composite Reliability	Cronbach Alpha	GOF
Legal requirements with the approach of public administration in the style of the private sector	0.557	0.806	0.799	
Strategic planning system	0.544	0.822	0.706	
Performance-based budgeting	0.593	0.918	0.908	
Attention to human capital and motivational policies	0.553	0.799	0.784	0.490
Management performance accounting and auditing system	0.578	0.781	0.721	
IT infrastructure with an enterprise architecture approach and integrated systems	0.578	0.818	0.719	
Process-oriented attitude and management	0.514	0.773	0.730	

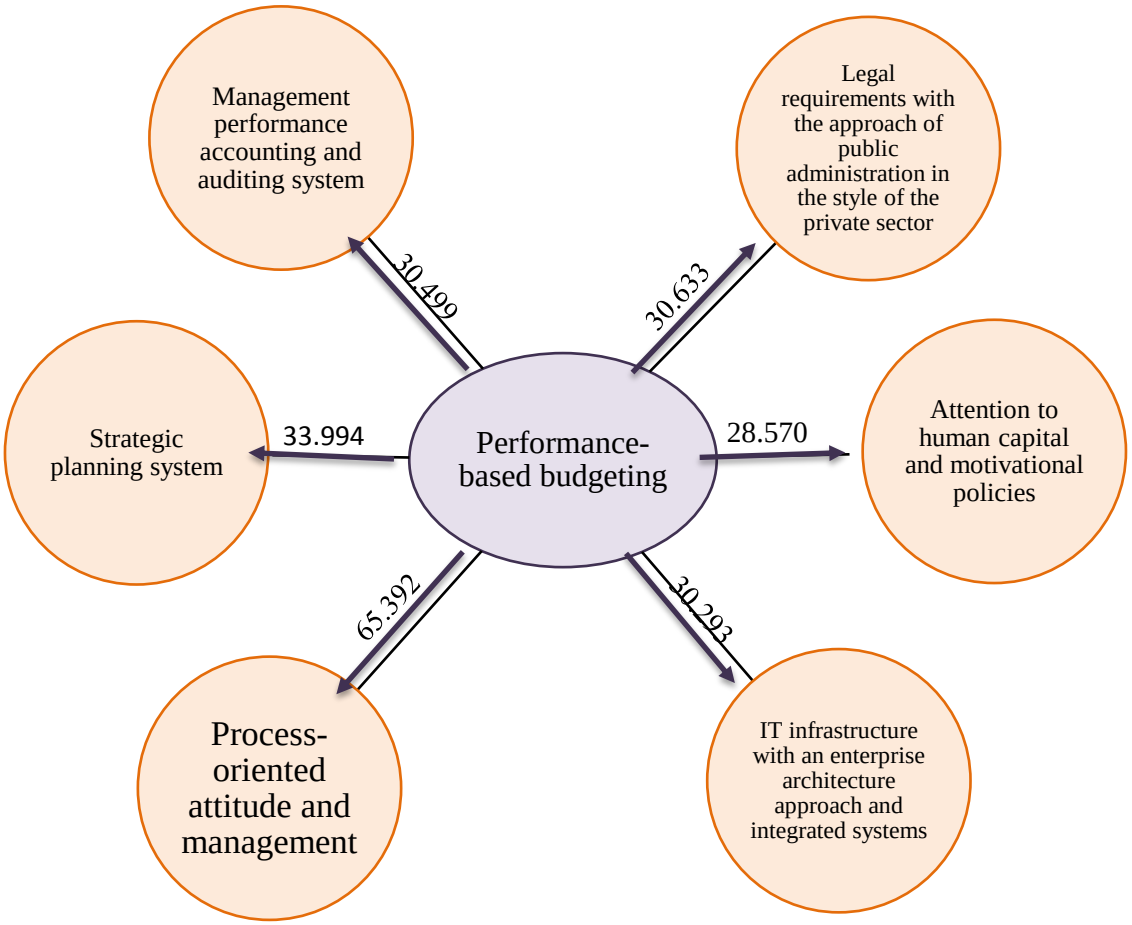

Figure 4. Measurement of the general model and the results of the hypotheses in a significance mode

- A Cronbach's alpha value above 0.7 indicates acceptable reliability.
- If the CR value for each structure is above 0.7, it indicates the appropriate internal stability for the measurement model.
- A value of AVE above 0.5 indicates acceptable convergent validity.
- Considering the three values of 0.01, 0.25 and 0.36 as weak, medium and strong for GOF, the result of 0.49 indicates a strong fit of the model.

The following table summarizes the significance coefficient and the results of the hypotheses.

Table 5. Results of hypotheses

Hypothesis	Result
1- Legal requirements with the approach of government administration in the private sector style are among the factors affecting integrated performance-based budgeting.	Confirmed
2- Paying attention to human capital and incentive policies are effective factors in performance-based budgeting on time.	Confirmed
3- Information technology infrastructures based on enterprise architecture and integrated systems are effective factors in integrated performance-based budgeting.	Confirmed
4- Process attitude and process management are effective factors in integrated performance-based budgeting.	Confirmed
5- A strategic planning system is one of the effective factors in integrated performance-based budgeting.	Confirmed
6- The accounting and auditing system of management performance is one of the factors affecting integrated performance-based budgeting.	Confirmed

1. Hypothesis No. 1 of the study claimed that legal requirements with the approach of public administration in the style of the private sector are one of the factors affecting integrated performance-based budgeting. Statistical analysis shows that according to Table 5, the significance of the path between the two variables is greater than 1.96, so this hypothesis is confirmed. On the other hand, because the significant number obtained is positive, this effect is direct.

2. Hypothesis 2 of the study claimed that attention to human capital and incentive policies affect integrated performance-based budgeting. According to Table 5, the statistical analysis shows a significant path between the two variables is greater than 1.96. Hence this hypothesis is confirmed. On the other hand, because the significant number obtained is positive, this effect is direct.

3. Hypothesis No. 3 of the study claimed that information technology infrastructure with an enterprise architecture approach and integrated systems is one of the factors affecting integrated performance-based budgeting. The statistical analysis, Table 5, shows that the significant number of paths between the two variables is greater than 1.96, confirming this hypothesis. On the other hand, because the significant number obtained is positive, this effect is direct.

4. Hypothesis No. 4 of the study claimed that process attitude and process management affect integrated performance-based budgeting. The statistical analysis shows that according to Table 5, a significant number of paths between the two variables is greater than 1.96; hence this hypothesis is confirmed. On the other hand, because the significant number obtained is positive, this effect is direct.

5. In Hypothesis No. 5 of the study, it was claimed that the strategic planning system is one of the factors affecting integrated performance-based budgeting. The statistical analysis shows that according to Table 5, a significant number of paths between the two variables is greater than 1.96; hence this hypothesis is confirmed. On the other hand, because the significant number obtained is positive, this effect is direct.

6. Hypothesis No. 6 of the study claimed that the accounting and auditing system of management performance is one of the factors affecting integrated performance-based budgeting. The statistical analysis shows that according to Table 5, a significant number of paths between the two variables is greater than 1.96; hence this hypothesis is confirmed. On the other hand, because the significant number obtained is positive, this effect is direct.

5. Conclusion

A performance-based budgeting system as a subsystem of management system for results seeks to prioritize government expenditures optimally and improve the effectiveness and efficiency of budgetary resources by strengthening the link between executive organizations' credits and performance. According to the International Monetary Fund, performance-based budgeting refers to the methods and mechanisms that strengthen the link between credit allocated to executive organizations and their outputs and outcomes through performance information in resource allocation. In other words, the performance-based budgeting system uses financial performance information (cost of activities and services) and non-financial performance information (performance indicators of programs and activities) to link budget and results. The results of this research are consistent with the findings of Belfo and Trigo (2013), Daneshmand and Sanati (2016), and Larry (2014). A strategic management system and attention to managing organizational processes and mechanizing them with the organizational architecture approach are effective factors in timely performance budgeting, leading to a reliable platform for establishing performance-based budgeting. In this paper, using the grounded theory, 28 dertminents of performance based-budgeting on the integrated reporting have been extracted as a qualitative. Then the structural equation modeling method was applied to estimate the relationship between 28 observed and latent

variables (performance-based Budgeting on the Integrated Reporting Approach) as a quantitative.

Paying attention to human capital and incentive policies is another important factor in establishing performance-based budgeting by monitoring resources and expenditures and guiding them to achieve efficiency and effectiveness. According to studies and expert opinions, comprehensive databases should be designed and used to prepare performance-based budgets so that resources and expenditures can be controlled and thus monitored; one of the integrated financial systems relies on preparing organizational plans and organizational architecture. The following important factor that should be considered with comprehensive information systems is the attention to information technology infrastructure, which is the role of cloud computing. Further, the development of IT-based tools such as business intelligence and mobile devices should be considered to establish performance-based budgeting. In this regard, value-added activities and value chain modification should be identified if necessary. Legal requirements with the approach of public administration in the style of the private sector are one of the effective factors that have emphasized the country's laws as follows in the field of establishing performance-based budgeting with an integrated reporting approach:

- the circular of electronic government and emphasis on enterprise architecture
- General policies of the administrative system announced by the Supreme Leader and emphasis on streamlining and smartening processes
- Paragraph C of Article 7 of the Law on the Sixth Five-Year Development Plan
- Executive instructions for performance-based budgeting attached to the annual budget directives
- Executive regulations for the realization of e-government approved by the Supreme Administrative Council
- Regulations of Article 16 of the Civil Service Law and paragraph C of Note 19 of 2021/1400 Budget Circular

Laws should also be codified in order to value social capital, including the important role of human beings in the budget process and communication conditions, which requires the motivational policies of managers instead of punitive policies, and managers should provide the necessary conditions to encourage subordinates. However, it is noteworthy to pay attention to the accounting and auditing system in the current situation of Iran, which is one of the factors affecting government management in the style of the private sector and the establishment of performance-based budgeting, implementation and establishment of accrual accounting and performance-based auditing. Accrual accounting is the basis for determining the cost of activities in the public sector. Moreover, the performance-based auditing system provides the ground for better establishing a performance-based budgeting system, emphasizing outcomes and outputs instead of inputs.

References

1. Abbasi, E. and Ahmadi, M.S. (2012). Information Technology Infrastructure for Establishing Performance-Based Budgeting, *5th International Conference on Performance-Based Budgeting. Iran Center for Management and Productivity Studies*, Tarbiat Modares University, Tehran, Iran. pp. 204-212 (In Persian).
2. Andrews, M. (2004). Authority, acceptance, ability and performance-based budgeting reforms. *International Journal of Public Sector Management*, 17(4), pp. 332-344. https://doi.org/10.1108/09513550410539811
3. Azar, A., Zahedi, S.S. and Amirkhani, T. (2010). A Model for Implementing Performance-based Budget: A System Dynamics Approach. *Iranian Journal of Management Sciences*,

5(18), pp. 29-54 (In Persian).
4. Babajani, J. and Osta, S. (2015). A comparative study of performance-based budgeting in Iran and developed countries (A case study of: Canada*). Governmental Accounting*, 2(1), pp. 7-16. https://dorl.net/dor/20.1001.1.24234613.1394.2.1.1.3
5. Badem, A. C., Kilinc, Y. and Kavas, T. (2013). Performance-Based budgeting process in Turkey: Kocaeli University case. *Kocaeli University, Social Science Journal*, 26, pp. 77-104. http://dx.doi.org/10.18854/gjhss.v3i3.1568
6. Bal, T. (2015). Applicability of alternative models in Turkey within the framework of performance based budgeting (PBB) system. *Sayıştay Journal*, 96, pp. 25-54.
7. Belfo, F. and Trigo, A. (2013). Accounting information systems: Tradition and future directions. *Procedia Technology*, 9, pp. 536-546. https://doi.org/10.1016/j.protcy.2013.12.060
8. Biondi, L. and Bracci, E. (2018). Sustainability, popular and integrated reporting in the public sector: A fad and fashion perspective. *Sustainability*, 10(9), A. 3112. https://doi.org/10.3390/su10093112
9. Bogsnes, B. (2016). Implementing Beyond Budgeting: Unlocking the Performance Potential. New Jersey*: John Wiley & Sons*. Hoboken, New Jersey, United States
10. Celebi, A.K. and Kovancilar, B. (2012). Theoretical and practical problems of performance-based budgeting system. *Management and Economics*, 19(1), pp. 1-18.
11. Ciubotaru, M. and Hincu, V. (2016). Implementing Performance-Based Budgeting in Republic of Moldova. *International Conference "Risk in Contemporary Economy",* Galati, Romania, pp. 267-272.
12. Daneshmand, M. and Sanati, A. (2016). Accounting Information Systems: The Challenge of Real Time Reporting. *Applied Studies in Management and Development Sciences*, 1(1), pp. 23-33. (In Persian)
13. Demokaan D. (2015). The financial aspect of performance: Performance based budget. *Ataturk University Journal of Social Sciences Institute*, 19(1), pp. 265-282.
14. Downes, R., Moretti, D. and Nicol, S. (2017). Budgeting and performance in the European Union: A review by the OECD in the context of EU budget focused on results. *OECD Journal on Budgeting*, 17(1), pp. 1-60.
15. Egeli, H., Akdeniz, A., Aksarayli, M., Tugen, K. and Ozen, A. (2007). Analysis of critical control points of strategic planning oriented performance based budgeting system: The applications of Turkey's public institutions. *Journal of Dokuz Eylul University Faculty of Economics and Administrative Sciences*, 22 (1), pp. 27-47.
16. Erkutlu, H. V., Tanc, S. G. and Koçyiğit, S. Ç. (2017). The factors used to create performance-based budgeting: A research on Turkey. *Accounting and Corporate Reporting, Today and Tomorrow*, pp. 297-314. http://dx.doi.org/10.5772/intechopen.68920
17. Iacuzzi, S., Garlatti, A., Fedele, P. and Lombrano, A. (2020). Integrated reporting and change: evidence from public universities. *Journal of Public Budgeting, Accounting & Financial Management*, 32(2), pp. 291-310. https://doi.org/10.1108/JPBAFM-08-2019-0120
18. Jordan, M. M. and Hackbart, M. (2005). The goals and implementation success of state performance-based budgeting. *Journal of Public Budgeting, Accounting & Financial Management*, 17(4), pp. 471-487. https://doi.org/10.1108/JPBAFM-17-04-2005-B003
19. Karacan, E. and Yazici, K. (2015). Performance-Based Budget Arrangements, the Implementation Process and Advancements in Turkey. *International Journal of Business and Social Science*, 6(4), pp. 62-79.
20. Kim, J.M. and Park, N. (2007). Performance budgeting in Korea. *OECD Journal on Budgeting*, 7(4), pp. 1-11.

21. Larry, M. (2014). A look at electronic financial reporting: Real Time Reporting. *Hesabres Journal*, (93), pp. 44-51 (In Persian).
22. McNab, R. M. and Melese, F. (2003). Implementing the GPRA: Examining the prospects for performance budgeting in the federal government. *Public budgeting & finance*, 23(2), pp. 73-95. https://doi.org/10.1111/1540-5850.2302006
23. Mehrani, S., Akrami, S. R. A., Khoda Bakhshi, H. and Jabbari, M. (2019). A Review on the Role of Executives Accountants in Performance Based Budgeting. *Journal of Governmental Accounting*, 5(1), pp. 9-20. (In Persian). https://doi.org/10.30473/gaa.2019.36822.1160
24. Melkers, J. E. and Willoughby, K. G. (2001). Budgeters' views of state performance-budgeting systems: Distinctions across branches. *Public Administration Review*, 61(1), pp. 54-64. https://doi.org/10.1111/0033-3352.00005
25. Mirzaei Nasirabad, J., Mahboub Ahari, A., Zeynali, M. and Bagheri Shadbad, M. T. (2021). Development of the Beyond Activity Based Costing System in Faculty of Management and Medical Informatics of Tabriz: A New Approach for Costing in Higher Education. *Payavard Salamat*, 15(1), pp. 14-25. (In Persian). http://dorl.net/dor/20.1001.1.17358132.1400.15.1.7.7
26. Mirzaei Nasirabad, j., Mahboub Ahari, A.R., Zeynali, M. and Baradaran Hasanzadeh, R. (2020). Improving educational, research and support processes based on Business Processs Modeling Notation and timing under uncertainty: An Action Research Study at Tabriz University of Medical Sciences. *Hakim Health Systems Research Journal*, 23(3), pp. 367-378.
27. Pourghaffar, J., Mohammadzadeh Salteh, H., Zeinali, M. and Mehrani, S. (2022). Performance-Based Budgeting Model with a Real Time Financial Reporting Approach in Iran Public Sector. *Governmental Accounting*, 8(2), pp. 21-36. https://doi.org/10.30473/gaa.2022.61861.1528
28. Pourghaffar, J., Mohammadzadeh Salteh, H., Zeynali, M. and Mehrani, S. (2021). The Investigation of Main Determinants of Real Time Performance based Budgeting in Iran. *Quarterly Journal of Fiscal and Economic Policies*, 9(35), pp. 169-198. http://dx.doi.org/10.52547/qjfep.9.35.169
29. Sarraf, A. (2019). *Step-by-step performance-based budgeting*, Tehran: Public Management Education Center. Tehran, Iran. (In Persian)
30. Schick, A. (2007). Performance budgeting and accrual budgeting: Decision rules or analytic tools?. *OECD Journal on Budgeting*, 7(2), pp. 109-138. https://doi.org/10.1787/16812336
31. Vesty, G. M., Ren, C. and Ji, S. (2018). Integrated reporting as a test of worth: A conversation with the chairman of an integrated reporting pilot organization. *Accounting, Auditing & Accountability Journal*, 31(5), pp. 1406-1434. https://doi.org/10.1108/AAAJ-08-2016-2684

IJAAF; Vol. 7, No. 4, Autumn 2023, Serial 25

Ferdowsi University of Mashhad

Iranian Journal of
Accounting, Auditing & Finance

Quarterly

RESEARCH ARTICLE

Material Sustainability and Investment Efficiency

Mina Zarrinpour

Department of Accounting, Urmia Branch of Alzahra University, Urmia, Iran

Gholamreza Mansourfar*

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

Samira Joudi

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

How to cite this article:
Zarinpour, M., Mansourfar, G., & Joudi, S. (2023). Material Sustainability and Investment Efficiency. Iranian Journal of Accounting, Auditing and Finance, 7(4), 77-91. doi: 10.22067/ijaaf.2023.43842.1322
https://ijaaf.um.ac.ir/article_43842.html

ARTICLE INFO

Article History
Received: 2023-04-25
Accepted: 2023-06-22
Published online: 2023-10-15

Keywords:
Material Sustainability,
Investment Efficiency,
Accounting Conservatism.

Abstract

This study aims to investigate the effect of material sustainability investment on investment efficiency and to analyze how material sustainability moderates the relationship between accounting conservatism and investment efficiency. We examine the behavior of 104 listed firms in the TSE in four industries under the Extractives and Minerals Processing sector over six years from 2016 to 2021. Material Sustainability activities have been specified according to SASB standards and firms are scored according to disclosure of investing in these activities. The conservatism level has been measured using the accrual-based measure and the Q-Tobin measure is employed as a proxy for investment efficiency. The research findings indicate that firms investing more in material sustainability issues have higher efficiency. Furthermore, while the moderating role of material sustainability performance on the relationship between accounting conservatism and investment efficiency was not confirmed for the entire period study, the material sustainability investment intensified the relationship between conservatism and investment efficiency before the outbreak of COVID-19 (2016-2019).

https://doi.org/10.22067/ijaaf.2023.43842.1322

NUMBER OF REFERENCES
۵۴

NUMBER OF FIGURES
-

NUMBER OF TABLES
3

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

*Corresponding Author:
Gholamreza Mansourfar
Email: g.mansourfar@urmia.ac.ir
Tel: 09144482101
ORCID: 0000-0002-3076-0241

1. Introduction

Corporate sustainability has become an increasingly important concept in today's global landscape, driven by economic growth, environmental concerns, and social justice (Christofi et al., 2012). The concept originated from the Brundtland Commission's report on sustainable development in 1987 (Groenewald and Powell, 2016). It aimed to create long-term shareholder value while balancing short-term financial performance with long-term value (Amran and Keat Ooi, 2014). While the shareholders' theory suggests that pursuing short-term profit goals may come at the expense of long-term value, recent trends suggest that companies are increasingly looking beyond this narrow view.

According to Graham et al. (2005), 78% of managers with myopic behavior may be willing to sacrifice long-term value for short-term profits. However, many companies have moved away from Friedman's (1970) view that the sole responsibility of business is to increase profits (Poursoleyman et al., 2022). Freeman (1984) argues that, in addition to shareholders, stakeholders have a significant impact on an organization's long-term strategic goals. As a result, companies must consider the expectations of their stakeholders when implementing programs and strive to meet these expectations. These programs, known as sustainability activities, help companies establish a strong bond with their socially responsible stakeholders, leading to better financial performance and business success (Poursoleyman et al., 2023). Effective investment in sustainability can ultimately lead to better financial performance as companies build stronger relationships with their stakeholders.

Sustainable activities are crucial for firms to ensure economic growth and development while maintaining the interests of society (Porter and Van der Linde, 1991). Companies should work towards realizing social ideals and the well-being of the people in their community to contribute to their betterment (Arabsalehi et al., 2013). By doing so, organizations can strengthen their business and create employment opportunities while cooperating with their community.

In response to the growing awareness of the environmental impact of their operations, companies are increasingly reporting on their sustainable investment activities (Benlemlih and Bitar, 2018). The average reporting rate of sustainability information increased from 47% in 2011 to 72% in 2017, reflecting the growing demand for stakeholder sustainability data (Grewal et al., 2021). Pressure from beneficiary groups, tightening government regulations, and increasing demand from investors for ESG data are reasons companies should pay attention to sustainability reporting.

The demand for sustainability data in investment management has significantly increased over the past decade. Investors now evaluate financial criteria and non-financial factors related to corporate sustainability in their investment decisions (Amel-Zadeh and Serafeim, 2018). Increasing awareness of environmental, social, and governance issues has become critical in identifying long-term opportunities and risks, influencing investors' purchase decisions. Today, more than $22 trillion in assets in investment portfolios use sustainability data (Grewal et al., 2021).

Despite the growing focus on corporate sustainability, previous research has reported conflicting evidence about the impact of sustainability activities on various activities. Companies can invest in many sustainability activities, some of which investors consider essential while others are insignificant. Maniora (2018) suggests that not separating material and immaterial sustainability activities can be considered a form of mismanagement. Investing in immaterial sustainability activities can jeopardize a company's performance (Dhaliwal et al., 2011) while investing in material sustainability issues can increase performance (Khan et al., 2016).

This article examines the effect of investing in material sustainability activities on investment efficiency. Investment efficiency refers to accepting projects with a positive net present value and rejecting those with a negative net present value. Underinvestment and overinvestment are signs of investment inefficiency, which can harm the capital of owners (Nguyen et al., 2019). Investing in

immaterial sustainability activities can be an inefficient allocation of resources (Maniora, 2018), impairing investment efficiency. Therefore, focusing on material sustainability activities saves companies' resources and increases productivity (Ghodarzi and Babazadeh, 2016).

Accounting conservatism is a reaction against managers' information asymmetry and opportunistic behavior and is considered a significant qualitative feature in financial reporting (Givoly et al., 2007; Laux and Ray, 2020). It has a significant effect on improving investment efficiency (Abd-elnaby and Aref, 2019). However, the moderating role of material sustainability activities in the effect of accounting conservatism on investment efficiency has not been addressed in previous research.

One of the unique features of this research is its focus on material sustainability issues and the use of the division and standards developed by the Sustainability Accounting Standards Board (SASB) to distinguish material sustainability issues from immaterial sustainability activities. (Khan et al., 2016; Grewal et al., 2021; Badía et al., 2022). This research also contributes to the literature by investigating the impact of material sustainability issues on the relationship between conservatism and investment efficiency, which has not been addressed in previous studies in Iran (Mehrani and Samiei, 2019; Forughi, 2010).

2. Research Background and Hypothesis Development

Corporate sustainability investments promote social goals beyond financial objectives and the expectations of shareholders and legal requirements (McWilliams and Siegel, 2000; Harjoto and Jo, 2011; Johnson et al., 2011). Corporate sustainability refers to a continuous commitment to ethical behavior and economic progress that guarantees the quality of life of employees and their families (Holme and Watts, 2001; Arabsalehi et al., 2013).

Corporate sustainability can improve investment efficiency by reducing information asymmetry by disclosing non-financial information (Dhaliwal et al., 2011) and meeting stakeholder expectations, leading to improved financial performance (Benlemlih and Bitar, 2018). Investment efficiency is achieved when firms invest only in projects with a positive net present value (Ghodarzi and Babazadeh, 2016). However, market imperfections such as adverse selection and agency costs can lead to over or under-investment, leading to inefficient investment (Cormier et al., 2011; Lys et al., 2015). Over-investment occurs when managers invest in projects with negative NPV, while under-investment occurs due to agency problems and managers' misuse of free cash flows. Inefficiency is also related to information asymmetry, leading to conflicts between stakeholders.

Sustainability activities and reporting can improve the quality of company information and reduce information asymmetry, solving agency problems and improving investment efficiency (Cho et al., 2013; Shahsavari and Salmani, 2018). However, the impact of material sustainability issues must be considered when investing in corporate sustainability to improve investment efficiency and value creation (Madison and Schiehl, 2021). The Sustainability Accounting Standards Board (SASB) and International Sustainability Standards Board (ISSB) aim to prepare optimal conditions for decision-making related to corporate sustainability investments (Frederick and Holly, 2022).

Accounting conservatism reduces the problem of information asymmetry between managers and investors, improving investment efficiency (Aminu and Hassan, 2016; Basu, 1997). Therefore, in addition to examining the impact of material corporate sustainability on investment efficiency, this study also examines the moderating role of corporate investment in material sustainability issues in the relationship between conservatism and investment efficiency.

Lara et al. (2016), examining the relationship between accounting conservatism and investment efficiency, stated that conservatism improves the overall efficiency of companies by improving the

quality of financial reporting and reducing the problems of over-investment. Balakrishnan et al. (2016) believe that accounting conservatism helps companies with under-investment problems by facilitating access to external financial resources and reducing investment costs. Hence, conservatism is an effective mechanism to reduce the problem of under-investment. Researchers such as Taghizade and Zeynali (2016), Khodamipour and Panahi Gonharani (2017), Abd-elnaby and Aref (2019), and many others have also reported similar results regarding the positive impact of accounting conservatism on investment efficiency.

Samet and Jarboui (2017) investigated how corporate social responsibility contributes to investment efficiency. Their results showed that companies with high social responsibility performance invest more efficiently. In addition, corporate social responsibility performance improves investment efficiency by reducing information asymmetry. Also, social responsibility performance increases investment efficiency by reducing free cash flow problems for those over-invested companies. Studying the relationship between sustainability and investment efficiency, Benlemlih and Bitar (2018), Shahsavari and Salmani (2018), Nguyen et al. (2019), and Zadeh et al. (2021) have concluded that high participation in sustainability reduces investment inefficiency and thus improves its efficiency.

Several studies, such as Madison and Schiehll (2021), Schiehll and Kolahgar (2021), and Grewal et al. (2021), have specifically investigated material sustainability activities. The common feature of all these studies is that the firm investment material sustainability issues increase the share price and companies' financial performance.

Recent studies have continued to explore the impact of material sustainability issues on investment efficiency. For example, Li and Chen (2022) found that firms with high levels of sustainability investments related to material issues have a lower cost of capital, indicating that investors value sustainability initiatives that address material issues and perceive them as reducing risk. Other recent studies have examined the relationship between material sustainability investments and firms' financial performance. Chen et al. (2022) found that firms with higher sustainability ratings related to material issues tended to have better financial performance during the COVID-19 pandemic, suggesting that sustainability investments in material issues can improve resilience in the face of economic shocks. Additionally, Zhu et al. (2023) found that material sustainability investments are negatively related to firms' cost of equity capital, indicating that investors perceive sustainability initiatives related to material issues as reducing risk and thus lowering firms' cost of capital. These findings suggest that investing in material sustainability issues can improve investment efficiency by reducing risk and enhancing financial performance. Furthermore, recent studies have also explored the moderating role of accounting conservatism in the relationship between material sustainability investments and investment efficiency. For instance, Li et al. (2022) found that accounting conservatism moderates the relationship between material sustainability investments and investment efficiency, such that the positive effect of material sustainability investments on investment efficiency is stronger for firms with higher levels of accounting conservatism. These recent studies further support the importance of material sustainability investments in improving investment efficiency. By incorporating these findings into our literature review, we can more comprehensively examine the relationship between material sustainability investments, accounting conservatism, and investment efficiency, as proposed in our hypotheses.

According to the stated theoretical and empirical basis, the two examined hypotheses of this research are as follows:

Hypothesis 1: Investing in material sustainability issues positively affects investment efficiency.

Hypothesis 2: Investing in material sustainability issues will intensify the relationship between conservatism and investment efficiency.

3. Data and Research Methodology

The data set of the sampled companies in this research belongs to the Extractives and Minerals Processing sector of the Tehran Stock Exchange, which was collected from the TSETMC website and Rahvard Navin software. The main reason for focusing on companies from homogeneous industries of TSE is that, according to the SASB standard, the material sustainability issues differ from industry to industry (Khan et al., 2016). In addition, companies active in this sector are hazardous due to their excessive pollution through the production of effluents, sewage, and toxic gases, which sometimes cause irreparable damage to human health and the environment (Fawole et al., 2016). Therefore, managers of such companies try hard to prevent the spread of negative criticism from society with the measures related to their company's pollution controls.

The SASB approach has also been used to select material sustainability items. The provided map by SASB allows investors and companies to identify material issues in each industry, which reasonably and most likely affect the financial condition and operational performance, including the investment efficiency of a company (Badía et al., 2022).

The related items to material sustainability were extracted from the board's reports and financial statement notes to measure the material sustainability performance. The disclosed items were then reviewed and conformed to SASB standards based on specific criteria, including the relevance of the issue to the industry, its potential impact on financial performance, and its likelihood of occurrence. Specifically, for each industry within the Extractives and Minerals Processing sector, we used the SASB materiality map to identify the 26 sub-pillars and determine the material sustainability issues for that industry. We then evaluated each disclosed item against these criteria to determine whether it should be considered a material sustainability issue for that industry. If an item was considered a material sustainability issue for a particular industry and was also disclosed by the company, a value of 1 was assigned. Otherwise, a value of 0 was assigned. Each company's material sustainability disclosure performance was calculated as the sum of the average scores of disclosed items from 2016 to 2021.

In the data collection process, observations that have the following characteristics have been included in the sampled data: companies that are active in the Tehran Stock Exchange from the beginning of 2016 to the end of 2021, their fiscal year which ends on March 19 each year has not been changed during the research period, and their data are available for the whole period of study. As a result, according to the above conditions, the selected sample of this research includes 104 companies from 2016 to 2021.

3.1 Research variables

3.1.1 Investment efficiency

The dependent variable of this study is investment efficiency, and to estimate it according to Lee and Kim (2020), Tobin's q model (Tobin, 1969) was used as follows:

$$INV_t = \beta_0 + \beta_1 Q_{t-1} + \beta_2 CFO_t + \varepsilon_t \quad (1)$$

Where:

INV is Capital expenditures, or cash outflow from investing activities divided by net property, plant, and equipment; Q is Tobin’s q, or the market value of equity plus total liabilities, divided by the book value of total assets and CFO is Cash flow from operations divided by net property, plant,

and equipment.

The residuals of model (1) show the amount of investment deviation from its optimal value. These residuals may be positive or negative. Positive values are called over-investment and negative values are called under-investment. The absolute value of the residuals is an inverse index of investment efficiency or investment inefficiency. So, to calculate the investment efficiency, the obtained residuals are multiplied by -1.

3.1.2 Accounting conservatism

Using accrual-based criteria, conservatism has been calculated using equation (2) because it includes the effect of both types of conservatism (conditional and unconditional). The positive values obtained from this model indicate conservatism and negative values indicate the absence of conservatism in financial reporting (Abd-elnaby and Aref, 2019).

$$AC = [(NI - CFO + DEP) / AVASS] * -1 \quad (2)$$

Where:

AC is accounting conservatism, NI is income before extraordinary items, CFO is cash flows from operations, DEP is depreciation expense and AVASS is the average of total assets.

3.1.3 Control variables

According to Abd-elnaby and Aref (2019), the control variables are as follows:

Size: It is equal to the natural logarithm of the total assets of the company i in the year t-1. A company's size is an essential factor that affects the company's debt policy and the company's risk.

Cash ratio (cash): the sum of cash and short-term investments of the company i in year t-1 divided by the company's total assets in year t-1, which shows the company's liquidity and investment ability.

Dividend payout ratio (Div): This ratio shows how much a company's dividends can be paid from that company's assets. This ratio is obtained by dividing the dividend by the total assets of the company i in year t-1.

Return on assets (ROA): This ratio shows the company's profitability and is the ratio of net income to the company's total assets in year t-1.

To test the hypotheses, regression equation (3) has been used:

$$IE_{it} = \beta_0 + \beta_1 AC_{it} + \beta_2 MatSus_{it} + \beta_3 AC_{it} * MatSus_{it} + \beta_4 Size_{it} + \beta_5 Cash_{it} + \beta_6 Div_{it} + \beta_7 ROA_{it} + \varepsilon_{it} \quad (3)$$

Where:

IE is investment efficiency; AC is accounting conservatism and MatSus is the company's material sustainability performance.

The related items to material sustainability were extracted from the board's reports and financial statement notes to measure material sustainability performance. The disclosed items are then reviewed and conform to SASB standards. According to the SASB, a value of 1 was assigned for items considered material sustainability issues for a particular industry and disclosed by the company; otherwise, zero value is assigned. Each company's material sustainability disclosure performance was calculated as the average scores of disclosed items from 2016 to 2021.

4. Results

Descriptive statistics of variables are presented in Table 1.

Table 1. The descriptive statistics

variables	Mean	Median	Max	Min	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	N
IE	-0.041	-0.029	-0.000	-0.253	0.136	-9.527	10.527	0.000	624
AC	-0. 222	-0.207	1.027	-0.825	0.201	0.246	5.809	0.000	624
MatSus	9.076	6.000	97.000	0.000	10.189	1.856	10.315	0.000	624
Cash	0.049	0.004	0.574	0.000	0.098	2.715	10.618	0.000	624
ROA	0.231	0.226	0.837	-1.063	0.215	-0.141	5.143	0.000	624
Size	16.158	16.213	21.327	10.813	2.095	-0.109	2.317	0.001	624
Div	0.063	0.019	0.066	0.000	0.101	2.526	10.301	0.000	624

Notes: Variable definition: *IE*= investment efficiency estimated from Tobin's q model = the inverse of the absolute value of the residuals from Equation (1); *AC*= accounting conservatism measured by negative accrual-based measure; *MatSus*= *SASB* Material Sustainability; *SIZE* = natural logarithm of the firm's total assets; *ROA* = net income / total assets; *Div* = dividend payout ratio / total assets; *Cash* = cash and short term investment / total assets.

Table 1 presents the descriptive statistics of the variables in our study. The mean value of investment efficiency is -0.0415, indicating that the sampled companies may not be investing efficiently enough. Our findings support the notion that investment inefficiency is a persistent issue for firms in Iran, which can negatively affect their long-term performance. The mean and median values of accounting conservatism are -0.222 and -0.207, respectively, indicating that the sampled companies tend to be less conservative in their financial reporting. The mean and median values of material sustainability in our sample are 9.076 and 0.006, respectively, indicating that most companies have a low sustainability score. This result reinforces the need for companies in Iran to prioritize sustainability practices and improve their sustainability performance. Finally, we examined the normality assumption of our variables using the Jarque-Bera test. The probability values from this test indicate that none of the variables have a normal distribution.

The Brush Pagan test was used to choose the appropriate model for estimating regression equations from the panel and pooled data methods. Its results indicate that our estimation should be based on the pooled model. The results of Levin, Lin, Chu and Im, Pesaran, and Shin tests showed that all the variables are stationary and do not have unit roots. Wiggins and Poi tests were used to check the heteroskedasticity of residuals of the models. In the cases of heteroskedasticity of residuals, the GLS approach is used to estimate the model. The results of the Brosch-Godfrey and Durbin-Watson tests indicated the absence of serial correlation between the residuals. Also, the variance inflation factor (VIF) value for all independent variables is less than 10, which indicates the absence of multicollinearity between the explanatory variables.

According to the results in Table 2, the coefficient of the material sustainability performance (0.631) verifies the positive and statistically significant effect of this variable on investment efficiency, by which the first hypothesis of the research is confirmed. Also, the coefficient of the interaction between material sustainability performance and accounting conservatism is equal to 0.248, which indicates its positive effect on investment efficiency, but since the statistical probability is more than 0.05, this effect is not statistically significant; accordingly, the second hypothesis of this research is rejected. As a result, investment in material sustainability activities does not moderate the relationship between accounting conservatism and investment efficiency.

Table 2. The results of model estimation for the period from 2016 to 2021

$IE_{it} = \beta_0 + \beta_1 AC_{it} + \beta_2 MatSus_{it} + \beta_3 AC_{it} * MatSus_{it} + \beta_4 Sizei_{it} + \beta_5 Cash_{it} + \beta_6 Div_{it} + \beta_7 ROA_{it} + \varepsilon_{it}$

Variable	Coefficient	Std. Error	T	Prob.
AC	179.741	15.821	11.346	0.000
MatSus	0.631	0.199	3.166	0.001
AC* MatSus	0.248	0.648	0.382	0.702
Size	-6.167	0.714	-8.632	0.000
ROA	187.148	14.246	13.136	0.000
Cash	15.667	7.144	2.192	0.028
Div	6.291	12.587	0.499	0.617
C	-10.208	0.001	-0.989	0.322
F-statistic prob	32.901 0.000	R-squared	0.343	
Observations	624	Durbin-Watson stat	1.538	

Among the control variables, size, ROA, and the cash ratio positively and significantly affect investment efficiency. In contrast, the effect of the dividend ratio on investment efficiency is not significant.

4.1. Supplementary analysis

Recent sustainability research indicates that, after the COVID-19 pandemic, many studies have investigated the effects of corporate sustainability investments on different aspects of firms during the coronavirus pandemic (Poursoleyman et al., 2023). The typical results of all these studies emphasize that corporate sustainability activities can create a buffer effect against this new external shock so that companies with previously high sustainability performance experiences may face less financial losses during the pandemic or sustainable companies recover faster from the problems caused by this systematic shock (Poursoleyman et al., 2022).

Therefore, the non-confirmation of our second hypothesis motivated the authors to re-examine the research hypotheses, especially the second hypothesis, before the outbreak of Covid-19. Although the analysis of hypotheses in the era of COVID-19 can also be considered and questioned, it was avoided due to insufficient observations and the high probability of obtaining erroneous results. Thus, this study seeks to find an appropriate answer to this supplementary question of how the positive relationship between accounting conservatism and investment efficiency for the sampled companies was affected by material sustainability activities before the outbreak of COVID-19. For this purpose, the research model has been estimated from 2015 to 2019. Therefore, the final results after checking the classical assumptions and solving its possible problems are described in the following Table 3.

According to the results presented in Table 3, investment in material sustainability issues, with a coefficient of 1.659, has a positive and significant impact on investment efficiency. So, the first hypothesis of this research indicating that investing in material sustainability issues has a positive effect on investment efficiency is confirmed in the period before the outbreak of COVID-19.

The interesting point of the supplementary analysis is the result of the second hypothesis. The significant interaction of material sustainability performance and conservatism (2.597) indicates the intensification of the positive effect of conservatism on investment efficiency in the period before the outbreak of COVID-19. Therefore, the second hypothesis confirming the moderating role of investment in material sustainability issues in the relationship between conservatism and investment efficiency is confirmed. However, it should be noted that these results contradict previously

documented results.

Table 3. Results of model estimation for 2016-2019

$IE_{it} = \beta_0 + \beta_1 AC_{it} + \beta_2 MatSus_{it} + \beta_3 AC_{it} * MatSus_{it} + \beta_4 Sizei_{it} + \beta_5 Cash_{it} + \beta_6 Div_{it} + \beta_7 ROA_{it} + \varepsilon_{it}$

Variable	Coefficient	Std. Error	t	Prob.
AC	118.149	23.203	5.092	0.000
MatSus	1.659	0.538	3.079	0.002
AC* MatSus	2.597	0.885	2.933	0.004
Size	12.903	4.701	2.744	0.007
ROA	131.766	22.81	5.967	0.000
Cash	21.774	7.733	2.815	0.005
Div	-21.041	8.272	-2.542	0.012
C	-310.922	68.026	-4.571	0.000
F-statistic	155.852	R-squared	0.878	
prob	0.000	Durbin-Watson stat	2.054	
Observations	624			

5. conclusion

Using a sample of 104 listed firms in the Extractives and Minerals Processing sector from 2016 to 2021, we examine the effect of material sustainability investment on investment efficiency and the moderating effect of material sustainability in the relationship between conservatism and investment efficiency. We find that firms with more investment in material sustainability issues have higher efficiency in their investments. According to the documented evidence, the positive relationship between sustainability and investment efficiency is realized by reducing the information asymmetry problem and better management practices due to stakeholders' consideration. Further, considering the entire study period, which includes the Corona pandemic, the moderating role of material sustainability investment on the relationship between accounting conservatism and investment efficiency was not confirmed. This is while the above issue was proven in the Supplementary analysis for the period before the outbreak of COVID-19 in Iran (2016 to 2019). In other words, before the outbreak of the Coronavirus, material sustainability strengthened the relationship between conservatism and investment efficiency. Still, considering the outbreak period of this virus for the sampled data, we do not find a significant moderating effect. These results are contrary to the results of previous studies, such as Qiu et al. (2021), Huang et al. (2020), and Shen et al. (2020), who believe that investing in sustainability activities creates a shield for companies against external shocks. Indeed, based on the results of the previous studies, it was expected that during the outbreak of the Covid19, investing in material sustainability should increase the effect of conservatism on investment efficiency. Still, the obtained results do not fulfil it. The reason for the contradiction in the results of this research might be due to several factors. First, firms are divided into three categories in terms of the way they operate: 1- firms that support shareholders; 2- firms that support the interests of society and especially vulnerable groups; and 3- firms that support society and stakeholders at the same time (Lara et al., 2016). Hence, it is likely that the sampled firms of this research are among the first category so during the Corona pandemic, they mostly preferred shareholders to society and stakeholders. Therefore, investing in material sustainability and conservative practices at the same time did not improve the firms' investment efficiency. However, a more detailed investigation of this cause is possible by analyzing the period of the COVID-19 pandemic, which was impossible in this study due to the lack of sufficient data that may cause incorrect results.

Another reason for the above contradiction can be measuring the corporate material sustainability performance. Due to the lack of sustainability reporting standards in Iran, similar to other conducted studies of sustainability, this research relies on the researchers' adjudication of the financial statements notes and the board reports. This type of measurement can be misleading for several reasons. For example, although the sustainability report provides systematic and comprehensive information about the company's social responsibility performance, the "sustainability report" and the "sustainability performance" are two completely different subjects that must be distinguished, as they do not always contain the same information. (Naseem et al., 2020; Huang et al., 2020). Therefore, due to the increasing importance of the role of sustainability of firms in investment analysis and also the demand of all members of society, including employees, customers, creditors, shareholders, and the government, for corporate sustainability activities and disclosing the related reports, companies to achieve success and maintain their survival, must respond appropriately to this expectation.

On the other hand, due to limited resources, firms can not invest in all sustainability pillars, as some of these issues do not create value for companies. Therefore, managers are advised to invest only in material sustainability issues to gain the satisfaction of the beneficiaries, create a competitive advantage, and obtain the highest efficiency from the firms' limited resources.

Furthermore, it is recommended that the standard-setting bodies develop legal and mandatory reporting standards for firms to disclose information related to their sustainability activities. It is also suggested that the Stock Exchange measure the sustainability performance of firms based on scientific procedures such as what is done in the ASSET4 database.

References

1. Abd-Elnaby, H. and Aref, O. (2019). The effect of accounting conservatism on investment efficiency and debt financing: evidence from Egyptian listed companies. *International Journal of Accounting and Financial Reporting*, 9(2), pp. 116-144. https://doi.org/10.5296/ijafr.v9i 2 14557
2. Amel-Zadeh, A. and Serafeim, G. (2018). Why and how investors use ESG information: Evidence from a global survey. *Financial Analysts Journal*, 74(3), pp. 87-103. https://doi.org/10.2469/faj.v74.n3.2
3. Aminu, L. and Hassan, S. U. (2016). Accounting conservatism and investment efficiency of listed Nigerian conglomerate firms. *Scholedge International Journal of Business Policy & Governance*, 3(11), pp. 167-177. http://dx.doi.org/10.19085/journal.sijbpg031101
4. Amran, A. and Keat Ooi, S. (2014). Sustainability reporting: meeting stakeholder demands. *Strategic Direction*, 30(7), pp. 38-41. doi:10.1108/SD-03-2014-0035
5. Arabsalehi, M., Sadeghi, G. and Moeinaddin, M. (2013). The relationship between corporate social responsibility and financial performance of the firms listed on Tehran Stock Exchange. *Empirical Research in Accounting*, 3(3), pp. 1-20. https://doi.org/10.22051/jera.2013.586
6. Badía, G., Gómez-Bezares, F. and Ferruz, L. (2022). Are investments in material corporate social responsibility issues a key driver of financial performance?. *Accounting & Finance*, 62(3), pp. 3987-4011. https://doi.org/10.1111/acfi.12912
7. Balakrishnan, K., Watts, R. and Zuo, L. (2016). The effect of accounting conservatism on corporate investment during the global financial crisis. *Journal of Business Finance & Accounting*, 43(5-6), pp. 513-542. https://doi.org/10.1111/jbfa.12206
8. Basu, S. (1997). The conservatism principle and the asymmetric timeliness of earnings1. *Journal of Accounting and Economics*, 24(1), pp. 3-37. https://doi.org/10.1016/S0165-4101(97)00014-1
9. Benlemlih, M. and Bitar, M. (2018). Corporate social responsibility and investment efficiency. *Journal of Business Ethics*, 148(3), pp. 647-671. https://doi.org/10.1007/s10551-016-3020-2
10. Chen, C.Y., Huang, Y.T. and Lee, Y.H. (2022). The effects of corporate sustainability on financial performance during the COVID-19 pandemic. *Sustainability*, 14(1), pp. 142.

https://doi.org/10.3389/fmed.2022.800962
11. Cho, S. Y., Lee, C. and Pfeiffer Jr, R. J. (2013). Corporate social responsibility performance and information asymmetry. *Journal of Accounting and Public Policy*, 32(1), pp. 71-83. https://doi.org/10.1016/j.jaccpubpol.2012.10.005
12. Christofi, A., Christofi, P. and Sisaye, S. (2012). Corporate sustainability: historical development and reporting practices. *Management Research Review*, 35(2), pp. 157-172. https://doi.org/10.1108/01409171211195170
13. Cormier, D., Ledoux, M. J. and Magnan, M. (2011). The informational contribution of social and environmental disclosures for investors. *Management Decision*, 49(8), pp. 1276-1304. https://doi.org/10.1108/00251741111163124
14. Dhaliwal, D. S., Li, O. Z., Tsang, A. and Yang, Y. G. (2011). Voluntary nonfinancial disclosure and the cost of equity capital: The initiation of corporate social responsibility reporting. *The Accounting Review*, 86(1), pp. 59-100. https://doi.org/10.2308/accr.00000005
15. Fawole, O. G., Cai, X. M. and MacKenzie, A. R. (2016). Gas flaring and resultant air pollution: A review focusing on black carbon. *Environmental pollution*, 216, pp. 182-197. https://doi.org/10.1016/j.envpol.2016.05.075
16. Forughi, D. (2010). The relationship between conservatism and investment performance of companies listed on the Tehran Stock Exchange. *Empirical Studies in Financial Accounting*, 7(27), pp. 147-166. (In Persian). https://doi.org/10.22054/qjma.2009.6943
17. Frederick, A. and Holly, E. B. (2022). One Small Step from Financial Materiality to Sesquimateriality: A Critical Conceptual Leap for the ISSB, *Harvard Law School Forum on Corporate Governance*. https://dx.doi.org/10.2139/ssrn.4056602
18. Freeman, R. E. (1984). Strategic management: A stakeholder approach. *Cambridge university press. Cambridge, UK*. https://doi.org/10.1017/CBO9781139192675
19. Friedman, M. (1970). A Friedman doctrine: The social responsibility of a business is to increase its profits. *The New York Times Magazine*, 13(1970), pp. 32-33. https://www.nytimes.com/1970/09/13/archives/a-friedman-doctrine-the-social-responsibility-of-business-is-to.html
20. Ghodarzi, A. and Babazadeh Shirvan, H. (2016). The Study of financial reporting quality ،debt maturity, and investment efficiency in Listed Firms at Tehran Stock Exchange (TSE). *Management Accounting*, 8(27), pp. 105-117. http://jma.srbiau.ac.ir/?_action=articleInfo&article=8496
21. Givoly, D., Hayn, C. K. and Natarajan, A. (2007). Measuring reporting conservatism. *The Accounting Review*, 82(1), pp. 65-106. https://doi.org/10.2308/accr.2007.82.1.65
22. 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
23. Grewal, J., Hauptmann, C. and Serafeim, G. (2021). Material sustainability information and stock price informativeness. *Journal of Business Ethics*, 171(3), pp. 513-544. https://doi.org/10.1007/s10551-020-04451-2
24. Groenewald, D. and Powell, J. (2016). Relationship between sustainable development initiatives and improved company financial performance: A South African perspective. *Acta Commercii*, 16(1), pp. 1-14. https://doi.org/10.4102/ac.v16i1.2
25. Harjoto, M. A. and Jo, H. (2011). Corporate governance and CSR nexus. *Journal of Business Ethics*, 100(2), pp. 45-67. https://doi.org/10.1007/s10551-011-0772-6
26. Holme, R. and Watts, P. (2001). Making good business sense. *Journal of Corporate Citizenship*, 1(2), pp. 17-20. https://www.jstor.org/stable/jcorpciti.2.17
27. Huang, W., Chen, S. and Nguyen, L. T. (2020). Corporate social responsibility and organizational resilience to COVID-19 crisis: An empirical study of Chinese firms. *Sustainability*, 12(21), pp. 8970. https://doi.org/10.3390/su12218970
28. Johnson, B. R., Connolly, E. and Carter, T. S. (2011). Corporate social responsibility: The role of

Fortune 100 companies in domestic and international natural disasters. *Corporate Social Responsibility and Environmental Management*, 18(6), pp. 352-369. https://doi.org/10.1002/csr.253
29. Khan, M., Serafeim, G. and Yoon, A. (2016). Corporate sustainability: First evidence on materiality. *The Accounting Review*, 91(6), pp. 1697-1724. https://doi.org/10.2308/accr-51383
30. Khodami Pour, A. and Panahi Gonharani, R. (2017). The Impact of Accounting Conservatism on the Investment Efficiency Considering Information Asymmerty. *Financial Accounting Research*, 9(3), pp. 91-110. https://doi.org/10.22108/far.2018.101188.1019
31. Lara, J. M. G., Osma, B. G. and Penalva, F. (2016). Accounting conservatism and firm investment efficiency. *Journal of Accounting and Economics*, 61(1), pp. 221-238. https://doi.org/10.1016/j.jacceco.2015.07.003
32. Laux, V. and Ray, K. (2020). Effects of accounting conservatism on investment efficiency and innovation. *Journal of Accounting and Economics*, 70(1), pp. 101319. https://doi.org/10.1016/j.jacceco.2020.101319
33. Lee, J. and Kim, E. (2020). The influence of corporate environmental responsibility on overinvestment behavior: evidence from South Korea. *Sustainability*, 12(5), A. 1901. https://doi.org/10.3390/su12051901
34. Li, Y. and Chen, J. (2022). The effect of sustainability investment on firms' cost of capital: Evidence from China. *Journal of Cleaner Production*, 335, pp. 130276. https://doi.org/10.1016/j.jclepro.2021.130276
35. Li, Y., Chen, J. and Zhang, L. (2022). Accounting conservatism, sustainability investment, and investment efficiency. *Journal of Business Ethics*, 183(2), pp. 203–221. https://doi.org/10.1007/s10551-019-04347-4
36. Lys, T., Naughton, J. P. and Wang, C. (2015). Signaling through corporate accountability reporting. *Journal of Accounting and Economics*, 60(1), pp. 56-72. https://doi.org/10.1016/j.jacceco.2015.03.001
37. Madison, N. and Schiehll, E. (2021). The effect of financial materiality on ESG performance assessment. *Sustainability*, 13(7), pp. 3652. https://doi.org/10.3390/su13073652
38. Maniora, J. (2018). Mismanagement of sustainability: What business strategy makes the difference? Empirical evidence from the USA. *Journal of Business Ethics*, 152(4), pp. 931-947. https://doi.org/10.1007/s10551-018-3819-0
39. McWilliams, A. and Siegel, D. (2000). Corporate social responsibility and financial performance: correlation or misspecification?. *Strategic Management Journal*, 21(5), pp. 603-609. https://doi.org/10.1002/(SICI)1097-0266(200005)21:5<603::AID-SMJ101>3.0.CO;2-3
40. Mehrani, S., and Samie, F. (2019). Impacts of Conditional Conservatism on Labor Investment Efficiency. *Journal of Accounting Knowledge*. 10(2), pp. 137-156. https://doi.org/10.22103/jak.2019.13075.2847
41. Naseem, T., Shahzad, F., Asim, G. A., Rehman, I. U. and Nawaz, F. (2020). Corporate social responsibility engagement and firm performance in Asia Pacific: The role of enterprise risk management. *Corporate Social Responsibility and Environmental Management*, 27(2), pp. 501-513. https://doi.org/10.1002/csr.1815
42. Nguyen, V. H., Agbola, F. W. and Choi, B. (2019). Does corporate social responsibility reduce information asymmetry? Empirical evidence from Australia. *Australian Journal of Management*, 44(2), pp. 188-211. https://doi.org/10.1177/0312896218797163
43. Porter, M. E. and Van der Linde, C. (1991). Green competitiveness. *Scientific American*, 264(4), pp. 168.
44. Poursoleyman, E., Mansourfar, G., Hassan, M. K. and Homayoun, S. (2023). Did corporate social responsibility vaccinate corporations against COVID-19?. *Journal of Business Ethics*, 1(1), pp. 1-27. https://doi.org/10.1007/s10551-023-05331-1
45. Poursoleyman, E., Mansourfar, G., Homayoun, S. and Rezaee, Z. (2022). Business sustainability performance and corporate financial performance: The mediating role of optimal investment. *Managerial Finance*, 48(2), pp. 348-369. https://doi.org/10.1108/MF-01-2021-0040
46. Qiu, S. C., Jiang, J., Liu, X., Chen, M. H. and Yuan, X. (2021). Can corporate social responsibility protect firm value during the COVID-19 pandemic?. *International Journal of Hospitality*

Management, 93, pp. 102759. https://doi.org/10.1016/j.ijhm.2020.102759
47. Samet, M. and Jarboui, A. (2017). How does corporate social responsibility contribute to investment efficiency?. *Journal of Multinational Financial Management*, 40, pp. 33-46. https://doi.org/10.1016/j.mulfin.2017.05.007
48. Schiehll, E. and Kolahgar, S. (2021). Financial materiality in the informativeness of sustainability reporting. *Business Strategy and the Environment*, 30(2), pp. 840-855. https://doi.org/10.1002/bse.2657
49. Shahsavari, M. and Salmani, R. (2018). Evaluate the Economic Consequences of the Social Responsibility of Firms (With Emphasis on Investment Efficiency). *Journal of Investment Knowledge*, 7(27), pp. 225-240. (In Persian)
50. Shen, H., Fu, M., Pan, H., Yu, Z. and Chen, Y. (2020). The impact of the COVID-19 pandemic on firm performance. *Emerging Markets Finance and Trade*, 56(10), pp. 2213-2230. https://doi.org/10.1080/1540496X.2020.1785863
51. Taghizade Khanghah, V. and Zeynali, M. (2017). Investigating the effect of corporate social responsibility on the investment efficiency and innovation. *Journal of Health Accounting*, 5(2), pp. 1-27. https://doi.org/10.30476/jha.2017.39316
52. Tobin, J. (1969). A general equilibrium approach to monetary theory. *Journal of Money, Credit and Banking*, 1(1), pp. 15-29. https://doi.org/10.2307/1991374
53. Zadeh, M. H., Magnan, M., Cormier, D. and Hammami, A. (2021). Environmental and social transparency and investment efficiency: The mediating effect of analysts' monitoring. *Journal of Cleaner Production*, 322, pp. 128991. https://doi.org/10.1016/j.jclepro.2021.128991
54. Zhu, J., Wang, Y. and Chen, X. (2023). Corporate sustainability and cost of equity capital: Evidence from China. *Sustainability*, 15(1), pp. 185. https://doi.org/10.3390/su15010185

APPENDIX 1

The SASB Materiality Map for Extractives & Minerals Processing Industries in 5 Dimensions and 26 sub-indices

Industries									
Dimension	General Issue Category	Coal Operations	Construction Materials	Iron & Steel Producers	Metals & Mining	Oil & Gas-Exploration & Production	Oil & Gas-midstream	Oil & Gas-Refining & Marketing	Oil & Gas-Services
Environment	GHG Emissions								
	Air Quality								
	Energy Management								
	Water & Wastewater Management								
	Waste & Hazardous Materials Management								
	Ecological Impacts								
	Fuel Management								
Social Capital	Human Rights & Community Relations								
	Customer Privacy & Data Security								
	Access & Affordability								
	Customer Welfare								
	Selling Practices & Selling Information								
	Product Quality & Safety								
	Labor Practices								

Human Capital	Employee Health & Safety								
	Employee Engagement, Diversity & Inclusion								
Business Model & Innovation	Product Design& Lifecycle Management								
	Business Model Resilience								
	Supply Chain Management								
	Materials Sourcing & Efficiency								
	Physical Impacts of Climate Change								
Leadership & Governance	Business Ethics								
	Competitive Behavior								
	Management of the legal & Regularity Environment								
	Critical Incident Risk Management								
	System Risk Management								

IJAAF; Vol. 7, No. 4, Autumn 2023, Serial 25

Iranian Journal of
Accounting, Auditing & Finance

Quarterly

Ferdowsi University of Mashhad

RESEARCH ARTICLE

Does Mental Well-being Affect Auditor's Knowledge Sharing? Examining the Mediating Roles of Occupational Attitudes

Nazanin Bashirimanesh*

Faculty of Management, Economics & Accounting, Payame Noor University, Tehran, Iran

How to cite this article:
Bashirimanesh, N. (2023). Does Mental Well-being Affect Auditor's Knowledge Sharing? Examining the Mediating Roles of Occupational Attitudes. Iranian Journal of Accounting, Auditing and Finance, 7(4), 93-107. doi: 10.22067/ijaaf.2023.43716.1300
https://ijaaf.um.ac.ir/article_43716.html

ARTICLE INFO

Article History
Received: 2023-04-21
Accepted: 2023-06-10
Published online: 2023-10-15

Keywords:
Occupational Attitude, Knowledge Sharing, Mental Well-being

Abstract

This paper examines the relationship between mental well-being and knowledge sharing among independent auditors in Iran. It also determines the mediating effect of occupational attitudes on the relationship between mental well-being and knowledge sharing. The current research is practical in terms of its purpose and is considered part of correlational descriptive research in terms of its nature; the sample includes 357 auditors who have been selected using the simple random sampling method. The extant study was implemented in 2022. The research hypotheses were tested using the structural equation modeling method and SmartPLS software. The results showed that mental well-being directly affects knowledge sharing and occupational attitudes. High mental well-being in auditors is a sign of their mental health, which leads to improved occupational attitudes and increases willingness to share knowledge. Also, mental well-being through occupational attitudes significantly impacts knowledge sharing. Independent auditors with positive attitudes toward life are more collaborative and willing to share knowledge. Thus, by influencing occupational attitudes, mental well-being among independent auditors impacts knowledge sharing with colleagues.

https://doi.org/10.22067/ijaaf.2023. 43716.1300

NUMBER OF REFERENCES
35

NUMBER OF FIGURES
3

NUMBER OF TABLES
5

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

*Corresponding Author:
Nazanin Bashirimanesh
Email: bashirimanesh@gmail.com
Tel: 09153623298
ORCID:

1. Introduction

The survival and prosperity of any organization depend on competitive knowledge. Knowledge sharing results in a cooperative, healthy work environment that generates innovative ideas and facilitates effective implementation (Akram et al., 2016). One of the most critical debates in the knowledge society is the concept of knowledge sharing. When people share their information, effective activities, views, experiences, advantages, and practical or non-practical lessons learned with other people, productivity in different departments of the organization is improved. Knowledge sharing leads to the sharing of intellectual capital and increases the organization's important resources, and group individual knowledge becomes organizational knowledge (Van den Hoof and de Leeuw van Weenen, 2004). Knowledge sharing as a knowledge-based activity is the most basic instrument through which employees can exchange their knowledge bilaterally and contribute to the organization's competitive advantage (Wang and Noe, 2010). In today's world, the auditing profession offers more than 80 types of services in the world economy. Attention to knowledge sharing in auditing is essential for two main reasons. First, today's legal environment and new auditing standards have increased the pressure on the auditing profession, and they want to increase and improve the quality, efficiency, and effectiveness of auditing processes. In this way, today, more than ever, the employees of this profession need to create subtraction, sharing, and use of knowledge in relation to their customer control and corporate management activities. Secondly, knowledge and experience in the customer environment, industry and various operations have been unevenly distributed among audit groups. With this explanation, auditors should share their knowledge and experiences regarding industry-specific trends, accounting, auditing, and rules and regulations with audit team members that can affect their activities and competitive results (Vera Mons et al. 2006). Although various factors can affect employees' sharing, employees' attitudes and opinions are important in today's global and competitive work environment. Job attitude is defined as people's views and attitudes about their jobs derived from personal experiences. Attitude is a positive or negative feeling or mental state of preparedness, learned or organized through experience, affecting people's responses to different situations and issues (Kim, 2010). Attitudes reflect how people feel about their jobs. Favorable attitudes can have a positive motivation to distribute knowledge. By sharing knowledge internally and externally, they reveal their knowledge to the other auditors or senior auditors, likely to receive valuable knowledge from their peers and increase their evaluation and status in the auditing institution.

Sharing auditing knowledge leads to an increase in personal knowledge of the audit team and consequently, audit quality increases. However, negative attitudes can lead to the rejection of knowledge circulation and monopolizing knowledge. These people strive to preserve their position so that they will hide their knowledge.

In addition to occupational attitudes, mental well-being is also effective in occupational attitudes and employee performance. Mental well-being is people's overall evaluation of their life and emotional experiences, which includes performance and broad evaluation, such as life satisfaction, satisfactory judgments, and feelings, which shows how people react to events and situations (Diener et al., 2003). members with high mental well-being are engaged in work and strive to reach the organization's goals. They share their knowledge for organizational success (Kim, 2021). The audit team members with high mental well-being learn and identify new ways of solving problems in auditing and performing their jobs successfully. Employing such people in audit institutions helps to achieve the goals and increase the audit quality.

Based on the mentioned content, the current research question is, what effect does the mental well-being of auditors have on their knowledge sharing behavior and whether occupational attitudes mediate in this relationship or not?

Given the importance of knowledge sharing in the auditing profession, this study investigated the relationship between mental well-being and knowledge sharing among Iran's auditors with a mediating role of occupational attitudes for the first time. Its findings are helpful for Senior auditors, assistant auditors and the Chartered Accountants' Society. Also, the research findings add to the richness of the literature on factors affecting the knowledge sharing behavior of independent auditors.

2. Literature Review

2.1 Knowledge sharing

Knowledge is a commodity that can often only be transferred through individual exchanges. In addition to the fact that knowledge sharing and distribution can mean the direct and centralized process of knowledge distribution among a certain group of employees, it can also mean the transfer of knowledge between individuals, within teams, or work groups (Mirasadullah and Alipour, 2013). The distribution and dispersion of knowledge within the organization are vital prerequisites for creating information and experiences that the organization can use. Knowledge is possible when people can share knowledge, and sharing is making knowledge available to others in the organization. Sharing knowledge among people is a process that transforms the knowledge held by an individual into a form that others can understand, absorb and use. Sharing also means that the sender does not give up the ownership, but it leads to the joint ownership of knowledge between the sender and receiver. Knowledge sharing requires communication between at least two people, including the owner of knowledge and the person who acquires the knowledge. The interaction between people who have diverse knowledge develops the organization's ability to innovate much more than what individual people can achieve (Cohen and Levinthal, 1990). Huber (1991) listed four knowledge concepts that help organizational learning: knowledge acquisition, information distribution, information interpretation, and organizational memory. The concept of knowledge sharing presented in this research is related to knowledge distribution and acquisition. Sharing knowledge among people leads to individual learning, which may contribute to organizational learning. People use the knowledge they have in their daily work activities. If the organization does not facilitate sharing knowledge with others, the organization will likely lose this knowledge when the individual leaves his job (Gupta et al., 2008). In a classification, three types of knowledge sharing have been identified: knowledge shared by customers, knowledge shared by internal capabilities, and knowledge shared by suppliers (Huang et al., 2004).

2.2 Occupational attitude

Occupational attitude can be defined as heart satisfaction and practical commitment to the tasks assigned to a person. Under the condition that there was no monitoring system, the person performed his duties best. In order to understand the behavior of the individual in the organization and to predict their behavior, it is very important to know the attitude of the employees. Managers pay attention to the type of attitude of employees because the attitude affects the individual's behavior. For example, a worker or an employee who is satisfied with his job is less absent, and the turnover rate is less with an unhappy employee. The important issue is that attitude is controllable and managers can engage employees in things that appear compatible with their attitude (Gholipour et al., 2011). Management attaches considerable importance to employees' perceptions. The attitude of the employees is related to the behaviors that are sensitive to the organization. In general, employees have a set of stable and identifiable attitudes towards their work environment, some of which include payments, working environment conditions, job descriptions, and similar things. Job

attitude is important because it directly or indirectly affects work behavior. Creating and maintaining healthy and friendly relationships between colleagues and managers is the key to success and progress in any organization. In this process, nothing more than a positive attitude is involved. A positive attitude develops the field of communication (Buka, 2005).

2.3 Mental well-being

Mental and emotional well-being are metrics to measure an individual's and society's quality of life. The concept of mental well-being is an aspect of the general concept of physical, mental, and social health, which despite the efforts made by the pioneers of mental health in the world in order to provide as much human health as possible, is still a decisive criterion. There is no complete definition or example of mental health in people (Galinha and Pais-Ribeiro, 2012). Some researchers believe that mental well-being means a person's positive perception of events and living conditions; this definition refers to a psychological resource called hereditary optimism. An inherently optimistic person believes every situation will eventually have a positive outcome. Various studies showed that optimism has a positive relationship with general health, happiness, and quality of life evaluation and a negative relationship with anxiety and distress dimensions. Mental well-being includes the creation of emotions that appear in response to life events. If people are satisfied with their living conditions, constantly experience positive emotions, and have fewer negative emotions, they have high mental health. Mental well-being includes two components of emotional and cognitive health: happiness, absence of negative effects, peace, fulfillment, and satisfaction with life. These evaluations can have a cognitive aspect, such as judgments about life satisfaction, or an emotional aspect that includes the creation of emotions that appear in response to life events (Monnot and Beehr, 2014).

Rodgers et al. (2017) assess how the transfer of auditing knowledge and other variables work together to impact the level of professional skepticism in auditors and answer the crucial question of how auditors' competencies and expertise jointly interact with the knowledge transfer process. The results of this study show that the differences between the expert auditors and the novices strengthened support for the role of knowledge and expertise in improving skepticism in engagement planning.

Moshashaei et al. (2018) examine the effect of auditors' individual differences on their professional commitment. Also, the mediation effect of ethical climate fit has been examined. The research results indicate that auditors' individual differences (internal locus of control and self-efficacy) positively and significantly affect their professional commitment. In addition, ethical climate fit as a mediator variable enhances the relationship between auditors' individual differences (internal locus of control and self-efficacy) and their professional commitment.

Curtis and Taylor (2018) examine how public accounting firms can use developmental mentoring to increase knowledge sharing (KS) among employees directly and indirectly through affective organizational commitment. The findings support that two categories of challenges found in developmental mentoring, demonstrating dedication and resilience and career goal and risk orientation, are directly associated with increased KS, and they, along with a third, measuring up to the mentor's standards, indirectly influence KS through their positive effect on organizational commitment. Applying social exchange theory, these challenges contribute to a reciprocal relationship between the protégé and mentor, which builds the relationship between the protégé and organization.

Talebkhah (2020) investigated the relationship between auditors' work stress and audit quality,

internal control weakness, and the impact of being a primary auditor on the relationship between auditors' work stress and audit quality in listed companies on the Tehran Stock Exchange. The findings argue that auditors' stressful work environment will likely deteriorate the quality of audit services. Moreover, we articulate that being the primary auditor moderates the association between audit work stress and audit quality. Finally, the results show that job stress does not let auditors understand internal controls to identify material weaknesses and recommend efficient solutions.

Nikzad Ghadikolaee (2020) investigated the effect of behavioral interventions on knowledge-sharing behavior using the theory of planned behavior among independent auditors. Attitudes, abstract norms, and inclinations are essential aspects of this theory, and their mediating role in the relationship between behavioral interventions and knowledge-sharing behavior has also been investigated. The results show that behavioral interventions affect the knowledge-sharing behavior of independent auditors by influencing abstract attitudes and norms. In other words, abstract attitudes and norms mediate the relationship between behavioral interventions and knowledge-sharing behavior. There is also a significant difference between the amounts of information shared by each group; Participants who received targeted messages about behavioral and normative beliefs shared more information.

Duh et al. (2020) examine the effect of knowledge sharing in audit firms on audit quality and efficiency. We analyze data from a survey of audit professionals from 22 audit firms in Taiwan matched to publicly available data on individual audits conducted by those firms. The results indicate that knowledge sharing within an audit firm is positively associated with audit quality as manifested in lower absolute discretionary accruals and more unfavorable audit opinions. Moreover, The results show that knowledge sharing within audit firms is associated with higher audit efficiency as represented by shorter audit lags. More importantly, they find that higher audit quality and audit efficiency are simultaneously associated with higher levels of knowledge sharing, suggesting that effective knowledge sharing may help improve both audit quality and audit efficiency.

Sohrabi et al. (2021) examined individual factors affecting organizational knowledge sharing. Findings show that in a 95% confidence level, individual factors significantly affect knowledge sharing from the individual and can explain up to 0.487 the changes in knowledge sharing. The heterogeneity test shows that there is heterogeneity between the studies. According to the research findings, among the individual factors affecting the sharing of organizational knowledge, self-awareness with 0.638, altruism with 0.517, attitude with 0.507, and focused behavior with 0.609 have the highest effect size and significant relationship with organizational knowledge sharing.

Kajavi and Kermani (2021) showed that extroversion, agreeableness, and conscientiousness positively and significantly affect the staff knowledge-sharing process in audit firms. Still, there was no significant relationship between openness to experience and the staff knowledge-sharing process.

Nasirpour et al. (2023) present a model for audit quality based on spirituality and the moral atmosphere in Iran. The obtained results show that personal dimensions, including (character, motivation, and piety); organizational dimensions (sociability and organizational commitment); psychological dimensions (spirituality in the workplace, moral atmosphere of the organization,

psychological health of the workplace, job satisfaction, and personality type), and leadership dimensions (leadership style, spiritual leadership) have the highest impact on the audit quality based on spirituality and moral atmosphere in the Iranian workplace respectively.

Khodabakhshian Naen et al. (2022) investigate the personality traits affecting the financial reporting of managers and companies listed on the Tehran Stock Exchange. The results show that personality traits significantly affect the financial reporting of managers and companies listed on the Tehran Stock Exchange. Thus, investors and the board of directors of companies are advised to consider the person or persons in question' personality traits and components of financial intelligence at an acceptable level when selecting financial managers.

Arad et al. (2022) investigate the effect of audit commercialization on auditors' subjective well-being in auditing firms of the Iranian Association of Certified Public Accountants. The results show that all components of commercialization (market-oriented, customer-oriented, and process-oriented) of audit firms have a significant and positive effect on the subjective well-being of auditors. Also, the size of the auditing firm (Category A auditing firms) and the gender of the auditor have a positive moderating role on the relationship between commercialization and subjective well-being. This moderating effect reflects the higher psychological well-being of large audit firms and evaluates the gender factor as a positive component.

Albawwat (2022) examines the influence of tacit knowledge sharing on audit quality inputs within small firms. It also investigated auditors' social capital antecedent effect via tacit knowledge sharing on audit quality inputs. The results indicate that implicit knowledge sharing influences the auditors' values, ethics, attitudes, experiences, skills, and knowledge (i.e. audit quality inputs). This finding implies that active tacit knowledge sharing within a small audit firm is a strong driver for audit quality through improving its inputs. The results demonstrate that tacit knowledge sharing indirectly affects audit quality inputs through structural, relational, and cognitive social capital. Accordingly, social capital can be considered an audit firm resource that can smooth auditors' tacit knowledge-sharing progress.

3. Research Methodology

The current quantitative research is placed in the demonstrability research group and the descriptive studies category. The research method is a descriptive survey and uses a questionnaire to collect information. The research hypotheses were tested using the structural equation method and SmartPLS software.

3.1 Research hypotheses

H1: Occupational attitude has a significant effect on knowledge sharing.

H2: Mental well-being has a significant effect on occupational attitudes.

H3: Mental well-being has a significant effect on knowledge sharing.

H4: Occupational attitudes mediate the relationship between mental well-being and knowledge sharing.

3.2 Research model

According to the theoretical concepts and literature review, the conceptual model of the research (Figure 1) is presented.

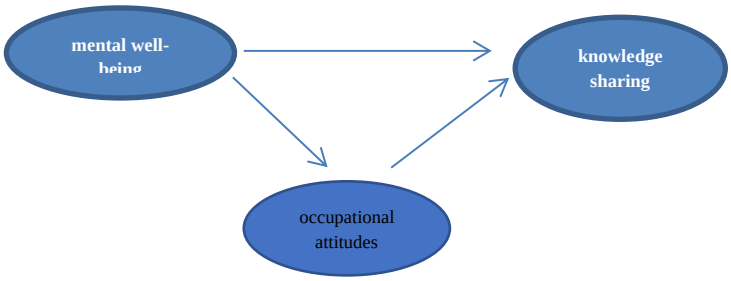

Figure1. The model of research

3.3 Research variables

Occupational Attitude: According to Azimi et al. (2018), the dimensions of human factors (6 items), occupational factors (6 items), and environmental factors (8 items) were used to measure job attitude.

Knowledge-sharing: For the behavior of knowledge sharing, using the study of Hou et al. (2009), the dimensions of sharing best practices (best practices), sharing errors and mistakes, and promoting ideas are used.

Mental well-being: The Keyes and Magyar-Moe (2003) questionnaire measures mental well-being. Dimensions include emotional, psychological and social dimensions.

3.4 Statistical population and sample

The statistical population in this research is auditors working in auditing organizations and auditing institutions are members of the Official Accountants' Society in Iran. Given that the statistical population in this research is unlimited, according to Cochran's formula, the number of statistical samples should be around 384 participants.

A simple random method was used to select the sample, and the questionnaires were sent electronically through social networks and also by attending audit institutions among the members. 420 participants participated and completed the questionnaire. Finally, data analysis was done on 357 questionnaires because some answers were missing, incomplete, or distorted.

3.5 Description of demographic variables

Before performing any analysis and interpretation, the demographic variables of the people in the statistical sample were investigated using frequency tables and graphs. The frequency of the respondents based on gender, age, level of education and work experience are analyzed in Table 1.

Table 1. Frequency distribution

Feature	Answer	Frequency	Relative frequency percentage
Gender	Male	216	60.5
	Female	141	39.5
Age	30 years and less	32	9
	31 to 40 years	105	29.4
	41 to 50 years	143	40.1
	More than 50 years	77	21.6
Level of Education	Expertise and less	80	22.4
	master degree	261	73.1
	Ph.D.	16	4.5
Job experience	1-10 years	120	33.6
	11-15 years	106	29.7
	More than 15 years	131	36.7

As seen in the above table, among the 357 respondents, 216 (60.5%) are male, and 141 (39.5%) are female. 32 participants (9 percent) are under 30 years old, 105 participants (29.4 percent) are between 31 and 40 years old, 143 participants (40.1 percent) are between 41 and 50 years old, and 77 participants (21.6 percent) are more than 50 years old. The education of 22.4% is at the expert level and below, and the education of 73.1% is at the master's level. Also, 4.5% of people have doctorate degrees. The frequency distribution of the respondents' work experience shows that the highest frequency is related to the category of more than 15 years, constituting 36.7% of the total frequency. Then the category of 11 to 15 years is in the second place with a frequency of 29.7%.

4. Research Findings

4.1 Reliability and convergent validity

Cronbach's alpha and composite reliability coefficients are criteria for checking the internal consistency between observable variables in a measurement model. Internal consistency indicates the degree of correlation between a variable and its related items. The acceptable criterion for Cronbach's alpha coefficient and composite reliability coefficient, which will indicate the reliability of the measurement model, is a minimum value of 0.7.

Table 2. The standard model and reliability

Variable	Cronbach's alpha coefficient (Alpha >0.7)	Composite reliability coefficient (CR>0.7)	Average variance extracted (AVE>0. 5)
Occupational attitudes	0.905	0.918	0.616
human factors	0.818	0.869	0.527
Occupational factors	0.908	0.929	0.686
Environmental factors	0.906	0.922	0.597
Mental well-being	0.962	0.964	0.680
Emotional well-being	0.944	0.952	0.624
Psychological well-being	0.948	0.954	0.536
Social welfare	0.932	0.940	0.512
Knowledge sharing	0.904	0.919	0.743
Sharing the best working methods	0.855	0.902	0.696
sharing errors and mistakes	0.815	0.878	0.643
Promote the idea	0.807	0.874	0.634

Convergent validity measures the extent to which the underlying variable is explained by the observable variables, measured by the average variance extracted (AVE) criterion. In other words, this index shows the degree of correlation of a structure with its representative objects. A minimum value of 0.5 is considered for this index. The results are presented in Table 2.

As seen in the above table, the values of Cronbach's alpha coefficient of all research variables are more than 0.7, and the appropriateness of reliability is confirmed with this index. The values of the combined reliability coefficient of all the studied variables are more than 0.7, and once again, it demonstrates the appropriateness of the reliability of the variables. Also, the mean of the extracted variance of the variables is more than 0.5, and the suitability of convergent validity with this index is also confirmed.

4.2 Divergent validity (Fornell and Larcker method)

Table 3 presents the results of divergent validity using Fornell and Larcker's method to investigate divergent validity in the measurement model.

Table 3. Fornell-Larcker matrix results

First order variables	Human factors	Occupational factors	Environmental factors	Emotional well-being	Psychological well-being	Social welfare	Sharing the best working methods	Sharing errors and mistakes	Promote the idea
Human factors	0.726								
Occupational factors	0.539	0.828							
Environmental factors	0.265	0.474	0.772						
Emotional well-being	0.382	0.370	0.388	0.790					
Psychological well-being	0.355	0.429	0.477	0.450	0.732				
Social welfare	0.428	0.476	0.443	0.577	0.547	0.716			
Sharing the best working methods	0.553	0.546	0.507	0.423	0.483	0.551	0.834		
sharing errors and mistakes	0.590	0.566	0.585	0.479	0.540	0.587	0.652	0.802	
Promote the idea	0.491	0.546	0.496	0.417	0.497	0.477	0.483	0.707	0.796

The above table shows the results of Fornell and Larcker's method for investigating divergent validity. The AVE root of each variable is located in the main diameter, and the correlation values of the variables are located under the main diameter. This method needs to confirm the divergent validity because the main diameter is greater than the following values, which happened in this research. Fornell and Larcker's method confirms the divergent validity.

4.3 Review of the structural model

A structural model is a model that examines the relationship between hidden variables. Figure 3 shows the conceptual model of the research in the case of standardized path coefficients.

The diagram below shows the conceptual model of research in the case of standardized path coefficients.

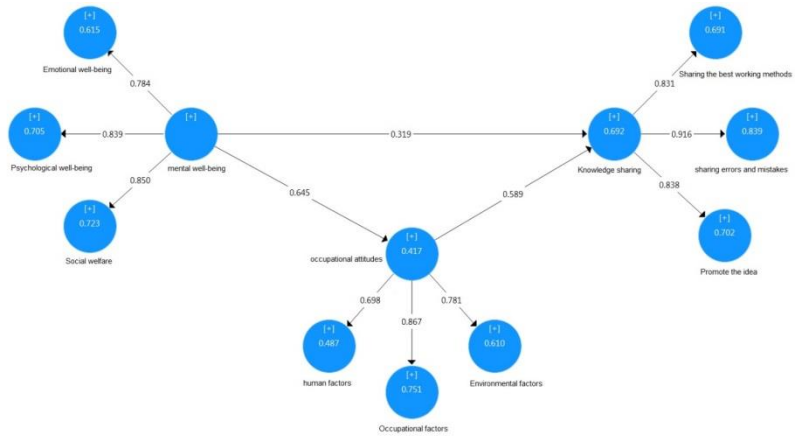

Figure 2. Path coefficients (Source: PLS-SEM)

The diagram below shows the conceptual model of the research in each state of the significant coefficients of T.

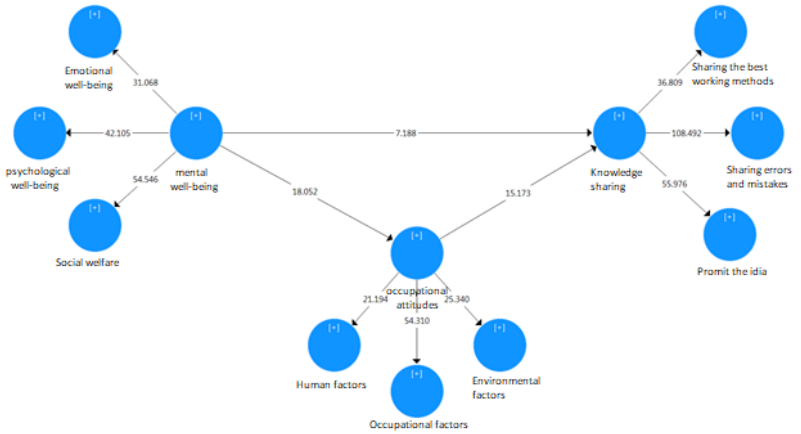

Figure 3. T-value (Source: PLS-SEM)

The first criterion of examining the structural model is the significant t coefficients between the underlying variables. That relationship or hypothesis is confirmed if the obtained value is more than 1.96. As shown in Table 4, the value of the t statistic and path coefficient between job attitude and knowledge sharing are 15.173 and 0.589, respectively (β=0.589, t=15.173>1.96, P<0.05). Considering that the significance value (t-value) is greater than 1.96 and the significance level (0.00) is less than 0.05. It can be concluded that this path coefficient is significant at the error level of 0.05; that is, job attitude has a positive and significant effect on knowledge sharing.

Table 4. The results of the path coefficient test

Path: Independent variable – dependent variable	Path coefficient	Std. dev.	T-value	p-value	R^2	Q^2
Occupational attitudes → Knowledge sharing	0.589	0.039	15.713	0.000	0.455	0.174
Mental well-being → occupational attitudes	0.645	0.036	18.052	0.000	0.415	0.152
Mental well-being → sharing knowledge	0.319	0.044	7.188	0.000	0.619	0.334

As a result, the first hypothesis of the research that there is an effect of job attitude on knowledge sharing is confirmed.

The findings show that the t-statistic and path coefficient value between mental well-being and occupational attitudes equals 18.052 and 0.645, respectively (β=0.645, t=18.052>1.96, P<0.05). Considering that the significance value (t-value) is greater than 1.96 and the significance level (0.00) is less than 0.05, It can be concluded that this path coefficient is significant at the error level of 0.05; That is, mental well-being has a positive and significant effect on occupational attitudes. Therefore, the research's second hypothesis that mental well-being affects occupational attitudes is confirmed. Also, the results show that the t-statistic and the path coefficient between mental well-being and knowledge sharing are 7.188 and 0.319, respectively (β=0.319, t=7.188>1.96, P<0.05). Considering that the significance value (t-value) is greater than 1.96 and the significance level (0.00) is less than 0.05, It can be concluded that this path coefficient is significant at the error level of 0.05; That is, mental well-being has a positive and significant effect on knowledge sharing. Therefore, the research's third hypothesis that mental well-being affects knowledge sharing is confirmed.

The fourth hypothesis of the research has been examined using the Sobel test. Considering that the value of the Sobel statistic is equal to 11.13 and more than 1.96, and the significance level of the test is lower than the error level of 0.05 at the 95% confidence level, the mediating effect of occupational attitudes in the relationship between mental well-being and knowledge sharing can be confirmed once again. The indirect effect of mental well-being on knowledge sharing is estimated at 0.379. The VAF index shows that 54.2% of the effect of mental well-being on knowledge sharing is applied through occupational attitudes.

Table 5. Sobel test results

Sobel test value	Significance level	The effect of mental well-being on knowledge sharing.			VAF	Test result
		Direct effect	Indirect effect	Total effect		
11.130	0.000	0.319	0.379	0.698	0.542	Confirmed

4.4 The goodness of fit the model

The structural model of this study is a reflective model, thus was assessed via coefficient of determination (R2), blindfolding-based cross-validated redundancy (predictive relevance, Q2), statistical significance and relevance of path coefficient as suggested by Hair et al. (2019). the coefficient of determination related to the endogenous (dependent) variables in the model indicates the effect of an exogenous variable on an endogenous variable, where three values of 0.19, 0.33 and 0.67 are considered as the criterion value for weak, medium and strong values of the coefficient of determination. The results of Table 5 show that the independent variables can explain the variance of the dependent variables. Another criterion for examining the structural model is Q^2. This standard specifies the predictive power of the model independent variables. Three values of 0.02, 0.15 and 0.35 are low, medium and strong predictive power. The findings of Table 5 show that the index Q^2 is optimal. Therefore, it can be concluded that the model's ability to predict endogenous variables is at a favorable and acceptable level. There is an index called GOF to evaluate the fit of the whole model. This test determines the overall quality of measurement and structural models. The formula for calculating the GOF index is as follows.

$$GOF = \sqrt{\overline{Communalities} \times \overline{R^2}} = \sqrt{0.455 \times 0.657} = 0.546$$

The higher the value of this index, the higher the fit of the model, and the closer it is to zero, the lower the model's fit. Given Wetzels et al. (2009) Introduced three values of 0.01, 0.25 and 0.36 as weak, medium and strong model fit, the research model is at a favorable and acceptable level.

5. Discussion and Conclusion

Awareness of attitudes enables a person to predict behaviors to a large extent. Many factors cause behaviors and various conditions and situations are effective in their formation. All these factors and conditions direct the behavior in the contexts compatible with the attitudes, and with the passage of time and the continuity of some primitive conflicts, which usually occur between the two, give way to adaptation and healing. On the other hand, mental well-being provides a suitable platform for progress to achieve goals, promote people in their altruistic participation in the work environment, and increase productivity. This research investigates the relationship between mental well-being and knowledge sharing in auditors with a mediating role of occupational attitudes. The research results showed that occupational attitudes positively and significantly affect willingness to share knowledge with independent auditors. The role of internal motivation in people and its effect on knowledge sharing shows that any manager's action that improves employees' attitudes will increase the organization's effectiveness. Knowledge sharing among audit team members can create significant learning and training resources and is a powerful mechanism for improving the audit firm's performance. Therefore, senior auditors are advised to increase employee trust so that people do not fear losing their unique value and confidently share their knowledge and learning with their colleagues. These findings are consistent with the results of Alvani and Lorestani's (2015) studies. The research results showed that mental well-being positively and significantly affects occupational attitudes and shared knowledge in independent auditors. Mental well-being is a positive judgment of life and feeling good. A person with high mental well-being experiences frequent life satisfaction and pleasure and rarely experiences negative emotions such as sadness or anger. People with a higher level of mental well-being feel more secure; They make decisions more easily and have a more cooperative spirit. These findings are consistent with Maarif and Sharifi's (2021) and Kim's (2021) studies. Senior auditors need to feel happier with members by increasing the sense of cooperation and organizational support so that occupational attitudes improve and they align their goals with the audit team’s goals and share their knowledge for the audit profession's success.

Also, the findings showed that the mental well-being of auditors increases the willingness to share knowledge with independent auditors through improving occupational attitudes. People's desire to engage in cooperative behaviors is influenced by their attitudes and mental norms regarding this action. People with positive attitudes toward life have a more collaborative spirit and are more willing to share knowledge. Considering the high turnover of employees in auditing institutions, it is recommended to promote the importance of sharing knowledge and creating a positive attitude towards it. Besides, holding training workshops and establishing an organizational atmosphere based on friendly relations and trust can improve mental and professional attitudes in auditing institutions so that knowledge-sharing behavior can be improved and increased. Also, institutions should increase the level of access and knowledge sharing by using appropriate information systems. Considering the importance of knowledge management and sharing in top audit institutions, it is recommended to future researchers that organisational barriers to knowledge sharing in independent auditors should be identified, and strategies to improve it should be identified. Moreover, the impact of auditors' personality characteristics on the willingness to share knowledge should be analyzed and investigated.

References

1. Akram, T., Lei, S., Hussain, S. T., Haider, M. J., & Akram, M. W. (2016). Does relational leadership generate organizational social capital? A case of exploring the effect of relational leadership on organizational social capital in China. *Future Business Journal*, 2(2), pp. 116-126. https://doi.org/10.1016/j.fbj.2016.06.001
2. Albawwat, I.E. (2022).Tacit knowledge sharing in small audit firms and audit quality inputs: the antecedent effect of auditors' social capital. *Journal of Knowledge Management*. 26(9): pp. 2333-2353. https://doi.org/10.1108/JKM-02-2021-0113
3. Alvani, S. M., & Lorestani, E. (2015). Study of Job Attitude Effect on Knowledge Sharing with Regard to Organizational Citizenship Behavior in Ghvamin Bank. *Journal of Development & Evolution Management*, 7(20), 1-10. (In Persian)
4. Arad, H., Moshashaee, S. M., & Bayanfar, F. (2022). Audit Commercialization and Auditors' Subjective Wellbeing: An Analysis of the Iranian Audit Environment. *Accounting and Auditing Review*, 29(1), 1-25. (In Persian) https://doi.org 10.22059/acctgrev.2022.323790.1008555
5. Azimi, H., Gudarzi, G., Ansari, M. I., Piraish, R. and Abdi Zarin, S. (2018). Designing a questionnaire to measure the occupational and organizational attitude of government employees; Case study: 80 government organizations in the center of Zanjan province. *Strategic Management Thought*. 5(1). pp. 169-200. (In Persian) https://doi.org 10.30497/smt.2011.154
6. Buka, M. (2005). *The job attitude differences among public and private school teachers in Albania*, Master's thesis, Middle East Technical University, Çankaya/Ankara, Türkiye
7. Cohen, W. M., & Levinthal, D. A. (1990). Absorptive Capacity: A New Perspective on Learning and Innovation. *Administrative Science Quarterly*, 35(1), pp. 128-152. https://doi.org/10.2307/2393553
8. Curtis, M.B. and Taylor, E.Z. (2018). Developmental mentoring, affective organizational commitment, and knowledge sharing in public accounting firms, *Journal of Knowledge Management*, 22(1), pp. 142-161. https://doi.org/10.1108/JKM-03-2017-0097
9. Diener, E., & Biswas-Diener, R. (2003). Findings on subjective well-being and their implications for empowerment. In Workshop on "Measuring Empowerment: Cross-Disciplinary Perspectives", *World Bank, Washington DC*. https://doi.org/10.1002/9780470939338.ch40
10. Duh, R.R., Knechel, W.R. and Lin, C.C. (2020). The Effects of Audit Firms' Knowledge Sharing on Audit Quality and Efficiency . *Auditing: A Journal of Practice & Theory*, 39(2), pp. 51-79. https://doi.org/10.2308/ajpt-52597
11. Galinha, I. C., & Pais-Ribeiro, J. L. (2012). Cognitive, affective and contextual predictors of subjective well-being. *International Journal of Wellbeing*, 2(1), pp. 34-34. https://dx.doi.org/10.5502/ijw.v2i1.3
12. Gholipour, A., Pourezzat, A. A., & mohammadi, F. (2011). Explanation of Intra organizational and Extra organizational Construction of Organizational Identity in Public Organizations. *Journal of Public Administration*, 3(7), pp. 149-166. (In Persian) https://doi.org 20.1001.1.20085877.1390.3.7.9.0
13. Gupta, B., Dasgupta, S., Gupta, A., (2008). Adoption of ICT in a government organization in a developing country: An empirical study. *Journal of Strategic Information Systems*, 17(2), pp. 140–154. https://doi.org/10.1016/j.jsis.2007.12.004
14. Hair, J.F., Risher, J.J., Sarstedt, M. and Ringle, C.M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, 31(1), pp. 2-24.

https://doi.org/10.1108/EBR-11-2018-0203
15. Hou, H. T., Sung, Y. T., & Chang, K. E. (2009). Exploring the behavioral patterns of an online knowledge-sharing discussion activity among teachers with problem-solving strategy. *Teaching and Teacher Education*, 25(1), pp. 101-108. https://doi.org/10.1016/j.tate.2008.07.006
16. Huang, S. M., Wei, C. W., Yu, P. T., & Kuo, T.Y. (2004). An empirical investigation on learners' acceptance of e-learning for public unemployment vocational training. *International Journal of Innovation and Learning*, 3(2), pp. 174-185. https://doi.org/10.1504/IJIL.2006.008419
17. Huber, G. P. (1991). Organizational learning: The contributing processes and the literatures. *Organization Science*, 2(1), pp. 88-115. https://doi.org/10.1287/orsc.2.1.88
18. Kajavi,S.A & kermani. A.(2021). Personality Traits Affecting Knowledge Sharing in Audit Firms with Structural Equation Approach. *Financial Accounting and Auditing Research*, 13(50), pp. 1-32. (In Persian)
19. Keyes, C. L. M, & Magyar-Moe, J. L. (2003). The measurement and utility of adult subjective well-being. Washington DC: American Psychological Association, Washington, pp. 411-425. https://doi.org/10.1037/10612-026
20. Khodabakhshian Naeni, M., Arab Salehi, M., Khoshakhlagh, H., & Jamshidian, A. (2022). The Impact of Psychological Dimensions of Financial Managers on Financial Reporting Quality. *Iranian Journal of Accounting, Auditing and Finance*, 6(1), pp. 67-75. (In Persian) https://doi.org 10.22067/ijaaf.2022.41542
21. Kim, B. P. (2010). Work family conflict and its job consequences: From attitudes to behaviors to the bottom-line, (Doctoral dissertation, Virginia Tech). Blacksburg, United States
22. Kim, C. Y. (2021). Psychological well-being, knowledge management behavior and performance: the moderating role of leader-member exchange. *Frontiers in Psychology*, 12(2021), PP. 566516. https://doi.org/10.3389/fpsyg.2021.566516
23. Maarif, F. & Sharifi, A.N. (2022). The effect of subjective well-being on motivation at work with the mediating role of perceived organizational support. *Journal of the Faculty of Health and Health Research Institute*. 19(1), pp. 113-122. (In Persian)
24. Mirasadullah Lajrod, L, Alipour Darvish, Z. (2014). Organizational Factors Affecting Knowledge Sharing Within Group (Case Study: Offices of the Central Building of BSI). *Educational Research Journal*. 1(29), pp. 62-78. (In Persian)
25. Monnot, M. J., & Beehr, T. A. (2014). Subjective well-being at work: Disentangling source effects of stress and support on enthusiasm, contentment, and meaningfulness. *Journal of Vocational Behavior*, 85(2), pp. 204-218. https://doi.org/ 10.1016/j.jvb.2014.07.005
26. Moshashaei, S. M., Hashemi, S. A., & Foroughi, D. (2018). The Effect of Auditors' Individual Differences on Their Professional Commitment: the Mediation Effect of Ethical Climate Fit. *Accounting and Auditing Review*, 25(3), pp. 415-432. (In Persian) https://doi.org/10.22059/acctgrev.2018.260636.1007921
27. Nasirpour, A., Jabbarzadeh Kangarloie, S., Bahri Sales, J., & Badavar Nahandi, Y. (2023). Audit Quality Model Based on Moral Atmosphere and Spirituality in Iran. *Iranian Journal of Accounting, Auditing and Finance*, 7(2), pp. 61-81. (In Persian) https://doi.org/ 10.22067/ijaaf.2023.42476.1144
28. Nikzad Ghadikolaee, M., Foroghi, D., & Amiri, H. (2020). The Effect of Behavioral Interventions on Auditors' Knowledge-Sharing Behavior: Examining the Mediating Role of Attitudes and Normative Beliefs. *Accounting and Auditing Review*, 27(3), pp. 429-453. (In Persian) https://doi.org/10.22059/acctgrev.2020.301925.1008374

29. Rodgers, W., Mubako, G. N., & Hall, L. (2017). Knowledge management: The effect of knowledge transfer on professional skepticism in audit engagement planning. *Computers in Human Behavior*, 70, pp. 564-574. https://doi.org/10.1016/j.chb.2016.12.069
30. Sohrabi, A., Yazdkhasty, A., & Sadeqi-arani, Z. (2021). The effect of individual factors on knowledge sharing in the organization: Meta-analysis of Iranian studies. *Scientific Journal of Strategic Management of Organizational Knowledge*, 3(11), pp. 1-44. (In Persian) https://doi.org/10.22091/stim.2020.6173.1471
31. Talebkhah, Z. (2020). The Relationship between Auditors Stress with Audit Quality and Internal Control Weakness. *Iranian Journal of Accounting, Auditing and Finance*, 4(1), pp. 99-112. (In Persian) https://doi.org/10.22067/ijaaf.2020.63059
32. Van den Hooff, B., & de Leeuw van Weenen, F. (2004). Committed to share: commitment and CMC use as antecedents of knowledge sharing. *Knowledge and Process Management*, 11(1), pp. 13-24. https://doi.org/10.1108/JKM-03-2018-0199
33. Vera-Mun˜ oz, S. C., Ho, J. L., & Chow, C. W. (2006). Enhancing knowledge sharing in public accounting firms. *Accounting Horizons*, 20(2), pp. 133-155. https://doi.org/10.2308/acch.2006.20.2.133
34. Wang, S., & Noe, R. A. (2010). Knowledge sharing: A review and directions for future research. *Human Resource Management Review*, 20(2), pp. 115-131. https://doi.org/10.1016/j.hrmr.2009.10.001
35. Wetzels, M., Odekerken-Schröder, G., & Van Oppen, C. (2009). Using PLS path modeling for assessing hierarchical construct models: Guidelines and empirical illustration. *MIS Quarterly*, 33(1), pp. 177-195. https://doi.org/10.2307/20650284

IJAAF; Vol. 7, No. 4, Autumn 2023, Serial 25

Ferdowsi University of Mashhad

Iranian Journal of
Accounting, Auditing & Finance

Quarterly

RESEARCH ARTICLE

Individual Differences in Investor Decision-making: Examining Representativeness Heuristics and Cognitive Reflection

Ruhollah Amareh, Esfandiar Malekian*, Hossien Fakhari

Department of Accounting, Faculty of Economics and Administrative Sciences, University of Mazandaran, Babolsar, Iran

How to cite this article:
Amareh, R., Malekian, E., & Fakhari, H. (2023). Individual Differences in Investor Decision-making: Examining Representativeness Heuristics and Cognitive Reflection. Iranian Journal of Accounting, Auditing and Finance, 7(4), 109-121. doi: 10.22067/ijaaf.2023.43844.1310
https://ijaaf.um.ac.ir/article_43844.html

ARTICLE INFO

Article History
Received: 2023-05-20
Accepted: 2023-06-23
Published online: 2023-10-15

Keywords:
Representativeness Heuristic and Conjunction Fallacy, Gambler's Fallacy and Stereotypes, and CRT

Abstract

Due to limited cognitive resources, investors often utilize mental shortcuts to make quick judgments. This study examines the impact of representativeness heuristics (Conjunction Fallacy, Gambler's Fallacy, and Stereotypes) and the Cognitive Reflection Test (CRT) on investor decision-making. The population of this study consists of a sample of investors in the Tehran Stock Exchange. The study employs a Chi-Square test (χ^2) to explore the relationship between heuristics and CRT, along with T-tests, one-way ANOVA, and correlation analyses to identify individual differences. Results indicate that proper utilization of cognitive resources can partially prevent the Conjunction Fallacy from occurring. Moreover, investors tend to consider the high probability of consecutive results for an event regardless of cognitive resource usage. Interestingly, this study also found that investors with lower CRT scores made decisions less influenced by stereotypes. We conclude that reducing the impact of representativeness heuristics can be achieved through knowledge and experience gained from similar situations and appropriately utilizing cognitive resources.

https://doi.org/10.22067/ijaaf.2023.43844.1310

NUMBER OF REFERENCES
43

NUMBER OF FIGURES
-

NUMBER OF TABLES
10

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

*Corresponding Author: Esfandiar Malekian
Email: e.malekian@umz.ac.ir
Tel: 09111124020
ORCID:

1. Introduction

In the face of uncertainty, people look for familiar patterns and use the representativeness heuristic to determine the probability of events occurring (Kahneman and Tversky, 1972). The heuristic representativeness theory stresses the importance of specific developments, reports, or statements without giving them careful attention (Fromlet, 2001). Objects are compared based on similarity and then organized based on a mental prototype (causes and effects must have similar characteristics) (Gilovich and Savitsky, 2002). Consequently, people are more likely to make incorrect decisions when they utilize the heuristic of representation as a criterion for making judgments, as similarity does not increase probability (Kahneman and Tversky, 1983). As a result, people rely on their mental abilities to accurately predict the likelihood of an event. This case may lead to ignoring reality or creating other cognitive biases (Fortune and Goodie, 2012).

Generally, the representativeness heuristic is a mental shortcut for estimating probabilities. Our decision to assess an event's likelihood is often based on its similarity to a mental prototype we already possess. Our tendency to rely on representations can result in errors as we overlook other information. Cognitive biases, such as the conjunction fallacy and gambler's fallacy, may explain this phenomenon. Individuals' ability to adhere to cognitive skills when making decisions is influenced by their thinking tendencies (Cokely and Kelley, 2009; Frederick, 2005; Oechssler et al., 2009; Parker and Fischhoff, 2005; Peters and Levin, 2008; Stanovich and West, 1998, 1999, 2000; Peters and Levin, 2008).

According to the theoretical literature in this field (Heckman et al., 2006), individuals with higher cognitive abilities make better decisions. Additionally, individuals with higher cognitive skills are more likely to analyze situations and take fewer risks (Shamosh and Gray, 2008; Frederick, 2005). As an essential component of judging and decision-making, cognitive ability has a significant relationship with behavioral biases (Campitelli and Labollita, 2010; Toplak et al., 2011) and individual utilitarian ethics (Paxton et al., 2012), Supernatural Issues and Theology (Gervais and Norenzayan, 2012; Pennycook et al., 2012), Individual performance (Dilchert et al., 2007; Finn and Hall, 2004; McGloin and Pratt, 2003; Engle et al., 1999), labor market participation (Kirsch, 1993), job success (Murray and Herrnstein, 1994), and individuals' income (Griliches, 1979; Griliches and Mason, 1972).

In addition to predicting people's reasoning, judgment, and decision-making abilities as well as what they believe, the reflective theory is considered an essential measure of cognitive skills (Pennycook et al., 2015a; Oechssler et al., 2009; Campitelli and Labollita, 2010; Hoppe and Kusterer, 2011; Besedeš et al., 2012; Moritz et al., 2013). Based on Frederick's (2005) description, the reflexive test is a valuable tool for analyzing individual differences in thinking, judgment, and decision-making. Individuals approach issues and decisions differently in their thinking, and these differences have a variety of consequences daily (Pennycook et al., 2015b). A cognitive reflection test is most commonly used for assessing individual differences in performance in this area (Frederick, 2005).

As with other cognitive and heuristic biases, we rely on representation to make sense of our limited cognitive resources. Our brains are designed to process thousands of decisions daily while conserving energy. Often, we rely on shortcuts when making quick judgments about the world—however, the heuristic of representativeness results from how we perceive people and things. Because categorization is fundamental to understanding the world, it is difficult to avoid the representativeness heuristic altogether.

The first step in correcting this problem is to be aware of it. The research results have shown that people often revise their judgments when informed that they use a heuristic. Several researchers have attempted to reduce the effects of representational detection by encouraging individuals to "think like statisticians." These movements improve people's ability to think in judgment, but the problem is that

even educated individuals do not employ their knowledge effectively. Due to this, we focus on whether people use their cognitive resources to reduce the effects of the representativeness heuristic during judgment and decision-making.

Lack of attention to decision-making and cognitive abilities by the researchers, as well as the deep research gap in behavioral finance, is something that behavioral finance research requires. As part of our contribution to behavioral financial literature, we inform researchers and investors that the representativeness heuristic cannot be avoided even with knowledge and experience. Investors will also understand that the necessity of similar situations does not increase the probability of their occurrence. In addition, this wrong mentality, which proper cognitive resources can prevent, is also eliminated. This study examines how cognitive reflection affects the representativeness heuristic among investors on the Tehran Stock Exchange. Nevertheless, we expect to present a new perspective on this research by reviewing the reflection on the representativeness heuristic.

The remainder of the paper is organized as follows. The following section discusses the related literature and outlines the main testable hypotheses. Our survey methods and data are summarized in Section 3. The main empirical results are presented in Section 4, and a brief discussion of the results is provided in Section 5.

2. Theoretical literature and development of hypotheses

Several researchers believe that representativeness heuristics underlie other heuristics and biases that influence how we process information.

Conjunction Fallacy occurs when we assume several things are more probable to occur than one thing alone. It is statistically impossible for this to be true. Another example of conjunction fallacy can be found in Tversky and Kahneman's work. According to one experiment, participants were given the following description:

Linda is 31 years old, single, outspoken, and very bright. She majored in philosophy. As a student, she was deeply concerned with discrimination and social justice issues and participated in anti-nuclear demonstrations. After reading this, Kahneman and Tversky (1981) asked people to rank several statements in order of their probability of being true. The list included the following three: "Linda is active in the feminist movement," "Linda is a bank teller," and "Linda is a bank teller who is active in the feminist movement." People believed the third option (being a bank teller and a feminist than if Linda was just a bank teller) was more likely for Linda. This stems from the representative heuristic. The fact that Linda fits people's initial image of a feminist skews their perception of possibility (Kahneman and Tversky, 1981). Although logically, we should not choose option three; we are more inclined to choose option 3. This is because Linda did the same thing as a student. Due to her particular background, Linda qualifies as a feminist. As a result, the probability of two events occurring in a sequence is always less than or equal to the possibility of each event happening separately.

Gambler's Fallacy tends to apply long-term probability to short-term events. For example, there is a fifty-fifty chance of getting a head or tail when tossing a coin. However, that does not mean that if you toss the coin twice, you will get tails once and head the next time. Generally, this probability only applies to long sequences, such as flipping a coin 100 times.

Despite that, human beings believe that short-term sequences (probabilities of outcomes occurring in the short term) should reflect long-term cues (so that the very possibility would also exist in a long time), which leads to the gambler's fallacy (Fortune and Goodie, 2012). It should be noted that this bias can have severe consequences for gamblers; for example, if someone believes that they have lost

consecutively at a gamble, their chances of winning are now more significant. The sequence of results of a decision does not indicate the likelihood that the same decision will be made in the future or vice versa.

Stereotypes: Our tendency to rely on categories can easily lead to prejudice, even when we do not realize it. Minority groups are often represented in the mass media in a way that reinforces common stereotypes about them. For example, black men are overrepresented in coverage of crime and poverty, while they are underrepresented as experts or consumers of luxury goods. According to these stereotypes, Black men are portrayed as violent and lazy, which viewers, including Black viewers, can internalize and incorporate into their concept of the exemplary black individual and proto-criminal (Donaldson, 2017). The bias can be attributed to representativeness heuristics, which contributes to discrimination. The police may disproportionately search for blacks in a crime because of representational heuristics (and stereotypes), which lead them to believe that blacks are more likely to be criminals than members of other groups (Bordalo et al., 2016).

As a result of high levels of cognitive reflection, Oechssler et al. (2009) claim that logical biases can be prevented more effectively than low levels of cognitive reflection. The correlation between cognitive reflection and decision-making (Cokely and Kelley, 2009; Frederick, 2005) is positive in high-risk choices (based on time choices). It has been shown that cognitive reflection can help predict sensitivity to cognitive biases and errors caused by inherent cognitive processes (Tversky and Kahneman, 1974; Toplak et al., 2014). Researchers have shown that individuals with high cognitive reflex scores are less susceptible (less sensitive) to biases (Toplak et al., 2011). However, these biases are accompanied by rational reasoning and deductive reasoning (biases such as confirmation bias, anchoring bias, and availability bias) (Liberali et al., 2012; Sirota et al., 2014; Toplak et al., 2011, 2014).

According to Pennycook et al. (2012), people who score higher on cognitive reflection tend to be more focused, rational, pessimistic, and less religious and hold fewer absurd beliefs. According to Campitelli and Labollita (2010), higher scores on the cognitive reflection test have been associated with better results in deciding and selecting the optimal option. When updating probabilities (mental accounting), a low score on the cognitive reflex test indicates that a variety of biases (mental accounting) may exist, including availability, risk aversion, confirmatory bias, and conservatism (Oechssler et al., 2009; Liberali et al., 2012; Achtziger et al., 2014; Frederick, 2005). Our hypotheses based on the theoretical research literature:

1. Investors who exhibit high cognitive reflection are better at preventing conjunction fallacy than those with low cognitive reflection.
2. Investing with a high level of cognitive reflection can prevent the gambler's fallacy more effectively than investing with a low level of cognitive reflection.
3. Investors who exhibit a high level of cognitive reflection are more likely to avoid stereotypes than those who show a low level of cognitive reflection.
4. Investors with high cognitive reflection are likelier to prevent representativeness heuristics than those with low cognitive reflection.

3. Research Methodology

Due to the nature of the variables and the objectives of this study, a questionnaire would be the most appropriate method for collecting data. This study aims to examine how cognitive reflection affects individuals' representativeness heuristics. The population of this study consists of a sample of

participants in the Tehran Stock Exchange, whose exact number, based on Cochran's formula, is 414 participants. Also, online and offline questionnaires were distributed in 2022. We examined individual differences using T-tests, one-way ANOVA, and correlation analyses. To determine the average difference between men and women in their responses to CRT questions, we used the two independent samples (T-test) test. A T-test only shows the difference between two independent groups of men and women. To compare the average of two or more independent groups (education and profession), you should perform a one-way analysis of variance. Furthermore, correlation coefficients were used to determine whether there was a relationship between the variables. Consequently, we decided if there was a relationship between respondents' age and the mean correct answer to CRT questions. Also, In the survey, we asked and tested four structured questions according to the theoretical foundations of representativeness bias. Further, reflective cognitive intelligence tests require participants to solve three simple math problems with incorrect intuitive and fundamental answers. According to Frederick, the test score varies due to the ease with which a person can check for wrong intuitive answers. This is because an individual can reflect upon a logical rather than an intuitive answer. There is an assumption that the correct answers must overcome the initial intuitive answer in this test, which has misleading first answers (Frederick, 2005). One needs to reflect on one's thinking to overcome the intuitive response. In this short test, a person is tested on their ability to ignore their immediate and direct answers and think more logically (Kokis et al., 2002). The questionnaire is shown in Appendix 1.

Firstly, the collected data do not have a normal distribution or a constant variance. It is common for our questions to be answered with A or B; they are nominal data. Therefore, parametric techniques are unsuitable for our case because our data cannot meet their requirements. Second, our data are consistent with these two assumptions in nonparametric procedures. Our samples are randomly selected and do not influence each other's responses and behavior. Therefore, we believe nonparametric methods are appropriate for our study. For our analysis, we divided our questions into two subsamples concerning CRT achievements. We hope to explore the relationship between these two CRT groups. We will examine whether investors in the high CRT group perform better on confirmation bias than investors in the low CRT group. For this reason, we use the Chi-square test to explore the relationship between categories, compare the observed frequencies or proportions of cases in categories, and determine whether there is a relationship between two measured variables (Pallant, 2020). Through the above explanations, we conclude that the Chi-square test is very suitable for testing the differences between our samples in this bias.

4. Result

4.1 CRT and individual differences

These statistics provide a general overview of how research data are distributed. By this, the following Table presents the percentage of responses to each of the three CRT questions and the mean scores and their standard deviations. The majority of respondents were unable to select the correct answer. The mean total correct response was 0.88, much lower than what Frederick (2005) and Oechssler et al. (2009) found in their studies.

Table 1. Mean scores CRT

CRT Questions	% Correct answers	% Wrong answers	Mean
Bat & ball	51.000	49.000	0.510
Machine	63.000	37.000	0.630
Lily pads	61.600	38.400	0.620

The following Table reports the results regarding the effects of four demographic characteristics.

An analysis of the impact was carried out using T-tests, one-way ANOVAs, and correlations.

Table 2. Mean Scores CRT by Gender

CRT Questions	Bat & ball	Machine	Lily pads	Mean
Man	0.510	0.650	0.630	1.781
Woman	0.520	0.690	0.580	1.692
t	-0.298	1.075	0.911	0.712
Sig. (2-tailed)	0.766	0.283	0.363	0.477

Based on the Prob, A two-tailed statistic greater than 0.05 for all CRT questions indicates no significant difference between men and women. As a result, the null hypothesis of this test is accepted. Therefore, men's scores in all questions are not different from women's scores. This result does not support the findings of Oechssler et al. (2009) and Stanovich and West (2000).

Table 3. Mean scores CRT by Age

CRT Questions	Bat & ball	Machine	Lily pads	Mean
More than 65 years	0.610	0.670	0.670	1.940
51-65	0.590	0.590	0.480	1.660
36-50	0.620	0.760	0.620	2.000
25-35	0.500	0.630	0.650	1.785
Less than 25 years	0.460	0.600	0.580	1.640
r	-0.092	-0.049	-0.015	-0.074
Sig.	0.061	0.317	0.762	0131

According to the correlation test, older people have higher mean scores than younger people. This is true only for the first question, and there is no relationship between age and response scores on the other CRT questions.

Table 4. Mean scores CRT by Education

CRT Questions	Bat & ball	Machine	Lily pads	Mean
Ph.D.	0.710	0.680	0.570	1.964
Masters	0.600	0.660	0.570	1.828
Bachelor	0.520	0.670	0.660	1.855
High school	0.450	0.580	0.600	1.628
F	2.786	1.280	0.666	1.545
Sig.	0.041	0.281	0.573	0.202

In light of the one-way ANOVA table results, we conclude that at least one of the study groups has different mean scores on the Bat & ball questions. Also, the analysis of the variance test cannot determine exactly which averages are different from the rest, so the average scores in the above Table should be used to detect such differences.

Table 5. Mean scores CRT by Profession

CRT Questions	Bat & ball	Machine	Lily pads	Mean
Retired	0.500	0.570	0.500	1.571
Manager, Employee	0.670	0.700	0.630	2.000
Researcher, Academic	0.510	0.660	0.600	1.771
Student or Housewife	0.490	0.610	0.630	1.730
F	1.091	0.567	0.352	0.627
Sig.	0.353	0.637	0.787	0.598

According to the results, the mean score for this question increases as the level of education increases. However, in the following two questions, the mean of all educational levels remains the same.

Based on the one-way variance analysis table results, we conclude that the mean scores for all CRT questions are not significantly different. There is no difference between people's jobs and their scores on cognitive reflection tests. Also, based on the results of Frederik's test (0 correct answers belong to the low CRT group; 1 and 2 correct answers belong to the medium CRT group: 3 correct answers belong to the high CRT group), the percentage of correct answers and intelligence of people based on these levels was measured in the Table below.

Table 6. % Correct answers for CRT groups

CRT	Frequency	Percent	Valid Percent	Cumulative Percent
low	79.000	19.100	19.100	19.100
1	95.000	22.900	22.900	42.000
2	88.000	21.300	21.300	63.300
high	152	36.700	36.700	100.000
Total	414	100.000	100.000	

4.2. CRT and types of the representativeness heuristic

The following tables show the results of the low and high CRT groups for each type of representativeness heuristic. The reported value is the percentage of patients who chose the patient option or the mean response. The subscripts indicate the total number of respondents in the low and high CRT groups who answered the item. A chi-square test (for dichotomous responses) is used to determine the level of statistical significance of group differences. In the rightmost column, the p-values indicate the level of statistical significance.

Table 7. CRT and the conjunction fallacy

Item	CRT Score		Chi-square value (χ^2)	P-value	Phi
	"Low"	"High"			
Sarah loves Apple products and is also active in the stock market; which one is possible? 1) Sara is an analyst in the stock market. 2) Sara is an analyst in the stock market and has shares of Apple in her stock portfolio.	60.8% $_{48}$	45.4% $_{69}$	6.989	0.072	0.130

The basis of this question is the fallacy of correlation, which occurs when we assume that several things are more likely to occur than one thing alone. It is statistically impossible for this to be true. According to the results of Table 7, the significance of the Chi-square value (6.989) indicates a significant relationship between the two variables CRT and the conjunction fallacy. Since the chi-score test cannot detect the intensity of a relationship, we use the Phi coefficient to determine the relationship's strength when each row and column variable has only one (yes) value. In this case, as well as according to Cohen's W table, this relationship has a weak effect.

Table 8. CRT and the gambler's fallacy

Item	CRT Score		Chi-square value (χ^2)	P-value	Phi
	"Low"	"High"			
The Real Madrid football team in 2022 has never lost in all their past games (12 games). How do you evaluate the result of this team's next match with Rayo Vallecano? Win or Draw Loss	48.1% 38	53.3%81	8.021	0.046	0.139

The gambler's fallacy is another bias caused by the representativeness heuristic, which causes people to apply long-term probabilities to short-term sequences. The likelihood of Real Madrid winning consecutive matches does not increase due to successive victories. Based on the results of Table 8, as indicated by the significance of the Chi-square value (χ^2) (8.021), we can conclude a significant relationship between the two variables CRT and the gambler's fallacy. In the context of Cohen's W table, we can say that this relationship has a weak effect.

Table 9. CRT and the stereotypes

Item	CRT Score		Chi-square value (χ^2)	P-value	Phi
	"Low"	"High"			
Do you think the owl is wise? • YES • NO	40.3% 34	59.9% 91	6.823	0.078	0.128

Our reliance on groups can easily lead to prejudice, even if we are unaware. As the wise animal of the forest, the owl frequently appears in children's stories. These beliefs have their origins in the mythologies of ancient Greece and Rome. According to Western cultures, the legend of the wise owl began with Athena, the Greek goddess of wisdom, who is often depicted holding an owl in her hand. It is interesting to note that owls are considered a symbol of stupidity in Indian culture. Is it true that owls are intelligent? According to studies, despite popular belief, owls are not imaginative animals. In contrast to birds such as crows, parrots, and pigeons that can be trained, owls cannot be trained; they cannot solve problems, and they cannot associate words and phrases with objects or events. Based on Table 9, the significance of the Chi-square value (6.823) indicates a significant correlation between the two variables CRT and Stereotypes. It is clear from Cohen's W table that this relationship has a weak effect.

Table 10. CRT and the representativeness heuristic

Item	CRT Score		Chi-square value (χ^2)	P-value	Phi
	"Low"	"High"			
Imagine a person with an IQ of 200 who went to college at age 15 and graduated with honors from the University of Chicago at age 19. Also, he has studied 15 languages, is fluent in five languages worldwide, and is recognized as an ornithologist. Do you think this person is more likely to be a scientist or a murderer?	59.5%47	43.4%66	8.731	0.033	0.145

This question accurately describes a murderer genius named Nathan Leopold (November 19, 1904 - August 29, 1971) who, along with Richard Albert Loeb (June 11, 1905 - January 28, 1936), is often referred to as "Leopold and Loeb." They were privileged and wealthy students at the University of

Chicago. Attempting to commit the "perfect crime," murdered 14-year-old Robert "Bobby" Franks in 1924. In 1958, Leopold was released from prison and spent the remainder of his life in Puerto Rico. He died of heart failure in 1971. From the results in Table 10, which indicate a significant correlation between the two variables CRT and the representativeness heuristic, we can conclude a substantial relationship between them. The association, according to Cohen's W table, is weak.

5. Conclusion

We first examine the individual differences between investors regarding obtaining points for the cognitive reflection test. Furthermore, based on the results of this study, there is no significant difference in cognitive reflection between men and women. Additionally, the results of one-way ANOVA indicate that the average cognitive reflection score increases with the level of education and that people's professions do not differ in their scores. According to the correlation test results, older individuals have higher average scores than younger individuals. Due to this, we are focusing on finding the root of the representativeness heuristic and then discovering how cognitive resources can be utilized to reduce these heuristics effectively. This led us to divide the representativeness heuristics according to the relationship between events (Conjunction Fallacy), the likelihood of consecutive outcomes for an event (Gambler's Fallacy), and the indiscriminate use of stereotypes as well as a specialized examination of representativeness heuristics.

The representativeness heuristic can occur even with adequate cognitive resources and is deeply embedded in people's subjective intuition. Despite our sample mean's success in suppressing early responses, they also suffered. Therefore, due to limited cognitive resources, investors often use mental shortcuts to make quick judgments (simulating various situations and categorizing events) and willfully make mistakes in rational decision-making. Our study measured the relationship between conjunction fallacy and people's cognitive resources using Kahneman and Tversky's "Linda," which they used in their research and used as the criterion. As shown in Table (7), most people who received a higher score than CRT were less affected by this bias. This means that 55.6% of people with a high CRT score could control their initial mental responses and were not subject to this bias. Consequently, using correct cognitive resources can partially prevent this from occurring.

Also, investors consider the probability of consecutive results for an event regardless of the use of high cognitive resources so that they can obtain definitive results and avoid uncertainty in the facts of the decision by applying a mental basis based on a series of events. The same thing that gamblers have experienced many times in that situation. Table (8) shows no difference between people involved in the gambler's fallacy in their CRT scores. Thus, people with different levels of cognitive resources are equally interested in this process. As a final and most exciting result of this study, we found that people who scored low on the test (roughly 60%) were less likely to make decisions based on stereotypes. While 60% of investors with higher cognitive resources and patiently answering the questions experienced this bias, only 40% of those with low scores did.

Based on the results of Table (10), we concluded that the representativeness heuristic could be reduced by acquiring knowledge and experience in similar situations and utilizing cognitive resources appropriately. Accordingly, 57% of people who could suppress their initial mental responses and doubt the association between events, the probability of consecutive outcomes for an event, and common stereotypes were able to reach the correct answer.

References

1. Achtziger, A., Alós-Ferrer, C., Hügelschäfer, S. and Steinhauser, M. (2014). The neural basis of belief updating and rational decision making. *Social cognitive and affective neuroscience*, 9(1), pp. 55-62. https://doi.org/10.1093/scan/nss099

2. Besedeš, T., Deck, C., Sarangi, S. and Shor, M. (2012). Age effects and heuristics in decision making. *Review of Economics and Statistics*, 94(2), pp. 580-595. https://doi.org/10.1162/REST_a_00174
3. Bordalo, P., Coffman, K., Gennaioli, N. and Shleifer, A. (2016). Stereotypes. *The Quarterly Journal of Economics*, 131(4), pp. 1753-1794. https://doi.org/10.1093/qje/qjw029
4. Campitelli, G. and Labollita, M. (2010). Correlations of cognitive reflection with judgments and choices. *Judgment and Decision making*, 5(3), pp. 182-191. https://doi.org/10.1017/S1930297500001066
5. Cokely, E. T. and Kelley, C. M. (2009). Cognitive abilities and superior decision making under risk: A protocol analysis and process model evaluation. *Judgment and Decision making*, 4(1), pp. 20-33. https://doi.org/10.1017/S193029750000067X
6. Dilchert, S., Ones, D. S., Davis, R. D. and Rostow, C. D. (2007). Cognitive ability predicts objectively measured counterproductive work behaviors. *Journal of Applied Psychology*, 92(3), pp. 616. https://doi.org/10.1037/0021-9010.92.3.616
7. Donaldson, L. (2017). When the media misrepresents Black men, the effects are felt in the real world. *The Guardian*. https://www.theguardian.com/commentisfree/2015/aug/12/media-misrepresents-black-men-effects-felt-real-world
8. Engle, R. W., Tuholski, S. W., Laughlin, J. E. and Conway, A. R. (1999). Working memory, short-term memory, and general fluid intelligence: a latent-variable approach. *Journal of experimental psychology: General*, 128(3), p. 309. https://doi.org/10.1037//0096-3445.128.3.309
9. Finn, P. R. and Hall, J. (2004). Cognitive ability and risk for alcoholism: short-term memory capacity and intelligence moderate personality risk for alcohol problems. *Journal of Abnormal Psychology*, 113(4), p. 569. https://doi.org/10.1037/0021-843x.113.4.569
10. Fortune, E. E. and Goodie, A. S. (2012). Cognitive distortions as a component and treatment focus of pathological gambling: a review. Psychology of Addictive Behaviors, 26(2), p. 298. https://psycnet.apa.org/doi/10.1037/a0026422
11. Frederick, S. (2005). Cognitive reflection and decision making. *Journal of Economic Perspectives*, 19(4), pp. 25-42. https://doi.org/10.1257/089533005775196732
12. Fromlet, H. (2001). Behavioral finance theory and practical application: Systematic analysis of departures from the homo oeconomicus paradigm are essential for realistic financial research and analysis. *Business economics*, 36(3), pp. 63-69. https://www.jstor.org/stable/23488166
13. Gervais, W. M. and Norenzayan, A. (2012). Analytic thinking promotes religious disbelief. *Science*, 336(6080), pp. 493-496. https://doi.org/10.1126/science.1215647
14. Gilovich, T. and Savitsky, K. (2002). Like goes with like: The role of representativeness in erroneous and pseudo-scientific beliefs. In T. Gilovich, D. Griffin, and D. Kahneman (Eds.), *Heuristics and biases: The psychology of intuitive judgment* (pp. 617–624). Cambridge University Press. https://doi.org/10.1017/CBO9780511808098.036
15. Griliches, Z. (1979). Issues in assessing the contribution of research and development to productivity growth. *The Bell Journal of Economics*, 10(1), pp. 92-116. https://doi.org/10.2307/3003321
16. Griliches, Z. and Mason, W. M. (1972). Education, income, and ability. *Journal of Political Economy*, 80(3, Part 2), pp. S74-S103. https://doi.org/10.1086/259988
17. Heckman, J. J., Stixrud, J. and Urzua, S. (2006). The effects of cognitive and noncognitive abilities on labor market outcomes and social behavior. Journal of Labor Economics, 24(3), pp. 411-482. https://doi.org/10.1086/504455
18. Hoppe, E. I. and Kusterer, D. J. (2011). Behavioral biases and cognitive reflection. *Economics*

Letters, 110(2), pp. 97-100. https://doi.org/10.1016/j.econlet.2010.11.015
19. Kahneman, D. and Tversky, A. (1972). Subjective probability: A judgment of representativeness. Cognitive psychology, 3(3), pp. 430-454. https://doi.org/10.1016/0010-0285(72)90016-3
20. Kahneman, D. and Tversky, A. (1981). *The simulation heuristic*. Stanford Univ CA Dept of Psychology. Stanford, California. https://doi.org/10.1017/CBO9780511809477.015
21. Kahneman, D. and Tversky, A. (1983). Can irrationality be intelligently discussed. *Behavioral and Brain Sciences*, 6(3), pp. 509-510. https://doi.org/10.1017/S0140525X00017246
22. Kirsch, I. S. (1993). *Adult literacy in America: A first look at the results of the National Adult Literacy Survey*. US Government Printing Office, Superintendent of Documents, Washington, DC 20402 (Stock No. 065-000-00588-3).
23. Kokis, J. V., Macpherson, R., Toplak, M. E., West, R. F. and Stanovich, K. E. (2002). Heuristic and analytic processing: Age trends and associations with cognitive ability and cognitive styles. Journal of Experimental Child Psychology, 83(1), pp. 26-52. https://doi.org/10.1016/S0022-0965(02)00121-2
24. Liberali, J. M., Reyna, V. F., Furlan, S., Stein, L. M. and Pardo, S. T. (2012). Individual differences in numeracy and cognitive reflection, with implications for biases and fallacies in probability judgment. *Journal of behavioral decision making*, 25(4), pp. 361-381. https://doi.org/10.1002/bdm.752
25. McGloin, J. M. and Pratt, T. C. (2003). Cognitive ability and delinquent behavior among inner-city youth: A life-course analysis of main, mediating, and interaction effects. *International Journal of Offender Therapy and Comparative Criminology*, *47*(3), pp. 253-271. https://doi.org/10.1177/0306624x03047003002
26. Moritz, B. B., Hill, A. V. and Donohue, K. L. (2013). Individual differences in the newsvendor problem: Behavior and cognitive reflection. *Journal of Operations Management*, 31(1-2), pp. 72-85. https://doi.org/10.1016/j.jom.2012.11.006
27. Murray, C. and Herrnstein, R. J. (1994). Race, genes, and IQ–An apologia. *The New Republic*, 211(18), pp. 27-37. https://newrepublic.com/article/120887/race-genes-and-iq-new-republics-bell-curve-excerpt
28. Oechssler, J., Roider, A. and Schmitz, P. W. (2009). Cognitive abilities and behavioral biases. *Journal of Economic Behavior & Organization*, 72(1), pp. 147-152. https://doi.org/10.1016/j.jebo.2009.04.018
29. Pallant, J. (2020). *SPSS survival manual: A step by step guide to data analysis using IBM SPSS*. Routledge. Oxfordshire, England, UK. https://doi.org/10.4324/9781003117452
30. Parker, A. M. and Fischhoff, B. (2005). Decision-making competence: External validation through an individual-differences approach. *Journal of Behavioral Decision Making*, 18(1), pp. 1-27. https://doi.org/10.1002/bdm.481
31. Paxton, J. M., Ungar, L. and Greene, J. D. (2012). Reflection and reasoning in moral judgment. *Cognitive science*, 36(1), pp. 163-177. https://doi.org/10.1111/j.1551-6709.2011.01210.x
32. Pennycook, G., Cheyne, J. A., Barr, N., Koehler, D. J. and Fugelsang, J. A. (2015a). On the reception and detection of pseudo-profound bullshit. *Judgment and Decision making*, 10(6), pp. 549-563. https://doi.org/10.1017/S1930297500006999
33. Pennycook, G., Cheyne, J. A., Seli, P., Koehler, D. J. and Fugelsang, J. A. (2012). Analytic cognitive style predicts religious and paranormal belief. *Cognition*, 123(3), pp. 335-346. https://doi.org/10.1016/j.cognition.2012.03.003
34. Pennycook, G., Fugelsang, J. A. and Koehler, D. J. (2015). What makes us think? A three-stage dual-process model of analytic engagement. *Cognitive psychology*, 80, pp. 34-72.

https://doi.org/10.1016/j.cogpsych.2015.05.001
35. Peters, E. and Levin, I. P. (2008). Dissecting the risky-choice framing effect: Numeracy as an individual-difference factor in weighting risky and riskless options. *Judgment and Decision making*, 3(6), pp. 435-448. https://doi.org/10.1017/S1930297500000012
36. Shamosh, N. A. and Gray, J. R. (2008). Delay discounting and intelligence: A meta-analysis. *Intelligence*, 36(4), pp. 289-305. https://doi.org/10.1016/j.intell.2007.09.004
37. Sirota, M., Juanchich, M. and Hagmayer, Y. (2014). Ecological rationality or nested sets? Individual differences in cognitive processing predict Bayesian reasoning. *Psychonomic Bulletin & review*, 21(1), pp. 198-204. https://doi.org/10.3758/s13423-013-0464-6
38. Stanovich, K. E. and West, R. F. (1998). Individual differences in rational thought. *Journal of experimental psychology: general*, 127(2), p. 161. https://psycnet.apa.org/doi/10.1037/0096-3445.127.2.161
39. Stanovich, K. E. and West, R. F. (1999). Discrepancies between normative and descriptive models of decision making and the understanding/acceptance principle. *Cognitive psychology*, 38(3), pp. 349-385. https://doi.org/10.1006/cogp.1998.0700
40. Stanovich, K. E. and West, R. F. (2000). Advancing the rationality debate. *Behavioral and brain sciences*, 23(5), pp. 701-717. https://doi.org/10.1017/S0140525X00623439
41. Toplak, M. E., West, R. F. and Stanovich, K. E. (2011). The Cognitive Reflection Test as a predictor of performance on heuristics-and-biases tasks. *Memory & Cognition*, 39(7), pp. 1275-1289. https://doi.org/10.3758/s13421-011-0104-1
42. Toplak, M. E., West, R. F. and Stanovich, K. E. (2014). Assessing miserly information processing: An expansion of the Cognitive Reflection Test. *Thinking & Reasoning*, 20(2), pp. 147-168. https://doi.org/10.1080/13546783.2013.844729
43. Tversky, A. and Kahneman, D. (1974). Judgment under Uncertainty: Heuristics and Biases: Biases in judgments reveal some heuristics of thinking under uncertainty. *Science*, 185(4157), pp. 1124-1131. https://doi.org/10.1126/science.185.4157.1124

Appendix 1.

You have been provided with a survey to conduct research. Please help us conduct this research by providing a few minutes. Your responses are greatly appreciated. Please note that you have been selected randomly, and your personal information will not be included in the survey.

Gender: male☐ female☐
Age: more than 65☐ 51 to 65☐ 36 to 50☐ 25 to 35☐ less than 25 years☐
Education: Ph.D.☐ Master☐ Bachelor ☐ High school☐
The Profession: Retired ☐ the manager, employee ☐ Academician, researcher☐ Student, or housewife☐

Read the following sentences carefully and mark the answer that best matches your thoughts or feelings.

1. A bat and a ball cost $1.10 in total. The Bat costs $1.00 more than the ball. How much does the ball cost? _____ cents
2. If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets? _____ minutes
3. In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take to cover half of the lake? _____ days
4. Imagine a person with an IQ of 200 who went to college at age 15 and graduated with honors from the University of Chicago at age 19. Also, he has studied 15 languages, is fluent in five languages worldwide, and is recognized as an ornithologist. Do you think this person is more likely to be a scientist or a murderer?
5. Sarah loves Apple products and is also active in the stock market; which one is more possible?
6. Sara is a stock market analyst.
7. Sara is an analyst in the stock market and has shares of Apple in her stock portfolio.
8. The Real Madrid football team in 2022 has never lost in all their past games (12 games). How do you evaluate the result of this team's next match with Rayo Vallecano?
9. Do you think the owl is wise?