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Game Theory-Based Analysis of the Relationship between Managers and Shareholders: An Emphasis on Information Disclosure Quality, Audit Quality and Expected Return

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Abstract

Game theory, or interactive decision-making theory, is a mathematical framework that helps predict the outcomes of a group of interacting agents. This research aims to design and describe strategic relations between managers and shareholders through signaling games. The study investigates the consequences of choosing strategies by managers (high and low quality of information disclosure) and its relationship with the strategies chosen by shareholders (high and low expected return of shareholders) and (high and low quality of audit services) in companies with different levels of internal control establishment. The statistical population of research consists of all companies listed in the Tehran stock exchange market from 2012 to 2021. 114 companies were considered as a statistical sample of research. The study outcomes illustrate that Bayesian Nash equilibrium is established in the strategy (high-quality information disclosure and low expected return) in the strong internal control environment and the strategy (low-quality information disclosure and high expected return) in the weak internal control environment. In these strategies, neither the manager nor the shareholder has the motivation to change the strategy because their benefits will not increase by changing their strategy.

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1. Introduction

Conflicts of interest are inevitable in the mutual relations of individuals, institutions, organizations, and even countries. One of the key areas where conflicts of interest arise in joint stock companies is within the relationship between managers and shareholders which can be explained by agency theory and game theory (Saffar et al., 2021). In an agency relationship, the shareholder appoints a representative (manager) to act on their behalf and delegates decision-making authority (Bansal and Vajpeyi, 2021). However, there is a fear that the manager will pursue his personal interests in the company and the interests of the shareholders will be neglected.

The transparency of financial statements and the quality of disclosure are crucial factors in ensuring the performance of managers (Assidi, 2023). They serve as practical solutions to protect the interests of shareholders. However, managers face the challenge of determining the appropriate level of disclosure quality based on the cost-benefit analysis. (Blankespoor et al., 2020). While it might seem logical for managers to provide maximum quality information regardless of the associated costs, this is not always the case. Disclosing information incurs direct (non-proprietary) and indirect (proprietary) costs for the company. (Gjergji et al., 2021). As a result, they may opt for a disclosure level lower than the maximum quality, which is not favorable for shareholders (Armstrong et al., 2011).

A crucial aspect of providing complete and reliable information lies in managers' attention to a well-designed internal control system within the organization (Hamed, 2023). By establishing and effectively implementing internal controls, managers can ensure the accuracy and validity of financial statements, thereby enhancing the overall quality of disclosure (Monteiro et al., 2021).

According to agency theory, joint-stock companies should establish effective control and monitoring mechanisms to safeguard shareholders from conflicts of interest. One such mechanism that helps reduce information asymmetry between managers and shareholders is the presence of high-quality auditing within the company (Joudi and Mansoorfar, 2020). Auditing serves as a monitoring mechanism that aligns the interests of managers and shareholders, acting as a deterrent against opportunistic behaviors by managers (Anukrithi and Zongwe, 2024). In addition to auditing, shareholders can use the Common Stock’s Expected return to protect their interests. If managers disclose low-quality information, shareholders can respond by increasing their expected return to compensate for the information risk. This, in turn, makes it more challenging for managers to secure financing, thus incentivizing them to disclose accurate and reliable information (Tran, 2022).

Game theory is a scientific discipline that employs theories and mathematical models to analyze the behavior of rational agents within strategic environments and predict their actions. In this research problem, where managers and shareholders are the key decision-makers in joint-stock companies and their actions have consequences for themselves and the other party, game theory provides a suitable framework for examination.

Given the significance of information asymmetry between managers and shareholders and the varying quality of internal controls within joint-stock companies, it is essential to model the behavior of managers and shareholders using signaling games. This research aims to demonstrate how managers make decisions regarding the disclosure of information quality within the context of joint-stock companies with different levels of internal controls. By designing the relationships between managers and shareholders as signaling games, the study explores how shareholders react to managers' actions, considering expected return strategies and the quality of audit services they receive. Additionally, the research aims to identify the optimal actions for both parties in situations of mutual dependence.

The review of theoretical and empirical studies in the research topic field shows that none of the strategic confrontation situations between the manager and the shareholder has been investigated with

the variables considered in this research. Also, in most of the studies conducted with the approach of game theory, most of the games have been examined in a static form and the form of a game with complete information (without paying attention to the problem of information asymmetry), but in this research, for the model Signaling games are used to build manager-shareholder relations; Because one of the assumptions of this type of games is the existence of an information advantage for one of the parties of the game, and considering that in joint-stock companies, the management has more information than the shareholders based on their position. Hence, game signalling methods seem favorable for analyzing the mutual relations between managers and shareholders. This study seeks to fill the void of existing studies in this field and examine the behavior of managers and shareholders in the form of signaling games. In fact, including the information asymmetry (which casts a shadow on manager-shareholder mutual relations as an influencing factor) in the modeling of manager-shareholder relations, makes the modeling of mutual relations and its results more consistent with the real world ignoring this important issue in previous research can question the accuracy of the results.

According to the mentioned contents, the following questions have been designed to examine the relationship between the manager and the shareholder in the form of signaling games:

Research Question 1:

$RQ_{1.1}$: When the manager signals low-quality information disclosure in a weak internal control environment, does the shareholder's average profit increase by choosing a high expected return compared to a low expected return?

$RQ_{1.2}$: If the shareholder's optimal strategy is to demand a high expected return and weak internal controls are present, does the manager's average benefit increase when sending a signal of low-quality information disclosure rather than high-quality information disclosure?

Research Question 2:

$RQ_{2.1}$: When the manager signals high-quality information disclosure in a strong internal control environment, does the shareholder's average profit increase by choosing a low expected return compared to a high expected return?

$RQ_{2.2}$: If the shareholder's optimal strategy is to demand a low expected return and strong internal controls are present, does the manager's average benefit increase when sending a signal of high-quality information disclosure rather than low-quality information disclosure?

Research Question 3:

$RQ_{3.1}$: When the manager signals low-quality information disclosure in a weak internal control environment, does the shareholder's average profit increase by receiving high-quality audit services compared to low-quality audit services?

$RQ_{3.2}$: If the shareholder's optimal strategy is to demand high-quality audit services and weak internal controls are present, does the manager's average benefit increase when sending a signal of low-quality information disclosure rather than high-quality information disclosure?

Research Question 4:

$RQ_{4.1}$: When the manager signals high-quality information disclosure in a strong internal control environment, does the shareholder's average profit increase by receiving low-quality audit services compared to high-quality audit services?

$RQ_{4.2}$: If the shareholder's optimal strategy is to seek low-quality audit services and strong internal controls are present, does the manager's average benefit increase when sending a signal of high-

quality information disclosure rather than low-quality information disclosure?

It is important to highlight that the sub-questions presented are formulated based on the conditions required to establish equilibrium in signaling games. These conditions will be further elaborated upon in subsequent parts of the discussion.

This paper comprises distinct sections, each serving a specific purpose and contributing to the overall analysis. A critical examination of existing scholarly works and theories about the subject matter is presented; the approach, techniques, and data collection methods employed to investigate the research questions are outlined; the results and insights derived from the analysis are presented; and the main findings are summarized.

2. Literature review

In recent years, some research has been carried out using the game theory approach in accounting and auditing. For example, Yang (2024) investigated environmental accounting information disclosure motivations in the form of bargaining games. The models of this research identify Nash Equilibrium and possible changes in strategic behavior due to adjustments within the regulatory environment. Such research implies that regulators should prescribe an integral and well-rounded approach between punitive sanctions and incentives to encourage truthful disclosure. Acknowledging the dangers of overregulation, it highlights that the regulatory framework should be dynamic and balanced to encourage compliance without stifling economic growth. Eleftheriou et al. (2023) apply game theory to model how alternative mandatory audit firm rotation regimes can affect the strategic interaction between auditee and auditor firms and analyze potential consequences on detection risk and impairment of auditor skepticism. The major results suggest that: relative to an initial state with no rotation requirement but a high probability for impaired auditor skepticism, imposing either short-term or long-term mandatory audit firm rotation will remove the threat to auditor skepticism and lead to higher audit fees and lower detection risk. They further find that imposing supplementary regulatory instruments, such as increased regulatory scrutiny of the auditee and/or auditor, can lower the detection risk and increase audit quality.

In the context of the importance of monitoring the activities of managers, Navabi Moghadam et al., (2022) showed that a lack of information about managers' operations contributes to conflicts of interest. Shareholders are unable to monitor managers' daily actions and decisions to ensure alignment with their interests. Consequently, shareholders require mechanisms to ensure managerial performance and accountability. Bahrololoum and Shamsi (2019) confirmed that implementing comprehensive disclosure approaches and ensuring transparency in financial reporting are essential factors that contribute to creating a secure environment and increasing confidence in protecting shareholders' interests.

In the following, the research related to the variables used in the design of games (the relationship between the transparency of information disclosure and the cost of capital as well as audit quality) will be discussed.

Transparency in the disclosure of financial information is a crucial factor influencing the cost of capital. When there is less transparency in information disclosure, the liquidity of stocks in the market decreases. As a result, the cost of capital increases due to higher transaction costs or reduced demand for firm securities (Tran, 2022; Johnstone, 2016; Bashirimanesh et al., 2016).

The characteristics of audit quality can influence the level of information disclosure in companies (Movahedi et al., 2019). Lee et al. (2006) propose that the quality of financial statement information results from the combined efforts of management and the audit process. Thus, the content of the

annual report is not solely audited by auditors but also influenced by them. Therefore, when managers provide inadequate information, shareholders are expected to seek greater assurance through higher-quality audits and more rigorous scrutiny of financial statements.

As a branch of applied mathematics, game theory employs mathematical models to analyze cooperation and competition among rational and intelligent entities. It aims to capture the mathematical behavior that governs strategic situations, particularly those involving conflicts of interest. Such situations arise when an individual's success depends on the strategies chosen by others. The ultimate objective of game theory is to identify the optimal strategy for the players involved.

2.1 Signaling Games

Signaling games are dynamic games that involve incomplete information and two players. In these games, one player possesses more information than the other, making it crucial for the less informed player to gain additional information. The player with superior information, known as the sender, aims to convey information to the opposing player through messages and signals, influencing their actions in line with the sender's interests. On the other hand, the less informed player, referred to as the receiver, must consider all possible states the sender can be in, along with the probabilities associated with each state. The receiver considers the possible states of the sender through the environment, which represents the set of possible states of the sender. Moreover, the receiver determines their actions based on the information received. Once the environment is established, the sender becomes aware of their exact state, known as the current or real state. The sender then takes action, ultimately determining the game's outcome for both players.

One can view the exchange between the sender and receiver as a dynamic game, allowing for analyzing their interaction and determining optimal actions and signals to be sent. This analysis enables a deeper understanding of the strategic dynamics at play and aids in identifying the most advantageous course of action for both players (Abdeli, 2013).

2.2 How to Show the Signaling Games?

Signaling games are dynamic games with incomplete information involving two players: the sender (S) and the receiver (R). The timing of the signaling game unfolds as follows:

The environment determines the type or state (t_i) of the sender. The sender can assume different states, denoted as T_S, where $T_S = \{t_1, ..., t_i\}$, and t_i belongs to T_S. However, the environment only reveals one set from T_S, specifically t_i, to the sender. Thus, the sender becomes aware of their actual type. Before the revelation of t_i, each member of T_S has a probability of occurrence, which we refer to as the probability distribution of T_S. The following properties can characterize this distribution:

$$P(ti) > 0,\ P(t1) + P(t2) + \ldots + P(Ti) = 1$$

The receiver knows the members of the T_S set, but he does not know and cannot observe which type of player the sender is (that is, which $t_i \in T_S$ the environment revealed to him). Therefore, there is asymmetric information between the sender and the receiver.

2. The sender observes its type, i.e. t_i. Then, among the different symbols that can be sent, which expresses or indicates his type, he sends the symbol q_j, which is $M= \{q_1, q_2, \ldots, q_j\}$ and $q_j \in M$, and the set of symbols sent is known to the receiver.

3. The receiver can see q_j but not ti and must infer from q_j whether it is of type t_i or not. Then

choose an action from $a_k \in A$, $A= \{a_1, \ldots, a_k\}$.

4. The utility of the sender is shown by $U^S(t_i, q_j, a_k)$ and the receiver by $U^M(t_i, q_j, a_k)$.

3. Research methodology

The current research is focused on proof theory and employs a quantitative approach. Financial data from companies' financial statements and activity reports is required to conduct the research. The data was collected using Rahavard Novin software, the Stock Exchange Organization database, and the Codal website. The collected information is then analyzed using Spss and Eviews econometric software.

The statistical population for this research is the companies admitted to the Tehran Stock Exchange, and the study period covers ten years from 2012 to 2022. The purposeful sampling method (systematic elimination) is used to select the sample companies. Companies that entered the stock market during the period had financial years ending not on March 19th, had a trading break of more than six months, were part of holding companies, leasing companies, insurance, investment, or financial intermediation companies, or had unavailable information were excluded. Ultimately, 114 companies were selected for the study.

The research methodology involves designing models to investigate the manager and shareholder relationship through signaling games. Variables such as the severity of internal control weakness, quality of information disclosure, cost of normal capital, and quality of audit were calculated for the sample companies. The companies were divided into two classes (high and low) for each variable based on quartiles. The average interests of the manager and shareholder were calculated for 16 separate cases, corresponding to the sub-questions of the research. The Mann-Whitney statistical test, a non-parametric technique for comparing means, was used to compare the average interests between the two groups. Finally, the results of this test were examined to test the three conditions of Nash Bayesian equilibrium and determine whether equilibrium was established in the designed games.

3.1 Research variables

The research variables are considered based on the interests of managers and shareholders, which are calculated as follows:

A) Interests (Utility-Consequence) of Shareholders (U^S) [1]: The firm's annual return from eight months before the beginning of the financial year to four months after it, which is considered as a criterion for the extent of the shareholders' interest (Arab Kiasari and Abdi, 2015).

b) Interests (Utility-Consequence) of Managers (U^M) [2]: The result of dividing the bonus of the board of directors by the net profit of the firm in question for each year will be published in the financial statements of the following year (Arab Kiasari and Abdi, 2015).

Weaknesses of Internal Controls: Significant weaknesses are identified from the report of independent auditors, who assess internal control weaknesses. In this research, similar to the studies conducted by Hajiha and Mohammad Hosseinnejad (2014), Saedi and Dastgir (2018), and Hajiha et al. (2017), the content analysis method is used, referring to the control instructions. Internal controls are focused on the clauses under the legal responsibilities of the firm's audit report. If the firm has at least one weakness in the internal control system, the value assigned will be 1. Otherwise, it will be zero

The Severity of Weakness in Internal Controls: In this research, the severity of weaknesses in internal controls will be determined based on their grading. Minor weaknesses will be assigned a

[1] Utility of Shareholders
[2] Utility of Managers

value of 1, major weaknesses will be assigned a value of 2, and severe weaknesses will be assigned a value of 3. If only one weakness is reported in the auditor's report, it will be considered minor. If two weaknesses are reported, they will be considered major. And if there are more than two weaknesses, they will be considered severe.

Mandatory Disclosure Quality: In this research, the disclosure index developed by Cheung et al. (2010) was utilized to measure the level of disclosure. This index consisted of 60 criteria. It is important to note that this checklist was modified to align with Iran's environmental conditions by Didar et al. (2010) in their article on the effect of corporate characteristics on the level of disclosure of companies listed on the Tehran Stock Exchange. The same modified checklist was used in this research. For each item mentioned in the checklist, a score of (1) is assigned if a firm discloses it. If a firm does not disclose a particular item, a score of (0) is assigned. If an item is deemed not applicable to a firm, it is removed from the list, following the approach outlined by Cheung et al. (2010).

The Quality of Voluntary Disclosure of Information: In this research, the measurement of the voluntary disclosure index is based on the indices proposed by Botosan (1997), which were derived from the opinions of the Jenkins Committee (Kashanipour et al., 2009). Since 2013, the board of directors' activity report has been presented in a specific format mandated by the Tehran Stock Exchange and Securities Organization. However, companies still voluntarily provide information beyond what the law requires in these reports. This voluntary disclosure is the focus of this research (Mohammadi and Sarlak, 2012).

After verifying that the information is not required according to accounting or legal standards, the indicators were determined in six general sections, comprising 71 indicators. These sections include 1) information background, 2) summary of important historical results, 3) non-financial key statistics, 4) departmental information, 5) forecast information, and 6) management discussion and analysis. The optional disclosure score is calculated by dividing the total score obtained from the six sections by the maximum possible score of 134. The mandatory and optional disclosure quality points are combined to determine the quality level of information disclosure. Values of the criterion exceeding the sample's third quartile indicate high-quality information disclosure, while values below the second quartile indicate low-quality disclosure.

Cost of Common Stock Equity: The model used to calculate the cost of common stock capital in this research is the Gordon model, derived from the following valuation model (Kaviani et al., 2018).

$$P_0 = \frac{\boldsymbol{D0(1+g)}}{\boldsymbol{k-g}}$$

In this model, k represents the expected return of common stock, and it can be obtained through the following equation:

$$K = r_{i,t} = (D_1)/P_0 + g$$

$$g = (S_{1400}/S_{1391})^{(1/10)} - 1$$

In this equation, D_1 represents the projected profit per share for the upcoming year, P_0 represents the share market price at the beginning of the year, and g represents the stock growth rate. This study uses the sales growth rate to measure the stock growth rate, as it is considered more stable and predictable than the profit growth rate. This is because the sales growth rate is less influenced by

accounting procedures (Mashayekhi and Farhadi, 2015).
When determining the cost of capital, values exceeding the third quartile of the sample indicate a high cost of equity, while values below the second quartile indicate a low expected return.

Audit quality: According to the research conducted by Memeshli and Karshenasan (2019), the calculation of this variable has been performed using three crucial indicators of audit quality: the auditor's reputation, the auditor's independence, and the auditor's expertise in the industry. In this study, the auditor's reputation is considered a dummy variable. Mofid Rahbar Audit Organization and Audit Institute, a large institution with a high credit and reputation grade (1), is contrasted with other audit institutes that are members of the public accountants' community. These institutions are smaller and have a lower credit and reputation grade (2).

Suppose the auditor of the owner's firm has held a leadership position in the audit organization and Mofid Institute during the research period. In that case, the virtual variable value of the auditor's reputation is considered one. Otherwise, its value is zero (Javid and Ahmadi Chegni, 2020).

Discretionary accruals have been utilized as an inverse indicator to measure auditor independence. Jones's adjusted model (1995) measures discretionary accruals in this study (Arab Kiasri and Abdi, 2014). Subsequently, the average of this variable is calculated for the companies under investigation. If the ratio exceeds the average for a particular firm, a value of zero is assigned, whereas a value of one is assigned if it is below the average (Memeshli and Karshenasan, 2019).

$$Accruals_t = a\,(Assets_{t-1}) + b\Delta sales_t + cPPE_t + dROA_t + \mu_i$$

Auditor's expertise in the industry: In this research, to calculate the auditor's expertise in a specific industry, the total assets of all employers associated with a particular audit firm within that industry are divided by the total assets of all employers in that industry (Sun and Liu, 2013; Etemadi et al., 2009). This variable solely focuses on measuring the auditor's industry-specific expertise and is independent of the size of the audited firm (Badavar Nahandi and Taghizadeh, 2013). The average of this variable is then calculated for the companies under investigation. If the ratio surpasses the average for a given firm, a value of 1 is assigned; otherwise, it is assigned as 0 (Memeshli and Karshenasan, 2019).

To simplify the interpretation of results, this research employs the factor analysis technique in the Eviews software, following the approach of Alzoubi (2018). The three audit quality criteria are converted into an index using this method. Values obtained from the factor analysis method that are greater than the third quartile of the sample indicate high audit quality, while values smaller than the second quartile indicate low audit quality.

3.2 Modeling games and finding their equilibrium

3.2.1 Designing the test related to the questions in the form of manager-shareholder signaling games

First, nature selects the type t_i (environment) for the sender (manager) from the set of possible types $T= \{t_1, ..., t_I\}$ according to the probability distribution $P(t_i)$ where for each i, $P(t_i) > 0$ and $P(t_1) + \ldots + P(t_I)= 1$.

$T = \{(t_2)$; Strong internal controls, (t_1); Weak internal controls$\}$
P (weak internal controls) > 0, P (strong internal controls) > 0
P (weak internal controls) + P (strong internal controls) = 1

The sender (manager) observes t_i and then selects q_j from the set of possible messages Q= {q_1, ..., q_J}.

Q = {(q_2); High-quality information disclosure (q_1) Low-quality of information disclosure}

In this game, the sender (manager) has four pure strategies:

S_M= AS (t_1) *AS (t_2)
= {(q_1 (t_1), q_1 (t_2)), (q_1 (t_1), q_2 (t_2)), (q_2 (t_1), q_1 (t_2)), (q_2 (t_1), q_2 (t_2))}

For example, the strategy (q_1 (t_1), q_1 (t_2)) is interpreted as if nature chooses t_1 (weak internal controls), the manager chooses q_1 (low-quality disclosure), and if t_2 (controls strong insider) to play q_1 (low disclosure quality).

The recipient (shareholder) observes q_j and not (t_i) and then chooses the move c_k from the set of possible actions: A = {c_1, ..., c_k}, in the scenarios designed in the first and second questions of the game.

A= {(c_1); High Expected return, (c_2); Low Expected return}

Also, in the scenarios designed for the third and fourth questions, shareholders will have the following set of actions:

A= {(a_1); High audit quality, (a_2); Low audit quality}

The recipient (shareholder) also has four net strategies in the first and second questions:
S_S= AR (q_1) *AR (q_2)
= {(c_1 (q_1), c_1 (q_2)), (c_1 (q_1), c_2 (q_2)), (c_2 (q_1), c_1 (q_2)), (c_2 (q_1), c_2 (q_2))}

The shareholder strategies in the third and fourth questions are:
= {(a_1 (q_1), a_1 (q_2)), (a_1 (q_1), a_2 (q_2)), (a_2 (q_1), a_1 (q_2)), (a_2 (q_1), a_2 (q_2))}

For example, (c_1 (q_1), c_1 (q_2)) means that if the manager chooses q_1 (low-quality of information disclosure), the shareholder chooses c_1 (high expected return), and if q_2 (high-quality of information disclosure), play c_1 (high expected return).

4. Utilities are determined by U^S (t_i, q_j, c_k) and U^M (t_i, q_j, c_k). These functions can be displayed in the form of the manager's and shareholder's income matrix in Table 1.

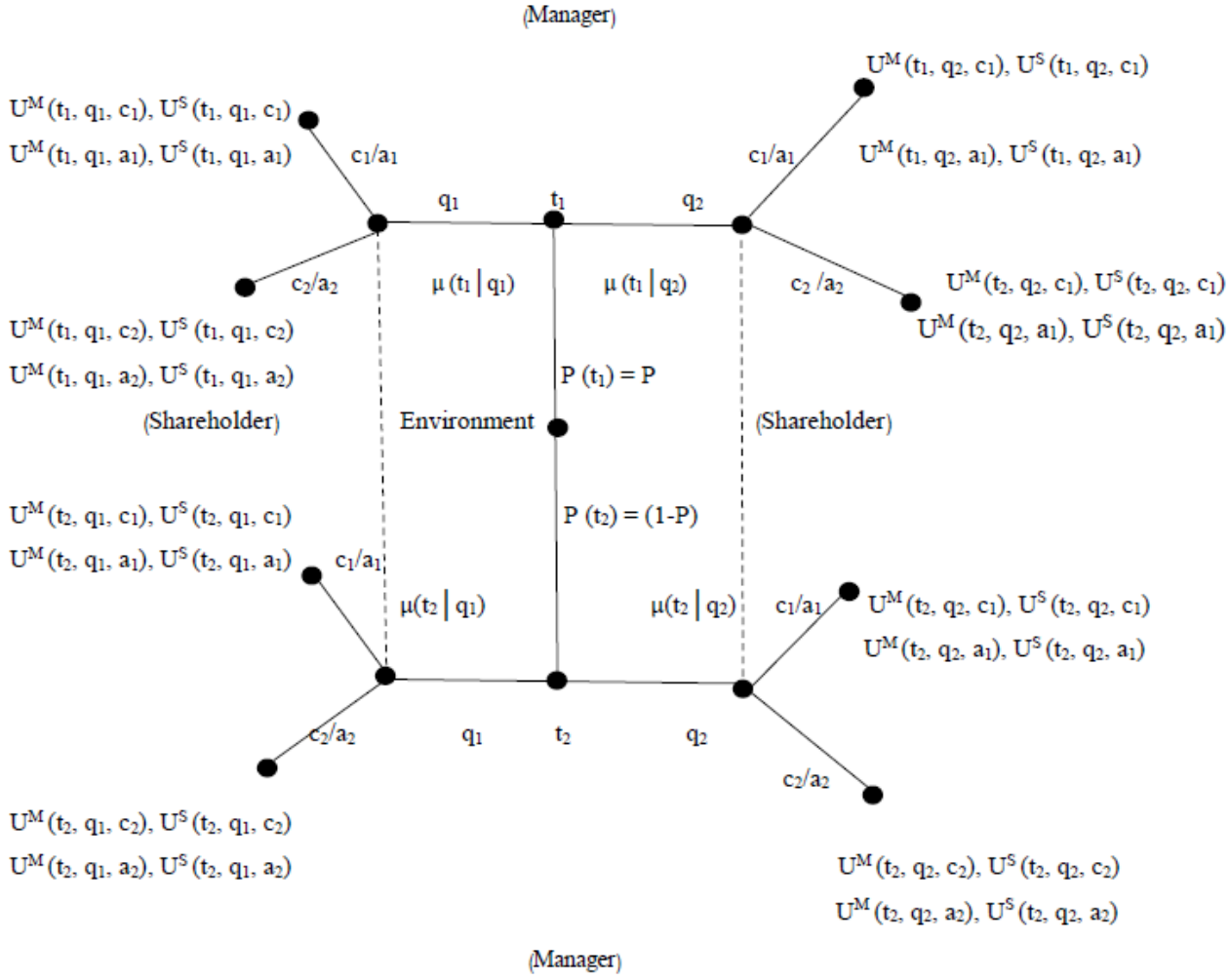

Figure 1: The quality of internal controls is determined by the environment, which can be categorized as weak (t_1) or strong (t_2) with probabilities P (t_1) and P (t_2) respectively. The manager is certain about each environment and communicates this information to the shareholder using the conditional probability (Ti | Qj) μ; (Ti= t_1, t_2, Qj= q_1, q_2). However, the shareholder cannot definitively determine their state based on the received signals, as depicted by the dotted line.

Source: research findings

Table 1. Manager's and Shareholder's Income Matrix

	Low expected return	**High expected return**
Low quality of information disclosure	$U^M(t_i,q_1,c_1)$, $U^S(t_i,q_1,c_1)$ $U^M(t_i,q_1,a_1)$, $U^S(t_i,q_1,a_1)$	$U^M(t_i,q_1,c_2)$, $U^S(t_i,q_1,c_2)$ $U^M(t_i,q_1,a_2)$, $U^S(t_i,q_1,a_2)$
High quality of information disclosure	$U^M(t_i,q_2,c_1)$, $U^S(t_i,q_2,c_1)$ $U^M(t_i,q_2,a_1)$, $U^S(t_i,q_2,a_1)$	$U^M(t_i,q_2,c_2)$, $U^S(t_i,q_2,c_2)$ $U^M(t_i,q_2,a_2)$, $U^S(t_i,q_2,a_2)$

Weak/ Strong internal controls (T_I, i= {1, 2})

For example, U^S (t_1, q_1, c_1) is the shareholder's income in the case that the environment is weak internal controls (t_1), the manager chooses the strategy of low-quality information disclosure, and the shareholder chooses the strategy of high-expected return (c_1).

Figure 1: The quality of internal controls is determined by the environment, which can be categorized as weak (t_1) or strong (t_2) with probabilities P (t_1) and P (t_2) respectively. The manager is certain about each environment and communicates this information to the shareholder using the conditional probability (Ti | Qj) μ; (Ti= t_1, t_2, Qj= q_1, q_2). However, the shareholder cannot definitively determine their state based on the received signals, as depicted by the dotted line.

Source: research findings

3.2.2 Perfect bayesian equilibrium in signaling games

To achieve a complete Bayesian equilibrium in a signaling game, it is essential to satisfy conditions 1 to 3, which will be explained below. In the signaling game, the sender (manager) completely knows the game's background. This means that when the environment determines their type, they are fully aware of the decision node or information set they are in. Consequently, a message or signal is selected within a single information set for the sender.

Therefore, the sender does not need to adhere to condition 1 since they have certainty about their information set. Conversely, the receiver (shareholder) can observe and receive the sender's message but cannot perceive the sender's type directly. As a result, the receiver's (shareholder's) action choice takes place within a non-singular information set, and condition 1 applies to the receiver. The receiver needs to satisfy condition 1, as they lack complete knowledge of the sender's type (Abdeli, 2013).

Condition 1: Once the receiver receives the symbol q_j from the set of symbols Q, where $q_j \in Q$, they must form a belief regarding the potential type of the sender associated with that particular symbol. This belief is shown by the probability distribution $\Sigma\mu$ (t_i | q_j), which (ti | q_j) >= 0 $\forall ti \in T$ and indicates the probability of t_i with sign q_j:

$$\sum_{ti \in t} \boldsymbol{\mu(ti|qj) = 1}$$

The receiver's belief when he receives the message q_1 is obtained as follows:

$$P= \mu (t_1 \mid q_1)= \frac{P(q1|t1)*P(t1)}{P(q1|t1)*P(t1)+P(q1|t2)*P(t2)}$$

$$(1\text{-}P) = \mu (t_2 \mid q_1) = 1\text{-} \mu (t_1 \mid q_1)$$

And the receiver's belief when he receives the message q_2 is calculated as follows:

$$Q = \mu (t_1 \mid q_2)= \frac{P(mq2|t1)*P(t1)}{P(q2|t1)*P(t1)+P(q2|t2)*P(t2)}$$

$$(1\text{-}q) = \mu (t_2 \mid q_2) = 1\text{-} \mu (t_1 \mid q_2)$$

After the receiver receives the signal and forms his belief, his optimal action must be determined. Condition 2 specifies his optimal action:

Condition 2 for the receiver: For each signal it receives, denoted as $q_j \in M$, the receiver must consider the belief formed about the sender's type associated with that particular signal (as per condition 1). Based on this belief, the receiver should choose the action that maximizes their expected outcome. This optimal action is represented as a*(q_j). In essence, a*(q_j) is the solution to the following optimization problem:

$$\text{Max} \sum_{ak \in A \ ti \in T} \boldsymbol{\mu(ti|qj)UR(ti.qj.ak)}$$

Condition 2 for the sender: the sender can choose and transmit different messages to the receiver based on their type. However, considering the receiver's reaction by condition 2, which is determined by the receiver's strategy ($a^*(q_j)$), the sender must strategically select a message that maximizes their expected outcome. In other words, $q_j^*(t_i)$ is the following optimization solution:

$$MAX_{qj \in q} U_S(t_i, q_j, a^*(q_j))$$

Condition 3: In the states where the optimal message is q_j (represented as $q^*(t_i) = q_j$), for every $t_i \in T_j$ in the information set corresponding to q_j, the receiver's belief is determined through the application of Bayes' law and the sender's strategy:

$$\mu(t_i \mid q_i) = \frac{P(ti)}{\sum_{ti \in Ti} P(ti)}$$

Definition of complete Bayesian equilibrium: The pure strategy in a signaling game is the combination of strategies $q^*(t_i)$ and $a^*(q_j)$ as well as the belief $\mu(t_i \mid q_j)$ that satisfies conditions 1 to 3 it does (Gibbons, 1958).

Because the conditions for establishing equilibrium have been included in the design of the research questions, a positive answer to the sub-questions means that the conditions for equilibrium have been established.

4. Research findings

4.1 Descriptive statistics of research variables

To provide comprehensive answers to the research questions, the statistics of the variables related to information disclosure quality, audit quality, and the Cost of common stock capital are categorized into low and high groups based on quartiles. The descriptive statistics of these research variables lead to eight distinct scenarios, as depicted in diagram 1. These scenarios are classified based on the manager and shareholder's interests and desirability. The outcomes of these scenarios are presented in Table 2, showcasing the analysis results. It is worth noting that the number of observations varies across different cases due to the separation of information disclosure quality levels, audit quality, and the cost of common stock capital. This differentiation allows for a more precise examination of the relationships between these variables in each context.

In all combinations, it is observed that more than 50% of managers and shareholders have lower interests than the average. The standard deviation provides insight into the extent of deviation from the average for each variable. For instance, in a specific case where the environment exhibits strong internal controls, the manager discloses high-quality information, and the shareholder imposes a low expected return on the manager (t_2, q_2, c_2), the standard deviation for shareholder interests is calculated to be 2.78.

Descriptive statistics also reveal interesting patterns. Over 18 years, firms' managers tend to disclose low-quality information in an environment characterized by weak internal controls. In response, shareholders react by imposing a high cost of equities. However, in the 46 years of the firm's existence, despite managers disclosing low-quality information in a weak internal controls environment, shareholders fail to correctly interpret the signals and form their beliefs inaccurately. Consequently, despite the low-quality information disclosure, they impose a low expected return on the managers.

Furthermore, analyzing the combination of strategy (t_2, q_2, a_2) reveals that the minimum and maximum benefits obtained are zero and 3% for managers, respectively, indicating a potential loss

of 56% and a remarkable return of 800% for shareholders. This particular situation provides a rich dataset for analysis.

Table 2. Descriptive statistics of the variables related To the research questions

	question	variable/quantity	Mean	Median	Min	Max	standard deviation	Number of observations
Question 1	Sub-question1-1	$U^{S}_{t1,q1,c1}$	3.839	1.288	-0.457	18.387	5.755	18
		$U^{S}_{t1,q1,c2}$	0.675	0.091	-0.644	16.600	2.665	46
	Sub-question 1-2	$U^{Q}_{t1,q1,c1}$	0.003	0.001	0.000	0.021	0.005	18
		$U^{Q}_{t1,q2,c2}$	0.002	0.000	0.000	0.022	0.005	30
Question 2	Sub-question 2-1	$U^{S}_{t2,q2,c2}$	2.595	1.689	-0.480	14.234	2.787	45
		$U^{S}_{t2,q2,c1}$	0.155	0.062	-0.482	3.965	0.765	31
	Sub-question 2-2	$U^{m}_{t2,q2,c2}$	0.072	0.003	0.000	0.706	0.165	45
		$U^{m}_{t2,q1,c1}$	0.009	0.001	0.000	0.048	0.013	46
Question 3	Sub-question 3-1	$U^{S}_{t1,q1,a1}$	1.180	0.333	-0.457	11.563	2.890	20
		$U^{S}_{t1,q1,a2}$	1.131	0.147	-0.644	8.594	2.639	22
	Sub-question 3-2	$U^{m}_{t1,q1,a1}$	0.023	0.002	0.000	0.323	0.071	20
		$U^{m}_{t1,q2,a2}$	0.005	0.002	0.000	0.022	0.007	15
Question 4	Sub-question 4-1	$U^{S}_{t2,q2,a2}$	1.399	0.435	-0.569	8.795	2.053	70
		$U^{S}_{t2,q2,a1}$	0.926	0.189	-0.586	6.506	1.787	24
	Sub-question 4-2	$U^{m}_{t2,q2,a2}$	0.003	0.000	0.000	0.037	0.006	70
		$U^{m}_{t2,q1,a1}$	0.006	0.000	0.000	0.031	0.009	20

Source: Research findings

4.2 The results of inferential statistics

First, the secondary questions must be examined to establish a foundation for analyzing the main research questions. In this regard, the means of the two groups were compared using the Mann-Whitney test. This test was chosen because the results of the Kolmogorov-Smirnov test indicated that the data deviated significantly from normality, with p-values less than 5%. The interests of the two key actors, managers and shareholders, were evaluated based on the percentage of the manager's bonus and the percentage of annual return on shares for the shareholders. These research questions were subjected to the Mann-Whitney test, and the results are presented in Table 3.

4.3 Examining the research sub-questions

4.3.1 Sub-question test (1-1)

In this question, the null hypothesis (H_0) states that if a manager sends a signal of low-quality information disclosure in an environment of weak internal controls, the average benefit of the shareholder will be the same for both high and low-cost capital strategies. The probability value of the Z statistic was calculated as 0.004, which is less than the significance level of 0.05. Hence, we reject the assumption of equal average shareholder interests.

Based on the average scores obtained from the test (43 and 27.93, respectively), we can claim that if the manager chooses to disclose low-quality information in a weak internal controls environment, shareholders will have higher average benefits when they choose the high expected return strategy compared to the low expected return strategy. Therefore, the answer to the first sub-question is affirmative.

Table 3. Results of inferential statistics related to research questions

	Question	Strategy combination	Number of observations	Total of ranks	Average of ratings	Mann-Whitney	z statistic	prob	Results
Question 1	Sub-question1-1	$U^{S}_{t1,q1,c1}$	17	731	43.00	204.000	-2.896	0.004	confirmed
		$U^{S}_{t1,q1,c2}$	46	1285	27.93				
	Sub-question 1-2	$U^{m}_{t1,q1,c1}$	18	552	30.67	159.000	-2.640	0.008	confirmed
		$U^{m}_{t1,q2,c2}$	30	624	20.80				
Question 2	Sub-question 2-1	$U^{S}_{t2,q2,c2}$	45	2260	50.22	170.000	-5.575	0.0001	confirmed
		$U^{S}_{t2,q2,c1}$	31	666	21.48				
	Sub-question 2-2	$U^{m}_{t2,q2,c2}$	28	1229	43.89	465.000	-2.018	0.044	confirmed
		$U^{m}_{t2,q1,c1}$	46	1546	33.61				
Question 3	Sub-question 3-1	$U^{S}_{t1,q1,a1}$	17	358	21.06	169.000	-0.510	0.624	rejected
		$U^{S}_{t1,q1,a2}$	22	422	19.18				
	Sub-question 3-2	$U^{m}_{t1,q1,a1}$	20	373	18.65	137.000	-0.435	0.681	rejected
		$U^{m}_{t1,q2,a2}$	15	257	17.13				
Question 4	Sub-question 4-1	$U^{S}_{t2,q2,a2}$	70	3443	49.19	722.000	-1.023	0.306	rejected
		$U^{S}_{t2,q2,a1}$	24	1022	42.58				
	Sub-question 4-2	$U^{m}_{t2,q1,a2}$	70	3155	45.07	670.000	-0.304	0.761	rejected
		$U^{m}_{t2,q1,a1}$	20	940	47.00				

Source: Research findings

4.3.2 Sub-question test (1-2)

In this question, the null hypothesis (H_0) states that in an environment of weak internal controls, the average benefit of the manager will be the same if they send a signal of low-quality information disclosure and the shareholder reacts with a high expected return strategy, compared to when the manager chooses to disclose high-quality information and the shareholder imposes a low expected return.

The probability value of the Z statistic was calculated as 0.008, which is less than the significance level of 0.05. Therefore, we reject the assumption of equal average manager interests.

Considering the average scores obtained from the test (30.67 and 20.80, respectively), we can claim that if the manager opts for low-quality information disclosure in a weak internal controls environment. If the shareholder imposes a high expected return strategy, the manager's average benefits will be higher than when they choose high-quality information disclosure. The shareholder imposes a low expected return. Therefore, the answer to the second sub-question is also affirmative.

The positive answer to sub-questions (1-1) and (1-2) confirms that the equilibrium is established at point (t_1, q_1, c_1). If weak internal controls are established in the environment, the manager will reach an equilibrium by signalling low-quality information disclosure and the shareholder with a high expected return.

4.3.3 Sub-question test (2-1)

In this question, the null hypothesis (H_0) states that if the manager sends a signal of high-quality information disclosure in an environment of strong internal controls, the average benefit of the shareholder will be the same regardless of their chosen strategy - high or low expected return.

The probability value of the Z statistic was calculated as 0.0001, which is less than the significance level of 0.05. Therefore, we reject the assumption of equal average shareholder interests.

Considering the average scores obtained from the test (50.22 and 21.48, respectively), we can claim that if the manager chooses high-quality information disclosure in a strong internal controls environment, the average benefits of shareholders will be higher when they choose the low expected return strategy compared to the high expected return strategy. Therefore, the answer to the third sub-question is also affirmative.

4.3.4 Sub-question test (2-2)

In this question, the null hypothesis (H_0) states that in an environment of strong internal controls, the average benefit of the manager will be the same if he sends a signal of high-quality information disclosure and the shareholder reacts with a low expected return strategy, compared to the scenario where the manager chooses low-quality information disclosure and the shareholder imposes a high expected return.

The probability value of the Z statistic was calculated as 0.044, which is less than the significance level of 0.05. Therefore, we reject the assumption of equal average interests of the manager.

Considering the average scores obtained from the test (43.89 and 33.61, respectively), we can claim that if the manager chooses high-quality information disclosure in a strong internal controls environment. Suppose the shareholder imposes a low expected return. In that case, the manager's average benefits will be higher than when the manager chooses low-quality information disclosure in the same environment. The shareholder imposes a high expected return. Therefore, the answer to the fourth sub-question is also affirmative.

The positive answer to sub-questions (2-1) and (2-2) confirms that the equilibrium is established at point (t_2, q_2, c_2).

4.3.5 Sub-question test (3-1)

In this question, we conducted a hypothesis test to determine if weak internal controls and low-quality information disclosure by the manager have an equal average benefit for shareholders in high and low audit services quality strategies.

The obtained probability value of the Z statistic was 0.624, which is above the significance level of 0.05. Therefore, we do not have enough evidence to reject the null hypothesis that both strategies' average shareholder interests are equal.

Furthermore, additional analysis shows that there is no statistically significant difference in the average shareholder interest between the high audit quality strategy (U^S t_1, q_1, a_1) and the low audit quality strategy (U^S t1, q1, a2) when the manager employs a high-quality strategy of information

disclosure.

According to the best response function, the average ratings for the strategies are 21.06 and 19.18, respectively. However, in the studied sample, this difference was not found to be statistically significant. Therefore, the answer to the fifth sub-question is negative.

4.3.6 Sub-question test (3-2)

In this question, we are examining the null hypothesis (H_0) that the average benefit to the manager, under weak internal controls, is the same when he discloses low-quality information and the shareholder responds with a high-quality audit services strategy, compared to when the manager discloses high-quality information. The shareholder imposes a low-quality audit services strategy.

The obtained probability value of the Z statistic is 0.681, greater than the significance level of 0.05. As a result, we do not have sufficient evidence to reject the assumption of equality in the manager's average interests.

The average scores obtained from the test are 18.65 and 17.13 for the respective scenarios. This suggests that even though the manager chooses low-quality information disclosure in an environment of weak internal controls, and the shareholder selects a high-quality audit services strategy, the average benefits to the manager will be higher compared to when the manager chooses high-quality information disclosure and the shareholder receives a lower quality of audit services. However, it is important to note that the difference in the average benefits between the two groups is not statistically significant. Therefore, the answer to the sixth sub-question is negative.

The negative answer to sub-questions (3-1) and (3-2) confirms that the equilibrium is not established at point (t_1, q_1, a_1).

4.3.7 Sub-question test (4-1)

In this question, we are testing the null hypothesis (H_0) that if the manager discloses high-quality information in an environment of strong internal controls, the average benefit to the shareholder will be the same for both high and low-audit service quality strategies.

The obtained probability value of the Z statistic is 0.306, greater than the significance level of 0.05. Thus, we do not have enough evidence to reject the assumption of equality in the average shareholder interests.

When examining the average shareholder interest in each strategy, namely high audit quality (U^S t_2, q_2, a_1) and low (U^S t_2, q_2, a_2), there is no significant difference if the manager chooses high-quality information disclosure. In the studied sample, the average ratings obtained are 49.19 and 42.58, respectively, but the difference is not statistically significant. Therefore, the answer to the seventh sub-question is negative.

4.3.8 Sub-question test (4-2)

In this question, we are testing the null hypothesis (H_0) that the average benefit to the manager is the same when he sends a signal of high-quality information disclosure and the shareholder reacts with a low audit services quality strategy, compared to when the manager chooses to disclose low-quality information and the shareholder imposes a high audit services quality strategy.

The obtained probability value of the Z statistic is 0.761, greater than the significance level of 0.05. Therefore, we have enough evidence to reject the assumption of equality in the average interests of the manager.

Examining the average scores obtained from the test, which are 45.07 and 47 for the two groups respectively, we find that the difference in the average of the two groups is not statistically significant.

Therefore, the answer to the eighth sub-question is negative.

The negative answer to sub-questions (4-1) and (4-2) confirms that the equilibrium is not established at points (t_2, q_2, a_2).

5. Conclusion and suggestions

This research uses signalling games to consider information asymmetry in modeling the relationship between manager and shareholder. To this end, the manager and the shareholder are treated as players in a signaling game, operating within a joint-stock firm with varying degrees of internal control mechanisms. The manager can choose between high-quality or low-quality information disclosure strategies. At the same time, shareholders can adopt strategies of high or low expected return rates and opt for high or low-quality audit services. The four combinations of strategies proposed in the primary research questions can be analyzed within two distinct parts.

Firstly, the research findings affirm a positive response to the first and second research questions. This implies that in joint-stock companies with weak internal controls and managers disclosing low-quality information, achieving equilibrium of interests can be attained by shareholders adopting a high expected return strategy. Similarly, in an environment characterized by strong internal controls and high-quality information disclosure by managers, a Nash Bayesian equilibrium can be established through shareholders opting for a low expected return strategy. Any deviation from these game strategies by either party would result in a decrease in their respective interests. The findings of this research highlight the expected return of common stock as an effective mechanism for shareholders to counteract manager behavior and establish equilibrium in manager-shareholder relations. This result aligns with the research findings of Johnstone (2016) and Bashirimanesh et al. (2016).

The findings indicate a negative response to the third and fourth research questions. In other words, if joint-stock companies have weak internal controls and managers disclose low-quality information, the equilibrium of interests cannot be achieved by shareholders selecting high-quality audit services. Conversely, in an environment with strong internal controls and high-quality information disclosure by managers, shareholders cannot attain a Nash Bayesian equilibrium by opting for low-quality audit services. This suggests that the quality of auditing services cannot compensate for the quality of information disclosure by managers and bring about an equilibrium of interests between the parties. This result contradicts the research findings of Movahedi et al. (2019).

Additionally, the results of this research demonstrate that game theory plays a significant role in explaining the manager-shareholder relationship and identifying equilibrium points in the game can have a crucial impact on the decisions made by both parties, as supported by the research of Saffar et al. (2021).

In general, the research results show that shareholders' expected return can be considered a suitable tool for shareholders against the low quality of information disclosure. It means that if managers neglect the interests of shareholders by adopting opportunistic behavior in managing and controlling the company's affairs, shareholders can fine the managers and limit their freedom of action by demanding higher expected returns. The result of this appropriate action will be to balance the interests of the game parties. Also, if the managers disclose high-quality information, the shareholders by demanding low expected returns, can prevent the waste of the company's resources and encourage the managers to better pursue the company's interests, the result of which will be the optimization of the utility of both sides of the game. Also, the results of the research showed that at present, the audits performed by auditors do not have such a significant difference from each other in terms of quality, and it cannot be considered as a protective shield for shareholders to balance their interests against the low quality of information disclosure.

References

1. Abdeli, G. (2013). *Game theory and its applications (incomplete, evolutionary and cooperative information games).* Tehran: Organization for the study and compilation of human sciences books (Samt), Tehran, Iran (In Persian)
2. Alzoubi, E. S. S. (2018). Audit quality, debt financing, and earnings management: evidence from Jordan. *Journal of International Accounting, Auditing and Taxation*, 30, pp. 69-84. https://doi.org/10.1016/j.intaccaudtax.2017.12.001
3. Anukrithi, V. and Zongwe, D. P. (2024). Study on role of independent auditors in corporate governance, Alliance School of Law, Anekal, India.
4. Arab Kiasri, M. and Abdi, S. (2015). Designing and analyzing the manager-shareholder strategic game: applying game theories, profit management and corporate governance, *Accounting and Auditing Reviews*, 22(2), pp. 221-242. https://doi.org/10.22059/acctgrev.2015.54971
5. Armstrong, C. S., Core, J. E., Taylor, D. J. and Verrecchia, R. E. (2011). When does information asymmetry affect the cost of capital? *Journal of Accounting Research*, 49(1), pp. 1-40. https://doi.org/10.1111/j.1475-679X.2010.00391.x
6. Assidi, S. (2023). Voluntary disclosure and corporate governance: substitutes or complements for firm value? *Competitiveness Review: An International Business Journal*, 33(6), pp. 1205-1229. https://doi.org/10.1108/CR-08-2022-0112
7. Badavar Nehandi, Y. and Taghizadeh Khanqaeh, V. (2013). Investigating the relationship between audit quality and capital efficiency, *Accounting and Auditing Quarterly*, 1(2), pp. 19-42. https://doi.org/10.22055/jiar.2016.12914
8. Bahrololoum, M. M. and Shamsi, P. (2019). Studying the effect of intellectual capital disclosure quality on equity cost of capital of companies listed on the Tehran stock exchange. *Empirical Studies in Financial Accounting*, 16(61), pp. 79-100. https://doi.org/10.22054/qjma.2019.29209.1747
9. Bansal, S. and Vajpeyi, A. (2022). The warning of an ambush: Disarming and appeasing activist shareholders. ILI Law Review, New Delhi, India.
10. Bashirimanesh, N., Rahmani, A. and Mosavi, M. (2016). Consequences of voluntary disclosure: Structural equation modeling approach. *Empirical Research in Accounting*, 6(2), pp. 161-186. https://doi.org/10.22051/jera.2016.2291
11. Blankespoor, E., deHaan, E. and Marinovic, I. (2020). Disclosure processing costs, investors' information choice, and equity market outcomes: A review. *Journal of Accounting and Economics*, 70(2-3), A. 101344. https://dx.doi.org/10.2139/ssrn.3449751
12. Botosan, C. A. (1997). Disclosure level and the cost of equity capital. *Accounting Review*, 72(1), pp. 323-349. https://dx.doi.org/10.2139/ssrn.208148
13. Cheung, Y. L., Jiang, P. and Tan, W. (2010). A transparency disclosure index measuring disclosures: Chinese listed companies. *Journal of Accounting and Public Policy*, 29(3), pp. 259-280. https://doi.org/10.1016/j.jaccpubpol.2010.02.001
14. Didar, H., Mansoorfar, G. and Khojaste, H. (2010). The effect of corporate characteristics on the level of disclosure of companies admitted to the Tehran Stock Exchange. *Empirical Studies of Financial Accounting*, 8(32), pp. 141-168 (In Persian).
15. Eleftheriou, K., Komarev, I. and Klumpes, P. (2023). Regulating the market for audit services: a game theoretic approach. *Abacus*, 59(3), pp. 697-734. https://doi.org/10.1111/abac.12278
16. Etemadi, H. O. S. S. E. I. N., Mohammadi, A. M. I. R. and Nazemi Ardakani, M. (2009). The

relationships between auditor industry specialization and earnings quality in listed companies on the Tehran Stock Exchange. *Financial Accounting Research*, 1(1), pp. 17-32 (In Persian). https://dor.isc.ac/dor/20.1001.1.23223405.1388.1.1.2.7

17. Gibbons, R. (1958). *The application of game theory in economics*, translated by Shahbazi, k. (2017). Tehran: Samt Publications. Tehran, Iran (In Persian).
18. Gjergji, R., Vena, L., Sciascia, S. and Cortesi, A. (2021). The effects of environmental, social and governance disclosure on the cost of capital in small and medium enterprises: The role of family business status. *Business Strategy and the Environment*, 30(1), pp. 683-693. https://doi.org/10.1002/bse.2647
19. Hajiha, Z. and Mohammad Hossein-Nejad, S. (2014). Factors affecting weaknesses with the importance of internal controls, *Financial Accounting and Auditing Research*, 7(26), pp. 119-137 (In Persian).
20. Hajiha, z., Oradi, J. and Saleh Abadi, M. (2017). Weakness in internal controls and audit report delay, *Financial Accounting Quarterly*, 9(33), pp. 78-96 (In Persian). https://doi.org/10.22059/acctgrev.2021.317284.1008500
21. Hamed, R. (2023). The role of internal control systems in ensuring financial performance sustainability. *Sustainability*, 15(13), A. 10206. https://doi.org/10.3390/su151310206
22. Javid, D. and Ahmadi Chegani, M. (2020). Investigating the relationship between auditor's reputation and capital adequacy management of banks admitted to Tehran Stock Exchange, *Management Sciences Research*, 2(2), pp. 51-62 (In Persian).
23. Johnstone, D., (2016). The effect of information on uncertainty and the cost of capital, *Contemporary Accounting Research*. 33(2), pp. 752-774. http://dx.doi.org/10.1111/1911-3846.12165
24. Joudi, S. and Mansoorfar, G. (2020). The role of audit quality on the relationship between information asymmetry and the dimensions of awareness and deception of earnings management. *Financial Accounting Research*, 12(1), pp. 19-38 (In Persian). http://dx.doi.org/10.22108/far.2020.118604.1499
25. Kashanipour, M., Rahmani, A. and Parchini Parchin, S. (2009); the relationship between voluntary disclosure and non-obligatory managers, *Accounting and Auditing Reviews*, 16(57), pp. 85-100 (In Persian).
26. Kaviani, M., Khaja Fard, N. and Montazeri, Z. (2018). A comprehensive review of the approaches to explain the Cost of equity model in financial research, *Accounting and Social Benefits*, 8(1), pp. 151-129 (In Persian).
27. Lee, P. J., Taylor, S. J. and Taylor, S. L. (2006). Auditor conservatism and audit quality: evidence from IPO earnings forecasts. *International Journal of Auditing*, 10(3), pp. 183-199. https://doi.org/10.1111/j.1099-1123.2006.0349.x
28. Mashayekhi, B. and Farhadi, S. (2015). The effect of firm size on the relationship between the quality of disclosure and the Cost of equity of companies listed on the Tehran Stock Exchange. *Management Accounting*, 6(4), pp. 101-115 (In Persian).
29. Memeshli, R. and karshenasan, A. (2019). The effect of audit quality on managers' overconfidence and the possibility of fraudulent reporting: a mixed multidimensional approach. *Applied Research in Financial Reporting*, 8(15), pp. 169-208 (In Persian).
30. Mohammadi, A. and Sarlak, N. (2012). Examining the relationship between the financial and non-financial characteristics of the firm with the quality of mandatory and optional disclosure of companies listed on the Tehran Stock Exchange, Master's Thesis, University of Qom. Qom, Iran (In Persian).

31. Monteiro, A. P., Vale, J., Silva, A. and Pereira, C. (2021). Impact of the internal controls and accounting systems on the financial information usefulness: The role of the financial information quality. *Academy of Strategic Management Journal*, 20(3) pp. 1-13. https://doi.org/10.1016/j.accinf.2022.100557
32. Movahedi, A., Kazemi, H. and Saraf, F. (2019). The impact of audit quality on the level of voluntary disclosure of information in the capital market. *Science and Engineering Elites*, 15(3), pp. 1-14 (In Persian).
33. Navabi Moghadam, Z., Zare, A., Yousefi Sadeghloo, A. and Jamali, J. (2022). An Investigation on the conflict of interests of bank shareholders using the corporate governance approach. *Legal Research Quarterly*, 24(96), pp. 360-387 (In Persian). https://doi.org/10.29252/JLR.2021.185115.1659
34. Saedi, R. and Dastgir, M. (2018). The effect of weak internal controls and the gap between controlsling shareholders on the investment efficiency of companies listed on the Tehran Stock Exchange, *Financial Accounting Research*, 9(4), pp. 17-38. https://doi.org/10.22108/far.2018.106912.1147
35. Saffar, Y., Nodeh, F. M., Rezaei, F. and Sadrara, M. (2021). Investigating the relationship between manager and shareholder using game theory: applying accounting conservatism and financial reporting quality. *Journal of Contemporary Issues in Business and Government*, 27(2), p. 843. https://doi.org/10.47750/CIBG.2021.27.02.103
36. Sun, J. and Liu, G. (2012). Auditor industry specialization, board governance, and earnings management. *Managerial Auditing Journal*, 28(1), pp. 45-64. http://dx.doi.org/10.1108/02686901311282498
37. Tran, L. T. H. (2022). Reporting quality and financial leverage: Are qualitative characteristics or earnings quality more important? Evidence from an emerging bank-based economy. *Research in International Business and Finance*, 60(1), A. 101578. https://doi.org/10.1016/j.ribaf.2021.101578
38. Yang, L. (2024). Environmental accounting information disclosure from the perspective of game theory. *In SHS Web of Conferences*, 188(1), pp. 3015-3020. https://doi.org/10.1051/shsconf/202418803015