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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:

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- Utmost 5 keywords in Times New Roman
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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;
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Editor's Note

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

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

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

Yours faithfully,
Mahdi Moradi
Editor in Chief

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Quarterly

RESEARCH ARTICLE

Portfolio Diversification Based on Clustering Analysis

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Abstract

Forming an investment portfolio is one of the main concerns of managers and investors who strive in order to create the best investment portfolio to get the best return from the market. So far, many methods have been presented to construct a portfolio, of which the most famous is the Markowitz approach. Our research aims to offer a classical portfolio selection using cluster analysis. We trained four models using k-means clustering with daily log returns as features and agglomerative clustering methods with complete, single and average linkages based on correlation-based distances. Four equally weighted portfolios of 30 stocks each were formed by selecting the stock with the highest Sharpe ratio from each cluster. Based on the silhouette scores and Sharpe ratio, we selected agglomerative clustering with average linkage trained on last year's data as our final model. The performance of our selected portfolios over the test period was better than random selection in terms of Sharpe ratio but worse than the overall index. The results in terms of volatility showed better performance; our selected portfolio had an annualized volatility lower than the random selection and the average volatility of all clusters and relatively close to that of the equally weighted portfolio consisting of all 334 stocks in the data.

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1. Introduction

Data mining is introduced as the science of data analysis to gain insights and knowledge about the data under study. Researchers in most scientific fields, such as management, business, medicine, engineering and biology, face the rapid growth of information and high-dimensional data, so this method is used to try to understand the relationships between existing phenomena (Williams, 2011).

Clustering is one of the most critical data mining methods to extract useful information from high-dimensional data sets (Kumar and Wasan, 2010). In other words, clustering is a process in which a group of objects is clustered, so objects in one cluster are similar and different from objects in other clusters (Chaudhuri and Ghosh, 2016; Jain & Dubes, 1988). In recent years, different clustering methods have been proposed and developed that can be defined and designed as a mathematical technique to uncover the classification structures in data collection of real-world phenomena (Majewski et al., 2014).

One of the most critical investment issues facing different investors is choosing an optimal investment portfolio and balancing risk and return to maximise investment returns and minimise investment risk (Kolm et al., 2014). Markowitz first introduced the theory of portfolio analysis in “Portfolio Selection” (1952), which was used by investors and financial institutions for a long time (Pardalos et al., 1994). In the following years, some mathematical approaches have been used in financial decisions (Detemple, 2014).

Securities optimization is a significant financial problem, and the issue of choosing the optimal portfolio of stocks has long concerned investment professionals. One of the basic assumptions in finance is that due to a shortage of resources, all economic options are subject to some exchange. In deciding to invest, a rational investor faces the fundamental problem of choosing between the level of return they want to earn and the level of risk they are willing to accept for that return. A key step in the investment process is allocating one’s financial resources optimally (Bechis, 2020).

According to Gallup (Jones, 2017), the average percentage of Americans owning stocks from 2009 to 2017 is 54%, which has decreased by 8% since the financial crisis. Many people have withdrawn from the stock market because they are not getting ideal returns or because there is no high-yield investment strategy to generate reasonable profits while withstanding the market's volatility. This problem affects not only retail investors but also many institutional investors. Modern portfolio theory suggests that investors can achieve this goal through portfolio diversification by reducing risk by spreading a portfolio across many different investments (Bodie et al., 2014). Portfolio diversification allows investors to avoid over-exposure to a single source of risk; an investor with a well-diversified portfolio can be immune to many of the company's risks (Hull, 2018). This project aims to use clustering methods to construct well-diversified portfolios that reduce volatility and losses and increase capital preservation.

In the first part of the paper, portfolios are constructed using different clustering methods for 334 stocks and the stock with the highest Sharpe ratio is selected from each cluster. For k-means clustering, we use daily log returns as features. In contrast, we use correlations between stocks for agglomerative clustering as a user-defined distance metric, as suggested by several previous studies (León et al., 2017). Using the Sharpe ratio and silhouette scores, we select our final model to test with the test data. In the second part of the portfolio, we evaluate and compare the test results based on the Sharpe ratio with the overall index and portfolios of randomly selected stocks as benchmarks. We also calculate the annualized volatility of the portfolio and compare it to that of each cluster and the overall index to evaluate our model. We conclude our study by interpreting the results of the first and second parts and suggesting several improvements.

2. Literature Review

Clustering is one of the most critical tasks in data mining and one of the unsupervised learning

models. This method aims to naturally group a set of objects and data into different sections, and then the quantitative comparison of the features of each section allows the discovery and investigation of hidden structures in the data (Jain, 2010). The clustering of time series data is commonly used to discover patterns in time series datasets (Wang et al., 2002).

This task itself is divided into two separate sections. The first part is to find patterns that occur frequently in time series (Chung et al., 2001; Chiu et al., 2003), and the second part is to methods that examine patterns that occur infrequently in time series.

It also explores events that have surprising effects on the time series process (Keogh et al., 2002; Leng et al., 2009). Clustering categorizes data by reducing the volume of data and finding patterns. The general approaches of clustering algorithms are shown in Figure 1.

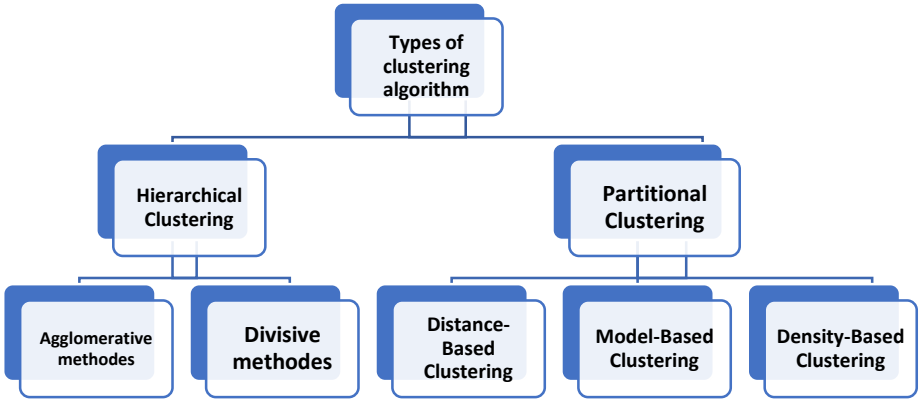

Figure 1. Types of clustering algorithms
Source: (Saxena et al., 2017)

2.1 Types of clustering algorithms (Saxena et al., 2017)

Clustering is divided into two categories: partial and hierarchical, which are defined and categorized below:

2.1.1 Partial clustering (segmentation):

They divide datasets into non-overlapping subsets so that each piece of information is contained in exactly one subset.

Hierarchical clustering is divided into two categories:

2.1.2.1 Agglomerative methods (bottom to top method)

Starts with each dataset in a cluster. Repeatedly, it combines clusters close to each other at each stage to remain a cluster finally.

2.1.2.2 Divisible methods (top to the bottomed method)

Starts the entire data as one cluster. Repeatedly splits the data into one of the clusters until there is only one dataset per cluster.

In this study, k-means clustering and hierarchical clustering methods are used, both of which are

explained in detail.

2.1.2 Clustering techniques

There are many clustering techniques, depending on the strategy and identification categories. The choice of which technique to use depends on the type and structure of the data. In this section, two clustering methods are discussed:

2.1.2.1 K-means clustering

K-Means is JB's best known clustering method. MacQueen proposed this method in 1967 as a classical clustering algorithm for scientific research and industrial applications. The k-means algorithm aims to find and group data points in similar classes, where this similarity is perceived as the opposite of the distance between the data. The closer the data points are to each other, the more likely they are to belong to a cluster. The basic idea of this algorithm is to divide n^{th} data objects into n^{th} clusters such that the sum of the squares of the data points in each cluster is the smallest distance from the center of the cluster (Thuraisingham and Ceruti, 2000).

The algorithm finds the center of "k" and assigns each data point to exactly one cluster to minimize the variance within the cluster (called inertia). This method usually uses Euclidean distance (the typical distance between two points), but other distance criteria can be used. The k-means algorithm provides a local optimum for a given K and proceeds as follows:

1. This algorithm determines the number of clusters.
2. The data points are randomly selected as cluster centers.
3. Each data point is assigned to the cluster center closest to it.
4. The cluster centers are updated to the average assignment.
5. Steps 3 and 4 are repeated until all cluster centers remain unchanged.

2.1.2.2 Hierarchical clustering

Hierarchical clustering creates clusters that have a dominant order from top to bottom. The main advantage of hierarchical clustering is that the number of clusters does not need to be determined. The model itself determines them and solves this problem. This clustering method is divided into two types: agglomerative hierarchical clustering and divisive hierarchical clustering.

Agglomerative hierarchical clustering is the most common type used to group objects based on similarity. This is a bottom-up approach where each observation starts in its own cluster, and cluster pairs are merged as they move up the hierarchy. The agglomerative hierarchical clustering algorithm provides a *local optimum* that works as follows:

1. Think of each data point as a one-point cluster, starting at N.
2. Consider two data points closer together and group them into N-1 clusters.
3. Consider two clusters close to each other and combine them into N-2 clusters.
4. Repeat step 3 to stay with only one cluster.

Divisive hierarchical clustering works "top-down" and separates the remaining clusters to form distinct subgroups of each. Both methods create the N-1 hierarchical level and facilitate clustering at the level that best divides the data into homogeneous groups.

Hierarchical clustering allows the drawing of dendrograms, an image of a binary hierarchical clustering. A dendrogram is a tree diagram that shows hierarchical relationships between different data sets. Dendrograms provide an exciting and informative representation of the results of hierarchical clustering that includes the memory of the hierarchical clustering algorithm, making it possible to express the formation of clusters simply by looking at the diagram.

One of the advantages of hierarchical clustering is that it is easy to implement, the number of

clusters does not need to be fixed, and the dendrograms generated are very useful for understanding the data. However, the time complexity of hierarchical clustering can lead to longer computation times than other algorithms, such as K-Means. For a large dataset, it is difficult to determine the correct number of clusters by observing the dendrogram. Hierarchical clustering is very sensitive to outliers in the data, which significantly affects the model's performance (Tatsat et al., 2020).

The agglomerative method is one of the hierarchical clustering algorithms. It classifies objects by collecting small clusters from the bottom up in a tree structure. The clustering process starts by declaring each point as its cluster, and then the two most similar clusters are merged into a single cluster according to their linkage. The termination criterion in scikit-learn is the number of clusters entered, so the above process is repeated until the specified number of clusters is left. Unlike k-means, Agglomerative Clustering in scikit-learn allows a user-defined distance metric. Therefore, a correlation-based distance metric can be used. The custom distance metric we use is as follows:
$distance=(1-correlation)$

There are four different linkage criteria to determine how similarities between two clusters are measured: single, complete, average, and station. The two with the least minimum distance between their points are merged in a single linkage. The two clusters with the least maximum distance between their points are merged in the complete linkage. The two clusters with the least average distance between all their points are merged in average linkage. Ward linkage, the default setting in scikit-learn, merges two clusters so that all clusters' variance increases the least. Since Ward only allows the Euclidean distance metric, it is omitted for our purpose of using correlation distances.

2.2 Sharpe ratio

The Sharpe ratio, widely used to evaluate portfolio performance, is used in this project to examine portfolio performance. It measures how much a portfolio outperforms the risk-free return on a risk-adjusted basis. The higher the ratio, the better the performance. The Sharpe ratio is calculated using the following formula:

$$Sharp\ Ratio(SR) = \frac{R_p - R_f}{\sigma_p} \qquad (1)$$

Clustering is one of the data mining techniques that group data based on a similarity criterion without knowing the number and characteristics of the groups. Clustering based on the similarity of trends can be very useful in evaluating the common movement of prices. So far, various research works have been conducted in the field of clustering and studying the correlation or convergence between stocks on a stock exchange, the overall index or the index for a particular industry on the stock exchanges of different countries or the index of different industries on a stock exchange, which are discussed and presented below.

Raffinot (2017) proposes an asset allocation method based on hierarchical clustering using network theory and machine learning techniques. His experimental results show that the hierarchical clustering based portfolio is stable, truly diversified, and performs better risk adjustment than traditional optimization techniques (Raffinot, 2017).

In a paper by Ding et al. (2019), the CSI800 index was clustered using the stock K-Means benchmark. In this study, hierarchical clustering diagrams and similarity structure diagrams were drawn and analyzed, and it was found that clustering approaches in stock analysis have visual characteristics and ease of analysis (Ding et al., 2019).

In their research, Nakagawa et al. (2019) used the pattern of stock price fluctuation, which is not yet fully used in the financial market, as an input feature for prediction. They extracted the representative stock price fluctuation patterns with k- Medoids Clustering with the Indexing DTW

method (Nakagawa et al., 2019).

In their study, Huarng et al. (2008) investigated the structural changes using the K-Means clustering method to analyze a time series in the capitalization-weighted stock index of the Taiwan Stock Exchange. This study also illustrates the advantages of using the cluster method to determine structural changes (Huarng et al., 2008).

Liao et al. (2008) investigated a two-stage data mining method to summarize and visualize the data of the Taiwan Stock Market. In the first stage, a series of methods were used to illustrate the patterns and rules to suggest stock categories. In the second stage, K-Means clustering was implemented to identify stock category clusters and provide helpful information to investors (Liao et al., 2008).

Prior studies (Barziy and Chlebus, 2020; Snow, 2020; Molyboga, 2020; Jaeger et al., 2021; Nourahmadi and Sadeqi, 2021) used the HRP approach. (Lohre et al., 2020) In their paper, they examine diversification strategies based on hierarchical clustering. (Raffinot, 2018) Their results show that HERC portfolios based on descending risk criteria perform statistically better than CDaR criteria for risk adjustment.

3. Research Methodology

This paper aims to use clustering algorithms to create a diversified portfolio to reduce volatility and the overall risk of an investment portfolio. The first step in data preparation is data mining. For this purpose, we extracted the adjusted daily data of all listed companies from 01/01/2017 to 07/30/2020 (about 660 stocks) using the Noavarn Amin software. All calculations are performed by Python version 3.8. The second step in data preparation is data preprocessing. In this stage, we first need to clean the data from noise, outdated data and missing data that compromise the quality of the data. First, the number of trading days was calculated for all stocks, and based on the number of trading days, the remaining 334 stocks and the rest were removed from the statistical population because they did not have enough data.

This study used the adjusted final price as the primary variable for clustering. It starts with the P_{it} raw price series, which shows the stock price of company *i* on day *t*, and Pit-1 also shows the stock price of the company *i* on day *t-1*. Then the log returns of the companies' stocks are calculated according to Equation 2.

$$R_{it} = ln\frac{P_{it}}{P_{it-1}} \quad (2)$$

In order to determine the degree of similarity between two time series, it is necessary to detect the extent to which time series A can explain time series B. This value is determined using the following equation, known as the correlation coefficient, where the original diameter is one, and the other elements indicate their correlation coefficient:

$$\rho_{AB} = \frac{\mathrm{Cov(A,B)}}{[\mathrm{Var(A)Var(B)}]^{\frac{1}{2}}} \quad (3)$$

Equation 4 is used to convert the correlation coefficient into a metric criterion:

$$\mathrm{Dist}_{\rho}(\mathrm{A,B}) = \sqrt{2(1-\rho_{\mathrm{AB}})} \quad (4)$$

After processing the data, we try to achieve order in the data in the model learning phase. As mentioned earlier in this study, we want to use the clustering method as an unsupervised learning method and use it to optimize the portfolio. We divide the period into two parts: the testing and training periods. The training period, 02/07/2019 to 01/01/2017, covers 768 days, and the testing

period, 02/08/2019 to 07/30/2020, covers 539 days. We use the overall index as the criterion for comparing the results.

Figure 2 shows the returns of all stocks.

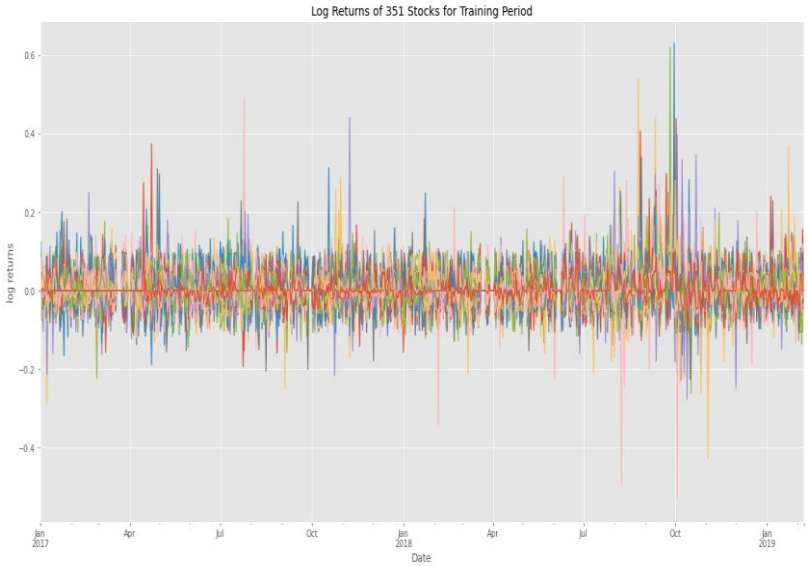

Figure 2. Return of stocks
Source: Research findings.

The literature review states that the portfolio selection problem can be solved more efficiently by grouping stocks into clusters and then selecting stocks in clusters to form efficient portfolios (Gubu et al., 2019). The general framework in this paper is shown in Figure 3.

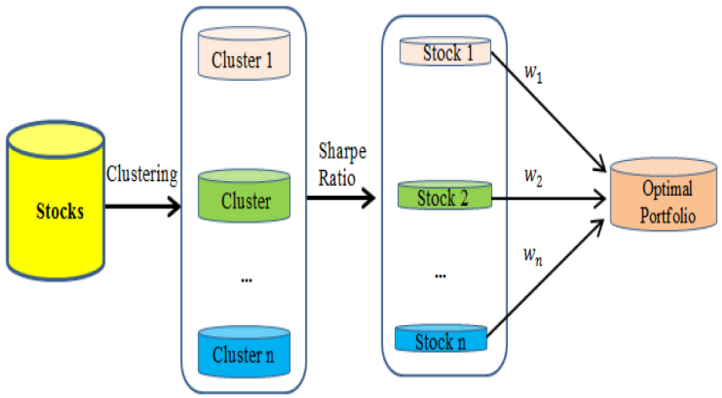

Figure 3. General steps of portfolio selection
Source:(Gubu et al., 2019)

In order to assess how well stocks are clustered, we use the Sharpe ratio, silhouette scores, and annualized volatility. A higher Sharpe ratio indicates a better portfolio risk-adjusted return, suggesting the portfolio is well diversified. We compare the Sharpe ratio in the created portfolios and the benchmarks. Since we are simply comparing different models over the same period, we used the daily Sharpe ratio: the mean of the log returns over the period divided by the standard deviation of

the log returns over the period. The result is successful if our portfolio has a higher Sharpe ratio than the benchmarks. The silhouette score measures how similar an asset is to its own cluster compared to other clusters. It ranges from -1 to +1, with a higher value indicating that the object is a good match to its cluster and a poor match to neighboring clusters. If most objects have a high value, the cluster configuration is appropriate. If any items have a low or negative value, there may be too many clusters in the model.

Finally, annualized portfolio volatility is calculated for each cluster to assess diversification:

$$vol = \sqrt{w^T \sum w} \quad (5)$$

Where $\sum$ is the covariance matrix of returns, w and w^T are the portfolio weights and their transpose. If our clusters are well constructed and we group similar stocks in each cluster, the volatility in each cluster should be higher than the portfolio's volatility. We also compare the volatility of the portfolio to the volatility of benchmarks: a portfolio of 30 randomly selected stocks and an equally weighted portfolio consisting of all 334 stocks in the data.

Two benchmarks indicate the market performance used in this project. The first is the overall index.

To construct this benchmark portfolio, 30 stocks are randomly selected based on a uniform distribution. However, instead of simply drawing 30 stocks at random once, we constructed 30 such portfolios and calculated the average Sharpe ratio of the 30 portfolios to control for variability. The same benchmark is also used to evaluate volatility.

We calculate the Sharpe ratio for all stocks and the overall index in the first step. The Sharpe ratio for the overall index is 0.399126. Then we randomly select 30 stocks from the data and calculate the Sharpe portfolio ratio, which consists of 30 randomly selected stocks and is 0.33981.

4. Result

We will create a portfolio using the k-means method in the next step. First, we cluster 334 stocks using the k-means method. We set the number of clusters to 30 and then performed the clustering. We use daily stock prices as a feature. In the next step, based on the Sharpe criterion, we select the stock from the cluster with the highest Sharpe criterion and select it as the selected stock to form the portfolio. The Sharpe criterion for a portfolio consisting of the k-means method is 0.32347.

4.1. The correlation matrix

We will use the correlation distance between the price histories of each stock for hierarchical clustering, so let us create our correlation matrix and visualize how our clustering results are formed. We assume that correlation distance works better than daily prices because it can account for price and movement similarities. The heat map does not show the 30 clusters we construct but visualizes the results of our practice in a more general sense.

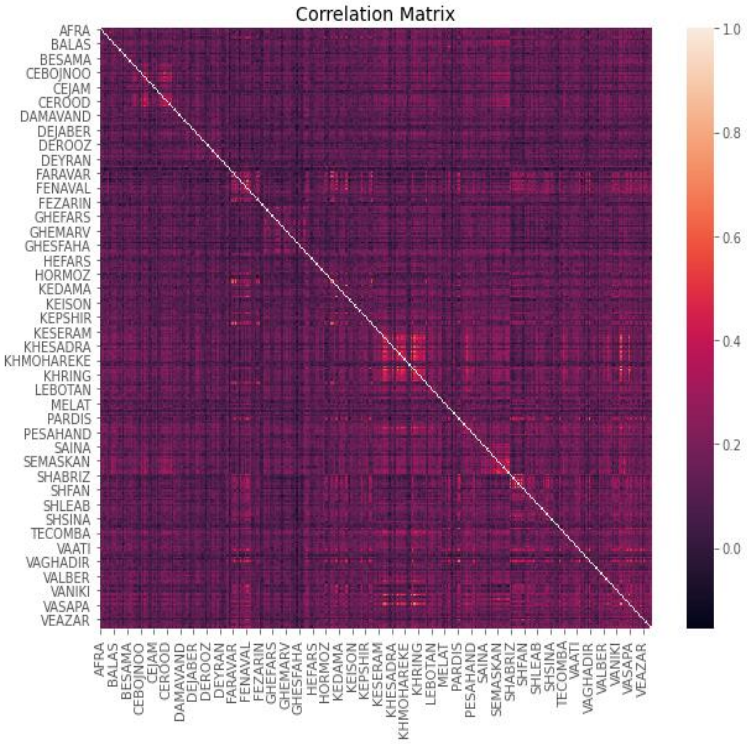

Figure 4. Heat Map (Correlation matrix)
Source: Research findings.

Figure 5 shows the Heat Map of Stocks Clustered by Correlation Distances, Average Linkage in Training Period 1.

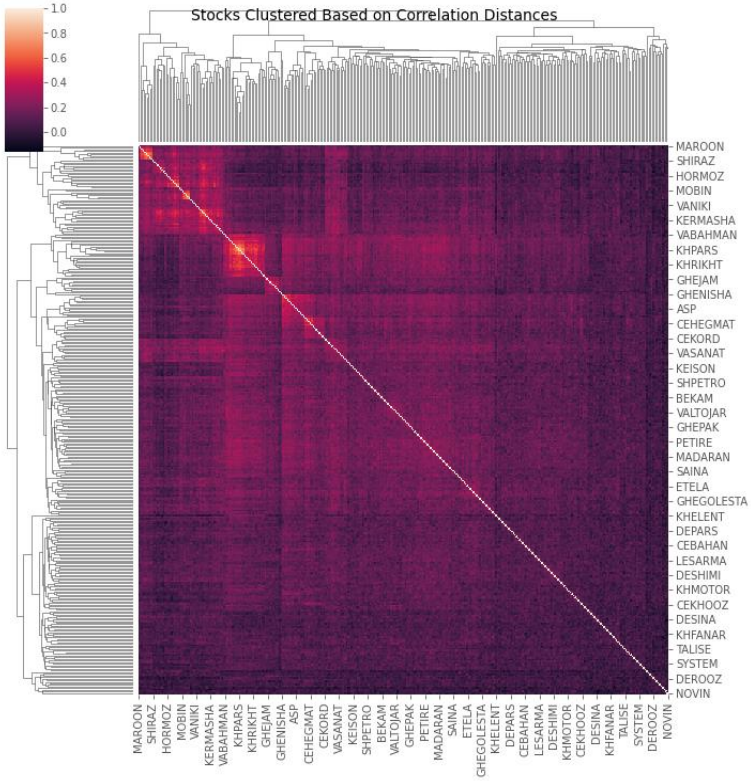

Figure 5. Heat Map (Stocks clustered by correlation distances, Average linkage, training period 1)
Source: Research findings.

Table 1 Shows 30 stocks selected from 334 stocks using various clustering methods.

Table 1. Hierarchical (Agglomerative) Clustering and k-means

Average		Complete		Linkage		K-means	
Sharpe	**Group**	**Sharpe**	**Group**	**Sharpe**	**Group**	**Sharpe**	**Group**
FEOLAD	0	FEROS	0	FEOLAD	0	SHKARBON	0
GHESALEM	1	CEKHAF	1	SEDABIR	1	FEPANTA	1
REANFOR	2	MOBIN	2	VEAZAR	2	SHSINA	2
PAKSHOO	3	GHEPIRA	3	PAKSHOO	3	GHEJAM	3
KEKHAK	4	DAMAVAND	4	NOVIN	4	KHRING	4
KHODKAFA	5	KEMANGANEZ	5	VAETEBAR	5	KEHRAM	5
ENERGY	6	VABOALI	6	KEMARJAN	6	KAZERO	6
VAETEBAR	7	GHEHEKMAT	7	FEKHAS	7	SHPARS	7
CEBOJNOO	8	SHPAKSA	8	GHEMAHRA	8	SHZANG	8
VADEY	9	KEKHAK	9	KEDAMA	9	CEKHAF	9
KEMARJAN	10	CEFANO	10	GHESALEM	10	FENAVAL	10
DESINA	11	GHEFARS	11	KOSAR	11	CEBAGHER	11
HEFARS	12	CHEKAREN	12	KEHRAM	12	SENOSA	12
CHEKAREN	13	VAETEBAR	13	ETEKAM	13	LEKEMA	13
CEFANO	14	PAKSHOO	14	HEFARS	14	CEKHASH	14
GHESHESFA	15	FLAMI	15	CEBOJNOO	15	FEOLAD	15
NOVIN	16	GHEMAHRA	16	BEMAPNA	16	BESAMA	16
KOSAR	17	HAMRAH	17	FEPANTA	17	SEPARDIS	17
VAKAR	18	VADEY	18	CHEFIBER	18	NIROO	18
SYSTEM	19	ENERGY	19	DEFRA	19	VAETEBAR	19
GHEMAHRA	20	SHKARBON	20	DETMAD	20	PELOLEH	20
KHNASIR	21	FEOLAD	21	DERAZAK	21	FARAVAR	21
SEDABIR	22	BESAMA	22	FLAMI	22	KEGHAZVI	22
FEKHAS	23	KESERAM	23	FAJR	23	KHELENT	23
DAROO	24	KEMARJAN	24	KAZERO	24	KHMOTOR	24
FAJR	25	DESINA	25	CEKHASH	25	SHETRAN	25
FLAMI	26	KEHAMEDA	26	FESEPA	26	BEKAB	26
VEAZAR	27	FEKHAS	27	DEROOZ	27	KHAZIN	27
KHELENT	28	GHESALEM	28	CEHORMOZ	28	VALTOJAR	28
CEKERMA	29	NOVIN	29	GHEFARS	29	PAKHSH	29

In Table 2, we compare Sharpe ratios of different clustering methods.

Table 2. Sharpe Ratio (Training Period 1)

	K-Means	**Single**	**Complete**	**Average**	**Total index**	**Random**
Sharpe ratio	0.323	0.347	0.305	0.328	0.399	0.339

Source: Research findings

The silhouette value measures how similar a point is to its cluster (*cohesion*) compared to other clusters (*separation*). The range of the silhouette value is between +1 and -1. A high value is desirable and indicates that the point is placed in the correct cluster. We may have created too many clusters if many dots have a negative silhouette value (Tatsat et al., 2020).

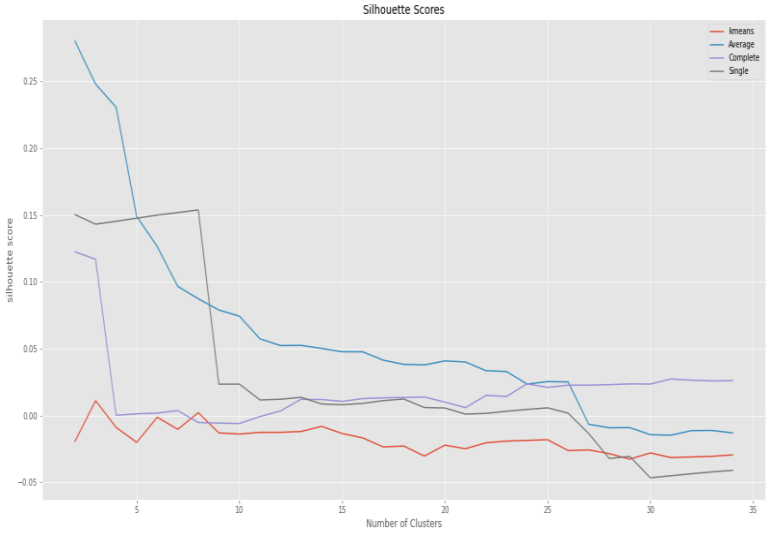

Figure 6. Silhouette Scores (Training Period 1)
Source: Research findings.

The above results do not seem consistent with our expectations or the silhouette values. Contrary to our expectations, k-means clustering has the highest Sharpe ratio, followed by single linkage. The silhouette scores indicate the worst performance for average linkage. This may be because we add noise using training data that goes back too long. Stock prices from 4 years ago do not necessarily match today's prices. Let us try a shorter training period and see if it works better.

Below we present the results from Training Period 2 (07/07/2019 to 07/07/2020).

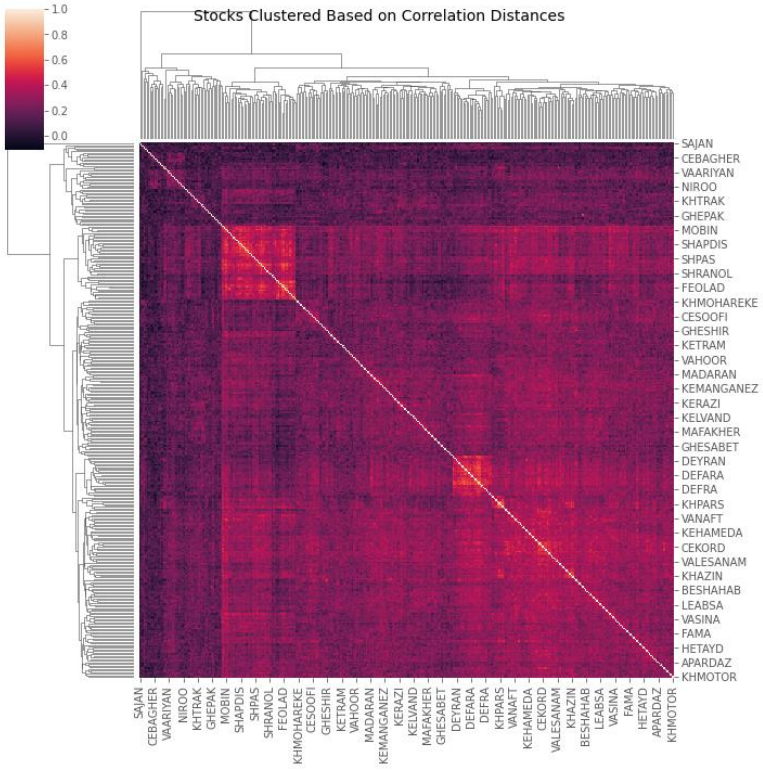

Figure 7. Heat Map (Stocks Clustered by Correlation Distances, Average Linkage, Training Period 2)
Source: Research findings.

Table 3. Hierarchical (Agglomerative) Clustering and Kmeans

Average		Complete		Single		K-means	
Sharpe	**Group**	**Sharpe**	**Group**	**Sharpe**	**Group**	**Sharpe**	**Group**
FEOLAD	0	REANFOR	0	FEOLAD	0	SHFARS	0
KHETOGHA	1	PEDERAKHSH	1	VEAZAR	1	HAMRAH	1
SHNAFT	2	FEROS	2	VAKADO	2	DAMAVAND	2
GHESALEM	3	CEKHAF	3	SEGHAZVI	3	SHKARBON	3
KEMARJAN	4	KEKHAK	4	TEPCO	4	KESERAM	4
GHESABET	5	FARAVAR	5	SHSINA	5	GHEHEKMAT	5
CEBAGHER	6	SHNAFT	6	TEPUMPI	6	DEABOR	6
VAKADO	7	GHESALEM	7	KHODRO	7	ZAGROS	7
FLAMI	8	FLAMI	8	KHTRAK	8	SHPAKSA	8
VEAZAR	9	SHTOOKA	9	NIROO	9	VATOOSHE	9
TEPUMPI	10	KHFANAR	10	SAJAN	10	PARDIS	10
TEPCO	11	KEFRA	11	KESAVEH	11	KHETOGHA	11
KHFANAR	12	KESERAM	12	KHODKAFA	12	FEROS	12
LEKEMA	13	HAMRAH	13	PELOLEH	13	TIPIKO	13
CEKHAF	14	TEPCO	14	GHEFARS	14	CEOROUM	14
DAMAVAND	15	VEAZAR	15	ENERGY	15	VATOSAM	15
SAJAN	16	LEKEMA	16	GHESHESFA	16	CABZEVA	16
GHEGOL	17	GHEHEKMAT	17	GHEGOL	17	DEAMIN	17
VABAHMAN	18	KHELENT	18	GHEMAHRA	18	FEOLAD	18
GHEFARS	19	CEBAGHER	19	CHEKAREN	19	KELVAND	19
KHODRO	20	ENERGY	20	KAZERO	20	KEAMA	20
ENERGY	21	SHAMLA	21	KEFPARS	21	GHSHEKAR	21
KEDAMA	22	DAMAVAND	22	GHEJAM	22	RETAP	22
KEFPARS	23	SAJAN	23	FEPANTA	23	ENERGY	23
KHODKAFA	24	SHKARBON	24	GHESALEM	24	GHEPINO	24
FEKHAS	25	LEKHAZAR	25	CEBAGHER	25	KHODRO	25
KESAVEH	26	SEGHAZVI	26	KHFANAVAR	26	CEBAGHER	26
PELOLEH	27	KHODRO	27	KEHRAM	27	GHESALEM	27
CHEKAREN	28	FEOLAD	28	KESERAM	28	KEMASEH	28
KELVAND	29	VABAHMAN	29	CEJAM	29	BOURSE	29

Table 5 compares the results of the Sharpe ratios of different clustering methods.

Table 5. Sharpe Ratio (Training Period 2)

	K-Means	**Single**	**Complete**	**Average**	**Total index**	**Random**
Sharpe ratio	0.319	0.334	0.328	0.341	0.399	0.339

Source: Research findings.

Table 5 shows the results for the second training period. The portfolios constructed by k-means clustering and agglomerative methods with single, complete and average linkages have Sharpe ratios of about 0.319, 0.334, 0.328 and 0.341, respectively.

Figure 8 illustrates the silhouette scores in the second training period. The results show that the single-linkage model performs worst at 30 clusters, consistent with the Sharpe ratio results. The results in the second training period are much more consistent with expectations and silhouette scores, suggesting that better clusters are formed.

Considering that our data consists of 334 firms, we can claim that the volatility of our portfolio is satisfactory. Our model also performs better than random selection in terms of Sharpe ratio and volatility.

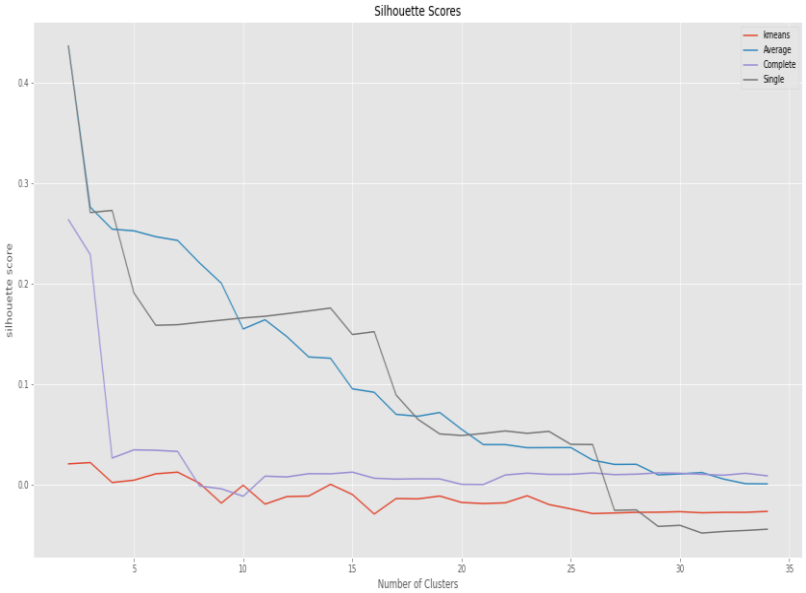

Figure 8. Silhouette Scores (Training Period 2)
Source: Research findings.

Table 6. The Volatility

Volatility	
Total index	0.200
Portfolio	0.168
Random	0.210
Cluster	0.383

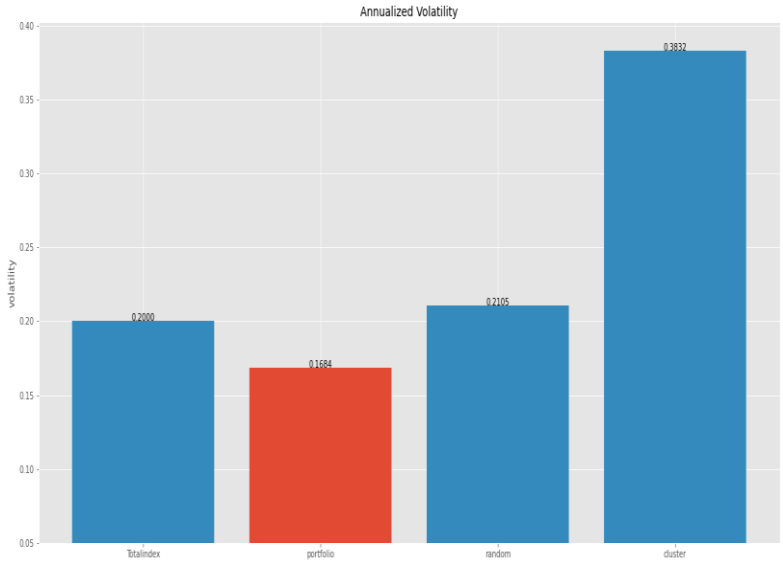

Figure 9. Volatility
Source: Research findings.

5. Conclusion and Recommendations

Data mining is one of the most powerful tools for extracting information and knowledge from raw data, and clustering, as one of the standard methods in data mining, is a suitable method for grouping

data into different clusters, which helps in understanding and analyzing relationships. In general, clustering is one of the data mining methods in which similar data is classified into related or homogeneous groups (Rai and Singh, 2010). Investors who intend to buy and add new stocks to their portfolio or investors who want to construct an optimal portfolio must first pay attention to the degree of mobility or, in other words, the correlation between different stocks because this reduction of investor risk is risk averse and increase investor return is risky so that they can use clustering methods. One of the most critical investment issues facing different investors is choosing an optimal investment portfolio and balancing risk and return to maximise investment returns and minimize the investment risk (Kolm et al., 2014). Thus, this project aims to create a well-diversified portfolio using clustering. We trained four models using k-means clustering with daily log returns as features and agglomerative clustering with average, full, and single linkages based on correlation-based distances. Four equally weighted portfolios of 30 stocks each were formed by selecting the stock with the highest Sharpe ratio from each cluster. Based on the silhouette scores and Sharpe ratio, we selected agglomerative clustering with average linkage trained on last year's data as our final model. The performance of our selected portfolio over the test period was better than random selection in terms of Sharpe ratio but worse than the overall index. The results in terms of volatility showed better performance; our selected portfolio had an annualized volatility lower than the random selection and the average volatility of all clusters and relatively close to that of an equally weighted portfolio consisting of all 334 stocks in the data.

There are a few ways to improve the performance of our model potentially. First, we could further adjust the length of the training period. We could try to adjust the number of clusters since we obtained higher silhouette values with smaller clusters.

Another way to ensure well-constructed clusters is to use a distance threshold. Distance thresholds define the maximum distance within a cluster such that the components of a cluster are "similar" enough. Finally, we could improve the portfolio's risk-adjusted return by weighting the individual stocks in the portfolio based on an optimization problem with maximizing the Sharpe ratio as a constraint.

6. The implications

In terms of performance evaluation, we could add additional means of portfolio evaluation such as Sortino ratio, Calmer, Max Drow Down, Omega ratio, VaR and CVaR to draw more concrete conclusions. We can also construct another benchmark by selecting three stocks with the highest Sharpe ratio in several industry sectors.

In addition, we can perform another qualitative analysis using the industry data to understand the commonalities within each cluster by examining whether the stocks in the typical clusters are similar in terms of sectors. We can also use time series analysis to build a model that describes the changes in stock prices over the entire period.

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RESEARCH ARTICLE

Designing a Model of Intangible Causes of Bankruptcy by TISM

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Abstract

One of the competitive conflicts of the capital market is the structural disruption of companies in terms of company capacity with market changes that can lead to the bankruptcy of companies. Bankruptcy will usually have detrimental social effects and loss of stakeholder rights due to individual negligence and lack of strategic structural insights at the market level, that knowing that can prevent financial helplessness and bankruptcy and maintain the ground for growth or maintaining the competitive position of the company in the markets as well as the capital market. This study aims to design a model of intangible causes of bankruptcy of capital market companies based on modeling a Total Interpretive Structural Modelling. This research is methodologically based on the result, developmental, and data type is a mixed method. In the qualitative part of the research, through Meta-synthesis and Delphi analysis, an attempt was made to screen the themes of companies' bankruptcy in the capital market and then determine their theoretical adequacy based on Delphi analysis. In the quantitative part of the research, an attempt was made to prioritize the approved themes of the qualitative part while analyzing the total interpretive structural model to determine the most influential theme of the bankruptcy of capital market companies. The target population in this research in the qualitative part included 12 accounting and financial management specialists at the university level and in the quantitative part were 25 managers of the top 50 companies of the stock exchange. The results showed that the lack of strategies to reduce the size of the company based on the product life cycle of products is the most intangible factor in the bankruptcy of capital market companies. This research is limited because it focuses on companies' content and structural dimensions in creating bankruptcy risk. Based on a combination of qualitative and quantitative analysis, he sought to explain the dimensions identified in prioritizing the themes of bankruptcy of capital market companies, an area that, despite its strategic importance and institutional governance in protecting the interests of shareholders, has received less attention. This research can be used to develop theoretical foundations on the one hand and the structural and content relevance of companies on the other to surround the stimulus considered the risks of bankruptcy. The paper shapes the relationship between a firm's situation, its symptoms, the bankruptcy syndrome and the causes of a particular situation. Using one of the newest developed theories, total interpretive structural modelling (TISM) used in firms' diagnosis – the bankruptcy syndrome – the paper extends the characteristics of this term and uses it in determining the causes that generate anomalies at the firm level.

Keywords:
Content Causes of Corporate Bankruptcy, Structural Causes of Corporate Bankruptcy, Total Interpretive Structural Modelling

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1. Introduction

Making the right decision in competitive conditions in the capital market today requires information that reflects reality and is consistent with the current situation of companies. This information, before analysis, is in the form of raw data that, if not properly analyzed, cannot be a basis for decision making and, possibly at the level of a competitive market, can lead to bankruptcy (Ghaderi and Ghaderi, 2017). In fact, for investors and many investment companies that are affected by the bankruptcy of companies, it is essential to use a quick and reliable tool to identify the financial distress of companies because they often have to make quick decisions about their capital and may They do not have an analytical understanding of the performance of companies (Nishi and Peabody, 2019). Identifying the causes of corporate bankruptcy in the form of mathematical techniques and simulating corporate disclosed data is considered an analytical basis in today's unbalanced economic conditions that can help create a free flow of information (Li et al., 2019). Increasing competition from businesses has limited profitability and increased the likelihood of bankruptcy. Thus, financial decision-making has become more strategic than in the past based on the application of identifying the causes of bankruptcy (Inam et al., 2019). It should be noted that financial decision making is always associated with risk and uncertainty; one of the ways to help investors is to provide cognitive models about the overall outlook of companies. Accordingly, the more the knowledge of the causes of companies' bankruptcy increases, the more correct decisions can be made (Setayesh and Aznab, 2019). Therefore, recognizing the effective causes of bankruptcy is one of the tools for estimating the future situation of companies so; that due to the focus on providing the necessary warnings, it can alert companies to the occurrence of financial instability and bankruptcy so that they can develop appropriate strategies to control these factors. Carrying out these processes is of great importance to investors and society because it indicates the importance of protecting the company's interests; companies are aware of the possibility of bankruptcy, so they can take preventive measures and strengthen the confidence of shareholders and investors. It should be noted that investors and creditors are very interested in understanding the bankruptcy status of companies because, in case of bankruptcy, they will incur high costs. Based on this, it can be stated that each of the models for predicting the bankruptcy of companies has its own strengths and weaknesses (Fakhrehosseini and Aghaei Meybodi, 2019). Assessing the causes of bankruptcy is also especially important for corporate governance mechanisms, as they examine the firm's structural strengths and weaknesses in response to changing needs. In this way, they help the company to develop a longer-term vision of the competitive situation and meet the expectations of shareholders and investors. Therefore, this research can help the development of financial literacy in stakeholder decision-making through the following:

First, the screening of models to identify the causes of corporate bankruptcy shows that most analytical models are classified into two groups: statistical models and artificial intelligence. In other words, a group of bankruptcy studies on linear methods were concentrated, such as multiple analysis models, Logit and Probit. While another group of studies on newer methods concentrated such as artificial intelligence; data mining techniques; genetic algorithms and intelligent systems, although they have been able to contribute well to the effectiveness and validity of the models in presenting linear assumptions through the normality of input variables, they pay less attention to the content and structural dimensions of companies in creating bankruptcy risk. Thus, as can be seen, most models analyze the company bankruptcy by the existence of standards or financial statement items. At the same time, less research has examined the existence of bankruptcy based on content screening for multidimensional theoretical analysis. (Jia et al., 2020). For example, previous research such as Qu et al. (2019) examined "identifying the causes of bankruptcy through machine learning"; Ptak-Chmielewska (2018) "Identifying the micro-causes of company bankruptcy through data mining

techniques"; Bateni and Asghari (2020) "bankruptcy prediction through genetic algorithm and logit regression" and Vaghfi (2019)" Analysis of the causes of financial bankruptcy based on artificial intelligence algorithm", confirms the claim that although the issue of identifying the causes and predicting the company bankruptcy has been considered. However, less research has examined the dimensions of failure in terms of combining the content and structural basis with the financial functions of financial statements, and this research can contribute to the development of theoretical literature in this area.

Second, the results of this study can help regulators, such as capital market policymakers, because of their ability to predict the competitive functions of enterprises to develop sustainability requirements in preventing the possibility of corporate bankruptcy to investor protection. Also, this research can look at the corporate governance structure in order to focus on controlling the probabilities of bankruptcy probability such as leverage ratios; legal mechanisms; timely and reliable disclosure of news and information will help increase the level of information transparency in financial reporting and prevent the company from being in a critical situation.

Therefore, to understand this theoretical and practical gap, the research tries to determine the components and themes of the causes of bankruptcy in the capital market by examining the content of similar research in the first step and then, based on theoretical adequacy, through a total interpretive structural model, to provide a model to determine the most influential themes of the causes of bankruptcy of Tehran Stock Exchange companies. Therefore, the main question of the research is what are the most effective themes of bankruptcy of Tehran Stock Exchange companies by total interpretive structural model?

2. Literature Review

In this section, an attempt is made to present the theoretical dimensions related to the concept of corporate bankruptcy in both theoretical and experimental sections.

2.1. Bankruptcy

The word bankruptcy means helplessness in business and is a kind of financial loss that causes the company's debt level to be overestimated over its assets.

Figure 1. The conceptual basis of bankruptcy

In legal terms, however, bankruptcy means the inability of the company to pay its debts to creditors so that, according to Article 412 of the Commercial Code, the property is seized and consequently stopped from paying the funds it owes (Heidari et al., 2021). Cooper and Uzun (2019) define corporate bankruptcy as follows: "bankrupt businesses enterprise stop their business operations and have legal responsibility for assigning creditors. In the Iranian Stock Exchange, the owner of the bankruptcy and delisting of companies from the stock exchange, in accordance with Article 141 of the Amended Commercial Code and its provisions,» if at least half of the company's capital is lost as a result of losses incurred, the board of directors is obliged to immediately convene an extraordinary

general meeting to invite shareholders to consider the issue of liquidation or survival of the company. Suppose the said assembly does not vote to dissolve the company. In that case, it must reduce the company's capital to the amount of the existing capital in the same meeting and compliance with the provisions of Article 6 of this law (Dabagh and Sheikhbeiglou, 2020). On the other hand, Karels and Prakash (1987) describe financial distress as a decrease in the firm's profitability, which increases the likelihood of inability to repay the principal and interest on the debt.

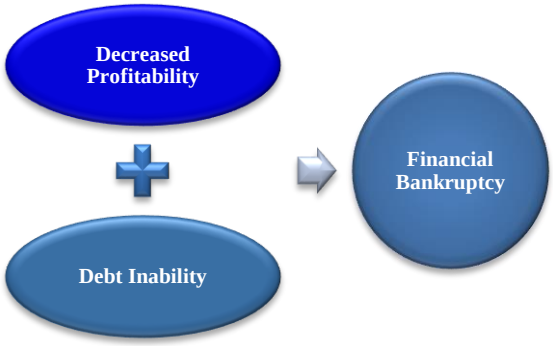

Figure 2. The basis of financial bankruptcy

In fact, according to this framework, in the early stages of financial distress, the mean operating profit of the company is not adjusted based on earnings. It can be measured after controlling for other factors that cause a significant change in increasing the company's performance. Notably, timely and accurate identification of companies on the verge of bankruptcy can greatly prevent potential stakeholder losses. But the question is, given the importance of identification time, what mechanisms can help identify the causes of corporate bankruptcy on time? In this regard, Aktan (2012) presented mechanisms for the timely identification of corporate bankruptcy in the form of the following theoretical framework.

Figure 3. The mechanisms for timely identification of company bankruptcies

As it turns out, R&D is seen as a mechanism for identifying bankruptcy in the first dimension of

the Aktan (2012) model, which can lead to a correlation between environmental expectations and stimuli with intra-organizational capacities for a more coherent perception of the environment; On the other hand, the dynamics of corporate governance create the ground for increasing effective oversight in order to adhere to equal benefits between the company and external stakeholders. The effective information environment is the third dimension of the bankruptcy identification model Aktan (2012) expresses the company's interactive atmosphere with external stakeholders in full reflection of news and information in a symmetrical way so that creating an effective information environment can identify bankruptcy incentives.

On the other hand, effective internal control is an important part of financial reporting processes in line with auditing standards, and this can transmit any deviation from the company's performance to the company's decision makers in the form of balanced evaluation programs and is an important mechanism in identifying the causes of bankruptcy. In the fifth dimension of this model, the effectiveness of decision-making refers to understanding the practical realities of the company and avoiding excitement and bias in the company's decisions. In the last dimension, wise management provides a level of managerial rationality (Berkovitch et al., 1998). As it turns out, the importance of identifying the causes of bankruptcy is so crucial that many Small and Medium Entrepreneur Companies (SMEs) do not reach the growth process and fail in their early years, so predicting the growth and decline of companies can come at a huge cost (Bărbuță-Mișu, N., and Madaleno, 2020).

On the other hand, Olsen and Tamm (2017) point out that due to the lack of identification of possible causes of bankruptcy, it is not necessary to directly use the data of financial statements to predict the bankruptcy of companies in the coming years and focus on the content and structural dimensions. Utilizing models created and defined by scientific-experimental methods can be more efficient, especially for enterprises operating in a competitive market. Therefore, relying on theoretical foundations and based on the existing theoretical and empirical gap regarding reliance on structural and content causes of companies in identifying the causes of bankruptcy, research questions are presented in the following order:

What are the components and themes of the causes of bankruptcy of capital market companies?

What are the most influential identified causes of bankruptcy of capital market companies?

2.2. Prior research

By examining the financial reports of the Chinese Stock Exchange, Hu et al. (2020) found that the main reason for the bankruptcy is the mismatch between the characteristics of the financial structure of companies and their competitive status, in such a way that the existence of financial restrictions has caused many companies to don't have the strength to invest in projects, or many projects to fail, and this increases the probability of bankruptcy.

To predict bankruptcy and profitability, Dabagh and Sheikh Begoo (2020) analyzed the financial performance and status using logistic regression and financial ratios of artificial neural network and Fulmer models and figured out that the power and accuracy of artificial neural network model bankruptcy prediction compared to Fulmer's model has a higher accuracy. Also, accounts receivable over sales are the highest, and debt-to-equity ratios are the lowest financial ratios affecting bankruptcy in the artificial neural network model.

Veganzones and Severin (2021) sought to identify the causes of commercial bankruptcy of companies through content analysis. The results indicated the creation of a model based on the theoretical consensus of experts, where the essential basis in predicting bankruptcy is the economic insight of companies in future estimates and the use of appropriate evaluation scenario models.

Laitinen (2021) used simple mathematical modeling to depict the bankruptcy process of companies and figured out that the linear system embedded in accounting can be effective in risk analysis due to

the evaluation of financial ratios linearly. Also, based on return and risk, the results showed a significant difference between companies with a low probability of bankruptcy and those with a high probability of bankruptcy.

Jandaghi et al. (2021) used the ant colony theme along with the k-nearest neighbor algorithm to select the characteristics and classification of companies and solved the problem of asymmetry of the data set with the subsampling technique and showed that variables such as the ratio of EBIT to total sales; proprietary; current; cash, and debt are most effective factors in predicting the state of credit health of companies.

Antill (2022) showed that since bankruptcy leads to the dissolution of companies due to the inability to fulfill obligations to creditors, companies can focus on recovering blocked resources to pay their obligations to creditors. That means by providing them with their products or a part of the blocked assets; they can improve their obligations and prevent bankruptcy at the commercial market level. Kuttner et al. (2023) considered the overall quality of accounting systems, the quality of early warning systems, and the reengineering of valid information disclosures to examine how insolvent SMEs can provide evidence to the court about their ability to repay their debt and found that the existence of a reorganization plan in the way of information disclosure can significantly help the short-term and long-term success of bankrupt small and medium-sized companies to continue their business activities with the efficient and effective use of resources.

By reviewing the studies, we can see that most of the studies are about analyzing the causes of corporate bankruptcy, based on the use of financial statement data and by relying on neural network models, Logit, and artificial intelligence, and few studies have examined dimensions other than financial dimensions to evaluate the reasons for bankruptcy. Therefore, this research aims to cover this weakness of studies by screening the content and identifying the dimensions of bankruptcy of capital market companies in the first step (qualitative part of the research) and then prioritizing it in the form of a hierarchical model to create more knowledge for the users in the second step (the quantitative part of the research).

3. Research Methodology

In terms of purpose, this research is in the category of descriptive research to explain the phenomenon at the level of capital market companies. In terms of results, it is part of developmental research because first, the concepts related to the causes of corporate bankruptcy are identified based on related research and relying on various theories, and then based on matrix analysis, it proceeds to prioritize each of the identified criteria. Therefore, relying on the lack of academic integrity in corporate bankruptcy's content and structural concept, this study tries to create an integrated model through development functions. Finally, in terms of data collection logic, this study is of inductive-deductive type because in the qualitative method, first, relying on the inductive approach will be identified the dimensions related to the causes of companies' bankruptcy. The themes identified among the participants in the quantitative section will then be evaluated inductively.

In this research, which is a mixed method, meta-synthesis is used in the qualitative part. Meta-synthesis involves steps to arrive at components and propositions; perhaps the most important way is through process steps, which include a range of knowledge of the root cause of the problem in the form of research question formulation and the presentation of a specific model based on identifying propositional themes from the results of previous research based on the participation of panel members. Then, based on Delphi analysis, in order to determine the theoretical adequacy according to the two criteria of mean and agreement coefficient, an attempt is made to confirm the propositions in terms of theoretical adequacy, which includes a range of knowledge of the root cause of the problem in the form of research question formulation, the presentation of a specific model based on

identifying propositional themes from the results of previous research based on the participation of panel members. Then, based on Delphi analysis, in order to determine the theoretical adequacy according to the two criteria of mean and agreement coefficient, an attempt is made to confirm the propositions in terms of theoretical adequacy. Finally, in a quantitative part, through the analysis of a comprehensive interpretive and structural model, the identified layers are explained in the form of a prioritization model in terms of influence and effectiveness.

3.1. Statistical population and research sampling method

Based on the nature of the research, which is mixed, the target population in the qualitative section includes the research related to the research topic and 12 accounting and financial management specialists at the university level who identify the content propositions of the research based on the process of meta-synthesis, critical evaluation and Delphi analysis. In order to select these individuals, a homogeneous qualitative sampling method in the form of panel group members has been used. In this sampling method, the researcher tries to select the research participants to gain in-depth knowledge to select experts with the necessary experience and analytical knowledge in relation to the research topic. The target audience in a small section is 25 managers of the top 50 companies on the Tehran Stock Exchange; based on the nature of the analysis based on the limited number of research participants, it tries to explain the components and propositions identified in the qualitative sector at the level of the capital market through cross-matrix analysis, because the purpose of quantitative analysis is to use cross-matrix questionnaires with the participation of 15 to 30 people according to Singh and Kant research (2011); Malone (2014); Ramesh et al. (2010) and Attri et al. (2013) confirmed the optimal sample size selection in the range of 15 to 30 people.

4. Findings

In this section, due to the nature of the research methodology, the analyses are presented in two parts, qualitative and quantitative, in order to create a more coherent understanding of the research findings.

4.1. Qualitative section analyzes

In this section, two Meta-synthesis and Delphi analyzes have been used. First, in this section, it is necessary to review the valid scientific databases to select similar research from 2018 to 2021 in domestic and foreign research. This will help to obtain newer research on the research phenomenon. Therefore, in order to achieve research related to the field of research, in the next step, screening should be done in the first three stages, including title screening, Content and action analysis to create a more specific perception, Figure (4) is used to perform the second step.

It should be noted that the 14 initial types of research should be analyzed in the third step in terms of critical evaluation with the participation of research experts. This process includes the following 10 criteria, which are examined based on a minimum score of (1) and a maximum of (5). The total score based on 10 criteria can be 50, and if a research score of 30 or more, it enters the fourth step. Based on a better understanding of the analysis process in this step, with the participation of research experts, 14 approved initial researches will be analyzed for points based on critical evaluation analysis.

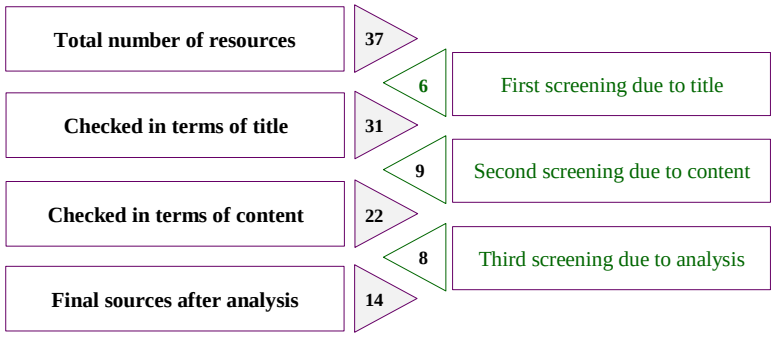

Figure 4. The screening analysis process

Table 1. The critical evaluation analysis

		International researches									Internal researches			
		1	2	3	4	5	6	7	8	9	10	11	12	13
	Approved research	**Nagel and Aviles (2021)**	**Oware and Appiah (2021)**	**Nguyen and Huynh (2020)**	**Jace et al. (2020)**	**He et al. (2020)**	**Lohmann and Ohliger (2019)**	**Nishi and Peabody (2019)**	**Ghosh (2019)**	**Farooq and Jibran (2018)**	**Jandaghi et al. (2021)**	**Hashemi and Heidarpoor (2021)**	**Hosseini and Morshedi (2020)**	**Pour Tabarestani et al. (2019)**
Critical proposal criteria	Purpose	3	2	3	2	2	4	3	2	3	5	3	2	3
	Method	5	1	4	1	2	3	3	3	4	4	5	3	3
	Plan	4	3	4	2	3	3	3	2	3	4	4	2	3
	Sample	3	2	5	3	4	4	4	3	3	3	3	1	2
	Collecting	4	3	4	2	3	4	3	2	3	3	4	3	4
	Generalization	4	2	3	3	3	4	4	3	4	4	3	2	3
	Ethical	5	3	4	3	3	3	4	3	4	3	3	3	4
	Analyze	4	2	3	3	3	3	3	3	4	4	3	1	3
	Theoretical	4	2	4	2	3	4	4	3	3	3	4	2	3
	Value	4	3	4	2	4	4	4	3	3	4	4	2	3
	Total	**40**	**23**	**38**	**23**	**30**	**36**	**34**	**27**	**34**	**37**	**36**	**21**	**31**

After performing the critical evaluation process, it was determined that 4 studies were excluded from the total of approved studies because they scored below 30. In order to determine the themes of corporate bankruptcy, the process of selecting the largest number of distribution distributions by content analysis at the heart of approved research is used. Therefore, based on the approved research, first, all the criteria related to the research concept are determined and given in column (2) to put a "☑" sign in front of each research to finally determine what the highest frequency of the identified component is. In other words, based on each researcher's use of the sub-criteria written in the table column, the symbol "☑" is inserted, then the scores of each ☑ are added together in the sub-criteria column, and scores above the mean of the conducted research are selected as research components.

The result of the component determination process showed that they are the content and structural causes of corporate bankruptcy. In this section, after analyzing the basics of the approved components of the above research, the themes for each main component are determined separately.

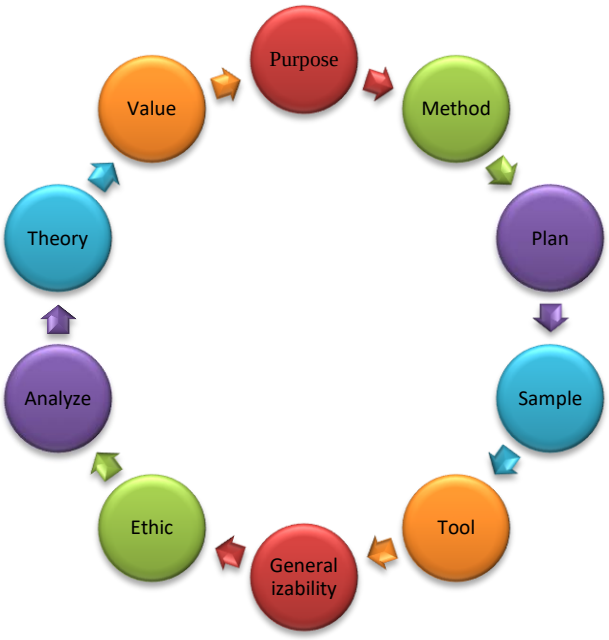

Figure 5. The criteria for the critical evaluation process

Table 2. The process of determining the components of corporate bankruptcy causes

		Content causes of corporate bankruptcy	Ethical causes of corporate bankruptcy	Legal and Institutional Causes of Bankruptcy	Economic causes of corporate bankruptcy	Structural causes of corporate bankruptcy	
International researches	Nagel and Aviles (2021)	☑	-	-	☑	☑	Frequency distribution of components in validated studies
	Nguyen and Huynh (2020)	-	☑	-	☑	-	
	He et al. (2020)	-	-	☑	-	☑	
	Lohmann and Ohliger (2019)	☑	-	-	-	-	
	Nishi and Peabody (2019)	☑	☑	-	-	☑	
	Farooq and Jibran (2018)	☑	-	☑	-	-	
Internal researches	Jandaghi et al. (2021)	-	☑	-	☑	-	
	Hashemi and Heidarpoor (2021)	☑	-	☑	-	☑	
	Pour Tabarestani et al. (2019)	-	-	-	☑	☑	
	Total	5	3	3	4	5	

Table 3. The process of determining the causes of corporate bankruptcy

		7-point score scale								
		7	6	5	4	3	2	1		
Bankruptcy Causes Components	Content Dimensions of Firm Bankruptcy								Lack of company environmental awareness of changes and social expectations	Corporate Bankruptcy Assessment Statements
									Lack of company size reduction strategies based on product life cycle	
									Instability of administrative technologies in various sectors, such as finance	
									Lack of attention to the business life cycle	
									Lack of review of the company's competitive position	
									Failure to review the organizational culture based on market requirements and expectations	
	Structure Dimensions of Firm Bankruptcy								Recognize the large organizational structure in the company.	
									Existence of structural complexities in the company	
									The high focus on decision making at the top of the organization by the CEO	
									Lack of organizational knowledge due to disregard for company personnel ratios	
									Lack of focus on research and development to develop innovation and creativity	
									Failure to review direct and indirect production costs	
									The tension of fixed assets with high depreciation	

In the next step, in order to determine the consensus of experts to fit the research propositions with the main components, Delphi analysis based on two criteria of mean and coefficient of agreement is used. Therefore, to perform this section, according to the scale of 7 evaluation options, according to Table (4), the results of Delphi analysis are presented. After two rounds of analysis in the Delphi step, the results showed that 5 propositions were removed because they had an agreement coefficient below 0.5 and a mean below 5. Therefore, a total of 8 statements based on two main components were approved as an analytical basis for the causes of corporate bankruptcy. In this section, as a final step in qualitative analysis, a theoretical research model for analyzing the dimensions of corporate bankruptcy is presented.

Table 4. The Delphi process

		The first round of Delphi		**The second round of Delphi**		**Result**		
		Mean	Coefficient of Agreement	Mean	Coefficient of Agreement			
Bankruptcy Causes Components	Content Dimensions of Firm Bankruptcy	4	0.35			*Delete*	Lack of company environmental awareness of changes and social expectations	Bankruptcy Assessment Statements
		5.20	0.60	5.30	0.65	Confirm	Lack of company size downsizing strategies based on product life cycle	

	3	0.20			*Delete*	Instability of administrative technologies in various sectors, such as finance
	6	0.80	6.20	0.85	Confirm	Lack of attention to the business life cycle
	5	0.50	5.10	0.55	Confirm	Lack of review of the company's competitive position
	5.30	0.65	5.50	0.75	Confirm	Failure to review the organizational culture based on market requirements and expectations
Structure Dimensions of Firm Bankruptcy	4	0.35		*Delete*		Lack of organizational knowledge due to disregard for company personnel ratios
	6	0.80	6.20	0.85	Confirm	Recognize the large organizational structure in the company.
	4	0.30		Delete		Lack of focus on research and development to develop innovation and creativity
	5.20	0.60	5.30	0.65	Confirm	The high focus on decision making at the top of the organization by the CEO
	5.30	0.65	5.50	0.75	Confirm	Failure to review direct and indirect production costs
	2	0.15		*Delete*		Existence of structural complexities in the company
	5.20	0.60	5.30	0.65	Confirm	The tension of fixed assets with high depreciation

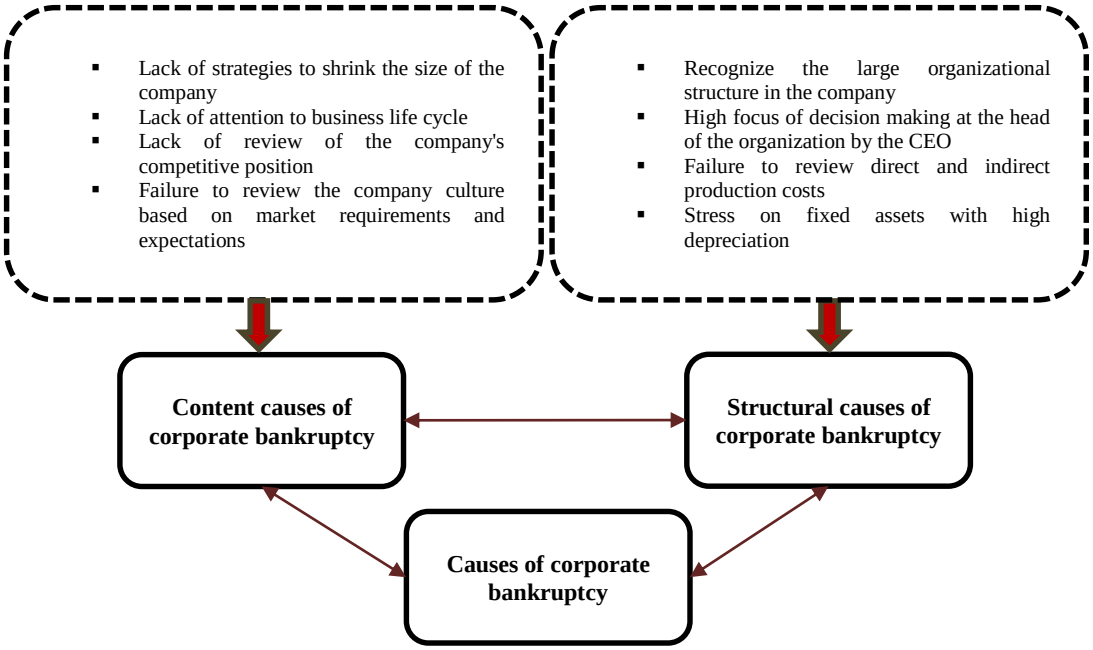

Figure 6. The theoretical framework

4.2. Qualitative section analyzes

As further explained in this section, the research seeks to assess the themes of capital market firm bankruptcy through a total interpretive structural model. First, the propositional contents of each of the main components must be coded randomly.

After assigning specific codes, a matrix should be formed with the participation of 25 managers of the top 50 companies. This matrix performs a pairwise comparison process based on rows and columns, and according to the "Mode" index, the highest frequency distribution of rows and columns is placed at the intersection of two propositional themes. After comparing the pairs of rows and columns of research propositions, the achievement matrix is formed. In other words, in this step, the symbols of the structural matrix in relation to the numbers zero and one can be formed as the achievement matrix based on Table 6.

Table 5. Coding the themes of the causes of corporate bankruptcy

		Themes of the Causes of Corporate Bankruptcy
Abbreviation	V1	Lack of review of the company's competitive position
	V2	Lack of company size reduction strategies based on product life cycle
	V3	Lack of attention to the business life cycle
	V4	Failure to review direct and indirect production costs
	V5	The tension of fixed assets with high depreciation
	V6	Recognize the large organizational structure in the company
	V7	The high focus on decision making at the top of the organization by the CEO
	V8	Failure to review the organizational culture based on market requirements and expectations

Table 6. Achievement matrix

			The themes of corporate bankruptcy							
			V1	V2	V3	V4	V5	V6	V7	**V8**
Lack of review of the company's competitive position	Proposition themes in line "j"	V1	**1**	0	0	0	0	0	1	**1**
Lack of company size reduction strategies based on product life cycle		V2	1	**1**	0	0	0	0	1	**1**
Lack of attention to the business life cycle		V3	0	0	**1**	0	1	0	1	**1**
Failure to review direct and indirect production costs		V4	0	0	0	**1**	0	0	0	**1**
The tension of fixed assets with high depreciation		V5	0	0	0	0	**1**	0	0	**1**
Recognize the large organizational structure in the company.		V6	0	0	0	0	0	**1**	0	**1**
The high focus on decision making at the top of the organization by the CEO		V7	0	0	0	0	0	0	**1**	**1**
Failure to review the organizational culture based on market requirements and expectations		V8	0	0	0	0	0	0	0	**1**

In the continuation of the analysis to determine the indirect relationship between the contents of corporate bankruptcy statements, the pairwise comparison of the first statement is compared in pairs with all elements from (i + 1) to nth. For each connection, the answer is yes, "Y" or "N", and the reason is stated in case of a positive answer. But if the answer is "N", the participants must comment on the pair of variables.

Table 7. The paired comparison between themes based on the matrix

	Cross matrix V1… V6													
	V1 – V2	V2 – V1	V1 – V3	V3 – V1	V1 – V4	V4 – V1	V1 – V5	V5 – V1	V1 – V6	V6 – V1	V1 – V7	V7 – V1	V1 – V8	**V8 – V1**
V1		✓		✓		✓	✓			✓		✓		✓
	Cross matrix V2… V6													
	V2 – V3	V3 – V2	V2 – V4	V4 – V2	V2 – V5	V5 – V2	V2 – V6	V6 – V2	V2 – V7	V7 – V2	V2 – V8	V8 – V2		
V2		✓		✓	✓			✓		✓				
	Cross matrix V3… V8													
	V3 – V4	V4 – V3	V3 – V5	V5 – V3	V3 – V6	V6 – V3	V3 – V7	V7 – V3	V3 – V8	V8 – V3				
V3	✓		✓			✓				✓				
	Cross matrix V4… V8													
	V4 – V5	V5 – V4	V4 – V6	V6 – V4	V4 – V7	V7 – V4	V4 – V8	V8 – V4						
V4		✓						✓						
	Cross matrix V5… V8													
	V5 – V6	V6 – V5	V5 – V7	V7 – V5	V5 – V8	V8 – V5								
V5		✓												
	Cross matrix V6… V8													
	V6 – V7	V7 – V6	V6 – V8	V8 – V6										
V6	✓	✓												
	Cross matrix V7… V8													
	V7 – V8	V8 – V7												
V7														

Table 8. Describes the relations of the pairwise matrix

Cross matrix	Cross-matrix description
Lack of review of V1's competitive position	
V2 → V1	The lack of strategies to shrink company size based on product life cycle is a reason to reconsider the company's competitive position**.**
V3 → V1	Lack of attention to the business life cycle is a reason not to reconsider the company's competitive position.
V4 → V1	Failure to review direct and indirect production costs is a reason not to review the company's competitive position**.**
V1 → V5	Lack of review of the company's competitive position is a reason for the stress of fixed assets with high depreciation.
V6 → V1	Recognition of the large organizational structure in the company is a reason not to reconsider the competitive position of the company.
V7 → V1	The CEO's high concentration of decision-making at the top of the organization is a reason not to reconsider the company's competitive position.
V8 → V1	Failure to review the organizational culture based on market requirements and expectations is a reason not to review the company's competitive position**.**
Lack of strategies to reduce the size of the company based on the life cycle of "V2" products	
V3 – V2	Lack of attention to the business life cycle is a reason not to reconsider strategies for downsizing a company based on the product life cycle**.**
V4 – V2	Failure to review direct and indirect production costs is a reason not to review strategies to downsize the firm based on the product life cycle**.**
V2 – V5	The lack of strategies to shrink firm size based on product life cycle is a reason for the tightness of fixed assets with high depreciation**.**
V6 – V2	Recognizing the large organizational structure in the company is a reason not to reconsider the strategies of downsizing the company based on the product life cycle**.**
V7 – V2	The CEO's high concentration of decision-making at the organisation's top is a reason not to reconsider strategies for downsizing the company based on the product life cycle**.**
Lack of attention to the "V3" business life cycle	
V3 – V4	Lack of attention to the business life cycle is a reason not to reconsider direct and indirect production costs.
V3 – V5	Lack of attention to the business life cycle is a reason for the stress of fixed assets with high depreciation.
V6 – V3	Recognizing the large organizational structure in the company is a reason for not paying attention to the business life cycle.
V8 – V3	Failure to review the organizational culture based on market requirements and expectations is a reason for not paying attention to the business life cycle.
Failure to review direct and indirect production costs of "V4."	
V5 – V4	Failure to review the direct and indirect production costs is a reason for the tightness of fixed assets with high depreciation**.**
V8 – V4	Failure to review organizational culture based on market requirements and expectations is a reason not to review direct and indirect production costs**.**
The tension of locked fixed assets with high depreciation "V5."	
V6 – V5	Recognition of the high organizational structure in the company is a reason for the stress of fixed assets with high depreciation.
Recognize the large organizational structure in the company "V6."	
V6 – V7	Recognizing the high organizational structure in the company is a reason for the CEO to focus on decision-making at the top of the organization**.**
V7 – V6	The high concentration of decision-making at the top of the organization by the CEO is a reason to recognize the large organizational structure in the company.
The high focus on decision-making at the top of the organization by the CEO of "V7."	
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Based on the pairwise comparison matrix, in this section, the reciprocal matrix relationships of each approved theme from the qualitative stage of the research are described to establish the necessary transitional relationships (Cross matrix) in the final model.

Next, the structural self-interaction matrix "SSIM" should be formed based on pairwise comparisons of corporate bankruptcy themes according to the results in the table above. Therefore, for each connection in which the answer "Y" or "N" is given, stating the reason, the cell with the option "Yes" is placed as "1*" at the intersection of row "*i*" and column "*j*". This matrix is obtained by converting the structural interaction matrix itself into a zero and one binary matrix.

Table 9. The achievement matrix in terms of the degree of transferability of propositional themes

			The themes of corporate bankruptcy							
			V1	V2	V3	V4	V5	V6	V7	**V8**
Lack of review of the company's competitive position	Proposition themes in line "j"	V1	**1**	0	0	0	0	0	1	**1***
Lack of company size reduction strategies based on product life cycle		V2	1	**1**	0	0	0	0	1	**1***
Lack of attention to the business life cycle		V3	0	0	**1**	0	1	0	1	**1***
Failure to review direct and indirect production costs		V4	0	0	0	**1**	0	0	0	**1**
The tension of fixed assets with high depreciation		V5	0	0	0	0	**1**	0	0	**1**
Recognize the large organizational structure in the company.		V6	0	0	0	0	0	**1**	0	**1**
The high focus on decision-making at the top of the organization by the CEO		V7	0	0	0	0	0	0	**1**	**1**
Failure to review the organizational culture based on market requirements and expectations		V8	0	0	0	0	0	0	0	**1**

As seen in Table 9, the conceptual symbols assigned according to the fashion proposition have been converted to 0, 1, and 1* points according to the definition of the conceptual relation to the numbers according to the previous table. In the following table, specify the penetration power (1 point obtained from the row) and the dependency power (1 point obtained from the column):

Table 10. Process of determining the influence and dependence

			Influence power	**Dependency power**	
Bankruptcy Assessment Statements	Lack of review of the company's competitive position	V1	3	2	The sum of the rows "i" and the column "j" are the contents of the proposition.
	Lack of strategies to reduce the size of the company based on the life cycle	V2	4	1	
	Lack of attention to the business life cycle	V3	4	1	
	Failure to review direct and indirect production costs	V4	2	1	
	The tension of fixed assets with high depreciation	V5	2	2	
	Recognize the large organizational structure in the company	V6	2	1	
	The high focus on decision making at the top of the organization by the CEO	V7	2	4	
	Failure to review the organizational culture based on market requirements and expectations	V8	1	8	

By determining the penetration and dependence power, the output set forms a conical matrix,

forming common inputs and elements to determine the most influential priorities of propositional themes. Here the goal is to get to know the most effective propositions.

Table 11. Conical matrix of propositional themes

			Reachability set	Antecedent set	Intersection		
	Determining the first level of impact						
Themes of bankruptcy statements	Lack of review of the company's competitive position	V1	1,7,8	1,2	1		Leveling the effectiveness of propositional themes
	Lack of strategies to reduce the size of the company	V2	1,2,7,8	2	2		
	Lack of attention to the business life cycle	V3	3,5,7,8	3	3		
	Failure to review direct and indirect production costs	V4	4,8	4	4		
	The tension of fixed assets with high depreciation	V5	5,8	3,5	5		
	Recognize the large organizational structure in the company	V6	6,8	6	6		
	The high focus on decision making at the top of the organization by the CEO	V7	7,8	1,2,3,7	7		
	Failure to review the organizational culture based on market requirements and expectations	V8	8	1,2,3,4,5,6,7,8	8	I	
	Determining the second level of impact						
Themes of bankruptcy statements	Lack of review of the company's competitive position	V1	1,7	1,2	1		Leveling the effectiveness of propositional themes
	Lack of strategies to reduce the size of the company	V2	1,2,7	2	2		
	Lack of attention to the business life cycle	V3	3,5,7	3	3		
	Failure to review direct and indirect production costs	V4	4	4	4	II	
	The tension of fixed assets with high depreciation	V5	5	3,5	5	II	
	Recognize the large organizational structure in the company	V6	6	6	6	II	
	High focus on decision making at the top of the organization by the CEO	V7	7	1,2,3,7	7	II	
	Determining the third level of impact						
Themes	Lack of review of the company's competitive position	V1	1	1,2	1	III	Rating
	Lack of strategies to reduce the size of the company	V2	1,2	2	2		
	Lack of attention to the business life cycle	V3	3	3	3	III	
	Determining the fourth level of impact						
Themes	Lack of strategies to reduce the size of the company	V2	2	2	2	IV	Rating

The results of the similarity of outputs and common elements showed that the most influential theme of the causes of bankruptcy is the lack of strategies to reduce the company's size, which is in the fourth level of this model.

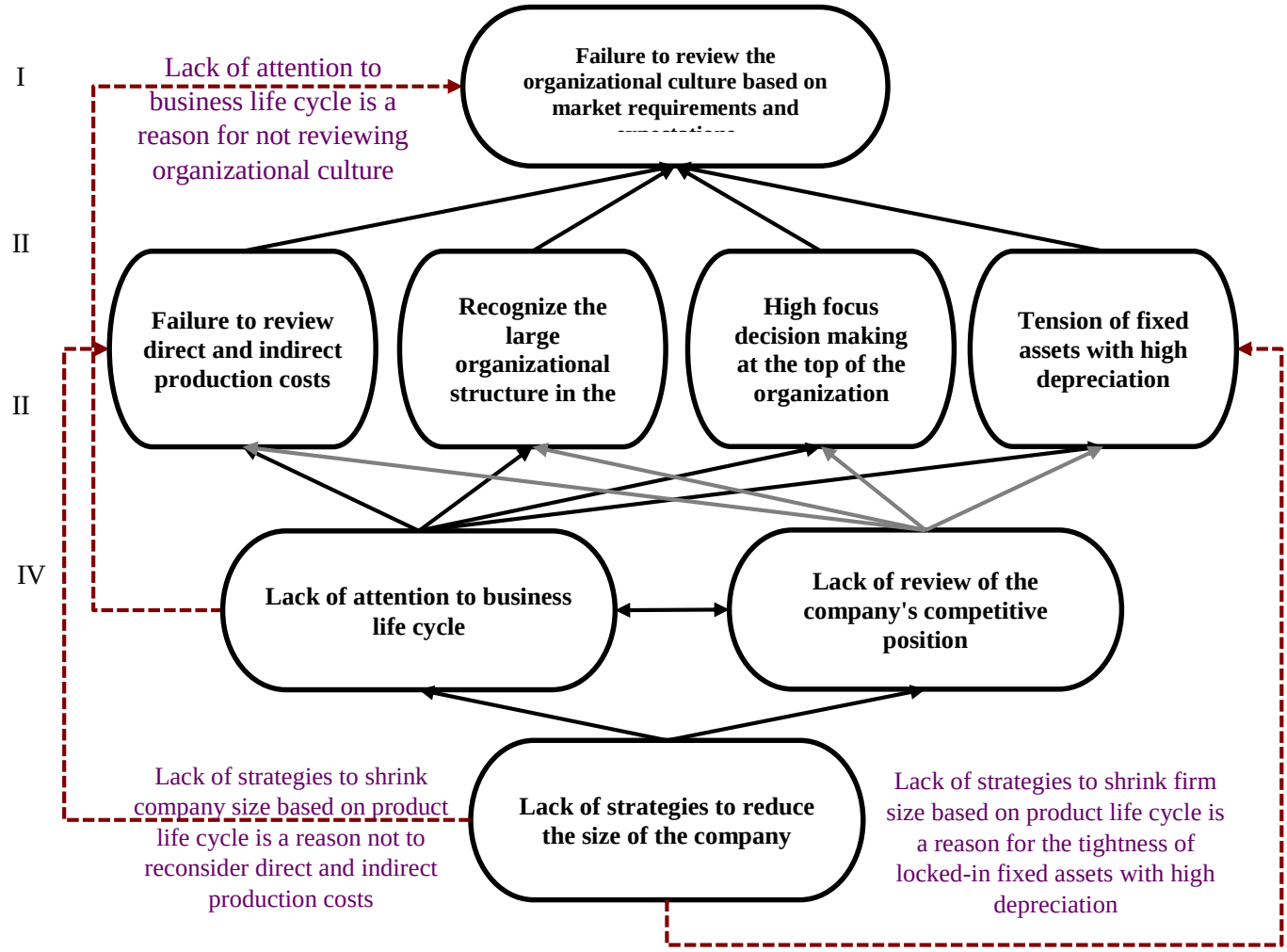

Figure 7. The model for prioritizing the causes of bankruptcy

5. Conclusion

This study aimed to design a model of intangible causes of bankruptcy of capital market companies. In this study, as the research analysis process showed, through the analysis of the qualitative part, first, an attempt was made to identify the intangible components and themes of corporate bankruptcy. For this purpose, the meta-synthesis was first determined in several stages of research related to the nature of the research and then re-screened based on the critical evaluation of the research. Finally, the results in this section indicate the determination of two components and 13 propositional themes to measure it. Delphi analysis was then used to determine the theoretical consensus. Based on the two criteria of mean and coefficient of agreement, 5 themes of elimination propositions and 8 themes to measure the evaluation of the most effective reasons for companies' bankruptcy were included in the quantitative analysis. The results in this section showed that the most influential theme of capital market company bankruptcy is the lack of strategies to reduce the company's size. This result means that companies that are large and based on the product life cycle as the basis for their competitive position do not have the plan to shrink their size, or they do not use dual-core structuring strategies, gradually losing their effective competitive capacities due to the intensification of environmental changes and the gaining of competitors, and with bankruptcy, it is

first marginalized and then out of the market, because this process stems from the open and free flow of the market, large and long companies that do not think about the agility of their structure, will face bankruptcy and financial crisis. Most capital market companies gradually withdraw from the market because they do not have suitable evaluation indicators for their restructuring and size, and they lose their competitive capacities, increasing the probability of company bankruptcy.

On the other hand, in the third level of the impact of corporate bankruptcy themes, the two themes of lack of attention to the business life cycle and lack of review of the company's competitive position are identified as factors that upset the corporate balance and corporate bankruptcy. This result shows that the lack of attention to the business life cycle means not reviewing the various stages of the company, from the entry to the consolidation stage and possibly the company's decline. Usually, companies have to review their life cycle assessments at a specific time and re-engineer their structural term or term accordingly.

In other words, reviewing the competitive position is a cross-cutting issue in line with business life cycle assessments, which reflects the company's insight into competitors and the target market environment. Therefore, ignoring such continuous and periodic evaluations can cause the company not to have the necessary capabilities in terms of competitive functions and therefore be doomed to fail and leave the competitive market because they cannot respond to rapid changes. Results from the research of Nagel and Aviles (2021); Lohmann and Ohliger (2019); Nishi and Peabody (2019); Farooq and Jibran (2018) and Hashemi and Heidarpoor (2021) correspond. The results indicate that the causes of corporate bankruptcy are substantive. This means that companies need to focus on drivers such as strategies, and the environment, update the technology and size of the company, its functions and structure in line with environmental changes, and anticipate possible disruptions to control them to prevent gradual company bankruptcy. Based on these results, it is suggested that by examining the return on assets ratio and in line with the competitive position, capital market companies make the company structure more agile in two processes (two cores). A structure that is large in proportion to the organizational structure and, in terms of process, plans and delegates relations and functions in horizontal relations. This function of the organization in terms of size can lead to the sustainable development of product production commensurate with the capacities of the market and major customers, and while increasing the company's market share in the long run, prevent the company from declining within the business cycle. Through constant reviews, companies can gain a more coherent understanding of their competitive performance and not lose market share with the slightest unpredictable pervasive change.

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RESEARCH ARTICLE

Developing an Optimal Model of Accrual Accounting System in the Public Sector

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Abstract

When human societies in science, industry and economics are constantly growing and developing, and the role of financial activities in any development is undeniable, the need for daily accounting development, especially the primary need in society, is felt. It becomes. The primary purpose of accrual accounting is to help users evaluate the economic performance of organizations over a certain period. This research is considered exploratory research in nature. Thus, the research data was compiled in 2020 using semi-structured interviews with experts, coded and analyzed by the researcher, and finally reached theoretical saturation. In addition, the content analysis method and the content network type have been used to analyze the data. The research findings showed the optimal model of the accrual accounting system in the public sector from four comprehensive themes: a) development of institutional trust in executive bodies, b) facilitation in the management process of executive bodies, c) efficient organizational productivity of executive bodies and d) the optimization of the financial rules and regulations of the executive apparatus identified nine organized themes and finally reached theoretical saturation with 43 basic themes. Among the research innovations are achieving social structures such as increasing accountability and responsibility, increasing the reliability of government performance and transparency of financial reports in the form of comprehensive content, and increasing institutional trust in the executive apparatus and managerial and structural structures.

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1. Introduction

Scientific, industrial and economic developments plus daily development of accounting are a basic need so that they cannot be used to plan, target and determine the future policy of each economic unit, review and study accounting information and reports, and from there, accounting information. It should be recorded, classified and summarized in the financial statements alone. Expenditure control has lost its importance with the advancement of government duties and the rapid rise of government spending and its relationship with the general state of the country's economy and has created problems for organizations and the need for improvement in systems, planning, management and control of public sector resources and has highlighted the need to set goals and emphasize results to increase service quality and reduce costs.

Because accrual-based accounting is more complex than cash-based accounting and provides more comprehensive information, governments face a wide range of essential issues in implementing public sector accrual accounting standards. These issues include identifying assets, liabilities, revenues and expenditures, having full political support at the governance level, and allocating sufficient and appropriate resources. Governments need to analyze the costs and benefits of adopting accrual accounting and have the capacity to implement these changes effectively before deciding to transition to accrual accounting. Political commitment and adequacy of existing systems are the factors that affect the success of change in accounting principles. Governments that have made this change pay more attention to accrual accounting (Nowak, 2017).

Having effective and efficient information is a critical resource that can make organizations successful in facing these conditions. On the other hand, due to the continuous complexity of internal and external requirements of organizations, managers' information needs have become more diverse and complex. Correct and informed choices require correct, complete, accurate and timely information.

Having effective and efficient information is a critical resource that can make organizations successful in facing these conditions. On the other hand, due to the continuous complexity of internal and external requirements of organizations, managers' information needs have become more diverse and complex. Correct and informed choices require correct, complete, accurate and timely information (Rakhshani et al., 2021).

Efforts to implement accrual accounting increased in the public sector with the announcement of comprehensive and integrated programs for the resistance economy, so in paragraph one of Article 26 of the Law on Adding Certain Articles of the Law on Public Sector Regulation, Financial Regulations (2), Public Sector Accounting Necessary to change the legal provisions are provided. The most important measures taken to support public sector accounting after the start of the reforms are: (a) the establishment of a specialized accrual accounting committee in the provinces; (B) the formation of a working group for the implementation of accrual accounting; (C) developing and communicating a short-term executive plan for accrual accounting; (D) Sending the audit board to the executive bodies and announcing the weaknesses of the accounting system; (E) to draw up regulations for the commentary of paragraph one of Article 26 of the Law on the Accession of Certain Articles to the Laws Regulating a Part of the Government's Financial Regulations (2); (C) developing and communicating asset identification procedures; (G) formulating and communicating debt recognition procedures; (H) creating the necessary platform for receiving and processing the balance of operations and preparing financial statements in the immediate supervision system of the Deputy of Financial Supervision and Treasury of the whole country (Senama); (G) Preparing and communicating a roadmap for the full implementation of accrual accounting in the public sector; (D) Updating the public sector accounting system each year in accordance with new public sector accounting laws and standards; (I) Responding to inquiries from executive bodies regarding issues

and ambiguities arising from the implementation of accrual accounting; (R) Preparing the executive by-laws of (a), (b) and (c) of Article (8) of the Law on the Sixth Five-Year Plan for Social, Economic and Cultural Development of Iran; And (g) preparation of audit procedures for the financial statements of public sector reporting units subject to Note (2) of Article (4) of the Executive Regulations of paragraphs (a), (b) and (c) of Article (8) of the Sixth Five-Year Development Plan Law (Akrami, 2020).

Accrual accounting requires public sector entities to keep complete records of assets and liabilities to facilitate management control and help managers compare service costs. The accrual basis provides more vital information and a more robust financial reporting system than the cash base and can be helpful in public sector reform (Hajiha et al., 2021).

Public Sector accounting seeks to record the financial effects of transactions, events and conditions that have cash consequences on the receipt, receipt or payment of cash by the Company, but not on the occurrence of those transactions, circumstances and needs. Public sector accounting also assists government agencies accountable for all aspects of accountability, including economic and government financial performance. Therefore, it can be said that the primary purpose of accrual accounting is to help users evaluate organizations' economic performance over time (Hajiha, Ostad Mirzaei, 2013). We can understand the most crucial difference between accrual and cash accounting principles with a simple comparison. Instead of traditional cash accounting, accrual accounting is much more appropriate because the costs are compared to the performance objectives in accrual accounting rather than to the previously agreed budgets. In accrual accounting, income is recognized and recorded when it is realized. Revenue time is when revenue is definitively identified or earned through the provision of services; therefore, this method does not consider the time of receipt of money. Consequently, what matters in determining and recording income is the timing of the realization of income. In addition, costs are identified and recorded when incurred or incurred (Maleki et al., 2014).

Various studies have pointed to the positive consequences of accrual accounting and its objectives. Among them are researchers such as Maleki et al. (2014), Naghizadeh Baghi et al. (2015), Mohammadzadeh Saleteh and Faraji (2016), Hajiha and Ostad Mirzaei (2013), Caperchione (2015) and Bushman, Lerman and Zhang (2016) mentioned the impact of public sector accounting on performance-based budgeting, accountability, transparency and decision-making.

Accrual accounting has a significant impact on improving the quality of government financial performance reports in Iran. The transition from cash to accrual accounting is a change in the accounting system and a conceptual shift in applying accounting principles and standards in public sector management (Naghizadeh Baghi et al., 2015).

Therefore, considering the theoretical and empirical importance of accrual accounting in various sectors, especially the public and government sectors, the present study intends to develop an optimal model for the accrual accounting system in the public sector.

2. Theoretical Background and Hypothesis Development

The transition to accrual accounting in the public sector goes far beyond a change in accounting rules and regulations because this change affects the entire public sector. In order to carry out the transfer process, it is necessary to fully address the various challenges arising from the adoption of accrual accounting and define a precise and clear methodology and practical plan. Since accounting is based on a more complex commitment than cash-based accounting and provides more comprehensive information, governments face a wide range of essential issues in implementing public sector accrual accounting standards. Among these issues are identifying assets, debts, incomes and expenses, enjoying full political support at the sovereign level, and allocating adequate and

appropriate resources. Governments need to analyze the cost and benefits of adopting this approach and can implement these changes efficiently before deciding to transition to accrual accounting. Political commitment and adequacy of existing systems affect the success of changes in accounting principles. The governments that have made this change are more attentive to accrual accounting (Nowak, 2017).

Public sector accounting is a system that collects, classifies, summarizes, and reports financial information about the activities of government agencies and ministries to make sound financial decisions and control approved annual budget plans and government funding. The public sector accounting system is essential for evaluating managers' productivity. The public sector accounting system follows the budgeting system, compares financial information with the financial data projected in the budget, and reveals desired or unwanted budget variations (Kacholi, 2016). The main objectives of the public sector accounting system can be classified into three groups: 1. Assists the public sector in playing and evaluating the accountability role. 2. Meets the information needs of users of the financial reporting of reporting units. And 3. Provides the necessary basis for estimating and calculating the costs of activities, programs, services and products to implement performance-based budgeting (Public Sector Accounting System, 2019).

In the world of public sector accounting, a distinct move, the new Public Management Model (NPM), has profoundly impacted accounting practice (Mahadi et al., 2017). One of the by-products of this movement is the commitment-based accounting system, which certainly offers better transparency and efficiency tools due to increased financial supervision and management. Many governments have adopted these accounting systems. The eighth principle of the 12 GASB states that the adjusted accrual or accrual basis should be used to measure the financial situation and operating results. The detailed explanation of this principle is as follows: 1. Accrual accounting is preparing a crucial operational budget to accurately estimate revenues and expenses and create a basis for savings and reduction of project costs. 2. Accrual accounting means having access to comprehensive and accurate management data to allocate and optimize available resources. 3. All financial events in accrual accounting provide transparency and full identification of expenses, revenues, property and assets.

In accrual accounting, the cost of services in the service process is straightforward and transparent. Accrual accounting means providing the necessary basis for using government financing facilities and guaranteeing the implementation of large projects. Regarding the use of accrual basis and adjusted accrual basis mentioned in the third paragraph of this principle, it is argued that accrual basis is the superior accounting method for the economic benefits of any organization. It insists on measuring actual events and transactions, not just receiving or paying cash, thus enhancing accounting data's objectivity, relevance, completeness, timeliness, and comparability. Therefore, it is recommended that the accrual basis be used in all its practice areas in the public sector. The accrual basis is used in independent accounts of government funds with minor differences (adjusted accruals) in the independent accounts of equity funds (Mahadi et al., 2017).

As an efficient information system, accounting and financial reporting in the public sector have two outstanding features. On the one hand, as one of the main tools for fulfilling financial and operational accountability, it helps elected and appointed officials fulfill their accountability and ensure the rights of citizens to know the facts about the receipt and consumption of public funds. On the other hand, maintaining and providing useful financial information on time provides the necessary grounds for the correct decisions of the mentioned officials and managers under supervision to achieve the goals of the government and its affiliated units (Rahmati and Pourzamani 2021).

Financial supervision in the implementation of public sector accounting is considered one of the critical issues. The General Accounting Law entrusts the accountant with the exercise of supervision

before and during the expenditure in the executive bodies. Therefore, it will be essential to pay attention to the direct impact of the performance of accountants in the financial supervision of public sector accounting in Iran. The pre-expenditure oversight system is vital to a country's financial oversight. It is increasingly criticized by the country's executive officials (Jani et al., 2021). The public sector financial accounting and reporting system, as one of the main tools for realizing and evaluating the financial and operational accountability of the public sector, can play a significant role in achieving this (Gholami Jamkarani and Kaveh 2019).

While government agencies have accepted the application of public sector accounting at various levels within the NPM, research on accrual accounting in the public sector has increased and extensive knowledge in the public sector accounting literature has been enriched (Mahadi et al., 2017). For this reason, many governments see the change process as part of a new public administration agenda and the accrual approach to achieve the public sector with a "semi-commercial and functional" approach. Proponents of this theory argue that this type of accounting provides more relevant data for managerial decision-making, ultimately leading to a more efficient and effective public sector (Hyndman and Connolly, 2011).

Despite the growing popularity of accrual accounting worldwide, the way it is accepted in different countries has been other. According to Christiaens et al. (2010), these differences are observed at two levels of content: the duration of the transition from cash to accrual accounting and how accruals are accepted. Canada introduced accrual accounting in the public sector in 2002, and the United Kingdom implemented it in the public sector in 2006 (Bruns, 2014). As staunch advocates of accrual accounting, Australia and New Zealand have set the same standards for both sectors to reform the accounting system of public sector units and move towards traditional accounting in for-profit units. Despite the environmental differences between public, for-profit, and accounting departments, traditional occupations in for-profit units can be used in government units to increase the transparency and usefulness of financial statements (Foroughi and Sudan, 2015).

The importance of the accounting and financial reporting system with the main features generally agreed upon by experts as one of the main tools for fulfilling and evaluating accountability is unanimous. There is no significant difference between their views on this issue. Also, from the respondents' point of view, the government's accounting and financial reporting system does not have the necessary capabilities to assess accountability compared to the expected accounting system (Gholami Jamkarani and Kaveh, 2019).

Accrual accounting in the public sector of Iran was first used as a reporting basis by the Municipality of Tehran in 1991 when the municipality made optimal use of this method's benefits in identifying and recording its assets. For example, in May 2006, the total property of Tehran Municipality in the cash system was 3,765 billion rials, calculated in the accrual system as 8,776 billion rials. One of the valuable problems in developed countries is the necessary resources for the field of health since more than five percent of GDP and about five to ten percent of government expenditures are related to this sector, so the economic work of the health sector needs a special place to analyze and control the performance of costs and adopt appropriate policies for the optimal allocation of resources and improve the quality of services. In 2006, the Ministry of Health and Medical Education, after changes in its management structure to the Board of Trustees, due to the benefits of accrual accounting and cost control, independently changed the basis from cash accounting to accrual and was expanded to medical universities of the provinces. The Islamic Republic of Iran is one of the developing countries that has realized the need to change its accounting system. Given the experience of changing the accounting system in the public sector, the Ministry of Health and Medical Education and municipalities in the last decade and its positive effects on transparency and financial accountability can help change the financial system in the government and

its subsidiaries. Despite the experience of other countries, it is a successful transition in this direction (Deputy of Economic Research, 2015).

If the accrual basis of accounting is chosen for forecasting and budgeting, major changes in resource allocation, time savings, significant reduction of costs, increased organizational security, etc., will occur. On the other hand, it is necessary to have an appropriate accounting system to help perform public accountability, meet the information needs of users of financial reports and create the essential basis for extracting and calculating the cost of programs, activities, services and products for performance-based budgeting, so that the transparency of accounts and the presentation of comprehensive financial reports through the calculation of the cost of services and management of costs and the preparation of periodic performance reports can be the main objectives of the accrual accounting process (Zabihullah Nejad, 2020).

In Iran, accrual accounting has been emphasized due to the preparation of the necessary conditions for implementing comprehensive programs of the resistance economy. In other words, using accrual accounting can strengthen the country's financial system to increase productivity and provide the necessary basis for maintaining public spending and economic transparency (paragraph 9 of the Communication on Comprehensive Plans of Resistance Economy). Considering the tough decision of the government and paragraphs 3, 16 and 19 of this communiqué to achieve the goals of the resistance economy, it provides the necessary basis for realizing these goals. Given that the link between the chains of accounting financial systems and its output is used by the other two pillars of the system (budgeting and auditing), changing the basis of public sector accounting is the starting point. It is intended to strengthen the country's financial system. Therefore, the comprehensive application of this type of accounting is considered one of the country's current requirements.

The need to change and theorize financial perspectives is felt when examining the overall framework for financial performance in the public sector. Complex organizational structures have doubled the need to predict future profitability in economic activities and evaluate costs and revenues, the need to provide new solutions and thus the application of accrual accounting in the public sector.

2.1. Literature review

Mahadi et al. (2014) showed that moving towards accrual accounting was to implement problems such as identifying and evaluating assets, human resources competence, and high implementation costs.

Bruns (2014) showed that using an accrual accounting system motivates and promotes public services and stakeholder satisfaction.

Toma et al. (2015) concluded that higher capital gains from the accrual accounting system, not the cash system. Caperchione (2015) believes the accounting system's effectiveness is effective in Australian municipalities' performance. In addition, the complexity of the accounting system and the risks of corruption, fraud and compromising domestic capital are less visible.

Bushman et al. (2016) noted a significant decrease in the relationship between accrual accounting and cash flows and showed no significant difference between the disclosure of accrued operating cash flows and cash accounting.

Nowak (2017) believes that the underlying variables related to implementation barriers include the lack of qualified and skilled accountants in the public sector and this overshadows the change in public sector accounting such as the acceptance of public sector accounting standards; he also added the behavioral variables to the set of factors.

Since the study is qualitative, the research hypothesis is refused. The questions of the present study are as follows:

1. What desirable model can be presented for the accrual accounting system in the public sector?

2. What elements make up the optimal model of the accrual accounting system in the public sector?
3. Does the public sector's optimal model of accrual accounting system have the necessary credibility and reliability?

3. Research Methodology

This research is part of nature, is applied in terms of the type of research, and is strategically part of inductive research. In addition, the current research is qualitative and thematic in terms of data nature and data collection method. Therefore, the data were collected through semi-structured interviews (including open-ended, guided or structured questions and face-to-face interviews) with experts and specialists in accrual accounting 2020 nationwide and coded and analyzed by the scholar. Finally, with 10 semi-structured interviews, the research data has reached theoretical saturation. According to Flick (2009), the theoretical saturation of this category (in this study, themes) is the basis for assessing the time required to stop sampling from the various groups associated with that category. That is, nothing new is achieved. More precisely, theoretical saturation is when (a) no new or relevant data is available. (B) the category is well developed and provable in terms of features and dimensions, and (c) the relationships between categories are well defined and validated (Strauss and Corbin, 1998). Finally, to design the optimal model of the accrual accounting system in the public sector, content analysis and a network of themes (indicating the relationship and dependence between themes) were used to analyze the data.

In addition, the validation method was used as a communication method to validate the themes of the model (Flick, 2009). This way, the interviewed members control the basic, organized and comprehensive issues. Also, the audit method, such as quoting experts (auditors and consultants), was used to confirm the mentioned items. To evaluate the reliability of basic, organized and comprehensive themes, two methods of reproducibility and transferability (generalizability) were used (Strauss and Corbin, 1998). Such that in the reproducibility, the coefficient of agreement method between two coders or a collaborating researcher is used (Sarukhani, 2008) and the existing inconsistencies have been eliminated (the reliability coefficient obtained was equal to 0.91 and in that part of the themes that there were disagreements between the two encoders, revision has taken place).

Table 1. The characteristics of the respondents in the thematic analysis study

No.	Gender	Education	Age	Occupation	Field of study
1	Male	Master's	47	Accountant	Accounting
2	Male	PhD	42	Director General	Governmental Management
3	Female	Bachelor's	43	Accountant	Accounting
4	Male	Master's	49	Deputy of Support and Human Resources	Business Management
5	Male	Master's	57	Director-General	Economical science
6	Male	PhD	46	Accountant	Financial Management
7	Female	Master's	48	Accountant	Accounting
8	Male	Master's	45	Administrative and Financial Assistant	Accounting
9	Male	PhD	53	Director General	Economy
10	Male	Master's	47	Accountant	Accounting
Total	10				

In order to transfer or generalize, theoretical sampling has been tried to be as regular and complete as possible (Strauss and Corbin, 1998). Academic and executive experts at various levels were invited to conduct semi-structured interviews. Table 1 shows the characteristics of the interviewees in the content analysis study.

4. Findings

Content analysis was used in interviews with experts in the field of accrual accounting. The content network method was used as one of the content analysis methods. Content analysis is done in different ways, including theme format (to determine hierarchical levels of themes Extracted), a matrix of themes (to compare themes), and a template of themes (to show the relationship and dependence of the themes). Themes Network is a content analysis method developed by Attride-Stirling (2001). The following steps must be performed to obtain a network of themes: (a) Discovering key themes (identifiers and key points of the text). (B) Discovering organized themes (themes derived from summarizing and combining key themes). C) Examining broad themes (excellent themes that incorporate the text's principles). Inclusive themes are at the heart of the subject network. Organized themes are the link between the overarching and central themes of the network. The main themes express an important point in the text and by combining them, an organized theme is formed (Abedi et al., 2011). Next, the analysis of data obtained from semi-structured interviews with accrual accounting professionals with a theoretical coding process that includes open, pivotal, and selective encryption to discover key, organized, and comprehensive topics, and finally, a network of topics. The general accrual accounting system is paid.

Table 2. Theoretical coding process in the public sector to cover the basic, organized and comprehensive themes of the accrual accounting system

Selective Coding	Open Coding	Open Coding
Comprehensive themes	**Organized themes**	**Basic themes**
Increase institutional confidence in executive agencies.	Transparency of financial report	Reduce financial error
		Achieve financial transparency
		Optimizing financial efficiency
		Clarity about income and expenses
		Achieve transparency of material and financial resources.
		Functional government transparency
		Examine financial statements thoroughly.
		Proper and accurate review of expenses and revenues
		A proper review of expenses, income and assets and debt
		Recognize government debts and demands.
		Report and record financial events and transactions when they occur
		Control of all capital and assets obtained
		Calculate the financial resources of the programs in a very accurate way.
		Optimize financial events
		Achieve credible financial data.
		Achieve complete financial data on the current situation.
		Enabling accurate financial reporting
		Assess the size of assets and devices thoroughly.
	Raise the percentage of confidence in government efficiency.	Achieving valid and useful data
		Increase the confidence of budget decision makers.
		Raise public confidence
		Provide reliable reports of assets and liabilities.
	Increased ability to respond and accept government	Increase responsiveness and clarity
		Answering executive devices operationally

	responsibility	Increasing the accountability of managers in the organization
		Evaluate the level of responsibility of the manager.
Improving the management process of executive devices	Improve the planning and decision-making process	Achieve useful financial data for planning purposes.
		Optimize decision making and management planning.
		Optimize planning by relevant managers.
		Do planning for unearned income.
		Establishing the right connection between our executive organizations
	Increasing the ability to budget operationally	Facilitate performance-based budgeting
		Improve resource allocation
		Assist with operational budgeting.
Improving the organizational productivity of executive organizations	Enhance performance	Optimizing and improving the performance of managers of organizations
		Improving the performance of executive organizations
	Improving the effectiveness of activities	Influence on the creation of a product or service
		Optimizing the effectiveness of the work done in the organization
Optimization of financial laws and regulations of executive organizations	Optimization of control and measurement of organizations	Achieve complete data to control government efficiency and performance.
		Enabling control over the efficiency of organizations
		Optimize cost and revenue control.
	Avoid financial threats in the organization.	Reducing corruption in executive agencies
		Reduction of financial violations in the government

The number of comprehensive, organized, and basic themes of the optimal model of the accrual accounting system in the public sector extracted from the qualitative data related to the semi-structured interview are shown in Table 3.

Table 3. The number of comprehensive, organized and basic themes of the optimal model of the accrual accounting system in the public sector

No.	Comprehensive Themes	Organized Themes	Basic Themes
1	Increasing institutional trust in executive organizations	3	26
2	Optimizing the management process of executive organizations	2	8
3	Increasing the organizational productivity of executive organizations	2	4
4	Optimization of financial laws and regulations of executive organizations	2	5
Total	Increasing institutional trust in executive organizations	9	43

As Table 3 shows, the optimal model of the accrual accounting system in the public sector is based on semi-structured interviews with 10 accrual accounting experts of theoretical saturation with four comprehensive topics, 9 organized themes and 43 key themes. Figure 1 shows the conceptual model of accrual accounting system networks in the public sector regarding comprehensive and organized themes.

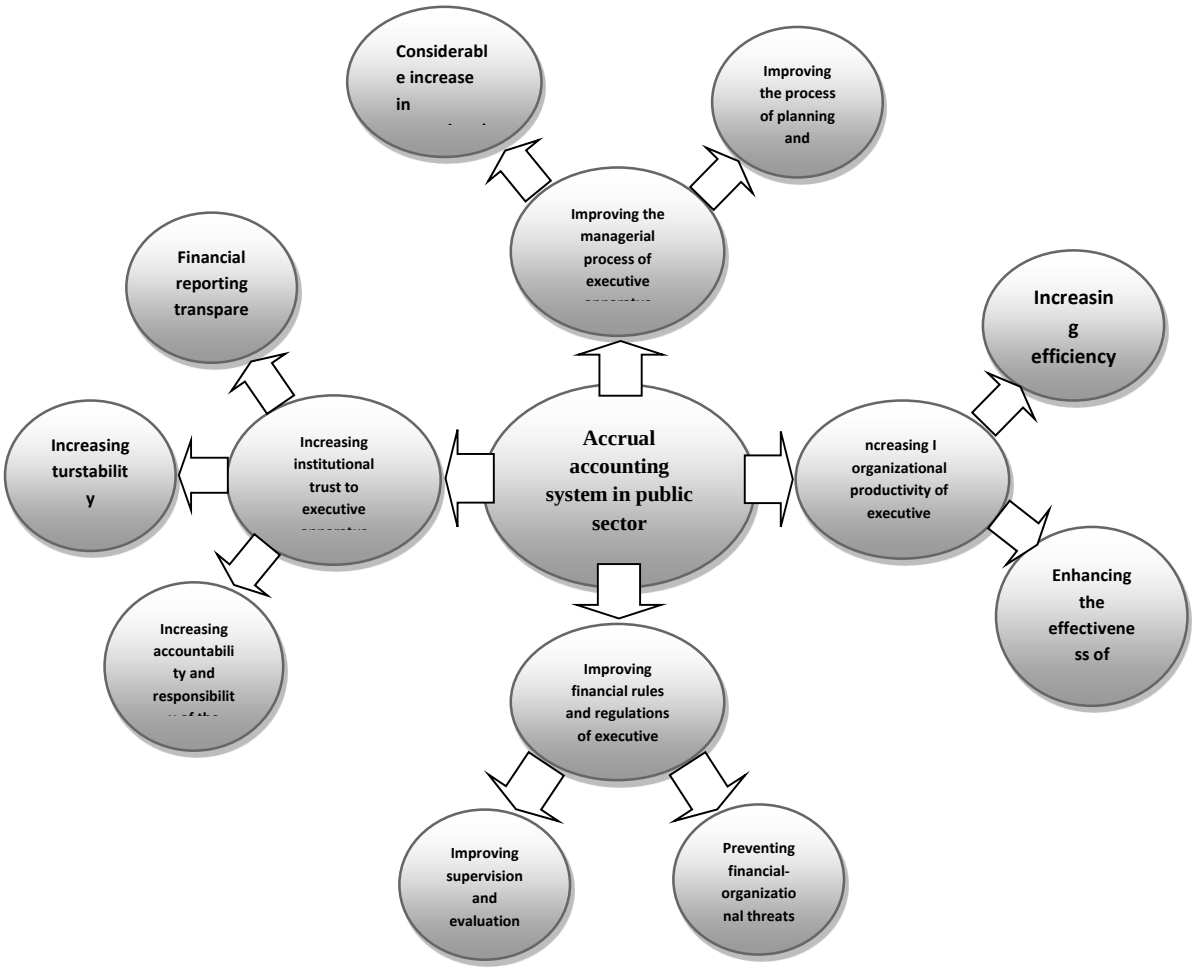

Figure 1. Appropriate network conceptual model of accrual accounting system in the public sector based on comprehensive and organized themes

5. Discussion and Conclusion

The present study, with a qualitative approach and referring to experts and opinion leaders in the field of accrual accounting and conducting interviews in a semi-structured manner and analyzing it by content analysis in the public sector, seeks to identify and enumerate the correct model of the accrual accounting system. The results of the present qualitative study showed that in the public sector, the appropriate network theoretical model of accrual accounting system in the public sector with 4 comprehensive themes had been saturated with theoretical data, which are: 1- Increasing institutional confidence in executive organizations 2- Optimizing the management process of executive organizations 3- Increasing the organizational productivity of executive organizations 4- Optimizing the financial rules and regulations of executive organizations.

In addition, each of these four overarching themes consists of sub-themes, organized as follows: The first overarching theme in the optimal accrual accounting model is to increase institutional trust in the executive branch. The general theme of increasing institutional trust in the executive apparatus includes the three organized themes of "enhancing the credibility of government performance", "transparency of financial reports", and "promoting accountability and government accountability", which are explained in social and group interactions. The social mechanism plays a vital role in a variety of functions. Anthony Giddens (2004) considers trust as waiting for expectations to be met about possible events. In other words, trust can be regarded as a belief in the ability of the individual

or system and adherence to moral principles, abstract and intangible (such as technical knowledge).

Since accrual accounting significantly impacts improving the qualitative characteristics of government financial performance in Iran, one of the most critical issues that can be prepared and submitted by accrual accounting in the country's governing bodies is high transparency financial reports (Naghizadeh Baghi et al., 2015). In addition, the main purpose of public sector financial reporting is to help the government be accountable to the nation (Pourzamani and Moinian, 2015). Thus, institutional trust will also increase in the executive apparatus by strengthening and increasing the transparency of financial reports, confidence in the government's performance, and the government's ability to be accountable. The findings of this study on the above topics are in line with the research of Naghizadeh Baghi et al. (2015), Caperchione (2015) and Bushman et al. (2016) regarding the transparency of financial statements and accountability and strengthen them empirically.

The second most common issue is improving the executive device management process. The general theme of improving the management process of the executive apparatus consists of two organized themes: "Improving the planning and decision-making process" and "Increasing the capacity of operational budgeting". There is a significant and positive relationship between accrual-based budgeting and various dimensions of performance-based budgeting.

The third comprehensive theme of the accrual accounting system is to increase the organizational efficiency of executive bodies. This pervasive theme consists of two organized themes: "increasing efficiency" and "improving the effectiveness of activities" equates productivity with doing the right thing (effectiveness) and doing the right thing (efficiency) (Khaki, 1999). In addition, as a philosophy and vision based on an improvement strategy, the efficiency of human resources is the most crucial goal of any organization. The mission of the management department and the critical and primary objectives of the organization's managers is the effective and improved use of various resources and other facilities such as manpower, capital, information and energy (Safari and Rangriz, 2020). Therefore, individual and organizational productivity will also increase if the executive bodies and their managers have the necessary effectiveness and efficiency. The findings of this study in relation to the above topics are close to Rahmani and Rezaei (2011); in the public sector, accrual accounting better defines the current situation of the reporting unit and increases awareness of economic effects and merges it empirically.

Finally, the fourth comprehensive issue of the accrual accounting system is the reform of the financial rules and regulations of the executive bodies. The general theme of improving the financial rules and regulations of the executive apparatus consists of two organized themes: "Improving the supervision and evaluation of the apparatus" and "preventing financial threats to companies". The findings of this study on the above topics are consistent with Caperchione (2015) and Bushman et al. (2016) that an accrual accounting system leads to better financial management and control and compares the efficiency of management in different sectors.

Finally, it should be noted that the basis of progress in today's turbulent world is based on easier and more access to accurate information and reports. Awareness of the current situation and the ability to create and change is one of the factors facilitating management. However, organizations have a special role in achieving their big goal. On the other hand, managers and organizations need accurate and timely information on increasing optimal decisions, financial transparency, information transparency and reducing corruption, accountability, the possibility of operational budgeting, and organizational efficiency (efficiency and effectiveness).

6. Practical Implications

In order to increase the efficiency of accrual accounting in the public sector, according to the

contents of the statistics and identified to the managers and accountants of the following agencies is recommended:

- Be diligent in increasing the institutional trust of citizens in the executive apparatus due to the transparency of their financial reporting.
- Improve the management process of the executive apparatus by improving the planning and decision-making process in the executive apparatus as well as improving the operational budgeting capability.
- Improve organizational productivity by increasing efficiency as well as improving the effectiveness of activities in the executive apparatus.
- Finally, by improving the financial laws and regulations in the executive bodies, on the one hand, they can prevent organizational financial threats, and on the other hand, they can improve the process of monitoring and evaluation of the bodies by those in charge.

7. Research Limitations

Lack of evaluation and fit of the conceptual model calculated by conducting experimental and field studies and lack of reliability, like all qualitative research (although the necessary measures were taken in this regard), are among the limitations of the present study.

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The Effect of Managerial Overconfidence on Abnormal Audit Fees with Respect to Stakeholder Equity Mechanisms

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Abstract

The pricing of audit services has been a topic of interest to many audit researchers. In case auditors recognize managerial overconfidence, they are expected to incorporate this risk factor into their audit planning and compensate for additional audit efforts to reduce diagnostic risk. This research investigates the effect of the stakeholder equity mechanisms on the relationship between managerial overconfidence and abnormal audit fees. The research sample comprises 144 listed firms on the Tehran Stock Exchange (TSE) from 2012 to 2021. Multiple regression techniques are used to test hypotheses. Furthermore, the Burks et al. (2019) method of testing interaction role is applied. The capital expenditure ratio index has been used for measuring managerial overconfidence. The results indicated a positive and significant relationship between managerial overconfidence and abnormal fees for auditing services. Moreover, the stakeholder equity mechanisms undermine the relationship between managerial overconfidence and abnormal fee for auditing services.

Keywords:
Managerial Overconfidence, Abnormal Fees, Stakeholder Mechanisms

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1. Introduction

Independent auditors have been providing auditing and assurance services for a fixed fee for many years; nevertheless, recent scandals paid special attention and consideration to auditors' economic behavior by researchers and professional society. There have been attempts to determine factors affecting auditing fees and additionally to determine a specific pattern for fee values by researchers. Accountability to the public is a prerequisite for the democratic process. Accountability is also one of the main considerations in auditing and accounting fields. Indeed, auditing and accounting exist in the monitoring aspect of any system and organization; they are widely used from the highest level of government to the smallest business units because each system needs monitoring and feedback for survival (Duellman et al., 2015).

Reduction in the requirements and provisions in the auditing labor market has enabled auditing companies to expand their economic goals and also look for additional revenues and ways of reducing their costs in any audit work.

The determinants of Auditing fees are divided into two general groups: First, the characteristics of the auditing company. Second, the characteristics of the client or customer (Mousavi and Darogheh Hazrati, 2011). Examining these factors is an essential work and there have been attempts to identify them. Some of these determinants are investigated in previous studies; this research investigates the factors and conditions that have not been examined in previous studies.

Overconfidence is a modern financial concept and an important personality trait, so it has a special place in financial and psychological theories. Psychologists have found that people overestimate their abilities to perform tasks appropriately, directly related to the importance given to different businesses. Accordingly, psychologists have reported that people attach more importance to outstanding information when making decisions and judgments. Studies about the effect of managerial overconfidence on a company's performance are of great significance since overconfidence can lead to inappropriate decisions and investments, financing or accounting policies, and costs, and consequently, heavy burdens may be imposed on the company. Overconfidence is a critical personality trait of managers that affects their risk-taking ability. Overconfident managers overestimate the probability and impact of favorable events on cash flows and underestimate the probability and impact of negative events (Duellman et al., 2015).

Hill and Jones (1992) investigated the agency and stakeholder theories in their study. By examining the previous studies conducted in this field, they asserted that the agency theory had been one of the dominant economic models in the literature during the past decades. According to the literature, agency theory primarily concerns the relationship between managers and shareholders. Accordingly, the dividends per share (DPS) policy is considered one of the most effective instruments for managers to reduce agency conflicts between managers and shareholders. In addition, researchers have recently been investigating the functions of agency theory, including strategic management, business performance, organizational behavior, etc. One function, for instance, is the capacity of agency theory to explain implicit and explicit contractual relationships between various groups of stakeholders. In the financial and managerial literature, this approach is known as the stakeholder theory approach. Contrary to the agency theory, which considers only the relationship between managers and shareholders, the stakeholder theory considers the communication link between all the suppliers of a company's resources (stakeholders). According to the agency theory, shareholders invest in a company to earn a profit. Nonetheless, according to stakeholder theory, conflicts of interest between different groups of stakeholders may reduce the returns owed to shareholders (Bøhren et al., 2012).

This study contributes to the literature because 1- the relationship between managerial

overconfidence and abnormal audit fees is not studied well in Iran and 2- the main effect of the stakeholder equity mechanism on this relationship is not studied before in Iran. There this study has enough novelty. The present study investigates, "Do stakeholder equity mechanisms affect the relation between managerial overconfidence and abnormal audit fees?"

2. Theoretical Foundations and Research Hypotheses

Auditing fee is one of the most important factors affecting professional power, which has gained substantial importance in the profession and academic studies after the financial scandals of the early 2000s. Auditing fees are a prerequisite for the survival of the auditing profession and, of course, one of the main determinants of auditor independence. Implementing auditing based on relevant standards and the interests of the auditing community is threatened when auditors do not gain sufficient and proper profits from doing their professional activities (Darogheh Hazrati and Pahlavan, 2011).

Managerial overconfidence can affect auditors' assessment of financial reporting risk-taking because they are more likely to overestimate projects' future cash flows. In contrast, they underestimate the overall probability of negative events. Previous studies indicate that overconfident managers use less accounting conservatism (Ahmed and Duellman, 2012). Due to their optimistic bias towards profit, these managers misrepresent profit, re-evaluate financial statements, use real earning management, and maintain ineffective internal controls (Carey et al., 2017).

Salehi et al. (2019) investigated the relationship between the substitution of managers and auditing fees. The results showed that changing the position of the board's chairman in sample companies reduces auditing fees. Also, they concluded that a change in the responsibilities of board managers positively impacts auditing fees.

Noshadi et al. (2020) investigated the factors influencing auditing fees, like Factors relevant to the professional, cultural and social environment. According to the results, public views of auditing, users' and stakeholders' perceptions of auditing, decision-makers, and policymakers' degree of regulatory competition are the most critical factors influencing the level of professional and environmental conditions. In the meantime, factors such as the market size and concentration, the extent of international relations of institutions, and the risk of lawsuits against auditors in Iran are among the most important factors determining auditing fees. In addition, a set of factors mentioned is described, along with the consequences of reasonable fees and surrounding conditions.

Nemati Mofrah and Bigler (2020) investigated the correlation between earnings, earnings volatility, and auditing fees. The study suggests that the correlation between earnings and earnings volatility is related to auditing fees. Correlation and volatility of earnings can be considered as a set of profit characteristics that may influence the auditor's perception of inherent risk. Auditors should conduct more extensive testing to reduce auditing risks in response to greater inherent risks.

Jizi and Nehme (2018) examined the relationship between CEO duality and auditing fees. The study's statistical population includes US commercial banks, which were collected using the archival method. This study uses the board's structure and the audit committee's characteristics to measure the corporate governance mechanisms. The regression analysis showed that auditing fees positively correlate with the board of director's independence, the board size, CEO duality and audit committee members' financial expertise. Despite the increased risk of misstatement and the financial significance of managerial overconfidence, there is not adequate evidence to support that auditors identify characteristics that reflect managerial overconfidence and that there is a relationship between managerial overconfidence and increased audit risks. It is expected that if auditors consider managerial overconfidence, they may include this risk factor in their audit plan and increase their auditing fee as compensation for additional efforts they assign to reduce the exploration risk. Given all the above, managerial overconfidence seems to increase the audit fee. Accordingly, the first

hypothesis of the research is presented as follows:

First hypothesis: There is a positive and significant relationship between managerial overconfidence and an abnormal fee for auditing services.

The effects of the shareholder equity mechanism on appointing managers and creating incentives for managers to do what is in the best interest of minority shareholders and avoiding inappropriate behaviors by management are highly significant (Bennedsen and Wolfenzon, 2000). These mechanisms act as an oversight system that diminishes conflicts between various shareholders. In other words, various shareholders with almost equal shares prevent large shareholders' tunnelling behaviour. The balance mechanism of shareholders is an aspect of corporate governance which helps other shareholders supervise the largest shareholder and create an environment in which the behavior of managers can be supervised and be more rational (He et al., 2020). In addition, balanced equity can have controlling effects through the participation of corporate governance mechanisms. When the votes are well distributed among major shareholders, neither major shareholders nor the company manager can independently control the production activities and those related to decision-making for the entire company (Maury and Pajuste, 2005). It can prevent shareholders and managers from conspiring against the interests of small and medium-sized shareholders. The existence of various leading shareholders can boost the effective monitoring of managers. So, the oversight system can work more efficiently as minority shareholders are interested in monitoring the behavior of leading shareholders and managers. Eventually, as a result of this oversight system, internal control quality may increase and earning manipulation by self-confident managers may decrease and also, the probability of auditors' opinion shopping by managers may decrease (He et al., 2020).

Bryan et al. (2018) stated that earnings and volatility are associated with auditing fees. Autocorrelation and volatility of earnings may affect auditor perception of inherent risk. They showed a negative (positive) association between earning autocorrelation (volatility) and audit fees. Moreover, they conclude that industry-specialist auditors respond to lower earnings autocorrelation more efficiently than non-specialists; thus, the relationship between earning autocorrelation and audit fees is weakened. Kusharyanti and Kusuma., (2020) investigated the effects of a stakeholder equity theory on the relations between managerial overconfidence and abnormal fee for auditing services. The results showed a positive and significant correlation between managerial overconfidence and abnormal fee for auditing services. In addition, a shareholder equity mechanism can significantly attenuate the positive correlation between managerial overconfidence and abnormal audit fees.

Given all the above, it can be said that the mechanism of shareholders' equity affects the relationship between management overconfidence and audit fee by moderating and limiting the overconfidence behavior of managers. In addition, when auditors consider the mechanism of shareholders' equity, given the effect of this mechanism on the inherent risk of auditing, they moderate the auditing fee. Therefore, stakeholders' equity mechanisms are expected to moderate the relationship between management overconfidence and abnormal audit fees.

Second hypothesis: The stakeholder equity mechanisms moderates the relationship between managerial overconfidence and abnormal fee for auditing services.

3. Research Methodology

The initial sample consists of all listed firms on Tehran Stock Exchange (TSE) from 2011 to 2020. The screened sample of the research is 144 companies that meet all of the following requirements:

1. The selected companies should not be grouped as financial institutes in financial and investments, banking, insurance, and financial services.

2. Selected companies should not be non-manufacturing (transportation, trade, services, etc.)

3. The research sample firms must have entered the capital market before the research period (2011 to 2020).

4. The financial data needed for this research should be available, especially the notes accompanying financial statements.

5. The selected firms should not have been removed from the capital market listed companies' boards during the research period.

6. The Selected companies should not have changed their fiscal year during the research period.

3.1. Research models and variables

In this study, the following regression model is used:

$$AAF_{it} = \beta_0 + \beta_1 OVERCON_{it} + \beta_2 EQUITY_{it} + \beta_3 OVERCON \times EQUITY_{it} + \beta_4 SIZE_{it} + \beta_5 AGE_{it} + \beta_6 ROA_{it} + \beta_7 LEV_{it} + \beta_8 CR_{it} + \beta_9 GR_{it} + \varepsilon_{it}$$

3.1.1 Dependent variable

Abnormal auditing fees (AAF $_{it}$)is calculated using the residuals of the following model:

$$LAF_{it} = \beta_0 + \beta_1 LTA_{it} + \beta_2 CR_{it} + \beta_3 CATA_{it} + \beta_4 ARINV_{it} + \beta_5 ROA_{it} + \beta_6 LOSS_{it} + \beta_7 FOREIGN_{it} + \beta_8 LEV_{it} + \beta_9 INTANG_{it} + \beta_{10} OPINION_{it} + \varepsilon_{it}$$

LAF: Logarithm of audit fees

LTA: Logarithm of total asset

CR: Current assets divided by current liabilities

$$\text{CR} = \frac{\text{Current assets}}{\text{current liabilities}}$$

CATA: Current assets divided by total assets

$$\text{CATA} = \frac{\text{Current assets}}{\text{Total assets}}$$

ARINV: Total accounts receivable plus inventories divided by the total assets

$$\text{ARINV} = \frac{\text{Total accounts receivable } + \text{balances}}{\text{Total assets}}$$

ROA: Return on assets

$$\text{ROA} = \frac{\text{Net profit}}{\text{Total assets}}$$

LOSS = Firms that have experienced loss is considered equal to 1 and otherwise equal to zero.

FOREIGN = Firms with foreign income are equal to 1 and otherwise equal to zero.

LEV: Total liabilities divided by total assets

$$\text{LEV} = \frac{\text{Total liabilities}}{\text{Total assets}}$$

INTANG: Intangible assets divided by total assets

$$\text{INTANG} = \frac{\text{Intangible assets}}{\text{Total assets}}$$

OPINION = If the auditor's statement about the company's financial statements is acceptable, it equals 1; otherwise, it equals zero.

3.1.2. Independent variable

Managerial overconfidence (OVERCON**)**

In the present study, capital expenditures have been used as a criterion to measure managerial overconfidence.

Measuring Managerial overconfidence based on capital expenditures criteria results in a dummy variable obtained by calculating capital expenditures' median. Accordingly, if the capital expenditures divided by the total assets in a given year are greater than the median of industry capital expenditures divided by total assets, it will be equal to 1 and otherwise zero. This measurement method is based on Malmendier and Tate's (2005) and David's (2010) findings. Capital expenditures lead to the maintenance, continuation, or increase in the production capacity of goods and services; they also have future profitability for the company (Ahmadi and Mojtahedzadeh, 2009).

$$\text{capital expenditures ratio} = \frac{(\text{Purchase of fixed assets t} - \text{Sale of fixed assets t}) - (\text{Purchase of fixed assets t}-1 - \text{Sale of fixed assets t}-1)}{\text{fixed net assets t}-1}$$

3.1.3. Moderating Variable

Stakeholder equity mechanisms (EQUITY_{it})

Total shares held by banks and insurance firms, holdings, investment firms, pension funds, investment funds, and state-owned companies are divided by the total shares issued by the company.

3.1.4 Control variable

The literature shows that some company characteristics affect most financial elements as abnormal audit fees. These variables are size, age and leverage (He et al., 2020, Mousavi and Darughe Hazrati, 2011, Kusharyanti and Kusuma, 2020). Company size (SIZE_{it}): Natural logarithm of the total assets

$$\text{SIZE}_{it} = \text{Ln(ASSETS)}$$

Company age (AGE_{it}): Equivalent to logarithm, the number of years the company participated in the Tehran Stock Exchange.

$$\text{AGE}_{it} = \text{Ln(Years)}$$

Financial leverage of the company (LEV_{it}): Total liabilities of the company to total assets of the company

$$LEV_{it} = \frac{Total\ liabilities}{Total\ assets}$$

Previous studies show that ROA, CR, and GR affect abnormal audit fees (Khodadadi et al. 2019, He., et al. 2020, Hasas Yeganeh., et al. 2015).

Return of assets (ROA_{it}): Net income divided by the total assets

$$\text{ROA}_{it} = \frac{\text{Net income}}{\text{total assets}}$$

The current ratio of the company (CR_{it}): Current assets divided by current liabilities

$$CR_{it} = \frac{Current\ assets}{current\ liabilities}$$

Company sales growth (GR): This year's sales minus last year's sales divided by last year's sales

$$GR_{it} = \frac{Sale_t - Sale_{t-1}}{Sale_{t-1}}$$

4. Research Findings

4.1 Descriptive statistics

In order to interpret the overall and basic characteristics of the main research variables, the descriptive statistics of variables must be shown. In descriptive methods, in order to contribute to the transparency of the subject, it is crucial to describe the research data by presenting a table and using descriptive statistical tools such as central and dispersion indexes. The number of valid and accurate observations for each variable is 10 years. This study's data were available for 144 firms listed on the Tehran Stock Exchange, which covers the 2012 to 2021 period. The first section shows the most important central indexes of research variables. Among the central indexes, the most important ones, the variable's mean, median, maximum and minimum, have been shown. Finally, the standard deviation, the most important scattering parameter, is obtained from the variance square root. These indexes are presented in Table 1. Excel and EViews v10 software has calculated the figures in this table.

Table 1. The descriptive statistics of research variables

Variable Research	Symbol	Average	Median	Maximum	Minimum	Standard Deviation
Abnormal fee for auditing services	AAF	0.000	0.092	6.391	-6.525	1.890
Managerial overconfidence	OVERCON	0.507	1.000	1.000	0.000	0.500
stakeholder equity mechanisms	EQUITY	0.587	0.699	0.994	0.000	0.323
Company size	SIZE	14.217	14.055	20.183	10.226	1.473
Company age	AGE	2.810	2.833	3.931	1.098	0.453
Return of assets	ROA	0.117	0.095	0.626	-0.362	0.128
Financial leverage of the company	LEV	0.578	0.584	0.996	0.059	0.186
The current ratio of the company	CR	1.496	1.315	6.138	0.196	0.786
Company sales growth	GR	0.322	0.238	6.555	-0.733	0.500

Research hypotheses results

4.2 Assessing the stability of research variables

Data must be analyzed before hypotheses can be tested. For this purpose, before comparing the models, the stability of the research variables was first checked by Levin, Lin and Chao tests using Eviews10 software. The results are presented in Table 2.

Table 2. Stability tests results of research variables

Variable Research	Symbol	P-Value	Statistic -T	Conclusion
Abnormal fee for auditing services	AAF	0.000	-62.066	It is stable
Managerial overconfidence	OVERCON	0.000	-26.279	It is stable
stakeholder equity mechanisms	EQUITY	0.000	-485.933	It is stable
managerial overconfidence×abnormal audit fees	OVERCON×EQUITY	0.000	35.369	It is stable
Company size	SIZE	0.000	-3.921	It is stable
Company age	AGE	0.000	-45.962	It is stable
Return of assets	ROA	0.000	-22.087	It is stable
Financial leverage of the company	LEV	0.000	-9.015	It is stable
The current ratio of the company	CR	0.000	-14.300	It is stable
Company sales growth	GR	0.000	-13.114	It is stable

4.3 Heteroscedasticity Test

The results are shown in Table 3. In the research model, the significance level is less than 5%. That is, there is Heteroscedasticity. The white correction factor was used to solve this problem.

Table 3. Heteroscedasticity analysis results

Inequality	Heteroscedasticity analysis		Model
Conclusion	Chi2	P-Value	
Yes	2343.432	0.000	Research regression model

Reference: Results

4.4 Collinearity Test

The variance inflation factor (VIF) index is used to diagnose the collinearity. The collinearity test (VIF) of the research variables is described in Table 4.

Table 4. Collinearity Test

Variable Research	Sign Exclusive	Research regression model VIF
Managerial overconfidence	OVERCON	4.331
stakeholder equity mechanisms	EQUITY	2.287
managerial overconfidence×abnormal audit fees	OVERCON×EQUITY	2.215
Company size	SIZE	1.079
Company age	AGE	1.074
Return of assets	ROA	1.555
Financial leverage of the company	LEV	2.313
The current ratio of the company	CR	2.170
Company sales growth	GR	1.065

Reference: Results

4.5 Diagnostic tests and model estimation

In this section, the model is estimated using the panel data method to ensure the results of estimating the models. One of the advantages of panel data is that it reduces heterogeneity and variability by considering heterogeneity in collinearity areas. In the panel data method, more complex models can be tested.

Table 5. F-Limer Test Results

Test Result	P-Value	Statistic - F	Model
Fixed Effect Model	0.000	19.073	Research regression model

The results of the F-limer test in Table 5 show that both models are panel data (p-value <0.05). Therefore, the research model is estimated د by the panel data method.

In this phase, Breusch and Pagan's (1980) test was performed. The results of this test are presented in Table (6). The results rejected the null hypothesis. The obtained results emphasized the necessity of using the random effect model for the companies.

Table 6. Breusch–Pagan Test

Test Result	P-Value	Statistic chi-bar	Model
Random Effect Model	0.000	543.092	Research regression model

As the F-limer test confirmed the existence of fixed effects and the Pagan method test also confirmed the existence of random effects, the Hausman test (1978) was performed to choose one of the two methods mentioned.

Table 7. Hausman Test Results

Test Result	P-Value	chi-square Statistic	Model
Fixed Effect Model	0.000	46.154	Research regression model

Hausman test results are presented in Table 7, showing that the fixed effects method is the most appropriate regression estimate. (p-value <0.05)

4.6 Research hypothesis test results

Based on Burks et al. (2019), the interaction analysis is tested in two steps. Step one is inserting interaction variables in the research model and step two is testing the conditional effect of interaction variables.

According to the results obtained from regression analysis provided in Table 8, the adjusted determination coefficient is 0.329, indicating that if other factors are assumed to be constant, approximately 32.9% of the changes in the dependent variable (abnormal fee for auditing services) are explained by independent and control variables. As shown in Table 8, the F-statistic is significantly less than 5% (95% confidence). Thus, the null hypothesis concerning no linear relation between dependent and independent variables is rejected. Therefore, it can be said that there is a significant linear relationship between the model variable.

Table 8. Research hypothesis test results (step 1)

Variable	Sign Exclusive	Research regression model			
		Coefficients	Std. Err	T statistics	P-Value
Managerial overconfidence	OVERCON	0.155	0.076	2.029	0.042
stakeholder equity mechanisms	EQUITY	-0.409	0.124	-3.278	0.001
managerial overconfidence×stakeholder equity mechanisms	OVERCON×EQUITY	-0.118	0.046	-2.553	0.010
Company size	SIZE	0.201	0.051	3.887	0.000
Company age	AGE	0.465	0.087	5.339	0.000
Return of assets	ROA	0.315	0.197	1.592	0.111
Financial leverage of the company	LEV	-0.100	0.143	-0.699	0.484
Current ratio of the company	CR	0.032	0.010	3.095	0.002
Company sales growth	GR	0.042	0.020	2.029	0.042
intercept	Cons	1.835	0.577	3.176	0.001
Number of observations			1440		
R^2 coefficient of determination			0.395		
Adj R-squared			0.489		
Statistics significance level F			0.000		
Statistics F			5.240		
Durbin and Watson			1.603		

Reference: Results

The results of the autocorrelation test (Durbin-Watson statistics) showed that there is no autocorrelation in the research regression model (Durbin-Watson statistics value should be ranged from 1.5 to 2.5; hence it is clear that the model does not have autocorrelation).

First hypothesis: Statistical hypothesis for the first hypothesis is zero (H0) and the opposite hypothesis (H1) is as follows :

Hypothesis (H1): There is a positive and significant relationship between managerial overconfidence and abnormal fee for auditing services.

Investigating the relationship between managerial overconfidence and abnormal fee for auditing services, the coefficient of the managerial overconfidence variable is both statistically positive and significant. As the managerial overconfidence variable coefficient is positive (0.155), managerial overconfidence positively affects the abnormal fee for auditing services. Considering that the significance level of this relationship is less than 0.05, this relation is significant. As a result, there is a positive and significant relationship between managerial overconfidence and abnormal fee for auditing services; therefore, the first hypothesis of the research is confirmed.

Second hypothesis: Statistical hypothesis for the second hypothesis is zero (H0) and the opposite hypothesis (H2) is as follows:

Hypothesis (H2): The stakeholder equity mechanisms undermine the relationship between managerial overconfidence and abnormal fee for auditing services.

Regarding the second hypothesis, i.e. the stakeholder equity mechanisms undermine the relationship between managerial overconfidence and abnormal fee for auditing services, it can be said that there is an interaction effect of the coefficient of the variable of managerial overconfidence and stakeholder equity mechanisms (-0.118). Considering the significant level of the interactive effect of managerial overconfidence and the stakeholder equity mechanisms, which is equal to 0.01, it can be concluded that the stakeholder equity mechanisms significantly affect the relationship between managerial overconfidence and abnormal fee for auditing services. Considering the opposite direction of the interactive effect variable with the independent variable of the research, it can be concluded that the stakeholder equity mechanisms undermine the relationship between managerial overconfidence and abnormal fee for auditing services. Therefore, the second hypothesis is

confirmed.

Regarding control variables, it can be concluded that: The estimated coefficients of the control variables "company size", "company age" and "return on assets" in Table 9 indicate a significant relationship between these variables and the abnormal fee for auditing services.

In the second step and based on Burks et al. (2019) the conditional effect of stakeholder equity mechanisms is analyzed as follows:

Table 9. Analysis of conditional effect on the abnormal fee for various equity mechanisms (step2)

EQUITY distribution point	EQUITY Level	T statistics	Std. Err	Coefficients
10%	0.222	1.065	1.167	1.243
25%	0.386	1.426	1.413	2.016*
50%	0.620	2.799	2.016	2.844*
75%	0.802	1.529	0.896	1.370*
90%	0.971	0.904	2.238	2.025

Given the continuous nature of EQUITY, we analyzed the effect of OVERCON over a range of EQUITY values. Table 9 shows statistical tests of the estimated slope on OVERCON at different values of EQUITY. These points correspond to EQUITY values of 0.22 to 0.971; the table shades the range of EQUITY values where the slope on OVERCON significantly differs from zero.

.Based on the results, at the levels of 0.376, 0.620 and 0.802, the effect of OVERCON is significantly different from zero (based on one-tailed $p< 0.10$);

The magnitude and significance of these conditional effects are similar to the unconditional effect of abnormal fees from the linear-additive model.

5. Conclusion and Implications

This study aimed to investigate the effect of stakeholder equity mechanisms on the relations between managerial overconfidence and abnormal fees in companies listed on the Tehran Stock Exchange. According to the findings, an attempt has been made to examine the following question "Does stakeholder equity mechanisms affect the relationship between managerial overconfidence and abnormal fee for auditing services?"

To answer the above question, the following hypotheses have been proposed:

First hypothesis: There is a positive and significant relationship between managerial overconfidence and abnormal fee for auditing services.

Second hypothesis: The stakeholder equity mechanisms undermine the relationship between managerial overconfidence and abnormal fee for auditing services.

The results of the analysis of the empirical model showed that there is a positive and significant relationship between managerial overconfidence and abnormal auditing fees. Despite the increased risk of material misstatement due to managerial overconfidence, there is little evidence that auditors detect the characteristics that prove managerial overconfidence and the relationship between managerial overconfidence and increased audit risk. It is expected that if auditors take managerial overconfidence into account, they may include this risk factor in their audit plan and, as a result, increase their auditing fees for additional efforts to reduce exploration risk. Given all the above, managerial overconfidence seems to increase the auditing fee. The results of the present hypothesis are somewhat consistent with the findings of Kusharyanti and Kusuma (2020).

The results of the second hypothesis indicated that the stakeholder equity mechanisms undermine the relationship between managerial overconfidence and abnormal fee for auditing services. Leading

shareholders can create effective oversight over managers. To protect their interests, they are interested in monitoring the behavior of managers, thereby creating more effective oversight. Finally, the quality of internal control of listed companies is improved and the motivation of overconfident managers to manage earnings and buy auditing opinions is reduced. Therefore, the positive effect of managerial overconfidence on abnormal auditing fees has been undermined. The results of the present hypothesis are somewhat consistent with the findings of Kusharyanti and Kusuma (2020).

Considering the results, it is suggested that leading investors, especially shareholders, take these three steps to reduce the effect of their managerial overconfidence on abnormal auditing fees. First, increasing the number of board members to control the managers. Second, the company manager should not be the board's chairman due to influencing the company's major decisions. Third, capital market policy makers oversee the company's management activities. Forth auditors be aware of managerial overconfidence and its effect on audit fees.

It is suggested that future research investigate the effect of investors' inclinations on the relationship between managerial overconfidence and abnormal fee for auditing services.

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RESEARCH ARTICLE

Evaluating the Effect of COVID-19 on Profitability and Bank Performance

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Abstract

The primary purpose of this study is to investigate the effect of COVID-19 on profitability and employee performance in state-owned and private banks in Iran. In other words, the present study seeks to find an answer to whether COVID-19 can affect the profitability and performance of employees of Iranian banks or not. In terms of objective, the study method is a practical and descriptive survey. The study's statistical population comprises all managers, staff, and customers of state-owned and private banks in Iran, through which 540 questionnaires were filled and analyzed. The sampling method of the study is available non-random that is used as the study's sample. In this paper, the PLS tests are employed to assess the effect of independent variables on the dependent ones. The results from the study's hypotheses show that COVID-19 has a positive and significant effect on profitability and employee performance. Moreover, the effect is more tangible in state-owned banks than the private ones. The present study was carried out in emergent financial markets, like Iran, which is highly competitive and suffering from severe economic sanctions since due to the sanctions, most countries, including the United States, did not allocate vaccines to the Iranian people and that exacerbated the conditions in Iran, it can provide the readers with useful information to develop science and knowledge in this field.

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1. Introduction

The COVID-19 pandemic caused a global economic shock and caused the deepest global recession in nearly a century (OECD 2020). Although the global economy is on the path to recovery, returns are expected to be unequal among countries, so returns in developing countries may be much later than in developed countries (World Bank, 2021). The countries of the Persian Gulf are among the regions that have been severely affected by this pandemic and are expected to face serious problems in developing and increasing per capita income for at least a decade. (World Bank, 2021). Continued implementation of large-scale restrictive measures by governments and uncertainty about the timing of the pandemic continue to negatively affect developing countries' economic and financial conditions, making a recovery more diverse, difficult, and uncertain. The financial sector of the Middle East, especially Iran, has not escaped this pandemic, as it has exposed financial institutions to tremendous operational and financial challenges.

The COVID-19 pandemic contributed to the sharp rise in corporate and household debt and negatively affected banks' financial performance and ability to mediate and support economic recovery (Minney 2020; Tyson 2020; Barua and Barua 2020). Given the central role of banks in economic prosperity, growth and development of countries, banking performance is still considered by industry experts, policymakers and researchers. The most common measure of a bank's performance is profitability, often characterized by profitability ratios such as return on assets (ROA), return on equity (ROE), and net income margin (NIM) (Sufian and Habibullah, 2009; Rahman et l., 2015; Kumar et al., 2020; Titko et al., 2015). In the extensive existing literature, bank profitability is generally expressed as a function of internal (especially bank) and external (macroeconomic and industry-specific) factors (Titko et al., 2015; Sufian and Habibullah, 2009; Rahman et al., 2015). However, various internal and external factors contribute to banks' profitability in emerging and developing economies, largely due to the thematic literature's mixed and sometimes contradictory empirical results. A comparative analysis of this study showed that Nigeria's most consistent determinants of bank profitability are the ratio of overhead cost to total assets and the cost-efficiency ratio. In contrast, in South Africa, the ratio of capital adequacy and overhead cost is the total assets. In the United States, no determinants of bank profitability had a statistically significant effect on bank performance. He also found that the return on assets is higher in Nigeria and lower in the United States, indicating that the Nigerian banking sector is more profitable than the US banking sector. At the same time, inflation and GDP growth are lower in the US and much higher in Nigeria. This shows that the United States has greater macroeconomic stability than Nigeria. Therefore, the study concluded that the factors determining banks' profitability are divergent in different countries according to the country's specific characteristics, such as the nature of banking systems, the level of development of the financial sector, and banking regulations and supervision. One of the studies highlighting the differences in the determinants of banks' profitability between countries is Boateng (2018). While examining specific factors affecting bank profitability, this study showed that credit risk, net profit margin, capital adequacy, and inflation significantly affect bank profitability as measured by asset returns in Ghana and India. In contrast, liquidity risk and GDP growth had little effect on banks' profitability in both countries, while the cost-to-income ratio and bank size had little effect on the profitability of the Bank of India but were very important to the profitability of the rich bank. On the other hand, Almaqtari et al. (2019) showed that bank size, number of branches, asset management ratio, operating efficiency and leverage ratio are the key bank-specific factors in explaining the profitability of Indian commercial banks.

Therefore, the factors determining banks' profitability vary over time in countries. For example, Sufian and Habibullah (2009) and Rahman et al. (2015) examined the factors affecting the profitability of banks and both studies showed that the intensity of loans positively and significantly

affects the bank's profitability. Sufian and Habibullah (2009) also found that interest-free income, credit risk and cost significantly affect all three criteria of bank profitability, while Rahman et al. (2015) found that the power of capital (both regulatory capital and capital Stocks), cost efficiency and off-balance sheet activities significantly affect all three criteria of bank profitability. Further, Sufian and Habibullah (2009) also found that the effect of size is not the same in all measures of bank profitability and that macroeconomic determinants except inflation, which is negatively related to the profitability of Bangladeshi banks, do not significantly affect bank profitability. Next, Adelopo et al. (2018) examined the behavior of bank profitability determinants before, during and after the global financial crisis in the economic community of West African countries. This study showed that the return on assets before, during and after the financial crisis was significantly affected by cost management, liquidity and size, while the impact of bank-specific factors such as market power, credit risk and capital strength and macroeconomics factors such as GDP and inflation were sensitive to applied periods of analyzing and measuring bank profitability. Therefore, the study concluded that the financial crisis generally does not affect the relationship between some of the bank's specific determinants and profitability. Moreover, Kohlscheen et al. (2018) showed that the global financial crisis and economic growth have significantly affected banks' profitability.

An emerging collection of articles on the effects of the COVID-19 pandemic on the banking sector mainly applies to advanced economies (Barua and Barua 2020), while the pandemic is expected to have a more adverse effect on banking systems in low-income and developing countries. (Damak et al., 2020). Among the few existing studies in emerging and developing countries, Elnahass et al. (2021) and Barua and Barua (2020), Elnahass et al. (2021) examined the impact of the COVID-19 pandemic on global banking stability and found that the prevalence of COVID-19 had a negative impact on financial stability and financial performance. The results were consistent in different regions and countries in the global banking sector as well as in different levels of the country's revenue generation and banking characteristics. Besides, these studies showed that the pandemic has significant changes and effects on conventional and Islamic banking systems. Since the start of the Corona pandemic, regulators have taken steps to ensure financial stability and reduce risks to the banking system. However, understanding the effects of the COVID-19 pandemic on the profitability of banks and their employees in developing countries is crucial, given their pivotal role in flexibility and improving the situation in Iran (Barua and Barua, 2020). Although many studies have been conducted on the impact of COVID-19 on stock market returns, no study has been published on the impact of COVID-19 on the profitability and performance of bank employees.(Anh and Gan, 2021; Insaidoo et al., 2021), COVID-19 and stock returns (Narayan et al., 2021). For this purpose, due to the lack of empirical research on the impact of the COVID-19 pandemic on the performance of banks in developing countries, this article examines the impact of the COVID-19 pandemic on profitability and employee performance in state-owned and private banks in Iran. A literature review has shown that no previous empirical study has explicitly examined the effect of the COVID-19 pandemic on the profitability and performance of state-owned and private bank employees in developing countries, including Iran.

2. Theoretical Framework and Hypothesis Development

2.1 The impact of COVID-19 on bank profitability

Economies worldwide have been hit hard by COVID-19. Unemployment in the United States increased unprecedentedly in the first half of 2020. At the same time, such a shock is unlikely to affect banks. Equity buffers have improved significantly since the 2007 national crisis, and monetary and regulatory responses have been rapid to strengthen the flexibility of the financial system (Feyen

et al., 2020). In addition, governments acted to support the real economy, which indirectly benefited the banks. The pandemic has affected banks' health and ability to support the economy through lending (Beck and Keil, 2021). In addition to the health crisis, COVID-19 caused a severe recession worldwide. The economic downturn caused by COVID-19 and the shock of falling oil prices will push the national economy into its next recession. With the severe outbreak of the disease, financial markets suffered heavy losses. On February 27, the Dow Jones Industrial Average saw its biggest one-day drop. Although there has been a significant increase in the government response, the stock market has failed several times. However, research shows that the five major US banks have seen the strongest results in nearly a decade, as trading and debt issuance levels have risen sharply in the mid-1930s (Fitch, 2020). Instability in the stock market will increase business activity, so the commercial income of banks will increase significantly. Moreover, increasing the need for liquidity by companies to survive in the economic downturn caused by the pandemic leads to debt expectations (Fitch, 2020). On the other hand, during the pandemic, they reduced the Fed rate to 0.25% (Fitch, 2020). Therefore, reducing short-term and long-term interest rates can disrupt banks' profitability. Besides, as Fitch (2020) shows, declining economic activity may significantly reduce banks' profitability for several months. Also, due to closures, social distancing, and telecommuting due to pandemics, bank customers' activities will decrease and reduce the income from fees. Therefore, the financial effects of COVID-19 have caused banks' profitability to decline.

However, researchers must focus on how Iranian banks react to the epidemic and how to maintain them in the long run while maintaining a healthy and safe profit margin. As the disease continues, many economic factors affect banks' efficiency. The previous literature shows some factors that affect the bank's performance. For example, Ashraf and Shen (2019) have studied the relationship between economic policy uncertainty and bank loan pricing. They have shown a positive relationship between economic policy uncertainty and bank lending pricing. Francis et al. (2014) also stated that political uncertainty increases lending rates. Karadima and Louri (2020) also stated that political uncertainty affects the performance of banks. Bordo et al. (2016) also showed a negative and significant relationship between political uncertainty and the growth of banks' credit. Jin et al. (2019) also argued that political uncertainty has a significant positive relationship with bank profitability. Also, Sharif et al. (2020) and Zhang et al. (2020) examined the impact of COVID-19 on economic conditions. Therefore, we expect COVID-19 to lead to a change in banks' profitability. Since no research has been done in Iran, some believe the epidemic has decreased profitability. Some have stated that the increase in bank visits will increase profitability. Therefore, we express the research hypothesis pointlessly. Hence, according to what has been said, the first hypothesis is as follows:

H1: COVID-19 affects bank profitability.

2.2 The impact of COVID-19 on the performance of bank employees

In addition to mortality, the impact of COVID-19 has increased the incidence of the disease in all countries. Since the first case was reported on March 2, 2020 (Compass, 20/5/2020), the COVID-19 pandemic has profoundly affected global mental health. Many people feel helpless because of the epidemic, panic and anxiety (Zhang and Ma, 2020). COVID-19 has directly impacted all global economic, social and psychological aspects of stock markets (Liu et al., 2012). The COVID-19 pandemic can also disrupt banking performance (Disemadi and Shaleh, 2020). Thus, banks' operational risk management must be done properly to improve the performance of banking services to customers. Achieving superior performance requires systematic innovation (Nwachukwu et al., 2018) and retaining competent and motivated employees to compete in unstable environments (Adeola and Adebiyi, 2016). At the time of the COVID-19 pandemic, most banking services were normal to serve customers, to prevent the transmission of the virus and customers could make

financial transactions through the bank's electronic channels. Information and communication technology changes businesses and organizations (Cascio and Montealegre, 2016), and the performance of banks that use Internet banking services and banks that do not use electronic banking services are different. Margaretha (2015) and Mardiah (2017) examined the application of technology in banking and stated that technology in the banking industry positively affects their performance. Marsal and Hidayati (2018) also stated that social media affects the performance of banks and rapid technological advances in the banking sector has begun. Jarkom SP Banking Communication Networks said 50,000 employees had been fired for replacing machines (Detikfinance, 2019). Employees are the main elements of an organization. An organization's success or complaint depends on employees' performance (Hameed and Waheed, 2011). The outbreak of COVID-19 has disrupted banking operations. Although this was not the case until the first quarter of 2020, the banking industry's performance was disrupted in 2020. In order to continue working during the COVID-19 pandemic, employees are required to perform well. According to Armstrong and Baron (1998), performance is about how work is done and its results. Performance is the result of work that has a strong relationship with the strategic goals of an organization, institution or company, customer satisfaction, and economic participation. Performance is the foundation of an organization because if there is no performance, the organization's goals are not achievable. Employee performance significantly affects service quality and customer satisfaction (Supit et al., 2015; Amelia and Rodhiyah, 2016; Virgiawansyah et al., 2019). Employee performance can be improved by increasing employee compensation and better implementation of human resource development (Hamzah et al., 2018). Studies such as Bima (2017), Nawawi et al. (2018) show that rewards and motivation simultaneously affect employee performance. Also, Nasution et al. (2019) state that reward, motivation and job satisfaction affect performance. During this illness, analyzing the impact of employee rewards and motivation on the performance of bank employees will be very important. By being aware of the performance of bank employees, we can use it as assessment material for leaders to determine the level of performance in the event of an outbreak of the COVID-19 pandemic. As the bank functions as a collector and distributor of public funds and its purpose are to support the implementation of national development, to improve distribution and development, economic growth and national stability, and to improve the lives of many people, it will be important to review the performance and impact of COVID-19. Therefore, according to what has been said, the second hypothesis is as follows:

H2: COVID-19 affects the performance of bank employees.

3. Research Methodology

This paper is practical in terms of objective and type based on analyzing the collected data in the survey method. In this method, referred to as the field method, the scholar will collect data and information by being present at the statistical population level and using different tools, including a questionnaire. The survey method is applied to assess the distribution of the characteristics of the statistical population to analyze the status quo and explore the relationship between events. The collected data were analyzed using the PLS Statistical Software, through which the authenticity of the hypotheses and the obtained results will be generalized to the entire statistical population.

3.1 Data collection

The information used in this paper is divided into two groups. The first group is for information related to theoretical principles and the literature of the study provided by studying local and international resources; the second group is for information collected through the questionnaire. The questionnaire of the present study is scholar-made and most of its questions are omitted since they

are irrelevant to the condition of Iran. This paper was carried out 2021 in the Iranian Stock Exchange, private and state-owned banks section. The scholar-made questionnaire concerns COVID-19, electronic banking, and information technology factors (cloud computing, investment in IT, etc.). In this section, the respondents face two types of questions. By answering the initial part of the questions, we can determine whether or not the factor currently exists in Iranian banks regarding the professional experience of the respondent and the answer to the second part expresses the amount of significance (extremely high, high, average, low, extremely low) of the factor from the respondent's viewpoint. The reliability of the questionnaire is assessed based on the opinion of the opinion leaders and the validity of that is determined based on the Cronbach's Alpha.

3.2 Research sample and population

The study's statistical population includes all managers, executives, staff, and customers of Iranian state-owned and private banks.

3.3. Research model

3.3.1 Conceptual model of the first hypothesis: COVID-19 affects bank profitability

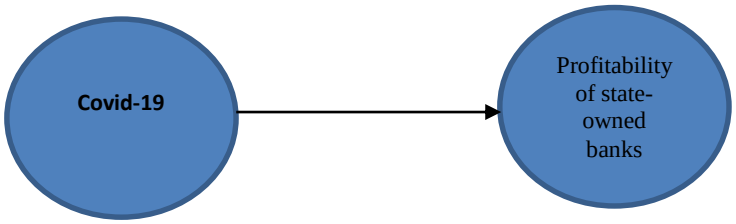

Figure 1. The general model of the first hypothesis on state-owned banks

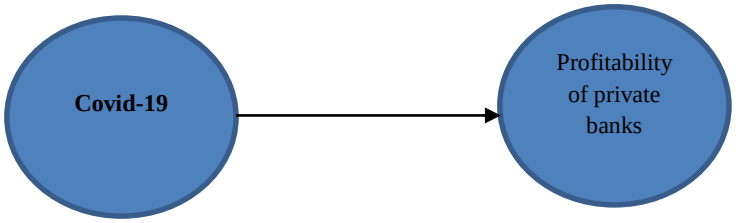

Figure 2. The general model of the first hypothesis on private banks

3.3.2 Conceptual model of the second hypothesis: COVID-19 affects the performance of bank employees.

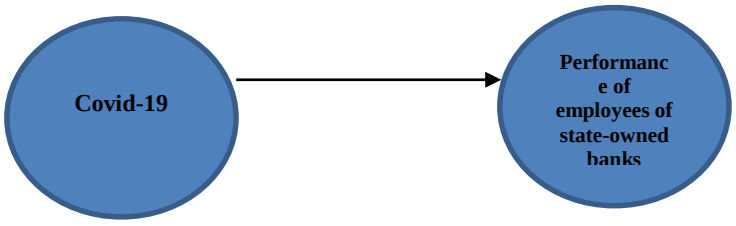

Figure 3. The general model of the second hypothesis on state-owned banks

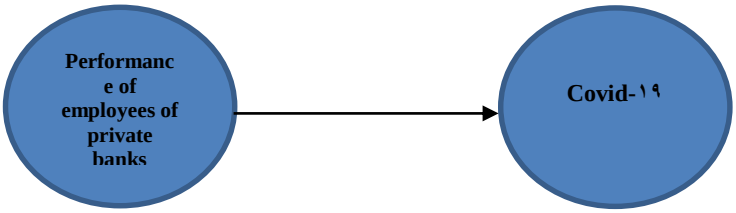

Figure 4. The general model of the second hypothesis on private banks

The scholar-made questionnaire examines Corona and standard questionnaires to assess profitability and employees' performance.

4. Data Analysis

4.1 Statistical population status based on gender

Given the data analysis of the statistical sample under study, 205 participants (59%) are male and 141 (41%) are female. The highest frequency is for men (Table 1)

Table 1. The frequency distribution of gender status of respondents

Gender		Frequency	Frequency percentage	cumulative frequency
Respondent	Male	439	81.3	81.3
	Female	65	12.0	93.3
	No answer	36	6.7	100
	Total	540	100%	100%

As shown in Table 1, 439 respondents (81.3%) are male and 65 respondents (12%) are female, and 36 did not answer.

4.2 Statistical sample status based on respondents' age

The obtained information from the frequency of subjects' questionnaire based on the respondents' age is presented in the following Table and diagram.

Table 2. The frequency of distribution of respondents' age

Age		Frequency	Frequency percentage	cumulative frequency
Respondent	26-30	34	6.3	6.3
	31-35	108	20	26.3
	More than 35	385	71.3	97.6
	No answer	13	2.4	100
	Total	540	100%	100%

Given the data analysis among the statistical sample under study, 34 participants (6.3%) aged between 26 and 30, 108 participants (20%) aged between 31 and 35, 385 participants (71.3%) aged more than 35 and 13 participants did not answer. The highest frequency is for ages over 35 (Table 2).

4.3 Statistical sample status based on the education level

The obtained information from the frequency of subjects' questionnaires based on the education level is presented in the following Table and diagram.

Table 3. The frequency of distribution of education level

Education		Frequency	Frequency percentage	cumulative frequency
Respondent	Diploma and lower	15	2.8	2.8
	Associate Degree	28	5.2	8
	Bachelor's	211	39.1	47.1
	Master's degree and higher	250	46.2	93.3
	No answer	36	6.7	100
	Total	540	100%	100%

Given the data analysis among the statistical sample under study, 15 participants (2.8%) have a high school diploma or lower degree, 28 participants (5.2%) have an associate degree, 211 participants (39.1%) bachelor's degree, 250 participants (46.2) master's degree and higher, and 36 participants did not answer. The highest frequency is for a master's degree or higher.

4.4 Statistical sample status based on the field of study

The obtained information from the frequency of subjects' questionnaires based on the field of study is presented in the following Table.

Table 4. The frequency of distribution of the field of study

Field of Study		Frequency	Frequency percentage	cumulative frequency
Respondent	Accounting and auditing	154	28.5	28.5
	Economy	12	2.2	30.7
	Financial Management	97	18.0	48.7
	Other disciplines	227	42.0	90.7
	No answer	50	9.3	100
	Total	540	100%	100%

Given the data analysis among the statistical sample under study, 154 participants (28.5%) in accounting and auditing, 12 participants (2.2%) in economics, 97 participants (18.0%) in financial management, and 227 participants (42.0%) in other disciplines.

4.5 Statistical sample status based on the work experience of respondents

The obtained information from the frequency of subjects' questionnaire based on the work experience of respondents is presented in the following Table and diagram.

Table 5. The frequency of distribution of the work experience of respondents

Work experience		Frequency	Frequency percentage	cumulative frequency
Respondent	Less than 5	15	2.8	2.8
	6-10	16	3	5.8
	11-15	56	10.4	16.2
	More than 15	417	77.2	93.4
	No answer	36	6.6	100
	Total	346	100%	100%

Given the data analysis among the statistical sample under study, 15 participants (2.8%) were five years and lower, 16 participants (0.3%) were between 6 and 10 years, 56 participants (10.4%) between 11 and 15, 417 participants (77.2%) more than 15 years and 36 participants did not answer. The highest frequency is for work experience of more than 15 years (Table 5).

4.6 Statistical sample status based on the job position of respondents

The obtained information from the frequency of subjects' questionnaire based on the job position of respondents is presented in the following Table.

Table 6. The frequency of distribution of the job position of respondents

Work experience		Frequency	Frequency percentage	cumulative frequency
Respondent	Senior Manager	6	1.1	1.1
	Mid-level manager	18	3.3	4.4
	operational manager	72	13.4	17.8
	Employee	103	19.1	36.9
	Customer	341	63.1	100
	Total	346	100%	100%

Given the data analysis among the statistical sample under study, 6 participants (1.1%) were senior managers, 18 participants (3.3%) were middle managers, 72 participants (13.4%) were operational managers, 103 participants (19.1%) employees, and 341 (63.1%) have jot title of customer.

4.7 Reliability and validity in PLS

4.7.1 Cronbach's Alpha

Internal consistency shows the amount of correlation between a structure and its related indicators. The Cronbach's Alpha value higher than 0.7 is indicative of acceptable reliability.

Table 7. The Cronbach's Alpha value for state-owned banks

Row	Measurement Model	Amount
1	Profitability of state-owned banks	0.868
1	Covid-19	0.844

Table 8. The Cronbach's Alpha value for private banks

Row	Measurement Model	Amount
1	Profitability of private banks	0.823
2	Covid-19	0.731

Table 9. The Cronbach's Alpha value for state-owned banks

Row	Measurement Model	Amount
1	Performance of employees of state-owned banks	0.749
2	Covid-19	0.873

Table 10. The Cronbach's Alpha value for private banks

Row	Measurement Model	Amount
1	Performance of employees of private banks	0.862
2	Covid-19	0.868

Given the above Tables, they have Cronbach's Alpha values of more than 0.7 and are acceptable.

4.7.2 Combined reliability (CR)

If the CR value for each structure is more than 0.7, internal sustainability would be appropriate for measurement models.

Table 11. The combined reliability values of state-owned banks

Row	Measurement Model	Amount
1	Profitability of state-owned banks	0.935
2	Covid-19	0.866

Table 12. The combined reliability values of private banks

Row	Measurement Model	Amount
1	Profitability of private banks	0.895
2	Covid-19	0.733

Table 13. The combined reliability values of state-owned banks

Row	Measurement Model	Amount
1	Performance of employees of state-owned banks	0.825
2	Covid-19	0.903

Table 14. The combined reliability values of private banks

Row	Measurement Model	Amount
1	Performance of employees of private banks	0.863
2	Covid-19	0.873

According to the above Tables, the combined reliability value of the state-owned and private banks variables is more than 0.7, indicative of appropriate reliability.

4.7.3 Examining the coefficients of factor loads

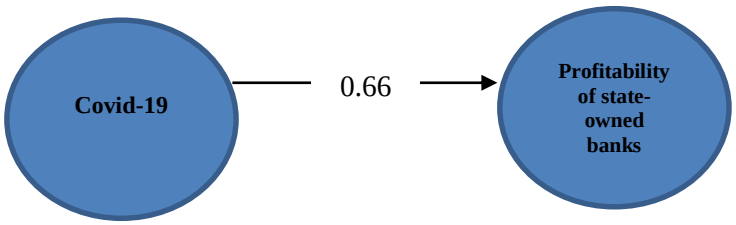

Figure 5. The standardized coefficients of factor load about the probability of state-owned banks

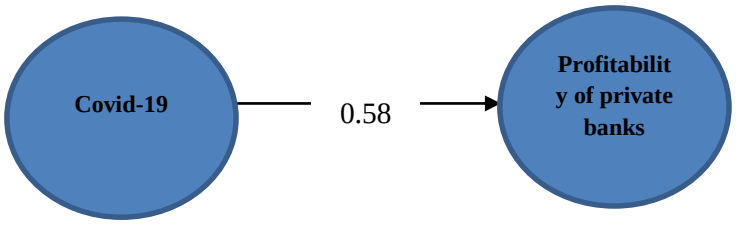

Figure 6. The standardized coefficients of factor load about the probability of private banks

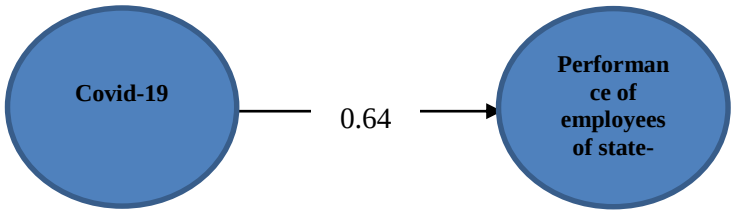

Figure 7. The standardized coefficients of factor load about the staff performance of state-owned banks

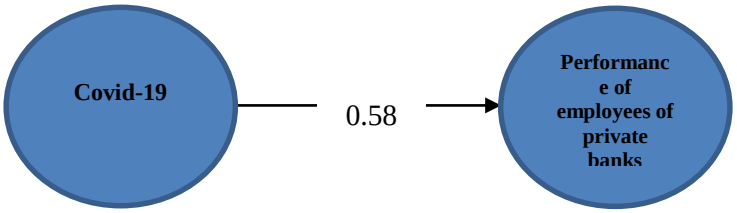

Figure 8. The standardized coefficients of factor load about the staff performance of private banks

According to the above Figures, it is clear that the high factor value of the first hypothesis for state-owned and private banks is higher than 0.4, indicating this criterion's appropriateness.

4.7.4 Convergent validity

Table 15. The convergent validity values (AVE) for state-owned banks

Row	Measurement Model	Amount
1	Profitability of state-owned banks	0.678
2	Covid-19	0.573

Table 16. The convergent validity values (AVE) for private banks

Row	Measurement Model	Amount
1	Profitability of private banks	0.541
2	Covid-19	0.501

Table 17. The convergent validity values (AVE) for state-owned banks

Row	Measurement Model	Amount
1	Performance of employees of state-owned banks	0.534
2	Covid-19	0.541

Table 18. The convergent validity values (AVE) for private banks

Row	Measurement Model	Amount
1	Performance of employees of private banks	0.574
2	Covid-19	0.592

Fornell and Larcker consider the appropriate value for AVE to be 0.5 or higher, while the obtained results in the above Tables show that the AVE value for the COVID-19 structure for the profitability of state-owned and private banks is more than 0.5, which is acceptable.

4.7.5 Divergent validity

Divergent validity in PLS is analyzed using the Fornell and Larcker method.

Table 19. The divergent validity measurement matrix using the Fornell and Larcker method for the profitability of state-owned banks

Variables	Profitability of state-owned banks	Covid-19
Profitability of state-owned banks	0.937	0.000
Covid-19	0.706	0.770

Table 20. The divergent validity measurement matrix using the Fornell and Larcker method for the profitability of state-owned banks

Variables	Profitability of private banks	Covid-19
Profitability of private banks	0.813	0.000
Covid-19	0.582	0.732

Table 21. The divergent validity measurement matrix using the Fornell and Larcker method for the staff performance of state-owned banks

Variables	Performance of employees of state-owned banks	Covid-19
Performance of employees of state-owned banks	0.731	0.000
Covid-19	0.644	0.681

Table 22. The divergent validity measurement matrix using the Fornell and Larcker method for the staff performance of private banks

Variables	Performance of employees of private banks	Covid-19
Performance of employees of private banks	0.821	0.000

Table 23. The R^2 values

Variables	R Square
Profitability of state-owned banks	0.268
Profitability of private banks	0.339

The square root matrix's major diameter is the AVE values for profitability structures in state-owned and private banks. As seen in the above Tables, the AVE structure square root value for the profitability of state-owned banks (0.937) is more than the correlation value with COVID-19. As for the COVID-19 structure, the AVE structure square root value is more than the structure correlation value for state-owned profitability. In other words, the divergent validity of the model is at an appropriate limit for the profitability of the state banks. Moreover, the Fornell and Larcker criterion for the profitability of private banks is significant.

4.8 Z coefficients of significance (t-values)

The Z significance coefficient is used to confirm the study's hypothesis at a 0.95 confidence level. The relationship between structures would be correct if that value is more than 1.96.

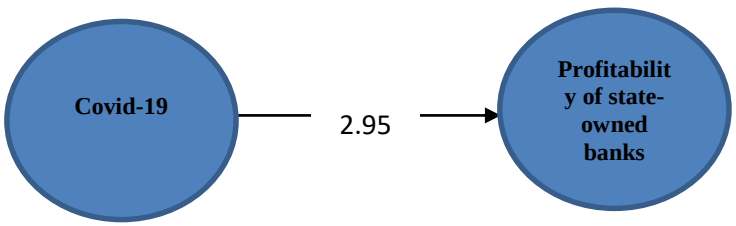

Figure 9. The first hypothesis model, along with z significant coefficients about the profitability of state-owned banks

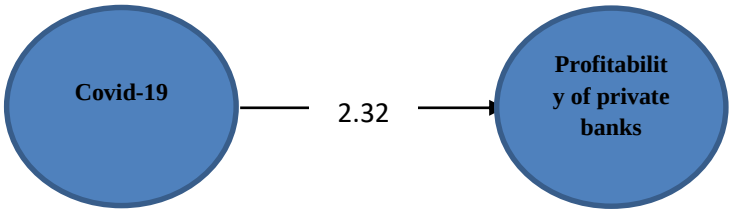

Figure 10. The first hypothesis model, along with z significant coefficients about the profitability of private banks

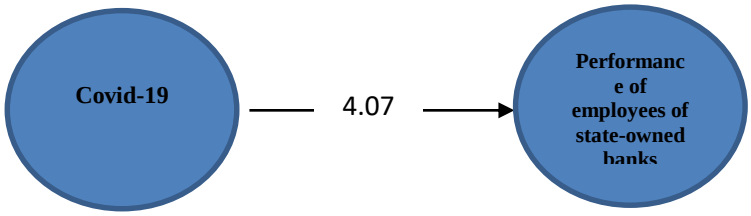

Figure 11. The second hypothesis model, along with z significant coefficients about employees' performance in the state-owned bank

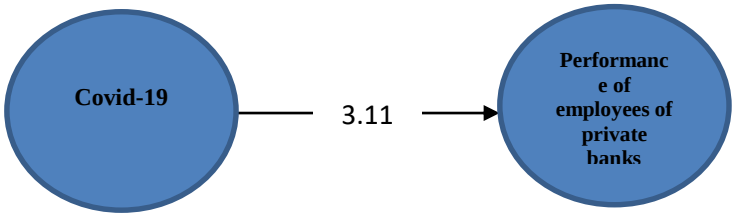

Figure 12. The second hypothesis model, along with z significant coefficients about employees' performance in private banks

As seen from the Figures above, the coefficients for COVID-19 on the profitability of state-owned and private banks have exceeded 1.96, confirming the structural model's fit.

4.9 R2 criteria

The second criterion to be assessed for the structural model fitting within a study is the R^2 coefficients related to the dependent variables of the model. Three values of 0.19, 0.33, and 0.67 are considered the weak, average, and strong thresholds.

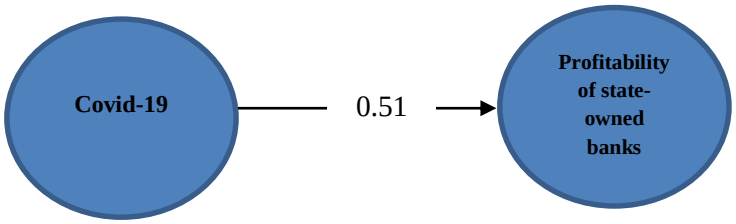

Figure 13. The R^2 value for profitability in state-owned banks

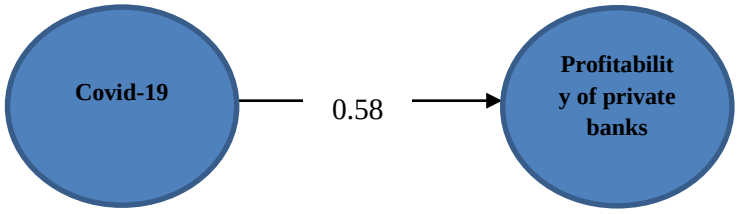

Figure 14. The R^2 value for profitability in private banks

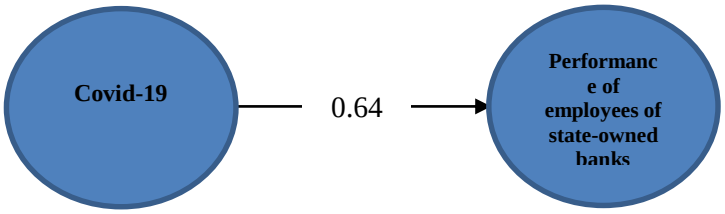

Figure 15. The R^2 value for employees' performance in state-owned banks

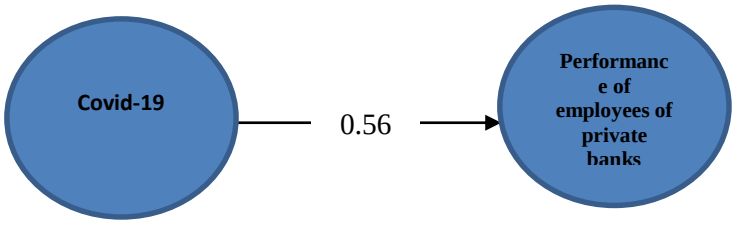

Figure 16. The R^2 value for employees' performance in private banks

Table 24. The R^2 values

Variables	R Square
Performance of employees of state-owned banks	0.415
Performance of employees of private banks	0.321

As can be seen in the above Figure, the R2 value for the structure of profitability in state-owned banks is 0.268 and for private banks 0.339, employees' performance in state-owned banks is 0.415, and 0.321 for employees' performance in private banks given the threshold value, it is an almost average fitting of the structural model for the structure of profitability in state-owned banks and an average value for the structure of profitability in private banks.

4.10 Impact size criterion (F2)

The criterion determines the relationship intensity between model structures and values of 0.02, 0.15, and 0.35 indicate the small, medium, and large size of a structure over another one.

Table 25. The f2 values

f^2	Profitability of state-owned banks	Covid-19
Covid-19	0.366	0.000

As seen in the Table, the amount of impact size is large for the COVID-19 structure for the profitability of state-owned banks (0.336).

Table 26. The f2 values

f^2	Profitability of private banks	Covid-19
Covid-19	0.513	0.000

As seen in the Table, the impact size is large for the COVID-19 structure for the profitability of private banks (0.513).

Table 27. The f2 values

f^2	Performance of employees of state-owned banks	Covid-19
Covid-19	0.710	0.000

As shown in the Table, the impact size is large for the COVID-19 structure for employees' performance in state-owned banks (0.710).

Table 28. The f2 values

f^2	Performance of employees of private banks	Covid-19
Covid-19	0.474	0.000

As seen in the Table, the amount of impact size is large for the COVID-19 structure regarding employees' performance in private banks (0.474).

4.11 Q2 criterion (Stone-Guisser Criterion)

This criterion should be calculated for all endogenous structures of the model and the result should be stated in the model interpretation section. Regarding the intensity of the model's predictive power for endogenous structures, three values are 0.2, 0.15 and 0.35, indicating the structure's weak, medium, and strong predictive power or related exogenous structures, respectively.

Table 29. The Q^2 values

Q^2	SSO	SSE	1-SSE/SSO
Profitability of state-owned banks	97.000	72.451	0.253
Covid-19	776.000	776.000	0.000

Since the Q2 value of the endogenous structure for the profitability of the state-owned banks is 0.253, the prediction power of the model is medium.

Table 30. The Q^2 values

Q^2	SSO	SSE	1-SSE/SSO
Profitability of private banks	495.000	445.032	0.101
Covid-19	792.000	792.000	0.000

Since the Q2 value of the endogenous structure for the profitability of private banks is 0.101, the prediction power of the model is weak.

Table 31. The Q^2 values

Q^2	SSO	SSE	1-SSE/SSO
Performance of employees of state-owned banks	388.000	244.246	0.370
Covid-19	776.000	776.000	0.000

Since the Q2 value of the endogenous structure of employees' performance in state-owned banks is 0.370, the prediction power of the model is strong.

Table 32. The Q2 values

Q^2	SSO	SSE	1-SSE/SSO
Performance of employees of private banks	1683.000	1432.017	0.149
Covid-19	792.000	792.000	0.000

Since the Q2 value of the endogenous structure of employees' performance in private banks is

0.149, the prediction power of the model is medium.

4.12 General model fitting criteria

Moreover, according to Table 16, the mean shared values for the profitability of private banks and COVID-19 are equal to: $\overline{Communality}$= (0.54+0.50)/2= 0.52

The $\overline{R^2}$ value (Table 23) is equal to the profitability of the state-owned banks (0.27) and the use of profitability in private banks is equal to 0.34.

Therefore, the GOF standard value for the profitability of state-owned banks is equal to (0.21) and for using the profitability of private banks is equal to (0.25), which according to the three values of 0.01, 0.25 and 0.36, which are introduced as weak, medium and strong values for GOF and obtaining the value (0.21) for GOF on the effect of COVID 19 on the profitability of state-owned banks proves the approximate average fit of the model. And on the profitability of private banks with the value (0.25), the average fit of the general model is confirmed.

Moreover, according to Table 17, the mean shared values for the employees' performance of private banks and COVID-19 are equal to: $\overline{Communality}$= (0.54+0.60)/2= 0.59

The $\overline{R^2}$ value (Table 24) is equal to the employees' performance of the state-owned banks (0.42) and the use of profitability in private banks is equal to 0.32.

Therefore, the GOF standard value for the employees' performance of state-owned banks is equal to (0.31) and for using the employees' performance of private banks is equal to (0.25), which according to the three values of 0.01, 0.25 and 0.36 which are introduced as weak, medium and strong values for GOF and obtaining the value (0.31) for GOF on the effect of COVID 19 on the employees' performance of state-owned banks proves the approximate average fit of the model. And on the employees' performance of private banks with the value (0.25), the average fit of the general model is confirmed.

4.13 H1 result: COVID-19 affects bank profitability

Table 33. The hypothesis one table for bank profitability

Hypothesis	Standard beta coefficient	T Statistics	P-value	Result
Covid-19 ⟶ Profitability of state-owned banks	0.517	2.951	0.003	Confirm
Covid-19 ⟶ profitability of private banks	0.582	2.320	0.021	Confirm

Based on the results of T and P, the path coefficient of COVID-19 explains the amount (0.517) of changes in profitability of state-owned banks, which is significant; however, the value of T (2.951) is larger than 0.196 and the P-value is less than 0.05, so the COVID-19 hypothesis on the profitability of state-owned banks is confirmed. Also, the path coefficient of COVID-19 explains (0.582) changes in the profitability of private banks, which is significant so that the T-value (2.320) is greater than 1.96 and the P-value is less than 0.05. Accordingly, the first hypothesis of research on the impact of COVID-19 on the profitability of state-owned banks is influential.

4.14. H2 result: COVID-19 affects the performance of bank employees

Table 34. The hypothesis two table for the performance of bank employees

Hypothesis	Standard beta coefficient	T Statistics	P-value	Result
Covid-19 ⟶ Performance of employees of state-owned banks	0.644	4.070	0.000	Confirm
Covid-19 ⟶ Performance of employees of private banks	0.567	3.112	0.004	Confirm

Based on the results of T and P, the path coefficient of COVID-19 explains the amount (0.644) of changes in the performance of bank employees in state-owned banks, which is significant and the T-value (4.070) is larger than 0.196. The P-value is less than 0.05, so the COVID-19 hypothesis on the performance of bank employees in state-owned banks is confirmed. Also, the path coefficient of COVID-19 explains (0.567) changes in the performance of bank employees in private banks, which is significant so that the T-value (3.112) is greater than 1.96 and the P-value is less than 0.05. Accordingly, the second research hypothesis on COVID-19 on the performance of bank employees in state-owned and private banks is influential.

5. Discussion and Conclusion

Overall, this study provides new insight into the impact of the COVID-19 pandemic on the profitability and performance of employees of state-owned and private banks in Iran while also controlling specific and macroeconomic factors that determine a bank's profitability in Iran. The results of the hypothesis testing indicate that COVID-19 had a positive and significant effect on the profitability and performance of subsidiary banks, which was far more effective in state-owned banks than private banks. This is in line with the results of Katusiime (2021), who states that COVID-19 affects the performance of banks and in contrast with Kohlscheen et al. (2018), Damak et al. (2020); Elnahass et al. (2021) and Barua and Barua (2020). Elnahass et al. (2021) stated that the pandemic could adversely affect the banking system in less developed and developing countries. This can be because the factors determining banks' profitability in different countries differ in political and economic conditions. The banking sector in Iran was not doing well before the advent of COVID-19, as it had lower liquidity ratios and poor financial health. Increasing non-performing loans, capital flight from Iran, and aggressive lending methods cause the current liquidity situation in the banking sector, and profitability and financial health are also affected. Liquidity is significant because it can affect a business's most important goal, profitability. In the second quarter of 2020, all liquidity ratios and the financial health of listed banks were severely affected and worsened. The emergence of this pandemic affects not only the banking sector but also the ongoing concerns about uncertainty about the duration of the pandemic and containment measures, as well as the speed of economic recovery and its impact on the performance of banks, the need for monitoring systems and addressing emerging risks is essential to stabilizing the financial sector, maintain profitability, and improve performance (Sande, 2020). But the results of the present study showed that Iranian banks, especially state-owned banks in Iran, could maintain and improve their performance during COVID-19 and increase their profitability these days. This can be due to various factors such as job closures and economic recession due to the disease pandemic. In the days of quarantine, only banks continued to operate. These banks could use new financial technologies and electronic banking to facilitate their customers' affairs.

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RESEARCH ARTICLE

The Effect of Board Independence on the Relationship between Ownership Structure and Corporate Sustainability Performance Disclosure

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Abstract

Sustainability is essential in human societies, and companies play an important role in recognizing and properly implementing corporate sustainability, including social, management and environmental dimensions. Mainly, in different companies, sustainability originates from the decisions of the managers of that organization or members of the board of directors and, in general, the ownership structure. The purpose of this research is to investigate the effect of the ownership structure of companies on corporate sustainability performance disclosure with the moderating role of the independent board of directors. For this purpose, 111 companies listed on the Tehran Stock Exchange from 2016 to 2020 have been used as a case study. In this research, multiple regression based on panel data was used. Examining the hypotheses indicates that the structure of family ownership, major ownership and state ownership is effective on the corporate sustainability performance disclosure in social, governance and environmental dimensions. Also, the results show that the independent board of directors adjusts the relationship between the family ownership structure and major shareholders by disclosing the sustainability performance of the companies in environmental, social and governance dimensions. In case, the independent board of directors had no significant moderating effect on the relationship between state ownership and corporate sustainability performance disclosure.

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1. Introduction

Many changes have been made in recent decades regarding companies' disclosure of non-financial worldwide information. This has caused the formation of many concepts related to economic issues, including environmental, social and human concerns (Manes-Rossi et al., 2018). The challenges in economic, social and human development and its combination with environmental development have raised a new paradigm called sustainability and sustainable development, which emphasizes intergenerational and intragenerational justice and social justice, and environmental protection is one of its principal axes (Azadnia et a., 2017). Thus, Increasing the attention of many interest groups on how companies deal with sustainability issues has created a lot of pressure on companies to adopt sustainability reporting practices and has led companies to disclose their environmental and social performance through non-financial reporting (El-Bassiouny and El-Bassiouny, 2018). Therefore, the disclosure of information related to the activities of companies is one of the demands of the stakeholders (Al Amosh and Mansor, 2021), and the issues related to the disclosure of corporate sustainability in environmental, social and governance dimensions have received the attention of the stakeholders. It will give companies this great opportunity to gain the trust of shareholders and increase legitimacy (Khatib et al., 2021). According to the agency theory, the separation of ownership from management has caused conflicts of interest between managers and owners, which has led to agency problems. Besides, the ownership structure, in terms of internal and external shareholders, has characteristics that can affect the affairs of companies and determine the level of agency problems between shareholders and managers (Barzegar et al., 2016). The ownership structure of the companies, the legislative and economic system of the country, as well as the timely disclosure of information are among the factors that affect the relationship between voluntary disclosure of information and the cost of equity capital (Samaha and Dahawy, 2011). Due to the increase in the quality level of disclosure and transparency in companies, the presence of the government in the ownership structure of companies can be useful for other stakeholders. (Al Amosh and Khatib, 2021). Previous studies have raised issues regarding the relationship between government ownership factors and disclosure, but the issue of its relationship with the quality of sustainability disclosure has not been investigated. Khan et al. (2021) have also stated that the presence of government ownership in companies leads to pressure on the board of directors of those companies to consider sustainability issues, including sustainability in environmental, social, human and governance dimensions. Therefore, it will increase companies' legitimacy from the perspective of society (Khan et al., 2013). They also found that majority ownership enables management to dominate the company's decisions and leads to limit participation in social activities to reduce costs which will negatively affect the disclosure of social responsibility. On the other hand, family ownership helps control management behaviour and reduces the manager's authority (Bansal et al., 2018). Lagasio and Cucari (2019) argue that there are still doubts about the effect of family ownership on corporate sustainability disclosure. Chau and Gray (2010) report that family ownership significantly affects voluntary disclosure practices and helps increase transparency and reduce information asymmetry. Jalila and Devi (2012) and Rees and Rodionova (2015) believe that companies with more family ownership do not have a strong incentive to disclose information which has a negative effect on the disclosure level of companies.

On the other hand, the board of directors' independence is needed to strengthen proper governance in companies, where decisions are made without bias or personal interests. Moreover, independent boards of directors also have an important supervisory role in the performance of companies (Fuzi et al., 2016). In addition, independent boards of directors also limit the negative effect of ownership on disclosure methods, such as family ownership (Chau and Gray, 2010). Therefore, it leads to an

increase in the transparency and trust of the shareholders and guarantees that the demands of the stakeholders are taken into consideration. According to the legitimacy perspective, the board's independence strengthens social responsibility disclosure and increases the company's sustainable activities (Fernández-Gago et al., 2018). Thus, it is expected that independent boards of directors are more willing to meet the demands of shareholders and consider methods and tools that guarantee the company's legitimacy in the environment in which it operates. Theoretical foundations, according to the research by Zaid et al. (2020), indicate that the independence of the board plays an essential moderating role in promoting corporate social responsibility because its positive effect on foreign ownership and government ownership is reflected in companies' disclosure methods. Cucari et al. (2018) have stated that companies with a more independent board structure invest more in sustainability activities and are more involved in corporate sustainability activities. Considering the theoretical foundations presented in this research, the moderating role of the independent board of directors in the relationship between the ownership structure and sustainability disclosure performance is investigated. Therefore, the main questions of the current research are presented as follows: Does the ownership structure affect the disclosure of governance, social, and environmental performance? If there is a relationship between the ownership structure and the disclosure of governance, social and environmental performance, does the independent board of directors play a moderating role or not?

2. Theoretical Foundations

In recent years, most companies globally have provided information related to social and environmental activities to other stakeholders. The management of companies has recognized that stakeholders are not only interested in financial information but also seek social, environmental and ethical information about companies; Therefore, companies try to identify their stakeholders and focus on their sustainability information concerning the needs of these stakeholders (Galbreath, 2012). The ongoing concern about the impact of sustainability performance dimensions on the capacity of the business has encouraged most companies to manage their sustainability level (Adams and Frost, 2008); As a sequence, involving more companies to voluntarily engage in governance, social, ethical and environmental activities and clarify it.

Studies have shown that sustainability performance can positively affect a company's image. This process not only helps to support stakeholders but also these activities can be used as a tool for evaluating companies to assess the possible evaluations of activities that they can face in society and the environment (Rao and Holt, 2005); Thus, companies must pay attention to sustainability activities and clarify it. Companies can raise their corporate image and increase their credibility by informing their stakeholders about the sustainability activities under their supervision. Companies that actively participate in sustainability and report it has competitive advantages because they can gain their stakeholders' trust and goodwill (Kolk and Pinkse, 2010) and have loyalty. There are more brands among customers, which increases customer satisfaction. In addition, such companies can attract and retain talented and privileged employees, and in the same way, it causes employees to work with employers with a good corporate reputation (Adams and Zutshi, 2004).

According to the stakeholder theory, organizations more actively apply sustainability measures to stakeholders who have more influence. This theory predicts that managers engage in sustainability actions to fulfil their spiritual, ethical and social obligations to their stakeholders and strategically achieve the company's goals for their stakeholders. Expanding on traditional stakeholder theory, Jensen (2002) presents intellectual stakeholder theory (enlightened value maximization). This theory suggests that managers should make decisions that include the interests of all company stakeholders. When corporate managers serve stakeholders, there must be a trade-off to reduce conflict between

stakeholders and important areas (Hillman et al., 2009). Freeman's stakeholder theory (1984) and Jensen's intellectual maximization theory (2002) recognize the maximization of sustainable performance and the company's long-term value as a measure to balance the interests of all stakeholders. On the one hand, non-financial sustainability activities cause cooperation between the maximization of shareholders' wealth and the maximization of the welfare of beneficiaries, and on the other hand, it causes conflict between them. Overall, this theory states that sustainability activities and performance through fulfilling social responsibilities, addressing environmental obligations (Clarkson et al., 2011) and improving their reputation (Weber, 2008) increase the value of the company in the long term. However, these sustainability activities may require the allocation of significant resources, which may conflict with the goals of maximizing shareholder wealth, and management may be forced to invest solely in sustainability measures that only lead to long-term financial sustainability.

Legitimacy theory emphasizes that organizations are committed to socially desirable actions. According to the literature, corporate sustainability performance and its disclosure is a way for the organization to increase credibility, efficiency, and legitimacy and increase relations with stakeholders (Rodríguez Bolívar et al.,2015). This is an essential tool to achieve organizational legitimacy that can influence society's expectations and perceptions. Sustainability performance disclosure can be considered a dialogue between the organization and its stakeholders. By sharing their activities with stakeholders, organizations control their legitimacy and demonstrate that they behave appropriately and meet the expectations and needs of stakeholders. However, if organizations cannot show that their activities are compatible with social values, even if they are in accordance with society's expectations, their legitimacy will be threatened (Michelon and Parbonetti, 2012).

Signalling theory helps explain managerial motivations to achieve financial and non-financial dimensions of corporate sustainability performance and investors' reactions to sustainability performance information (Grinblatt and Hwang, 1989). This theory states that companies disclose "good news" through mandatory financial reporting for the financial dimension of their sustainability performance and voluntary reporting for the non-financial dimensions of their sustainability performance to differentiate themselves from companies with lower sustainability performance show distinct Voluntary reports by companies may serve as a supplement to information signals about expected future financial performance. Instead, signalling mechanisms can be replaced by providing a negative relationship between the likelihood of voluntary disclosure and the use of these signals (Grinblatt and Hwang, 1989). This theory encourages business organizations to send a single and aligned signal to achieve financial and non-financial dimensions of corporate sustainability performance to communicate with all stakeholders (including supply chain partners) about synergy, integration and dependence on different management resources (Connelly et al., 2011).

Dealing with corporate social responsibility (CSR) and corporate sustainability (CS) can be described as an overall goal of the organization to align various interests (shareholders and stakeholders) with the long-term interests of society as a whole. Addressing these activities creates value for suppliers, employees, customers and other stakeholders (Thomsen and Conyon, 2012). Participation in sustainability and social responsibility activities can increase organizational competitiveness and create social and economic value in the organisation's operating environment (Porter and Kramer, 2011). In response to increasing pressures for companies to act responsibly, incentives to disclose sustainability information have increased to demonstrate their corporate sustainability involvement. Companies involved in sustainability need to realize that sustainability brings them benefits, not in the short term, but in the long term.

2.1 Literature review and hypothesis development

Alnabsha et al. (2018) showed a significant relationship between the characteristics of the board

of directors and corporate governance, and the overall level of disclosure of the company is effective in the mentioned relationship. Babaei et al. (2021) stated that the financial dimension of companies' sustainability significantly affects the company's value. This effect was positive, and also the non-financial dimension of sustainability has a significant and positive effect on the value has a company and also companies with a higher disclosure score; the effect of the independent variable on the dependent variable is greater, and the effect of those variables on each other is greater with the presence of small and large companies. In research, Lin et al. (2022) studied the relationship between the level of sustainability of companies (environmental, social and human) and their performance with the moderating influence of narcissism and pride. The results of their research generally indicated that corporate governance has a significant and positive effect on the company's performance. Al Amosh and Khatib (2021) believe that ownership by foreign shareholders and government ownership has played an important role in influencing the ownership structure on sustainability performance in governance, environmental and social dimensions. Also, the independent board of directors has significantly and effectively improved the relationship between those two variables. Furthermore, institutional shareholders and governance ownership have had a negative effect on the governance, environmental and social sustainability performance of the sample companies mentioned in the research. Malekian et al. (2019) concluded that the ratio of non-obligatory members, the ratio of ownership of the board of directors, the ratio of the presence of women on the board of directors, as well as the level of stability among the members of the board of directors have a positive effect. It has a level of reporting on environmental, social and corporate governance issues.

2.1.1 State ownership and corporate sustainability performance disclosure

In theory, companies with a large percentage of shares owned by the government are expected to be more motivated to participate in sustainability and social responsibility activities and disclose more information to increase their legitimacy (Garde Sánchez et al., 2017). They argue: the role of the state, representing the interests of society, contributing to social welfare, protect the environment and transparent actions to legitimize. It is to forgive its actions." A report by Rigringsconsult (2016) stated that society owns state-owned enterprises (SOEs), increasing the demand for information about their performance. Even if public companies work in a competitive environment, they can affect society, which means they should promote sustainability practices in relation to their stakeholders (e.g., citizens). Public enterprises should consider not only the collective view of their target society but also the specific opinions and goals of specific stakeholders regarding social responsibility and sustainability issues (Deegan, 2002). According to stakeholder theory, public companies should identify their different stakeholders with different interests. Stakeholders pressure government companies to report information related to social and environmental activities and how these activities affect the environment and society. Government companies and other companies disclose information about the impacts on society and the environment in their reports to achieve or maintain good relations with stakeholders as well as to increase their image and reputation (Amin et al., 2018). However, disclosure of sustainability performance can increase competition. Legitimacy theory points out that SOEs should legitimize their actions to gain public trust, which can lead to SOEs becoming more aware of the demand for information about their sustainability performance. Companies with a higher percentage of shares owned by the government are expected to be under more pressure to accept social responsibility. Therefore, there is a need for responsibility and sustainability for public companies (Garde Sánchez et al., 2017). The institutional theory explains that companies strive to improve organizational mechanisms to increase competitive advantages (DiMaggio and Powell, 1983). According to the published literature, the first hypothesis of the research is stated as follows:

H1: Government ownership has a significant effect on corporate sustainability performance disclosure.

2.1.2 Major shareholders and corporate sustainability performance disclosure

Ownership concentration refers to how shares are distributed among the shareholders of a company; the smaller the number of shareholders, the more concentrated the ownership will be. Zhu and Li (2008) point out that multiple major shareholders in the ownership structure of companies lead to balanced conditions because the presence of multiple major shareholders in the company can effectively limit the ability of the largest shareholder to exercise control over the company and confiscate its resources. Moreover, the presence of several major shareholders can play a huge role in supporting the interests of minority shareholders. In this situation, the level of conservatism in the preparation of financial statements increases in proportion to the increase in the limiting power of other major shareholders (Vaez et al., 2019). Major stakeholders constantly try to influence company decisions by directing managers to engage in a specific program (Al-Janadi et al., 2016). Empirical analysis of major and large shareholders shows that it can act as a stimulus for investing in social responsibility and corporate sustainability performance because previous theoretical foundations have shown two competitive effects. On the one hand, major stakeholders with "block power" may want to maintain their reputation, especially their social reputation, which may create a positive relationship between major stakeholders and sustainability activities (Anderson et al., 2003). On the contrary, block power can be expected to reduce agency problems, and therefore, block and major shareholders are expected to negatively affect investment in corporate sustainability (Ntim and Soobaroyen, 2013). With regard to the above theoretical foundations, the second hypothesis of the research is stated as follows:

H2: Major stakeholders have a significant effect on corporate sustainability performance disclosure.

2.1.3 Family ownership and corporate sustainability performance disclosure

Management and ownership in family firms are controlled by families, which is often associated with an intergenerational view of the firm (Zellweger et al., 2013). On the other hand, the presence of family-owned shares helps to control management behaviour and reduces the authority of the manager (Bansal et al., 2018). Companies provide A sustainability report to reduce information asymmetry between informed managers and uninformed investors (Martínez-Ferrero et al., 2018). Most family firms tend to score higher in values such as altruism, empathy, and zeal (Payne et al., 2011). Previous results showed that family ownership has a negative effect on the performance of social responsibility (Block and Wagner, 2014) and the quality of sustainability reporting (Wang, 2014). After all, greater sensitivity and responsiveness to normative and imitative institutional pressures increase the possibility of family companies participating in corporate social responsibility. Cordeiro et al. (2018) by emphasizing the "long-term horizon" point of view, showed that family firms have higher levels of participation in corporate social responsibility. Lagasio and Cucari (2019) argue that there are still doubts about the effect of family ownership on ESG disclosure. Regarding the proposed theoretical foundations, the third hypothesis of this research is proposed as follows:

H3: Family ownership significantly affects corporate sustainability performance disclosure.

2.1.4 The moderating role of the independent board of directors

Agency theory suggests that an independent board of directors can effectively control and monitor the actions of agents and brokers. In addition, board independence indicates greater clarity and transparency, which increases value in the long term (Jizi et al., 2014). According to the legitimacy perspective, the board's independence stimulates the disclosure of social responsibility and increases

the sustainability of the company's activities (Fernández-Gago et al., 2018). In the framework of stakeholder theory, board independence is expected to be positively related to a higher level of corporate sustainability performance because outside directors are less pressured by stakeholders and directors than inside directors. In addition, being outside the organization leads to investing in accountability to a wider audience and higher marketing costs (Prado-Lorenzo and Garcia-Sanchez, 2010). In addition, independent boards also limit the negative effect of ownership, such as family ownership, on disclosure procedures (Chau and Gray, 2010). Due to a commitment to society, they try to participate in social and environmental activities (Barzegari Khanagha and Jafari Taraji, 2016). On the other hand, the independence of the board of directors plays an important moderating role in promoting the social responsibility of the company because its positive effect on foreign ownership and government ownership is reflected in the disclosure method of companies (Zaid et al., 2020) and also companies with the structure of boards of directors. More independent, they will invest more in sustainability activities and are more involved in corporate sustainability activities (Cucari et al., 2018). Therefore, according to the cases mentioned above, the fourth to sixth hypotheses of the current research is presented as follows:

H4: The moderating role of the independent board of directors is significant in the relationship between state ownership and corporate sustainability performance disclosure.

H5: The moderating role of the independent board of directors is significant in the relationship between major shareholders and the corporate sustainability performance disclosure.

H6: The moderating role of the independent board of directors is significant in the relationship between family ownership and corporate sustainability performance disclosure.

3. Research Methodology

This research is applied in terms of its purpose and is also considered a semi-experimental type of research. This research is descriptive and belongs to post-event research. The logic of this research is analogy induction. Multiple regression was used to analyze the data. In this research, the information and data related to the variables of this research include many items from the audited financial statements and accompanying explanatory notes, as well as from the report of the activities of the board of directors to the general assembly of shareholders for the variable of corporate sustainability performance by referring to the stock exchange organization library. The statistical population of this research includes companies accepted in Tehran Stock Exchange. The research period is 5 years, from 2016 to 2020. In order to select the sample, the following restrictions have been applied:

1) They must be present in the stock market earlier than 2016 to the end of 2020.
2) Except for banks, insurance companies, investment companies and intermediaries.
3) The end of their financial year is the end of March.
4) They have not changed the financial year during the research period.
5) They have not withdrawn from the stock market during this period.

According to the application of the above restrictions, 111 companies have been examined for 5 years (a number of 555 companies). In this research, using panel data and using multiple regression, research hypotheses are tested. The first regression model related to the first, second and third hypotheses of the research is as follows:

$$CSPD_{it} = a_0 + \beta_1 OS_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_3 ROA_{it} + \beta_3 AGE_{it} + Year + Industry + \varepsilon_{it}$$

Also, the second model of the research, in which the fourth, fifth and sixth hypotheses of the research are tested, is as follows:

$$CSPD_{it} = a_0 + \beta_1 BIND_{it} + \beta_2 OS_{it} + \beta_3 OS_{it} * BIND_{it} + \beta_4 SIZE_{it} + \beta_5 LEV_{it} + \beta_6 ROA_{it} + \beta_7 AGE_{it} + Year + Industry + \varepsilon_{it}$$

3.1 Measurment of variables

3.1.1 Dependent variable

Corporate sustainability performance disclosure (CSPD):

To measure the disclosure of environmental, governance and social performance, the research of Al Amosh and Khatib (2021) has been followed with 28 indicators. There are 7 environmental indicators, 13 social indicators and 8 governance indicators. If any case is revealed, the number one will be given; otherwise, zero will be given. The mentioned criteria are presented in Table 1.

Table 1. Corporate sustainability disclosure standards

Criterion type	Indicators
Environmental	Is the way energy consumption is directly and indirectly disclosed in the company?
	Are the amount and intensity of energy disclosed in the company?
	Are energy sources (water, electricity, gas or others) disclosed in the company?
	Is the management of water consumption disclosed in the company?
	Is waste management disclosed in the company?
	Is the environmental management disclosed in the company?
	Is the company's environmental impact disclosed?
Social	Is the payment to CEOs disclosed
	Is the payment to female employees disclosed?
	Is the amount paid to the company's employees disclosed
	Is gender diversity disclosed in the company?
	Is non-discrimination among employees disclosed?
	Is the amount of damage that employees may face disclosed?
	Are child labour activities disclosed in the company?
	Are human rights policies disclosed in the company?
	Is managerial diversity disclosed in the company?
	Are charitable donations disclosed?
	Is the method of selection (qualification) of employees disclosed?
	Is the company's social work disclosed?
	Is the way of paying attention to the health of the employees disclosed?
Governance	Is the separate role of each member of the board of directors disclosed?
	How to vote in companies is disclosed.
	Are incentive payments disclosed in the company?
	Are labour rights disclosed in the company?
	Are business ethics indicators disclosed?
	Are consumer rights protection indicators disclosed?
	Are the money laundering and anti-corruption rules disclosed to the partners?
	Is the tax transparency disclosed in the company?

Finally, the corporate sustainability disclosure score is calculated as follows:

$$CSPD = \frac{\sum ENV + \sum SOC + \sum CG}{28}$$

3.1.2 Independent variable

State ownership (STOWN): In order to calculate the variables of state ownership, the percentage of the company's shares owned by the government or its subsidiaries is used.

Major shareholders (MSHARE): In order to calculate the variable of major shareholders, the total percentage of shareholders who own at least 5% of the company's shares has been used.

Family owned (FOWN): Family ownership is a dummy variable in this research. It is 1 if natural

persons own at least 20% of the company's ordinary shares, or at least one relative or causal member of the family is a member of the board of directors or an executive director and actively works in the board of directors; otherwise, it is 0.

3.1.3 Moderating variable

Independent board of directors (BIND): The board of directors independence is calculated using the ratio of non-obligatory members to all members of the company's board of directors.

3.1.4 Control variable

SIZE: The company's size is equal to the natural logarithm of the company's assets at the end of the period.

Financial Leverage (LEV): Financial leverage is calculated by dividing the book value of liabilities by the book value of the company's assets.

Return On Assets (ROA): return on assets is calculated by dividing the operating profit by the book value of the company's assets.

AGE: The company's age equals the natural logarithm of the number of years of presence on the Tehran Stock Exchange.

4. Research Findings

The results of the descriptive statistics of the research data are presented in Table 2. The final data for analysis was 555 company years, representing 111 companies investigated over 5 years. According to the information obtained from the descriptive statistics of the variables of this research, i.e., the dependent variable of governance, environmental and social disclosure, the largest data value equals 0.887, the lowest value equals 0.153, and the average value of this variable is 0.425, which is less than 50%. It shows the low interest of the companies in the examined sample regarding governance, environmental and social issues. The average amount of government ownership in the sample of the investigated companies equals 0.367, which indicates that more than one-third of the shares of the investigated companies in this research are owned by the government. For the measure of ownership of major shareholders, its maximum and minimum values equal 0.891 and 0.052, respectively, and the average value of major shareholders equals 0.238.

Table 2. The descriptive statistics of research variables

Variables	Number	Minimum	Maximum	Mean	Sd	Skewness	Kurtosis
CSPD	555	0.153	0.887	0.425	0.198	1.133	2.950
STOWN	555	0.169	0.815	0.367	0.143	1.211	2.922
MSHARE	555	0.052	0.891	0.238	0.108	3.416	5.938
FOWN	555	0	1	0.249	0.426	1.163	2.353
BIND	555	0.2	1	0.651	0.125	1.332	3.564
SIZE	555	11.082	19.874	13.954	2.672	-0.244	3.561
LEV	555	0.256	0.943	0.607	0.197	-0.055	2.191
ROA	555	-0.100	0.339	0.103	0.113	0.353	2.642
AGE	555	1.098	3.689	2.171	0.137	1.681	3.341

Regarding the criterion of family ownership, its average value for the sample companies in this research shows that approximately 25% of the companies are run by families. Regarding the independence variable of the board of directors, the average value (0.651) shows that approximately 65% of the board of directors members are independent and non-executive. Multicollinearity between variables was tested using Pearson's pairwise correlation coefficient. If the correlation coefficient between two variables is less than 0.8, the multicollinearity problem is very partial and can be ignored

(Gujarati and Porter, 2009). Since the correlation coefficient for all variables is less than 0.8, it can be stated that there is no multicollinearity problem between the variables. Also, this research used the value of the variance inflation factor (VIF) to investigate the collinearity between the variables. According to Table 3, the VIF value of research variables is less than 4, which shows that there is no collinearity between the variables of this research.

Table 3. Correlation and multicollinearity analysis results for independent variables

Variables	CSPD	STOWN	MSHARE	FOWN	BIND	SIZE	LEV	ROA	AGE
CSPD	1.000								
STOWN	0.696	1.000							
MSHARE	-0.459	-0.026	1.000						
FOWN	-0.347	-0.075	0.554	1.000					
BIND	0.665	0.666	-0.050	-0.119	1.000				
SIZE	0.418	0.234	-0.326	-0.393	0.250	1.000			
LEV	-0.452	-0.591	-0.273	-0.354	-0.109	0.381	1.000		
ROA	0.531	0.372	0.465	0.295	0.624	0.396	-0.482	1.000	
AGE	0.474	0.192	-0.586	-0.586	0.163	0.139	-0.295	0.476	1.000
VIF	-	1.83	1.68	1.25	1.30	1.21	2.01	1.98	1.11

Examining the first research model shows that the Wald statistic is significant for all four regressions, so the regression fits well. According to the results obtained from the regression output in Table 4, the relationship between government ownership in companies and the level of corporate sustainability performance disclosure is significant at the 0.05 level. Therefore, the first hypothesis of the research is confirmed. As can be seen from the regression output and the sign of the variable coefficient of government ownership (0.757), it can be interpreted that with the increase in the government's shareholding in companies, the level of attention of those companies to issues such as environmental, social and governance will increase. Thus, a broader conclusion can be made that with the increase in the government's shareholding in companies, these companies pay less attention to profit and profit issues. Then, they do not refrain from spending on the mentioned issues and the cost of these items is less. In the company under their ownership, they pay attention and give more importance to the common interests. Regarding the second hypothesis of the research, the results show that major shareholders in companies have a significant effect on the level of corporate sustainability performance disclosure. Therefore, the second hypothesis of the research is confirmed. The sign of the variable coefficient of major shareholders (-0.613) shows that with the increase of major shareholders in companies, the level of attention of those companies to issues such as environmental, social and governance will decrease and these companies pay less attention to non-profit issues, so They refuse to pay for the issues above. Also, based on Table 4, the results of the third hypothesis show that the relationship between family ownership in companies and the level of corporate sustainability performance disclosure was significant at the 0.05 level. Therefore, the third hypothesis of the research is confirmed. The sign of the variable coefficient of family ownership (-0.169) indicates that with the increase of family ownership in companies, the level of attention of those companies to issues such as environmental, social and governance will decrease. Therefore, family-owned companies will probably refrain from spending on sustainability measures due to the desire to earn more profit by reducing costs. Also, according to Table 4, the results of these hypotheses have been confirmed in the fourth regression.

Table 4. Regression results of the first research model

$$CSPD_{it} = a_0 + \beta_1 OS_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_3 ROA_{it} + \beta_3 AGE_{it} + \varepsilon_{it}$$

Test	1	2	3	4
STOWN	0.757***			0.683***
	(13.77)			(9.54)
MSHARE		-0.613***		-0.527***
		(-9.38)		(-6.91)
FOWN			-0.169***	-0.136***
			(-8.08)	(-5.98)
SIZE	0.014***	0.013***	0.012***	0.013**
	(5.76)	(5.91)	(4.70)	(2.09)
LEV	-0.203	-0.251	-0.198	-0.679
	(-0.41)	(-1.12)	(-0.98)	(-0.87)
ROA	0.311**	0.421**	0.376**	0.299**
	(2.24)	(2.39)	(2.18)	(2.03)
AGE	0.655***	0.291***	0.551***	0.416***
	(7.36)	(6.750	(6.77)	(5.45)
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Wald chi2	497.91	240.16	280.39	183.78
P-Value(Wald chi2)	0.000	0.000	0.000	0.000
R2	0.787	0.622	0.570	0.617

The first line is the variable coefficient, and the second line (z statistic)
*at 10% significance level, **at 5% significance level and *** at 1% significance level

According to Table 5, the Wald statistic related to the second model for all four regressions is significant at the 0.05 level and has a suitable fit. Based on the results obtained from the fourth hypothesis test of the research, the value of the t statistic (-0.87) is not significant at the 0.05 level for the modifier variable STOWN* BIND. Therefore, it can be concluded that the board of directors' independence does not significantly affect the relationship between state ownership and the disclosure of social, environmental and governance performance. Therefore, the fourth hypothesis of the research is rejected. Examining the fourth hypothesis shows that the modifier variable MSHARE* BIND coefficient is significant at the 0.05 level. As a result, the independent variable of the board of directors significantly affects the relationship between major shareholders and the disclosure of social, environmental and governance performance. Therefore, the fifth hypothesis of the research is also confirmed. The negative sign of this variable shows that the board of directors' independence reduces the negative relationship between the major shareholders and discloses the company's sustainability. On the other hand, the results of the test of the sixth hypothesis of the research, according to Table 5, show that the t-statistic of the FOWN* BIND variable (-3.08) is significant at the 0.05 level. The value of the coefficient of this variable (-0.485) and its sign shows that the board of directors' independence has a negative effect on the relationship between family ownership and corporate sustainability performance disclosure. By confirming the sixth hypothesis of the research, it can be stated that the board of directors' independence reduces the negative effect of family ownership on corporate sustainability performance disclosure. In other words, family-owned companies pay less attention to sustainability measures; as a result, the independent board of directors pressures these companies for more sustainability measures in order to pay more attention to other stakeholders. According to Table 5, the results of these hypotheses are confirmed in the fourth regression for the second model.

Table 5. Regression results of the second research model

$$CSPD_{it} = a_0 + \beta_1 BIND_{it} + \beta_2 OS_{it} + \beta_3 OS_{it} * BIND_{it} + \beta_4 SIZE_{it} + \beta_5 LEV_{it} + \beta_6 ROA_{it} + \beta_7 AGE_{it} + Year + Industry + \varepsilon_{it}$$

Test	1	2	3	4
BIND	0.707***	0.943***	0.980***	0.816***
	(3.12)	(6.74)	(13.51)	(6.52)
STOWN	0.614***			0.567***
	(4.35)			(3.98)
STOWN* BIND	-0.381			-0.324
	(-0.87)			(-1.01)
MSHARE		-0.466***		-0.391**
		(-2.81)		(-2.14)
MSHARE* BIND		-0.511***		-0.497**
		(-2.92)		(-2.23)
FOWN			-0.166**	-0.182**
			(-2.01)	(-1.99)
FOWN* BIND			-0.485***	-0.391**
			(-3.08)	(-2.53)
SIZE	0.110***	0.109***	0.098***	0.101***
	(4.82)	(3.75)	(3.48)	(4.01)
LEV	-0.215*	-0.198*	-0.204	-0.221
	(-1.82)	(-1.91)	(-1.26)	(-1.16)
ROA	0.329***	0.401***	0.389**	0.358***
	(4.80)	(3.98)	(2.39)	(3.57)
AGE	0.609***	0.239**	0.439***	0.531**
	(6.91)	(2.42)	(4.67)	(2.36)
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Wald chi2	207.01	212.48	335.08	249.11
P-Value(Wald chi2)	0.000	0.000	0.000	0.000
R2	0.591	0.579	0.672	0.515

The first line is the variable coefficient, and the second line (z statistic)
*at 10% significance level, **at 5% significance level and *** at 1% significance level

5. Conclusion

This research aims to investigate the effect of ownership structure on corporate sustainability performance disclosure, such as social, environmental and governance measures. Also, this study uses the board of directors' independence to modify the ownership structure and its effect on corporate sustainability performance disclosure. The study results showed that the ownership structure could affect the disclosure of a company's sustainability performance. The presence of the government in the ownership structure of companies can be useful for other stakeholders, and this is due to the increase in the quality level of disclosure and transparency in companies (Al Amosh and Khatib, 2021). The state ownership in companies leads to pressure on the board of directors of those companies to consider corporate sustainability issues (including sustainability in environmental, social and governance dimensions), which will lead to an increase in the legitimacy of companies from the perspective of society (Barzegari Khanagha and Jafari Taraji, 2016). The findings show that major ownership dominates the company's management decisions. In this way, companies are limited to carrying out corporate sustainability measures to reduce costs, which negatively affects major shareholders' performance disclosure. It shows the stability of a company. Furthermore, the presence of family-owned shares helps control management behavior and reduces the manager's discretion (Bansal et al., 2018). Family ownership pursues its goals through internal corporate governance and informal relationships, and the pressure to fulfil their rights increases, and this causes the governance to be exposed to their demands in order to maintain their positions. This dominance directs the

company's strategies towards the interests of family shareholders and no other shareholders (Wang, 2014). Hence, family-owned companies are not inclined to perform social, environmental and managerial actions and do not significantly affect the disclosure of voluntary actions. The findings of this research also show that the members of the independent board of directors seek to transmit information related to the disclosure of the company's sustainability performance in order to prevent conflict of interest and any tension between the stakeholders. In order to create legitimacy through sustainability measures, the independent members of the board of directors should inform companies and management about this and gain the trust of shareholders and society (Malekian et al., 2019). As a result, the independent members of the board of directors impact family ownership and major shareholders in companies, reducing the conflict of interest between them and other shareholders by disclosing sustainability performance and limiting their opportunistic goals (Chau and Gray, 2010). Therefore, according to the research findings, it is suggested that the ownership structure of the companies be diversified to create legitimacy in society by carrying out sustainability measures so that the interests of the companies are aligned with other stakeholders and society. It can also be suggested to the shareholders in companies with a weak ownership structure that with the presence of an independent board of directors in the structure of the company's board of directors, the relationship between the weak ownership structure such as family ownership and major shareholders, is reduced. In contrast, the relationship between that ownership structure and the corporate sustainability performance disclosure increased. We look forward that these findings will have significant implications for regulators, policymakers, shareholders, and investors, and these concepts have helped to develop a theoretical framework for the role of ownership structures in corporate sustainability performance disclosure practices.

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RESEARCH ARTICLE

Financial Analysts Cover which Firms?

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Abstract

This study explores the primary factors influencing the number of analysts following a firm. The research sample comprises 11,459 non-U.S. firms, followed by various unique analysts during 2019 and 2020. The study proposes a straightforward model of analyst following, identifying several firm characteristics likely to affect the aggregate demand or supply of analyst services for a particular firm. A regression model tests the relationship between analyst following and high-technology firms (as proxied by R&D expenses) and firm size. The results reveal that, in the following year, analysts are more inclined to follow firms with a higher volume of R&D expenses and larger size in the current year. The study also uncovers that most control variables regarding firm characteristics significantly affect analyst following. In summary, the empirical results are consistent with economic intuition.

Keywords:
Financial Analysts, Firms' Coverage, R&D, Size

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1. Introduction

Financial analyst coverage is a critical facet of financial markets, attracting significant attention in recent years. The extent of coverage a firm receives from financial analysts can notably impact its financial reporting quality, stock market liquidity, and overall performance. Despite its importance, there has been limited research into the factors determining the number of analysts following a firm.

Financial analysts are crucial in producing and analyzing a firm's information, making their coverage an essential element of the financial market (Bhushan, 1989). Previous studies have shown a positive correlation between the number of financial analysts and a firm's size in time-series earnings-forecasting models (Brown et al., 1978). In addition, the information content of earnings announcements has been explored, revealing a negative relationship with firm size (Atiase, 1985; Freeman, 1987; Bhushan, 1989). This inverse relationship is attributed to the increased private information investors acquire for larger firms due to augmented analyst coverage, which reduces the information's informativeness in the long term. Sell-side financial analysts play a vital role in the financial market by collecting information from various sources, including earnings conference calls, tracking and evaluating the current performance of the firms they follow, making recommendations to investors, and forecasting the future prospects of these firms (Healy and Palepu, 2001). Given that analysts' forecasts and reports primarily focus on earnings and cash flows, it is unsurprising that several studies have documented the relationship between analyst following and financial reporting and operating decisions of managers for pre-impairment earnings and cash flows. This includes research that examines the impact of analyst following on earnings management through discretionary accruals (Chen et al., 2015; Irani and Oesch, 2013; Liu, 2014; Yu, 2008), opportunistic income smoothing (Sun, 2011), accounting conservatism (Sun and Liu, 2011), real earnings management (Chen et al., 2015; Duellman et al., 2013; He and Tian, 2013), and goodwill impairments (Ayres et al., 2019).

Financial analysts provide comprehensive information on the firms they cover, including buy and sell recommendations, insights into the industry, and any current or anticipated legal actions. Companies rely on analysts to sell their securities and increase liquidity (Krigman et al., 2001), while investors use the research reports analysts provide to make informed investment decisions (Madan et al., 2003; Premti et al., 2017). The number of analysts following a firm can be viewed as a proxy for the total expenditure in the economy on analyst services for that firm. The interaction between the aggregate demand and supply of analyst services determines this expenditure. Therefore, the firm's characteristics influencing analyst coverage can be studied by examining the aggregate demand and supply functions for analyst services.

This paper contributes to the existing literature on financial analyst coverage by exploring the significant determinants of the number of analysts following a firm. Using the number of unique analysts who followed 11,459 non-U.S. firms in 2019 and 2020, the paper introduces a straightforward model of analyst following and tests the relationship between various firm characteristics and the number of analysts following a firm. The results prove that high-technology firms (proxied by R&D expenses) and firm size significantly determine analyst coverage. This finding aligns with previous research showing that firms with a higher volume of R&D and larger firms are more likely to be followed by analysts. In addition, the paper provides empirical evidence supporting the relationship between the determinants of analyst coverage and the number of analysts following a firm.

The results of this paper hold critical practical implications for firms and investors. Firms can utilize the insights from this study to comprehend how they can attract more analyst attention and enhance their access to information. Investors can use the results to make more informed investment decisions by identifying firms likely to be followed by a larger number of analysts. In summary, this

paper extends the existing literature on financial analyst coverage by providing evidence on the major determinants of analyst coverage, the relationship between these determinants, and the number of analysts following a firm. The results of this study can assist firms and investors in making more informed decisions and enhance their understanding of the factors that influence analyst coverage.

2. Hypothesis Development

Previous research emphasizes analysts' crucial role in corporate monitoring, acting as intermediaries between a company's management and its investors (Ellul and Panayides, 2018; Lehavy et al., 2011; Frankel et al., 2006; Premti et al., 2017). They assist in disseminating private information from a firm's management to investors and help investors identify investment opportunities by repackaging publicly available information (Roulstone, 2003; Piotroski and Roulstone, 2004; James and Karceski, 2006; Easley et al., 1998). Given this pivotal role, a financial analyst's decision to follow or discontinue coverage of a firm is likely influenced by the information environment in which they operate.

Moreover, the literature has investigated whether systematic differences exist in the accuracy of financial analysts' forecasts. Early studies found no such differences (O'Brien, 1990; Butler and Lang, 1991). However, recent research has adopted alternative methodologies, different time frames, and independent data sources to scrutinize analysts' forecast accuracy heterogeneity. These studies have revealed that various factors, such as analyst experience, ability, the size of the analyst's brokerage house, and the number of firms followed, can influence the accuracy of financial analysts' forecasts (Mikhail et al., 1997; Clement, 1999). Such studies include those by Karamanou (2011), Wilson and Wu (2011), Hribar and Mclnnis (2012), Choi et al. (2014), and Zhou et al. (2017).

Firms with significant R&D expenses possess more information asymmetry between managers and investors and more inherent uncertainty about firm value than other firms. These factors suggest that, in the absence of private information acquisition and processing by information intermediaries, such as analysts, the share prices of high intangible firms would reflect their fundamental values less accurately. The potential for less informative prices indicates opportunities for profitable private information acquisition activities. These activities can yield more profitable investment recommendations and higher trading commissions for analysts. Thus, it is hypothesized that analyst coverage is higher for firms with more R&D expenses.

H1: *Analyst coverage is positively associated with increasing R&D expenses.*

Additionally, the aggregate demand for analyst services is likely an increasing function of firm size. An investor might find private information about larger firms more valuable than that about smaller ones. Analysts have incentives to concentrate on larger firms as they are more widely held and pique the interest of numerous investors, leading to more potential transactions. More information released by a firm may facilitate analysts' tasks by providing valuable, necessary information. Thus, it is assumed that the benefits from information acquisition are likely to increase with firm size, implying that the aggregate demand for analyst services would be higher for larger firms.

H2: *Analyst coverage is positively associated with increasing firm size.*

3. Research Methodology

3.1 Sample and data collection

The data collected included key financial metrics such as the number of analysts and other firm-

specific variables. The data was gathered at the beginning of January 2019 and 2020, offering a comprehensive analysis of the companies' financial performance over two years. Using a random sampling method and collecting financial data from reliable sources, such as Yahoo Finance, ensured the research results were accurate and could support informed decisions about the companies under investigation. To test the hypotheses, the final sample identified several unique analysts that followed 11,459 non-U.S. firms in 2019 and 2020.

3.2 Empirical model

The research method used in this study is multivariate regression analysis. First, the following multivariate regression analysis is the primary model (Equation 1):

$$COVERAGE_{i,t+1} = \alpha_1 + \beta_1 R\&D_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 ROA_{i,t} + \beta_4 PPE_{i,t} + \beta_5 LEV_{i,t} + \beta_6 CAPEX_{i,t} + \beta_7 ROE_{i,t} + \beta_8 COMDIV_{i,t} + \beta_9 LOSS_{i,t} + \beta_{10} CFO_{i,t} + \beta_{11} INTANGIBLE_{i,t} + \beta_{12} INVREC_{i,t} + \beta_{13} CURR_{i,t} + \beta_{14} GOODWILL_{i,t} + e_{i,t}$$

In the above equation, R&D expenses (*R&D*) and firm size (*SIZE*) are the main independent variables to test whether more analysts follow high-technology and larger firms. To achieve this, the impact of several factors that may affect analyst following is controlled based on the findings in the extant literature (e.g., Bhushan, 1989; Chung and Jo, 1996; Lang and Lundholm, 1996; Dechow and Dichev, 2002; Yu 2008; Hong et al., 2014). For example, return on assets (ROA) is controlled as Yu (2008) shows that firm performance and analyst following are positively correlated. The leverage ratio (LEV) is controlled for external financing activity since it impacts analysts' perception of accounting quality and willingness to follow a firm. A dummy variable (LOSS) is considered because a firm with high financial risks is likely to be dropped by analysts.

Fixed effects are often included in econometric models to control for time-invariant variables (e.g., industry, firm) that could affect the outcome of interest. However, there are reasons why researchers may choose not to include fixed effects (FE) in their models. One reason could be the limitation of the sample size. FE requires a large sample size to obtain reliable estimates, as it necessitates that the number of fixed effects is much smaller than the number of observations. In other words, if the number of time-invariant variables is large, the sample size requirement can be prohibitively high, making it difficult to obtain accurate estimates of the parameters of interest. Another reason could be the concern about omitted variables bias. This bias occurs when a variable that affects the outcome of interest is not included in the model, leading to biased estimates of the parameters of interest. When using FE, it is crucial to ensure that all relevant time-invariant variables are included in the model; otherwise, omitted variables bias may persist. Lastly, including or excluding FE depends on the research question and available data. For example, if the research question focuses on the effect of a time-varying variable (e.g., a policy change), then including FE may not be necessary as time-invariant variables are unlikely to affect the outcome of interest (Wooldridge, 2010; Cameron and Trivedi, 2010).

4. Results

Table 1 of Panel A presents the descriptive statistics for all variables used in the analyst following models. The mean (median) number of analysts following a firm (*COVERAGE*) is 8.662 (5), which indicates that, on average, around nine analysts are following one firm. These figures are consistent with the results reported in previous studies such as Luo et al. (2020), Dong et al. (2017), and He et al. (2020).

The mean R&D expenditure (*R&D*) is approximately double the median, suggesting that most of the firms in the sample have higher research and development expenditures. SIZE's mean and median values are close, indicating a similar firm size distribution in the sample. The mean return on assets (*ROA*) is slightly above 0.5%, while the average Property, Plant, and Equipment (*PPE*) and Leverage (*LEV*) are high at 24.5% and 21%, respectively. The current ratio (*CURR*) is 1.946, and for the measure of whether firms report negative earnings (*LOSS*), the difference between the mean (0.118) and median (0) suggests that the majority of the firms in the sample have positive earnings. These figures are comparable with previous studies such as Qian et al. (2019), Ayres et al. (2019), and Mak (2017).

In Panel B of Table 1, the correlation matrix displays the relationships between the variables in the study. The dependent variable, *COVERAGE*, significantly correlates with *SIZE* and all the control variables. This suggests a strong relationship exists between the number of analysts following a firm and its size and other factors.

Panel C presents the results of tests of mean differences in analyst coverage by the type of low (first quartile) and high (fourth quartile) R&D expenses and firm size. The results indicate that analyst coverage significantly increases with increasing R&D expenses and firm size. This supports the first and second hypotheses, which predicted a positive relationship between analyst coverage and R&D expenses and firm size. These findings are consistent with previous research in the field and provide further evidence of the importance of these variables in determining analyst coverage.

Table 1. Summary statistics for analyst following models

Panel A: Descriptive data

Variable	Mean	Std.Dev	Q1	Median	Q3
COVERAGE	8.662	9.092	2	5	12
R&D	0.030	0.053	0.004	0.016	0.035
SIZE	9.667	2.897	7.922	9.586	11.518
ROA	0.006	0.132	-0.050	-0.018	0.029
PPE	0.245	0.170	0.108	0.219	0.347
LEV	0.210	0.153	0.081	0.198	0.316
CAPEX	0.040	0.036	0.016	0.031	0.056
ROE	0.006	0.346	-0.105	-0.034	0.064
COMDIV	0.339	0.454	0.032	0.183	0.459
LOSS	0.118	0.323	0	0	0
CFO	-0.055	0.091	-0.079	-0.041	-0.017
INTANGIBLE	0.150	0.171	0.028	0.078	0.213
INVREC	0.274	0.145	0.163	0.269	0.367
CURR	1.946	1.437	1.145	1.564	2.228
GOODWILL	5.953	2.885	4.018	5.918	7.693

Panel A provides the descriptive statistics for variables used in the empirical analyses. I winsorized continuous variables at the top and bottom one percent. Appendix A provides definitions for all variables.

Panel B: Correlation matrix

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
COVERAGE (1)	1														
R&D (2)	-0.011	1													
SIZE (3)	.347**	-.261**	1												

ROA (4)	-.060**	.278**	-.134**	1											
PPE (5)	.095**	-.236**	.269**	-.067**	1										
LEV (6)	.054**	-.177**	.140**	-0.027	.340**	1									
CAPEX (7)	.122**	-.096**	.117**	.078**	.539**	.140**	1								
ROE (8)	-0.027	.204**	-.065**	.815**	-.048**	-.054**	.081**	1							
COMDIV (9)	.143**	-.112**	.048**	-0.029	.213**	.713**	.050**	-.038*	1						
LOSS (10)	-.133**	.216**	-.170**	.183**	-.045*	.091**	-.059**	.081**	.098**	1					
CFO (11)	-.113**	-0.031	0.029	-.480**	-.119**	0.032	-.273**	-.446**	.056**	.083**	1				
INTANGIBLE (12)	.077**	.127**	-.356**	.054**	-.387**	.088**	-.235**	0.030	.169**	.092**	-.036*	1			
INVREC (13)	-.167**	-.073**	-.039*	-.071**	-.214**	-.097**	-.094**	-.055**	-.150**	-.101**	.111**	-.343**	1		
CURR (14)	-.098**	.127**	-.089**	0.030	-.205**	-.452**	-.116**	0.029	-.281**	-.040*	0.004	-.136**	-0.020	1	
GOODWILL (15)	.379**	-.173**	.736**	-.099**	.037*	.158**	-0.012	-.060**	.129**	-.119**	0.015	.144**	-.180**	-.128**	1

Panel B presents Pearson correlation coefficients for variables included in Equation (1). **, * indicate significance levels of less than 1 and 5 %, respectively.

Panel C: Tests of mean differences

Variable	R&D			SIZE		
	Q1	Q4	Difference (1-4)	Q1	Q4	Difference (1-4)
Coverage	8.56	9.46	-0.901*	4.58	11.27	-6.690**
Observations	975	749		692	1240	

Panel C reports tests of mean differences in analyst coverage by the type of low (first quartile) and high (fourth quartile) R&D expenses and firm size. ** denotes two-tailed statistical significance at 1%, and * at 5%.

Based on the results from Table 2, it can be concluded that analyst coverage is positively associated with increasing R&D expenses and firm size. These findings provide strong evidence that in the next year, analysts are more likely to follow firms with higher levels of R&D expenses and firm size in the current year. Given these results, the following recommendations can be made:

For Hypothesis 1:

- Firms looking to increase analyst coverage could consider increasing their R&D expenses. This investment in research and development could lead to increased attention from financial analysts, providing benefits such as improved financial reporting quality and increased liquidity in the stock market.

For Hypothesis 2:

- Similar to the recommendation for Hypothesis 1, firms seeking to increase analyst coverage

could focus on growing their firm size. This growth could come through mergers, acquisitions, or organic growth initiatives. By increasing the size of their firm, these companies could attract more attention from financial analysts and reap the benefits of increased analyst coverage.

Furthermore, the coefficients on all control variables, except *PPE* and *ROE*, are statistically significant, suggesting that *ROA*, *LEV*, *CAPEX*, *COMDIV*, *LOSS*, *CFO*, *INTANGIBLE*, *INVREC*, *CURR*, and *GOODWILL*, have a significant influence on analyst following, which is consistent with previous studies (Bhushan, 1989; O'Brien and Bhushan, 1990). The R-square for the model is 22.7%. Both the significant estimates on predictor variables and the R-square indicate that the main model captures the variance in analyst following. In addition, the results for variance inflation factors (VIF) tests reveal that none of our continuous independent variables has a VIF value higher than 5, indicating no multicollinearity issue for the regression analysis.

Table 2. Regression results from equation (1) where the dependent variable is the number of following analysts

Variable	Predicted sign	Estimate	T-stat	p-value	VIF
$R\&D_t$	+	18.451	6.184	0.000	1.253
$SIZE_t$	+	1.026	10.035	0.000	4.420
ROA_t	+	-4.842	-2.419	0.016	3.502
PPE_t	?	-1.362	-1.093	0.274	2.268
LEV_t	+	-11.034	-7.439	0.000	2.582
$CAPEX_t$	?	22.579	4.658	0.000	1.519
ROE_t	+	-1.023	-1.433	0.152	3.081
$COMDIV_t$	?	3.807	8.415	0.000	2.128
$LOSS_t$	-	-1.741	-3.705	0.000	1.162
CFO_t	+-	-12.092	-6.386	0.000	1.505
$INTANGIBLE_t$	+	5.578	4.034	0.000	2.801
$INVREC_t$	-	-4.993	-4.176	0.000	1.510
$CURR_t$	?	-0.554	-4.844	0.000	1.360
$GOODWILL_t$	?	0.327	3.469	0.001	3.737
Intercept		-2.117	-1.917	0.055	-
Observations			3236		
F-statistic			67.537***		
R-squared			0.227		

This table reports the results of the following regression model.
$COVERAGE_{i,t+1} = \alpha_1 + \beta_1 R\&D_{i,t} + \beta_2 SIZE_{i,t} + X_{i,t} + e_{i,t}$
The dependent variable is the number of analysts following firm i in year t+1. The leading independent variables to test the hypotheses are $R\&D_{i,t}$, i.e., research and development expenditure divided by the book value of total assets measured at the end of fiscal year t, and $SIZE_{i,t}$, the natural logarithm of the firm's asset book value at the end of fiscal year t. $X_{i,t}$ is a vector of firm-specific variables that are expected to affect $COVERAGE_{i,t+1}$, which includes return on assets (*ROA*), Property, plant & equipment divided by book value of total assets (*PPE*), the book value of debt divided by book value of total assets (*LEV*), Capital expenditure scaled by the book value of total assets (*CAPEX*), Rate of return on common stockholders' equity (*ROE*), Common dividends scaled by stakeholders equity (*COMDIV*), an indicator for earning losses (*LOSS*), Cash flows scaled by the beginning balance of total asset (*CFO*), The ratio of intangible assets to total assets (*INTANGIBLE*), Some of the firm's receivables and inventory divided by its total assets (*INVREC*), Current assets to current liabilities (*CURR*), Goodwill to total assets (*GOODWILL*).

5. Conclusion

This study does provide crucial insights into the factors driving financial analyst following of firms, particularly highlighting the positive relationships between analyst coverage and both R&D expenditure and firm size. Companies with larger sizes and higher R&D investments tend to draw more analyst attention, likely due to the greater information asymmetry surrounding these firms,

which heightens the demand for analyst services. However, this paper's model is indeed a simplified representation of the complex interplay of factors that influence analyst following. Other elements, such as uncertainties, free ridership, and the role of prices in aggregating and transmitting information, are not captured in the current model. These factors are important in an analyst's decision-making process, and their inclusion in future research would undoubtedly deepen our understanding of the economics of analyst following. The study's implications are valuable for various stakeholders. Companies can strategize to boost analyst coverage by investing more in R&D and growing their firm size. Additionally, the findings can aid investors in making more informed decisions by taking into account the level of analyst coverage of a firm.

It is also important to acknowledge the limitations of the study. The sample size comprising 11,459 non-U.S. firms may not fully represent the global corporate landscape. Additionally, the model considers a limited set of variables and overlooks other possible influencers of analyst following, such as the quality of financial reporting, the degree of corporate governance, and the level of industry competition. In sum, this study offers important insights into what drives analyst following of firms, but substantial scope exists for enhancement and further exploration. Future studies should strive to incorporate more variables and utilize more intricate models to comprehend the intricacies of analyst better following.

Appendix. Variable definitions

$COVERAGE_{t+1}$	= The natural logarithm of one plus the number of analysts following firms in the next year.
$R\&D_t$	= Research and development (R&D) expenditure divided by the book value of total assets measured at the end of fiscal year t.
$SIZE_t$	= The natural logarithm of the firm's asset book value at fiscal year t's end.
ROA_t	= Return on assets ratio defined as operating income after depreciation divided by book value of total assets, measured at the end of fiscal year t.
PPE_t	= Property, plant & equipment divided by book value of total assets measured at the end of fiscal year t.
LEV_t	= Firm i's leverage ratio, defined as the book value of debt divided by the book value of total assets measured at the end of fiscal year t.
$CAPEX_t$	= Capital expenditure scaled by the book value of total assets measured at the end of fiscal year t.
ROE_t	= Rate of return on common stockholders' equity at the end of fiscal year t.
$COMDIV_t$	= Common dividends scaled by stakeholders' equity at fiscal year t's end.
$LOSS_t$	= A dummy variable set to one if a firm's earnings per share (EPSFX) is negative and zero otherwise at the end of fiscal year t.
CFO_t	= Cash flows scaled by the beginning balance of total assets at the end of fiscal year t.
$INTANGIBLE_t$	= The ratio of intangible assets to total assets for firm i at the end of fiscal year t.
$INVREC_t$	= Some of the firm's receivables and inventory divided by its total assets at the end of fiscal year t.
$CURR_t$	= Current assets to current liabilities at the end of fiscal year t.
$GOODWILL_t$	= Goodwill to total assets at the end of fiscal year t.

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