International Journal of Finance and Managerial Accounting, Vol.12, No.46, Summer 2027 IJFMA

Ranking of Influential Factors on Financial Distress Criteria Using Structural Equation Modeling

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Submit: 27/09/2024 **Accept:** 18/02/2025

ABSTRACT

The aim of this research is to explain the model of financial distress in companies listed on the Tehran Stock Exchange. In line with the research objective, data was collected from the financial statements of companies listed on the Tehran Stock Exchange during the period 1390 to 1401 (2011–2022). A structural equation modeling approach was used for statistical analysis. For financial distress risk, the adjusted Altman, Fulmer, Springate, and Zmijewski criteria were employed. The results of the study indicate that the rate of return on assets, financial leverage, and accounting conservatism are the top three factors influencing financial distress criteria.

Keywords: financial distress risk, adjusted Altman, accounting conservatism

1. Introduction

One of the constant concerns of financial managers in companies is securing financing. Financial managers often need financing to execute development projects or to fund their daily working capital (Panahi et al., 2014). Additionally, firms and economic enterprises are highly dependent on financial markets to secure their capital. The role of these markets is to provide the necessary capital to companies and institutions. Companies face two sources of financing in their financial decisions: internal and external financing. Internal financial resources include cash flows from operating activities, the sale of assets, and retained earnings. External financial resources encompass funds obtained through financial markets, such as issuing bonds, new shares, or acquiring loans from banks. Managers must decide how to secure the funds they need and how to utilize the available financial resources. These resources can be allocated to pay dividends to shareholders, execute profitable investment projects, repay matured debts, or increase working capital (Frank & Goyal, 2003).

A key aspect that financial managers consider is the methods of financing. On the other hand, companies face limitations and financial distress when attempting to secure funding. The term "financial distress" refers to the presence of obstacles in securing financing for desirable investments. Inability to secure funds for investments may be due to poor credit conditions, inability to obtain loans, inability to issue new shares, or the presence of illiquid assets. However, financial distress is not synonymous with financial pressure, economic pressure, or bankruptcy risk, although these terms are related (Kanani Amiri, 2007). The presence of limitations and financial distress from internal and external financing sources has a varying impact on the sensitivity of investments to cash flows. Various theories have been proposed on this subject in recent years (Karimi & Sadeghi, 2009).

Kaplan and Zingales (1997) and Cleary (1999), using a classification approach, discovered higher levels of cash flow sensitivity in companies that are less likely to face financial distress. Researchers have introduced single-variable models to identify financial distress, such as dividend payout ratios, company age, company size, ownership concentration, and debt ratios. Additionally, several indicators have been introduced to measure financial distress, and criticisms have been raised for each criterion. Klepsch and Elsas (2016) studied four common financial distress indicators and concluded that the KZ, WW, and SA indices correctly identified 88.73%, 84.95%, and 83.65% of companies without financial constraints, respectively. Moreover, the results for companies with financial constraints using the Cleary, WW, and SA indices were lower, with a correct identification rate of around 25%, while the KZ index accurately identified 28.76% of such companies. As a result, these indicators performed relatively well in identifying companies without financial distress but performed poorly in identifying companies with financial distress. They showed that when these four indicators are used to identify companies without financial distress, between 27.11% and 35.16% of companies are incorrectly classified as financially unconstrained. Conversely, when using these four indicators to identify financially constrained companies, errors occurred in 24.71% of cases when using the KZ index and about 75% of cases when using the other three indices. Therefore, Klepsch and Elsas (2016) recommended that researchers exercise caution when using these four indices to identify companies with varying degrees of financial distress.

Theoretical foundations of research

The issue of financial distress and corporate failure has always been a significant and complex challenge for economic enterprises. Due to the importance of this subject, accounting and financial scholars worldwide have sought methods to predict financial distress in companies. Poor financial conditions in a company can lead to losses for various sectors of society, especially investors. While it is difficult to provide a precise definition of the groups involved in financial distress, it is evident that management, investors, creditors, and regulatory bodies are among the first to be impacted by financial distress. Consequently, the prediction of financial distress has gained considerable importance today. Predicting a company's financial status can serve as a valuable guide for investors in making informed decisions. By forecasting financial distress, investors can not only prevent the loss of their capital but also use such predictions as a tool to mitigate the risk of their investment portfolios (Mehrani et al., 2004). Moreover, corporate managers, if made aware of the risk of bankruptcy in a timely manner, can take preventive measures to avoid it. Given that bankruptcy imposes heavy economic and social costs on society, it is a matter of concern from a macroeconomic perspective as well.

Financial distress in companies has always been a primary concern for creditors, investors, and governments. Early detection of companies on the verge of financial distress can help mitigate potential losses for stakeholders (Mashayekhi & Ganji, 2014). Analyzing financial distress has long been a significant topic in finance and economics. Today, companies compete in a dynamic environment where resource shortages, poor management of available resources, and unstable economic conditions contribute to some companies' inability to meet their obligations in a timely manner, leaving them on the verge of being

eliminated from the competition. Thus, several researchers, including Altman (1968), Ohlsan (1980), and Shirata (1995), have developed models for predicting and analyzing financial distress based on companies' financial ratios and other financial statement variables.

The recent financial distress of major international companies has brought the issue of financial distress to the forefront of financial and economic discussions. Therefore, understanding the causes of distress and, more importantly, evaluating financial distress using common models is crucial. Financial distress marks the end of an economic enterprise's operations, which is why it is vital for financial management to understand the factors influencing it. By identifying the signs of financial distress in a timely manner, financial managers can alert company decision-makers and propose strategies to prevent the company's collapse (Jabarzadeh Kangarlouei et al., 2009).

Considering the varied results from previous studies on factors leading to corporate bankruptcy, this research seeks to identify common indicators and provide a comprehensive model. It aims to issue timely warnings to help reporting entities escape financial distress. Most prior studies have used a single criterion to measure financial distress. However, the strength of this research lies in its examination of two different criteria to measure financial distress and analyze the impact of identified factors. This allows for an in-depth analysis of financial distress from different perspectives, including leverage, cash flows, and profitability ratios.

The Iranian market, due to limited resources for investors and managers and the lack of economic growth for companies, has faced challenges in securing financing. Thus, identifying influential variables in the Tehran Stock Exchange to uncover the nature of these constraints and recognize variables to mitigate the impact of financial limitations has become increasingly important. In such an environment, economic growth is lower than in other developed economies, and there is often a shortage of resources for project development. This research aims to identify influential variables by studying theoretical foundations and previous research and develop an independent model for the Iranian capital market using appropriate statistical methods.

Research methodology

Research method

This research is classified as **correlational** in nature and content and appliedin terms of its objectives. The study follows a deductive-inductive reasoning approach, meaning the theoretical foundations and literature review are conducted deductively through library resources, journals, and other credible websites, while data collection for hypothesis testing is done inductively. Furthermore, since the data used in this research are real and historical, the study is classified as ex-post factor.

Data analysis method

For data analysis and hypothesis testing, structural equation modeling (SEM) has been employed. The statistical software SPSS and Smart PLS were used for conducting these analyses.

Structural Equation Modeling (SEM)

SEM is a comprehensive statistical approach used to test hypotheses about the relationships between observed and latent variables. This method allows researchers to test the validity of theoretical models in specific populations using correlational, non-experimental, and experimental data. SEM combines two types of analysis:

1. Measurement Model
2. Structural model

Measurement model examines the relationship between latent and observed variables. Its main application is to evaluate convergent validity, discriminant validity, and composite reliability. The primary output of the measurement model is the factor loading, which was discussed earlier in the convergent validity section.

Structural model examines the relationship between latent variables (endogenous and exogenous) and is mainly used for hypothesis testing. The output of structural models in standard estimation mode is a coefficient or path estimate, which shows the influence of latent variables on one another. In its standardized form, this coefficient is similar to standardized regression coefficients (betas) in regression equations. To confirm or reject the hypotheses in structural models, the T-value or significance level must be evaluated. If these values are greater than 1.96 or less than -1.96, the research hypothesis is confirmed at a 95% confidence level.

Model Fit in Structural Equation Modeling

When the collected data from a statistical sample is considered a representation of reality, the question arises: to what extent do the collected data support the theoretically developed model? This critical question forms the basis of model fit, where the researcher, having made efforts to develop the theoretical model and collect data, expects the data to fit the model according to acceptable scientific criteria.

Although various tests, generally referred to as goodness-of-fit indices, are constantly being compared, developed, and refined, there is no

universal agreement on a single optimal test. As a result, different articles have presented different indices, and even well-known structural equation modeling programs like Smart PLS provide a wide range of fit indices.

Statistical Population and Sample

The statistical population of this research includes all companies listed on the Tehran Stock Exchange. The study period covers the years from 1390 to 1401. A sample of 167 companies was selected from this population based on the following criteria:

Criterion A: The company must have been listed on the Tehran Stock Exchange before 1390 and remain listed until the end of 1401.

Criterion B: To ensure comparability and consistency, the financial year of the companies must end in March.

Criterion C: Financial companies (such as investment and financial intermediaries) were excluded due to the lack of clarity between operational and financial activities.

Criterion D: Companies with incomplete financial data necessary for calculating primary financial variables were excluded.

Criterion E: Companies that experienced suspension or changed their period of operation were excluded.

Research variables

In this study, the dependent variable is the financial distress risk. The criteria used to measure this risk are as follows:

First Criterion: Adjusted Altman Model

Financial distress is defined as the cessation of operations due to liquidation, bankruptcy, operational stoppage, or creditor claims. The adjusted Altman model (1983) is used to measure financial health as follows:

$$0.998\ X_5 + 0.420\ X_4 + 3.107\ X_3 + 0.847\ X_2\ 0.717\ X_1 + = Z'$$

Where:

Z': Overall bankruptcy index

X1: Ratio of working capital to total assets

X2: Ratio of retained earnings to total assets

X3: Ratio of earnings before interest and taxes to total assets

X4: Ratio of the book value of equity to the book value of total liabilities

X5: Ratio of sales to total assets

If the calculated Z' score is less than 1.9, the company is at risk of financial distress; if it is greater than 1.9, the company is not threatened by financial distress.

This model is widely accepted and has been used in similar studies (e.g., Namazi and Ghadirian Arani, 2014; Noorifard and Chenari, 2016). In this study, companies facing financial constraints are coded 1, while others are coded 0.

Second Criterion: Springate Model

This model was first developed by Gordon L.V. Springate at Simon Fraser University. Like Altman, Springate used multiple discriminant analysis to select the best ratios for identifying financially healthy and bankrupt companies.

$$Z = 1.3\ X_1 + 3.07\ X_2 + 0.66\ X_3 + 0.4\ X_4$$

Where:

Z; Overall bankruptcy index

X1: Ratio of working capital to total assets

X2: Ratio of earnings before interest and taxes to total assets

X3: Ratio of earnings before interest and taxes to current liabilities

X4: Ratio of total sales to total assets

According to this model, if the calculated Z score is less than 0.862, the company is considered financially distressed. Similarly, companies facing financial constraints are coded 1, and others 0.

Third Criterion: Fulmer Model

Another researcher who explored bankruptcy prediction using financial ratios was Fulmer (1984). He developed the following model using multivariate analysis:

$$Z = 5.52\ X_1 + 0.212\ X_2 + 0.073\ X_3 + 1.27\ X_4 – 0.12\ X_5 + 2.335\ X_6 + 5.575\ X_7 + 1.082\ X_8 + 0.894\ X_9 – 6.075$$

Where:

Z: Overall bankruptcy index

X1: Ratio of retained earnings to total assets

X2: Ratio of sales to total assets

X3: Ratio of earnings before interest and taxes to equity

X4: Ratio of cash flow to total liabilities

X5: Ratio of total liabilities to total assets

X6: Ratio of current liabilities to total assets

X7: Logarithm of tangible assets

X8: Ratio of working capital to total liabilities

X9: Logarithm of earnings before interest and taxes to interest expense

If the calculated Z score is less than 0, the company is classified as financially distressed and at risk of bankruptcy. Again, companies with financial constraints are coded 1, and others 0.

Fourth Criterion: Zmijewski Model

Zmijewski utilized financial ratios that measure liquidity, performance, and financial leverage to create a model. He employed probit analysis for model development. The Zmijewski bankruptcy prediction model is represented by the following equation:

$$Z = -4.3 – 4.5\ X_1 + 5.7\ X_2 + 0.004\ X_3$$

Where:

Z: Overall bankruptcy index

X1: Ratio of net income to total assets

X2: Ratio of total liabilities to total assets

X3: Ratio of current assets to current liabilities
If the calculated Z score is less than 0, the company is considered financially distressed and classified as bankrupt. In this research, companies with financial constraints are coded 1, and other companies are coded 0.
The independent variables in this study are as follows:
Earnings Management
The modified Jones model is used to calculate accruals, starting with the following equation (7):
Equation (7)

$$TA_{t,i} = \Delta CA_{t,i} - \Delta CL_{t,i} - \Delta CASH_{t,i} + \Delta STD_{t,i} - DEP_{t,i}$$

Where:
TA: Total accruals of company \(i \) in year \(t \)
Delta CA: Change in current assets between year \(t \) and \(t-1 \)
Delta CL: Change in current liabilities
Delta CASH: Change in cash
Delta STD: Change in the current portion of long-term debt
DEP: Depreciation expense
Next, to determine non-discretionary accruals (NDA): the following regression (Equation 8) is used to estimate parameters alpha_1, alpha_2, alpha_3:
Equation(8)

$$TA_{i,t}/A_{i,t-1} = \alpha_1(1/A_{i,t-1}) + \alpha_2[(\Delta REV_{i,t} - \Delta REC)/A_{it,-1}] + \alpha_3(PPE_{it}/A_{i,t}) = +\varepsilon_{it}$$

We have:
TA_{i, t}= Total accruals of company \(i \) in year \(t \)
Delta REV_{i,t} = Change in sales revenue of company \(i \) between year \(t \) and \(t-1 \)
Delta REC= Change in receivables of company \(i \) between year \(t \) and \(t-1 \)
PPE_{it} = Gross property, plant, and equipment of company \(i \) in year \(t \)
A_{it,-1} = Total book value of assets of company \(i \) in year \(t-1 \)
varepsilon_{it} = Unspecified effects of random factors
alpha_1, \alpha_2, \alpha_3 = Estimated parameters for company \(i \)
After calculating the parameters alpha_1, \alpha_2, \alpha_3 using the least squares method, the non-discretionary accruals (NDA) are determined via equation (9) as follows:
Equation (9)

$$NDA_{t,i} = \alpha_1(1/A_{i,t-1}) + \alpha_2[(\Delta REV_{i,t} - \Delta REC)/A_{i,t-1}] + \alpha_3(PPE_{i,t}/A_{i,t-1})$$

And finally, discretionary accruals (DA) are calculated using equation (10) after determining NDA:
Equation (10)

$$DA_{i,t} - (TA_{i,t}/A_{i,t-1}) - NDA_{i,t}$$

Earning management based on real activities
In this research, the normal levels of cash flow from operating activities, discretionary expenses, and production costs were first calculated using the extended model by Dechow et al. (1998), similar to the approach taken in Roychowdhury's study (2006). In the aforementioned research, cash flow from operating activities is defined as a linear function of sales and their changes. To estimate this model, the following cross-sectional regression was applied for the year-company:

$$\frac{CFO_{it}}{A_{it-1}} = K_0 + K_1\left(\frac{1}{A_{it-1}}\right) + K_2\left(\frac{Sale_{it}}{A_{it-1}}\right) + K_3\left(\frac{\Delta Saleit}{Ait-1}\right) + \varepsilon_{it}$$ Equation (11)

Abnormal cash flow from operating activities is equal to the cash flow from operating activities minus the normal level of operating cash flow, which is calculated using the coefficients of model (11). Production costs are defined as the sum of the cost of goods sold and changes in inventory during the year. In this research, the cost of goods sold was considered a linear function of sales for the same period.

Equation (12) $$\frac{COGS_{it}}{A_{it-1}} = K_0 + K_1\left(\frac{1}{A_{it-1}}\right) + K_2\left(\frac{Sale_{it}}{A_{it-1}}\right) + \varepsilon_{it}$$

In this research, the growth of inventory was also considered a linear function of concurrent changes and lagged changes in sales, as described below.

Education (13) $$\frac{\Delta INV_{it}}{A_{it-1}} = K_0 + K_1\left(\frac{1}{A_{it-1}}\right) + K_2\left(\frac{\Delta Sale_{it}}{A_{it-1}}\right) + K_3\left(\frac{\Delta Sale_{it-1}}{A_{it-1}}\right) + \varepsilon_{it}$$

The normal level of production costs was estimated using models (2) and (3) as follows:
Equation (14)

$$\frac{Prod\ Cost_{it}}{A_{it-1}} = K_0 + K_1\left(\frac{1}{A_{it-1}}\right) + K_2\left(\frac{Sale_{it}}{A_{it-1}}\right) + K_3\left(\frac{\Delta Sale_{it}}{A_{it-1}}\right) + K_4\left(\frac{\Delta Sale_{it-1}}{A_{it-1}}\right) + \varepsilon_{it}$$

The normal level of discretionary expenses was also considered a linear function of sales, as shown below:
Equation (15)

$$\frac{Disc\ Exp_{it}}{A_{it-1}} = K_0 + K_1\left(\frac{1}{A_{it-1}}\right) + K_2\left(\frac{Sale_{it-1}}{A_{it-1}}\right) + K_3\left(\frac{\Delta Sale_{it}}{A_{it-1}}\right) + K_4\left(\frac{\Delta Sale_{it-1}}{A_{it-1}}\right) + \varepsilon_{it}$$

In the final step, real earnings management is calculated as follows:

Real earnings management = (Error terms from model 15 × -1) + (Error terms from model 14) + (Error terms from model 11 × -1)

Managerial ability

Demerjian et al. (2012) introduced a measure of managerial ability based on the efficiency of managers in generating revenues, which assesses managerial ability using accounting information. This research uses this approach, with some adjustments, to measure managerial ability. In line with Demerjian et al. (2012), a two-stage linear optimization process was used to estimate managerial ability.

In the first step, overall company efficiency is measured using a data envelopment analysis (DEA) model. Sales revenue is considered as the output, while five other variables—net property, plant, and equipment, intangible assets, cost of goods sold, general, administrative, and selling expenses—are used as the inputs in the DEA model. The following model is run separately for each industry to obtain the efficiency of companies:

Max θ = (Sales) x (v_1CoGS + v_2SG&A + v_3PPE + v_4Intan)$^{-1}$

The efficiency calculated by this model is a numerical value between zero and one. A maximum efficiency of one indicates the highest level of efficiency for a company, and the lower the obtained value, the less efficient the company is within the industry. Demerjian et al. (2012) believe that the calculated efficiency figure encompasses two components: the inherent characteristics of the company and managerial ability.

Thus, in the second step, to control for the influence of the inherent characteristics of the company, they implemented a regression model that separates six specific company characteristics—company size, market share, availability of cash, age of the company in the stock market, operational complexity, and foreign operations—from the overall efficiency figure. Ultimately, the residual value from this model reflects managerial ability.

Firm Efficiency = β_0 + β_1 Size + β_2 Growth Sale + β_3 Free Cash Flow Indicator + β_4 Age + β_5 Foreign Currency Indicator + ε

Corporate Governance

Corporate governance refers to the set of relationships between shareholders, managers, and auditors that ensures a control system aimed at protecting the rights of minority shareholders, implementing proper resolutions of the general meeting, and preventing potential abuses. It is based on principles of accountability and social responsibility and is a set of duties and responsibilities that must be fulfilled by the company's bodies to ensure transparency and accountability.

Board Size: This variable is measured by the number of board members.

CEO Duality: This refers to whether the CEO and the board chairperson are the same individual or two separate people.

Ratio of Non-Executive Directors: Calculated as the ratio of non-executive members to the total number of board members.

Institutional Shareholders: Institutional shareholders are legal entities that act as intermediaries between individuals and companies, creating a stock portfolio on behalf of individuals. This variable is measured as the percentage of shares owned by institutional shareholders relative to total capital stock.

Working Capital

In this research, working capital is calculated using the ratio of the difference between current assets and current liabilities to total sales revenue, based on Mann and John (2015).

Managerial Overconfidence

Managerial behavior is examined from various angles in empirical studies, one of which is overconfidence in investing in assets. Managerial overconfidence is measured using the following model:

Δ Assets $_{it}$ = β_0 + β_1 Δ Sales $_{it}$ + ε $_{it}$

In this model, Delta Assets_{it} represents the changes in the total assets for the current year compared to the previous year, while Delta Sales_{it} indicates the changes in total sales revenue for the current year compared to the previous year. According to the above model, the portion of changes in asset volume that is not influenced by sales levels is reflected in the error terms of the model. Therefore, the measure for detecting the level of overconfidence (or reliability) of managers is based on the magnitude of the error terms obtained from the model estimation. The higher the error values of a model for a company, the greater the level of overconfidence (or reliability) of the managers.

Conservatism in Accounting

For this purpose, the Givoly and Hayn measure is used. The motivation for selecting this model is twofold: a) Existing models for measuring conservatism, including the Basu model—which has been widely used in some domestic and foreign research—encounter significant errors in measuring conservatism. For instance, the Basu model assumes that negative stock returns are indicative of accounting

conservatism, while in the Iranian capital market, negative stock returns are often due to non-accounting information rather than accounting information. b) The Givoly and Hayn model is based on accounting information and does not utilize market indicators. Thus, given the accessibility of financial statement information, this model is more suitable for measuring conservatism embedded in financial statements in developing markets like the Iranian capital market (Bani Mahd et al., 2014).

$$CSCORE_{it} = \frac{AFCC}{TA} \times (-1)$$

CSCORE\(_t\):Conservatism degree; AFCC: Operational accruals (difference between net income and operating cash flow plus depreciation expense); TA: Book value of assets.

Agency Costs

The asset utilization ratio measures how effectively the company's assets are used by managers to generate sales and profits. This ratio serves as an inverse measure of agency costs, meaning that the larger this ratio, the lower the agency costs will be (Henry, 2010; Pourheidari et al., 2012). This ratio is calculated as sales divided by total assets.

Earnings Smoothing

According to the Iglehart index, a company is identified as an earnings smoothener if the coefficient of variation of its earnings is less than the coefficient of variation of its revenues, expressed as follows:

$CY = \frac{CV\,\Delta I}{CV\,\Delta S} < 1$

CVΔI: Coefficient of variation of earnings changes for company \(i \) over the research period

CVΔS: Coefficient of variation of sales changes for company \(i \) over the research period

If \(CY \) is greater than or equal to one, the company has not smoothed its earnings; if \(CY \) is less than one, the company has smoothed its earnings. It is worth noting that the coefficient of variation is measured based on the ratio of the standard deviation of net income or sales for the current period to the average net income or sales of the company during the period under review (Mirdamadi, 2020).

The control variables in the research are as follows:

Company Size

Company size primarily reflects the company's status in terms of profitability, activity level, and value, and is calculated using the natural logarithm of the total book value of assets.

Equation (6)

{LN (Total Book Value of Assets)} = ;Company Size}

Financial Leverage: Represents the company's financial risk and is calculated as the ratio of total debt book value to total asset book value.

Equation(7) Total Assets / Total Debt = Financial Leverage

Sales Growth: Indicates the company's profitability status and is calculated as the difference between this year's sales and last year's sales divided by last year's sales.

Equation (8) Last Year Sales / (Last Year Sales - This Year Sales) = Sales Growth

Return on Asset: Indicates company performance, calculated as the ratio of net income to total assets.

Equation(9) Total Assets / Net Income = Return on Assets

Growth Opportunities: Calculated as the ratio of book value to market value of shareholders' equity.

Descriptive Statistics:

Descriptive statistics for the research variables are presented in Table 1:

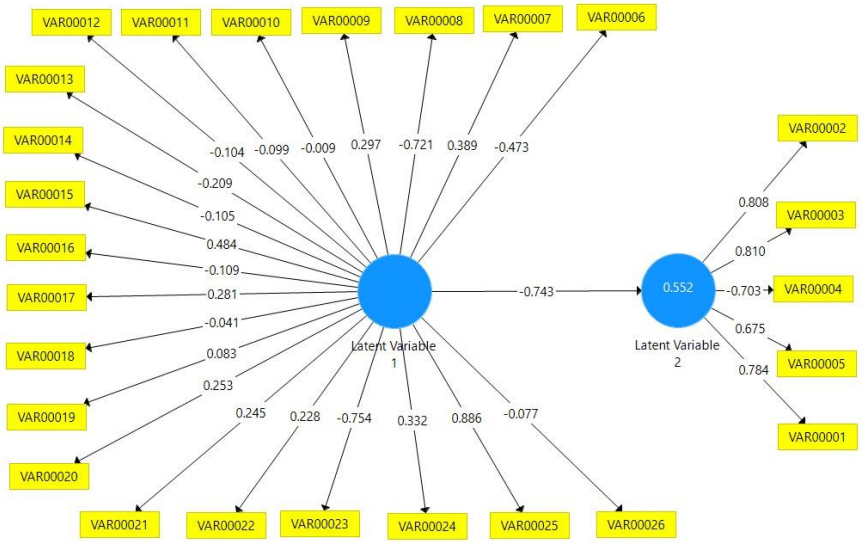
Table 1. Descriptive Statistics of Research Variables

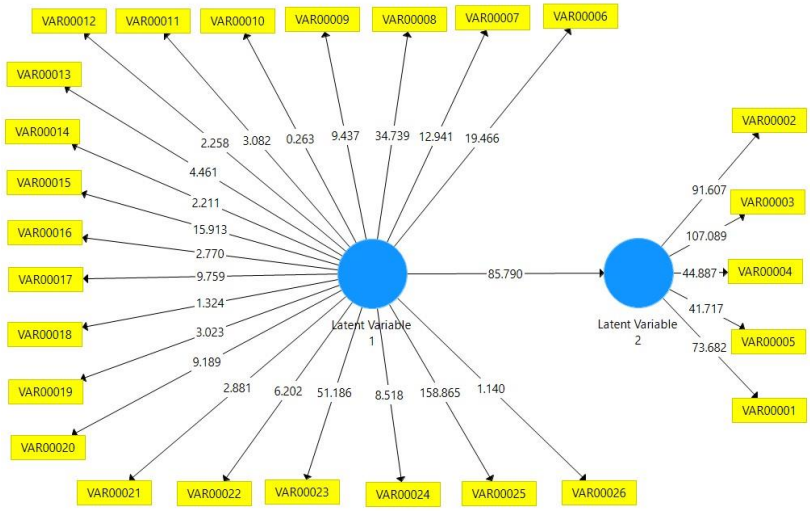
Skewness	Standard deviation	Minimum	Maximum	Median	Mean	Variable name
523298/7	405353/1	012384/0	45151/29	909676/0	213976/1	Quality of earning
839810/0-	147604/0	360426/1-	574270/0	030110/0-	038162/0-	Conservatism in Accounting
411038/2	200198/0	0	1	020736/0	114988/0	Diversification
689797/0-	322603/0	0	999200/0	688300/0	579349/0	Institutional Shareholders
625912/5-	116127/0	396464/2-	05-E38/2-	075383/0-	106412/0-	Accrual Earnings Management (Koutari et al.)
625912/5-	116127/0	396464/2-	05-E38/2-	076253/0-	104705/0-	Accrual Earnings Management (Kaznik)
22042/12-	943902/1	32425/48-	002821/7	109034/0	05-E52/4-	Accrual Earnings Management
382239/0	199219/0	296716/2-	865774/1	013810/0-	05-E48/3	Modified Jones Earnings Management
216816/0-	256948/0	005789/2-	121874/2	005203/0	000124/0	Real Earnings Management
971043/2	669022/0	014012/0	678687/6	803222/0	958489/0	Agency Costs
099526/0-	126031/0	529072/0-	452523/0	004977/0	05-E34/5	Managerial Ability
35844/23	572760/1	34473/11-	85578/54	183496/0	271071/0	Working Capital
730410/0	723815/1	03122/10	32763/21	29083/14	53708/14	Company Size

Skewness	Standard deviation	Minimum	Maximum	Median	Mean	Variable name
492530/0	214547/0	031431/0	077506/2	570688/0	569028/0	Financial Leverage
14708/11	678350/0	909189/0-	16988/18	250110/0	353465/0	Sales Growth
520203/0	149477/0	581141/0-	681977/0	110465/0	134756/0	Return on Assets
076764/1-	426675/0	668458/5-	527819/3	367171/0	436394/0	Book Value to Market Value Ratio

Findings from ranking

Figures 1-4 and 2-4 illustrate the research models related to the research hypotheses. The relationships between latent variables are referred to as path coefficients and are used to test the hypotheses. All coefficients are tested using the t-statistic. This statistic (t-value) is considered significant when it is greater than 1.96 or less than -1.96.





One of the applications of factor analysis is in ranking items. Essentially, there are two approaches for weighting items. The first approach involves using field surveys, where specialists and informed individuals provide opinions, and judgments about indicators and items are based on their views. The second approach employs statistical methods with minimal bias, maximizing the objectivity of measurement. This means determining a set of items, examining their statistical structure, assessing the degree of correlation, and presenting their weights based on observed data.

Assuming X1, X2, X3, ..., p are the items under consideration, the goal of using factor analysis is to find combinations of items to create uncorrelated factors Z1, Z2, Z3, ..., p. Uncorrelatedness means that each factor provides a different explanation of the data. If we want to examine a topic in a population with m items, those items tend to have some correlation with each other. In other words, each item contains part or all of the information present in one or more other items, leading to shared variance among them. Thus, some items may be redundant, which could waste resources for data analysis. Therefore, only items that genuinely distinguish the population should be considered. In this case, we can regard m as a linear function of these items and select the best discriminators among them. If these linear transformations are executed in such a way that the linear functions become uncorrelated, the task simplifies significantly; we can then discard functions that reflect less variance and only consider those that represent greater variance, indicating that they account for a larger percentage of the changes.

The uncorrelated linear functions are referred to as principal components. The linear function Z1 will be the first principal component:

$$Z_1 = \gamma_{11}X_1 + \gamma_{12}X_2 + \cdots + \gamma_{1p}X_p$$

Each linear function in the form of Z1 represents a specific factor or aspect of the items evaluated based on the corresponding variance. The greater the variance of the linear functions, the more important they are, and they are arranged in order of importance as follows:

$$\mathrm{Var}(Z_1) > \mathrm{Var}(Z_2) > \cdots > \mathrm{Var}(Z_P)$$

When decomposing a tool into principal components, a number of components with small variances can be disregarded. In this case, changes in the dataset can be sufficiently explained by a limited number of items or Zi with acceptable variances. In the principal component analysis method, the fundamental principles are: a) finding a linear combination of items that maximizes variance as the first factor, b) finding the second linear combination of items that is orthogonal to the first and explains the most variance from the remaining variance, and so on until the last linear combination. Indeed, the number of items can create a linear combination (factor). The use of principal component analysis is generally aimed at reducing the dimensionality of data and uncovering latent factors among the items. However, based on the characteristics inherent in this type of analysis, the results can also be used to determine item weights and find an appropriate linear combination for ranking subjects based on a measurement scale.

According to the results of confirmatory factor analysis, an indicator with a higher factor loading has greater importance than others. Consequently, the return on assets holds the top rank, while company size ranks last.

Table 2. Ranking of Influential Factors in the Research Model

Ranking	Factor loading	Variables	Description
5	473/0-	Earning smoothing	Influential factors
6	389/0	Quality of earning	
3	721/0-	Conservatism in accounting	
8	297/0	Diversification	
21	009/0-	Duality Of ceo role	
17	099/0-	Institutional Shareholders	
16	104/0-	Accrual Earnings Management (Koutari)	
13	209/0-	Accrual Earnings Management (Kaznik)	
15	105/0-	Accrual Earnings Management	
4	484/0	Modified Jones Earnings Management	
14	109/0-	Real Earnings Management	
9	281/0	Overconfidence of Managers	
20	041/0-	Political Connections	
18	083/0	Agency Costs	

Ranking	Factor loading	Variables	Description
10	253/0	Managerial Ability	
11	245/0	Working Capital	
12	228/0	Company Size	
2	754/0-	Financial Leverage	
7	332/0	Sales Growth	
1	886/0	Return on Assets	
19	077/0-	Book Value to Market Value Ratio	

Conclusion and recommendations

Today, companies compete in a dynamic environment. Resource scarcity on one hand, and management weaknesses in utilizing existing resources on the other, along with the unstable economic conditions of countries, are factors that prevent some companies from fulfilling their commitments in a timely manner, placing them at risk of being eliminated from competition. As a result, many researchers have developed models to assess the financial distress of companies based on financial ratios and other variables in financial statements, to identify the company's situation at various stages of financial distress and to prevent waste of resources or initiate restructuring, allowing them to continue competing and maintain operations.

If, due to incurred losses, at least half of the company's capital is lost, the board of directors is obliged to immediately call an extraordinary general meeting of shareholders to discuss the issue of dissolution or continuation of the company. If the meeting does not vote for the company's dissolution, the company's capital must be reduced to the amount of the existing capital during the same session, in accordance with Article 6 of the law. One method that can assist in effectively utilizing investment opportunities and better resource allocation is the explanation of financial distress or bankruptcy of companies. This involves providing necessary warnings to alert companies about impending financial distress so that they can take appropriate measures based on these alerts. Additionally, investors and creditors can identify suitable investment opportunities and allocate their resources accordingly.

Financial distress poses a serious threat to the economic viability of countries. The individual and societal costs of financial distress make the prediction of such distress a critical issue for many managers, banks, investors, policymakers, and auditors. Forecasting financial distress is particularly important for three groups: managers, creditors, and auditors. Managers, representing shareholders, pursue activities that ensure the continuity and profitability of the company. Creditors wish to evaluate the company's ability to meet its obligations and assess the sustainability of business operations. Auditors must express opinions regarding the continuity of the client's operations and the fairness of the financial information presented in the reports.

Economic conditions in global markets, intense competition, and uncertainty in the business environment can sometimes lead to financial distress. Financial distress, which can sometimes lead to bankruptcy, refers to situations where a company cannot fulfill its obligations to creditors or encounters difficulties in meeting these obligations. Therefore, explaining financial distress plays a vital and increasing role in the economy, as it imposes significant costs on companies, shareholders, creditors, and, at a macro level, the entire economy. The costs of financial distress include lost opportunities due to missed sales, reduced profitability, and loss of market position, which further deteriorate the company's ability to repay debts.

The aim of this research is to explain the model of financial distress in companies listed on the Tehran Stock Exchange. The results indicate that the return on assets, financial leverage, and conservatism in accounting are the top three factors influencing financial distress metrics. Based on these findings, it is recommended that future research be conducted at different stages of the business lifecycle and differentiated by industry.

References

Bony Mahd, Bahman; Moradzadeh, Mahdi; Valikhani, Mohammad Jafar (2014). Accounting conservatism and management rewards, Management Accounting, 7(22), 21-34.

Panahi, Hossein; Asadzadeh, Ahmad; Jalili, Alireza (2014). Five-year financial distress prediction for companies listed on the Tehran Stock Exchange, Financial Research, 16(1), 57-76.

Jabarzadeh, Saeed; Khodayari Ganeh, Saeed; Pour Reza, Akbar (2009). Investigating the relationship between earnings smoothing and financial distress of companies listed on the Tehran Stock Exchange, Financial Accounting Research, 1(2), 60-80.

Karimi, Farzad; Sadeghi, Mohsen (2009). Internal and external financial constraints and their relationship with capital asset investment in

companies listed on the Tehran Stock Exchange, Financial Accounting, 1(4), 43-58.

Khanani Amiri, Mansour (2007). Investigating the relationship between financial constraints and stock returns in the Iranian capital market, Business Strategies, 5(26), 17-31.

Mashaiee, Beita; Ganjizadeh, Hamid Reza (2014). The impact of earnings quality on bankruptcy prediction using artificial neural networks, Financial Accounting and Auditing Research, 6(22), 147-173.

Mehrani, Sasan; Mehrani, Kaveh; Karami, Gholamreza (2004). Using historical financial and non-financial information to differentiate between successful and unsuccessful companies, Accounting and Auditing Reviews, 11(4), 77-92.

Altman, E. I., & Hotchkiss, E. (1993). *Corporate financial distress and bankruptcy* (Vol. 1998, pp. 105-110). New York: John Wiley & Sons.

Altman, E. I. (2013). Predicting financial distress of companies: revisiting the Z-score and ZETA® models. In *Handbook of research methods and applications in empirical finance* (pp. 428-456). Edward Elgar Publishing.

Cleary, S. (1999). The relationship between firm investment and financial status. *The journal of finance*, *54*(2), 673-692.

Dechow, P. M., Sloan, R. G., & Sweeney, A. P. (1995). Detecting earnings management. *Accounting review*, 193-225.

Demerjian, P. R., Lev, B., Lewis, M. F., & McVay, S. E. (2013). Managerial ability and earnings quality. *The accounting review*, *88*(2), 463-498.

Frank, M. Z., & Goyal, V. K. (2003). Testing the pecking order theory of capital structure. *Journal of financial economics*, *67*(2), 217-248.

Givoly, D., & Hayn, C. (2000). The changing time-series properties of earnings, cash flows and accruals: Has financial reporting become more conservative?. *Journal of accounting and economics*, *29*(3), 287-320.

Kaplan, S. N., & Zingales, L. (1995). Do financing constraints explain why investment is correlated with cash flow?.

Roychowdhury, S. (2004). *Management of earnings through the manipulation of real activities that affect cash flow from operations*. University of Rochester.

Schauer, C., Elsas, R., & Breitkopf, N. (2019). A new measure of financial constraints applicable to private and public firms. *Journal of Banking & Finance*, *101*, 270-295.