

# The effect of companies' debt structure and investment on the financial distress of companies admitted to the Tehran stock exchange

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## Abstract

This study aimed to evaluate the effect of companies' debt structure and investment on the financial distress of companies listed on the Tehran Stock Exchange. This applied study was conducted on companies listed on the Tehran Stock Exchange in 2016-2021, 120 of which were selected by screening. The research hypotheses were tested, and the results were analyzed using panel data, generalized least-squares (GLS) regression, and EViews software version 10. Based on the results, the capital structure had a positive and significant effect on the financial distress of listed companies. In addition, there was a significant negative relationship between investment and financial distress.

Keywords: Capital Structure, Financial Distress, Company Investment  
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## 1 Introduction

Modigliani and Miller [10] clarified the initial perception of capital structure through capital structure theory in corporate finance. According to Modigliani and Miller's theory, it does not matter where or how the firm's assets are financed under certain conditions; (for example, in the absence of taxes, bankruptcy costs, and agency costs. Therefore, a company's capital structure and dividend policy do not affect its value. In addition, the company's financial policy, including its debt maturity and investment decisions, are determined independently [4]—nevertheless, companies in the real-world face highly interdependent dynamic investment and financing decisions. Therefore, the agency problems involved in the interactions between management, debt holders, and shareholders, especially agency problems related to the level of debt and its maturity structure, create over- or under-investment incentives. In addition, a company's financial policy, including its debt level and maturity structure, significantly impacts its investment decision [1].

The capital structure includes a combination of financial resources derived from equity and total liabilities of the company to provide the required cash. According to the needs of companies in providing the required funds for carrying out business, investment plans, and cash funds, providing resources and obtaining funds with the lowest financial cost and the most flexibility for the company are of particular importance. Thus, the balance of these funds, called the capital structure, affects the company's value and the continuation of its activities [9].

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Every company buys its required assets to implement this plan at the beginning of its activity while presenting a business plan. Financing for the provision of these assets is conducted in different ways such as common shares or other borrowing methods. After the start of the operation, either the business plan is successful, the repayment of the principal and sub-debts is made on time, and the shareholders also get the expected return from this investment, or the business plan fails, and the outgoing cash flow exceeds the incoming cash flow. The second situation occurs when a company cannot generate enough cash to meet its continuous needs and becomes financially helpless [8]. The balance sheet of a distressed company faces two main difficulties: a lack of cash on the asset side and a large number of obligations on the liability side. In other words, the cash flow does not provide the coverage necessary to fulfill the liabilities during the time of helplessness, and the company suffers a temporary inability to pay the debts. In this case, companies turn to selling assets (investment cash flow) and receiving loans (financing cash flow), which decreases production capacity and performance, as well as increases pyramids [13].

Distress plays an essential role in the economy because it has many costs on the company, shareholders, creditors, and on a macro level on the entire economy. The costs of financial helplessness are the company's lost opportunities in cases such as lost sales, reduced profitability, and loss of market position, which worsens the company's ability to pay debts. High financing costs are other costs of distress. Raising capital through short-term loans in a distressed situation will be expensive and difficult, if not impossible. The managers of a company must therefore take timely measures to determine the company's financial condition and reduce the risks of not being able to pay debts as soon as incapacity occurs [12]. It is possible to do the necessary planning to prevent bankruptcy and prevent the imposition of bankruptcy costs on society by predicting the process and factors affecting the helplessness of companies. The placement of companies in competition has caused unsuccessful companies to leave the field of competition quickly, and other companies have gained a better position to compete and make more profit. Financial resources and financing are necessary for the company to operate in such conditions and meet its needs to survive [3].

From an economic point of view, financial helplessness can be interpreted as the loss of the company, in which case the company has failed. Hence, the company's rate of return is lower than the cost of capital. Another state of financial distress occurs when the company fails to comply with one or more clauses related to debt, such as maintaining the current ratio based on the contract, which is called technical default. Another state of financial distress occurs when the company's cash flows are insufficient to repay the principal and sub-debt when the company's equity value becomes negative [7].

In most of the research on the issue of distress, two completely different concepts of distress, and bankruptcy are considered as synonyms with the same concept. However, these two concepts are other. In most studies in Iran, the criteria for bankruptcy of companies are subject to Article 141 of the Commercial Law. However, the financial distress of companies includes four stages, failure, poor liquidity, malpractice, and bankruptcy [5].

Since financial distress differs from bankruptcy and the stage before it, distressed companies are not necessarily considered bankrupt. When the company is severely distressed, it can still repay the debts on the due date, which is subsequently determined by renegotiation, but in the case of bankruptcy, this ability does not exist, and the company cannot repay the debts. Financial distress does not necessarily lead to bankruptcy, but declaring bankruptcy is one of its consequences, usually the last resort. The bankruptcy of companies can be prevented by identifying and evaluating factors affecting financial distress. Accordingly, factors affecting financial distress should be determined both from the point of view of investment and capital structure [5].

Fatahi et al. [7] evaluated the effect of capital structure [7] on financial distress with the moderating role of the size of companies listed on the Tehran Stock Exchange and stated that variables of financial leverage and short- and long-term debt had a positive and significant effect on financial distress. In addition, the moderating (strengthening) role of company size in the relationship between capital structure and financial distress is accepted in the case of financial leverage (total debt) and long-term debt but not in the case of short-term debt.

Sabouri and Farahani [6] investigated the impact of capital adequacy, capital structure, and liquidity on the financial performance of banks admitted to the Tehran Stock Exchange. The results indicated a positive and significant effect of capital adequacy ratio and capital structure on financial performance. The size of the bank had a negative and significant impact on the bank's return on equity. The age of the bank and the ownership percentage of institutional shareholders did not significantly affect the banks' return on equity. Nik Bakhsh et al. [11] indicated a negative and significant relationship between capital structure and bankruptcy risk, but there was a positive and meaningless relationship between capital structure and bankruptcy risk with the role of the moderator of financial performance.

Yang [16] examined the effect of financial constraints on stock returns on New York Stock Exchange companies from 1985 to 2012 using a structural model for maximizing the company's value. The results showed that the limitation in financing through debt in one year created only three percent of risks. Bhutta et al. [2] stated that real earnings

management increases investment inefficiency and leads to overinvestment by firms, and short-term debt moderates the relationship between real earnings management and investment inefficiency. A higher level of short-term debt weakens the adverse effects of real earnings management on the firm's investment efficiency.

Neuman et al. [12] studied the debt maturity structure and company investment in a financially constrained environment and stated that companies rely more on short-term financing in Pakistan. Given a capital structure characterized by a higher proportion of short-term financing, a higher level of leverage is less likely to create an underinvestment problem. Further, underinvestment is more prevalent in companies with higher levels of long-term debt. The debt spillover problem may persist even in financially constrained environments with limited attractive investment opportunities and tight long-term financing.

Given the mentioned issues, this study aims to evaluate the effect of companies' debt structure and investment on the financial distress of the companies admitted to the Tehran Stock Exchange.

### 1.1 Hypotheses

1. The debt structure significantly affects the financial distress of companies listed on the Tehran Stock Exchange.
2. The companies' investment significantly affects the financial distress of the companies admitted to the Tehran Stock Exchange.

## 2 Method

This applied and descriptive-correlational study was conducted based on a semi-experimental research design and using a post-event approach (through past information).

The collected data were analyzed for correct statistical inference and accurate interpretation. In the analysis stage, the data were tested to compare with each other and external factors, and hypothesis rejection and acceptance were clarified. Considering that mere guesswork does not create certainty, it is necessary to correctly confirm or deny intelligent guesswork using statistical methods and analogical reasoning. The data relating to 120 companies were analyzed in 2016-2021 to test the research hypothesis by examining the relationship between the variables.

The population included all the companies listed on the Tehran Stock Exchange, except for brokerage, financial, insurance, and banks, whose type of activity is fundamentally different from other companies. The inclusion criteria were:

1. Companies that have been present in Tehran Stock Exchange in 2016-2021.
2. The trading symbol of the companies should be active, and the end of their financial year should be March 20.
3. Companies whose book value of equity is not negative.
4. Companies under investigation should not be investment, holding, and intermediary financial companies.
5. The company's financial information should be available during the study period.

Finally, 120 companies were selected as samples and analyzed after applying the above filters.

## 3 Research model

$$FS_{it} = B_0 + B_1Debt_{it} + B_2INVEST_{it} + B_3SIZE_{it} + B_4LEV_{it} + B_5Q_{it} + \varepsilon_{it}$$

in which *FS*: Financial distress

*Debt*: capital structure

*INVEST*: Company Investment

*SIZE*: Company size

*LEV*: financial leverage

*Q*: Tobin's *Q* ratio

## 4 Definition of research variables

### 4.1 Independent variables

1. Capital structure: In this study, the capital structure is measured based on Titman's research [14], which is equal to the sum of short- and long-term liabilities divided by the shareholders' equity.
2. The company's investment is also measured as a ratio (capital expenditure - depreciation) of the company's total fixed assets [12].

$$\text{Investment} = \text{Total assets} \div (\text{capital expenditure} - \text{depreciation})$$

Capital expenditures are obtained from the change in fixed assets between years  $t$  and  $t-1$ .

### 4.2 Dependent variable

Financial distress: The word distress in the Oxford dictionary means pain, sorrow, lack of financial resources, and poverty. Various definitions of financial distress have been presented in the financial literature. Gordon defined financial distress as a decrease in the company's profitability, which increases the probability of being unable to repay the debt's interest and principal. According to Whitaker, financial distress is when the company's cash flows are less than its interest costs on long-term debt [15].

Altman's model is used to assess financial distress, which has better results than other models and the 141 laws of commerce to identify distressed companies. Article 141 of the Trade Law was not chosen because the companies included in this article of the Trade Law cannot be considered bankrupt from a legal, financial, or economic point of view.

Altman's model is as follows:

$$Z = 0.717X_1 + 0.847X_2 + 3.107X_3 + 0.42X_4 + 0.998X_5$$

in which  $Z$  is the total index.

$X_1$ : Ratio of working capital to total assets

$X_2$ : Ratio of profit to total assets

$X_3$ : Ratio of pre-tax profit to total assets

$X_4$ : The ratio of the book value of shares to the total book value of liabilities

$X_5$ : Ratio of sales to total assets

With a lower  $Z$ , the degree of financial distress of the company is higher, so companies with a score higher than 2.9 are classified as healthy companies, and companies with a  $Z$  less than 1.23 are classified as bankrupt companies. Finally, bankrupt companies are represented by the number one, and non-bankrupt companies are represented by the number zero.

### 4.3 Control variables

**Company size:** obtained through the natural logarithm of total company assets.

**Financial leverage:** obtained from the ratio of total liabilities to assets.

**Tobin's Q ratio:** equal to (book value of debt + stock market value) divided by the book value of the company's assets

## 5 Findings

### 5.1 F-Leimer and Hausman's test

In studies with panel data, it is necessary to determine the individual differences or heterogeneity between sections. Limer's F test can be used to specify the heterogeneity among areas. When the null hypothesis is the homogeneity of cells (the appropriateness of the combined model is confirmed), all the data should be combined, and the parameters should be estimated by a classical regression (Table 1). Considering that the significance level of Limer's F test is lower

than the threshold level of 0.05, it is concluded that the panel method is suitable for estimating the research model. After identifying the heterogeneity in cross-sections and individual differences, the panel data method is appropriate for estimation. It should be determined whether the estimation error is caused by changes in cross-sections or has occurred over time. Table 1 shows the Hausman test results, indicating that the random effects panel method is suitable for research.

Table 1: The results of the F-Limer and Hausman test

Description	Statistic value	Significance level	Result	Method	
Model	F-Limer	12.27	0.000	$H_0$ is rejected	combined (panel)
	Hausman	2.09	0.35	$H_0$ is confirmed	Random effects

## 5.2 Classic tests (normality)

Regression models can produce valid results when the assumptions for their use are established. The normality of the dependent variable and the estimation error of the difference between the predicted and actual values is one of these presuppositions. The Jarque-Bera test was used to test the normality of the data. Considering that the significance level of the Jarque-Bera statistic in Table 2 for the error component variable is lower than the 0.05 error level in research models, the null hypothesis that the error component is normal is rejected. When the sample size is large enough, deviations from the normality assumption are usually insignificant, and the consequences are negligible. As a result of the central limit theorem, even if the residuals are not normal, the test statistics have asymptotically no bias and efficiency. Therefore, the normality of the normal distribution can be assumed, and the error component can be ignored.

## 5.3 Durability test of panel data

The data is durable when the mean, variance, and covariance of the research data series are not a function of time. In this research, the durability of the data was examined before estimating the models because the t and F statistics are invalid and skewed in the case of non-durability of the data, and the fitted regression is false. Unit root tests of time series data are invalid in models based on panel data. Therefore, non-durability tests of variables should be used in the form of unit root tests of panel data. Therefore, Levin, Lin, and Chu (LLC), Im-Pesaran-Shin (IPS), and Fisher-Phillips Perron (PP) tests were used to check non-durability as the most basic unit root tests in panel data. However, different methods may provide contradictory results in unit root tests based on panel data. The null hypothesis is based on a single root in all these tests.

Table 2: Panel data unit root test

Variable		Result	Levin, Lin, and Chu (LLC)	Im-Pesaran-Shin (IPS)
Capital Structure	Durable	Statistic value	-8.80	-25.39
		Significance level	0.000	0.005
Investment	Durable	Statistic value	-25.15	-2.24
		Significance level	0.000	0.012
Financial distress	Durable	Statistic value	-19.94	-5.35
		Significance level	0.000	0.008
Financial Leverage	Durable	Statistic value	-19.42	-2.18
		Significance level	0.000	0.014
Company size	Durable	Statistic value	-31.46	-5.91
		Significance level	0.000	0.000
Tobin's Q	Durable	Statistic value	-74.97	-11.64
		Significance level	0.000	0.000

Since the significance level of the test is less than 0.05, the null hypothesis based on the non-significance of the research variables is rejected, and the research variables are significant.

## 5.4 Variance heterogeneity test

Residual homoscedasticity is one of the basic assumptions of a suitable regression model. The White test is used to investigate this assumption in this research. The null hypothesis is residual homoscedasticity, which is accepted

when the probability value is more significant than 0.05. The heteroscedastic test for the model of this research is as follows:

Table 3: Heteroscedastic test

Variable	White statistics	probability	Result
Research model	0.34	0.11	homoscedasticity

According to Table 3, the value of White's statistic for the two research models is more than 0.05. Therefore, the null hypothesis of residual homoscedasticity is accepted, and there is no problem of heteroscedastic between the variables.

### 5.5 Autocorrelation test of residuals

The Durbin-Watson test was used to determine the presence or absence of autocorrelation. Autocorrelation is when the dependent variable behavior is studied in a regression period, and there is the problem of non-independence of errors. Linear regression cannot be used when there is autocorrelation in errors. The Durbin-Watson score is between 0 and 4. When there is no serial correlation between the residuals, the value of this statistic should be close to 2. Approaching zero indicates a positive correlation, and approaching 4 shows a negative correlation. A statistic between 1.5 and 2.5 does not cause concern. The autocorrelation mentioned here is between  $t$  and  $t-1$ , and the lack of autocorrelation means the errors at time  $t$  and  $t-1$ . The hypotheses  $H_0$  and  $H_1$  for this statistical test are as follows:

Table 4: Durbin-Watson statistic

Model	Limits of non-autocorrelation	Durbin-Watson statistic	Result
Measurement of research model error	$2.5 < dw < 1.5$	1.77	Lack of non-autocorrelation

### 5.6 Testing the hypotheses

Table 5: Estimation and testing of research model parameters

$FS_{it} = B_0 + B_1Debt_{it} + B_2INVEST_{it} + B_3SIZE_{it} + B_4LEV_{it} + B_5Q_{it} + \varepsilon_{it}$					
Parameters	Coefficients	t-value	Probability	Result	VIF
Constant	0.38	3.74	0.002	Significant and positive	–
Capital Structure	0.51	5.14	0.000	Significant and positive	1.51
Investment	-0.67	-3.61	0.000	Significant and positive	1.37
Company size	-0.34	-12.61	0.000	Significant and negative	1.18
Tobin's Q	-0.003	0.62	0.53	Insignificant	1.14
Financial Leverage	0.37	3.8	0.0001	Significant and positive	1.58
F-value		537		F-value probability	0.000
coefficient of determination		0.59		The adjusted coefficient of determination	0.58
Durbin-Watson					1.77

In this hypothesis, the coefficient of determination was 0.59, indicating that the independent variables can predict the dependent variable. In addition, the adjusted coefficient of determination was 0.58, which is close to the coefficient of determination, indicating the realness of the data and the appropriate fit of the regression model.

In contrast, Fisher's test has a significance level below 5%, which indicates that the hypothesis is significant.

Variance Increment Factor (VIF) values are an indicator to check the collinearity between independent variables. When the VIF value is higher than 10, there is a possibility of collinearity between independent variables. The amount of this index for variables is less than 10.

The significant level of the t-test for capital structure variables is less than 0.05 at the 95% confidence level. Thus, the capital structure has a positive and significant effect on the company's financial distress, and the movement toward bankruptcy accelerates with the increase in the company's debt.

Improving the company's investment situation could prevent the company's financial distress, and investment has a negative and significant effect on financial distress.

The control variable of company size has a negative and significant effect, and financial leverage positively and significantly impacts the company's financial distress.

## 6 Conclusion and recommendations

The regression model showed that the coefficient of the capital structure variable is 0.51 with a significance level of 0.000. Therefore, the capital structure had a positive and significant effect on the financial distress of companies listed on the Tehran Stock Exchange at the 99% confidence level. Further, Altman's Z score increases with the increase in the capital structure. The results of this study were consistent with the [11] study results.

Investments with an impact factor of 0.67 and a significance level of 0.000 had a negative and significant impact on financial distress. Nouman et al. [12] stated that the financial policies of companies in the modern world and their investment decisions are related to each other because agency problems, related to the level of debt and its maturity structure, create incentives to overinvest or underinvest. The results of this study were in line with those of the present study.

Based on the results, companies should have debt ratios in their financing to avoid financial distress and bankruptcy. Companies should also aim for optimal financial leverage for themselves rather than control them to avoid bankruptcy and a critical situation.

The information presented in the financial statements has not been adjusted because of inflation. Since the business units were established and acquired their assets at different times, the quality of the items can affect the research results, and the generalization of the results is limited.

This study was conducted using the data of companies listed on the Tehran Stock Exchange. Investment, leasing, and insurance companies were excluded from the statistical population due to the specific nature of their activities. Therefore, the obtained results cannot be generalized to all companies.

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