Non-linear Dynamics of Size, Capital Structure and Profitability in Threshold Panel Regression Framework in TSE

Vahid Bekhradi Nasab [1], Ali khoshdel [2]

Abstract

The purpose of this research is to investigate the non-linear effect of size and capital structure of companies on profitability in the framework of threshold panel regression in companies listed on Tehran Stock Exchange. For this purpose, 105 companies from different industries were selected as a statistical sample between 2010 and 2021. Hypotheses testing were analyzed under two scenarios: linear multivariate regression and non-linear multivariate regression (threshold panel regression method). Profitability as a dependent variable, capital structure and company size as independent variables and equity, sales growth and company life as control variables were examined. The results of statistical analysis showed that there is no significant relationship between company size and profitability in a non-linear mode. In the case of a threshold panel, the size of the company is known as the threshold variable and the capital structure is known as the dependent variable of the regime. The threshold value was estimated at 15.89, since the model has a threshold limit, so two different regimes were obtained for the capital structure variable. In both regimes, the relationship between capital structure and non-linear profitability is negative and significant. In this way, in the first regime, the capital structure up to the threshold value of the company's size reduces the profitability, and in the second regime, when the capital structure value exceeds the threshold value, the capital structure has less effect on the profitability and increases the profitability. It reduces less than before. According to the obtained results, the companies that are in the second regime have a more favorable capital structure and profitability than the companies in the first regime.

Keywords

Profitability, capital structure, company size, threshold panel regression.

1. PhD in Accounting, Department of Accounting, Najafabad Branch, Islamic Azad University, Najafabad, Iran. vahid.bekhradinasab@gmail.com
2. PhD in Accounting, Department of Accounting, Tehran Branch, Islamic Azad University, Tehran, Iran.

Introduction

Profit is one of the most important information in economic decisions, and the studies and researches done about profit constitute one of the most voluminous research efforts in the history of accounting. Profit as a guide for paying dividends, a tool for measuring the effectiveness of management, a tool for predicting and evaluating decisions, has always been used by investors, managers and financial analysts. On the other hand, nowadays companies try to maximize the value of the company to attract investors. Increasing income and growth in profit is one of the ways that they consider for this purpose. In Tehran Stock Exchange, companies are trying to encourage investors to invest in Stocks become normal. On the other hand, investors in the capital market are trying to direct their resources to the direction that has the highest return for them (Setaish et al., 2013).

The environment in which companies operate today is a growing and highly competitive environment, and companies have to compete with various factors at the national and international levels and expand their activities through capital in order to survive. Investments are new and companies need financial resources for investment, but financial resources and their use must be determined well so that the company can be profitable. Based on this, many researchers tried to identify the factors affecting the profitability of companies, and in this field, researches on the factors affecting profitability separately, such as capital structure, company size, company life, financial leverage, etc... done.

The issue of capital structure and its optimal combination, in other words, the way to finance the company from different sources, is a topic that was first raised by Modigliani and Miller (1985) and since then many researches such as Abor (2005, 2008) and Ghani et al. (2011) have shown that the capital structure of companies is influenced by the financial and non-financial characteristics of companies. Using the optimal level of debt, minimizing the overall cost of capital helps to increase the profitability of a company. Identifying the most appropriate level of debt in the financial affairs of large companies has been investigated and it has often been shown that debt has a positive, negative or no effect on the profitability of companies (Jaisinqani and Kanjilal, 2017). Knowledge and awareness of the capital structure of companies is important for shareholders and potential investors. For more financing, companies issue shares when the stock market value is high and buy back shares when the stock market value is low. Capital structure is considered as the most important parameter affecting the valuation and direction of economic enterprises in the capital market, which guarantees the continuation of their activity while maintaining and increasing profitability. The issue of capital structure in Iran's companies and economic institutions has become one of the most fundamental issues of the day due to the direction of the government's macroeconomic policies and privatization. The main goal of capital structure decisions is to maximize the company's market value through the appropriate combination of long-term financing sources. This combination is called optimal capital structure. The capital structure of a company shows the relationship between debt and equity. Capital increases flexibility and decision-making power, while debt creates restrictions for managers, but nevertheless, the use of debt in the structure of financial capital increases the expected return of shareholders. This can increase the company's risk. Inappropriate capital structure for any company or especially in the case of small companies affects all areas of the company's activity and can lead to issues such as inefficiency in product marketing, inefficiency and inability to proper use of manpower and similar cases (Rahmani, 2015).

The size of the company also indicates the volume and scope of the company's activity; indicators are often considered as the size that shows the performance of the company. With the increase in the size of the companies and the diversity of their activities, the expectation of financial problems and losses is eliminated to a large extent. As a result, according to investors' assurance of the continuity of activity and profitability of large companies,

investors turn their attention to the profit of each share for the valuation of stocks. Improving profitability will have a positive effect on the value of the company in the future (Pourheidari et al., 2014).

This research seeks to examine the relationship between capital structure and company size on profitability in Tehran Stock Exchange companies. For this purpose, the linear and non-linear effect between the size and capital structure of companies with profitability is discussed. The question of the present research is how capital structure and size affect profitability in a non-linear mode.

Theoretical Foundations and Research Background

Profitability

Profitability refers to the company's ability to earn income and profit. Net income or profit is the only measure of profitability. Investors and creditors are very interested in evaluating the current and future profitability of a company. In order to attract the capital, they need, companies have to earn enough profit to provide a suitable return for investors and creditors. If the companies do not earn enough profit, they will not be able to attract the capital needed to implement all kinds of projects through shareholders or creditors. The durability and survival of a company in the long term depends on its ability to earn money to fulfill all obligations and provide suitable returns for the main shareholders (Shamshiri, 2015).

Capital Structure

Different definitions of capital structure have been presented, each of these definitions express aspects of financial provision methods as capital structure. According to Cooper, the capital structure is the ratio of securities with a higher rating to total investments. Belkoi introduces the capital structure as a general claim on the company's assets (Sajadi et al., 2010). Rajan and Zingales (1995) measured the capital structure as the ratio of total debt to the value of the company according to the purpose of research in studies related to agency issues. Antonio et al. (2002) state the capital structure including a combination of debt and equity that is used as a source of financing for the company. Elsewhere, Dimitrix and Maria (2011) describe the capital structure as a combination of ordinary shares, preferred shares and related subcategories, retained earnings and debt that the business entity uses to finance its assets. do In the complete definition of the capital structure, it is a combination of the company's total liabilities and equity, which is used in order to provide the required cash funds through which the companies finance their assets. give In examining the capital structure of companies, an attempt is made to explain the combination of different financial sources used by them in financing the required activities and investments. The purpose of determining the capital structure is to determine the composition of the financial resources of each company in order to maximize the wealth of its shareholders, because the cost of capital of the company is considered a function of its capital structure. Choosing the optimal capital structure reduces the capital cost of the company and increases its market value (Madras and Abdulzadeh, 2018).

Company Size

The size of the company is another factor that is expected to play an effective role in the company's borrowing power. A company that is considered large in terms of sales volume and amount of assets is also a company that has a high collateralization ability in terms of taking on debt, and it has no problem in terms of the ability to repay the principal and sub-debt due to the high sales. Many studies show a positive relationship between leverage and company size. Marsh (1982) concluded that large companies often choose long-term debt, while small companies use short-term debt. Large companies have more bargaining power against creditors, and therefore the cost of issuing debt and shares is inversely related to the size of the company. Fama and Jensen (1983), argue that large companies are more willing to provide information to creditors. Also, studies by Booth and colleagues (2001) indicate the

existence of a positive correlation between leverage and company size. The size of the company is one of the important factors that determine the profitability and capital structure of the company. The size of the company indicates the volume and extent of the activity of a company, indicators are often considered to show the size of the company, which shows the performance of the company, not its physical capacity. The size of the company in various ways, including the company's sales, daily or book value of the company's total assets, daily or book value of ordinary shares, market or book value of equity, price-to-earnings ratio, ratio of the book value of shares to its market value. The number of personnel or a combination of the mentioned factors is measured (Wahm et al., 2015).

The relationship between Capital Structure and Profitability

One of the most important topics that are of interest to financial economists is to identify the relationship between profitability and financing decisions of companies or capital structure. Financial economics researchers have found that capital structure and profitability are interdependent, but the relationship between them is not the same according to the financial operations of joint stock companies in the international area and depends on the financial structures and economic conditions depending on the type of country. Therefore, according to the type of countries, researchers analyze the relationship between capital structure and profitability, although the results obtained in this regard are different from each other. The basic question of the research can be stated as follows: Is there a meaningful relationship (linear and non-linear) between profitability and capital structure in Tehran Stock Exchange? If there is a significant relationship, in what direction is this relationship (positive or negative)? Several factors, including the nature of the activity, assets and economic conditions ruling the society, can affect the financial provision of companies and consequently their profitability, identifying the results of these economic actions by using analytical methods. Effective and dynamic, it can be a provider of knowledge-based decisions by government men, managers and investors (Sadeghi Shahdani et al., 2011).

The relationship between Company size and Profitability

Company size is one of the most effective factors in the profitability of companies. Some aspects of the direct and indirect effect of size on the profitability of companies are:

1- Larger companies have a variety of activities and number of products compared to smaller companies, and they have better success in terms of marketing and product supply facilities. As a result, large companies can relatively have more sales and profitability than small companies.

2- Larger companies have more credibility in terms of the capital market and compared to small companies, they have better and more access to low-interest foreign currency and can finance in more ways.

3- In large organizations, due to the objectivity of organizational instructions, procedures and methods, specialized units such as budget unit and quality control unit are established officially and independently. In these organizations, order and administrative and organizational controls are established in an appropriate manner and tasks and responsibilities are well divided. In addition to the division of work, the creation of training units also increases the skill and expertise in the departments and human resources, and as a result of these measures, the resources of the organization are used more efficiently, the efficiency and effectiveness of the resources, and the efficiency and quality of the activities. It is improved and saves costs.

4- Bigger companies have more ability to resist the policies of other competing companies and can exert more power of influence in the market and defeat the competitors with their policies.

5- The large size of the business unit often leads to better cost management practices and reduced costs.

6- By investing in large and leading companies, the business risk can be significantly reduced (Farzin-Nia, 2015).

7- Large companies reduce the risk and liquidity of their shares for investors due to having more number of shares and having more free floating shares.

8- Due to political reasons, large companies have more motivation for profit management and thus reduce the risk of profit fluctuation for their shareholders (Bagherzadeh, 2014).

9- Larger companies are more stable in terms of profitability than smaller companies, and the profitability of smaller companies is more subject to market conditions and fluctuations. Larger companies are more profitable than smaller companies due to the large volume of activity. Because bigger companies have specialist forces and these forces evaluate the activities of different departments of the company and eliminate unnecessary and non-economic activities (Bukhari et al., 2005).

The relationship between Company Size and Capital Structure

Many studies have investigated the relationship between company size and capital structure. Hwa Kimin (2004) investigated the relationship between company size and capital structure. The results of their study show that larger companies have less risk than smaller companies. Also, the debt costs of larger companies are lower than smaller companies. As a result, this factor causes their leverage to be high. Among other important researches in this field, we can mention the research of Corderoy (2002) who investigated the relationship between company size and leverage in several European countries and came to the conclusion that between company size and There is a relational capital structure in European countries. Another study by Bala and Mathios (2002) was conducted in Hungary between 1995 and 1999 on the choice of capital structure, and the results of the study showed that there is a direct relationship between company size and financial leverage (Zinali and Mohammad Shilan, 2012) the influence of company size on capital structure is such that the bigger and wider the size of the company, the greater the credibility of the company, and as a result, the company has more and better access to the capital markets to obtain loans and required funds. Will have. In other words, the larger the size of the company, the more creditable the company will be in the capital markets, lenders and investors, because the lenders believe that large companies are more capable of paying their debts than small companies... The size of the company is one of the factors affecting the capital structure, so that the lenders consider the size of the company in granting loans, and the managers of the companies consider the reputation of larger companies and the acquisition of credit with lower interest. They use debt to finance their projects and use the benefits of debt to maximize the value of the company. In fact, there is a positive and significant relationship between the size of the company and the capital structure (Metan et al., 2010). Also, many previous researches have pointed out that companies with different sizes have different capital structures. This shows that there are different effects of debt on profitability depending on the size of the company. This relationship can be explained by considering size as a threshold variable (Jaisenghani and Kanjilal, 2016).

Research Background

Nasserpour (2017) in a research entitled "Investigation of the non-linear relationship between the size and capital structure with the profitability of companies admitted to the Tehran Stock Exchange" investigated the non-linear relationship between the size and capital structure with the profitability of 112 companies between 1391 and 1395. Is. The results of this research showed that there is a non-linear and significant relationship between the size of the company and the profitability of the companies admitted to the Tehran Stock Exchange. Also, there is a non-linear and significant relationship between the capital structure and the profitability of the companies admitted to the Tehran Stock Exchange.

Imam Vardi et al. (2016) in a research entitled "Investigation of the threshold and asymmetric effect of the leverage ratio on the profitability of companies active in the Tehran Stock Exchange" to investigate the effect of the capital structure of companies on the profitability of companies by considering the effects The asymmetry of the debt ratio has affected the profitability index of companies. In line with this goal, 181 companies were selected from the statistical population (companies admitted to the Tehran Stock Exchange). In order to investigate the hypotheses of the research, the researcher first used the threshold regression of the balanced panel, while finding the threshold values and testing the statistical significance of these thresholds, he showed that the effects of the debt ratio with the profitability of companies is a non-linear and asymmetric relationship. Is. Using the bootstrap method and minimizing the sum of squares of the residuals and maximizing the coefficients of determination, the threshold values were estimated as 11% and 89%, respectively. In order to investigate the influence of the leverage ratio on the return on assets of the companies using the GMM estimation method, the balanced panel data model with fixed effects was estimated during the period, and the results of the research indicate that: high debt ratio has an effect It has a negative effect on the profitability of companies, and the low debt ratio has had a relatively greater positive effect compared to other regimes, and in the range between the two thresholds, the leverage ratio has had no effect on the profitability of companies.

Zamani and Zarabadipour (2016) in a research entitled "Investigating the relationship between capital structure and profitability in companies listed on the Tehran Stock Exchange" to investigate the effect of profit smoothing on the capital structure and profitability of companies listed on the stock exchange. Tehran securities were analyzed using the systematic elimination method during the years 1395-1390. In this research, statistical techniques such as simple linear regression and Pearson and Zr correlation tests were used to analyze and test the hypotheses, and finally, to distinguish between paving companies and non-paving companies, the Eckel model was used. The findings of this research confirmed the existence of smoothing and the relationship between capital structure and profitability and showed that companies perform smoothing at different levels of profit, including operating profit, gross profit and net profit. The main result of the research indicates that despite the existence of a significant relationship between some research variables in profit smoothing and non-smoothing companies, in terms of the relationship between capital structure and profitability, there is no significant difference between these two groups of companies.

Rahmani (2015) in a research entitled "Investigation of the effect of capital structure on the profitability of companies listed in the Tehran Stock Exchange" on the effect of capital structure criteria and profitability of 212 companies during a four-year period (2008-2012) through Fitting the multivariate regression model with pay table data. The results of the research showed that there is an inverse effect between the ratio of short-term debt to assets and profitability of the company, between the ratio of long-term debt to assets and profitability, and also between the ratio of total debt to assets and profitability.

Krusi et al. (2018) in a research entitled "Relationship between capital structure and capabilities of registered companies and profitability in Nairobi Stock Exchange" investigated the relationship between capital structure and profitability of companies listed in Nairobi Stock Exchange. they paid. In this research, a longitudinal research design has been used by using quantitative secondary data, obtained from annual audited reports of companies and information related to the Nairobi Stock Exchange. The results showed that there is a positive and significant correlation between the profitability of the company (which is measured by the return on capital employed) and the internal value. In addition, long-term debt was negatively related to profitability. Therefore, increasing long-term debt reduces

profitability and vice versa. The researchers also concluded that non-financial companies are more dependent on equity financing than debt financing.

Jaisinghani and Kanjilal (2017) in a research titled "Nonlinear Dynamics of Size, Capital Structure and Profitability: Empirical Evidence from the Indian Manufacturing Sector" analyzed the nonlinear relationships between firm size, capital structure and profitability using threshold panel regression method, for They discussed finding different regimes in which the capital structure affects the profits of companies differently based on their size. This research was conducted on a sample of 1194 manufacturing companies in the Indian general trading market from 2005 to 2014. The results indicate the importance of a single threshold for size, which indicates the existence of two separate regimes where this threshold level or size cut-off is estimated at 148 million rupees. The results of the research showed that the companies that are above the threshold by using debt in their capital structure have a positive effect and vice versa on the profit of the company.

In a research entitled "Dynamic relationship between diversification, capital structure and profitability", Joyda (2017) built a panel vector autoregression (PVAR) model for 412 French financial institutions in ten years. There was evidence of reverse causality between these variables after controlling for individual fixed effects. In addition, there was an inverse two-way causality relationship between leveraged profitability and diversification. The stability condition was not confirmed for the relationship between diversity and leverage, but it was observed for the three factors simultaneously. However, analysis of variance of the prediction error confirmed the choice of diversity as an endogenous variable. Impulse response functions of communications showed important dynamics in the financial sector.

Vatava (2016) in a research entitled "Analysis of non-linear panel data on capital structure and its effect on profitability" dealt with the determinants of financial performance in 125 companies listed on the Bucharest Stock Exchange during the period of 2003-2012. This analysis was based on descriptive analysis, linear and non-linear regression analysis. The results showed that Romanian companies record higher returns when they work with limited loans. When investments are taken from domestic funds, it has a negative effect on the return of capital, which affects the level of income in the short term. The current financial crisis affects the performance of the company, while the inflation rate creates a loop effect in its returns and fluctuations.

Barkat (2014) in a research entitled "The effect of financial structure, financial leverage and profitability on the share value of industrial companies". In this research, 46 industrial companies of the Saudi stock market were examined between 2009 and 2011. The obtained results indicated that there is a statistically significant relationship between the two independent variables of return on equity and capital structure, and the dependent variable was expressed by the stock market price. Also, the results of the research showed that there is a weak and inverse relationship between financial leverage and stock value, and this relationship is not significant, so there is no statistically significant relationship between financial leverage and company value. Based on multiple regression analysis, there is a positive relationship between capital structure and equity. Finally, the results showed that there is a clear effect of the financial structure of equity return on the value of each share of the company, so by examining these variables, the financial analyst can predict the future value of the company.

Hypotheses and Research Model

1- There is a non-linear and significant relationship between capital structure and profitability in companies with a size below the threshold.

2- There is a non-linear and significant relationship between capital structure and profitability in companies with a size greater than the threshold.

The pattern of realization of research hypotheses is as described in relation (1).

relationship (1)

$$-R\acute{O}A_{it} = \mu_i + \acute{\beta}_1 CS_{it} I(SIZE_{it} \leq \lambda) + \acute{\beta}_2 CS_{it} I(SIZE_{it} > \lambda) + \acute{\beta}_3 Z_{it} + \varepsilon_{it}$$

In this relationship:

ROA_{it}: Profitability in i-th company in year t

CS_{it}: capital structure in the i-th company in year t - variable dependent on the regime in the i-th company in year t

$SIZE_{it}$: company size in i-th company in year t - threshold variable in i-th company in year t

Z_{it}: control variables including return on equity, company sales growth, company life

λ: indicator of the threshold parameter (threshold point) - the calculated value of the threshold variable

μ_i: specific section of constant effect parameter (width from the origin)

β_i: model coefficients

ε_{it}: error component with zero value and a constant variance of σ^2

I: index function or virtual variable whose value is between 0 and 1.

A virtual variable is a variable that cannot be directly observed and measured, but it is related to the independent and dependent variables of the research. This may affect the results of the research or the effect of the independent variable on the dependent variable, but the researcher cannot observe or measure it.

How to measure model variables is described below.

The Dependent Variable

Profitability: Profitability is calculated by dividing the operating profit (profit before interest and tax) by the total assets.

relationship (2)

$$ROA_{it} = \frac{Ebit_{it}}{Total\ Asset_{it}}$$

In this relationship:

$Ebit_{it}$: Earnings before interest and taxes for the i-th company at the t-th time.

$Total\ Asset_{it}$: total assets for the i-th company at the t-th time.

Independent Variable

Capital structure: Capital structure is calculated by dividing total liabilities (short-term and long-term) by total assets. Also, it is an explanatory variable dependent on the regime in the estimation of the threshold of the panel.

relationship (3)

$$CS_{it} = \frac{Total\ Debt_{it}}{Total\ Asset_{it}}$$

In this relationship:

$Total\ Debt_{it}$: the sum total of debts for the i-th company at the t-th time.

$Total\ Asset_{it}$: total assets for the i-th company at time t.

Company Size: Size represents the natural logarithm of total assets.

relationship (4)

$$Size_{it} = Ln(Total\ Asset_{it})$$

Control Variables

Return on equity: It examines the efficiency of a company in creating net profit for shareholders and is calculated by dividing net profit by total equity (Rahmani, 2015).

relationship (5)

$$ROE_{it} = \frac{NI_{it}}{Equity_{it}}$$

In this relationship:

NI_{it} : Net profit in company i in year t

$Equity_{it}$: is the sum of equity in company i in year t

Company's growth: It is calculated from the current year's sales minus the previous year's sales divided by the previous year's sales.

Company Age: the natural logarithm of the number of years the company has been active in the Tehran Stock Exchange.

Research Method

Threshold Regression

Threshold regression model is one of the most interesting forms of nonlinear regression models. Threshold regression model estimates a simple nonlinear regression model and displays the model using piecewise linear specifications and changing from one regime to another. The threshold value of λ determines the location of the model regime change. The number of threshold levels can be one or more levels, and every time the number of threshold levels is increased, the number of regimes also increases. In threshold regression, a threshold variable is defined and the model is analyzed based on the changes of this threshold variable. This model has many applications in economics. Direct applications include the analysis of different balances and experimental tests. Threshold regression is causal in nature and practical in terms of purpose, which explores and interprets relationships between variables. In threshold models, there is no need for regression coefficients to be constant, in experimental research, regression models with constant coefficients (non-threshold models) are widely used, these models only show behavior They describe the mean of the discussed samples. Threshold models allow us to examine non-linear and non-identical relationships between the dependent variable and the explanatory variables. The threshold regression method proposed by Hansen (1999) seeks to answer the question of whether regression functions uniformly pass through all observations or can be broken into separate groups.

The analysis of nonlinear relationships is usually divided into two groups based on the sample splitting approach:

 1- It is exogenous, which is based on judgment and individual preferences. If this method is used, the choice of the number of regimes and its location is optional and based on the guidance of previous economic theories. Therefore, in this case, the accuracy of the results and estimated parameters is questionable, because it largely depends on the choice of the point where the threshold occurs.

2- Another method that is used in threshold analysis is the successive regression method or regression tree, which determines the number and location of thresholds completely endogenously and by using It determines the sorting of the available data. This topic has been seriously developed by Hansen by presenting a new technique in econometrics. Another advantage of this method is that subjective ideas do not interfere in the formation of the type of nonlinear relationship and it does not require any form of definite nonlinear function in the investigation of nonlinear relationships (Zibaei and Mazaheri, 2018).

Based on whether the threshold variable $SIZE_{it}$ is less or more than the threshold parameter (λ), they are divided into two regimes, less or more than λ. These regimes are characterized by the difference in the regression slopes β_1 and β_2. The identification of β_1 and β_2 requires that CS_{it} elements are not unchanging over time. It is also assumed that the threshold variable $SIZE_{it}$ is not invariable over time. As for the error term, it is assumed that it is independent and uniformly distributed and has a mean of zero and a variance of δ^2 (Hansen 1999). After determining threshold points by Hansen's method, the model of this research is estimated as follows:

$$\acute{ROA}_{it} = \left[\begin{array}{ll} \mu_i + \acute{\beta_1} CS_{it} + \varepsilon_{it} & (SIZE_{it} \leq \lambda) \end{array} \right. \qquad \text{relationship (6)}$$

$$\mu_i + \acute{\beta}_1 CS_{it} + \varepsilon_{it} \quad (SIZE_{it} > \lambda) \qquad \text{relationship (7)}$$

The above relationships show that if the threshold variable is smaller than the threshold parameter, regression (6) is used, and when the variable is greater than the obtained threshold parameter, regression (7) is used. be made

Another representation of the above model used and estimated in this research is as follows: relationship (8)

$$\acute{RÓA}_{it} = \mu_i + \acute{\beta}_1 CS_{it}\, I(SIZE_{it} \le \lambda) + \acute{\beta}_2 CS_{it} I(SIZE_{it} > \lambda) + \acute{\beta}_3 Z_{it} + \varepsilon_{it}$$

I is an index function or a virtual variable whose value is between 0 and 1 (a virtual variable is a variable that takes the value of one if there is an attribute and the value of zero in the absence of that attribute) if $SIZE_{it} \le \lambda$ The value of the index function is equal to zero, and if $SIZE_{it} > \lambda$, the value of the index function is equal to one.

Threshold Parameter Estimation

What is important in the above relationships is the estimation of the threshold parameter (λ) based on which the data can be divided into two separate groups. Threshold point indicates a difference, which is shown either by changing the sign of the coefficient or without changing the sign and simply by changing the value of the coefficient with the same initial sign. At this point, there is a break in the data, where two or more different regressions are formed along the threshold variable data. In fact, the threshold point is the change factor in the whole model. In this way, before the threshold variable reaches the threshold point, the behaviors are in one way and after that in another way. Observations are divided into two regimes based on whether the threshold variable is lower or higher than the threshold point. To estimate the value of λ, the desired formula is designed in the software and a regression is estimated for each of the considered values. For each of these estimated regressions, the sum of squared errors is calculated as follows.

relationship (9)

$$S_1(\lambda) = \hat{e}(\acute{\lambda})\, \hat{e}(\lambda)$$

At this stage, based on the algorithm provided by Hansen, the optimal value of the threshold parameter is determined based on minimizing the sum of squares of the error sentences as follows:

relationship (10)

$$\hat{\lambda} = \arg\min_{\lambda} S_1(\lambda)$$

In this relationship:

$S_1(\lambda)$: error sum function

$\arg\min_{\lambda}$: the remaining regimes

Chan (1993) shows that if the threshold parameter is unknown, consistent estimates of the parameter can be obtained by maximizing the R^2 coefficient or minimizing the residual sum of squares (RSS). (Mehrara Vazarei, 2012).

Threshold Effect Significance Test

After the threshold parameter (λ) was estimated, the significance test of the threshold effect becomes particularly important. What is very important is the inference of its significance. At this stage, it should be tested whether the coefficients $\beta\text{-}3^{\acute{}}$ and $\beta\text{-}2^{\acute{}}$ have a significant difference from each other and whether the model is linear or non-linear. Hansen (1999) has proposed the F test to test the existence of the threshold effect. In this study, bootstrap method is used for F test. Determining the value of the test statistic without threshold, one and... is used.

Bootstrap Resampling Method

The resampling method is a simple method, which is used to determine the statistical accuracy or estimate the distribution from the sample statistics. The distinctive feature of this method is that it replaces statistical or mathematical analysis with simulation based on re-sampling of a certain set of data. Therefore, this method is a means to evaluate the accuracy

of estimated parameters without the need to resort to strong parametric assumptions or precise confidence interval formulas. This method is done by relying on the individual sample, which often is the only source that a researcher has for research, and this adds to the importance of the resampling method. When access to the community distribution is not possible or very expensive, resampling the sample distribution can bring its conditions closer to the community distribution and thus be used as a representative of the community distribution. take The main goal of the bootstrap method is to evaluate the accuracy of parameter estimation. This method is very suitable for this purpose because this method provides the researcher with estimates without relying on unreliable assumptions (such as assumptions related to normality or large sample size). The bootstrap method is used to estimate the accuracy of estimators, such as the standard error, confidence interval, or skewness of an estimator. This technique is useful when collecting information is costly, past information is scattered, assumptions related to distribution are unclear, or access to past information is difficult (Gorji, 2011).

Implementation of the Bootstrap Method

The basis of this method is very simple. Suppose there is an original sample of size N. The process starts from this sample, in such a way that a new random sample of the same size is drawn from the original sample (resampling), and at the same time, each selected observation is returned to the original sample after removal. to be This random sampling or resampling is the basis of the bootstrap method and requires a uniform random number generator to select random numbers between 1 and N. When the new sample is created, it can be seen that some observations are selected more than once and others are not selected at all. Therefore, although all the observations in the resample are drawn from the original sample, the resample is different from the original sample. By having a new sample, the desired parameters can be estimated using it. When the sampling process is repeated many times (B times), we will get a set of B parameters. This set B of estimates is considered as a bootstrap sample of parameter estimation. This bootstrap method is known as non-parametric, because resampling is done from a certain set of data and no specific assumption is considered for data distribution. If a certain distribution is assumed for the data, the bootstrap method will be implemented parametrically. When the parametric method is used, Bootstrap provides more accurate answers than using common formulas, and it is possible to obtain answers to problems if certain formulas are not available. provides The bootstrapped sample can be used to estimate the confidence interval of the parameters (Dawood, 2005).

The principle of equality of resampling states that the estimator of the sample taken by the resampling method is equal to the estimate of the original sample. To use the resampling method, the following steps are required:

1- First, we estimate the model with the threshold and calculate the regression residuals ($\hat{e}_{it}^*$) and define a sample of random numbers with a mean of zero and a variance of one.

2- We regress ROA_{it}^* on $\mu_i + \beta_1 CS_{it}^* + \beta_2 SIZE_{it}^* + \beta_3 Z_{it}^* + \varepsilon_{it}^*$ and obtain the sum of squares of bound residuals.

3- We regress ROA_{it}^* on $\mu_i + \beta_1 CS_{it}^* + \beta_2 SIZE_{it}^* + \beta_3 Z_{it}^* + \varepsilon_{it}^*$ and calculate the sum of squares of the unconstrained residuals.

4- We calculate $F = \frac{S_0 - S_1(\lambda)}{\hat{\partial}^2}$.

$S_0 = \hat{e}^* \hat{e}^*$

$S_1(\lambda) = \hat{e}(\acute{\lambda}) \, \hat{e}(\lambda)$

$\hat{\partial}^2 = \frac{1}{n(T-1)} \, \hat{e}^* \hat{e}^* = \frac{1}{n(T-1)} S_1(\lambda)$

5- We repeat the above steps 300 times and show the statistic corresponding to the nth repetition with F_n^*.

6- The p-value is calculated as follows:

relationship (11)

$$p - value = \frac{1}{300} \sum_{n=1}^{1000} L(F_n^* \geq F)$$

If the hypothesis H_0 is correct at the 10% level, it means that the threshold value is not significant and the relationship is linear, and if the hypothesis H_1 is correct and Prob is less than 10%, it means that the result of the threshold value is significant and the relationship is non-linear (Hansen, 1996).

Research findings

Descriptive Statistics

The description of the components is as described in table (1).

Table (1): Descriptive statistics of model variables

(Kurt)	(Skew)	(Max)	(Min)	(Std. Dev.)	(Mean	variables
36/02	3/5	2/17	-0/78	0/19	0/16	**ROA**
47/47	4/05	4/00	0/44	0/26	0/60	**CS**
3/99	0/92	19/31	11/03	1/49	14/00	**Size**
670/93	-24/64	10/05	-72/70	2/7	0/19	**Roe**
92/66	8/72	15/66	-0/86	1/15	0/33	**Sg**
3/89	0/30	4/36	1/39	0/49	2/86	**Age**

The above table shows these results. For example, the average for ROA profitability variable is equal to 16%, which shows that most of the data are concentrated around this point. Also, the average value of the capital structure is about 60%, which shows that the companies have financed 60% of the resources through the capital structure. Standard deviation is the most important parameter of dispersion. The value of this parameter for return on equity (Roe) is equal to 2.66 and for the variable of profitability (ROA) is equal to 19%, which have the highest and lowest dispersion among research variables, respectively. The value of skewness and kurtosis, for example, for profitability, capital structure and firm size, the skewness is greater than zero and the distribution of the variables is asymmetric. Also, the elongation is greater than 3, so the prominent curve and the height of the curve is greater than the normal distribution.

Analysis of the results of the estimation of the third and fourth hypothesis of the research

Threshold regression

Threshold regression has been used to investigate non-linear effects. To do this, first, the company size variable (Size) is determined as a threshold variable. Then, the variable of capital structure (Cs) is determined as a dependent variable of the regime, which shows a dual behavior against the dependent variable. According to the presented hypotheses and estimation models, the capital structure affects the profitability of companies differently based on their sizes.

Threshold parameter estimation

To estimate the threshold value, first the equation is estimated by determining the threshold variable and the regime-dependent variable and choosing a single threshold. For determining the threshold parameter, the model has the minimum sum of the squared error or the maximum value of the coefficient of determination. According to the results of table (2), the threshold value for the nonlinear model at the 95% confidence level is equal to 15.89. According to the threshold limit (15/89), the model can be divided into two regimes,

companies with a capital structure lower than the threshold limit and companies with a capital structure above the threshold limit. Companies with a capital structure less than the threshold are in the group of companies with a low capital structure, while companies with a capital structure exceeding the threshold are in the group of companies with a high capital structure.

Table (2): Threshold parameter estimation results

Maximum threshold	The lowest threshold	(Threshold)	Model
۱۵/۹۴	۱۵/۶۶	۱۵/۸۹	(Th-1)

Significance test of threshold effect

According to the results of the threshold effect test for the company size threshold variable in table (3), it can be stated that the value of the F statistic in the single threshold mode is greater than the critical value at the 10% level (18.78). <31/01). Also, according to the probability of F statistic (0.06) which is less than 10%, the hypothesis H_0 is not accepted and therefore the threshold value is significant at the 90% level and the model is non-linear. In single threshold mode, 300 bootstrap times were used to estimate the model.

Table (3): Threshold effect test results

The results of the hypotheses

Threshold	Botstrop	F stat	F Prob	Crit٪10	Crit٪5	Crit٪1
۱۵/۸۹	times ۳۰۰	۳۱/۰۱	۰/۰۶	۱۸/۷۸	۴۲/۹۱	۷۶/۰۰

To test these hypotheses, nonlinear multivariable regressions of threshold effects in composite data with fixed effects were used, and the threshold value was estimated at 15.89. Since regression includes a threshold limit, two regimes are created. The capital structure before and after this threshold has an effect on profitability in two different regimes. The degree of influence of the capital structure on profitability before and after the threshold limit will be different, the capital structure has an effect on profitability up to the threshold limit of company size with a factor of -0.26 and after the threshold limit with a factor of -0.083. has put Both coefficients are completely significant at the confidence level of 0.05.

Table (4): The results of model estimation

$RÓA_{it} = \mu_i + \acute{\beta}_1 CS_{it} I(SIZE_{it} \leq \lambda) + \acute{\beta}_2 CS_{it} I(SIZE_{it} > \lambda) + \acute{\beta}_3 Z_{it} + \varepsilon_{it}$					
Prob	t statistic	s-e	Coefficients	Variables	
۰/۰۰۰	۳/۶۲	۰/۱۹	۰/۶۸	μ_i	
۰/۷۶	-۰/۳۰	۰/۰۲	-۰/۰۰۵	Size	Threshold variable
۰/۴۸	۰/۷۱	۰/۰۰۲	۰/۰۰۱	Roe	
۰/۰۱	۲/۴۶	۰/۰۰۵	۰/۰۱	Sg	
۰/۰۳	-۲/۱۶	۰/۰۵	-۰/۱۱	Age	
۰/۰۰۰	-۷/۷۱	۰/۰۳	-۰/۲۶	CS Diet 1	Diet dependent variable
۰/۰۰۰	-۷/۹۸	۰/۰۱	-۰/۰۸	CS Diet 2	Diet dependent variable

R^2	Sig statistic F	statistic F	timespan	The number of companies	observations
۰/۱۲	۰/۰۰۰	۲۳/۲۲	۲۰۱۰-۲۰۲۱	۱۰۵	۸۰۰

The first and second hypotheses of the research are stated as follows:

First hypothesis: There is a non-linear and significant relationship between capital structure and profitability in companies with a size below the threshold.

According to the value and probability of the t statistic, the capital structure variable (Cs) is -7.71 and 0.000, respectively. Considering that the probability is less than 0.05, it can be stated that profitability (Roa) has a non-linear and significant relationship with capital structure. Also, the coefficient of this variable is equal to -0.26 (negative sign), which shows the indirect relationship between capital structure and profitability, in other words, if the capital structure increases by one unit, the profitability decreases by 0.26 units. finds as a result, there is a negative and significant nonlinear relationship between capital structure and profitability in the first regime, and the first hypothesis is accepted.

Relationship (12)

$$\acute{R}OA_{it} = \cdot/۶۸ - \cdot/۲۶\, CS_{it}(SIZE_{it} \leq ۱۵/۸۹) - \cdot/۱\, Z_{it} + \varepsilon_{it}$$

Second hypothesis: There is a non-linear and significant relationship between capital structure and profitability in companies with a size greater than the threshold.

According to the value and probability of the t statistic, the capital structure variable (Cs) is -7.98 and 0.000, respectively. Considering that the probability is less than 0.05, it can be stated that profitability (Roa) has a non-linear and significant relationship with capital structure. Also, the coefficient of this variable is equal to -0.08 (negative sign), which shows the indirect relationship between capital structure and profitability. In other words, if the capital structure increases by one unit, the profitability decreases by 0.08 units. As a result, there is a negative and significant non-linear relationship between capital structure and profitability in the second regime, so the second hypothesis is accepted.

Relationship (13)

$$\acute{R}OA_{it} = \cdot/۶۸ - -\cdot/\cdot۸\, CS_{it}(SIZE_{it} > ۱۵/۸۹) - \cdot/۱\, Z_{it} + \varepsilon_{it}$$

According to the results of the table above, in both regimes, the relationship between capital structure and profitability is non-linear and negative. In this way, in the first regime, the capital structure has reduced the profitability up to the threshold value of the company size. But in the second regime, when the amount of capital structure exceeds the threshold value, the capital structure has less effect on profitability and reduces profitability less than before. Therefore, in companies with a company size above the threshold, increasing the capital structure will have less impact on reducing the profitability of these companies. The companies that are in the second regime have a more favorable capital structure and profitability than the companies in the first regime.

According to the results, the value and probability of the t statistic of the company size variable are -0.30 and 0.76, respectively. Considering that the probability of t-statistic is more than 0.05, company size does not have a significant relationship with profitability in non-linear mode at the 0.05 confidence level. In general, the results related to control variables indicate that return on equity (Roe) does not have a significant relationship with profitability at the confidence level of 0.05. The company's sales growth (Sg) has a positive and significant relationship with profitability at the confidence level of 0.05. Age of the company has a negative and significant relationship on profitability at the confidence level of 0.05.

Although company size and equity have no significant relationship with profitability. But according to the results obtained in the above table, it can be seen that the probability value of F statistic is equal to 0.000 which is less than the error level of 0.05 and indicates the significance of the entire regression model of the research, which indicates It is that the model is significant at the 95% confidence level. The coefficient of determination of the explanatory power of the independent variables shows compared to the dependent variable. The adjusted coefficient of determination (R^2) of the model shows that 12% of the changes in the profitability variable (Roa) are explained by the mentioned independent and control variables.

Equation (13) of the nonlinear model

$$\acute{R}OA_{it} = \cdot/۶۸ - \cdot/۲۶ \, CS_{it}(SIZE_{it} \leq ۱۵/۸۹) - \cdot/\cdot۸ \, CS_{it}(SIZE_{it} > ۱۵/۸۹) - \cdot/۱ \, Z_{it} + \varepsilon_{it}$$

Discussion and conclusion

In this research, the non-linear effect of capital size and structure on profitability has been investigated. For this purpose, firstly, the linear relationship between capital size and structure on profitability was investigated and then the non-linear relationship between capital structure and profitability was investigated based on threshold regression. Capital in linear and non-linear mode has a negative and significant relationship with profitability. Of course, this effect of capital structure on profitability in linear mode is less than the effect of capital structure in the first regime and higher in the non-linear mode in the second regime. In the linear mode, with the increase in the capital structure, the profitability increases and vice versa. In the non-linear mode, capital structure has a negative and significant relationship with profitability in two different regimes, although the effect of capital structure on profitability in the second regime is less than the first regime. Capital structure has a different effect on the profitability of companies depending on their size group. In companies with a smaller size, higher debts lead to a greater decrease in profitability, but companies with a larger size are able to better use debts in their capital structure, and the capital structure has less impact on their profitability. has it. This means that the capital structure has a greater impact on small companies than on large companies. The results show that the negative relationship between capital structure based on company size and profitability can be caused by ambiguous and complicated relationships in the market and problems of financial provision based on debts, in terms of facilities received at the level of companies. Larger companies have better conditions for foreign financing such as borrowing from the bank, and hence they will be less likely to go bankrupt, which increases the use of debt by large companies. According to the results, the size of the company has a positive and significant relationship with profitability in a linear mode, and as the size of the company increases, profitability increases and as the size of the company decreases, profitability decreases. According to the theory of some researchers, it can be stated that larger companies are more stable in terms of profitability than smaller companies, because the profitability of smaller companies is more subject to market conditions and fluctuations. Larger companies are more profitable than smaller companies due to the large volume of activity. Because, bigger companies have specialist forces and these forces evaluate the activities of different departments of the company and eliminate unnecessary and uneconomical activities, large companies have a certain share of the sales market. They have the power and in the conditions of imperfect market competition, due to their power, they can play a determining role in terms of the price and amount of product supply to the market. But in the non-linear case, size has no significant relationship with profitability, and in fact, size has no effect on profitability. The company's sales growth in both linear and non-linear modes has a positive and significant relationship with profitability. The life of the company does not have a significant relationship with profitability in linear mode, but it has a negative and significant relationship with profitability in non-linear mode. Return on equity has a positive and significant relationship with profitability in a linear state, but it does not have a significant relationship with profitability in a non-linear state.

The first hypothesis is stated as follows:

Is there a non-linear and meaningful relationship between capital structure and profitability in companies with a size less than the threshold?

According to the value and probability of the t statistic, the capital structure variable (Cs) is -7.71 and 0.000, respectively. Considering that the probability is less than 0.05, it can be stated that profitability (Roa) has a non-linear and significant relationship with capital

structure. Also, the coefficient of this variable is equal to -0.26 (negative sign), which shows the indirect relationship between capital structure and profitability, so the relationship between capital structure and profitability is the opposite of each other, and as capital structure increases, profitability decreases. and by reducing it, profitability should increase. In other words, if the amount of capital structure increases by one unit, the profitability will decrease by 0.26 units. As a result, there is a negative and significant non-linear relationship between capital structure and profitability in the first regime, and the third hypothesis is accepted. This result is consistent with the research results of Nasserpour (2017), Imam Vardi et al. (2016) and Amponze Adae et al. (2013), but with the results of Jaisinghani and Kanjilal (2017), Ghani et al. and Khurshid (2014) does not match.

The second hypothesis is stated as follows:

Is there a non-linear and significant relationship between capital structure and profitability in companies with a size greater than the threshold?

According to the value and probability of the t statistic, the capital structure variable (Cs) is -7.98 and 0.000, respectively. Considering that the probability is less than 0.05, it can be stated that profitability (Roa) has a non-linear and significant relationship with capital structure. Also, the coefficient of this variable is equal to -0.08 (negative sign), which shows the indirect relationship between capital structure and profitability. In other words, if the capital structure increases by one unit, the profitability decreases by 0.08 units. As a result, there is a negative and significant non-linear relationship between capital structure and profitability in the second regime, so the fourth hypothesis is accepted. This result is consistent with the results of research such as Nasserpour (2017), Imam Vardi et al. (2016) and Amponze Adae et al. (2013), but with the results of Jaisinghani and Kanjilal (2017), Gani et al.) and Khurshid (2014) do not match.

During the conduct of any research, limitations are placed on the researcher's path, and this research is no exception. The main limitations of the current research that should be considered in the interpretation of the research findings and its generalization are as follows:

1- Many of Iran's political, economic and social conditions (especially the country's inflationary conditions and the lack of preparation of adjusted financial statements) are effective on the findings of the research, which were beyond the researcher's ability to control. Considering the different inflation rates in the years under review, if the data used were adjusted for this, the results might be different from the current results.

2- In the present research, some working companies such as investment, leasing, banks, holdings and insurance, due to the nature of the activity, the type of income from the operation and also the structure of the profit and loss statement are different from other companies, they have been left out of the statistical population, so the results obtained cannot be generalized to all companies.

3- Due to the fact that the society under investigation was the Tehran Stock Exchange, the use of non-stock companies makes it possible to obtain different results from the current results, and the non-use of the information of these companies is due to the impossibility of accessing it. It has been

4- Performance measurement in this research was done only from financial aspects and no attention was paid to non-financial aspects of performance.

Suggestions based on research findings

1- According to the results in both regimes, the relationship between capital structure and profitability is indirect. In this way, as the capital structure increases, profitability decreases and vice versa. Therefore, companies that are above and below the desired threshold should pay their outstanding debts to reduce their debt ratio and increase profitability.

2- Company managers are suggested to use a suitable combination in the capital structure and use less debts in order to make the companies profitable.

3- Capital market activists are advised to design more diverse long-term financing tools and offer them in the capital market, so that companies can also provide capital from this market in the long term.

4- Companies can finance their capital needs by selecting hedge funds and investment funds. These financial strategies will help companies to prepare themselves for doing business by reducing overall costs and thus producing positive economic value and increasing profitability.

5- Due to the high inflation rate in Iran, companies should reassess their assets (revaluation of assets). This causes the debt ratio to decrease.

Future offers

1- Testing these hypotheses for non-listed companies.

2- Due to the fact that there are many industries in the country and the industries also affect the research, it is suggested that this research be examined in each industry separately.

3- Examining the research hypothesis with more observations through increasing the research period or the number of sample companies can provide more reliable results.

Refrences

Abor, J. (2005). The Effect of Capital Structure on Profitability. **Journal of Risk Finance**, 6, 438-445.

Abor, J. (2008). Determinants of the Capital Structure of Ghanaian Firm. **African Economic Research Consortium, Nairobi, AERC Research**, P176.

Antoniou, A., Guney, Y., Paudyal, K. (2002). Determinants of Corporate Capital Structure: Evidence from European Countries, **Centre for Empirical Research in Finance, University of Durham**, 23-26.

Barakat, A. (2014). The Impact of Financial Structure, Financial Leverage and Profitability on Industrial Companies Shares Value (Applied Study on a Sample of Saudi Industrial Companies). **Research Journal of Finance and Accounting**, Vol.5, No.1, 55-66.

Balla, A. and Mateus, C. (2002). **An Empirical Research on capital structure Choices**. University of Pecs / Faculty Business and of economics Working Paper, Hungary.

Booth, L., Aivazian ,V. Demiurguc – Knut , A. E and Maksimovic , v.(2oo1). capital structure in Developing countries. **Journal of finance**, 56:87-130.

Dowd, K. (2005). Measuring Market Risk, 2nd Edition. **Second ed.Wiley, NewYork**.

Dimitris, M. A. and Maria, P. B. (2011). Capital Structure, Equity Ownership and Firm Performance. **Journal of Banking and Finance**. (34) , 621–632.

Fama, E. F. and Jensen, M. C. (1983). Scparation of ownership and control. **Journal of Law and Economics**, Vol. 26. 327-349.

Guney, Y., Li, L., & Fairchild, R. (2011). The relationship between product market competition and capital structure in Chinese listed firms. **International Review of Financial Analysis**, 20(1), 41-51.

Hansen, B. E. (1999). Threshold effects in non-dynamic panels: Estimation, testing, and inference. **Journal of Econometrics**, 93(2), 345-368.

Hovakimian, A. (2004). The role of target leverage in security issues and repurchases. **The Journal of Business**, 77(4), 1041-1072.

Hovakimian, A., Opler, T. and Titman, S. (2001). The debt-Equity Choice. **Journal of Financial and Quantitative Analysis**, 36, 1-24.

Jaisinghani, D., & Kanjilal, K. (2017). Non-linear dynamics of size, capital structure and profitability: Empirical evidence from Indian manufacturing sector. **Asia Pacific Management Revie**, 22(3),159-165.

Jouida, S. (2017). Diversification, capital structure and profitability: A Panel VAR approach. **Research in International Business and Finance**, 45, 243-256.

Kerosi, D., Mugo, R., & Kalui, F. (2018). The Relationship Between Capital Structure And Profitability Of Firms Listed At The Nairobi Securities Exchange. **African development finance journal**, 2(1),182-216.

Modigliani, F., & Miller, M. H. (1958). The cost of capital, corporation finance and the theory of investment. **American Economic Review**, 48, 261.

Rajan, R. G., & Zingales, L. (1995). What do we know about capital structure? Some evidence from international data. **Journal of Finance**, 50(5), 1421−1460

Vatavu, S. (2016). Non-linear Panel Data Analysis for Capital Structure and Its Impact on Profitability. **The Review of Finance and Banking**, 8(1), 21-36.

Wahome, M.N. , Memba, F., & Muturi,W. (2015). The effects of firm size and risk on Capital Structure decisions of Insurance Industry in Kenya. **International Journal of Scientific and Research Publications**, Volume 5, Issue 8 , 1-12.

Imam Vardi, God's power; Karimi, Mojtaba and Sadeghi Bonab, Helen. (2016). Examining the threshold and asymmetric effect of leverage ratio on the profitability of active companies in Tehran Stock Exchange. Financial Economics Quarterly, (39)11, 57-81.

Pourhydari, Omid; Soleimani Amiri, Gholamreza and Mohsen Safajo. (1384). Accounting and auditing reviews, 42, 3-19.

Rahmani, chief. (2015). Investigating the effect of capital structure on the profitability of companies admitted to the stock exchange. Master's Thesis, Payam Noor University, West Tehran.

Zamani, Mehdi and Zarabadipour, Munir. (2016). Investigating the relationship between capital structure and profitability in companies listed on the Tehran Stock Exchange. Specialized Scientific Quarterly of Management, Accounting and Economics, (1)1, 63-73.

Satish, Mohammad Hossein; Mumtazian, Alireza and Behpour, Sajjad. (2013). Investigating the non-linear relationship between growth and profitability in companies listed on the Tehran Stock Exchange. Scientific-Research Quarterly of Asset Management and Financial Provision, (4)3, 51-66.

Sajjadi, Seyed Hossein; Dastgir, Mohsen Mahmoudi, Vahid. (2006). Factors affecting the profitability of companies admitted to the Tehran Stock Exchange. Journal of Economic Research, (3) 42.

Shamshiri, Ehsan. (2015). Investigating the effect of the company's characteristics on the company's financial risk-taking. Master's thesis of Azad University, Kermanshah branch.

Sadeghi Shahabi, Mehdi; Chavoshi, Kazem and Mohseni, Hossein. (2011). Modeling the relationship between profitability and capital structure in Tehran Stock Exchange with the generalized torque panel approach. Journal of financial engineering and securities management, number 11.

Farzinnia, Ayub. (2015). Investigating the effect of company size on the relationship between financial structure, financial leverage, profitability and stock value of companies listed on the Tehran Stock Exchange. Master's thesis of Urmia University.

Georgia, Mahsa. (2011). Estimation of value at risk (VAR) using bootstrap resampling method in Tehran Stock Exchange. Master's Thesis, Raja Institute of Higher Education.

Methane, Mojtabi; Yahiizade Far, Mahmoud and Naboi Chashmi, Seyyed Ali. (1389). The effect of the characteristics of the company on its capital structure in the companies admitted to the Tehran Stock Exchange. Researcher Magazine, Volume 7, 42-52.

Modares, Ahmed and Abdolazadeh, Farhad. (1378). financial management. Tehran Bazargani Publishing Company, first edition (second volume).

Naserpur, Hangama. (2017). Investigating the non-linear relationship between capital size and structure and profitability of companies listed on the Tehran Stock Exchange. Master's thesis of Amol Institute of Higher Education.