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Presenting a model and optimizing the non-linear relationship between debt volume and profit quality

Javad Mirabbasi, Azita Jahanshad*, Zahra Pourzamani

Department of Accounting, Central Tehran Branch, Islamic Azad University, Tehran, Iran

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Abstract

Increasing the quality of profit can have significant economic consequences, including enhanced investment efficiency. Although strong and stable theories support this relationship, there is very little empirical evidence for this claim. By increasing reporting and the quality of information provided, companies can bring their investments closer to the efficiency limit. This research aims to investigate whether the relationship between debt and profit quality exhibits a nonlinear relationship. If this relationship is non-linear, is the relationship related to long-term or short-term debts? This research has been carried out in the framework of inductive-inductive arguments. In this research, library and field methods were used to collect information. The theoretical bases and research carried out were used as a library basis. The statistical population of this research includes all the companies listed on the Tehran Stock Exchange during the financial periods of 2013-2022. According to the systematic elimination method, 217 final samples were selected. According to research findings, there is a positive relationship between low levels of debt and profit quality, but for higher levels of debt, the relationship is negative. This suggests that at high levels of debt, it is preferable to reduce the quality of profits so that they do not suffer losses due to breach of contracts. Also, according to the McNichols model, the results show a statistically significant relationship between the volume of debts and the quality of profits, and the first hypothesis is confirmed. Also, because the probability value of the total debts and the square of the total debts variables is more than 0.05. The quality of profit has a significant and non-linear effect on the volume of short-term debt in companies listed on the Tehran Stock Exchange. That is, no U-shaped or inverted U-shaped effect has been seen in this relationship; the relationship between the quality of profit and the amount of short-term debt is not a direct linear relationship, so that an increase (decrease) in ownership will not change the amount of short-term debt. Also, there is a significant and positive relationship between accounting profit management and short-term debt maturity. In fact, managers have a greater incentive to manage earnings by using short-term debt. This result is consistent with the debt contract hypothesis and financial helplessness theory. Therefore, according to the McNichols model, the non-linear relationship between the volume of debts and the quality of profit is also related to short-term debts and not only long-term debts. In this way, based on this model, the second hypothesis is rejected.

Keywords: non-linear model, debt volume, profit quality, McNichols model, modified Jones model
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*Corresponding author
Email addresses: javadmirabbasi@yahoo.com (Javad Mirabbasi), az_jahanshad@yahoo.com (Azita Jahanshad), zahra.poorzamani@yahoo.com (Zahra Pourzamani)

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1 Introduction

The theory of profit quality was first proposed by financial analysts and stock brokers, because they felt that the reported profit does not show the power of profit as it is imagined in the mind. They found that predicting future profits based on reported results is a difficult task. In addition, analysts found that the analysis of financial statements of companies is a difficult task due to several weaknesses in measuring accounting information [6]. The basic question is why financial analysts do not use the reported net profit or profit per share of this company in their evaluation and observe the side of caution? The answer is that in determining the value of the company, not only the quantity of profit but also its quality should be considered. The meaning of profit quality is the potential basis of profit growth and the probability of realization in the coming years; In other words, the value of a share does not depend only on the profit per share of the current year of the company, but it depends on the expectation of the future of the company and the profitability of the coming years and the confidence factor about it [11, 12].

Profit as a guide for dividend payments, a tool for measuring management effectiveness and measuring success in management performance, and a tool for predicting and evaluating decisions, has always been used by investors, managers and financial analysts. In other words, profit is considered as one of the most important information in economic decisions, and for this reason, the studies and research conducted about profit form one of the largest and most research efforts in the history of accounting [14, 15]. On the other hand, based on the theoretical foundations of financial reporting, the primary goal of financial reporting is to help investors in making economic decisions. Financial market activists need financial information for their economic decisions and invest in an economic unit when they have enough information about it [16, 20]. The purpose of preparing financial statements is to provide information about financial status and performance results. Participants in the capital market are always looking for quality financial information, and the information must have the necessary quality to influence users' decisions. The quality of the prepared information depends on various factors such as timeliness, impartiality, predictability, etc., and the mentioned factors affect the relevance of accounting information (such as profit per share) [21].

Financing through debt is considered a more favourable solution for financing due to tax savings and its lower rate compared to the expected return of shareholders [23]. However, what is important for lenders in terms of granting loans and credit is the ability to pay the principal and interest of the loan and credits paid by the borrower [24]. Generally, one of the solutions that lenders pay attention to to evaluate the ability to pay the principal and interest of the loan is to examine the financial statements of companies, among which the profit and loss statement and especially the figure of profit before interest is of particular importance [25]. But what has caused the creditors to worry about the use of accounting profit is the calculation of this figure using the accrual approach [26]. Based on this approach, profit is recognized by the realization of revenues and the occurrence of expenses, regardless of the time of cash exchange.

Therefore, forecasts and estimates are used in the calculation of profit, which makes it possible to manipulate the profit by the management, and the quality of reported profit, that is, the ability of profit to predict future cash flows, is questioned [33, 34].

If interest predicts future cash flows more accurately, lenders will have less risk, because they can more accurately estimate the risk of the ability to pay the debt and reduce the possibility of being harmed due to incorrect granting of credit [36]. Therefore, lenders demand more high-quality information, especially high-quality information, to evaluate borrowers' credit. The accounting literature has proposed three different views on how financing through debt affects the motivations, the choice of accounting procedures and management estimates, and, as a result, the quality of profit [19, 27].

The first view is based on the positive effect of financing through debt on the quality of profit. According to this view, the lenders have control and supervision over the borrowers by requesting valid audited financial statements to assess the situation of the borrowers [17]. As a result of this increasing control by creditors, it is expected that with the increase in liabilities, accruals and reported profits, it will have more information about future cash flows and be of better quality, so to speak. On the other hand, lenders react to the quality of borrowers' accounting information [4]. This means that the better the quality of credit recipients' accounting information, the less restrictive the conditions and the lower the interest rates are considered in their loan contracts and vice versa. As a result, the borrowers try to reduce the interest cost and other restrictive conditions of debt contracts by reporting high-quality information [7, 8].

The second point of view is based on the negative effect of financing through debt on the quality of profit. In this view, two reasons for the negative effect of debt on the quality of profit are proposed. First, due to the conflicts of agency between lenders and managers, lenders enter into contracts with borrowers and include conditions and restrictions in the contract in order to preserve their wealth and interests when granting loans and credits.

Violation of these conditions entails costs for borrowers [2]. Therefore, opportunistic managers are motivated to manipulate profit to reduce the possibility of violating the terms of debt contracts, which can cause the destruction of

profit quality [28]. The second reason is that the lenders rely on the financial statements of the companies to evaluate the ability to pay the principal and interest of the loan. As a result, the managers of the companies may manipulate the profit to attract the positive opinion of the creditors so that they can display a favourable image of the company's profitability and attract the required capital [3]. As a result, it can be said that debt hurts the quality of profit [35].

According to the two opposite views regarding the effect of debt on the quality of profit, a third view is proposed. According to them, the reasons presented in both of the above views seem logical. Therefore, it is not expected that the relationship between debt financing and profit quality is a direct or inverse linear relationship; Rather, it is a kind of proportional relationship that is ultimately determined by the action and reaction between the positive and negative effects of financing through debt on the quality of profit. They believe that when the debt level of the companies is low, it is expected that the restrictive conditions contained in their debt contracts are less or do not have any restrictive conditions at all, as a result of which the risk of violating the terms of the contract is reduced and managers are less inclined to manipulate profits and destroy their quality.

Instead, they tend to reduce interest costs and other restrictive covenants by reporting high-quality earnings. On the other hand, when companies have considerable debt, the relationship between debt and profit quality is reversed. In this case, although company managers are motivated to reduce interest costs and other limiting terms of debt contracts through reporting high-quality profits, they also have a high risk of violating the terms of debt contracts [32]. Therefore, it is expected that the managers will use their discretion in the estimation and selection of accounting procedures to avoid violating the terms of such contracts and manipulating profits. In other words, managers prioritize avoiding the violation of the terms of the debt contract over the benefits of high-quality profit reporting. According to the mentioned contents, Gash and Moon believe that the relationship between financing through debt and the quality of profit is a kind of proportional relationship (non-linear) which is ultimately determined by the action and reaction between the positive and negative effects of debt on the quality of profit [29].

In this regard, much research has been carried out, some of which is mentioned:

In a research, Mousavi Shiri et al. [31] examined the relationship between the company's business strategies and management abilities with profit quality during the period of financial crisis (economic recession). For this purpose, they considered the financial crisis as a moderating variable on the relationship between differentiation and cost leadership strategies and the ability to manage profit quality. The results of the research hypotheses test indicate that the financial crisis strengthens the relationship between differentiation strategy and profit quality, weakens the relationship between cost leadership strategy and profit quality, and has no effect on the relationship between management ability and profit quality.

Azad and Rastegari Rad in [9] addressed the nonlinear effect of managerial ownership on the ratio of short-term and long-term debts. In this regard, three hypotheses were proposed, and the relationship between the variables was evaluated. In this research, three criteria (short-term debt-to-asset ratio, long-term debt-to-asset ratio, and total debt-to-asset ratio) have been used for capital structure. To test the hypotheses, the necessary information was collected for 165 companies. Analysis and testing of hypotheses were done by Eviews statistical software and panel data. The results of the research show that ownership management does not have a significant and non-linear effect on the ratio of short-term debt and total debt in companies listed on the Tehran Stock Exchange. However, ownership management has a significant and non-linear and inverted U-shaped effect on the long-term debt ratio in companies listed on the Tehran Stock Exchange.

Eshghi [18] has investigated the relationship between profit quality and three variables of sales, assets and liabilities in Tehran Stock Exchange. This research was conducted to investigate the effects of each of the quality characteristics of profit and their combination under the title of the effect of quality of profit on sales, return on assets and debt ratio.

For this purpose, 108 companies in the Tehran Stock Exchange market were selected as sample companies, and a systematic and targeted method in the period of 2008 to 2013 was selected, and the relationship between the quality of profit and the triple variables of sales, assets and liabilities in the capital market was evaluated.

The results showed that there is no significant relationship between sales variables, debt ratio and profit quality. Also, there is a significant and very weak relationship between the components of profit quality (stability, predictability and conservatism) and return on assets. With the increase in the variability of profit in the changes of stock returns, the amount of sales decreases and with the more stable and repeatable profit, the return on assets increases.

Hasani and Khodami [22] by studying the relationship between managers' behaviour in profit reporting and debt structure, showed that there is a significant and positive relationship between accounting profit management and short-term debt maturity. In fact, managers have a greater incentive to manage earnings by using short-term debt. This result is consistent with the debt contract hypothesis and financial helplessness theory. Other results showed

that income size and volatility have a significant and positive relationship with accounting profit management; while financial leverage, growth, loss, operating cash flow and board size have a significant and negative relationship with accounting profit management.

Bailey [10] states in his research that short-term and long-term debts and dividend payments can be affected by managers' positions. In other words, the fronting of managers will have positive and negative effects on the mentioned components of the company.

Cristiano-Botia et al. [13] in the research titled "Evaluation of the transmission of the monetary policy interest rate to the market interest rates considering agents' expectations" stated that the company's debt contracts create different incentives for managers to apply earnings management. According to many studies in the research literature, companies seek to reduce discretionary accruals to reduce information asymmetry and lead to lower financing costs. However, other studies point out that companies with high levels of debt can act by increasing discretionary accruals to avoid unrealized liabilities. According to these two theories, this paper presents a non-linear relationship between debt and discretionary components of earnings for companies listed in B3 from 2008 to 2015. Evidence shows that there is a positive relationship between low levels of debt and earnings quality, but a negative relationship for higher levels of debt. This suggests that at high levels of debt, it is preferable to reduce the quality of earnings so as not to incur losses due to breach of contracts.

An et al. [5] have studied the role of earnings management in debt financing in a company. According to the results of this research, company managers try to transfer selected information to investors and beneficiaries by using profit manipulation and actually managing profit and placing it at the desired level to use it to achieve their goal in financing. The research results show that companies with better profit management have higher financial leverage.

The hypotheses investigated in the current research include the following:

The first hypothesis: the relationship between the volume of debts and the quality of profit is non-linear.

The second hypothesis: the non-linear relationship between debt volume and profit quality is related to long-term debt and not short-term debt.

2 Research method

The current research method is applied according to the purpose, and the results can be useful for a wide spectrum, including company managers, shareholders, investors, lenders, researchers and standards compilers. The present study is retrospective. This research is descriptive and correlational. The statistical population of this research includes all the companies accepted in the Tehran Stock Exchange, which have been active in the stock exchange since the beginning of 2013 until 2022. In this study, in order for the research sample to be a suitable and homogeneous representative of the desired statistical population, a random method was used to select the sample. In this regard, the statistical sample of this research includes all companies that have the following conditions:

1. They were present in the stock market during the fiscal years 2013 to 2022.
2. The companies should not be part of banks, investment companies, mediation, insurance and monetary and financial institutions. Because the nature of these companies' operations is different from other companies.
3. The end of their financial year is the end of March every year and they have not changed their financial year during the aforementioned period.
4. In all the years under review, the required information and data should be available at the end of the financial year.

The models used to estimate the dependent variable of this research (profit quality) are as described in the following table:

Table 1: Models used to estimate and estimate profit quality

Equation	Model	Calculation method
1	Adjusted Jones model [14]	$AC_{it}/A_{it-1} = \alpha/A_{it-1} + \beta_1([\Delta ROL_{it}/A_{it-1}]-[\Delta CR_{it}/A_{it-1}]) + \beta_2[Imob_{it}/A_{it-1}] + \varepsilon_{it}$
2	McNichols [30]	$\Delta CG_{it}/ATM_{it} = \beta_0+\beta_1[FCO_{it-1}/ATM_{it}]+\beta_2[FCO_{it}/ATM_{it}]+\beta_3[FCO_{it+1}/ATM_{it}]+ \beta_4[\Delta ROL_{it}/ATM_{it}] + \beta_5[Imob_{it}/ATM_{it}] + \varepsilon_{it}$

The main research model is as follows:

$$\begin{aligned}\text{Discretionary Accruals}_{it} = {} & \beta_0 + \beta_1 Debt_{it} + \beta_2 Debt_{it}^2 + \beta_3 \text{Operational Cycle}_{it} + \beta_4 Size_{it} + \beta_5 Receipt_{it} \\ & + \beta_6 \text{Cash Flow}_{it} + \beta_7 Loss_{it} + \beta_8 \text{Debt Cost}_{it} + \beta_9 Z - score_{it} + \beta_{10} Growth_{it} \\ & + \beta_{11} \text{Gross Margin}_{it} + \beta_{12} Age_{it} + \beta_{13} ROA_{it} + \varepsilon_{it}\end{aligned}$$

2.1 Variables

The operational definition of research model variables is as follows:

Table 2: Operational definition of research variables

Row	Variable symbol	Variable name	Variable type	Operational definition
1	Discretionary Accruals It	Accrual items	Dependent	It is estimated according to the information in Table 1.
2	Debt	Debts	Independent	Total debts of the company at the end of the financial year
3	$Debt^2$	Debts squared	Independent	Total debts of the company at the end of the financial year to the power of 2
4	Operational Cycle_{it}	Business cycle	control	The natural logarithm of the average operating cycle of the company in each year
5	$Size_{it}$	size of the company	control	The natural logarithm of the company's total assets at the end of the financial year
6	Receipt	Accounts Receivable	control	The balance of accounts receivable divided by the total assets of the company at the end of the financial year
7	Cash Flow_{it}	cash flow	control	Cash flow from operating activities
8	$Loss_{it}$	loss	control	It is dummy variable, if the company is losing, the number will be one and otherwise it will be zero
9	Debt Cost_{it}	debt cost	control	The ratio of financial expenses to the average total debts
10	$Z - score_{it}$	Bankruptcy	control	It is calculated using the modified Altman model
11	Growth	Sales growth	control	Current year's sales minus last year's sales divided by last year's sales
12	Gross Margin_{it}	Operating profit growth	control	Current year's operating profit minus last year's operating profit divided by last year's operating profit
13	ROE_i	Return on equity	control	Operating profit to total equity at the end of the financial year
14	ROA_i	Return on assets	control	Operating profit to total assets at the end of the financial year

3 Findings

In panel analysis, the data are collected cross-sectionally, that is, the data collected for different sections (here, companies) over time. In the data collected in this way, the independence of the observations is not maintained because several observations have been repeated from each company in different years, and these observations are interdependent (because they belong to the same company). Panel analysis is used to analyze this type of data. In the discussion of panel analysis, there are three types of models without fixed effects, with fixed effects and with random effects, and different tests are used to identify the appropriate model.

3.1 Model selection

In this section, the appropriate model is selected from among the models (integrated model, model with fixed effects, or model with random effects). The results of the Chow and Hausman test to identify the appropriate model are presented in the table below:

Table 3: Chow test and Hausman test to select the appropriate model

Models	Hausman test			Chow or Lemer test			Result
	Chi-square value	Freedom degree	p-value	value	Freedom degree	p-value	
First model	31.97	13	0.002	1.90	203.2012	0.000	Fixed effects model
				391.35	203	0.000	

Second model	72.00	13	0.000	1.64	203.1808	0.000	Fixed effects model
				341.51	203	0.000	
Third model	35.03	13	0.001	1.94	203.2010	0.000	Fixed effects model
				397.66	203	0.000	
Forth model	63.94	13	0.000	1.66	203.1808	0.000	Fixed effects model
				346.35	203	0.000	
Fifth model	31.03	13	0.003	1.92	203.2010	0.000	Fixed effects model
				395.58	203	0.000	
Sixth model	65.67	13	0.000	1.63	203.1806	0.000	Fixed effects model
				341.30	203	0.000	

The probability value of Chow's test for the first to twelfth model is all equal to 0.000, which is less than 0.05.

Therefore, the used models are the type of models with effects, based on the Hausman test, the probability values for the first to twelfth models are less than 0.05, which indicates a model with fixed effects.

In the following, this type of model (model with fixed effects) has been used to examine the hypotheses.

3.1.1 The first model: (adjusted Jones - total debt)

In this section, panel analysis is used to evaluate and estimate the overall model.

$$\begin{aligned}\text{Discretionary Accruals}_{it} = {} & \beta_0 + \beta_1 Debt_{it} + \beta_2 Debt_{it}^2 + \beta_3 \text{Operational Cycle}_{it} + \beta_4 Size_{it} + \beta_5 Receipt_{it} \\ & + \beta_6 \text{Cash Flow}_{it} + \beta_7 Loss_{it} + \beta_8 \text{Debt Cost}_{it} + \beta_9 Z - score_{it} + \beta_{10} Growth_{it} \\ & + \beta_{11} \text{Gross Margin}_{it} + \beta_{12} Age_{it} + \beta_{13} ROA_{it} + \beta_{14} \text{Corporate Gov.}_{it} \\ & + \beta_{15} \text{Audited Big 4}_{it} + \sum \beta_j Segment_i^j + \varepsilon_{it}\end{aligned}$$

The null hypothesis and the opposite hypothesis in this model are as follows:

$$\begin{cases} H_0 & : \beta_1 = \beta_2 = ... = \beta_{23} = 0, \\ H_1 & : \beta_i \neq 0 \ i = 1, 2, ..., 23 \end{cases}$$

$$\begin{cases} H_0 : & \text{There is no meaningful model.} \\ H_1 & \text{There is a meaningful model.} \end{cases}$$

In the table below, the model with fixed effects is estimated, and the significance probability value of F for this model is equal to 0.000. This value is less than 0.05, so the null hypothesis is rejected at the 95% confidence level, that is, there is a significant model at the 95% confidence level. The coefficient of determination is equal to 0.23, that is, about 23% of the changes in the dependent variable are expressed by the independent and control variables.

The value of the Watson camera statistic is equal to 2.04; the values close to 2 indicate the lack of autocorrelation of the residuals, which is another hypothesis of regression (Therefore, there is no autocorrelation between the residuals).

Table 4: Estimation and testing of the parameters of the first model

Parameters	**The amount of coefficients**	**t value**	**p-value**	**result**	**VIF**
Constant	-5.245	-7.25	0.000	Meaningful and negative	–
$Debt_{it}$	8.940E-09	4.47	0.000	Meaningful and positive	4.86
$Debt_{it}^2$	-5.190E-17	-3.52	0.000	Meaningful and negative	4.28
Operational Cycle_{it}	0.040	1.26	0.208	meaningless	1.55
$Size_{it}$	0.160	2.44	0.015	Meaningful and positive	2.76
$Receipt_i$	0.295	1.37	0.171	meaningless	1.10
Cash Flow_{it}	2.590E-09	0.36	0.716	meaningless	2.43
$Loss_{it}$	0.583	5.92	0.000	Meaningful and positive	1.60
Debt Cost_{it}	1.317	1.60	0.109	meaningless	1.16
$Z - score_{it}$	-0.136	-2.67	0.008	Meaningful and negative	1.66
Growth	0.167	3.95	0.000	Meaningful and positive	1.64
Gross Margin_{it}	0.003	0.32	0.751	meaningless	1.14
Age	-0.011	-0.74	0.461	meaningless	1.05
ROA_i	1.114	3.72	0.000	Meaningful and positive	2.10
F p-value	0.000		F-value	2.74	
Durbin Watson	2.04		coefficient of determination	0.23	

VIF (Variance Increment Factor) values are an indicator to check the collinearity between independent variables. If its 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, and its highest value is 4.86 (for the Debtit variable).

The value of the t statistic for $Debt_{it}$ is equal to 4.47, and for $Debt_{it}^2$ is equal to -3.52. These values are in the region of rejecting the null hypothesis, so the relationship between $Debt_{it}$ and the dependent variable is significant and positive, and the relationship between $Debt_{it}^2$ and the dependent variable is significant and negative. Therefore, the first hypothesis of this research is confirmed. Also, the value of the t statistic for $Size_{it}$ is equal to 2.44, because these values are in the region of rejecting the null hypothesis, so the relationship between $Size_{it}$ and the dependent variable is significant and positive. Finally, the relationship between the control variables $Loss_{it}$, Growth and ROA_i with the dependent variable is significant and positive, and the relationship between the $Z - score_{it}$ variable and the dependent variable is negative and significant. The other variables do not have a significant relationship with the dependent variable.

3.1.2 The second model: (McNichols - total debt)

In this section, panel analysis is used to evaluate and estimate the overall model.

$$\begin{aligned}\text{Discretionary Accruals}_{it} = \beta_0 &+ \beta_1 Debt_{it} + \beta_2 Debt_{it}^2 + \beta_3 \text{Operational Cycle}_{it} + \beta_4 Size_{it} + \beta_5 Receipt_{it} \\ &+ \beta_6 \text{Cash Flow}_{it} + \beta_7 Loss_{it} + \beta_8 \text{Debt Cost}_{it} + \beta_9 Z - score_{it} + \beta_{10} Growth_{it} \\ &+ \beta_{11} \text{Gross Margin}_{it} + \beta_{12} Age_{it} + \beta_{13} ROA_{it} + \beta_{14} \text{Corporate Gov.}_{it} \\ &+ \beta_{15} \text{Audited Big 4}_{it} + \sum \beta_j Segment_i^j + \varepsilon_{it}\end{aligned}$$

The null hypothesis and the opposite hypothesis in this model are as follows:

$$\begin{cases} H_0 & : \beta_1 = \beta_2 = ... = \beta_{23} = 0, \\ H_1 & : \beta_i \neq 0 \ i = 1, 2, ..., 23 \end{cases}$$

$$\begin{cases} H_0 : & \text{There is no meaningful model.} \\ H_1 & \text{There is a meaningful model.} \end{cases}$$

In the table below, the model with fixed effects is estimated, and the significance probability value of F for this model is equal to 0.000. This value is less than 0.05, so the null hypothesis is rejected at the 95% confidence level, that is, there is a significant model at the 95% confidence level. The coefficient of determination is equal to 0.24, that is, about 24% of the changes in the dependent variable are expressed by the independent and control variables.

The value of the Watson camera statistic is equal to 2.08; the values close to 2 indicate the lack of autocorrelation of the residuals, which is another hypothesis of regression (Therefore, there is no autocorrelation between the residuals).

Table 5: Estimation and testing of the parameters of the second model

Parameters	**The amount of coefficients**	**t value**	**p-value**	**result**	**VIF**
Constant	-6.032	-6.46	0.000	Meaningful and negative	–
$Debt_{it}$	1.440E-08	6.16	0.000	Meaningful and positive	4.25
$Debt_{it}^2$	-5.020E-17	-2.61	0.009	Meaningful and negative	4.01
Operational Cycle_{it}	0.236	6.82	0.000	Meaningful and positive	1.56
$Size_{it}$	0.238	2.88	0.004	Meaningful and positive	2.66
$Receipt_i$	0.629	2.59	0.010	Meaningful and positive	1.11
Cash Flow_{it}	3.660E-09	0.40	0.689	meaningless	2.38
$Loss_{it}$	0.416	3.82	0.000	Meaningful and positive	1.62
Debt Cost_{it}	-3.531	-3.80	0.000	Meaningful and negative	1.18
$Z - score_{it}$	-0.148	-2.61	0.009	Meaningful and negative	1.64
Growth	0.096	2.03	0.042	Meaningful and positive	1.65
Gross Margin_{it}	-0.001	-0.07	0.943	meaningless	1.16
Age	-0.074	-4.10	0.000	Meaningful and negative	1.05
ROA_i	1.645	4.78	0.000	Meaningful and positive	2.07
F p-value	0.000		F-value	2.65	
Durbin Watson	2.08		coefficient of determination	0.24	

VIF (Variance Increment Factor) values are an indicator to check the collinearity between independent variables. If its 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, and its highest value is 4.25 (for $Debt_{it}$ variable).

The value of the t statistic for $Debt_{it}$ is equal to 6.16, and for $Debt_{it}^2$ is equal to -2.61. These values are in the region of rejecting the null hypothesis, so the relationship between $Debt_{it}$ and the dependent variable is significant and positive, and the relationship between $Debt_{it}^2$ and the dependent variable is significant and negative. Therefore, the first hypothesis of this research is confirmed. Also, the value of the t-statistic for Operational Cycle$_{it}$ is equal to 6.82, and for $Size_{it}$ is equal to 2.88. These values are in the region of rejecting the null hypothesis. Therefore, the relationship of Operational Cycle$_{it}$ with the dependent variable is significant and positive, and the relationship of $Size_{it}$ with the dependent variable is significant and negative. Finally, the relationship between the control variables $Loss_{it}$, Growth and ROA_i with the dependent variable is significant and positive, and the relationship between the $Z-score_{it}$ variable and the dependent variable is negative and significant. The other variables do not have a significant relationship with the dependent variable.

3.1.3 The third model: (adjusted Jones - short-term debt)

In this section, panel analysis is used to evaluate and estimate the overall model.

$$\begin{aligned}\text{Discretionary Accruals}_{it} = \beta_0 &+ \beta_1 Debt_{it} + \beta_2 Debt_{it}^2 + \beta_3 \text{Operational Cycle}_{it} + \beta_4 Size_{it} + \beta_5 Receipt_{it} \\ &+ \beta_6 \text{Cash Flow}_{it} + \beta_7 Loss_{it} + \beta_8 \text{Debt Cost}_{it} + \beta_9 Z - score_{it} + \beta_{10} Growth_{it} \\ &+ \beta_{11} \text{Gross Margin}_{it} + \beta_{12} Age_{it} + \beta_{13} ROA_{it} + \beta_{14} \text{Corporate Gov.}_{it} \\ &+ \beta_{15} \text{Audited Big 4}_{it} + \sum \beta_j Segment_i^j + \varepsilon_{it}\end{aligned}$$

The null hypothesis and the opposite hypothesis in this model are as follows:

$$\begin{cases} H_0 & : \beta_1 = \beta_2 = ... = \beta_{23} = 0, \\ H_1 & : \beta_i \neq 0 \ i = 1, 2, ..., 23 \end{cases}$$

$$\begin{cases} H_0 : & \text{There is no meaningful model.} \\ H_1 & \text{There is a meaningful model.} \end{cases}$$

In the table below, the model with fixed effects is estimated, and the significance probability value of F for this model is equal to 0.000. This value is less than 0.05, so the null hypothesis is rejected at the 95% confidence level, that is, there is a significant model at the 95% confidence level. The coefficient of determination is equal to 0.23, that is, about 23% of the changes in the dependent variable are expressed by the independent and control variables.

The value of the Watson camera statistic is equal to 2.05; values close to 2 indicate the lack of autocorrelation of the residuals, which is another hypothesis of regression (Therefore, there is no autocorrelation between the residuals).

Table 6: Estimation and testing of the parameters of the third model

Parameters	**The amount of coefficients**	**t value**	**p-value**	**result**	**VIF**
Constant	-4.988	-6.87	0.000	Meaningful and negative	–
$Debt_{it}$	1.720E-08	4.34	0.000	Meaningful and positive	4.86
$Debt_{it}^2$	-2.020E-16	-4.83	0.000	Meaningful and negative	4.28
Operational Cycle$_{it}$	0.041	1.29	0.197	meaningless	1.55
$Size_{it}$	0.139	2.12	0.034	Meaningful and positive	2.76
$Receipt_i$	0.258	1.20	0.231	meaningless	1.10
Cash Flow$_{it}$	5.200E-09	0.76	0.446	meaningless	2.43
$Loss_{it}$	0.580	5.89	0.000	Meaningful and positive	1.60
Debt Cost$_{it}$	1.340	1.63	0.103	meaningless	1.16
$Z - score_{it}$	-0.127	-2.49	0.013	Meaningful and negative	1.66
Growth	0.174	4.12	0.000	Meaningful and positive	1.64
Gross Margin$_{it}$	0.005	0.46	0.649	meaningless	1.14
Age	-0.009	-0.61	0.543	meaningless	1.05
ROA_i	1.027	3.43	0.001	Meaningful and positive	2.10
F p-value	0.000		F-value	2.77	
Durbin Watson	2.05		coefficient of determination	0.23	

VIF (Variance Increment Factor) values are an indicator to check the collinearity between independent variables. If its 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, and its highest value is 4.86 (for the $Debt_{it}$ variable).

The value of the t-statistic for $Debt_{it}$ is equal to 4.34, and for $Debt_{it}^2$ is equal to -4.83. These values are in the area of rejecting the null hypothesis, so the relationship between $Debt_{it}$ and the dependent variable is significant and

positive, and the relationship between $Debt_{it}^2$ and the dependent variable is significant and negative. Also, the value of the t statistic for $Size_{it}$ is equal to 2.12, because these values are in the region of rejecting the null hypothesis, so the relationship between $Size_{it}$ and the dependent variable is significant and positive. Finally, the relationship between the control variables $Loss_{it}$, Growth and ROA_i with the dependent variable is significant and positive, and the relationship between the $Z-score_{it}$ variable and the dependent variable is negative and significant. The other variables do not have a significant relationship with the dependent variable.

3.1.4 The fourth model: (McNichols - short-term debt)

In this section, panel analysis is used to evaluate and estimate the overall model.

$$\begin{aligned}\text{Discretionary Accruals}_{it} = \beta_0 &+ \beta_1 Debt_{it} + \beta_2 Debt_{it}^2 + \beta_3 \text{Operational Cycle}_{it} + \beta_4 Size_{it} + \beta_5 Receipt_{it} \\ &+ \beta_6 \text{Cash Flow}_{it} + \beta_7 Loss_{it} + \beta_8 \text{Debt Cost}_{it} + \beta_9 Z-score_{it} + \beta_{10} Growth_{it} \\ &+ \beta_{11} \text{Gross Margin}_{it} + \beta_{12} Age_{it} + \beta_{13} ROA_{it} + \beta_{14} \text{Corporate Gov.}_{it} \\ &+ \beta_{15} \text{Audited Big 4}_{it} + \sum \beta_j Segment_i^j + \varepsilon_{it}\end{aligned}$$

The null hypothesis and the opposite hypothesis in this model are as follows:

$$\begin{cases} H_0 & : \beta_1 = \beta_2 = ... = \beta_{23} = 0, \\ H_1 & : \beta_i \neq 0 \ i = 1, 2, ..., 23 \end{cases}$$

$$\begin{cases} H_0 : & \text{There is no meaningful model.} \\ H_1 & \text{There is a meaningful model.} \end{cases}$$

In the table below, the model with fixed effects is estimated, and the significance probability value of F for this model is equal to 0.000. This value is less than 0.05, so the null hypothesis is rejected at the 95% confidence level, that is, there is a significant model at the 95% confidence level. The coefficient of determination is equal to 0.23, that is, about 23% of the changes in the dependent variable are expressed by the independent and control variables.

The value of the Watson camera statistic is equal to 2.07; values close to 2 indicate the lack of autocorrelation of the residuals, which is another hypothesis of regression (Therefore, there is no autocorrelation between the residuals).

Table 7: Estimation and testing of the parameters of the fourth model

Parameters	**The amount of coefficients**	**t value**	**p-value**	**result**	**VIF**
Constant	-5.974	-6.25	0.000	Meaningful and negative	–
$Debt_{it}$	1.470E-08	2.96	0.003	Meaningful and positive	4.25
$Debt_{it}^2$	-1.240E-16	-2.70	0.007	Meaningful and negative	4.01
Operational Cycle_{it}	0.242	6.94	0.000	Meaningful and positive	1.56
$Size_{it}$	0.226	2.68	0.007	Meaningful and positive	2.66
$Receipt_i$	0.601	2.45	0.014	Meaningful and positive	1.11
Cash Flow_{it}	3.360E-09	0.35	0.726	meaningless	2.38
$Loss_{it}$	0.410	3.73	0.000	Meaningful and positive	1.62
Debt Cost_{it}	-3.342	-3.57	0.000	Meaningful and negative	1.18
$Z-score_{it}$	-0.135	-2.35	0.019	Meaningful and negative	1.64
Growth	0.109	2.29	0.022	Meaningful and positive	1.65
Gross Margin_{it}	0.002	0.13	0.897	meaningless	1.16
Age	-0.069	-3.78	0.000	Meaningful and negative	1.05
ROA_i	1.561	4.49	0.000	Meaningful and positive	2.07
F p-value	0.000		F-value	2.47	
Durbin Watson	2.07		coefficient of determination	0.23	

VIF (Variance Increment Factor) values are an indicator to check the collinearity between independent variables. If its 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, and its highest value is 4.86 (for the $Debt_{it}$ variable).

The value of the t-statistic for $Debt_{it}$ is equal to 2.96, and for $Debt_{it}^2$ is equal to -2.70. These values are in the area of rejecting the null hypothesis, so the relationship between $Debt_{it}$ and the dependent variable is significant and positive, and the relationship between $Debt_{it}^2$ and the dependent variable is significant and negative. Also, the value of the t-statistic for $Size_{it}$ is equal to 2.68, because these values are in the region of rejecting the zero hypothesis; therefore, the relationship between $Size_{it}$ and the dependent variable is significant and positive. Finally, the relationship between the

control variables $Loss_{it}$, Growth and ROA_i with the dependent variable is significant and positive, and the relationship between the $Z-score_{it}$ variable and the dependent variable is negative and significant. The other variables do not have a significant relationship with the dependent variable.

3.1.5 The fifth model: (modified Jones - long-term debt)

In this section, panel analysis is used to evaluate and estimate the overall model.

$$\begin{aligned}\text{Discretionary Accruals}_{it} = \beta_0 &+ \beta_1 Debt_{it} + \beta_2 Debt_{it}^2 + \beta_3 \text{Operational Cycle}_{it} + \beta_4 Size_{it} + \beta_5 Receipt_{it} \\ &+ \beta_6 \text{Cash Flow}_{it} + \beta_7 Loss_{it} + \beta_8 \text{Debt Cost}_{it} + \beta_9 Z-score_{it} + \beta_{10} Growth_{it} \\ &+ \beta_{11} \text{Gross Margin}_{it} + \beta_{12} Age_{it} + \beta_{13} ROA_{it} + \beta_{14} \text{Corporate Gov.}_{it} \\ &+ \beta_{15} \text{Audited Big 4}_{it} + \sum \beta_j Segment_i^j + \varepsilon_{it}\end{aligned}$$

The null hypothesis and the opposite hypothesis in this model are as follows:

$$\begin{cases} H_0 & : \beta_1 = \beta_2 = ... = \beta_{23} = 0, \\ H_1 & : \beta_i \neq 0 \ i = 1, 2, ..., 23 \end{cases}$$

$$\begin{cases} H_0 : & \text{There is no meaningful model.} \\ H_1 & \text{There is a meaningful model.} \end{cases}$$

In the table below, the model with fixed effects is estimated, and the significance probability value of F for this model is equal to 0.000. This value is less than 0.05, so the null hypothesis is rejected at the 95% confidence level, that is, there is a significant model at the 95% confidence level. The coefficient of determination is equal to 0.24, that is, about 22% of the changes in the dependent variable are expressed by the independent and control variables.

The value of the Watson camera statistic is equal to 2.05; values close to 2 indicate the lack of autocorrelation of the residuals, which is another hypothesis of regression (Therefore, there is no autocorrelation between the residuals).

Table 8: Estimation and testing of the parameters of the fifth model

Parameters	**The amount of coefficients**	**t value**	**p-value**	**result**	**VIF**
Constant	-5.510	-7.66	0.000	Meaningful and negative	–
$Debt_{it}$	-3.140E-08	-2.16	0.031	Meaningful and negative	4.86
$Debt_{it}^2$	1.220E-15	2.17	0.030	Meaningful and positive	4.28
Operational Cycle_{it}	0.054	1.72	0.086	meaningless	1.55
$Size_{it}$	0.172	2.64	0.008	Meaningful and positive	2.76
$Receipt_i$	0.269	1.25	0.212	meaningless	1.10
Cash Flow_{it}	9.450E-09	1.38	0.169	meaningless	2.43
$Loss_{it}$	0.579	5.88	0.000	Meaningful and positive	1.60
Debt Cost_{it}	1.621	1.97	0.049	Meaningful and positive	1.16
$Z-score_{it}$	-0.133	-2.61	0.009	Meaningful and negative	1.66
Growth	0.184	4.36	0.000	Meaningful and positive	1.64
Gross Margin_{it}	0.004	0.35	0.727	meaningless	1.14
Age	-0.010	-0.61	0.541	meaningless	1.05
ROA_i	1.050	3.52	0.000	Meaningful and positive	2.10
F p-value	0.000		F-value	2.67	
Durbin Watson	2.05		coefficient of determination	0.22	

VIF (Variance Increment Factor) values are an indicator to check the collinearity between independent variables. If its 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, and its highest value is 4.86 (for the $Debt_{it}$ variable).

The value of the t-statistic for $Debt_{it}$ is equal to -2.16, and for $Debt_{it}^2$ is equal to 2.17. These values are in the region of rejecting the null hypothesis, so the relationship between $Debt_{it}$ and the dependent variable is significant and negative, and the relationship between $Debt_{it}^2$ and the dependent variable is significant and positive. Also, the value of the t statistic for $Size_{it}$ is equal to 2.64, because these values are in the region of rejecting the null hypothesis, so the relationship between $Size_{it}$ and the dependent variable is significant and positive. Finally, the relationship between the control variables $Loss_{it}$, Growth and ROA_i with the dependent variable is significant and positive, and the relationship between the $Z-score_{it}$ variable and the dependent variable is negative and significant. The other variables do not have a significant relationship with the dependent variable.

3.1.6 The sixth model: (McNichols - long-term debt)

In this section, panel analysis is used to evaluate and estimate the overall model.

$$\begin{aligned}\text{Discretionary Accruals}_{it} = \beta_0 &+ \beta_1 Debt_{it} + \beta_2 Debt_{it}^2 + \beta_3 \text{Operational Cycle}_{it} + \beta_4 Size_{it} + \beta_5 Receipt_{it} \\ &+ \beta_6 \text{Cash Flow}_{it} + \beta_7 Loss_{it} + \beta_8 \text{Debt Cost}_{it} + \beta_9 Z - score_{it} + \beta_{10} Growth_{it} \\ &+ \beta_{11} \text{Gross Margin}_{it} + \beta_{12} Age_{it} + \beta_{13} ROA_{it} + \beta_{14} \text{Corporate Gov.}_{it} \\ &+ \beta_{15} \text{Audited Big 4}_{it} + \sum \beta_j Segment_i^j + \varepsilon_{it}\end{aligned}$$

The null hypothesis and the opposite hypothesis in this model are as follows:

$$\begin{cases} H_0 & : \beta_1 = \beta_2 = ... = \beta_{23} = 0, \\ H_1 & : \beta_i \neq 0 \ i = 1, 2, ..., 23 \end{cases}$$

$$\begin{cases} H_0 : & \text{There is no meaningful model.} \\ H_1 & \text{There is a meaningful model.} \end{cases}$$

In the table below, the model with fixed effects is estimated, and the significance probability value of F for this model is equal to 0.000. This value is less than 0.05, so the null hypothesis is rejected at the 95% confidence level, that is, there is a significant model at the 95% confidence level. The coefficient of determination is equal to 0.22, that is, about 22% of the changes in the dependent variable are expressed by the independent and control variables.

The value of the Watson camera statistic is equal to 2.07; values close to 2 indicate the lack of autocorrelation of the residuals, which is another hypothesis of regression. (Therefore, there is no autocorrelation between the residuals).

Table 9: Estimation and testing of the parameters of the sixth model

Parameters	**The amount of coefficients**	**t value**	**p-value**	**result**	**VIF**
Constant	-6.300	-6.71	0.000	Meaningful and negative	–
$Debt_{it}$	3.080E-08	1.98	0.046	Meaningful and positive	4.25
$Debt_{it}^2$	-3.560E-16	-0.55	0.580	meaningless	4.01
Operational Cycle_{it}	0.237	6.80	0.000	Meaningful and positive	1.56
$Size_{it}$	0.254	3.05	0.002	Meaningful and positive	2.66
$Receipt_i$	0.652	2.66	0.008	Meaningful and positive	1.11
Cash Flow_{it}	4.960E-09	0.54	0.586	meaningless	2.38
$Loss_{it}$	0.422	3.83	0.000	Meaningful and positive	1.62
Debt Cost_{it}	-3.314	-3.53	0.000	Meaningful and negative	1.18
$Z - score_{it}$	-0.140	-2.44	0.015	Meaningful and negative	1.64
Growth	0.101	2.13	0.034	Meaningful and positive	1.65
Gross Margin_{it}	0.003	0.26	0.795	meaningless	1.16
Age	-0.071	-3.90	0.000	Meaningful and negative	1.05
ROA_i	1.626	4.68	0.000	Meaningful and positive	2.07
F p-value	0.000		F-value	2.41	
Durbin Watson	2.07		coefficient of determination	0.22	

VIF (Variance Increment Factor) values are an indicator to check the collinearity between independent variables. If its value is higher than 10, there is a possibility of collinearity between independent variables. The amount of this index for the variables is less than 10, and its highest value is equal to 4.86 (for the $Debt_{it}$ variable).

The value of the t-statistic for $Debt_{it}$ is equal to 1.98, and for $Debt_{it}^2$ is equal to -0.55. These values are in the region of rejecting the zero hypothesis, so the relationship between $Debt_{it}$ and the dependent variable is significant and positive, and the relationship between $Debt_{it}^2$ and the dependent variable is significant and negative. Also, the value of the t-statistic for $Size_{it}$ is equal to 3.05. Because these values are in the region of rejecting the null hypothesis, therefore, the relationship between $Size_{it}$ and the dependent variable is significant and positive. Finally, the relationship between the control variables $Size_{it}$, Growth and ROA_i with the dependent variable is significant and positive, and the relationship between the $Z - score_{it}$ variable and the dependent variable is negative and significant. The other variables do not have a significant relationship with the dependent variable.

The results from the third to sixth models show that considering that the t-statistic in the adjusted Jones model is 4.34 for short-term debt (compared to 2.16 for long-term debt). The amount of the above statistic for the square of short-term debts is equal to 4.83 (compared to long-term debts, which is equal to 2.17). It is clear that according to the modified Jones model, the nonlinear relationship between the volume of debts and the quality of profit is related to short-term debt and not long-term debt. Therefore, the second hypothesis is rejected.

Also, considering that the t-statistic in the McNichols model for short-term debts is equal to 2.96 (compared to long-term debts which is equal to 1.98) and the above statistic for the square of short-term debts is equal to 2.70 (compared to long-term debts which were meaningless), it is clear that according to the McNichols model, the non-linear relationship between the volume of debts and the quality of profit is related to short-term debts and not long-term debts. Therefore, the second hypothesis is rejected.

4 Conclusion

Hypothesis 1: The relationship between the volume of debts and the quality of profit is non-linear.

According to the modified Jones model, the probability value of the variables of total debts and the square of total debts is more than 0.05; as a result, they have a statistically significant relationship with the dependent variable (profit quality). According to the results obtained from the estimation and testing of the research model, it is clear that the first hypothesis of the current research, that the relationship between the volume of debts and the quality of profit is non-linear, is confirmed. This result is consistent with the research findings of Cristiano-Botia et al. [13], confirming the existence of a non-linear relationship between debts and profit quality. That is, the company's debt contracts create different incentives for managers to apply earnings management.

Also, according to the findings of Mousavi Shiri [31], financing through debt is considered a more favorable solution for financing due to tax savings and its lower rate compared to shareholders' returns; But what is important for lenders in terms of granting loans and credit is the ability to pay the principal and interest of the loan and credits paid by the borrower. In general, one of the solutions that lenders pay attention to to evaluate the ability to pay the principal and interest of the loan is to examine the financial statements of companies, among which the profit and loss statement and especially the figure of profit before interest is of particular importance; But what has caused the creditors to worry about the use of accounting profit is the calculation of this figure using the accrual approach. Based on this approach, profit is recognized when revenues are realized and expenses are incurred, regardless of the time of cash exchange. Therefore, forecasts and estimates are used in the calculation of profit, which makes it possible to manipulate profit by the management and casts doubt on the quality of the reported profit, that is, the ability of profit to predict future cash flows. If profits predict future cash flows more accurately, lenders will take less risk, because they can estimate the risk of the ability to pay the debt more accurately and reduce the possibility of being harmed in the wrong granting of credit; Therefore, lenders demand more quality information, especially quality interest and away from any manipulation, to evaluate borrowers' credit.

The value of the t statistic for $Debt_{it}$ is equal to 4.47, and for Debtit2 is equal to -3.52. These values are in the region of rejecting the null hypothesis, so the relationship between $Debt_{it}$ and the dependent variable is significant and positive, and the relationship between Debtit2 and the dependent variable is significant and negative. Therefore, the first hypothesis of this research is confirmed.

Evidence shows that there is a positive relationship between low levels of debt and earnings quality, but a negative relationship for higher levels of debt. This suggests that at high levels of debt, it is preferable to reduce the quality of profits so that they do not suffer losses due to breach of contracts. Also, according to the McNichols model, the results show a statistically significant relationship between the volume of debts and the quality of profit. Because the probability value of total debts and the square of total debts variables is more than 0.05.

Hypothesis 2: The non-linear relationship between debt volume and profit quality is related to long-term debt and not short-term debt.

Considering that the t-statistic in the adjusted Jones model for short-term debts is equal to 4.34 and the above-mentioned statistic for the square of short-term debts is equal to 4.83, it is clear that, according to the modified Jones model, the non-linear relationship between the volume of debts and the quality of profits related to short-term debts is also correct, and not only long-term debt. Therefore, the second hypothesis is rejected.

Other empirical evidence, according to the research of An et al. [5] and Abbaszadeh and Razzaghi [1], shows that the quality of profit has no significant and non-linear effect on the ratio of short-term debt in companies listed on the Tehran Stock Exchange. That is, no U-shaped or inverted U-shaped effect has been seen in this relationship; the relationship between profit quality and short-term debt ratio is not a direct linear relationship, so that an increase (decrease) in ownership will not change the amount of short-term debt.

A short-term management horizon increases the self-interested behaviour of the manager, and its result is also reflected in the capital structure decisions. Hasani and Khodami [22] also studied the relationship between managers' behaviour in profit reporting and debt structure, and showed that there is a significant and positive relationship

between accounting profit management and short-term debt maturity. In fact, managers have a greater incentive to manage earnings by using short-term debt. This result is consistent with the debt contract hypothesis and financial helplessness theory.

Since real operations management is considered a more daring manipulation, distressed companies, which may have missed opportunities to successfully manipulate accruals, turn to it as a last resort to escape bankruptcy. Also, because the amount of conditional conservatism in healthy companies (as a result of applied profit management) is lower, it is concluded that the profit of financially helpless companies is more conservative than healthy companies and, in this sense, has a higher quality.

Considering that the t statistic in the McNichols model is 3.01 for short-term debts and the above statistic is 2.52 for short-term debts squared, it is clear that according to the McNichols model, the non-linear relationship between the amount of debt and the quality of profit is also related to short-term debt and not only long-term debt. In this way, based on this model, the second hypothesis is rejected.

4.1 Explanation of the research model

In this section, we explain the relationship between debt and profit quality. According to the first hypothesis, it was proved that the relationship between the volume of debts and the quality of profit is non-linear.

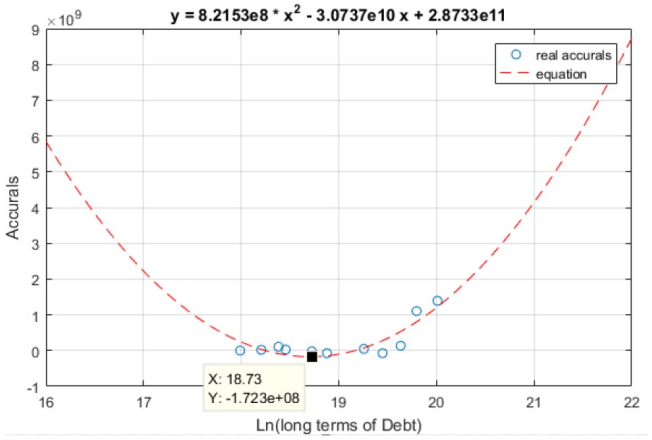

Figure 1: Long-term relationship between debt and earnings quality

In Fig. 1, accruals are on the vertical axis and debt is on the horizontal axis of the logarithm. With the increase in debt, first the quality of profit decreases with a downward slope and after the passage of time, it reaches its minimum value and then increases with an exponential slope.

According to the second hypothesis, the non-linear relationship between debt volume and profit quality is related to long-term debts and not short-term debts, which is rejected.

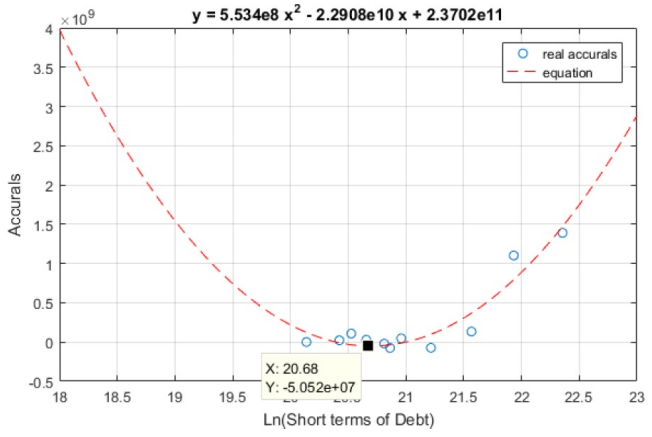

Figure 2: The short-term relationship between debt and earnings quality

In Fig. 2, the short-term relationship between debts and profit quality also indicates a non-linear and U-shaped relationship between the two variables.

4.2 Practical suggestions

Based on the research results, the following suggestions can be made:

1. Given that the first hypothesis of this research has been confirmed.
   Therefore, it is suggested to financial analysts, banks and financial and credit institutions, investors and company managers and other users of financial statements that pay special attention to the size of the company's debts, because the presence of debts has a statistically significant relationship with the quality of profit. But what is evident in the results of this research is the existence of a non-linear relationship between the volume of debts and the quality of profit, so the existence of the volume of debts increases the quality of profit up to the optimal point, and after the optimal point, the quality of profit strongly decreases. Therefore, it is suggested that the managers of the companies admitted to the Tehran Stock Exchange to prevent excessive debts in the company and determine the optimal point of the volume of debts and the quality of profit in their company according to the pattern determined by this research and manage the amount of their company's debts optimally.
2. According to the confirmation of the second hypothesis of the research, that the nonlinear relationship between the volume of debts and the quality of profit is related to short-term debts and not long-term debts, it is suggested to the managers of companies admitted to the Tehran Stock Exchange.
   In order to use the facilities received from financial and credit institutions and banks, they should pay special attention to obtaining short-term financial facilities, because the existence of a large amount of long-term debt will significantly affect the quality of profit.
3. Since the results of this research show that the volume of debts and the quality of profits have a non-linear and statistically significant relationship with each other, it is suggested to supervisory institutions such as audit organizations, audit institutes, Tehran Stock Exchange Organization and the Audit Bureau that pay special attention to the amount of short-term debts such as accounts and documents payable, prepayments, etc. in their investigations, because these items have a significant impact on the quality of the company's profits, and they must take into consideration that the existence of short-term debts increases the quality of profit up to the optimal point, but after the optimal point, the quality of profit will decrease.

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