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Investigating the nonlinear relationship between debt structure and real and accrual-based earnings management

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Abstract

Earning is one of the most important items of financial statements. Sometimes managers manipulate and distort earning reports to maximize their own benefits, reach a certain profitability level, or achieve a certain corporate objective. Firms with a low level of debt tend to have few or no restrictive clauses in their debt contracts, which allow them to operate with less concern

about breaching these contracts and give less incentive to managers to engage in earning management reports through accrual manipulation. However, when firms accumulate large amounts of debt, the relationship between debt and accrual-based earnings management tends to get reversed. In firms with large debts, managers are incentivized to report good earnings as they are under pressure to avoid the penalties of violating the restrictive clauses in their debt contracts. In the absence of scientific and empirical evidence regarding this issue, the present study examined the nonlinear relationship between debt structure and real and accrual-based earnings management. For this purpose, the data pertaining to a sample of 130 firms listed on the Tehran stock exchange from 2014 to 2019 were collected and analyzed. The results of multivariate regression analysis showed a nonlinear relationship between debt structure and accrual-based earnings management. A non-linear relationship was also found between current debt structure and real earnings management. However, the results could not confirm the presence of a non-linear relationship between total debt structure and real earnings management.

Keywords: Debt Structure, Real Earnings Management, Accrual-Based Earnings Management.

Introduction

A firm's earnings and how it is measured are among the most important determinants of its stock price as well as risk levels. Manipulation of future earnings for any reason tends to generate extra risks that ultimately affect the decisions of investors toward the firm (Firouzian Nezhad et al., 2019). Many of the managers who engage in earnings management do so to show a level of stability in their firm's growth or performance. Managers can manipulate earnings by adjusting discretionary accruals or the firm's real activities (Akhgar and Davoodi, 2019). Since earnings calculations are influenced by accounting estimates and it is the management's responsibility to prepare financial statements, managers are indeed able to engage in earnings management for a variety of reasons, like maximizing their own benefits, reaching a certain level of profitability, or achieving an objective. In any case, this practice involves providing incorrect information about the firm, which will cause investors to lose the ability to make the right decisions about the firm and their investments. Earnings management can be described as a deliberate intervention in the financial reporting process to achieve the expected level of earnings, i.e., showing increasing, steady, or even decreasing earnings depending on the goals and situation. It has been argued that the short-

term debt structure can affect earnings management by making it so that creditors have more supervision over earnings reporting (Hosseini and Fallah Joshaghani, 2019). Indeed, liabilities tend to have a disciplinary impact on the behavior of managers. It should however be noted that higher levels of debt that increase the threat of bankruptcy may put extra pressure on managers to engage in earnings management in order to remain in control of the company. Meanwhile, lower levels of debt generate less incentive for earnings management. Considering that real earnings management has more destructive effects than earnings management through accruals (Hamidian et al., 2020). it is necessary to explore the relationship between debt structure and real and accrual-based earnings management. Since the accounting literature in Iran as well as abroad contains very little empirical evidence on this subject, the present study seeks to bridge the gap in the literature in regards to the relationship between debt structure, real earnings management, and accrual-based earnings management.

Literature Review

Earnings forecast reports prepared by managers are one of the tools that they use to interact with the market and offer the firm an opportunity to influence market behavior. Excessively optimistic managers tend to engage in earnings management through income items and accruals (Rezazadeh et al., 2020). Supposing that the life cycle of a business is divided into three stages of growth, maturity, and decline, earnings management in the maturity stage is more likely to take place through the manipulation of production costs. In the decline stage, however, earnings management often takes place through abnormal operating cash flows. In other words, the closer a company gets to the last years of its life, the more likely it is to encounter real earnings management through manipulation of operating cash flows (Mehrabanpour et al., 2020). Firms need to always maintain an optimal level of debt to control the risk of bankruptcy, and this is quite important for financiers as well as shareholders. Different levels of debt may act as inventive for different levels of earnings management. In fact, sometimes managers engage in this practice just to satisfy the restraining terms put in by creditors in their financing contracts.

When a firm’s accounting system produces transparent reports, it will not be easy for the firm’s managers to manipulate earnings through accounting methods, and therefore they may start manipulating real activities, which classifies as real earnings management (Akhgar and Davoodi, 2019). The

existence of strong corporate governance mechanisms can control these opportunistic tendencies, thereby increasing the firm's credit rating. In other words, real earnings management plays a mediating role in the relationship between the quality of corporate governance and credit rating (Mohammadikhanghah et al., 2020). It is also essential to have an audit committee to supervise financial reporting and an effective internal control system to advance the objectives of internal controls and ensure the effectiveness of management system processes, internal controls, and the health of financial reports (Ghaemi et al., 2020). In this regard, a higher level of liability under stricter conditions will put the firm under more stringent oversight by financiers, which will limit the ability of managers to engage in accrual-based earnings management and increase the quality of earnings reports.

Larger debts and consequently higher pressure from debt contracts will make creditors demand more and better audited financial statements. This results in more careful monitoring and control of financial statements, which leaves less room for managers to engage in opportunistic behaviors, inadvertently leading to reduced real earnings manipulation. At the same time, since creditors are aware of the firms' debt ratio in their capital structure, they always consider default risk when signing lending contracts with risky firms and therefore include stricter terms in these contracts to reduce their own risks. These terms make it much riskier for managers to breach the debt contract, which considering the significant penalties involved, will incentivize them to start or continue doing real earnings management and manipulation, i.e. changing revenues through abnormal operating cash flows, considering abnormal production and sales figures, or considering unusual cost reductions. In short, management will prioritize avoiding the penalties of debt contracts over the benefits of high-quality earnings reporting, which is why one can expect a non-linear relationship between the level of debt and the level of real earnings management.

Iran is a developing country with a growing public interest in the capital market, especially in recent years. Although the Iranian stock market has gradually improved over the past decades, debt is still the main source of credit for Iranian firms. Since over-optimism can make management report unreasonably optimistic forecasts, it is more likely to encounter earnings management in firms with over-optimistic managers. Optimistic managers always try to keep negative information and news inside the firm and conceal them from investors in the hope that their poor performance will be covered by better performance in the future. As a result, they are more inclined to take

measures that aggravate the agency's problems (Rezazadeh et al., 2020). In any case, identifying the relationship between debt and earnings management can help shareholders gain a better sense of potential risks when making investment decisions. With the above explanation, this study aims to answer the question that "Is there a non-linear relationship between debt structure and real and accrual-based earnings management?"

Research Background

Abbaszadeh et al. (2019) in a study titled "Political Connections, Related Party Transactions, and Earnings Management In Listed Companies in Tehran Stock Exchange", report that there is indeed a significant positive relationship between political connections and related party transactions. While they found no significant direct relationship between these transactions and earnings management, an indirect relationship was revealed after considering political connections as a mediating variable.

Fatahi and Fazel (2018) investigated the effect of audit quality on accrual-based earnings management and real earnings management in companies listed on the Tehran Stock Exchange. These researchers report that as the audit quality increases, earnings management decreases. They added that the most important measures of audit quality in this area are the independence of the auditor and the size of the auditing firm, which both have a significant negative relationship with accrual-based and real earnings management.

Abbaszadeh (2018) in another study carried out the manipulation of real activities through abnormal operating cash flow and abnormal discretionary costs for increasing the current year's stock returns was found to have a significant relationship with the next year's stock returns. They reported that abnormal production cost due to increased production in the current period is not inversely related to next year's stock returns, which means that stock prices can fully reflect the effect of overproduction on the firm's future operating performance.

Ebrahimi and Ahmadi (2016) indicated that there is a negative relationship between financial leverage and accrual-based earnings management and the total level of earnings management. These results also showed a positive relationship between financial leverage and real earnings management.

Thanh et al. (2020) investigated the nonlinear relationship between debt structure and earnings management by reviewing the panel data of 432 Vietnamese firms for the period between 2006 and 2017. The results of this

study showed that the debt ratio has a nonlinear effect on earnings management, but while this effect is positive when debts are smaller, it becomes negative when debts become larger. This study also reported that the debt ratio changes in earnings management occur before and after firms reach the optimal debt threshold.

Lemma et al. (2018) these researchers found no relationship between institutional shareholders and real earnings management but reported a positive relationship between institutional owners and accounting earnings management. They also reported that competition in the product market has a positive relationship with accrual-based earnings management and a negative relationship with real earnings management.

Huang and Sun (2017) reported that management competence reduces the likelihood of real earnings management.

Nakashima and Ziebart (2015) in a study carried out, it was reported that companies in their sample had engaged in significant accrual-based earnings management both before and after the adoption of the Sarbanes-Oxley Act, real earnings management had decreased after this act.

Hypotheses

This study has two main hypotheses, each consisting of 2 sub-hypotheses:

Hypothesis 1: There is a non-linear relationship between debt structure and accrual-based earnings management.

Sub-hypothesis 1-1: There is a non-linear relationship between current debt structure and accrual-based earnings management.

Sub-hypothesis 1-2: There is a nonlinear relationship between total debt structure and accrual-based earnings management.

Hypothesis 2: There is a non-linear relationship between debt structure and real earnings management.

Sub-hypothesis 2-1: There is a non-linear relationship between current debt structure and real earnings management.

Sub-hypothesis 2-2: There is a non-linear relationship between total debt structure and real earnings management

Research Methodology

The study was deductive-inductive research, where the required data in terms of theoretical foundations and research background were collected from the library and online sources and then used with a deductive reasoning approach to confirm or reject the hypotheses with the help of statistical methods, and finally, an inductive approach was used to generalize the results. The software Excel and Eviews were used to test the statistical models of the hypotheses and analyze the collected information. Documentary and library methods were used to collect data and process theoretical foundations. The data required to test research hypotheses were obtained through documentary research including manual data extraction from the financial statements of companies listed on the Tehran Stock Exchange, which are available on the Codal website.

The statistical population of this study comprised all companies listed on the Tehran Stock Exchange during the 6 years from March 2014 to March 2020.

Sampling was done by systematic elimination, whereby all companies in the statistical population that met the following criteria were included in the sample:

1. Not being or being part of any bank, financial institution, investment firm, holding firm, or leasing firm (because, given the nature of activities of these firms, the studied variables will have unique relationships that cannot be generalized to other firms).

2. Being listed on the Tehran stock exchange before March 2013 and remaining listed from March 2014 to March 2020.

3. No suspension of the stock trade for more than three months between March 2014 and March 2020.

4. Availability of the firm information for the period between March 2014 and March 2020.

After eliminating the firms that did not meet these criteria, a total of 130 firms were included in the statistical sample.

1. Research model

The following model was used to test the hypotheses:

$$AM(RM)_{it} = \beta_0 + \beta_1 DEBT_{i,t} + \beta_2 DEBT^2{}_{i,t} + Size_{i,t} + \beta_3 COST_{i,t+1} + \beta_4 SdCFO_{i,t} + \beta_5 SdSALE_{i,t} + \beta_6 OC_{i,t} + \beta_7 RG_{i,t} + \varepsilon_{i,t} \quad (1)$$

2. Definition of variables

Independent variable	
(1) total current liabilities to total assets FDEBT $= \frac{tca_3}{TA}$ (2) total liabilities to total assets lDEBT $= \frac{tla_3}{TA}$	Debt Ratio (DEBT)
Dependent variables	
Equation (1): $ACCR_{it} = \beta_0 + \beta_1 CFO_{i,t-1} + \beta_2 CFO_{i,t} + \beta_3 CFO_{i,t+1} + \beta_4 \Delta REV_{i,t} + \beta_5 PPE_{i,t} + \varepsilon_{i,t}$ where $ACCR$: total accruals CFO: operating Cash Flow ΔREV: change in the firm's revenue $PPE_{i,t}$: gross value of property, plant, and equipment; $\varepsilon_{i,t}$: residual factor indicating the amount of accrual-based earnings management. A higher absolute value for this factor indicates more earnings management. All variables of Equation 1 are homogenized by dividing by assets.	Accrual-based earnings management (AM)
1- To measure abnormal operating cash flow (AB_CFO), the natural values of operating cash flow are estimated using the Roychowdhury model (2006): Equation (2): $\frac{CFO_{i,t}}{TA_{i,t-1}} = \beta_0 + \beta_1 \left(\frac{1}{TA_{i,t-1}}\right) + \beta_2 \left(\frac{Sales_{i,t}}{TA_{i,t-1}}\right) + \beta_3 \left(\frac{\Delta Sales_{i,t}}{TA_{i,t-1}}\right) + \varepsilon_{i,t}$ where CFO: operating cash flow TA: firm's total assets	Real earnings management (RM)

TA_{it_1}: firm's total assets in the previous year

$\Delta Sales_{i,t}$: change in sales

$Sales$: firm's sales

The abnormal operating cash flow (AB_CFO) is obtained from the difference between normal and actual or projected operating cash flow (equal to the residual term of Equation 2). It should be noted that these values should be multiplied by -1.

2- To determine abnormal production costs (AB_PROD), first, the natural values of production costs are estimated using the Roychowdhury model (2006):

Equation (3):

$$\frac{PROD_{i,t}}{TA_{i,t-1}} = \beta_0 + \beta_1\left(\frac{1}{TA_{i,t-1}}\right) + \beta_2\left(\frac{Sales_{i,t}}{TA_{i,t-1}}\right) + \beta_3\left(\frac{\Delta Sales_{i,t}}{TA_{i,t-1}}\right) + \beta_3\left(\frac{\Delta Sales_{i,t-1}}{TA_{i,t-1}}\right) + \varepsilon_{i,t}$$

Production cost (PROD) is assumed to be the sum of the cost of goods sold and inventory change during the year.

The residual term of the model is calculated by estimating the model for each year-firm. Abnormal production costs (AB_PROD) are calculated from the residual term of the model (the difference between the normal level of production costs and the actual level) for every year firm.

3- To determine the abnormal reduction of discretionary expenses (AB_DISEX), the normal values of discretionary expenses are estimated based on the Roychowdhury model (2006):

Equation (4):

$$\frac{DISEX_{i,t}}{TA_{i,t-1}} = \beta_0 + \beta_1\left(\frac{1}{TA_{i,t-1}}\right) + \beta_2\left(\frac{Sales_{i,t-1}}{TA_{i,t-1}}\right) + \varepsilon_{i,t}$$

Discretionary expenses (DISEX) are the sum of R&D expenses, advertising and sales expenses, and general and administrative expenses

The model is estimated for each firm year and the residual term of the model is considered to be the abnormal discretionary expense. Then, according to the model of Zang (2012), the residuals are multiplied by -1.

Finally, the residuals obtained from Equations 1, 2, and 3 are added together. Equation (5) $LE = \text{Ab\_CFO} + \text{Ab\_PROD} + \text{Ab\_DISEX}$	
Control variables	
$\text{SIZE} = \text{LN}(TA)$ TA: firm's total assets	Firm Size (SIZE):
$\text{SDCFO} = \frac{SDCFO_3}{TA}$ $SDCFO_3$: three-year standard deviation of operating cash flow	Operating Cash Flow Fluctuations (SDCFO)
$\text{SDSALE} = \left(\frac{SDSales_3}{TA}\right)$ $SDSales$: three-year standard deviation of sales	Sales Fluctuations (SDSALE):
$cycle = \left(\frac{365}{\frac{mean\,reciv}{cog}}\right) + \left(\frac{365}{\frac{mean\text{INVONLORY}}{sales}}\right)$ $mean\,reciv$: firm's mean accounts receivable cog: cost of goods sold $mean\text{INVONLORY}$: firm's mean inventory $Sales$: firm's sales	Operating Cycle (OC):
$\text{RG} = \left(\frac{Sales_t - Sales_{t-1}}{TA_{i,t-1}}\right)$ $Sales$: firm's sales $TA_{i,t-1}$: firm's assets in the previous year	Sales Growth (RG):

Research Findings

Descriptive statistics

The process of data analysis was started by obtaining the descriptive statistics measures for the collected data.

Table 1. Descriptive statistics of research variables

Variable	Mean	Median	Max	Min	Standard deviation	Skewness	Kurtosis
ABS_AM	0/111	0/072	0/419	0/008	0/110	1/494	4/489
ABS_EM	0/262	0/199	0/868	0/022	0/226	1/355	4/111
LDEBT	0/608	0/602	1/069	0/231	0/223	0/223	2/415
FDEBT	0/529	0/516	0/929	0/195	0/201	0/194	2/229
CYCLE	0/337	0/273	1/003	0/082	0/230	1/432	4/658
RG	0/182	0/129	0/935	-0/349	0/334	0/564	2/760
SDCFO	0/081	0/073	0/187	0/021	0/044	0/857	3/099
SDSALES	0/177	0/127	0/525	0/042	0/133	1/280	3/764
SIZE	14/328	14/246	16/896	12/289	1/200	0/407	2/689

Source: research findings

As shown in Table 4-1, the mean value of accrual-based earnings management was calculated to be 0.111. This means that when presenting earning reports, firms conduct on average 11% accrual-based earnings management with the purpose to achieve their desired earning levels. The median of this variable is 0.072, which means half of the firms have had an accrual-based earnings management level of less than 0.072 and the other half have had an accrual-based earnings management level of more than 0.072. The maximum and minimum values of this variable were 0.419 and 0.008, respectively, and its standard deviation was 0.110, which indicates a relatively small difference in the level of this practice among listed firms. The results also showed that the average earnings management through real activities is equal to 0.262. This means that on average firms make 26% manipulation in their real activities to achieve their desired earning level, which is consistent with the findings of (Shekari Dogh Abadi and Moradi, 2019). The median of this variable is 0.199, meaning that half of the firms have had a lower level of real earnings management and the other half have had a higher level of real earnings management. The maximum and minimum values of this variable are 0.022 and 0.868, respectively. The standard deviation of this variable is 0.220, which shows a moderate level of difference in the level of this practice among listed firms.

The statistical results of Table 4-1 also show that the current and total debt ratios are 60% and 52%, respectively, meaning that on average 60% of the firms' financial resources are financed through debt, or in other words, 60% of the firms' have accepted a high level of financial risk.

Good examples of firms with a debt ratio of higher than 1 include Saipa in 2014, Saipa Diesel in 2018-2019, and Gaz Louleh in 2014, which have a negative debt on account of having high amounts of accumulated losses in their equity account. The average operating cycle of the surveyed firms was 0.337, meaning that on average these businesses required 337 days to receive inventory, sell inventory and collect money from inventory sales. Also, on average, firms had a sales growth of 0.18, an operating cash flow fluctuation of 0.08, and sales of 0.17. The mean firm size was 14.32 which was very close to the median firm size, i.e. 14.24, showing the fairly limited dispersion of this variable.

As shown in Table 4-1, all variables had a kurtosis of about 3, with the most normal being related to operating cash flow fluctuations.

Sub-hypothesis 1-1

The results of the test of the first sub-hypothesis that "there is a non-linear relationship between current debt structure and accrual-based earnings management" are presented in Table 4-8.

Table 2. Results of the regression model for the first sub-hypothesis

Variable	Coefficient	Error	t statistic	Probability of t statistic
FDEBT	-0/266	0/076	-3.520	0.001
2^FDEBT	0/434	0/104	4.171	0.000
CYCLE	0/017	0/028	0.593	0.553
RG	-0/009	0/011	-0.841	0.400
SDCFO	0/359	0/057	6.267	0.000
SDSALES	0/024	0/026	0.936	0.350
SIZE	-0/028	0/027	-1.048	0.295
C	0/599	0/391	1.533	0.126
Coefficient of determination			۰,۳۸۸	
The adjusted coefficient of determination			۰,۳٦۱	
F statistic			۲,۱۰۱	
Probability of F statistic			۰,۰۰۰	
Durbin Watson statistic			۲,۰۱٤	

Source: research findings

As shown in Table 4-8, the probability value (or significance level) of F for this sub-hypothesis is 0.0000, which is smaller than 0.05. Therefore, the null hypothesis is rejected at the 95% confidence level, meaning that the model is statistically significant. The Durbin-Watson statistic for this sub-hypothesis is 2.014, indicating that there is no autocorrelation between the research variables. The obtained R-squared and adjusted R-squared show that about 36% and 38% of the variability of the dependent variable of the model are explained by its independent and control variables. Since the model is statistically significant, one can comment on the statistical significance of each variable.

According to the results of Table 4-8, the coefficient of the current debt ratio is -0.266 and its t statistic is significant at the 95% probability level. For the current debt ratio squared, the coefficient is 0.434 and the t statistic is significant at the 95% probability level. Therefore, there is an inverse non-linear relationship between the current debt ratio and accrual-based earnings management. Given the negative sign of the coefficient for this debt ratio and the positive sign of the coefficient for the debt ratio squared, one can mathematically infer that the corresponding parabolic curve will be facing upwards, or in other words, the parabolic function will be u-shaped. Therefore, the first sub-hypothesis that "there is a non-linear relationship between current debt structure and accrual-based earnings management" is confirmed.

Sub-hypothesis 1-2

The results of the test of the second sub-hypothesis that "there is a non-linear relationship between total debt structure and accrual-based earnings management" are provided in Table 4-9.

Table 3. Results of the regression model for the second sub-hypothesis

Variable	Coefficient	Error	t statistic	Probability of t statistic
FDEBT	-0/240	0/068	-3.533	0.000
2^FDEBT	0/514	0/100	5.140	0.000
CYCLE	0/022	0/023	0.941	0.347
RG	-0/011	0/012	-0.928	0.354
SDCFO	0/259	0/065	3.981	0.000
SDSALES	0/025	0/021	1.215	0.225
SIZE	-0/005	0/007	-0.697	0.486
C	0/270	0/096	2.825	0.005
Coefficient of determination			۰,۳۳۵	
The adjusted coefficient of determination			۰,۳۲۷	
F statistic			۱۷,۲۵۰	
Probability of F statistic			۰,۰۰۰	
Durbin Watson statistic			۱,٦۹٤	

Source: research findings

In Table 4-9, it can be seen that the probability value (or significance level) of F for this sub-hypothesis is 0.0000. Being smaller than 0.05 this probability value indicates that the null hypothesis is rejected at the 95% confidence level, meaning that the model is statistically significant. For this sub-hypothesis, the Durbin-Watson statistic is 1.694, showing that there is no autocorrelation. According to the obtained R-squared and adjusted R-squared, the independent and control variables of the model explain 13% and 12% of the variability of the dependent variable. Again, since the model is statistically significant, it is possible to comment on the statistical significance of each variable.

As the results of Table 4-9 show, for the total debt ratio, the coefficient is -0.240 and the t statistic is significant at the 95% probability level. The coefficient of the total debt ratio squared is 0.514 and its t statistic is significant at the 95% probability level. The sign of the coefficient for the total debt ratio squared indicates that as the total debt ratio increases, accrual-based earnings management first decreases and then increases. Therefore, there is an inverse non-linear relationship between the total debt ratio and accrual-based earnings management. Overall, given the negative sign of the coefficient for the total debt ratio and the positive sign of the coefficient for the total debt ratio squared, the corresponding parabolic curve will be u-shaped. Therefore, the second sub-hypothesis that "there is a non-linear relationship between total debt structure and accrual-based earnings management" is confirmed.

Regarding these results, it can be generally stated that when firms operate with a low level of debt, there tend to be fewer or no restrictive terms in their debt contracts, which means they can operate with a lower risk of breaching these contracts, and this reduces the incentive to manage earnings reports through accrual manipulation. However, when firms accumulate large amounts of debt, the relationship between debt and accrual-based earnings management becomes reversed. In firms with large debts, managers are incentivized to report good earnings so that the firm can meet the terms of its debt contracts as they are under pressure to avoid the penalties of breaking these terms. Therefore, these managers are more inclined to resort to accrual-based earnings management.

Sub-hypothesis 2-1

The results of the test of the third sub-hypothesis that "there is a non-linear relationship between current debt structure and real earnings management" are given in Table 4-10.

Table 4. Results of the regression model for the third sub-hypothesis

Variable	Coefficient	Error	t statistic	Probability of t statistic
FDEBT	-0/125	0/062	-1.993	0.047
2^FDEBT	0/151	0/071	2.114	0.035
CYCLE	0/171	0/027	6.369	0.000
RG	0/104	0/028	3.761	0.000
SDCFO	0/676	0/106	6.355	0.000
SDSALES	0/225	0/043	5.286	0.000
SIZE	0/076	0/037	2.031	0.043
C	-0/943	0/529	-1.781	0.076
Coefficient of determination			۰,٦١٨	
The adjusted coefficient of determination			۰,٥١٦	
F statistic			٦,۰٤٢	
Probability of F statistic			۰,۰۰۰	
Durbin Watson statistic			٢,۰۰٦	

Source: research findings

As Table 4-10 shows, the probability value (or significance level) of F for this sub-hypothesis is 0.0000, which is less than 0.05. Therefore, the null hypothesis is rejected at the 95% confidence level, indicating that the model is statistically significant. The Durbin-Watson statistic for this sub-hypothesis is 2.006, which shows that there is no autocorrelation between the variables. The obtained R-squared and adjusted R-squared show that the independent and control variables explain 61% and 51% of the variability of the dependent variable. Given the statistical significance of the model, the statistical significance of individual variables can be discussed.

In Table 4-10, it can be seen that the coefficient of the current debt ratio is -0.125 and its t statistic is significant at the 95% probability level. For the current debt ratio squared, the coefficient is 0.152 and the t statistic is significant at the 95% probability level. This means that there is an inverse non-linear relationship between the current debt ratio and real earnings management. Given the negative sign of the coefficient for the current debt ratio and the positive sign of the coefficient for the current debt ratio squared, it can be mathematically inferred that the corresponding parabolic curve will be u-shaped. Therefore, the third sub-hypothesis that "there is a non-linear relationship between current debt structure and real earnings management" is also confirmed.

Sub-hypothesis 2-2

The results of the test of the fourth sub-hypothesis that "there is a non-linear relationship between total debt structure and real earnings management" are

presented in Table 4-11.

Table 5. Results of the regression model for the fourth sub-hypothesis

Variable	Coefficient	Error	t statistic	Probability of t statistic
FDEBT	0/037	0/270	0.136	0.892
2^FDEBT	-0/047	0/177	-0.265	0.792
CYCLE	0/185	0/028	6.666	0.000
RG	0/129	0/017	7.580	0.000
SDCFO	0/452	0/224	2.017	0.044
SDSALES	0/261	0/046	5.676	0.000
SIZE	0/027	0/034	0.794	0.428
C	-0/291	0/474	-0.614	0.540
Coefficient of determination			۰,۵۷۷	
The adjusted coefficient of determination			۰,٤۸۷	
F statistic			٦,٤٤۰	
Probability of F statistic			۰,۰۰۰	
Durbin Watson statistic			۱,۸۹۲	

Source: research findings

Table 4-11 shows that the probability value (or significance level) of F for this sub-hypothesis is 0.0000, which is smaller than 0.05, indicating that the null hypothesis is rejected at the 95% confidence level. This means that the model is statistically significant. For this sub-hypothesis, the Durbin-Watson statistic is 1.892, indicating that there is no autocorrelation. According to the obtained R-squared and adjusted R-squared, the independent and control variables of the model explain 57% and 48% of the variability in the dependent variable. As before, since the model is statistically significant, one can discuss the statistical significance of each variable.

According to the results of Table 4-11, for the total debt ratio, the coefficient is 0.037 and the t statistic is not significant at the 90% probability level. Also, the coefficient of the total debt ratio squared is -0.47 and its t-statistic is also not significant at the 95% probability level. Therefore, there is no non-linear relationship between the total debt ratio and real earnings management. Thus, the fourth sub-hypothesis that "there is a non-linear relationship between total debt structure and real earnings management" is rejected.

Conclusion

The results of the test of research hypotheses showed that there is a non-linear relationship between debt structure (current debt and total debt) and accrual-based earnings management. To explain this relationship, it can be stated that firms operating with low levels of debt tend to have little to no restrictive terms in the debt contracts offered to them. As a result, managers of these firms can operate without worrying about the risk of breaching these contracts, which reduces the likelihood that they engage in accrual-based earnings management to avoid that situation. On the contrary, in firms that operate with a high level of debt, debt tends to have the opposite relationship with accrual-based earnings management. In these firms, managers are under heavy pressure to report good earnings to avoid the penalties contained in their debt contracts. Thus, these managers are more likely to engage in accrual-based earnings management so that their firms can meet the terms of their debt contracts. The results of the test of hypotheses also showed a non-linear relationship between current debt structure and real earnings management but showed no such relationship between total debt structure and real earnings management.

Today, investors and other users of financial statements are very sensitive to the quality of the contents of financial reports and especially the reported net profit figures. While making investment decisions, investors tend to select companies that have more stable earnings or in other words higher-quality and more reliable earning sources. When a business faces economic instability, managers come under pressure to handle the situation directly or indirectly so that instability does not affect the level of earnings reported in the financial statements and users of these statements and especially investors maintain a positive view of the firm.

Therefore, in the analysis of the observed relationship between low debts and low cash flow manipulation, it can be stated that as long as the firm is not under too much debt, the motivation and inclination of management to submit high-quality financial statements tend to outweigh the benefits of manipulating earnings. This can be considered a voluntary reason for management to avoid earning manipulation. As a firm's debt grows, creditors demand more carefully audited financial reports in the signed debt contracts, which results in increased monitoring and control over the financial statements and leaves less room for managers to engage in opportunistic practices. This can be seen as an involuntary reason for managers to avoid earning manipulation. However, being aware of the firms' debt ratio in their capital structure, to reduce their own risks, creditors tend to include stricter clauses in the debt contracts they offer to riskier firms. Because of the significant penalties included in these

clauses, managers become incentivized to start or continue doing earnings management and manipulation. In other words, in the eyes of managers, the benefits of avoiding the penalties contained in their debt contracts through earnings manipulation will outweigh the benefits of producing high-quality earnings reports. This explains the non-linear relationship observed in this study between debt and earnings management.

Suggestions

Suggestions based on research findings

When a firm's accounting system produces transparent and comparable reports, it makes it harder for managers to engage in earnings manipulation and this allows external users to gain a more realistic sense of the firm's economic performance (Akhgar and Davoodi, 2019). Firms with dual interests tend to have weaker information environments, which is why the managers of these firms are more motivated to control the information flows of these firms. Also, it seems that because of higher information asymmetry and lower quality of internal information in firms with dual interests, there is a higher level of motivation in these firms for opportunistic earnings management (Heidarzadeh Hanzaei and Barati, 2019). Environmental uncertainty can be defined as turmoil or change in markets, consumer preferences, technology, or competition. A firm's performance in international markets depends on how it manages these turbulences, as environmental uncertainty can affect a firm's agility in such markets. Since environmental uncertainty is one of the prominent features of any competitive market, firms operating in such markets need to make rational decisions based on information that describes or at least helps to identify the involved risks and uncertainties. Environmental uncertainty refers to the inability to assign probabilities to future events, the lack of information about the involved causal relationships, or the inability to predict possible outcomes of a decision that can affect investment(Majid et al., 2020). Volatilities in the capital structure rob a firm's management of the focus they need to create, maintain and increase revenue, thus interfering with the efforts to improve the firm's performance. One of the main tasks of managers is to decide on the composition of the firm's financing sources, or in other words, its capital structure. Volatilities in the short-term and long-term debt structure of companies tend to increase with the rise of inflation and decrease with the rise of interest rates. Also, volatilities in the firms' long-term debt structure often slightly increase with the increasing economic growth rate (Montasheri and Farid, 2020). It has been shown that the systematic risk level has no mediating role in the relationship between earnings management and

stock market value. Capital market inefficiency and the inability of investors to conduct proper risk analyses and interpret the content of financial statements on the one hand and the opportunistic attitude and capability of managers to manipulate earnings and affect investors' expectations, on the other hand, have made it so that systematic risk has no impact on the choice of earnings management method (Firouzian Nezhad et al., 2019). To protect the rights of shareholders, firms that do care about their social responsibilities need to hold extra cash reserves, as higher systematic risk increases the need to maintain additional cash. It also appears that corporate governance reduces a firm's need to retain cash and is, therefore, a good solution for firms that are interested in investing in social issues(Eghdami et al., 2020).

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	ABS_AM	ABS_EM	LDEBT	FDEBT	CYCLE	RG	SDCFO	SDSALES	SIZE
Mean	0.111412	0.262262	0.607840	0.528860	0.337434	0.181727	0.081059	0.176959	14.32778
Median	0.072465	0.198824	0.601648	0.516436	0.272839	0.129169	0.072705	0.127001	14.24595
Maximum	0.419062	0.868040	1.069186	0.928502	1.003379	0.934636	0.186993	0.525083	16.89562
Minimum	0.007882	0.021831	0.231369	0.195221	0.082284	-0.349173	0.020927	0.041739	12.28860
Std. Dev.	0.109792	0.226473	0.222594	0.201485	0.229967	0.334401	0.044494	0.132624	1.199786
Skewness	1.493820	1.355397	0.222500	0.193786	1.431857	0.564094	0.857232	1.280233	0.406988
Kurtosis	4.488660	4.110614	2.415476	2.229220	4.658232	2.760436	3.098662	3.764200	2.688925
Jarque-Bera	362.1182	278.9106	17.54006	24.19020	355.8942	43.23142	95.84634	232.0497	24.67806
Probability	0.000000	0.000000	0.000155	0.000006	0.000000	0.000000	0.000000	0.000000	0.000004
Sum	86.90141	204.5641	474.1154	412.5106	263.1983	141.7468	63.22604	138.0279	11175.67
Sum Sq. Dev.	9.390304	39.95497	38.59798	31.62441	41.19726	87.11109	1.542226	13.70193	1121.360
Observations	780	780	780	780	780	780	780	780	780

Sample: 1 780									
Included observations: 780									
Correlation									
Probability	ABS_AM	ABS_EM	LDEBT	FDEBT	CYCLE	RG	SDCFO	SDSALES	SIZE
ABS_AM	1.000000								
ABS_EM	0.041588	1.000000							
	0.2460	-----							
LDEBT	0.115840	0.089818	1.000000						
	0.0012	0.0121	-----						
FDEBT	0.044175	0.073835	0.888513	1.000000					
	0.2178	0.0392	0.0000	-----					
CYCLE	0.022597	-0.170187	0.005489	0.003830	1.000000				
	0.5286	0.0000	0.8783	0.9150	-----				
RG	-0.078423	0.058505	-0.097643	-0.086272	-0.318962	1.000000			
	0.0285	0.1025	0.0063	0.0159	0.0000	-----			
SDCFO	0.134245	0.167526	0.018888	0.070208	-0.123941	-0.058957	1.000000		
	0.0002	0.0000	0.5984	0.0500	0.0005	0.0999	-----		
SDSALES	0.068028	0.318443	0.110442	0.135019	-0.458246	0.053099	0.194896	1.000000	
	0.0576	0.0000	0.0020	0.0002	0.0000	0.1384	0.0000	-----	
SIZE	-0.046457	-0.095483	0.146184	0.127312	0.093701	0.025928	-0.150648	-0.158551	1.000000
	0.1949	0.0076	0.0000	0.0004	0.0088	0.4696	0.0000	0.0000	-----

Heteroskedasticity Test: White			
F-statistic	6.451529	Prob. F(7,772)	0.0000
Obs*R-squared	43.10700	Prob. Chi-Square(7)	0.0000
Scaled explained SS	67.27524	Prob. Chi-Square(7)	0.0000

Variance Inflation Factors			
Date: 08/10/20 Time: 03:13			
Sample: 1 780			
Included observations: 780			
	Coefficient	Uncentered	Centered
Variable	Variance	VIF	VIF
FDEBT	0.002757	62.84295	7.956338
MMFDEBT2	0.007367	8.745695	7.883681
CYCLE	0.000346	4.104870	1.300749
RG	0.000143	1.476380	1.139442
SDCFO	0.007572	4.607019	1.065664
SDSALES	0.000994	3.459453	1.243238
SIZE	1.04E-05	152.6344	1.061485
C	0.002853	203.1041	NA

Redundant Fixed Effects Tests			
Equation: Untitled			
Test cross-section fixed effects			
Effects Test	Statistic	d.f.	Prob.
Cross-section F	1.501487	(129,643)	0.0008
Cross-section Chi-square	205.382591	129	0.0000

Correlated Random Effects - Hausman Test			
Equation: Untitled			
Test cross-section random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	16.830605	7	0.0185

Dependent Variable: ABS_AM				
Method: Panel Least Squares				
Date: 08/10/20 Time: 02:27				
Sample: 1392 1397				
Periods included: 6				
Cross-sections included: 130				
Total panel (balanced) observations: 780				
White cross-section standard errors & covariance (d.f. corrected)				
WARNING: estimated coefficient covariance matrix is of reduced rank				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
FDEBT	-0.266293	0.075652	-3.519988	0.0005
MMFDEBT2	0.433997	0.104055	4.170834	0.0000
CYCLE	0.016751	0.028243	0.593111	0.5533
RG	-0.009475	0.011260	-0.841435	0.4004
SDCFO	0.358630	0.057225	6.267043	0.0000
SDSALES	0.024396	0.026073	0.935692	0.3498
SIZE	-0.028006	0.026723	-1.048023	0.2950
C	0.598597	0.390531	1.532776	0.1258
	Effects Specification			
Cross-section fixed (dummy variables)				
R-squared	0.387635	Mean dependent var		0.111412
Adjusted R-squared	0.361194	S.D. dependent var		0.109792
S.E. of regression	0.100555	Akaike info criterion		-1.598099
Sum squared resid	6.501517	Schwarz criterion		-0.779736
Log-likelihood	760.2587	Hannan-Quinn criter.		-1.283346
F-statistic	2.100743	Durbin-Watson stat		2.014178
Prob(F-statistic)	0.000000			

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Heteroskedasticity Test: White			
F-statistic	6.913125	Prob. F(7,772)	0.0000
Obs*R-squared	46.00931	Prob. Chi-Square(7)	0.0000
Scaled explained SS	70.82398	Prob. Chi-Square(7)	0.0000

Variance Inflation Factors			
Date: 08/10/20 Time: 03:15			
Sample: 1 780			
Included observations: 780			
	Coefficient	Uncentered	Centered
Variable	Variance	VIF	VIF
LDEBT	0.002085	65.80330	7.772324
MMLDEBT2	0.004185	8.568185	7.796122
CYCLE	0.000335	4.201823	1.331472
RG	0.000135	1.476762	1.139737
SDCFO	0.007204	4.639826	1.073252
SDSALES	0.000936	3.448964	1.239468
SIZE	9.87E-06	153.7951	1.069558
C	0.002789	210.1130	NA

Redundant Fixed Effects Tests			
Equation: Untitled			
Test cross-section fixed effects			
Effects Test	Statistic	d.f.	Prob.
Cross-section F	1.271840	(129,643)	0.0330
Cross-section Chi-square	177.264640	129	0.0031

Correlated Random Effects - Hausman Test			
Equation: Untitled			
Test cross-section random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	6.650354	7	0.4662

Dependent Variable: ABS_AM				
Method: Panel EGLS (Cross-section random effects)				
Date: 08/10/20 Time: 02:30				
Sample: 1392 1397				
Periods included: 6				
Cross-sections included: 130				
Total panel (balanced) observations: 780				
Swamy and Arora estimator of component variances				
White cross-section standard errors & covariance (d.f. corrected)				
WARNING: estimated coefficient covariance matrix is of reduced rank				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LDEBT	-0.239716	0.067843	-3.533371	0.0004
MMLDEBT2	0.513772	0.099948	5.140375	0.0000
CYCLE	0.021670	0.023036	0.940723	0.3471
RG	-0.010906	0.011753	-0.927958	0.3537
SDCFO	0.258625	0.064970	3.980660	0.0001
SDSALES	0.025487	0.020973	1.215235	0.2246
SIZE	-0.004838	0.006944	-0.696682	0.4862
C	0.270210	0.095664	2.824562	0.0049
	Effects Specification			
			S.D.	Rho
Cross-section random			0.021575	0.0449
Idiosyncratic random			0.099511	0.9551
	Weighted Statistics			
R-squared	0.335256	Mean dependent var		0.098397
Adjusted R-squared	0.327415	S.D. dependent var		0.106504
S.E. of regression	0.099488	Sum squared resid		7.641167
F-statistic	17.25001	Durbin-Watson stat		1.693797
Prob(F-statistic)	0.000000			
	Unweighted Statistics			
R-squared	0.148854	Mean dependent var		0.111412
Sum squared resid	7.992524	Durbin-Watson stat		1.619336

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Heteroskedasticity Test: White			
F-statistic	12.50687	Prob. F(7,772)	0.0000
Obs*R-squared	79.44583	Prob. Chi-Square(7)	0.0000
Scaled explained SS	114.7977	Prob. Chi-Square(7)	0.0000

Redundant Fixed Effects Tests			
Equation: Untitled			
Test cross-section fixed effects			
Effects Test	Statistic	d.f.	Prob.
Cross-section F	3.931968	(129,643)	0.0000
Cross-section Chi-square	453.622401	129	0.0000

Correlated Random Effects - Hausman Test			
Equation: Untitled			
Test cross-section random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	46.642158	7	0.0000

Dependent Variable: ABS_EM				
Method: Panel Least Squares				
Date: 08/10/20 Time: 02:33				
Sample (adjusted): 1393 1397				
Periods included: 5				
Cross-sections included: 130				
Total panel (balanced) observations: 650				
White cross-section standard errors & covariance (d.f. corrected)				
Convergence achieved after 6 iterations				
WARNING: estimated coefficient covariance matrix is of reduced rank				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
FDEBT	-0.124530	0.062479	-1.993138	0.0468
MMFDEBT2	0.150800	0.071338	2.113872	0.0350
CYCLE	0.170681	0.026800	6.368715	0.0000
RG	0.104165	0.027695	3.761211	0.0002
SDCFO	0.676284	0.106416	6.355085	0.0000
SDSALES	0.224901	0.042551	5.285500	0.0000
SIZE	0.075805	0.037322	2.031130	0.0428
C	-0.942584	0.529339	-1.780682	0.0756
AR(1)	0.007091	0.048029	0.147644	0.8827
	Effects Specification			
Cross-section fixed (dummy variables)				
R-squared	0.617848	Mean dependent var		0.256871

Adjusted R-squared	0.515593	S.D. dependent var	0.223866
S.E. of regression	0.155810	Akaike info criterion	-0.694396
Sum squared resid	12.42964	Schwarz criterion	0.256100
Log-likelihood	363.6787	Hannan-Quinn criter.	-0.325722
F-statistic	6.042204	Durbin-Watson stat	2.006015
Prob(F-statistic)	0.000000		
Inverted AR Roots	. 01		

Heteroskedasticity Test: White			
F-statistic	11.97111	Prob. F(7,772)	0.0000
Obs*R-squared	76.37580	Prob. Chi-Square(7)	0.0000
Scaled explained SS	111.1678	Prob. Chi-Square(7)	0.0000

Redundant Fixed Effects Tests			
Equation: Untitled			
Test cross-section fixed effects			
Effects Test	Statistic	d.f.	Prob.
Cross-section F	3.931193	(129,643)	0.0000
Cross-section Chi-square	453.554554	129	0.0000

Correlated Random Effects - Hausman Test			
Equation: Untitled			
Test cross-section random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	44.221709	7	0.0000

Dependent Variable: ABS_EM
Method: Panel Least Squares
Date: 08/10/20 Time: 07:36
Sample: 1392 1397
Periods included: 6
Cross-sections included: 130

Total panel (balanced) observations: 780				
White cross-section standard errors & covariance (d.f. corrected)				
WARNING: estimated coefficient covariance matrix is of reduced rank				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LDEBT	0.036599	0.269664	0.135720	0.8921
LDEBT2	-0.046933	0.177416	-0.264535	0.7915
CYCLE	0.184753	0.027715	6.666152	0.0000
RG	0.128610	0.016967	7.580045	0.0000
SDCFO	0.451505	0.223847	2.017028	0.0441
SDSALES	0.260733	0.045937	5.675916	0.0000
SIZE	0.026696	0.033630	0.793810	0.4276
C	-0.291269	0.474427	-0.613939	0.5395
	Effects Specification			
Cross-section fixed (dummy variables)				
R-squared	0.576654	Mean dependent var		0.262262
Adjusted R-squared	0.487112	S.D. dependent var		0.226473
S.E. of regression	0.162191	Akaike info criterion		-0.641947
Sum squared resid	16.91479	Schwarz criterion		0.176417
Log-likelihood	387.3592	Hannan-Quinn criter.		-0.327193
F-statistic	6.440083	Durbin-Watson stat		1.892490
Prob(F-statistic)	0.000000			