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Asymmetric Effect of Return on Assets on the Profitability of Listed Firms on Tehran Stock Exchange Based on Variance Heteroscedasticity Model

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Abstract
The primary objective of this paper is to investigate the asymmetric effect of return on assets on the profitability of listed firms on Tehran Stock Exchange based on variance inequality model. This research aims to answer questions that how much the return on assets is effective on the profitability of companies based on the leveraging effect (symmetric or asymmetric)? The investigation is focused on all listed companies on Tehran Stock Exchange from 2014 to 2017 as a statistical population. The variance inequality model considered equations around the mean and around the variance and accordingly based on the around the mean equation with return on assets coefficient 0.32, company growth factor 0.56, capital structure factor 0.03 and the company size logarithmic coefficient 0.07, together have the positive effect on the profitability of petrochemical companies. Furthermore, results show that the depreciation tax shield cost with the coefficient of 6.16 has an adverse impact on those companies. Moreover, the results of the around the variance equation of asymmetric effect (leveraging effect) on the return on asset validates the profitability of petrochemical companies.

Keywords*:* Profitability of Companies, Heteroscedasticity, Return on Asset

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1. Introduction

Nowadays, companies are trying to attract more investors to increase the value of the company by increasing revenue and annual profit (Etemadi & Montazer, 2013). Although the company growth can also bring new opportunities to its revenue growth, this argument is based on the concepts such as saving on the scale, the advantage of being first, external network, and effects of the learning curve (Verdi et al., 1396). A non-debt tax shield is an approach to lower the tax on the company's income (Baquar et al., 2015). De Angelo declares that companies can employ other non-debt options such as depreciation, tax credit, and also retirement pension funds to lower tax payments, therefore, companies with higher non-debt tax shield probably have lower debts (Shokraleh-Behpour et al ., 2014). Hierarchical Theory envisions an inverse proportional relationship. Based on the theory of asymmetry information, a corporate might raise capital by going public in the stock market for the first time and having an unsettled debt ratio (Dariush & Ehsan, 2016). Capital structure is the way a corporation finances its assets (Mohammadi & Abbasi, 2011). Financial decisions and investments in corporations should be made based on future requirements and the company's forecasts (Kazemnejad & Zolghari, 2013). A successful company uses current funds to meet its obligations to creditors in the future (Enayati, 2004).

Investigating and deciding on capital structure and prioritizing among debts and employee's income depend on the specific characteristics of a corporation which cannot be recognized merely. However, understanding the capital structure theory helps the executive managers elevate the shareholder's revenue (Enayati, 2004). According to Noori et al. (2012), proper management of working capital and reducing the cycle of cash changeover to a reasonable limit can improve the firm profitability and create more revenue for shareholders. Researchers in Syria (2012) and Ghanbari and Rasouli (2012) concluded that larger companies have more workstream and cashflow that over the years contribute to more profitability (Haddad, 2015). Technically, the levering effect has some impacts on efficiency and profitability of corporations (Keshavarzian, 2008), Gajraei (2006), Coad, Rao, and Tamagni (2014). Research showed that forecasted revenue has a positive effect on the current growth rate. However, past growth is inversely proportional to the current revenue Coad (2007). Ultimately, profitability is the outcome of all corporate financial plans and decisions and provides the most updated information on how the company is managed. Typically, variables of profit to sale ratio, return on all assets, and return on equity are used to measure profitability (Deari & Deari, 2010). Based on the traditional economic theories about companies, one of the most comprehensive hypotheses is to maximize profit and in most economic literature, maximizing the profit is one of the main goals of any company. Therefore, profitability has always been the primary focus of economic experts and identifying and forecasting a company revenue and its impacting factors have been the attention of investors, managers, financial analysts, researchers, and creditors (Fairfield & Yohn, 2001).

Mainly, the present research employs an empirical study of this topic using an integrated model in spite of the previous studies which examined the models by separate variables. The main goals of this research are to evaluate the symmetric effect of the return on assets, working capital turnover, company size, company growth, tax shield, and capital structure on the profitability of listed firms on Tehran Stock Exchange based on variance heteroscedasticity model. This paper continues with the theoretical bases and backgrounds of relevant research on the subject, as well as the research method and hypotheses derived from the problem and theoretical foundations of the research. Consequently, the results of hypothesis testing, the foundation of theory, conclusions,

and recommendations are presented, respectively.

2. Experimental and Theoretical Background

In John (2017), authors have examined the leverage effect and the asymmetric ratio on the profitability of listed firms on Tehran Stock Exchange. The results show that high debt ratios hurt the corporate profitability and low debt ratios, compared to other models, had a positive and relatively more effect, and within the two thresholds, the leverage ratio did not affect the profitability of the companies.

In Jang & Park (2011), the effect of new growth criteria on the performance of companies has been investigated. In this research, multivariable regression tests using data panel method have been used to determine the significance of the relationship between stock returns and asset growth rate criteria. The statistical sample of this study includes ninety-one listed firms on Tehran Stock Exchange in the period between 2008 and 2013. The results of the research show that there is no definite and significant relationship between stock returns and asset growth rate criteria.

Within a comparative study, Sivathaasan et al. (2013) assessed the relationship between working capital management and profitability of listed firms on Tehran Stock Exchange (food, pharmaceutical, mineral, and automotive industries). The results of this study showed that managers could increase the profitability of the company by reducing the accounts receivable and goods inventory. In other words, the period of credit for customers, or, in other words, reducing the customer's credit time or ++shorter return time of receivables accounts increase the revenue of the company. Therefore, depending on the type of industry, executive directors have to look for ways to influence the profitability of companies through proper management.

According to the results of Lazaridis & Tryfonidis (2016), there is a positive correlation between firm size and profitability. Further, in all research models, there was a positive correlation between cash ratio as a controlling variable with return on assets and equity returns. On the other hand, a negative relationship between financial leverage was observed in most research models with profitability indicators. Moreover, in the case of controlling variables, the life of the company has a weak correlation with the return on assets.

The results of Lazaridis & Tryfonidis (2016) show that with less than 5% error, there is a positive relationship between the growth rate of current, return on assets, and profitability in Tehran Stock Exchange. There is no significant relationship between the explanatory variable of the growth of fixed assets and stock returns. However, there is a significant and positive relationship between the growth of fixed assets and profitability in Tehran Stock Exchange. Among the three control variables of systematic risk, financial leverage, and the ratio of book value to the market, in all four models, there is a significant relationship between the controlling variables of the financial leverage and the ratio of book value to market with stock returns and asset utilization. There is no significant relationship between the control variable Beta with stock returns and profitability in Tehran Stock Exchange.

Padachi (2007) examines the effect of working capital management on the profitability of listed firms on Tehran Stock Exchange. According to the results, there is no significant relationship between the payout period and profitability. However, a negative correlation between profitability and the cashflow cycle has been seen, which measures the joint effect of the cash collection period, the inventory conversion period, and the payout period. Results indicate that companies can manage through proper circulation of capital and reducing the cash conversion cycle to a reasonable level to increase profitability and boost shareholders' equity.

Hierarchical theory predicts an inverse relationship. According to the information

asymmetry theory, a company may first raise capital through shares and hence have an undetermined connection with the debt ratio (Lee, 2015). Deciding over the structure of capital, its empirical analysis, and the choice between debt and owner income depends on the specific characteristics of the institution. However, understanding the capital structure theory helps the executive managers elevate the shareholder's revenue (Kaya & Emine, 2015).

The size of the company is measured based on various parameters including, the amount of sales, its value in a day changes, book of the total assets of the company, market value of the ordinary shares, market value, the employees' income or shareholders equity, the number of personnel, etc., or a combination of the factors mentioned. Firm growth rate is the growth in sales generated by financial planning that companies target for themselves. Nowadays, one of the solutions for companies is to attract investors to maximize the value of the company, and increase revenue and profit growth.

Over the years, researchers have concluded that larger companies have higher financial activity, which contributes to more profitability. The growth of the company can also create opportunities to boost its profitability. This argument is often based on concepts such as scale savings, being the first, external network, and learning curve effects. The forecasted profit has a positive impact on the current growth and the previous growth rate is likely to have a reversal effect on the current profit. Profitability is the outcome of all corporate financial plans and decisions and gives the eventual indications to investigators about the management of the company.

Non-debt tax shields are an approach to reduce corporate income tax. Authors discuss that companies can use other non-debt options, including depreciation, tax credits, and retirement funds to reduce tax revenues, therefore, companies that have a higher debt tax shield are more likely to have less debt.

3. Research Methodology

This study is based on applied research using the causal analysis method. Evaluation of the historical information of the phenomena is accomplished. In equations where the objective is to examine the relationship between several variables using the past data, the study has tried to apply the more practical method by emphasizing the desirability of the activity.

The main objective of this research is to determine the asymmetric effect of return on assets on the profitability of listed firms on Tehran Stock Exchange. Other goals are the determination of the effect of the followings on the profitability of the companies:

- asset return
- the size of the company
- company growth
- tax shields
- capital structure

The primary research hypothesis is to assume return on assets has an asymmetric effect on the profitability of listed firms on Tehran Stock Exchange. Sub-hypotheses claim that those factors mentioned above also have an impact on the profitability of the companies.

The results of this study can be used in organizations such as the Securities and Exchange Organization, Iran's Capital Markets, Iranian Money Market. The present study aims to examine the leverage effect (asymmetry or asymmetry) of the return on assets on the profitability of Iranian capital market companies based on the Variance Heteroscedasticity Model which is not carried by similar studies. Tools for collecting the required information to test the hypotheses of this research includes elements of

audited financial statements. The data of the companies used in this research are extracted from the offline public database and the official website of Tehran Stock Exchange.

After the static variables trial, the model is estimated using the expanded self-regression model under the Variance Heteroscedasticity (EGARCH) condition, and the results are analyzed based on the outputs around the mean and around the variance. The hypotheses are examined monthly for the period during 2014-2017. For this purpose, EVIEWS Software Version 9 is used. Research variables include independent variable, return on assets, firm size, firm growth, tax shield, and capital structure. The dependent variable is firm profitability.

4. Research Variables

4.1. Independent Variables:

Return on Assets (ROA):

Return on Assets, or return on assets of an index, depends on how profitable the company is on its total assets. Return on Assets gives us an idea of efficient management in relation to the use of assets to generate profits, which is calculated by dividing the annual profit into total assets of the company. Return on assets is expressed as a percentage. And sometimes it refers to the return on investment.

$$\text{ROA} = \frac{\text{Net Profit}}{\text{Total Assets Average}}$$

Company Size (SIZ):

The size of the company plays a vital role in the business environment of the company. In this study, company size is measured by the natural logarithm of corporate assets.

$$\text{SIZ} = \text{Log(Asset)}$$

Growth Rate (FGR):

The following formula is used to calculate the growth rate of companies:

$$\text{FGR} = \frac{(\text{Last Year Sale} - \text{Current Year Sale})}{\text{Last Year Sale}}$$

Depreciation Expense Tax (non-debt) (NDT):

NDT is the ratio of depreciation to total assets of the company.

Capital Structure (CAS):

In financial knowledge, how a company invests is called capital structure. When analyzing capital structure, the ratio of short- and long-term debt is taken into consideration, and in such discussions when referring to the capital structure, it usually refers to the debt-to-equity ratio.

$$\text{Capital Structure} = \frac{\text{Total Debt}}{\text{Total Equity}}$$

4.2. The dependent variable:

Corporate Profitability:

Since the firm's net profit consists of a set of operating and non-operating income and costs, it is therefore used to better assess the profitability of companies, net of operating income, which excludes non-operating costs. The operating profit ratio is used to measure the profitability of companies as follows:

$$\text{Corporate Prof.} = \frac{\text{Sold Price} - \text{Cost}}{\text{Financial Assets} - \text{Total Assets}}$$

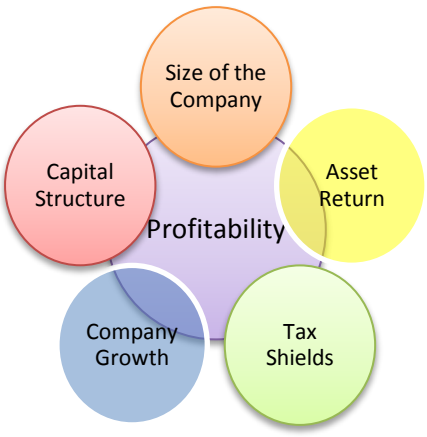

Figure 1: Conceptual model of the research

The data was limited to the available resources and published literature. The research model was based on the combination of study models in [35], [36] and [37] and presented by Eq. 1 as follows.

$$PRF_t = \alpha_0 + \alpha_1 CAS_t + \alpha_3 SIZ_t + \alpha_4 FGR_t + \ldots \alpha_5 NDT_t + \alpha_6 ROA_t + \varepsilon \quad (1)$$

5. Experimental Results

By carrying out the steady test, Dickey and Fowler propose a statistic that has a finite distribution and its critical quantities for a single root test is obtained and tabulated by simulation methods. In this test, the following three regression equations can be considered for a single root test.

$$\Delta y_t = \alpha y_{t-1} + \varepsilon_t \quad (2)$$

$$\Delta y_t = \beta_0 + \alpha y_{t-1} + \varepsilon_t \quad (3)$$

$$\Delta y_t = \beta_0 + \beta_1 t + \alpha y_{t-1} + \varepsilon_t \quad (4)$$

Equation (3) illustrates the random step process with drift. In Equation (4), y_t is a random step process that changes around a time step. The parameter under investigation in all relationships is parameter α. If α=0, then the time series y_t contains the unit root. In this method, one (or more) of the above equations is estimated by the OLS method and the test is performed using the estimated values and its standard deviation. T-statistic of the desired test is defined by:

$$t = \frac{\hat{a}}{\sqrt{var(\hat{a})}} \quad (5)$$

This statistic is compared with the value of the Dickey-Fuller Table. If the value of t is higher than the value of the Table, the null hypothesis is not confirmed.

5.1. Experimental results of the steady test

The Dickey-Fuller test was used to test the state variables. This test is one of the most critical unit root tests. In this test, the hypothesis is zero based on the existence of a single root. The summary of the results of this test is presented in Table 1.

Table 1: Root test results for unit variables based on the Dickey-Fuller Test

Variable	*statistical value*	*p-value*
PRF	-4.147606	0.0284
NDT	-5.255549	0.0058
ROA	-5.462360	0.0030
FGR	-5.940151	0.0014
CAS	-5.346072	0.0051
LSIZE	-5.556684	0.0026

Regarding the results of Table 1, all examined variables are at their steady state, in other words, I (0).

5.2. Heterogeneity of Variance

Based on the results of Table 2, the Breusch-Pagan-Godfrey test estimates the heterogeneity of the variance of the data model. Since p-value=0.0000 is significant, the H1 hypothesis is confirmed, and the model has heterogeneity variance.

Table 2: Breusch-Pagan-Godfrey test

Heteroskedasticity Test: White

F-statistic	25.88580	Pro.Fit(5.10)	0.0000
ObswR-squared	14.85246	Prob. Chi-Square(5)	0.0110
Scaled explained SS	8.346858	Prob. Chi-Square(5)	0.1381

5.3. Model estimation around the mean

According to the estimated results and based on the equation around the mean:

$$PRF = -6.16\ NDT + 0.32\ ROA + 0.56\ FGR + 0.03\ CAS + 0.07\ LSIZE + U_t \qquad (6)$$

Positive effects of return on assets, firm growth, capital structure, and the logarithm of firm size, as well as the negative effect of the tax shield on the cost of depreciation, are remarkable for companies' profitability. In other words, by shifting a tax shield unit, the profitability of the company varies by 6.16 units in the direction of the picture.

Besides, if the return on assets change per unit, the profitability of the companies will change 0.32 units with it, accordingly, if the growth of a company increases per unit, the profitability of the companies will increase by 0.56 units. For the per unit change of the capital structure, the profitability of the company will change by 0.03 units, and if the size of the company increases by one percent, the profitability of the companies will increase by 0.07 units.

Table 3: EGARCH

*LOG (GRACH)=C(4)+C(7)*ABS(RESID(-1)/@SQRT(-1))+C(8) *RESID(-1)/@SQRT(GARCH(-1))+ C(9)*LOG(GARCH(-1))*

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C(6)	-1.750299	0.010464	-167.2756	0.0000
C(7)	-3.390598	1.90E-101	-1.80E+101	0.0000
C(8)	-1.367343	0.449831	-3.039682	0.0024
C(9)	-0.131069	0.050928	-2.573594	0.0101

5.4. Model Estimation around Variance

To evaluate the leverage effect of the positive and negative impacts of the model's explanatory variables on the company's profitability, the equation around the output variance EGARCH is used. Based on the result and the significance of the GARCH variance difference coefficient, i.e., C(9), 5% asymmetry level, and the leverage effect can be verified. This is calculated from the coefficients of the model around the variance, and the impact of the positive and negative impulses, i.e., positive and negative news of explanatory variables can be analyzed.

Positive Impulse (i.e., good news):

$$\alpha + \gamma = -3.390 + (-1.367) = -4.757 \qquad (7)$$

Negative Impulse (i.e., bad news):

$$-\alpha + \gamma = 3.390 + (-1.367) = 2.023 \qquad (8)$$

According to the results and the difference between the values of the GARCH coefficients for good and bad news, the asymmetric effect of the explanatory variables of the model is confirmed.

5. Conclusions

The conclusions around the mean conditions include:

1- The negative impact of the tax shield on corporate profitability

2. The positive and significant effect of asset return on the profitability of companies in terms of increasing the company's income level and increasing the demand for company stocks will increase the company's profitability.

3. Effective and meaningful growth on the profitability of companies is also based on the increase in the scale of the company and its positive effect.

4. The positive and significant impact of capital structure on the profitability of companies is due to the proper structure of capital employed in the production and the level of profitability of the company.

5. The positive and significant impact of the size on the profitability of companies is also justified by the fact that the company is more productive when it is large.

Based on the results of estimating around the variance of the leverage effect and the asymmetric model response to the produced shocks in every independent variable, inequality has been observed in the effects of a positive shock unit and a negative shock unit.

The first comment for listed firms on the Stock Exchange is to apply technical and practical strategies to increase the company's asset returns. According to the results of the second hypothesis, technical and functional strategies have a positive impact. Also, the present study recommends to financial managers and analysts that policy of scale development in spite of concentration has a positive impact on the operational and financial growth of the company. Special attention is paid to the formation of the company's capital based on the proper structure of the company's type of activity and the continuity of capital accumulation with the framework of capital structure in the brokerage firms. It is suggested that the firm’s financial and operational mechanism should be modified to increase the profitability of the company. For future studies, the cause-effect relationships of the variables of the model under study should be examined. Also, the dynamic and long-term effects of model variables on corporate profitability should be examined. Finally, an analysis should be carried out about the interaction of the variables of the model with the VAR approach.

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