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Analyzing Threshold Effects of Dividend per Share on Financial Return in TSE-Listed Companies

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ABSTRACT

This study aims to examine the threshold effects of dividend per share (DPS) on the financial returns of companies listed on the Tehran Stock Exchange (TSE). To this end, 109 TSE-listed companies with financial information available for the 2015–20 period were selected. Research hypotheses were tested by balanced panel threshold regression. According to the statistical significance results of the thresholds and difference-in-difference (DID) programming approach, the thresholds had nonlinear correlations with the effects of DPS on financial returns with single or multiple thresholds. Furthermore, these two variables were directly correlated, where a higher DPS boosted financial returns.

Keywords: threshold effects of DPS, financial return threshold

1. Introduction

Financial reporting is a key accounting procedure that aims to provide users with the necessary information for making economic decisions on evaluating the performance and profitability of businesses. It is therefore essential to measure and present information to facilitate evaluation of historical performance, help measure profitability, and predict future business operations (Negin Taji & Hashemi Golsefidi, 2015). In other words, the wealth of financial reports regarding the details of corporate earnings can somehow raise the awareness of small shareholders with limited access to information, thereby improving transparency (Bartav *et al.*, 2009). The only information sources for users of financial statements are corporate financial reports and investors make decisions only based on the apparent values reflected therein. The mechanical hypothesis predicts a simple mechanical relationship between profit and share price. In other words, investors could be systematically misled by accounting standards and options (Yong et al., 2021).

In the reports of companies listed on stock exchanges, net income is much more important than any other information, for it concerns the current and future performance conditions of companies. It can also help estimate future returns and provide an outlook for the managerial mindsets and future activities of companies. The accuracy and correctness of corporate exposures can greatly affect investor behavior. Some theories state that the financial leverage of companies affects their net income, DPS, and financial returns. This is mainly tested by analyzing abnormal returns due to news announcement regarding DPS (Chumpeng YangXiaoyi Hu, 2020). Since investors partly use profit to evaluate risk and return, predictably, the profit and DPS of different periods contain information. Financial leverage and financial return are also expected to encourage investors to purchase and sell stocks. The mutual threshold effects of DPS and financial return can help potential and actual investors and other stakeholders to decide to purchase, sell, or hold their stocks. Hence, this study analyzed the threshold effects of dividend per share on financial returns in TSE-listed companies. To this end, the theoretical background is presented, the research literature is reviewed, and the methods and hypotheses of theoretical background and research problems are explained. The hypotheses are tested, and finally, a conclusion is drawn followed by several recommendations.

Theoretical and Research Background

The positive and negative reactions of the market to business policies on division of earnings and their magnitudes largely depend on the status of financial resources or financial limitations, which might have various dimensions at different companies. Therefore, DPS policies could be more important in fiscally-constrained companies than in other companies due to the potential costs on companies arising from adopting different DPS policies. Moreover, the intensity of competition among different companies and the necessity to conserve cash resources for active competition seem to be important factors in DPS policies. Therefore, owning managers selling some of their shares to investors with no role in corporate management will increase representative costs. In fact, paying a considerable percentage of earnings is a control mechanism adopted by investors to moderate this conflict of interests, for dividend per share compels management to create sufficient liquidity to pay earnings. It also directs management to the stock market to financial project and provides more information to the market. Eventually, paying DPS can reduce the excessive cash that is not used and wasted by the management in profitable investment projects (Fosu, 2013). Corporate DPS policy should always fulfill two goals: 1) providing the necessary liquidity to sustain corporate growth and 2) increasing shareholder wealth. Therefore, low DPS policy is a priority in growing companies that are responsible for development plans. By contrast, companies that have reached growth and stability can meet shareholder expectations with appropriate DPS and without any operational difficulties. The status of some TSE-listed companies can be explained with respect to these parameters. Companies that have experienced good price growths in recent years despite a low DPS have often had appropriate development plans in development and possessed large savings and accumulated profits. Moreover, analysis of the financial ratios of these companies showed improvement in ratios of activity and profitability and management's optimal use of undivided resources within operations. Therefore, companies facing financial limitations will face intensified problems of financial constraints with any decision to increase

DPS, for such decisions deplete internal resources; these resources are essential for using investment opportunities in a competitive market. Compliance of fiscally-constrained companies with fixed DPS policies will increase financial leverage and decrease liquidity; hence, every investor should consider rate of return as a major factor in their decisions. Investors have always been looking for a tool to predict their investment returns. This need has inspired different models to predict the returns of shares and other important factors (variables). A major problem in selecting a set of predicting variables in financial projections is the presence of too many potential predicting variables (Setayesh Kazemnejad, 2019). Meanwhile, the lack of consensus on predicting variables is a problem in predicting the returns of shares. Therefore, some misleading variables could affect projections (Liang *et al.*, 2015).

Companies that start paying DPS after a few non-DPS periods, have a lower return on their shares relative to liquidity. Typically, companies with high growths and many investment opportunities do not pay DPS, whereas stable companies with more cash flows and fewer projects are willing to pay a larger share of their profits as DPS (Damodaran, 2010). Hashemijoo *et al.* (2012) introduced DPS as a corporate policy that determines the rate of DPS and residual earnings for reinvestment in new projects. The philosophy of earnings division is that investors do not want lower-than-expected DPS unless they believe that the investment with promised profit will yield higher earnings (Enekwe *et al.*, 2015). Managers often try to make appropriate decisions to obtain the most optimal combination of different capital resources to increase their share value. There are different theories on the combination of capital resources. Selecting the proper capital structure will reduce cost of capital and increase market value. Financing decisions and determining the optimal mix of capital structures and financial leverage are important factors in managerial decision-making (Azarnia *et al.*, 2019). DPS policy affects corporate performance, and corporate profitability can be evaluated based on returns on capitals, earnings per share, and sales growth. Thus, corporate performance is greatly affected by DPS ratio (Zakaria *et al.*, 2012). Moreover, DPS may eliminate investor distrust of future company performance (Samuel *et al.*, 2018). Companies with good corporate management could surpass their rivals for two major reasons. First, supervised businesses use their financial and human resources efficiently for profitable investments. These businesses assure investors with the belief that cash flow is less likely to reduce due to the representation problem and higher expected payments. This will ultimately increase share prices and business value (Masters, 2015). According to the signaling theory, dividends affect share price with higher dividends reducing share prices. Dividend signaling states that dividends are positively correlated with share price. Nevertheless, both theories suggest that the dividend policy affects share price. Since both theories discuss the potential of dividends to affect the share price, it is still useful to analyze the dependence of share price on financial performance in case of a correlation between businesses and different dividend policies (Abdulkadir & Abdulrashid, 2019). Managers may have difficulties understanding the unprecedented effects of dividends on the share evaluation method in the market. This could lead to ineffective managerial decisions on dividends (Adam, 2019). This correlation can be explained from three different perspectives: signaling theory, investment opportunity, and agency theory. According to the signaling theory, despite the complications of investment decisions on capital expansion, a company may pay the DPS to signal its outlook (Amidu, 2007). The main idea of this reasoning is based on information asymmetry between managers and external entities. In other words, managers have exclusive information on the current and future of their companies that are not available to external investors. Fairchild *et al's.* (2014) investment opportunity theory states that dividends affects the ability of companies to invest in new projects and sends a confusing signal to investors. A higher dividend is a negative signal since the company lacks growth opportunities, whereas a lower dividend is a positive signal that gives the company considerable growth opportunities. According to the agency theory, even if a company has insufficient operating cash flows, shareholders can find DPS a viable option to control overinvestment. In fact, dividends reduce investment rate since DPS increases the frequency at which companies increase their excessive capital from debt markets. Fitri *et al.'s* (2016) analysis of the relationship between the performance of companies and the DPS ratio showed that the capital growth coefficient was negatively correlated with DPS; whereas ROA had a positive correlation with DPS.

Three basic concepts can be considered the main layers of corporate finance: investment, financing, and dividend. In addition, maximizing the corporate value is the core objective of the corporate finance hypothesis. The concept of investment determines what resources a company should invest in, whereas the concept of financing specifies the mix of resources required for investment. Furthermore, the concept of dividend determines the profit that should be reinvested and the amount paid to shareholders. If there are no investments with the minimum rate of returns, dividends will be paid to company owners (Damodaran, 2010). Managers have been involved in profit management to fulfill and compare the projected profit margin with the industry's profitability threshold (Dingh *et al.*, 2018; Razzaque *et al.*, 2016; Nguyen *et al.*, 2019). Some empirical evidence showed a negative correlation between earnings per share and/or dividends per share and share price voltaility in advanced markets. Managers may affect the DPS policy to reduce share risk (Phan & Tran, 2019). Mohsen Hafez *et al.* (2018) analyzed the correlation between DPS and the yields of Pakistan-based companies. The results showed that DPS, EPS, and price income rate positively affected investment returns. Abdulkadir & Abdulrashid (2019) concluded that corporate performance would affect long- and short-term decisions on EPS. Hence, managers should keep effectively using their assets while increasing share values by allocating a greater portion of their incomes to profitable investments. Parsian (2014) reported that EPS positively affected debt policies. Paying profits or debts may be complementary or supplementary, and DPS is projected to have a negative effect on debts. In this case, managers act in the interest of owners. According to agency theory, if EPS (or DPS) has a positive effect on debts, they are expected to be employed to reduce cash flow and liquidity. Otherwise, they are abused by managers. Al-Malawi (2007) concluded that businesses would pay higher debts to provide shareholders with DPS. Likewise, Kim *et al.* (2018) concluded that debt policy had a positive effect on DPS policy. According to Kim *et al.* (2018), the capital structure theory suggests that debt is negatively-correlated with DPS; whereas agency theory suggests that debt is positively-correlated with DPS. The results of Parsian's (2014) latest study were consistent with agency theory, confirming the positive effect of leverage on the DPS in Sweden's market. Since paying large amounts of dividends may not protect the interests of shareholders, there are some DPS limitations to reduce the severity of the problem in the debt obligation. Companies with higher financial leverages are willing to pay lower DPS to reduce costs of transactions for external financing. In information asymmetry, managers are willing to use financial leverage or EPS to give a positive signal to capital markets, which encourages EPS or debts to act as alternative signaling factors. Debts can also be used as a substitute to EPS for reducing the agency costs. Companies with higher rates of DPS consider crediting debts lower than crediting stocks whereas highly-leveraged companies are likely to pay lower rates of DPS; therefore, debts should have a negative effect on EPS. Furthermore, stocks markets have seen upward and downward trends in practice, leading to different regimes in such markets. Regime rotation models can identify this sudden behavioral change of investors and the dynamism of prices for the next few intervals after a period of change. In other words, these models match trends in financial markets, which have dramatically changed as a result of changes in investor behaviors, although the new status quo in financial variables will continue for several periods after these changes. The above regimes identified by financial econometric methods are consistent with different economic, political, and legal changes. In balance models, regimes considerably affect the dynamism of prices of financial assets and produce a nonlinear replacement risk–return relationship. Moreover, regime transfer and various behaviors of relevant variables can potentially lead to extensive outcomes in selecting the optimal portfolios of investors (Abtahi, 2016). McCurdy and Maheu (2000) used the regime rotation model to classify the New York Stock Exchange as two different regimes: high return and low return. In fact, they employed the Markov rotation model with temporal dependence to identify nonlinear structures in conditional mean and variance of returns on shares. Smail & Isa (2008) explained the regime transfer behavior of four indices in Bursa Malaysia within 1974–2003. This model managed to control the regime transfer scheduling in four designated time series and identified the reason for this change in financial and economic crises worldwide (*e.g.*, 1974 oil shocks, 1987 stock market plunge, and 1997 financial crises). Ajami & Charfeddine (2011) used the regime rotation

models to analyze Bourse de Tunis and found that all regime rotation models were more efficient that linear models in stock market modeling. Wasim & Bandi (2012) adopted the Markov rotation model to analyze regime transfer in the National Stock Exchange of India Limited. In fact, they used this method to identify the dynamism of stock market behavior and the roles of the market in different regimes. Horng *et al.* (2015) employed threshold models and confirmed the effects of the Toronto Stock Exchange, London Stock Exchange, and Tokyo Stock Exchange on the Stock Exchange of Hong Kong Limited as well as the asymmetric effects of these markets.

Hence, the behaviors of investors in financial markets may experience short-term and long-term changes based on different variations such as asset price fluctuations. Although some changes might be transient, asset price changes are often enduring. This study employed an autoregressive threshold model to analyze regime rotation behavior. Since such models are used as nonlinear regression methods, the conventional nonlinear test of time series for stock returns was first used for this purpose. The autoregressive threshold models were then presented for stock returns in the Tehran Stock Exchange. Therefore, this study aims to analyze the threshold effects of dividends per share on the financial returns of companies listed on TSE.

3. Literature Review

Marriam *et al.* (2020) examined the effects of centralized leverage and ownership on the performance of companies. According to their overall conclusion, businesses consider the availability and unavailability of growth options as essential factors in analyzing the ownership concentration and the effect of debt on corporate performance.

Zaher & Fattah (2020) investigated the effects of financial leverage, company size, and capital structure on the company value. Their results indicated that financial leverage had no effects on the company value and that there was a negative correlation between financial leverage and Tobin's Q ratio. Nevertheless, company size and capital structure positively affected the company value and Tobin's Q ratio had a positive correlation with company size and capital structure.

The results of Abdulkadir & Abdulrashid's (2019) analysis of the effect of DPS on corporate performance in Nigerian companies showed that corporate performance affected both short- and long-term decisions on dividends. Thus, managers should keep using their assets effectively and increase the value of their shares by putting a larger portion of their incomes in profitable investments.

Dutta *et al.* (2018) studied the effects of financial leverage on the value of 31 companies listed on the New York Stock Exchange in six different sectors for ten years. Their results showed a negative correlation between financial leverage and company value after controlling company size.

Cuong Li Lin (2016) analyzed the threshold effects of debt ratio on company value through threshold panel regression. The results showed that the debt ratio had two threshold effects on the relationship between the debt ratio and company value (*i.e.*, the profitability index).

Ishari (2016) studied the effects of financial leverage on company value in a sample of ten industrial businesses in the Sri Lanka Stock Market within the 2011–15. The results showed an inverse correlation between financial leverage and company value while also proving that financial leverage had no effect on company value. In fact, financial leverage is the use of debt in the capital structure of a business. When they make financial decisions, businesses should consider the capital structure due to its effect on the debt composition and equity. As a result, it affects the profit and risk of shareholders.

Nemati *et al's.* (2019) comparative analysis of the effects of capital structure on the profitability of companies listed on the Tehran Stock Exchange found two thresholds and three regimes in Iran and other countries in Southeast Asia. In Iran, the greatest effect of debt ratio on profitability was observed in the first regime. It had a declining effect in the second regime and a very large negative effect in the third regime. In Southeastern Asian countries, the greatest effect of debt ratio on profitability was observed in the second regime, whereas it had a declining effect and a negative effect in the first and third regimes, respectively. As a result, Iranian companies should increase their debt ratios to the first regime level to prevent loss and potential bankruptcy. However, Southeastern Asian countries can increase their debt ratios to the second regime level.

Dulo & Vatki (2018) analyzed the deviation of financial leverage from target leverage and the cost of equity. According to the results consistent with

theoretical predictions, shareholders would face higher risks for greater deviation from financial leverage. They would react by asking for a higher rate of return. Therefore, a higher deviation of financial leverage would increase the cost of equity. Moreover, companies with higher sensitivity of equity to deviations from financial leverage had lower levels of deviation from the target financial leverage and a faster moderation rate.

Sa'ati Ghareh Mousavi *et al.* (2017) studied the relationship between financial leverage changes with stock returns and market size with stock returns. The results showed a direct correlation between financial leverage and stock returns as well as market size and stock returns.

Ahmadi & Didar (2017) analyzed the mediating effects of capital structure in the relationship between ownership structure and dividend policy. The results showed that ownership structure had a significant and positive correlation with dividend policy but no significant correlation with capital structure. The findings also showed a positive significant correlation between ownership structure and dividend policy. According to the findings based on multivariate regression and the Sobel test, the capital structure did not mediate the correlation between ownership structure and dividend policy.

The results of Khani & Sinaei's (2017) analysis of the correlations of DPS, financial leverage, and familial ownership led to confirming all hypotheses. In other words, family businesses had negative effects on dividends, whereas non-family businesses had positive effects. Furthermore, family businesses had negative effects on financial leverage, whereas non-family businesses had positive effects.

Emamverdi *et al.* (2017) studied the asymmetric threshold effects of leverage ratio on profitability of TSE-listed companies. Their results showed that high debt ratios had a negative effect on profitability whereas low debt ratios had a positive effect relatively greater than other regimes. Within the two thresholds, the leverage ratio had no effects on corporate profitability.

Sadeghi Bonab *et al.* (2015) analyzed the threshold effects of capital structure (*i.e.*, the debt ratio) on profitability in TSE-listed companies. The results suggested that a high debt ratio had a negative effect on profitability whereas a low debt ratio had a positive and relatively greater effect on profitability than the other regimes. Within these two thresholds, the leverage ratio had no effects on corporate profitability.

Khorshid *et al.* (2015) studied the threshold effects of capital structure on profitability growth and economic value-add, and the results showed that profitability growth and economic value-add had significant positive correlations with capital structure (*i.e.*, the ratio of total debt to total asset). However, the correlation between capital structure and high debt ratio was negative. Moreover, the ratio of long-term debt to total asset had a direct significant correlation with profitability growth, whereas its relationship with the economic value-added was negative but not statistically significant.

Hashemi & Keshavarz Mehr (2015) analyzed the moderation rate asymmetry of capital structure through a dynamic threshold model. According to the hypothesis testing results, companies with budget deficit, higher investment rates, and lower revenue fluctuations moderated their capital structures faster than companies with the opposite characteristics. In fact, these companies had a greater incentive to moderate their capital structures for facing greater costs in financial crises or lower moderation costs. Hence, these companies moved toward their target leverages at different rates.

Research Hypotheses

The effect of DPS on financial return has a nonlinear correlation with one or several threshold values.

Methodology

This applied research was within the deductive-inductive reasoning framework. For this purpose, theoretical foundations and research background were reviewed through a desk method by deductively analyzing papers and websites and collecting data to inductively confirm or reject the hypotheses. The necessary research data were collected from financial statements and their attachment notes and the initial information on the Tehran Stock Exchange Board (via *Rahavard Novin* and *Iran Financial Data Bank*).

The statistical population included all the companies listed on the Tehran Stock Exchange within 2015–20. The systemic purposive sampling method was used for sampling according to the following criteria:

The fiscal year of each company ended on March 20 (or March 21). Companies were listed on the Tehran Stock Exchange for at least six months within 2015-20 with available financial statements. They exposed sufficient information for measuring the research variables.

Finally, 112 eligible companies were selected as the research sample.

Research Model and Variables:

Since Tang (1978) proposed the threshold model, this nonlinear time series model has grown in popularity in economic and financial studies. To estimate an autoregressive threshold model, the threshold effects should be first analyzed. If the null hypothesis cannot be rejected, there are no threshold effects. Disturbance causes the "Davis problem" after the nonstandard distribution. Hansen (1999) proposed the bootstrap method for evaluating the importance of threshold effects to calculate the unsigned distribution of the test statistic. In addition, when there are no null hypotheses, there are no threshold effects. Chan (1993) proved that the OLS estimation of threshold was compatible and resulted in asymptotic distribution. However, disturbance affected this distribution and made it nonstandard. Hansen (1999) used the simulation probability ratio test to obtain the non-normal distribution of a statistical test for thresholds. Hansen (1999) proposed using the two-step OLS method for estimating the panel threshold model. Firstly, the sum of squared errors (SSR) should be calculated separately. Secondly, the estimate should be found with the smallest number of squares. Finally, the threshold estimation should be employed to estimate and analyze the coefficients of each "regime".

According to the "trade theory" of the capital structure, the tax shield of interest increases as the debt ratio does. Nevertheless, the costs of higher leverage increase to compensate the positive effect of the debt-to-return ratio. Therefore, this paper aims to determine whether financial leverage has any threshold effects on financial returns and DPS policy. To this end, it is assumed that there is an optimal debt ratio, which is estimated through the threshold model that can record the relationships of financial leverage, financial return, and DVS policy while helping financial managers make the right decisions.

In addition, the fixed effects indicate the heterogeneity of companies in different operating conditions. The errors are assumed to be independent and distributed normally with the mean variance of zero within the distribution range. I (0) represents different companies and t denotes various periods. Another threshold regression model (1) is for regulation:

$$v_{it} = \mu_i + \theta' h_{it} + \alpha_1 d_{it} I(d_{it} \le \gamma) + \alpha_2 d_{it} I(d_{it} > \gamma) + \varepsilon_{it} \quad (2)$$

Where I (.) represents the index performance and can be defined as below:

$$v_{it} = \mu_i + \theta' h_{it} + \alpha' d_{it}(\gamma) + \varepsilon_{it}$$

As

$$v_{it} = \mu_i + \left[\theta', \alpha'\right] \begin{bmatrix} h_{it} \\ d_{it}(\gamma) \end{bmatrix} + \varepsilon_{it}$$

$$v_{it} = \mu_i + \beta' x_{it}(\gamma) + \varepsilon_{it} \quad (3)$$

$$d_{it}(\gamma) = \begin{bmatrix} d_{it} I(d_{it} \le \gamma) \\ d_{it} I(d_{it} > \gamma) \end{bmatrix}$$

where $\alpha = \left(\alpha_1, \alpha_2\right)'$, $\beta = \left(\theta', \alpha'\right)'$, and $x_{it} = \left(h_{it}', d_{it}'(\gamma)\right)'$.

The observations are divided into two "regimes" based on whether the threshold variable is smaller or greater than the threshold. The regimes with different regression slopes are denoted by d_{it}. The known variables and estimates of parameters (, , and) will be used.

Note that the mean (3) is obtained along the index t …:

$$\bar{v}_{it} = \mu_i + \beta' \bar{d}_{it}(\gamma) + \bar{\varepsilon}_{it} \quad (4)$$

where $\bar{v}_i = \frac{1}{T}\sum_{t=1}^{T} v_{it}$, $\bar{\varepsilon}_i = \frac{1}{T}\sum_{t=1}^{T} \varepsilon_{it}$, and $\bar{d}_i(\gamma) = \frac{1}{T}\sum_{t=1}^{T} d_{it}(\gamma) = \begin{bmatrix} \frac{1}{T}\sum_{t=1}^{T} d_{it} I(d_{it} \le \gamma) \\ \frac{1}{T}\sum_{t=1}^{T} d_{it} I(d_{it} > \gamma) \end{bmatrix}$.

With the difference between Returns (3) and (4):

$$v_{it}^* = \alpha' d_{it}^*(\gamma) + \varepsilon_{it}^* \quad (5)$$

where $v_{it}^* = v_{it} - \bar{v}_i$, $d_{it}^*(\gamma) = d_{it}(\gamma) - \bar{d}_i(\gamma)$, and $\varepsilon_{it}^* = \varepsilon_{it} - \bar{\varepsilon}_i$.

Now:

$$v_i^* = \begin{bmatrix} v_{i2}^* \\ \vdots \\ v_{iT}^* \end{bmatrix}, d_i^*(\gamma) = \begin{bmatrix} d_{i2}^*(\gamma)' \\ \vdots \\ d_{iT}^*(\gamma)' \end{bmatrix}, \text{ and } \varepsilon_i^* = \begin{bmatrix} \varepsilon_{i2}^* \\ \vdots \\ \varepsilon_{iT}^* \end{bmatrix}.$$

Determine the data and accumulated errors for an individual with a deleted interval. Place the collected data on all individuals and present the results.

$$V^* = \begin{bmatrix} v_1^* \\ \vdots \\ v_i^* \\ \vdots \\ v_n^* \end{bmatrix}, D^*(\gamma) = \begin{bmatrix} d_1^*(\gamma) \\ \vdots \\ d_i^*(\gamma) \\ \vdots \\ d_n^*(\gamma) \end{bmatrix}, \text{ and } e^* = \begin{bmatrix} \varepsilon_1^* \\ \vdots \\ \varepsilon_i^* \\ \vdots \\ \varepsilon_n^* \end{bmatrix}.$$

Use this symbol. Equation (5) will be ….

$$V_{it}^* = D_{it}^*(\gamma)\alpha + e_{it}^* \tag{6}$$

Equation (6) indicates the main threshold effect estimation model. In each case, the slope coefficient can be estimated through the OLS method. In other words:

$$\hat{\alpha}(\gamma) = \left(D^*(\gamma)'D^*(\gamma)\right)^{-1} D^*(\gamma)V^* \tag{7}$$

The vector of regression residuals is as follows:

$$\hat{e}^*(\gamma) = V^* - D^*(\gamma)\hat{\alpha}(\gamma) \tag{8}$$

$$SSE_1(\gamma) = \hat{e}^*(\gamma)'\hat{e}^*(\gamma) = V^*(I - D^*(\gamma)(D^*(\gamma)'D^*(\gamma))^{-1}D^*(\gamma)')V^* \tag{9}$$

This process is facilitated by minimizing the centralized value of squared errors; therefore, the least squared errors are estimated with the following equation:

$$\hat{\gamma} = argmin\, S\, SE_1(\gamma) \tag{10}$$

$$\hat{\sigma}^2 = \hat{\sigma}^2(\hat{\gamma}) = \frac{1}{n(T-1)}\hat{e}*'(\hat{\gamma})\hat{e}^*(\hat{\gamma}) = \frac{1}{n(T-1)}SSE_1(\hat{\gamma}) \tag{11}$$

Where *n* denotes the number of samples and *T* lists the sample periods:

$$v_{it} = \begin{cases} \mu_i + \theta' h_{it} + \alpha_1 d_{it} + \varepsilon_{it} & if \quad d_{it} \le \gamma_1 \\ \mu_i + \theta' h_{it} + \alpha_2 d_{it} + \varepsilon_{it} & if \quad \gamma_1 < d_{it} \le \gamma_2 \\ \mu_i + \theta' h_{it} + \alpha_3 d_{it} + \varepsilon_{it} & if \quad \gamma_2 \le d_{it} \end{cases}$$

for the double threshold effect

$$v_{it} = \begin{cases} \mu_i + \theta' h_{it} + \alpha_1 d_{it} + \varepsilon_{it} & if \quad d_{it} \le \gamma \\ \mu_i + \theta' h_{it} + \alpha_2 d_{it} + \varepsilon_{it} & if \quad d_{it} > \gamma \end{cases}$$ for

the single threshold effect

This study analyzed the hypothesis stating the threshold effects between financial leverage and DPS policy, between financial leverage and financial returns, and between DPS policy and financial returns. It is important to determine the statistical significance of the threshold. The null hypothesis and the alterative hypothesis are as follows:

$$\begin{cases} H_0: \alpha_1 = \alpha_2 \\ H_1: \alpha_1 \ne \alpha_2 \end{cases}$$

With a null hypothesis, there is no coefficient = threshold effect. With an alternative hypothesis, there is a coefficient – threshold effect between the debt ratio and the company value. Based on the null hypothesis of no threshold, the model is defined as below:

$$v_{it} = u_i + \theta' h_{it} + \alpha' d_{it}(\gamma) + \varepsilon_{it} \tag{12}$$

$$V_{it}{}^* = \alpha_1' H_{it}{}^* + e_{it}{}^* \tag{13}$$

Where errors are defined as $SSE_0 = \tilde{e}^{*\prime}\tilde{e}^*$:

Hansen (1999) showed that the F-test method and the super parent statistic were employed to test the existence of the threshold effects and test the null hypothesis.

$$F = sup\, F\,(\gamma) \tag{14}$$

$$F(\gamma) = \frac{(SSE_0 - SSE_1(\hat{\gamma}))/1}{SSE_1(\hat{\gamma})/n(T-1)} = \frac{SSE_0 - SSE_1(\hat{\gamma})}{\hat{\sigma}^2} \tag{15}$$

According to the null hypothesis, the absence of some coefficients (*e.g.*, the predetermined threshold) leads to disturbance. Based on the "Davis problem" (1977, 1987), the F-statistic has a non-normal distribution. Hansen (1996) showed that a bootstrap method is used for obtaining the first-order free distribution. Hence, all of the P-values created by the bootstrap method have no signs of validity. The regressors and the threshold variable are treated based on the given

equation. Their values are then repeated in the bootstrap samples, and the regression residuals are determined and classified separately.

If there are double thresholds, the model is modified as follows:

$$v_{it}=\begin{cases}\mu_i+\theta' h_{it}+\alpha_1 d_{it}+\varepsilon_{it} & if \quad d_{it}\le\gamma_1\\ \mu_i+\theta' h_{it}+\alpha_2 d_{it}+\varepsilon_{it} & if \quad \gamma_1<d_{it}\le\gamma_2\\ \mu_i+\theta' h_{it}+\alpha_3 d_{it}+\varepsilon_{it} & if \quad \gamma_2\le d_{it}\end{cases} \tag{21}$$

$\gamma_1<\gamma_2$

$\gamma_1,\gamma_2,\gamma_3,\cdots\gamma_n$

This model can be expanded into different threshold models.

$$v_{it}=\begin{cases}\mu_i+\theta' h_{it}+\alpha_1 d_{it}+\varepsilon_{it} & if \quad d_{it}\le\gamma_1\\ \mu_i+\theta' h_{it}+\alpha_2 d_{it}+\varepsilon_{it} & if \quad \gamma_1<d_{it}\le\gamma_2\\ \mu_i+\theta' h_{it}+\alpha_3 d_{it}+\varepsilon_{it} & if \quad \gamma_2\le d_{it}\end{cases}$$

for the single threshold

$$v_{it}=\begin{cases}\mu_i+\theta' h_{it}+\alpha_1 d_{it}+\varepsilon_{it} & if \quad d_{it}\le\gamma\\ \mu_i+\theta' h_{it}+\alpha_2 d_{it}+\varepsilon_{it} & if \quad d_{it}>\gamma\end{cases}$$

for the double threshold

Therefore, Hansen's (1999) balanced panel threshold regression method proposed seeks to find out if regression functions pass all observations uniformly or if they can be broken down into separate groups. The conventional analysis of nonlinear relationships is usually based on dividing a sample into two exogenous groups. This method is also based on personal judgment and preferences. This method determines the number of regimes and their locations with respect to the guidance provided by previous economic theories. In this case, the accuracy of results and estimated parameters can be questioned, for it depends greatly on the selection of the point in which the threshold occurs. The consecutive regression or the regression tree is another method of threshold analysis that determines the quantity and locations of thresholds in a totally endogenous way by sorting the existing data (Lee & Wong, 2005). This topic was seriously expanded by Hansen (1997, 1999, and 2000) by proposing a new econometric technique. The other advantages of this method are that subjective imaginations are not involved in developing the type of nonlinear relationships. In fact, there is no need for any forms of nonlinear functions for the analysis of nonlinear relationships (Zibaei & Mazaheri, 2009, 14).

If the balanced composite data are defined as $\{y_{it}, q_{it}, x_{it} : 1\le i<n, 1\le t<T\}$, in which i and t respectively refer to cross-sections and time, then y_{it} and q_{it} denote the scalar dependent variable and the scalar threshold variable, respectively. Moreover, regressor x_{it} is a vector. The structural form of this model is defined as follows:

$$Y_{it}=\mu_i+\beta_1' x_{it} I(q_{it}\le\gamma)+\beta_2' x_{it} I(q_{it}>\gamma)+e_{it}$$

Where I (0) is the index function.

The observations are divided into two regimes based on whether the threshold variable is smaller or greater than the threshold γ. These regimes are specified by differences of regression slopes. Elements must not change over time, and the threshold variable is also assumed unchangeable. The error expression is assumed to be independent with a normal distribution, a mean of zero, and a limited variance of σ^2 (idd). After determining the threshold points using the Hansen method, the research model is estimated as follows:

$$v_{it}=\begin{cases}\mu_i+\theta' h_{it}+\alpha_1 d_{it}+\varepsilon_{it} & if \quad d_{it}\le\gamma\\ \mu_i+\theta' h_{it}+\alpha_2 d_{it}+\varepsilon_{it} & if \quad d_{it}>\gamma\end{cases}$$

$$\theta=(\theta_1,\theta_2,\theta_3,\theta_4)',\ h_{it}=(s_{it},m_{it},g_{it},c_{it})'$$

Another representation of the above model is estimated as follows:

$$v_{it}=\mu_i+\theta' h_{it}+\alpha_1 d_{it} I(d_{it}\le\gamma)+\alpha_2 d_{it} I(d_{it}>\gamma)+\varepsilon_{it}$$

Threshold Estimation

In the above equations, it is important to estimate the threshold value for classifying data under two separate groups based on the debt-to-asset ratio. The estimation program was designed in software and a regression was estimated for each of the values set for ---. The sum of squared residuals is calculated for each of the estimated regressions as follows:

$$S_1(\gamma) = \hat{e}^*(\gamma)'\hat{e}^*(\gamma)$$

The sum of squared error depends on γ through the index functions. The optimal value is one that meets the following condition:

$$\hat{\gamma} = \arg_{\gamma}\min S_1(\gamma)$$

The sum of squared errors is then calculated. It has the smallest value when …. According to Chan (1993), with an unknown threshold parameter, estimates compatible with the threshold parameter can be obtained by maximizing the coefficient of determination (R^2) or minimizing the sum of squared errors (SSR) (Mehrara *et al.*, 2011).

The regression parameter is then obtained as residuals and squared errors by estimating the above equation through the OLS. If the threshold exists, the variance is calculated through the following equation:

$$\hat{\sigma}^2 = \frac{1}{n(T-1)}\hat{e}^{*\prime}\hat{e}^* = \frac{1}{n(T-1)}S_1(\hat{\gamma})$$

Finally, the likelihood ratio test for the hypothesis is defined as follows:

$$F_1 = \frac{S_0 - S_1(\gamma)}{\hat{\sigma}^2}$$

The sum of squared errors can be determined with or without the threshold. The value of F can be obtained by substituting these values in the equation. Hansen (1996) proposed the resampling method to compare the resultant values with the critical ones since the distribution was (and is) non-normal.

Conceptual Definitions

Financial Return

The financial return of every investment is obtained by dividing incomes by the investment amount. Thus, the return of equity was the measure of company performance. According to the theoretical background, it is the ratio of a company's net profit to total equity at the end of a fiscal year (Ghasemi *et al.*, 2018; Wataw, 2015; Moritala, 2012).

Dividends

Companies provide dividends to shareholders in the form of cash, reward shares, or other assets. In this study, the dividends per share were the ratio of profits from each share at the end of the fiscal year (Ghasemi *et al.*, 2018; Lee & Fun, 2017; Moliani *et al.*, 2016; Moritala, 2012).

Control Variables

Liquidity

Liquidity is the ratio of differences between current assets and current debts to the total assets at the end of the fiscal year (Ghasemi *et al.*, 2018; Lee & Fun, 2017; Wataw, 2015).

Company Size

It is equal to the natural logarithm of the company's stock market value (Rajorma *et al.*, 2019; Moliani *et al.*, 2016; Cooper *et al.*, 2014)

Corporate Growth

This variable is the ratio of changes in sales to the company's total sales in the first period at the end of the fiscal year (Rajorma *et al.*, 2019; Batmonch Wong, 2019; Agrawal & Padhan, 2017).

Growth Opportunities

Growth opportunities: To measure growth opportunities, the Kitobin ratio has been used:

Tobin's Q ratio is equal to the ratio of the market value of the stock plus the book value of the liabilities divided by the book value of the company's assets (Rajorma *et al.*, 2019; Cooper *et al.*, 2014).

Institutional Shareholders

This variable denotes the ratio of shares owned by institutional shareholders at the end of the fiscal year (Rajorma *et al.*, 2019; Moliani *et al.*, 2016).

Research Findings

Since the significance level of the F statistic and the *t*-statistic of the independent variable were below 0.05, the hypothesis was confirmed. Furthermore, the effects of dividends on financial returns had a nonlinear relationship with one or more threshold values. Also, according to the possibility of t-test related to the control variables, it can be said that the size of the companies and institutional ownership have no effect on the relationship between dividends paid and financial return, but the control variables of liquidity, company growth and growth opportunities have a direct effect on The relationship between the paid dividends and the amount of financial return has been

effective and has increased the financial return of companies.

According to the above tables, the value of 22.4% will divide the sample into two regimes, the first of which includes companies with high dividends and the second representing companies with low dividends. Moreover, the value of 73.6% will divide the sample into two regimes, the first including companies with relatively high dividends and the second representing companies with very high dividends above 22.4%. By contrast, the companies with sub 22.4% dividends were classified as low-dividend companies. Moreover, companies with very high dividends had rates above 73.6%.

According to the estimation results, the sub-5% parent chi-squared probability statistic indicated that the entire model was statistically significant. Furthermore, the *t*-test probability was below 5% for the dividends with a smaller threshold. Hence, the estimated coefficient of the above variable was statistically significant. By contrast, the coefficient of dividends with a higher threshold had no effects in the same interval. Therefore, it can be concluded that dividends had a nonlinear effect on financial returns with one or more thresholds.

Analyzing the effect of year using difference-in-difference programming:

The above table clearly shows that only in 2019, no effects were observed (omitted due to a high correlation). However, the greatest effects of dividends on financial returns were observed in 2015, 2016, 2017, 2018, and 2020. Hence, dividends had nonlinear effects on financial returns in 2015, 2016, 2017, 2018, and 2020 with one or more thresholds.

Table 1. Hypotheses Test Results

Variables	Estimated coefficient	Standard error	*t*-test statistic	*t*-test probability
DIVIDENDS	0.897051	0.143169	6.265682	0.000
SIZE	0.002557	0.003611	0.708151	0.479
INS	0.000568	0.000308	1.844557	0.066
LIQUIDITY	0.900948	0.163963	5.494812	0.000
GROW	0.057483	0.013718	4.190352	0.000
MB	0.091219	0.00887	10.26389	0.000
C	0.237401	0.064402	3.686213	0.000
R^2	0.443956	Durbin–Watson criterion		1.534223
Moderated R^2	0.436945			
Fisher's statistic	86.79509			
Fisher's probability	0.000			

Table 2. Estimation of Threshold Values

	Estimate
γ_1	0.224516
γ_2	0.736251

Table 3. Test of Threshold Effects

Test for Single Threshold	
F1	267.442
Bootstrapped p-value for one break	0.000
Test for Double Threshold	
F2	213.748
Bootstrapped p-value for two breaks	0.000

Table 4. Testing the Threshold Effects of the Research Hypothesis Based on Years of Research Years Using DID Programming

Variables	Estimated coefficient	Standard error	*t*-test statistic	*t*-test probability
DIVIDENDS2	0.0189237	0.0058208	3.25	0.001
DIVIDENDS1	0 (omitted)			
Effect of year				
2015	0.0328478	0.0097744	3.36	0.001
2016	0.0501074	0.009548	5.25	0.000
2017	0.062092	0.009468	6.56	0.000
2018	0.0350367	0.008758	4.00	0.000
2019	Omitted by software due to a high correlation			
2020	0.3041809	0.0353997	8.59	0.000
Fixed coefficient	5.576857	0.0989653	56.35	0.000
Chi-squared statistic in GLS regression	1375.62	Chi-squared statistic in GLS regression	0.000	

Discussion and Conclusion

In novel financial theories, financial managers have two responsibilities. Firstly, they should ensure the favorable size and combination of corporate assets. Secondly, they should guarantee the optimal use of resources for maximizing value. Therefore, the capital structure is characterized by maximizing corporate value by increasing return or reducing the corporate costs. The capital structure and its optimal combination or corporate financing through different resources are among the topics first introduced by Modigliani and Miller in 1985. Ever since, they have been used as the basic concepts of many financial studies, sometimes culminating in the development of novel theories. The most important goal of capital structure determination policies is to determine the combination of financial resources to maximize shareholder wealth.

The DPS policy is among short-term and long-term corporate strategies whose effects are observed in the public assemblies of companies at the end of each fiscal year and are referred to for evaluating corporate performance. In fact, the DPS policy determines the method of calculating dividends, accumulated profits, rewards of board members, financing methods, and other relevant topics, which are all codified and presented to the public assembly of shareholders. The DPS policy is among the serious strategies and major financial decisions of companies developed through the relevant theories, and its determinants are then identified. It has always been among controversial topics of economics, insomuch as contemporary researchers have grown fond it.

Since investors seek to maximize their returns in stock markets, they try to invest in stocks with more promise. They also believe that they should take higher risks to achieve higher returns. Therefore, it is recommended that they buy shares with lower rates of financial leverage but higher dividends.

The DPS is among important factors for investors in the stock market. The market legislators have also devised different measures to improve dividends per share. In fact, the DPS is among the most important areas of financial science and investment. It is really helpful to determine the factors that can affect dividends and financial returns by increasing dividends to help improve the efficiency of financial markets. This study analyzed the mutual threshold effects of dividends per share and financial returns at companies listed on the Tehran Stock Exchange.

The results of testing the research hypothesis showed that:

The dividends per share had nonlinear effects on financial returns with one or more threshold values. The results were consistent with the findings reported by Marriam *et al.* (2020), Zahir and Fattah (2020), Abdulkadir and Abdulrashid (2019), Dutta *et al.* (2018), Cuong Li Lin (2016), and Qash and Qash (2009).

This study aimed to analyze the threshold effects of dividends on financial returns of TSE-listed companies.

According to the results of research hypotheses, there was a nonlinear correlation between the effects of dividends and financial returns with one or more thresholds. Moreover, these two are directly correlated,

meaning that higher dividends increase financial returns. The results of hypothesis testing showed a positive correlation between dividends and financial returns. In fact, greater dividends mean higher financial returns.

To maximize their returns and earnings in stock markets, investors look for shares with more promise. They also believe that they should take more risks to gain higher returns. Therefore, it is recommended that they buy shares with higher dividends.

The effects of dividends on financial returns followed a nonlinear relationship with one or more thresholds.

There has been much effort to predict financial returns, a favorable factor for investors and financial researchers, to develop a model that can reliably predict financial returns. The financial returns on shares are among the most important criteria affecting decisions made by stock market investors. Therefore, many researchers have tried to identify the factors affecting company stocks to provide better estimates. For this purpose, there have been different models proposed for determining the patterns of returns on stocks. The three-factor Fama-and-French model is among the most famous methods of pricing capital assets. Initial studies were conducted to introduce the systematic risk as the only factor affecting returns on stocks. However, empirical tests showed that stock returns were not only influenced by risk. In fact, many factors such as liquidity ratios, leverage ratios, activity ratios, profitability ratios, market ratios, cash flow ratios, risk indices, profit management, profit prediction, real investment, and corporate features were involved in determining market return trends. Moreover, studies have reported contradictory results while trying to identify the factors affecting financial returns of TSE-listed companies. No studies have yet criticized the theoretical background and combination of results to reach a consensus. Hence, this study aimed to employ the threshold approach through DID programming to bridge the research gap and present specific results regarding the factors affecting the financial returns of TSE-listed companies. Analysis of research data through statistical methods suggested that DPS had a significant positive correlation with financial return, which indicated that increasing dividends would increase the financial returns of companies. In other words, companies with higher investment and profitability can ultimately yield higher returns, and will have more capacity to pay higher dividends. Therefore, a company with higher dividends will have higher financial returns and offer more promising shares for purchase and retention.

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