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Original scientific paper

THE IMPACT OF DIVIDEND POLICY ON PRICE-TO-EARNINGS RATIO – THE CASE OF WESTERN EUROPE

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Abstract

In a world full ofstudiesdealing withthe relationshipof price-to-earnings ratio and the dividend payout ratio, rarely noticeable are those examining the possibility that this relationship may be nonlinear.Although rare, studies that aim to fill this gap focus solely on the US capital market. The lack of those kinds of studies alongside with the absence of studies for Europewas main incentive for this paper. Therefore this paper aims to examine the conditional and nonlinear relationship between price-to-earnings ratio and dividend payout ratio where by the inclusion of various factors the non/linearrelationship is conditioned on the comparative levelsof return on equity and the required rate of return. In order to explore this relationship, a fixed effects panel regression model is used. Main findings are based on an examination of an annual data of 69 companies from 11 European countries in the period from 2014 to 2018. The results show positive relationship and convexity between the price-to-earnings ratio and the dividend payout ratio, leading to the conclusion that European investors prefer dividends and "award" the increase in the dividend payout with increased price-to-earnings ratio. The findings imply that financial managers of Western European companies should pay more attention to the reduction of the payout ratio.

Keywords:*dividend payout ratio, price-to-earnings ratio, nonlinearity, convexity, capital market*

JEL Classification*: C33, G12, G32, G35*

Introduction

The dividend phenomenon starts to get really famous by the mid 50's, and since thenresulted in a large body of both theoretical and empirical researches. However, until present dates, no general consensus has been reached. Furthermore, scholars often disagree about same empirical evidence. As the time passes, Fisher Black's statement about dividend policy"the harder we look at the dividend picture, the more it seems like a puzzle, with pieces that do not fit together" (Black, 1976,p.5) becomes more as a norm rather than an ordinary statement. The development of the dividends is conditioned mainly on the development of the corporations. Graham & Dodd (1934) argued that the sole purpose for the existence of the corporation is to pay dividends and that companies that pay higher dividends must sell their shares at higher prices. Completely opposite to this is the Miller & Modigliani (1961) dividend irrelevance hypothesis. The second half of the 20th century is well known by the differentiation

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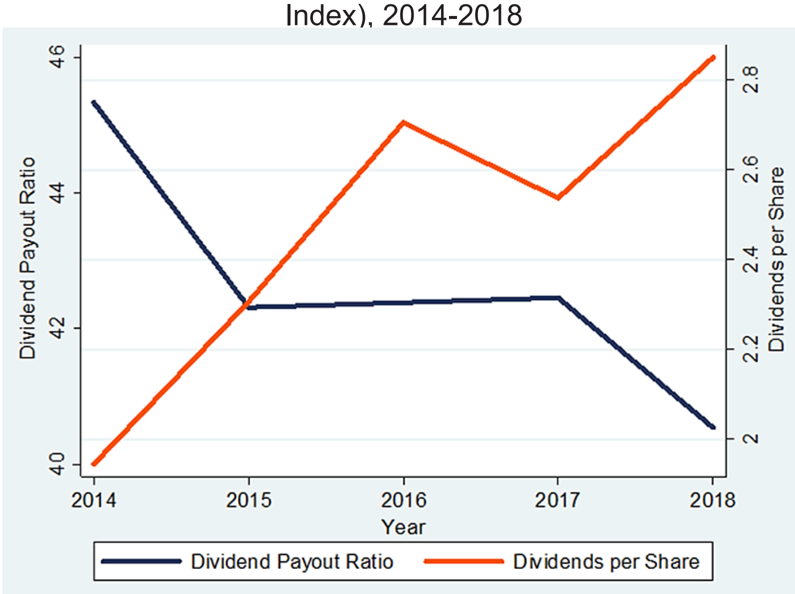
of the three main theories and explanations of dividend policy; the bird-in-the-hand argument, the tax-preference argument and the dividend irrelevance hypothesis. The existence of capital market imperfections resulted in many more theories and explanations of the dividend policy, such as the signaling effect, the clientele effect and the agency cost hypothesis. It is worth noting that nowadays as well as in the past, almost all theories are mainly being affected by the US capital market trends. Its complexity, level of development and longtime existence is certainly in line with this situation. Lack of studies about the predominating dividend policy among European companies, as well as studies about market reactions to changes in the dividend policyincentive this research. Over the past decades, noticeable are significant changes in the behavior of dividend paying companies. In the US, over the years there is very noticeable trend of fairly constant dividend per share and highly volatile dividend payout ratio (Baker & Smith, 2006; Reilly & Brown, 2011; Jitmaneeroj, 2018). However, this US-trend is not replicated on the European continent (based on Western European countries). Following the movement of average dividend payout ratios and average dividends per share based on 69 Western European companies, the volatility is present among both ratios (Figure 1).

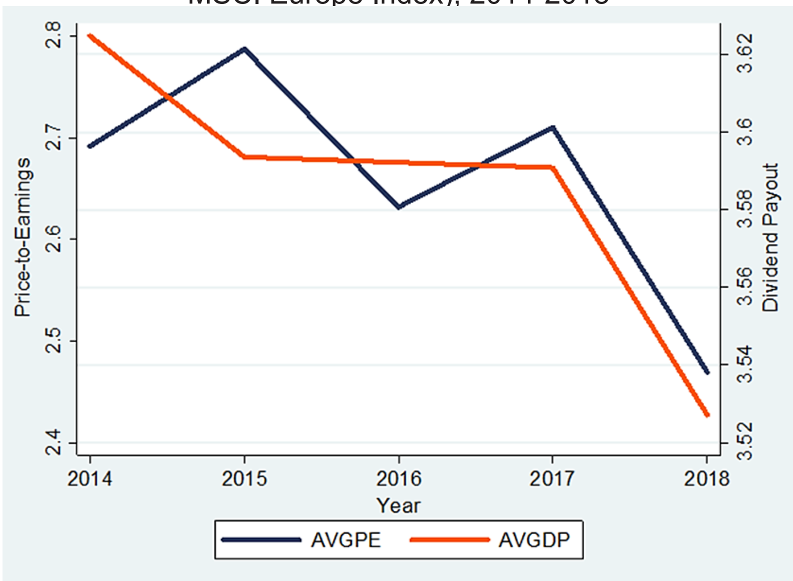
Figure 1. Average Dividend Payout Ratio and Average Dividends per Share Movements of Western European Companies (part of the MSCI Europe Index), 2014-2018



Source: Credit Suisse HoltLens™ data, author's calculation and illustration

The impacts that the dividends paid out have to the stock movements resulted in wide range of studies about this relationship (Reilly, Griggs, & Wong, 1983; Nikbahkt&Polat, 1998; Shamsuddin& Hillier, 2004; Anderson & Brooks, 2006; White, 2000; Huang &Wirjanto, 2012; Cho, 1994; Kane, Marcus, & Noh, 1996; Ramcharran, 2002). Usually those researchers resort to the Gordon's constant growth dividend discount model (DDM) as a key building framework while as an indicator of the stock value is used the price-to-earnings ratio. All those studies assume and conclude the linear relationship between the dividend payout and the price-to-earnings ratio. However, they fail to notice the DDM's implications that the relationship between price-to-earnings ratio and the payout ratio is not always linear. Figure 2 represents the movement of the average values of the price-to-earnings ratio and the dividend payout ratio on the case of 69 companies from Western Europe for the period 2014-2018. The unsynchronized movement in certain moments shines a light of a possible nonlinear relationship.

Figure 2. Average Price-to-Earnings (AVGPE) and Average Dividend Payout Ratio (AVGDP)Movements of Western European Companies (part of the MSCI Europe Index), 2014-2018



Source: Credit Suisse HoltLens™ data, author's calculation and illustration

So far, the only study that assumes for possible nonlinear relationship between the price-to-earnings and the dividend payout ratio is the study of Jitmaneeroj (2018) examining this relationship based on 1998-2014 annual data of US companies.No empirical literature hasbeen found that assumes the issue of conditional and nonlinear relationship between price-to-earnings ratio and dividend payout ratio for the whole European region, for the part of Europe neither for a single European country, to the best of author's knowledge. In order to assess this, data for 69 companies from 43 industries and 11 European countries for the period 2014-2018 is used, obtained from Credit Suisse Holt Lens™ data base.

The remainder of this paper is structured as follows: Section 2 summarizes the literature review. Section 3 refers to the research methodology.Section 4 reports the empirical results. Section 5 provides concluding remarks.

Literature Review

Much of the real world discussions of stock valuation concentrate on the price-to-earnings ratio. Practitioners often use the price-to-earnings ratio as an indicator of stock valuation due to its practical simplicity and initiative appeal (Jitmaneeroj, 2018).

This ratio, as proportion of market value per share and earnings per share might serve as a useful indicator of expectations of growth opportunities (Bodie, Kane, & Marcus, 2014). According to Bodie et al. (2014) the constant-growth DDM formula may be expressed with the price-to-earnings ratio, as follows:

$$\frac{P_0}{E_1} = \frac{d}{k-g} \tag{1}$$

where P_0 is the current stock price, E_1 is the earnings per share at the end of the next period, d is the dividend payout ratio, k is the required rate of return and g is the expected dividend growth rate.Since empirical studies of the determinants of the price-to-earnings ratio usually use the Gordon's constant-growth DDM and due the model adjustment ability, this formula is used as a starting point in this study too. The constant-growth DMM, as shown in equation (1), suggests that the price-to-earnings ratio is affected by the dividend payout ratio, the required rate of return and the expected dividend growth rate. The equation (1) suggests that any increase in the dividend payout ratio as well as the expected growth rate of dividends positively influence the price-to-earnings ratio, while opposed effect is expected from the increase of the required rate of return. In this study, instead of growth of dividends, growth rate of earnings per share will be used as a determinant of price-to-earnings ratio. Several researchers employ this approach in stock valuation because of the positive correlation between the price-to-earnings ratio and earnings growth (Fama& French, 1998; Lamont, 1998; Campbell, 2002; and Bagella, Becchetti, &Adriani, 2005). In addition to the aforementioned factors, many other determinants of the price-to-earnings ratio are identified in many empirical studies. For instance, Bennett (1968) analyzes 28 factors, among which: the earnings stability, the dividend payout ratio, the dividend yield, the percentage change of dividends, the leverage and others; Wenjing (2008) cluster all factors into financial and nonfinancial. The dividend payout ratio, the debt-to-asset ratio, the earnings per share growth, the return on equity growth and others are treated as financial. While the stock liquidity, the beta coefficient, the IPO price and others are clustered in the nonfinancial group of factors; Beaver & Morse (1978) analyze the impact of the beta coefficient and earnings growth on the inversed price-to-earnings coefficient. In this study, following factors will be treated as determinants of the price-to-earnings ratio: earnings growth, risk free rate, equity risk premium, market capitalization, debt-to-asset ratio, market-to-book ratio and the dividend yield. Those factors are identified in several studies such as Chen, Yu, & Huang (2015), Chua, DeLisle, Feng, & Lee (2015), Sum (2014), Yin, Peasnell, Lubberink, & Hunt (2014) and Jitmaneeroj (2018). In this study *the earnings growth* is represented as a percentage change of the earnings per share in current compared to the previous period. Reilly et al. (1983)suggests that the growth in earnings result in growth of the price-to-earnings ratio. On the other hand, Ward &Stathoulis (1993) state the negative relationship between the earnings growth and the price-to-earnings ratio. They complement this view with the following equation: $\frac{P_0}{E_1} = \frac{P_0}{E_0(1+g_e)}$, where P_0 is the current stock price, E_0 is the reported earnings, and g_e is the earnings growth rate.Despite Ward &Stathoulis (1993), Beaver & Morse (1978)studies show the negative correlation of earnings growth and price-to-earnings ratio. *Risk free rate* and *equity risk premium*as components of the required rate of return as the CAPM model suggests are negatively correlated to the price-to-earnings ratio (Anderson & Brooks, 2006; Cho, 1994; Jain &Rosett, 2006; Kane et al., 1996; Ramcharran, 2002; Reilly et al., 1983; White, 2000). In terms of *market capitalization* larger companies usually have higher price-to-earnings ratio than smaller companies possibly because mutual funds typically gravitate towards investing in larger companies (Anderson & Brooks, 2006; Basu, 1983; Cho, 1994; Huang &Wirjanto, 2012; Jitmaneeroj, 2018). High *debt-to-asset ratio* lead to greater required rate of return and lower price-to-earnings ratio (Beaver & Morse, 1978; Ramcharran, 2002). The *market-to-book ratio* is usually used as a proxy for growth opportunities (Penman, 1996)and lead to higher price-to-earnings ratio (Basu, 1977; Gaver&Gaver, 1993; Huang &Wirjanto, 2012; Wu, 2014). Higher *dividend yield* leads to higher required rate of return and lower price-to-earnings ratio (Fama& French, 1988; Kane et al., 1996). The movements of price-to-earnings and the dividend yield of S&P500 companies for the period of 1900-2018 confirms the negative correlation hypothesis (Easterling, 2019).In terms of Europe, not many empirical studies about the relationship between the dividend policy and the price-to-earnings ratio as well as about the determinants of the price-to-earnings ratio can be found, especially for the whole European region neither for certain European areas.Damodaran (2019) employs regression analysis for the relationship of the price-to-earnings ratio and the expected growth rate of earnings per share for the next 5 years, the dividend payout ratio and the beta coefficient based on a data of all traded companies in Western Europe and the UK. The results show positive relationship between the expected growth rate of earnings per share for the next 5 years and the dividend payout ratio, while negative relationship with the beta coefficient.Bhargava & Malhotra (2006) analysis of MSCI Europe Index companies for the period 1980-2000 shows positive relationship between subsequent stock prices and the price-to-earnings ratio, and negative relationship between subsequent stock yields and the price-to-earnings ratio.

Research Methodology

To study the nonlinear relationship between the price-to-earnings ratio and payout ratio, the following equation (2) will be obtained(Bodie et al., 2014):

$$\frac{P}{E} = \frac{dp}{ERR - ROE(1 - dp)} \tag{2}$$

where $\frac{P}{E}$ is the price-to-earnings ratio, dp is the dividend payout ratio, ERR is the required rate of return, and ROE is the return on equity. Following the limitation that the stock prices must be nonnegative and finite the assumption that $dp > 1 - \frac{ERR}{ROE}$ is imposed to hold in equation (2). The modified DDM equation by Bodie et al. (2014) in its original form is represented as follows: $\frac{P}{E} = \frac{1-b}{k - ROE \times b}$. Since we use the payout ratio instead of retention ratio *(b)*, several adjustments have been made: $1 - b$ is being replaced with the payout ratio; instead of multiplying ROE with the retention ratio, we multiply ROE by (*1 - payout ratio*); and k is represented by the ERR – required rate of return. The aforementioned adjustments of the modified DDM equation resulted in the equation (2), used in this study.To test for sensitivity of the price-to-earnings ratio of changes in the payout ratio first and second derivative of price-to-earnings ratio with respect to the payout ratio is exploited.The first derivate of equation (2) is presented in the following form:

$$\frac{d(\frac{P}{E})}{ddp} = \frac{ERR - ROE}{\left(ERR - ROE(1 - dp)\right)^2} \tag{3}$$

Conditioned on the comparative levels of ROE and ERR, the first derivative of price-to-earnings ratio with respect to the payout ratio can be zero, positive or negative (Table 1).

Table 1. First Derivative Results in Different ROE and ERR Scenarios

ROE>ERR	ROE=ERR	ROE<ERR
$\frac{d(\frac{P}{E})}{ddp} < 0$	$\frac{d(\frac{P}{E})}{ddp} = 0$	$\frac{d(\frac{P}{E})}{ddp} > 0$

Source: Author's calculation

The first derivative of price-to-earnings ratio with respect to the payout ratio equal zero, if the return on equity is equal to the required rate of return implying that the price-to-earnings ratio is not conditioned upon the payout ratio. If the return on equity exceeds the required rate of return, negative result of the first derivative of price-to-earnings ratio with respect to the payout ratio is expected, situation that indicates that the price-to-earnings ratio is a decreasing function of the dividend payout ratio. On the other hand, positive result of the first derivate of price-to-earnings ratio with respect to the payout ratio is expected when the return on equity is lower than the required rate of return indicating that price-to-earnings ratio is an increasing function of the dividend payout ratio.To sum up, the results confirm the existence of nonlinearity among price-to-earnings and dividend payout ratio, unless the required rate of return equals the return on equity. We are further interested in the intensity of this nonlinearity, more specifically we are interested in the slope of the price-to-earnings/dividend payout curve under different circumstances. Thus, the second derivative of price-to-earnings ratio with respect to the payout ratio is exploited in order to determine whether there is convexity or concavity in this association. The second derivate of equation (2) is presented in the following form:

$$\frac{d^2(\frac{P}{E})}{ddp^2} = \frac{-2ROE(ERR - ROE)}{\left(ERR - ROE(1 - dp)\right)^3} \tag{4}$$

The results of equation (4) can be either positive or negative, depending whether the return on equity is greater or less than the required rate of return (Table 2).

Table 2. SecondDerivative Results in Different ROE and ERR Scenarios

ROE>ERR	ROE<ERR
$\frac{d^2(\frac{P}{E})}{ddp^2} > 0$	$\frac{d^2(\frac{P}{E})}{ddp^2} < 0$

Source: Author's calculation

The second derivate of price-to-earnings ratio with respect to the payout ratio is positive, if the return on equity exceeds the required rate of return implying convex function of price-to-earnings. On the contrary, when the return on equity is lower than the required rate of return second derivate of price-to-earnings ratio with respect to the payout ratio is negative, thus implying concave function of price-to-earnings ratio.

Table 3. Summary Table of First and SecondDerivative Results in Different ROE and ERR Scenarios

	ROE>ERR	ROE=ERR	ROE<ERR
First Derivate off(P/E)	$\frac{d(\frac{P}{E})}{ddp} < 0$	$\frac{d(\frac{P}{E})}{ddp} = 0$ f(P/E) is not conditioned on the dividend payout	$\frac{d(\frac{P}{E})}{ddp} > 0$
Second Derivate of f(P/E)	$\frac{d^2(\frac{P}{E})}{ddp^2} > 0$		$\frac{d^2(\frac{P}{E})}{ddp^2} < 0$

Source: Author's calculation

Table 3 represents a summary of the results of the first and second derivative of price-to-earnings ratio with respect to the payout ratio under three different scenarios. The results lead to the conclusion of conditional and nonlinear relationship between price-to-earnings ratio and dividend payout ratio. Under the first scenario when ROE exceeds ERR, the price-to-earnings ratio is decreasing at a decreasing rate as the dividend payout ratio increases (convex function). The other scenario when ROE is lower than ERR points to the concavity of the price-to-earnings function. More specifically when the payout ratio increases, the price-to-earnings ratio is increasing at the decreasing rate. When ROE equals ERR, the price-to-earnings ratio is irrelevant to the payout ratio.

Taking into account the conditional and nonlinear relationship,between price-to-earnings ratio and dividend payout ratio may improve the decision making process of financial managers. Firstly, this relationship highlights the possible effects of the changes in the payout policy. In a scenario with two different stocks with equal price-to-earnings ratio and equal payout ratio, but different level of convexity, the equal change in the payout ratio will have different impact on the price-to-earnings ratio. If we assume that both stocks produce return on equity greater than the required rate of return, then the stock with lower convexity will have lower positive effect from the decrease of the payout ratio than the stock with greater convexity. However, lower convexity stocks will have greater negative effect from the increase of the payout ratio compared to the stock with greater convexity. Stocks with greater convexity will have higher price-to-earnings ratio than stocks with lower convexity when ROE>ERR. The opposite situation exists, if ROE<ERR. Furthermore, the effect of changes in the payout ratio is conditioned by the proportion of the earnings that the companies pay as dividends. Companies with low payout ratios will have greater effects of the changes in the payout ratio rather than companies with high payout ratios.

Empirical Models

A fixed-effects regression of the price-to-earnings ratio have been exploited using several afore-explained factors: dividend payout ratio(dp), earnings growth rate (eg), risk-free rate (rf), equity risk premium (erp), market capitalization (mcap), debt-to-asset ratio (da), market-to-book ratio (pb), and dividend yield (dy). In order to study the conditional and nonlinear relationship between the price-to-earnings ratio and the dividend payout ratio, additional variables were added, most of them in a form of dummy variables. The standard linear model was accompanied by: dummy variable (dummy1) that takes value 1 if the return on equity exceeds the required rate of return and 0 otherwise, dummy variable interacted with the payout ratio (dummy2), the quadratic term of the payout ratio (dp2), and dummy variable interacted with the quadratic term of the payout ratio (dummy3).

The complete fixed-effects regression model used in this study takes the following form:

$$(P/E)_{it} = \alpha_i + \beta_1 dummy1_{it} + \beta_2 dp_{it} + \beta_3 dummy2_{it} + \beta_4 dp2_{it} + \beta_5 dummy3_{it} + \beta_6 eg_{it} + \beta_7 rf_{it} + \beta_8 erp_{it} + \beta_9 mcap_{it} + \beta_{10} da_{it} + \beta_{11} pb_{it} + \beta_{12} dy_{it} + \varepsilon_{it} \quad (5)$$

Where i denotes the i^{th}company, t denotes the t^{th} year, α_i is a company fixed effect, β_1 to β_{12} are parameters, and ε_{it} is the error term. The company fixed effect (α_i) controls for time-invariant characteristics of the company which cannot be directly observed but which influence$i$'s price-to-earnings ratio. The time fixed effect controls for unobservable shocks arising at time t and affecting all companies in the panel. However, this element is not included in the model since the coefficients associated with time control variables were not significant at level of 0.10.According to literature review and the results from the first and second derivate of price-to-earnings ratio with respect to the payout ratio, the expected signs of coefficients of all factors are presented in Table 4.

Table 4. Expected Signs of the Coefficients Common to All Scenarios

Explonatory Variable	Coefficient	Expected Sign
$dummy1_{it}$	β_1	$\beta_1 > 0$
dp_{it}	β_2	$\beta_2 > 0$
$dummy2_{it}$	β_3	$\beta_3 < 0$
$dp2_{it}$	β_4	$\beta_4 < 0$
$dummy3_{it}$	β_5	$\beta_5 > 0$
eg_{it}	β_6	$\beta_6 > 0$
rf_{it}	β_7	$\beta_7 < 0$
erp_{it}	β_8	$\beta_8 < 0$
$mcap_{it}$	β_9	$\beta_9 > 0$
da_{it}	β_{10}	$\beta_{10} < 0$
pb_{it}	β_{11}	$\beta_{11} > 0$
dy_{it}	β_{12}	$\beta_{12} < 0$

Source: Author's calculation

Since we study the possibility of price-to-earnings ratio being conditioned on the comparative levels between return on equity and the required rate of return, we specify the expected signs of the coefficients under different scenarios (Table 5).

Table 5. Expected Signs of the Coefficients Conditioned on Scenarios

Scenario	Coefficient	Expected Sign
ROE > ERR	$\beta_2+\beta_3$	$\beta_2+\beta_3<0$
	$\beta_4+\beta_5$	$\beta_4+\beta_5>0$
ROE = ERR	$\beta_2+\beta_3$	$\beta_2+\beta_3=0$
	$\beta_4+\beta_5$	$\beta_4+\beta_5=0$
ROE < ERR	β_2	$\beta_2>0$
	β_4	$\beta_4<0$

Source: Author's calculation

The coefficients of main interest in this study areβ_1,β_2,β_3,β_4,andβ_5. If $\beta_1\neq 0$, $\beta_3\neq 0$, and$\beta_5\neq 0$, then we would be able to cofirm that the impact of the dividend payout ratio on price-to-earnings ratio is conditioned on the comparative levels between the return on equity and the required rate of return.When ROE exceeds ERR, we expect that $\beta_2+\beta_3<0$and$\beta_4+\beta_5>0$following the results stated before in this study for convex function in this particular scenario, the decrease with a decreasing rate of the price-to-earnings ratio with the increase of the payout ratio. More specifically, in this scenario we expect negative relationship and convexity. If $\beta_2+\beta_3<0$, then we will be able to conclude that in case the companies has return on equity greater than the required, investors prefer those companies to reinvest their earnings instead of paying dividends. Resulting in an increase of the price-to-earnings ratio when the dividend payout ratio is decreasing. If $\beta_4+\beta_5>0$ holds true, then the function of price-to-earnings ratio is convex. All of the conditions stated for the ROE equals ERR scenario are the ones we aim to reject with this study in order to conclude the existence of conditional and nonlinear relationship. When ROE is lower than ERR we expect that $\beta_2>0$,and$\beta_4<0$following the results stated before in this study, that the increase of the dividend payout ratio will lead to increase of the price-to-earnings ratio but with a decreasing rate (concave function), assuming positive relationship and concavity. When the company generates return that is below the required rate, then the price-to-earnings ratio will increase with the increase of the payout ratio $(\beta_2>0)$. Positive β_2 and negative β_4 point to concave function.

Despite the complete "nested" model, we build and analyse the sub-models nested in the completed model: unconditional linear model, conditional linear model, unconditional nonlinear model, and conditional nonlinear model.

Dataset

This study is based on an annual data for 69 companies from 11 European countries and 43 industries for the period from 2014 to 2018. The companies being selected for the analysis are listed companies on the MSCI Europe Index with positive earnings change over the analyzed period and continuous dividend payout. Financial institutions were not selected for this analysis due to the specifics of the business model and different form of financial reporting. At the end, we analyze 345 company-year observations in a strictly balanced panel.Table 6 represents the descriptive statistics for all variables, dependent and independent. It is worth to notice that all the regressors are varying meaning there are neither time-invariant regressorsnorindividual-invariant regressors (std.dev between/within ≠ 0). High standard deviations point to the possibility of outliers that may impact the regression results. As a consequence, the standard model is transformed into a log-log model. Natural logs for all elements of the equation for each sub-model and the complete model were used.

Table 6. Descriptive Statistics

Variable		Mean	Std. Dev.	Min	Max	Observations
P/E	overall	19.71971	14.55591	0.7	163.82	N = 345
	between		12.67097	1.344	78.566	n = 69
	within		7.293017	-5.046292	104.9737	T = 5
dp	overall	40.90484	21.62361	4.76	250	N = 345
	between		18.0392	4.892	100.894	n = 69
	within		12.08104	-14.74716	190.0108	T = 5
eg	overall	20.83595	49.97857	0.03	818	N = 345
	between		23.28955	5.546	178.864	n = 69
	within		44.29177	-152.588	659.972	T = 5
rf	overall	1.61942	0.4197863	1.1	3.5	N = 345
	between		0.348357	1.14	2.7	n = 69
	within		0.2372321	0.5194203	2.41942	T = 5
erp	overall	6.332	0.8686449	5.1	11.11	N = 345
	between		0.6215568	5.836	8.746	n = 69
	within		0.6104944	4.44	8.696	T = 5
mcap	overall	8970.435	16546.67	9.23	117617.5	N = 345
	between		16299.46	214.82	99888.13	n = 69
	within		3348.004	-10372.37	32815.63	T = 5
da	overall	14.57916	16.93271	0.01	81.98	N = 345
	between		16.63275	0.014	71.86	n = 69
	within		3.644895	3.909159	37.80916	T = 5
pb	overall	3.43058	2.584446	0.11	14.77	N = 345
	between		2.446262	0.178	12.366	n = 69
	within		0.8744989	-1.59542	8.07458	T = 5
dy	overall	2.143275	1.287822	0.08	10.82	N = 345
	between		1.066483	0.37	4.702	n = 69
	within		0.7309761	-1.252725	8.727275	T = 5

Source: Author's calculation

Empirical Results

In order to run the panel regression model we may choose between the following estimators: the pooled OLS estimator, the fixed-effects estimator and the random-effects estimator. In order to choose the best estimator, the Hausman and the Breusch-Pagan LM test are being exploited. We first run the Breusch-Pagan LM test for all sub-models and for the complete model. The statistically significant results in all cases (prob > chibar2=0.0000) point to the random-effects estimator compared to the pooled OLS estimator. In order to choose between the fixed and the random effects estimator, we run the Hausman test for all sub-models and for the completed model. The statistically significant results in all cases (prob > chibar2=0.0000) gives an advantage to the fixed-effects estimator rather than to the random-effects. For all sub-models and the completed model a fixed-effect model with cluster robust standard errors has been used. We use the cluster robust standard errors based on theBertrand, Duflo, & Mullainathan (2004) statement that this is one of the ways to avoid biases while using a fixed-effect estimator. Table 7 summarizes the estimations of all models, four sub-models and the complete model. Despite the main regression output, the Table presents the results of the obtained test of significance. Coefficients accompanied with three stars (***) are not statistically significant at level of 0.10, values in parenthesis are the robust standard errors.

Before discussing the results, it is worth noticing the high level of Rho. Rho is the fraction of the variance of error due to the individual specific effects (specifics of the companies being analyzed). High level of Rho (approaching 1) means that the individual effects dominate the idiosyncratic error, situation that allow as to say that even though we do not know what it is due to, but we know that there something about the companies that makes this variation high.

Table 7. Regression Results

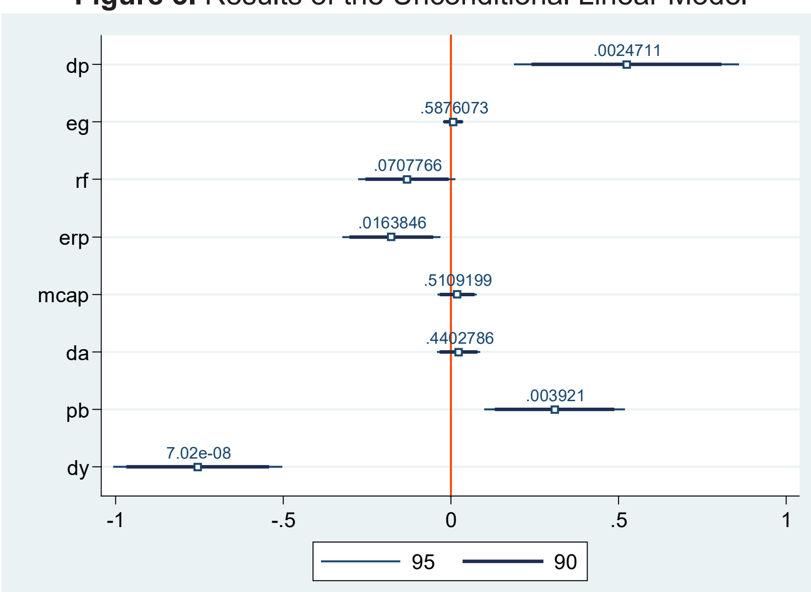
Explanatory Variable	Coefficient	Unconditional Linear Model	Conditional Linear Model	Unconditional Nonlinear Model	Conditional Nonlinear Model	Complete Model
Dummy	dummy1		-0.4978 (0.2365)		-0.4785 (0.2135)	-0.4730 (0.2106)
Dividend Payout Ratio	dp	0.5242 (0.1667)	0.5629 (0.1607)	0.5678 (0.1189)	0.5913 (0.1088)	0.5866 (0.1074)
Dummy Interacted with dp	dummy2		0.0532 (0.0211)			0.0501 (0.0215)
Quadratic Term of dp	dp2			0.1770 (0.0588)	0.1667 (0.0518)	0.1612 (0.0533)
Dummy associated with dp2	dummy3				0.0899 (0.0379)	0.0997 (0.0380)
Earnings Growth	eg	0.0074*** (0.0136)	0.0011*** (0.0113)	0.0030*** (0.0138)	-0.0070*** (0.0124)	-0.0042*** (0.0120)
Risk-free Rate	rf	-0.1310 (0.0713)	-0.1391*** (0.0837)	-0.0958 (0.0473)	-0.0553*** (0.0529)	-0.0960*** (0.0592)
Equity Risk Premium	erp	-0.1774 (0.0721)	-0.1140*** (0.0907)	-0.1118*** (0.0712)	0.0207*** (0.0941)	-0.0016*** (0.0944)
Market Capitalization	mcap	0.0184*** (0.0278)	0.0211*** (0.0295)	-0.0001*** (0.0223)	0.0012*** (0.0212)	0.0059*** (0.0205)
Debt-to-Asset Ratio	da	0.0287*** (0.0309)	0.0331*** (0.0302)	-0.0110*** (0.0238)	-0.0151*** (0.0225)	-0.0059*** (0.0222)
Market-to-Book Ratio	pb	0.3102 (0.1039)	0.2798 (0.1008)	0.2918 (0.0892)	0.2806 (0.0897)	0.2603 (0.0842)
Dividend Yield	dy	-0.7551 (0.1249)	-0.7490 (0.1356)	-0.8289 (0.1088)	-0.8405 (0.1120)	-0.8002 (0 .1221)
Rho		0.9561	0.9599	0.9624	0.9627	0.9634
Sigma u		0.7517	0.7516	0.7722	0.7427	0.7432
Sigma e		0.1611	0.1535	0.1527	0.1462	0.1448
Overall R^2		38.26%	38.92%	33.15%	39.55%	40.35%
Within R^2		61.94%	65.74%	65.93%	69.02%	69.72%
Between R^2		36.53%	37.20%	31.08%	38.02%	39.10%
Adj R^2		**61.02%**	**64.70%**	**65.01%**	**67.98%**	**68.61%**
F-stat (Ho: dp+dummy2=0)			**14.96**			**36.10**
F-stat (Ho: dp2+dummy3=0)					**14.86**	**14.73**

Source: Author's calculation

In terms of the other determinants of the price-to-earnings ratios, those not engaged with the dividend policy β_6-β_{12}, only the market-to-book ratio and the dividend yield are statistically significant at level of 0.10 for all models employed, accompanied with appropriate sign as expected. The price-to-earnings ratio is positively related to the price-to-book ratio ($\beta_{11} = 0{,}3102; 0{,}2798; 0{,}2918; 0{,}2806; 0{,}2603$)and negatively related to the dividend yield ($\beta_{12} = -0{,}7551; -0{,}7490; -0{,}8289; -0{,}8405; -0{,}8002$). The coefficients for risk-free rate are significant only in the unconditional models with appropriately expected sign. Almost similar is the case with the equity risk premium, statistically significant only in the unconditional linear model. All other factors (earnings growth, market capitalization and debt-to-asset ratio) are not statistically significant at level of 0.10. Coefficients of main interest in this study are those associated with the dummy variable (β_1), dividend payout ratio (β_2), dummy variable interacted with the payout ratio (β_3), the quadratic term of the payout ratio (β_4), and the dummy variable interacted with the quadratic form of the payout ratio (β_5). Results about those coefficients in each model employed are discussed in more details in the following sections. The following figures (3-7) represent each model results: x-axis represents coefficient value; y-axis represents variables, lines length represent the 90% and 95% confidence intervals, and value above each line represent appropriate p-value.

The results for the first model (Figure 3), the unconditional linear model are in line with numerous empirical studies that use the unconditional linear model (Cho, 1994; Reilly et al., 1983; Anderson & Brooks, 2006; Huang &Wirjanto, 2012; Kane et al., 1996; White, 2000; and others). The coefficient associated with the dividend payout ratio (dp) is positive and statistically significant, indicating that the price-to-earnings ratio is increasing with each unit increase of the payout ratio.

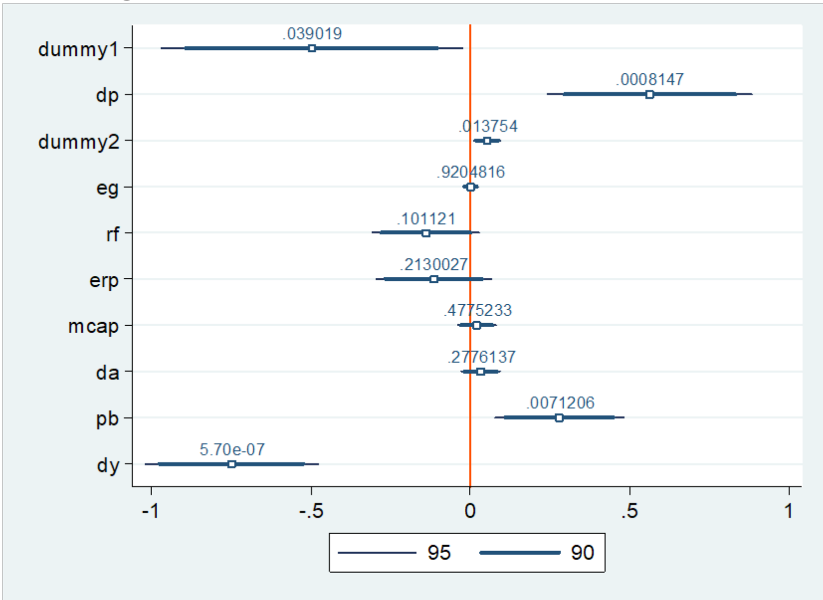
Figure 3. Results of the Unconditional Linear Model



Source: Author's calculation

The results from the second model, the conditional linear model (Figure 4) point to different conclusions than those expected.The coefficient associated with the first dummy variable is statistically significant, but surprisingly accompanied with negative sign implying that companies with ROE greater than ERR have lower price-to-earnings ratio. The significance of this coefficient is in line with the assumption that the price-to-earnings ratio is conditioned of the comparative levels of ROE and ERR. However the negative sign is opposed to the expectations. The rationale behind this result is the extremely high earnings that some of the companies with ROE greater than ERR reported in the analyzed period. It is nothing but expected low levels of price-to-earnings ratio in case of large earnings.Worth to notice is the change of the meaning of the second dummy variable, the one associated with the payout ratio. Our theoretical underpinnings lead us to the conclusion of decreasing function of the price-to-earnings ratio when ROE exceeds ERR. However, the data has completely different movement. Additionally, the same data was used in order to perform linear forecast and again the results pointed to an increasing instead of decreasing function. Thus, initially defined dummy variable that takes value 1 if ROE exceeds ERR and the change of the payout ratio is greater than the change of the price-to-earnings ratio has been reformulated as taking value 1 if ROE exceeds ERR and if the change of the payout ratio is lower than the change of the price-to-earnings ratio. The results of the test of significance $(H_0: dp + dummy2 = 0)$ confirm the assumption of conditional impact of the payout ratio to the price-to-earnings ratio based on the comparative levels of ROE and ERR(F-statistics = 14.96). Statistically significant and positive coefficients before the payout ratio (dp) and the dummy variable interacted with the payout ratio (dummy2) imply a situation where if the company produces return on equity greater than the required rate (dummy1=1) investors prefer increase of the payout ratio, so the increased dividend payout is accompanied with increased price-to-earnings ratio (positive coefficient of dummy2). On the other hand, when the company generated return on equity lower than the required rate, the increased payout ratio is still accompanied with increase of the price-to-earnings ratio (dp>0), however with smaller intensity compared to those that generate ROE greater than ERR.

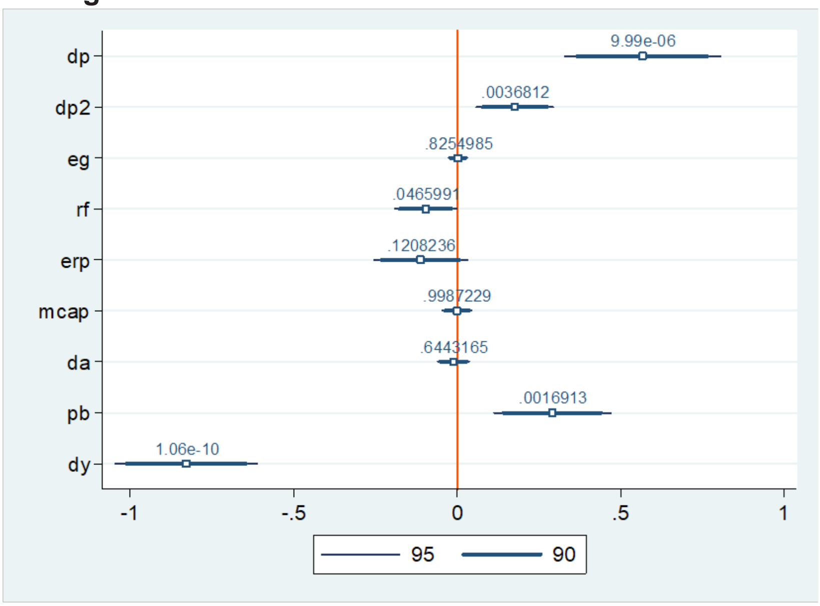
Figure 4. Results of the Conditional Linear Model



Source: Author's calculation

Identical to the previously discussed models the unconditional nonlinear model (Figure 5) result in positive and statistically significant coefficient associated with the payout ratio. New variable is introduced to this model, the quadratic form of the payout ratio (dp2) – after centering the payout ratio (dp). The positive and statistically significant coefficient associated with this variable implies the nonlinear relationship between the price-to-earnings ratio and the dividend payout ratio. The positive sign implies that positive effect of the payout ratio to the price-to-earnings ratio is “always” present or more specifically as the payout ratio increases the positive effect to the price-to-earnings ratio is stronger.

Figure 5. Results of the unconditional nonlinear model



Source: Author's calculation

The coefficient associated with the quadratic form of the payout ratio can be interpreted with the following equation:

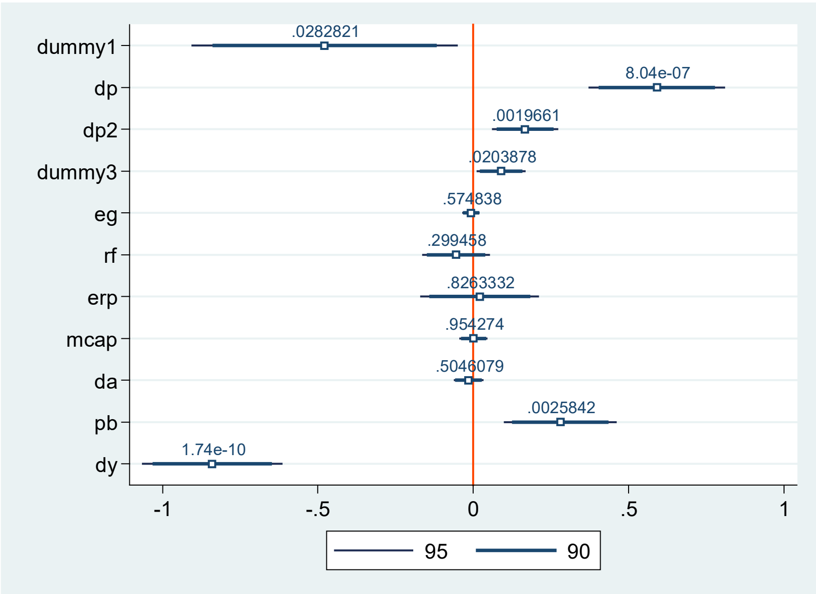
$$Expected\ change\ in\ the\ pe - dp\ slope\ = 2 * \beta_{dp2}$$

$$Expected\ change\ in\ the\ pe - dp\ slope\ = 2 * 0.1769818 = 0.3539636$$

For each one unit increase of the payout ratio the $pe - dp\ slope$ increases by 0.3539636.

The forth constructed model is the conditional nonlinear model (Figure 6).The results of the test of significance $(H_0: dp2 + dummy3\ = 0)$ confirm the assumption about the conditional nonlinear relationship between price-to-earnings ratio and payout ratio based on the comparative levels of ROE and ERR (F-statistics = 14.86). If ROE is lower than ERR (dummy1=0) convex relationship is addressed between the price-to-earnings ratio and the payout ratio, since the coefficients associated with the dividend payout ratio and the quadratic from of the payout ratio are positive. In this model, for the first time is introduced the dummy variable interacted with the quadratic form of the payout ratio. This variable takes value of 1 if ROE is greater than ERR and the ratio between the price-to-earnings ratio and quadratic form of the percentage change of payout ratio is 1 and 0 otherwise. The situation when ROE exceed ERR is almost identical to the one when ROE is lower than ERR, discussed above. The positive coefficient associated with the payout ratio (dp) and the positive sum of the coefficients associated with the quadratic form of the payout ratio (dp2) and the dummy variable interacted with the quadratic form of the payout ratio (dummy3) point to the convex relationship. The difference between the situation of a company generating ROE greater or less than the ERR is the magnitude of the coefficients ($dp2$for$ROE < ERR$; $dp2 + dummy3$for$ROE > ERR$), thus resulting in different price-to-earnings ratio/payout ratio slope. The convexity is greater when ROE exceeds ERR, since $dp2 + dummy3 > 0$and$dp2 + dummy3 > dp2$. To sum up the results, those companies that will succeed in generating return on equity greater than the required rate of return will be affected with lower pressure of changes in the dividend policy, compared to those companies that generate lower ROE than ERR.

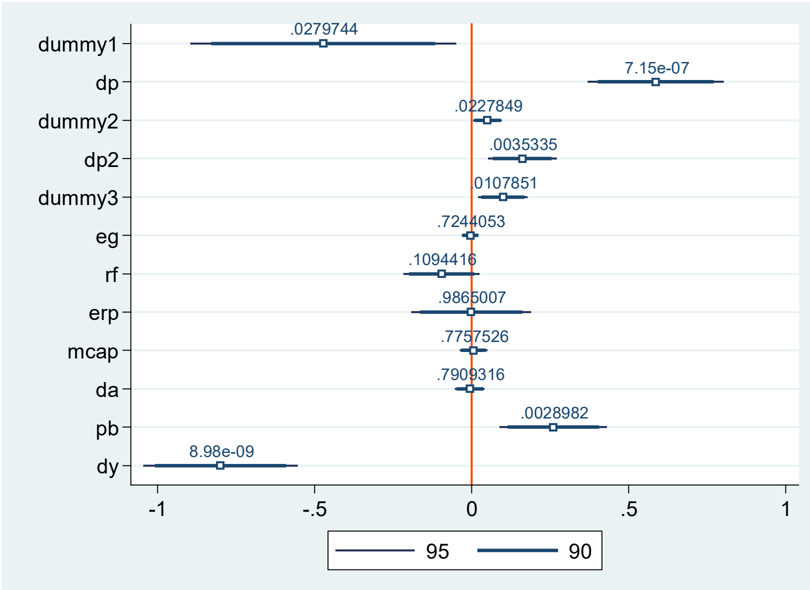
Figure 6. Results of the Conditional Nonlinear Model



Source: Author's calculation

The complete model (Figure 7) does not point to any different conclusions compared to the sub-model. The companies that generate return on equity greater than the required rate of return are being awarded by the investors for the increase of the payout ratio. The nonlinearity and high convexity allow this companies to feel greater freedom in lowering the payout ratio, compared to companies with ROE lower than the ERR.

Figure 7. Results of the CompleteModel



Source: Author's calculation

Conclusion

Vast bodies of empirical studies examine the effects of dividend payout ratio on the price-to-earnings ratio and usually document their positive linear relationship. The aim of this paper is similar, examining the effects of dividend policy on the price-to-earnings ratio. However, there is a difference between this and many other studies, especially in two main elements. Firstly, the data used in the research is associated with European companies and since Europe has always been different from the other parts of the world, the differences in this segment are expected too. The results are in line with this expectation that the European market reacts differently to the changes in the dividend payouts. Also the European company dividend policies differ from those of the US companies. Secondly, in this study the starting point for the examined relationship is not so "conservative" since it takes into account the possibility of nonlinearity. Based on the Gordon's constant growth dividend discount model, the conditioned impact of the dividend policy to the price-to-earnings ratio on the comparative levels of return on equity and required rate of return has also been examined. We tested those relationships by using fixed-effects model with several explanatory variables interacted with both dividend policy and other factors commonly used as determinants of the price-to-earnings ratio. The results confirm the assumption of conditional and nonlinear relationship between the price-to-earnings ratio and the payout ratio, implying that this relationship is more complicated than any linear model would ever indicate. The upwards slope of the price-to-earnings function significantly differ the results and conclusions from those expected based on the theoretical research and empirical results based on the US capital market. Positive relationship and convexity exists when the company generates return on equity greater than the required rate of return. This relationship holds true even when a company does not succeeds in generating the required rate of return. The only difference between the companies that do and the ones that do not generate the required rate of return is the intensity of the convexity. In a scenario of two companies that succeed in generating the required rate of return one based in US (positive convexity – according to empirical studies) and one based in Europe and all else being equal, if both companies decide to reduce the payout ratio, the US based company is in a much better position (increase of price-to-earnings) compared to the Europe based company (decrease of price-to-earnings). Thus implying the conclusion, that the US market allows great conformity in the decisions for retention of the earnings for companies that satisfy investor needs compared to the European market. The positive relationship between the price-to-earnings and the payout ratio alerts all companies (ROE>ERR andROE<ERR) in case of reduction of the payout ratio. The greater convexity of companies that generate ROE greater than ERR allow those companies to feel smaller negative effects than the negative effects of those companies that generate ROE lower than ERR.On the other hand, going back to the aforementioned scenario, if both of the companies (US and Europe based) decide to increase the dividend payouts, then the European company is expected to achieve greater price-to-earnings ratio while the US based company will be faced with a decreasing price-to-earnings ratio. The positive relationship and convexityallows greater freedom for the financial managers of the European companies since the increase of the payout ratio is accompanied with increased price-to-earnings ratio. This increased price-to-earnings will be greater for companies that generate ROE greater than ERR, than those who do not. All in all, the failure of accounting for the conditional and nonlinear relationship may lead to misleading conclusions of the financial managers in decisions about the dividend policy of the company.

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