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# The Proposal of Corporate Payout Decisions' Modelling

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*Decisions on a company's profit sharing are the most important financial decisions for both the shareholders as a source of additional income and the company as the source of cash outflow. The net profit can be transferred to the shareholders in the form of dividends or stock repurchases. Due to the fact that for both, dividends and share repurchase, the source of payments is the net profit (either last year profit, or retained profit), it can be assumed that decisions regarding dividend payments and share repurchases are interdependent. Therefore, a very important and so far without an unequivocal solution is the problem of measuring the relationship between decisions on dividend payments and share repurchases (whether to pay out a company's profit in one of the forms, in both forms or at all). Taking into consideration the possibility of interdependence of both forms of corporate payout policy as well as the fact that data describing payout policy are of panel nature and the relationships between the decisions and the determinants may be non-linear, two simultaneous equations second order panel binomial choice model with random specific effects, the parameters of which are estimated in the same way as in the two stage least squares, was suggested for modelling the payout policy. The modelling procedure was verified by the estimation of the model on a balanced panel of 153 companies listed on the Warsaw Stock Exchange over the period 2008–2016 (1,377 observations). The study results show that the proposed procedure enables the selection of appropriate factors determining the decisions on dividends and share repurchases and the assessment of the relationship between them. It takes into the consideration the panel nature of the data and the possibility of heterogeneity and removes the phenomenon of endogeneity in the model, thereby, filling an existing gap in the literature on corporate payout decisions.*

Keywords: *Corporate Payout Policy; Decisions' Modelling; Two Simultaneous Equations Second Order Panel Binomial Choice Model; Nonfinancial Companies; Dividend; Share Repurchases; Warsaw Stock Exchange.*

## Introduction

The decision regarding the profit distribution is one of the most important corporate decisions. It is about deciding whether to pay out a part of the profit, how much to pay, and in what form to pay. The decision to pay dividends is related to the corporate's investment financing decision (Aleknevičienė, Domeika, & Jatkunaitė, 2006). The dividend policy can also have an impact on the corporate's cost of equity (Mokhova & Zinecker, 2019). The net profit can be transferred to the shareholders in the form of dividends or stock repurchases. Dividend is a much older form of profit distribution than share repurchases.

The beginning of the legal regulation of dividends was observed in Great Britain - in the first half of the 19th century and in the United States and developed countries of Western Europe - in the second half of the 19th century. It can be argued that the institution of dividends, as understood today, was introduced only at the turn of the 19th and 20th centuries. On the reactivated Stock Exchange in Warsaw in 1991, the companies paid their first dividends in 1992.

Share repurchase is a much younger institution than dividend. In the United States share repurchase has never been forbidden. However, as Grullon and Michaely (2002) notice, till 1982 there were doubts whether repurchasing own shares is legal or not. The Securities and Exchange Commission (SEC) treated the share repurchases, in individual cases, as price manipulation (using the 1934 Act).

In other countries the institutions of repurchasing shares occurred later than in the United States. Share repurchases were not allowed in Great Britain until the beginning of 1980s (Andres, Betzer, da Silva & Goergen, 2009). In such countries as Germany or France it was legally limited until the late 1990s (Denis & Osobov, 2008, p. 75).

In Poland for many years the only legal procedure of repurchasing shares was the redemption of shares. The Act of 13th of June 2008 changed the former Polish regulations by implementing exceptions which allow share repurchases, adjusting the regulations to those applicable in more developed countries. Currently the Commercial Companies Code maintain the general prohibition of share repurchases (the Article 362§1) however with many exceptions, f.e. to prevent serious damage directly endangering the company,

to be offered for purchase to employees, for redemption. It should be noted that the list of exceptions is not closed.

The much longer history of dividends meant that they were initially used in empirical research. An unquestionable precursor of such research was John Lintner who in 1956 proposed a partial adjustments model allowing for the estimation of the target dividend payout ratio and speed of adjustment. This model is still used today to analyse the dividend policy of companies (Fernau & Hirsch, 2019).

Another approach of research was the analysis of factors determining the companies' propensity to pay dividends, initiated by Fama & French (2001). The authors suggested a logit model, the parameters of which were estimated by the Fama-MacBeth method (Fama & MacBeth, 1973). The increase in the number of companies repurchasing shares as well as the value of this form of corporate payouts, made the need to search for factors determining the propensity to repurchase shares.

The research on the factors determining the propensity to pay dividends and repurchase shares was conducted, among others, by Von Eije and Megginson (2008) and Jacob & Jacob (2013), Kazmierska-Jozwiak (2019). However, they treated the decisions about both forms of payment independently. In other words, panel models of the propensity to pay dividends and to repurchase shares were built separately, ignoring the fact that the source of both forms of payment is the same net profit, which may cause the interdependence of both phenomena.

Bhargava (2010) argue that "share repurchases can be included as an explanatory variable in the model for dividends and, conversely, dividends would be included in the model for share repurchases, i.e., a system of two simultaneous equations would be appropriate", but does not do so in his work and independently estimates firm-specific random effects panel models for dividends and share repurchases.

Thus, the literature shows that there is no modelling procedure for corporate payouts, which takes into account the possible interdependence between decisions on dividend payments and share repurchases by using the system of two simultaneous equations estimated on panel data.

The main – methodological aim of the presented work is an attempt to fill this gap by proposing a procedure examining the relationship (strength and direction) between dividend decisions and decisions on share repurchases and determining the factors of the propensity to pay dividends and to repurchase shares.

As a tool for achieving the aim was proposed a two simultaneous equations second order (quadratic) probit model with random specific effects, the parameters of which are estimated in the same way as in the two stage least squares (2SLS). The econometric methods used in the proposed procedure are known and used in the studies on corporate finance. However, using them in the proposed form to examine the corporate payout decisions based on a balanced panel data is a new value contributed by the authors.

The authors assume that a good methodology (procedure) should be empirically verified on the basis of data from a real economy. Therefore, an additional (auxiliary) aim of the study was formulated, which is to apply the proposed procedure to the assessment of the payout decisions of non-financial companies listed on the Warsaw Stock Exchange over the period 2008-2016.

The paper is organised as follows. Section 2 reviews the literature. Section 3 presents the hypotheses. Section 4 describes the methodology - procedure of modelling the decisions on corporate payouts to the shareholders. Section 5 presents the data and the variables adopted for modelling. While section 6 presents the results of the research and the discussion. The conclusions (and limitations of the research) are presented in the last section.

## Literature Review

Initially, the studies concerned only the factors determining the propensity to pay dividends. In 2001 Fama & French published a seminal paper in which they tried to identify the factors determining the 35-year decline in the propensity of US-listed companies to pay dividends. For this purpose, they suggested logit models, which they estimated using the Fama-MacBeth method, which consisted of estimating the parameters of the logit models each year on the basis of cross-sectional data, and then testing the significance of the mean values of the parameters from the entire analysed period using the t-student test. Fama & French (2002) suggested that in the inference process the critical value of the t-statistic should be increased 2.5 times due to the autocorrelation in time. Using this method, they concluded that more profitable companies (with a higher rate of return on total assets) with lower investment opportunities (measured by the ratio of the market value to the book value of assets and the asset growth rate) and bigger companies (the size of the company was measured by its share in market capitalisation) are characterised by a higher propensity to pay dividends. The work of Fama & French has become an inspiration for generations of researchers to study the factors determining the propensity to pay dividends.

The studies were conducted in two specific areas. The first included the analysis of the further factors determining the propensity to pay dividends. The second comprised the improvement of model estimation methods.

The following variables were also proposed inter alia[1]:

- maturity measured by the ratio of retained earnings to total assets and equity (DeAngelo, DeAngelo & Stulz, 2006), by the number of years since the companies' establishment or the number of years listed on the stock exchange (Salas & Chahyadi, 2006) and the ratio of share capital to equity capital (Hedensted & Raaballe, 2008),
- risk measured by the standard deviation of the equity return in the years preceding the decision to pay out (Hedensted & Raaballe, 2008), by standard deviation of residuals from the market model (specific risk) (Li & Zhao, 2008) or beta coefficient, which indicates the systematic risk of a firm (Wang, 2005) and the adoption of an enterprise risk management strategy (Anton, 2018),
- Tobin's q ratio square, as the measure of investment opportunities (inverted U-shaped relationship) and the assumption that the propensity to pay dividends is

[1]An attempt was made to list the authors who were the first to suggest a given variable in logit or probit models as a factor determining the propensity to pay dividends.

very low in companies with minor and very large investment opportunities (Kowerski, 2013),

- the companies' links with banks (Allen *et al.,* 2012),
- the ownership structure measured in a variety of ways, ranging from the identity of the controlling owner through to the equity value of the largest shareholder or 2nd largest shareholder (Renneboog & Szilagyi, 2008),
- macroeconomic factors measured by dividend premium developed by Baker & Wurgler (2004), GDP growth rate, market capitalization (Jacob and Jacob, 2013) and the economic sentiment of entrepreneurs and consumers measured by the EU Economic Sentiment Index (Kowerski, 2011).

Over time, the Fama-McBeth estimation method was replaced with the panel models with fixed or random specific effects.

Already Fama and French (2001) considered the influence of share repurchases on the decreasing propensity to pay dividends. However, after analysing the data at their disposal, they came to the conclusion that share repurchases propensity would be unusable in the study. However, subsequent authors began to consider share repurchases as an important factor in payout policy. Attention should be drawn to the perhaps underestimated work by De Jong, Van Dijk & Veld (2003), where the authors, based on the results of their own survey on the Canadian companies, estimated inter alia pooled two – equations simultaneous logit model in which share repurchases (1 – paid, 0 - not paid) were treated as endogenous explanatory variable in the dividend paying equation, and dividends (1 – paid, 0 not paid) were treated as endogenous variable in the share repurchases paying equation. A simultaneous logit model was estimated with the procedure analogous to the two-stage least squares method. In the first stage, the parameters of the reduced form are estimated. In the second stage, the structural equations are estimated (De Jong, Van Dijk & Veld, 2003). Such procedure protects from endogeneity. Though the parameter on share repurchases in equation dividend paying was not significant, likewise the coefficient on dividend paying in equation share repurchases which would indicate that the decisions do not influence each other, the procedure seems to be appropriate in the analysis of decisions on corporate payouts to shareholders. The disadvantage of this proposal was the fact that it concerned only one year (pooled data). Bhargava (2015) emphasises the validity of this approach.

However, the consideration of decisions about both forms of payouts independently appeared in many studies. For example, Von Eije & Megginson (2008) separately estimated logit random effects panel models to estimate propensities to pay dividends and repurchase shares for 15 countries of "the old European Union" over the years 1991–2005 (and in the five years subperiods). They adopted the previously discussed factors as explanatory variables, the model describing the propensity to pay dividends did not include the propensity to share repurchases and vice versa. It should be emphasised that in both cases, parameters on the same variables proved to be statistically significant, which would mean that larger, more profitable companies with fewer investment opportunities and less leveraged were more willing to pay dividends and repurchase shares. It could be considered if these conclusions would have been similar if the authors had applied the system of two simultaneous equations with respective share repurchases and dividends as explanatory endogenous variables.

Kazmierska-Jozwiak (2019) conducted a study on the factors determining the propensity to pay dividends or repurchase shares of non-financial companies listed on the Warsaw Stock Exchange over the period 2004–2016 (256 companies, 2433 observations). As in the study of Von Eije and Megginson (2008), the author examined the decisions on both forms of corporate payout policy independently. The author used the logit models to analyse the propensity to pay dividends or repurchase shares, which included 25 explanatory variables used in prior studies. The findings show that the determinants of the propensity to implement the corporate payout policy of analysed companies is in many aspects similar to those characteristics for more developed markets, especially confirmed by Von Eije & Megginson (2008). She found that the companies propensity to share repurchases is much lower than the propensity to pay dividends.

Kulchania (2013) also estimated independently the pooled logit model of dividend decisions and pooled and panel fixed effects models of share repurchases for American companies (1971–2010). Among the variables describing decisions on dividend payments was share repurchases yield, and among the variables describing decisions on share repurchases - dividend yield, which may cause the phenomenon of endogeneity. Unfortunately, the applied estimation methods do not "protect" against this phenomenon.

Andriosopoulos and Hoque (2013) used pooled logit models of announcements of intention to repurchase shares for Great Britain, Germany and France in 1997–2006. As explanatory variables, apart from the previously discussed, the authors used the dividend yield ratio and the dividend payout ratio. This could be considered as an intention to discover the links between decisions about both forms of payout. However, they did not examine the endogeneity phenomenon in the variables describing the dividend payout policy.

Another approach of research initiated by Jagannathan, Stephens & Weisbach (2000) was the use of multinomial logit models to examine the factors determining the choice between dividends and share repurchases in the United States in 1985–1996. For this aim, they specified four potential choices of payout methods: increasing only repurchases, increasing only dividends, increasing both, repurchases and dividends, or not increasing payouts, which were multinomial model dependent variables. A similar study was conducted by Kooli & L'Her (2010) for Canadian companies over the period 1985–2003. The authors found that dividends and share repurchases are used by different types of companies. Xie (2016), in turn, conducted study on the impact of company characteristics on the form of payment for British companies in 2002–2011. The results show that the decision to repurchase shares is positively related with earnings and negatively related with the leverage level of the firm.

Grullon & Michaely (2002) suggested another and so far used procedure of the estimation of the dependence between decisions on dividend payments and (or) share repurchases. They divided the analysed period into two sub-periods: preforecast period and forecast period. Then using Lintner model (Lintner, 1956) they calculated the expected dividend payment for each firm in the forecast period based on its past dividend behaviour. Then they calculated dividend forecast error as a difference between actual dividend payment of each firm and its expected dividend payment. By doing so, they could analyse whether firms are changing their past dividend policies. If they are substituting share repurchases for dividend payments, then a negative correlation between the dividend forecast error (actual minus expected) and share repurchase activity should occur. Therefore, a negative correlation result between these two analysed variables would mean that share repurchases have been partially financed with potential dividend increases. Otherwise, a positive result would suggest that dividend payments and share repurchases are complementary method of payout. Grullon & Michaely (2002) did two calculation sequences for US companies that have continuously paid dividends over the entire preforecast period according to the above procedure. In the first, the preforecast period covered the years 1973–1983 and the forecast period 1984–2000. In the second, the preforecast period covered the years 1973–1990 and the forecast period the years 1991–2000. The results indicated that "the dividend forecast error is negatively correlated with the share repurchase yield. The forecast error becomes more negative (monotonically) as the share-repurchase yield increases. That is, as firms repurchase more (i.e., a higher repurchase yield), the actual dividend is lower than the expected dividend" (Grullon & Michaely, 2002). These results supported the substitution (hypothesis) between dividends and share repurchases in US financial market in last decade of the 20th century. Bhargava (2010) identified the lack of a comprehensive econometric framework in these calculations. He highlighted that because firms are quite heterogeneous, it is important to include firm-specific random or fixed effects in the model.

Grullon & Michaely studies were repeated by Kulchania (2013) for the US firms, using data from 1971 to 1990. The negative and significant relationship between the dividend forecast error and the share repurchase yield suggests that firms repurchase more shares when the actual dividend is lower than the expected dividend. So Kulchania's findings supported Grullon & Michaely substitution hypothesis which was also true in the first decade of the 21st century. Armitage & Gallagher (2020) tested, using Grullon & Michaely's dividend and share repurchases substitution hypothesis, among British companies for the period 1993–2017 and they did not find evidence supporting substitution for UK firms in the 21st century (Armitage & Gallagher, 2020, s. 20).

**Hypotheses**

The hypotheses formulated in the study could be divided into two groups. First, the hypotheses arising directly from the literature review and related to the main aim of the study.

H1: The modelling procedure for corporate payout decisions based on the two simultaneous equations second order (quadratic) panel binomial choice model with random specific effects examines the relationship (strength and direction) between decisions on dividend payments and share repurchases and evaluating the factors determining these decisions.

Second, the hypotheses which concern the accomplishment of the auxiliary aim and are related to the decisions made by the companies listed on the Warsaw Stock Exchange (as the verification for the proposed modelling procedure). In the study there were only those hypotheses formulated, that, according to the authors, would be difficult to verify without applying the proposed procedure:

H2.1. There is a significant relationship between the dividend decisions and the decisions on share repurchases made by the companies listed on the Warsaw Stock Exchange.

H2.2. The relationship between the propensity to pay dividends and the propensity to share repurchases and two variables: investment opportunities and debt is the inverted U-shape.

H2.3. Corporate payout decisions are influenced by both the microeconomic factors describing the particular firm as well as the macroeconomic factors describing the entire economy of the country.

**Proposal of the Procedure for Modelling Decisions on Corporate Payouts to Shareholders**

A direct inspiration for the proposed research procedure was the study of De Jong, Van Dijk & Veld (2003), in which the authors proposed to assess the relationship between the dividend payments and share repurchases for 191 Canadian firms in 1997 using the two simultaneous equations binomial choice model, the parameters of which were estimated with a method analogous to 2SLS. However, it was a pooled model estimated on a small number of observations. Important were also the comments of Bhargava (2010) who argued that the system of two simultaneous equations would be an appropriate method to analyse corporate payout decisions. And that the estimation process should take into account the endogeneity in the relationships and the heterogeneity across firms, which is often quite large.

Propensities to pay dividends and share repurchases are latent variables which values are not observed. We are only observing decisions which are the results of these propensities (Gruszczynski, 2012).

Decisions regarding dividends and share repurchases can be described by binary variables:

$$DIV_{it} = \begin{cases} 1 \text{ if } i - \text{company did pay dividend in t year}, \\ 0 \text{ if } i - \text{company did not pay dividend in t year}, \end{cases}$$

$$SHRE_{it} = \begin{cases} 1 \text{ if } i - \text{company did repurchase own shares in t year}, \\ 0 \text{ if } i - \text{company did not repurchase own shares in t year} \end{cases}$$

Where:

$DIV_{it}$ – decision of dividend payment for i-company in t year,

$SHRE_{it}$ – decision of share repurchase for i-company in t year,

$i = 1,2,\dots,N$ – number of companies,

$t = 1,2,\dots,T$ – number of periods (years).

Due to the fact that the source of dividend payments and share repurchases is net profit (the last year or retained net profit), it can be assumed that the decisions on dividend payments and share repurchases are interdependent. If the data describing the payout policy are of a panel nature, then the payout policy should be described by the two simultaneous equations panel binomial choice model with random specific effects (model 1):

$$\begin{cases} DIV_{it} = \alpha_{01} + \beta_1 SHRE_{it} + \alpha_{11}X_{1it-1(t)} + \alpha_{21}X^2_{1it-1(t)} + \cdots + \alpha_{k1}X_{Kit-1(t)} + \mu_{1t} \\ SHRE_{it} = \alpha_{02} + \beta_2 DIV_{it} + \alpha_{12}X_{1it-1(t)} + \alpha_{22}X^2_{1it-1(t)} + \cdots + \alpha_{k2}X_{Kit-1(t)} + \mu_{2t} \end{cases}$$

$DIV_{it}$ - endogenous variable (jointly determined) that describes the decision to pay dividend,

$SHRE_{it}$ - endogenous variable (jointly determined) that describes the decision to repurchase shares,

$X_{jit}$ – value of j – exogenous variable (predetermined) for i–company in t–1 year (or t-year depending on the variable),

$j = 1,2,\dots,K$ – number of predetermined variables,

$\mu_{1t} = \alpha_{i1} + \varepsilon_{1t}$ – composite random disturbance term of the first equation, which is the sum of the specific random effects, and white noise, which is the random term $\varepsilon_{1t}$ of the first equation,

$\mu_{2t} = \alpha_{i2} + \varepsilon_{2t}$ – composite random disturbance term of the second equation, which is the sum of the specific random effects, and white noise, which is the random term $\varepsilon_{2t}$ of the first equation.

Applying the squares of the selected explanatory variables to the formulated models causes that they become second order binomial choice models (Osiewalski & Marzec, 2004), in which the explanatory variables assume the formula of a second-degree polynomial. Marzec (2008) argues that the advantage of the second order binomial choice models to the first order models, in which the explanatory variables assume the formula of a first order polynomial is, among others, the possibility of determining the optimal value of the explanatory variable, which maximises or minimises the probability of making a specific decision. Additionally, the second order polynomial is a better approximation of the studied phenomenon than the first order polynomial. Therefore, the above modification may contribute to a better estimation of the probability of dividend payment and share repurchases. At the same time, the explanatory variables still linearly depend on the parameter vector, therefore such a non-linear way of introducing explanatory variables theoretically does not cause any complications at the stage of estimation (Marzec, 2008).

Only after estimating the model (1) can we evaluate the nature of the relationships between endogenous variables. This is determined by the values of parameters $\beta_1$ and $\beta_2$. Positive and significant values of both parameters indicate a positive correlation – companies paying dividends also repurchase shares. Negative and significant values of both parameters indicate a negative interdependence - companies paying dividends are reluctant to repurchase shares (or vice versa). Insignificance of one of the parameters indicates the recursion, insignificance of both parameters - no relationship between the two decisions.

The fact that random effects $(\alpha_i)$ are treated as a component of the stochastic part of the model means that their values are not estimated in the estimation process (Witkowski, 2012).

Heckman (1978) was the first who suggested a multivariate model of latent variables and called it the Multivariate Probit Model. It could be also called the Logit Model. The estimation of this model should be analogous to the two stage least squares method.

In the first stage, based on selected predetermined variables, fitted values of both endogenous variables are estimated - reduced form (model 2):

$$\begin{cases} DIV_{it} = \alpha_{01} + \alpha_{11}X_{1it-1(t)} + \alpha_{21}X^2_{1it-1(t)} + \cdots + \alpha_{k1}X_{Kit-1(t)} + \mu_{1t} \\ SHRE_{it} = \alpha_{02} + \alpha_{12}X_{1it-1(t)} + \alpha_{22}X^2_{1it-1(t)} + \cdots + \alpha_{k2}X_{Kit-1(t)} + \mu_{2t} \end{cases}$$

$FDIV_{it}$ – fitted value of the variable $DIV_{it}$ for i–company in year t, calculated on the basis of the first equation of the model (2), wherein $FDIV_{it} = prob(DIV_{it} = 1)$,

$FSHRE_{it}$ – fitted value of the variable $SHRE_{it}$ for i–company in year t, calculated on the basis of the second equation of the model (2), wherein

$FSHRE_{it} = prob(SHRE_{it} = 1)$

In the second step (stage), the parameters of the structural equations of model (3) are estimated:

$$\begin{cases} DIV_{it} = \alpha_{01} + \beta_1 FSHRE_{it} + \alpha_{11}X_{1it-1(t)} + \alpha_{21}X^2_{1it-1(t)} + \cdots + \alpha_{k1}X_{Kit-1(t)} + \mu_{1t} \\ SHRE_{it} = \alpha_{02} + \beta_2 FDIV_{it} + \alpha_{12}X_{1it-1(t)} + \alpha_{22}X^2_{1it-1(t)} + \cdots + \alpha_{k2}X_{Kit-1(t)} + \mu_{2t} \end{cases}$$

The model parameters are estimated using the Maximum Likelihood Method. The estimated model (3) is the basis for the analysis and discussion.

An important issue in the above procedure is the selection of predetermined variables, which firstly, will enable the estimation of the fitted values of endogenous variables needed in the second stage, and secondly, will play the role of explanatory variables in the second stage.

To select predetermined variables for both equations the approach 'from general to specific' was used (Charemza & Deadman, 1997). The approach assumes that in the first step the model is estimated with all potential explanatory variables. Then, the variable with the highest value of p-parameter (and, at the same time, value above 0.05) is identified. In the next step such variable is eliminated from the model, and the model is re-estimated. This procedure is carried forward until all parameters in the model are significant at the 0.05 level. To evaluate the significance of individual parameters, the z-statistic with the distribution N (0,1) was used.

The method based on mathematical criteria is very useful – especially at the initial analytical step – because it allows the proper assessment of the statistical data. However, it should not be confined only to this method and consideration should also be given to other models. Therefore, starting with the initial model estimated with

the from general to specific selection method, a series of additional models which brought a significant amount of new information was also estimated.

For the evaluation of the estimated equations' quality, apart from the significance level of parameters, the statistics based on $\chi^2(k)$ with the number of degrees of freedom equal to the number of explanatory variables was used. Its statistical significance means that the set of explanatory variables altogether significantly describe the dependent variable.

Additionally, the intraclass correlation coefficient $\rho$, which is the relationship of intercept variance and total variance which is the sum of intercept variance and random disturbance term variance is also estimated.

If there is no intraclass variation, the value $\rho$ will be close to 0 and the pooled model can be used. If, using the likelihood-ratio (LR) test, we test that the indicator $\rho$ is statistically significant, it means that the panel model with random specific effects is correct, as the individual companies have their own specific characteristic (intraclass variation).

Additionally, in the case of equations with the same number of explanatory variables, the Akaike information criterion (AIC) and the Bayesian information criterion (BIC) are used.

The proposed procedure uses a number of econometric methods used to solve many problems in finance studies. Capably combination of these methods gives a new value (quality) that enables the analysis of the corporate payout decisions of public companies listed on various markets and has not been proposed in this form so far in the literature.

The proposed procedure:

- Enables the selection of appropriate factors determining both types of the corporate payout decisions (a method from general to specific).
- Takes into account the possibility of a non-linear relationship between some explanatory variables and the propensity to pay dividends and repurchase shares.
- Considers the panel nature of the data and the possibility of the heterogeneity.
- Takes into consideration and removes the phenomenon of the endogeneity in the model.
- Enables the assessment of the relationship between the dividend decision and the decision on share repurchases (whether the decisions are related to each other and what is the direction of the relationship).

Therefore, the proposed procedure allows us to achieve the aim of the paper and support the hypothesis H1.

## Decisions on Corporate Payouts to Shareholders on the Warsaw Stock Exchange (WSE). The Illustration of the Proposed Procedure

### *Data*

Data was obtained from the Thomson Reuters database and Eikon Thomson Reuters. In addition, current reports of companies for the years 2008–2016 were analysed using the Emis database and the economic service of the Polish Press Agency. In the next stage, for companies that implemented share repurchase programs, data on amounts paid to shareholders by share repurchase programs were obtained. For this purpose, the financial statements of individual companies were examined.

The sample construction began with a set of all domestic companies listed on the Warsaw Stock Exchange continuously over the period 2008–2016. There were 244 companies which met the criteria. Then from the sample the following companies were excluded:

- 32 financial companies, whose decisions regarding the profit distribution are usually not completely independent and depend on the recommendations of the financial supervision (in Poland - the Polish Financial Supervision Authority).
- 18 companies with negative values of equity.
- 6 companies that conducted share consolidation or split the shares.
- 25 companies which were delisted in the year following the last year of the analysis – the companies did not submit complete and reliable reports for 2016.
- 10 companies – for other reasons (companies with zero net revenues from sales - not conducting operating activity in a given year, the change of the fiscal year and tender offers).

Thus, a balanced panel data of 153 companies (1,377 observations) was obtained. They represent about 62.7 % domestic companies listed on the WSE continuously over the period 2008–2016. Their capitalization at the end of 2016 was equal to PLN 218.1 billion, which is 39.15 % of the capitalisation of all domestic companies listed on the WSE and accounted for 55.3 % of the initial group (244) of companies (which was mostly due to the lack of banks). This means that the constructed panel data is survival biased and "good situation" biased (after the exclusion of companies with a negative value of equity and those excluded in the year following the study). In our opinion, the research on corporate payout decisions, which have long-term effects, should use data from companies which have a long and undisturbed history.

In 2008–2016, the studied companies made 706 dividend payments, which represented 51.27 % of all possible dividend payments. The share of dividend payers increased from 41.2 % in 2008 to 58.2 % in 2016. At that time, on the WSE the fraction of dividend payers was 33.48 %. Over the years 2008–2016, the examined companies implemented 192 operations of share repurchases, which represented 13.94 % of all possible share repurchases. At that time, the proportion of companies repurchasing shares heavily fluctuated, with a tendency to decrease.

Therefore the studied companies are on average larger, older and are characterised by more than two times higher propensity to pay dividends compared to other domestic companies listed on the WSE, which will undoubtedly affect the modelling results and must be taken into account in the interpretation.

### *Variables Adopted for the Modelling*

In the modelling procedure the explanatory variables which well described the decisions on dividends and share repurchases used in prior studies of the developed and emerging markets were applied. First of all, the three

groups of variables suggested by Fama & French (2001). Profitability measured in this study by the return on assets (*ROA)* and return on equity (*ROE)* ratios. The size of the company measured in the study by the natural logarithm of total assets (*lnA*), natural logarithm of capitalization (*lnCap*) and the percentage share of the company's capitalisation in the market capitalisation of all domestic companies listed on the WSE (*ShCap*). The third group of variables is connected with investment opportunities, which, however, was considered in this study slightly different than proposed by Fama and French, who used the market value to book value ratio, with the market value being measured as the sum of capitalization and total debt (*MB*). Fama and French assumed and then positively verified on the New York exchanges quoted companies that the relationship between the propensity to pay dividends and the *MB* ratio is negative, which means that with the increase in investment opportunities, the propensity to pay dividends decreases. This interpretation seems reasonable in the case of companies in good economic and financial condition. However, the listed companies could also be in a difficult financial condition at that moment - they sell less than in the previous year, the value of their assets does not increase, and sometimes even declines. Investors know this well and value them low, which means the ratio of the market value to the book value of assets is very low. Such companies usually have negative financial results and do not pay dividends not because they have many investment opportunities, but since they do not have the appropriate resources. The above considerations lead to the hypothesis that perhaps the relationship between investment opportunities and the propensity to pay dividends is not linear. Therefore, an inverted U-shaped relationship has been suggested. According to this relationship, the propensity to pay dividends is very low in companies with minor and very large investment opportunities. Therefore, dividends are most often paid by companies with average investment opportunities, but in a stable situation: large, profitable and mature (Kowerski, 2013; Kowerski & Bielak, 2018). To verify the hypothesis, an additional explanatory variable $(MB^2)$ has been applied in the model. In the study the investment opportunities were also measured by the second proxy: capitalization to book value (*CB*) and its square ($CB^2$).

Another variable adopted in the research is the company's maturity measured in the number of the listing' years on the stock exchange (*Mat*).

An important variable in many studies is the leverage. Most often, it was assumed and, in many cases positively verified, that there was a negative relationship between both phenomena. This would mean that zero-levered companies are most likely to pay dividends and repurchase shares. However, usually young and small companies, which are not able to obtain an external capital at an early stage of life, use very little debt. Therefore, they are not willing to pay dividends and allocate profits for development (*life cycle theory of dividends*). Only with the growth of the company, they are more willing to use debt (to use the effect of the leverage), at the same time they are those companies that "can afford" to pay dividends or (and) repurchase share. Apparently, it is assumed that overleverage can be a sign of a deteriorating situation, therefore the companies with high leverage levels are reluctant to pay out cash to the shareholders. And here, as with investment opportunities, it is believed that the relationship between the level of debt and the propensity to pay dividends or share repurchases is inverted U shaped[2]. Leverage is measured by the debt ratio (*DR*) and its square ($DR^2$).

Corporate payout decisions are influenced not only by the company's economic and financial situation, but also by the environmental – macroeconomic situation (eg (Kowerski, 2011)). In this study the macroeconomic situation is measured by the annual growth rate of Poland's gross domestic product (GDP), the annual market development measured by WSE index rate of return (WIG) and the market's propensity to pay dividends, measured by the share of dividend-paying companies in the total number of domestic companies listed on the WSE at the end of the year (MPROP).

The values of the variables describing the economic and financial situation of each company concerned the year preceding the payment decision (t-1) due the fact that the General Meeting of Shareholders adopts a resolution on the dividend payment, takes into account directly the net profit generated for the last financial year and previous years, and indirectly other indicators that the company obtained in the last year fiscal year. The values of macroeconomic variables come from the year in which the payments were made (year t).

**The Results of Corporate Payout Models' Estimations**

As a result of the procedure "from the general to the specific", as the predetermined variables of the first equation (*DIV*) were selected: the company size measured by the *ShCap*, its investment opportunities (*CB* and $CB^{2)}$, leverage (*DR and* $DR^2$) and the market propensity to pay dividends (*MPROP).* As the the predetermined variables in the second equation (*SHRE*) we selected variables measuring investment opportunities (*CB* and $CB^2$), the leverage level (*DR and* $DR^2$) and macroeconomic variables (*MPROP* and *GDP*) (table 1).

It should be emphasised that in the case of the first equation, the elimination *ShCap* at an earlier stage of selecting the variables make it possible to obtain model with variables: *ROE, lnA, CB,* $CB^2$ and *MPROP* with significance, at the level of 0.05, of all parameters. Therefore, it could be argued that in this case the corporate propensity to pay dividends was influenced by its profitability, size and investment opportunity (as stated by Fama and French, 2001), as well as the market's propensity to pay dividends. Additionally, a replacement in the first equation the variable *ROE* with *ROA*, and *CB* and $CB^2$, with *MB* with $MB^2$ gave further models with all parameters statistically significant, however with higher values of the information criteria AIC and BIC. Due to the economic content of these models, they will also be the basis for the estimating two equations models. In all the models discussed above, Wald's tests confirmed the significance of entire sets of variables.

[2]This is an indirect reference to the trade-off theory of capital structure (Myers, 1984). Since there is a capital structure (measured e.g. by the debt ratio) that optimizes the value (and profitability) of the company, there should also be a capital structure that optimizes the propensity to pay dividends and repurchase shares.

Table 1

**The Results of the Predetermined Variables Selection by Panel Probit Quadratic Model with Specific Random Effects**

| Variables and test | Equation DIV | | Equation SHRE | |
|---|---|---|---|---|
| | parameter | p | parameter | p |
| ShCap | 0.7449 | 0.001 | | |
| CB | 1.1619 | <0.001 | 1.3206 | 0.005 |
| $CB^2$ | -0.1960 | <0.001 | -0.5340 | 0.007 |
| DR | 0.0351 | 0.018 | 0.0403 | 0.049 |
| $DR^2$ | -0.0003 | 0.031 | -0.0004 | 0.052 |
| MPROP | 0.0406 | <0.001 | -0.0287 | 0.005 |
| GDP | | | -0.1076 | 0.036 |
| Const | -2.8771 | <0.001 | -1.8470 | 0.006 |
| Wald $chi^2(k)$ | 70.8000 | <0.001 | 26,06 | <0.001 |
| Likelihood-ratio test of $\rho = 0$ | 337.66 | <0.001 | 208,1 | <0.001 |
| AIC | 1399.05 | | 890.269 | |
| BIC | 1440.872 | | 932.090 | |

*Source: Authors' own study*

Intraclass correlation coefficients $\rho$ were statistically significant which confirmed the validity of using panel models with specific random effects.

The results of the estimation of the two-equation panel probit quadratic models with random specific effects describing the corporate payout policy of non-financial companies listed on the Warsaw Stock over the period 2008–2016 are presented in table 2.

In the estimated optimal model of the corporate payout policy (model a), the parameters for both endogenous explanatory variables happened to be insignificant at the level of 0.05. This means that the company's decision to pay out dividends does not depend on the decision to repurchase shares and vice versa, which is not in line with the hypothesis H2.1. However, the findings are consistent with the results of De Jong, Van Dijk & Veld (2003), who used the pooled two - equations simultaneous logit model for Canadian companies in 1997 also found no correlation between decisions on dividends and decisions on share repurchases. However, many studies (conducted using other methods) indicated a substitution between both forms of corporate payout. In the case of the WSE, the obtained result may arise from a relatively small number of share repurchases in the analysed period. But the reasons may also be different: stock repurchases and dividends are used at different times from one another, by different kinds of firms (Kooli & L'Her, 2010). Stock repurchases are very pro-cyclical, while dividends increase steadily over time. Dividends are paid by firms with higher "permanent" operating cash flows, while repurchases are used by firms with higher "temporary", non-operating cash flows (Jagannathan, Stephens & Weisbach, 2000).

The first estimated equation of model shows that larger companies were more willing to pay dividends in periods when the entire market was more willing to pay dividends. The dividend payment was also influenced by investment opportunities measured by the ratio of capitalization to total assets and the leverage level measured by the debt ratio, in both cases it was a relationship in the shape of an inverted U. The propensity to pay dividends increased until the company's capitalization exceeded three times the book value of the company (3.01), then the tendency began to decline. In turn, the debt ratio, which maximized the propensity to pay dividends, was 55.1 % - the further debt discouraged it from paying dividends, which is consistent with the hypothesis H 2.2.

The second estimated equation shows that the relationship between the companies' propensity to repurchase shares and its investment opportunities and leverage has also the shape of an inverted U (in line with the hypothesis H2.2.). The propensity to repurchase shares by a company grew until the ratio of its capitalization to book value was 1.27, then the tendency began to decline. On the other hand, the debt ratio which maximized the propensity to repurchase shares was 48%. In this equation, the parameter for GDP is negative and statistically significant. This is in line with the statement that companies were more willing to repurchase shares in the periods of declining economic growth, which could be related to the deteriorating situation on the capital market and an attempt to defend the decline in share prices, which has been identified by several researchers for many years (eg. Dittmar, 2000).

The negative and significant value of the parameter in the second equation for the variable describing the propensity of the entire market to pay dividends (MPROP) means that the company was more willing to repurchase shares, while most other companies[3] did not pay a dividend.

The GDP and MPROP variables from the estimated models (tab. 2) are consistent with the hypothesis H2.3 regarding the influence of the macroeconomic factors on the propensity to make dividend payments and repurchase shares. Therefore, the results of the study support the hypothesis H2.3

[3] These were other companies, while the parameter for the DIV variable in the second equation was statistically insignificant.

Table 2

**The Estimation Results of Two-Equation Panel Probit Quadratic Models with Random Specific Effects Describing the Corporate Payout Policy of Non-Financial Public Companies**

| Variables and tests | Model a (optimal) | | | | Model b | | | | Model c | | | | Model d | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Equation DIV | | Equation SHRE | | Equation DIV | | Equation SHRE | | Equation DIV | | Equation SHRE | | Equation DIV | | Equation SHRE | |
| | parameter | P | parameter | p | parameter | p | parameter | p | parameter | p | parameter | p | parameter | p | parameter | p |
| FDIV | | | -0.1255 | 0,904 | | | 0.6654 | 0.239 | | | 0.8023 | 0.128 | | | -0.0058 | 0.995 |
| FSHRE | 1.7922 | 0.488 | | | 3.6269 | 0.124 | | | 4.9799 | 0.066 | | | 2.1211 | 0.414 | | |
| ROA | | | | | | | | | | | | | | | | |
| ROE | | | | | 0.0064 | 0.022 | | | 0.0080 | 0.003 | | | | | | |
| lnA | | | | | 0.3881 | <0.001 | | | 0.3549 | <0.001 | | | | | | |
| ShCap | 0.7363 | 0.001 | | | | | | | | | | | 0.7377 | 0.001 | | |
| MB | | | | | | | | | 1.0610 | <0.001 | | | | | 1.8284 | 0.039 |
| $MB^2$ | | | | | | | | | -0.1185 | 0.031 | | | | | -0.5523 | 0.014 |
| CB | 1.0679 | <0.001 | 1.3871 | 0,056 | 1.0098 | <0.001 | 0.9882 | 0.069 | | | 1.0148 | 0.038 | 1.0534 | <0.001 | | |
| $CB^2$ | -0.1774 | 0.001 | -0.5473 | 0,016 | -0.1309 | 0.012 | -0.4698 | 0.020 | | | -0.5003 | 0.011 | -0.1750 | 0.001 | | |
| DB | 0.0301 | 0.067 | 0.0420 | 0,091 | | | 0.0362 | 0.079 | | | | | 0.0293 | 0.073 | 0.0397 | 0.087 |
| $DB^2$ | -0.0003 | 0.104 | -0.0004 | 0,081 | | | -0.0004 | 0.071 | | | | | -0.0003 | 0.113 | -0.0005 | 0.063 |
| MPROP | 0.0447 | <0.001 | -0.0269 | 0,131 | 0.0431 | <0.001 | -0.0373 | 0.003 | 0.0447 | <0.001 | -0.0372 | 0.003 | 0.0454 | <0.001 | -0.0277 | 0.114 |
| GDP | | | -0.1077 | 0,036 | | | -0.1092 | 0.033 | | | -0.1096 | 0.032 | | | -0.1090 | 0.034 |
| Const | -2.9404 | <0.001 | -1.9153 | 0,031 | -7.0711 | <0.001 | -1.6009 | 0.022 | -7.1973 | <0.001 | -0.9541 | 0.056 | -2.9512 | <0.001 | -2.4369 | 0.017 |
| Wald $chi^2(k)$ | 71.80 | <0.001 | 26.07 | <0,001 | 92.2100 | <0.001 | 27.24 | <0.001 | 91.10 | <0.001 | 24.58 | <0.001 | 71.99 | <0.001 | 25.95 | <0.001 |
| Likelihood-ratio test of $\rho = 0$ | 336.68 | <0.001 | 208.11 | <0,001 | 302.93 | <0.001 | 199.41 | <0.001 | 306.46 | <0.001 | 203.76 | <0.001 | 336.65 | <0.001 | 209.44 | <0.001 |
| Max CB | 3.01 | | 1.27 | | 3.86 | | 1.05 | | | | 1.01 | | 3.01 | | | |
| Max CS | 55.08 | | 47.98 | | | | 45.95 | | | | | | 55.29 | | 41.64 | |
| Max MB | | | | | | | | | 4.48 | | | | | | 1.66 | |
| AIC | 1400.570 | | 892.254 | | 1378.35 | | 890.895 | | 1380.359 | | 890.089 | | 1400.384 | | 892.1106 | |
| BIC | 1447.619 | | 939.303 | | 1420.171 | | 937.944 | | 1422.181 | | 926.683 | | 1447.433 | | 939.1596 | |

*Source: author's own study*

It should be noted that the significance level of some parameters (one in the first equation, three in the second equation) slightly exceeded 0.05. It was influenced by the introduction of endogenous variables into the equations as explanatory variables, due the fact that in the models estimated independently all parameters were significant. The result is noteworthy because it means that although the parameters on endogenous explanatory variables were insignificant, the presence of these variables in the model makes the assessment of the impact of other explanatory variables on endogenous variables realistic. It may also be a justification for the application of the discussed procedure, even if it transpires that there are no significant relationships between endogenous variables.

Therefore, it is worth analysing other estimated models (table 2). As in the optimal model, the parameters of endogenous explanatory variables in the remaining analysed models are statistically insignificant, which supports the hypothesis regarding the independence of both types of decisions. In the equations in which the variables describing investment opportunities and leverage appear, the relations between the propensity to pay dividends and repurchase shares and these variables are also characterized by the shape of an inverted U. In the first equation of model b, profitability measured by ROE[4] and the size of the company, this time measured by lnA, positively affect the propensity to pay dividends. In the c model, the parameters for all predetermined variables are significant at the level of 0.05.

The model c and model d render it possible to estimate the values of MB ratios that maximise the propensity to pay dividends and repurchaseshares. Apparently, they are (while capitalisation is increased by debt) higher than the values of CB ratios and equal to 4.48 for dividend payments and 1.66 for share repurchases. It is also worth noting that in the c model parameters are significant for all variables predetermined in advance, although this model at the stage of selecting predetermined variables from the formal point of view was slightly worse. This, in turn, leads to the conclusion that the proposed procedure requires, however, consideration of a greater number of models than just the one selected by the method from "the general to the specific", which we have already signalled earlier.

## Conclusions

The proposed corporate payout decisions' modelling procedure based on the two simultaneous equations quadratic panel probit model with random specific effects allows for an appropriate description of the complex and multilaterally conditioned decision-making process. In particular:

- to take into consideration the behavioural character of payout decisions based on the latent values of propensity – the fitted values of binary endogenous variables calculated by the model are the probabilities of dividend payment or share repurchases which can be treated as estimations of propensities to pay dividends and share repurchases;
- to take into consideration the simultaneous character of the decisions of dividend payments and share repurchases (two equations model);
- to solve a very difficult problem, known in economics as interdependence (in econometrics - endogeneity) of dividend payment and share repurchases decisions (method of estimation analogous to two stage least squares);
- to take into account the fact that many potential motives for repurchasing shares (and dividend payment) may influence a large fraction of firms during one time period but only a small fraction of another period (Dittmar, 2000), which justify the use of panel modelling methods;
- to take into consideration the specific characteristics of studied companies;
- to allow the influence of different factors on the decision process to be analysed;
- to allow the values of exogenous variables to be found which optimise the propensity to pay dividends and share repurchase;
- to enable conclusions to be made on large sets of companies over long periods of time (panel data).

The study which was the verification of proposed procedure shows that on the WSE over the years 2008–2016 the dividend decisions did not depend on the share repurchase decisions and vice versa. According to the authors, such results are fully justified by the behaviour of companies listed on the WSE. Share repurchases are still not very popular on the Warsaw Stock Exchange. While decisions on dividend payments are made by the companies quite regularly, decisions on share repurchases are made much less frequently and irregularly. The proposed model has confirmed it.

The findings confirmed the inverted U-shape relationship between the propensity to pay dividends and the propensity to share repurchases and two variables: investment opportunities and debt. In the case of both variables, the increase in value initially caused the increase of the propensity to pay out part of the profit to shareholders but after exceeding the maximum the tendency began to decline.

The modelling procedure for corporate payout decisions based on the two simultaneous equations second order panel binomial choice model with random specific effects gives the possibility of examining the relationship between decisions on dividend payments and share repurchases and evaluating the factors determining these decisions. It is the first attempt to use such a combination of methods to analyse the corporate payout decisions. In prior studies some of the methods were used, but not in the combination proposed in this paper.

In prior studies some authors used logit random effects panel models separately to estimate propensities to either pay dividends or to repurchase shares (i.a. Von Eije & Megginson, 2008). Other authors used the two simultaneous equations binomial choice model however only for one-year data (De Jong, Van Dijk & Veld, 2003).

This research procedure could be valuable for investors, who can select firms in which they want to invest, based on the variables specified in the model, depending on their preferences:

- receiving regular dividends (then they will choose firms with a high propensity to pay dividends),
- voluntary shares resale at a time convenient for the investors (then they will choose firms with a high propensity to repurchase shares),

[4] In another model, which is not presented here, it is ROA.

- receiving dividends and reselling shares (then they will choose firms with propensity to pay dividends and repurchase shares exceeding a given threshold).

It could be also appreciated by the managers who are interested in the corporate payout decisions' analysis of the competitive firms, also those relating to the relationship between dividend payments and share repurchases.

Limitations of the study results are mainly the consequence of the relatively small number of share repurchase observations. However, the paper presents a methodology that could be used for applications on every market. Therefore, further research may investigate whether decisions regarding dividend payments and share repurchases depend on each other in other countries.

**Annex**

Table 3

**Descriptive Statistics**

| Year | Statistics | DIV | SHRE | Mat | MB | CB | DR | ROA | ROE | lnA | lnCap | ShCap |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2008 | mean | 0.41 | 0.16 | 6.45 | 1.02 | 0.57 | 45.31 | 4.69 | 6.29 | 12.69 | 11.83 | 0.38 |
| 2008 | median | 0.00 | 0.00 | 5.00 | 0.88 | 0.41 | 45.41 | 5.02 | 8.24 | 12.52 | 11.60 | 0.05 |
| 2008 | skewness | 0.36 | 1.89 | 0.21 | 2.58 | 2.46 | 0.03 | -1.31 | -1.36 | 0.65 | 0.76 | 7.07 |
| 2008 | kurtosis | 1.13 | 4.56 | 1.59 | 11.52 | 10.62 | 2.40 | 9.20 | 9.19 | 3.41 | 3.53 | 56.29 |
| 2009 | mean | 0.48 | 0.20 | 7.45 | 1.20 | 0.77 | 42.85 | 2.50 | 1.87 | 12.66 | 12.22 | 0.58 |
| 2009 | median | 0.00 | 0.00 | 6.00 | 1.09 | 0.69 | 42.25 | 3.69 | 6.01 | 12.42 | 11.95 | 0.09 |
| 2009 | skewness | 0.07 | 1.53 | 0.21 | 2.30 | 1.88 | 0.32 | -2.50 | -3.28 | 0.69 | 0.65 | 5.47 |
| 2009 | kurtosis | 1.00 | 3.34 | 1.59 | 10.43 | 8.55 | 2.60 | 12.43 | 17.95 | 3.49 | 3.12 | 33.47 |
| 2010 | mean | 0.46 | 0.12 | 8.45 | 1.31 | 0.86 | 44.87 | 4.46 | 5.62 | 12.75 | 12.41 | 0.34 |
| 2010 | median | 0.00 | 0.00 | 7.00 | 1.16 | 0.74 | 45.12 | 4.17 | 6.12 | 12.59 | 12.23 | 0.06 |
| 2010 | skewness | 0.17 | 2.37 | 0.21 | 3.54 | 3.45 | 0.22 | -0.57 | -4.28 | 0.67 | 0.58 | 6.04 |
| 2010 | kurtosis | 1.03 | 6.63 | 1.59 | 21.29 | 21.37 | 2.66 | 24.68 | 35.07 | 3.46 | 3.23 | 42.27 |
| 2011 | mean | 0.50 | 0.16 | 9.45 | 1.02 | 0.55 | 46.65 | 5.32 | 7.47 | 12.86 | 12.01 | 0.29 |
| 2011 | median | 1.00 | 0.00 | 8.00 | 0.91 | 0.43 | 44.92 | 4.96 | 7.16 | 12.68 | 11.77 | 0.04 |
| 2011 | skewness | -0.01 | 1.89 | 0.21 | 4.88 | 5.16 | 0.21 | -0.52 | -1.57 | 0.61 | 0.53 | 5.72 |
| 2011 | kurtosis | 1.00 | 4.56 | 1.59 | 36.89 | 40.74 | 2.75 | 11.01 | 15.22 | 3.42 | 3.16 | 35.97 |
| 2012 | mean | 0.48 | 0.17 | 10.45 | 1.09 | 0.63 | 45.83 | 2.86 | 2.73 | 12.86 | 12.10 | 0.35 |
| 2012 | median | 0.00 | 0.00 | 9.00 | 0.93 | 0.45 | 44.26 | 3.93 | 5.33 | 12.75 | 11.88 | 0.04 |
| 2012 | skewness | 0.09 | 1.76 | 0.21 | 3.63 | 3.72 | 0.37 | -2.25 | -3.05 | 0.54 | 0.52 | 6.23 |
| 2012 | kurtosis | 1.01 | 4.09 | 1.59 | 18.80 | 19.30 | 2.93 | 11.12 | 18.94 | 3.45 | 3.11 | 44.44 |
| 2013 | mean | 0.57 | 0.18 | 11.45 | 1.20 | 0.75 | 45.42 | 3.79 | 4.30 | 12.88 | 12.29 | 0.28 |
| 2013 | median | 1.00 | 0.00 | 10.00 | 1.03 | 0.56 | 44.39 | 3.64 | 6.02 | 12.74 | 12.10 | 0.04 |
| 2013 | skewness | -0.28 | 1.64 | 0.21 | 4.33 | 4.33 | 0.20 | -2.14 | -4.93 | 0.52 | 0.39 | 5.37 |
| 2013 | kurtosis | 1.08 | 3.69 | 1.59 | 30.53 | 30.07 | 3.10 | 16.67 | 46.59 | 3.46 | 2.80 | 34.43 |
| 2014 | mean | 0.56 | 0.09 | 12.45 | 1.09 | 0.64 | 45.44 | 3.82 | 5.40 | 12.93 | 12.16 | 0.24 |
| 2014 | median | 1.00 | 0.00 | 11.00 | 0.95 | 0.46 | 44.63 | 4.08 | 6.40 | 12.77 | 11.95 | 0.03 |
| 2014 | skewness | -0.22 | 2.83 | 0.21 | 3.22 | 3.18 | 0.02 | -3.11 | -2.06 | 0.52 | 0.36 | 5.16 |
| 2014 | kurtosis | 1.05 | 9.03 | 1.59 | 18.75 | 17.83 | 3.35 | 26.92 | 14.00 | 3.37 | 2.68 | 31.46 |
| 2015 | mean | 0.58 | 0.11 | 13.45 | 1.17 | 0.70 | 46.42 | 2.70 | 4.34 | 12.96 | 12.26 | 0.39 |
| 2015 | median | 1.00 | 0.00 | 12.00 | 0.99 | 0.45 | 45.12 | 4.38 | 7.77 | 12.82 | 12.09 | 0.05 |
| 2015 | skewness | -0.30 | 2.58 | 0.21 | 2.30 | 2.46 | 0.03 | -3.77 | -1.88 | 0.35 | 0.30 | 5.85 |
| 2015 | kurtosis | 1.09 | 7.68 | 1.59 | 8.83 | 10.22 | 3.23 | 21.40 | 15.96 | 3.52 | 2.56 | 41.67 |
| 2016 | mean | 0.58 | 0.08 | 14.45 | 1.19 | 0.70 | 49.06 | 2.67 | 2.02 | 13.01 | 12.30 | 0.39 |
| 2016 | median | 1.00 | 0.00 | 13.00 | 1.01 | 0.47 | 49.17 | 4.16 | 6.40 | 12.91 | 11.95 | 0.04 |
| 2016 | skewness | -0.33 | 3.14 | 0.21 | 2.74 | 2.61 | 0.25 | -3.78 | -3.44 | 0.32 | 0.33 | 6.12 |
| 2016 | kurtosis | 1.11 | 0.84 | 1.59 | 11.98 | 10.68 | 2.83 | 23.26 | 20.24 | 3.49 | 2.59 | 44.44 |

DIV–Decision of dividend payment in t year (1 – payment, 0 no payment), SHRE–Decision of share repurchase in t year, (1 – repurchase, 0 no repurchase), Mat–Maturity measured in the number of the listing' years on the stock exchange in t year, MB–Market to book value ratio at the end of the year t–1, CB–Capitalization to book value at the end of the year t–1, DR–Debt ratio at the end of the year t–1 (%), ROA–Return on assets ratio at the year t–1 (%), ROE–Return on equity ratio at the year t–1 (%), lnA–Natural logarithm of total assets at the end of the year t–1, lnCap–Natural logarithm of capitalization at the end of the year t–1, ShCap–Share of the company's capitalization in the WSE capitalization at the end of the year t–1 (%).

*Source: Authors' own study*

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