INVESTIGATING THE DIVIDEND POLICY DETERMINANTS USING A POISSON REGRESSION

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Abstract: *Using a sample of 4815 companies operating in various sectors of activity in EU countries, we investigate the firm-related factors influencing the frequency of dividend payments. Using a Poisson regression, we bring strong empirical evidence that the frequency of dividends payouts is influenced by the size of the firm, its profitability, indebtness and ownership structure. Furthermore, we find inconclusive results relating the frequency of the dividend payouts to the liquidity of the firm. When accounting for overdispersion problems via a Zero-Inflated Poisson (ZIP), the coefficients remain stable as sing and statistical significance, but their impact is diminished.*

Keywords: *Dividend policy, Poisson regression, Overdispersion.*

JEL classification: *C14, G35*

Introduction

Dividend policy is a controversial topic in the financial literature. It determines how much money a shareholder will receive from the firm's profit and when. The economic agents often focus on dividend payouts to assess the financial success of a firm, to choose whtear or not to buy its shares etc. Against this background, it is of interest to study the factors influencing the dividend policy.

The literature investigating the determinants of dividend payouts identified a series of firm-related factors such as Size, Profitability, Liquidity, and Board characteristics as major drivers for the amount of cash paid to the shareholders (**Ye et al., 2019; Wu et al., 2020**). Furthermore, to account for the impact induced by all these firm-related factors, a wide range of econometric methods were used, such as Panel Fixed Effects (**Miller et al., 2022**), LOGIT regression (**Beladi et al., 2022**), or TOBIT regression (**Ding et al., 2020**).

In this paper, we contribute to literature by investigating the frequency of dividend payouts in EU27 countries based on a Poisson regression. Up to our knowledge, this is the first attempt devoted to quantify the influence factors of dividends frequency, rather than propensity to pay dividends of their levels.

The remainder of the paper is structured as follows. Section 2 presents the data and the econometric approach; Section 3 is summarizing the results while Section 4 concludes the paper.

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Methodology

Using a sample of 4815 companies operating in various sectors of activity in EU countries, we investigate the firm-related factors influencing the frequency of dividend payments. The dividend represents a part of the net profit of a company, which belongs to every shareholder conditioned by the number of shares he/she owns. The dependent variable is represented by the number of years in which the contempt company has not paid dividends in the period 2012 - 2020. If the value of this variable is zero, then it means that they have paid dividends to shareholders in all nine years, and if it is eight, it means that only in one year or made such payments. Firms that did not pay dividends were excluded from the sample. All the explanatory variables such as Size, Indebtedness, Profitability, Liquidity, R&D expenditures, and Ownership structure, along with dividend information, are extracted from ORBIS database.

To study the frequency of dividend payments, which is a count variable, the most common approach is the Poisson regression. However, as we can see in Figure 1, the distribution of the dependent variables is highly asymmetrical (zero-inflated) so using a ZIP regression will be a better fit.

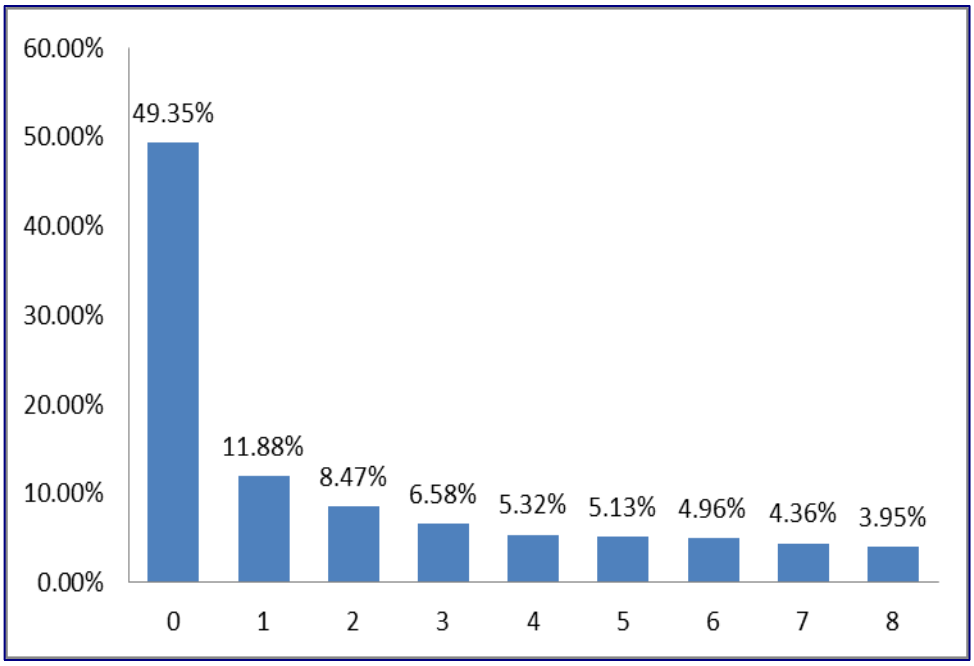

Figure 1 – No. of years without dividend payments during 2012-2020

Source: own processing

The Poisson distribution measures the probability that a certain number of events occur in a certain period of time. The discrete random variable X follows a Poisson distribution conditioned by the parameter λ if it has the following form:

$$f(x) = \begin{cases} e^{-\lambda}\dfrac{\lambda^x}{x!}, & x \in N,\ \lambda > 0 \\ 0, & otherwise \end{cases} \quad (1)$$

The shape of the Poisson distribution depends on the values of the parameter λ (See Figure 2), which is the mean, but also the variance of the distribution, i.e., E [X] = Var [X] = λ.

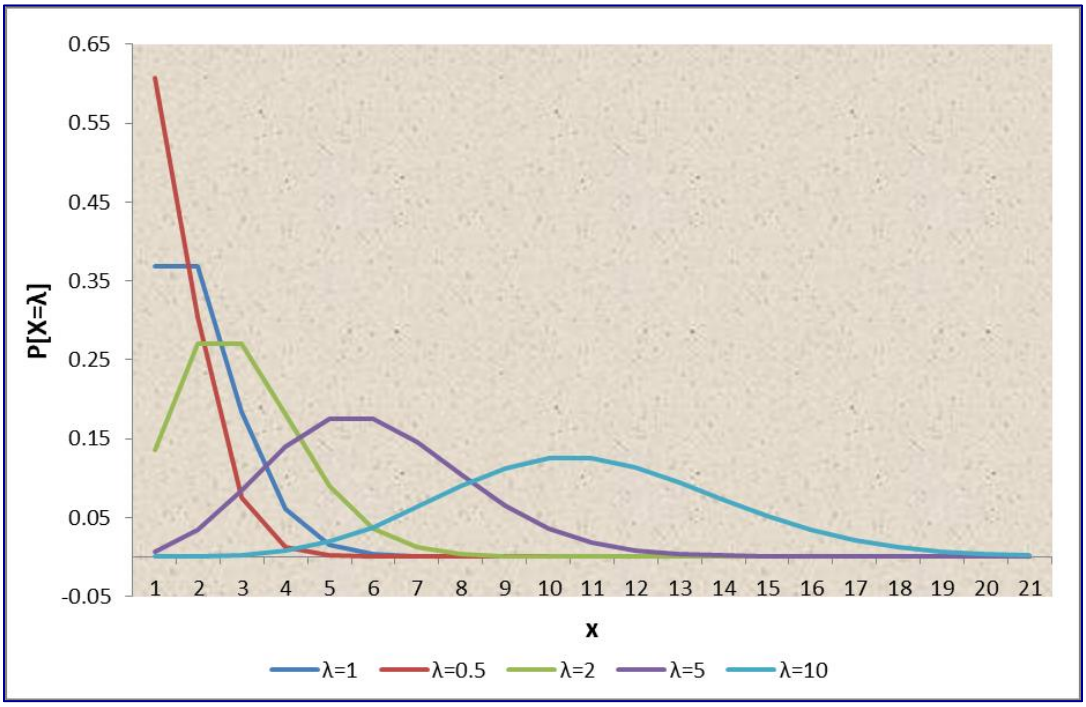

Figure 2 – PFD of Poisson distribution

Source: own processing

Let us assume that we select k explanatory variables, $(X_1, X_2, \ldots, X_k)$ for a sample of size n. For the observation $i \in \{1, 2, ..., n\}$ there exists the associated $x_i = (x_{1i}, x_{2i}, \ldots, x_{ki})$ and y_i, which belong to a population with a Poisson distribution with mean λ_i. So the dependent variable $Y = (y_1, y_2, \ldots, y_n)$ is the realization of independent random variables that follow a Poisson distribution. The Poisson regression specification relates the parameter λ_i to the realizations of the independent variables, $x_i = (x_{1i}, x_{2i}, \ldots, x_{ki})$:

$$\log(\lambda_i) = \beta_1 x_{i1} + \cdots + \beta_k x_{ik} \qquad (2)$$

The coeffcients$\beta = (\beta 1, \ldots, \beta k)$ of size $(k \times 1)$ are estimated using the maximum likelihood method. However, when we deal with zero-inflated data, the standard Poisson coefficients are affected by overdispersion i.e., the variance value is greater than the mean value (**Cameron and Trivedi, 1990**). The ZIP Regression corrects this problem by following the steps below:

i) Based on a LOGIT type model, the probability of granting dividends θ_i is estimated using the set of covariates $(Z_1, Z_2, \ldots, Z_p)$ which can be different from $(X_1, X_2, \ldots, X_k)$, but also identical.

ii) The ZIP distribution will be specified on the basis of the new observations:

$$P(Y_i = y_i) = \begin{cases} \theta_i(z_i) + \left(1 - \theta_i(z_i)\right)e^{-\lambda_i}, & y_i = 0 \\ \left(1 - \theta_i(z_i)\right)\dfrac{\lambda_i\ e^{-\lambda_i}}{y_i!}, & y_i > 0 \end{cases} \qquad (3)$$

The coefficients of the ZIP regression are estimated, similar to the ones of Poisson regression using the MLE approach, via the Newton-Raphson algorithm, as suggested by **Jansakul and Hinde (2002)**.

Results

In Table 1 we present the coefficients estimated using a Poisson regression. In Models 1-6 we include each covariate individually, while Model 7 presents the extended model results.

Table 1

Poisson regression estimates (p-values in parentheses)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Size	-0.2255 (0.0000)						-0.2334 (0.0000)
Indebtedness		0.3959 (0.0000)					1.4223 (0.0000)
Profitability			-1.4457 (0.0000)				-1.2584 (0.0000)
Liquidity				0.0033 (0.5400)			-0.0177 (0.0005)
R&D expenditures					-0.0726 (0.0000)		-0.0231 (0.0000)
Ownership structure						1.5375 (0.0000)	1.4790 (0.0000)
Intercept	3.4704 (0.0000)	0.5790 (0.0000)	0.7709 (0.0000)	0.6252 (0.0000)	0.6905 (0.0000)	0.1047 (0.0000)	3.0525 (0.0000)
Pseudo R-squared	0.0702	0.0009	0.0365	0.0001	0.0096	0.0400	0.1514
AIC	21540	23144	22320	23166	22944	22240	19670
Observations	4815	4815	4815	4815	4815	4815	4815

Source: own calculation

Except for liquidity, all the coeffcints retain their signs and statistical significance, regardless of the specification of the model. According to R-squared (which must be as large as possible) and AIC (which must be as small as possible), the size of the firm is the most influential factor when it comes to dividend policy. Thus, if the size of the firm increases with 1 unit, the number of years when the firm decides not to pay dividend decreases on average with $1-e^{-0.2255}$=18.63%. In addition, we report a positive association between Indebtedness and dividend frequency, indicating that high-indebtness firms are likely to reduce the dividends frequency. Furthermore, in line with the empirical literature (**Miller et al., 2022**), we report a negative relationship between the profitability of the firm proxied by ROA (return on assets) and the number of years without dividend payments that is, a positive link between ROA and the number of years with dividend payments.

We fail to report any robust evidence relating the liquidity of a form to dividend policy. Although in Model 7 the coefficient is statistically significant, in Model 4 it is not, and the value of R-square is at the highest level compared to the other specifications. Similarly, the AIC it is at the lowest level compared to the other specifications. Finally, we report a positive relationship between the ownership structure and the frequency of dividend payments. This suggests that a more diluted ownership is more likely to grant dividends more often.

One of the characteristics of the Poisson distribution is that the mean is equal to the variance. Often, this restriction is not valid when we use real and not simulated data, thus appearing the phenomenon of overdispersion. Under these conditions, the standard errors related to a Poisson-type model are quite small and implicitly they can erroneously generate estimates that are statistically significant as shown by **Roback and Legler (2021)**. Normally, if there is no overdispersion phenomenon, then the residuals must follow a uniform distribution. As we can see in Figure 3, there are significant differences between the residual generated by Model 7 and the ones simulated from a uniform distribution, so we can conclude that overdispersion affects the estimates.

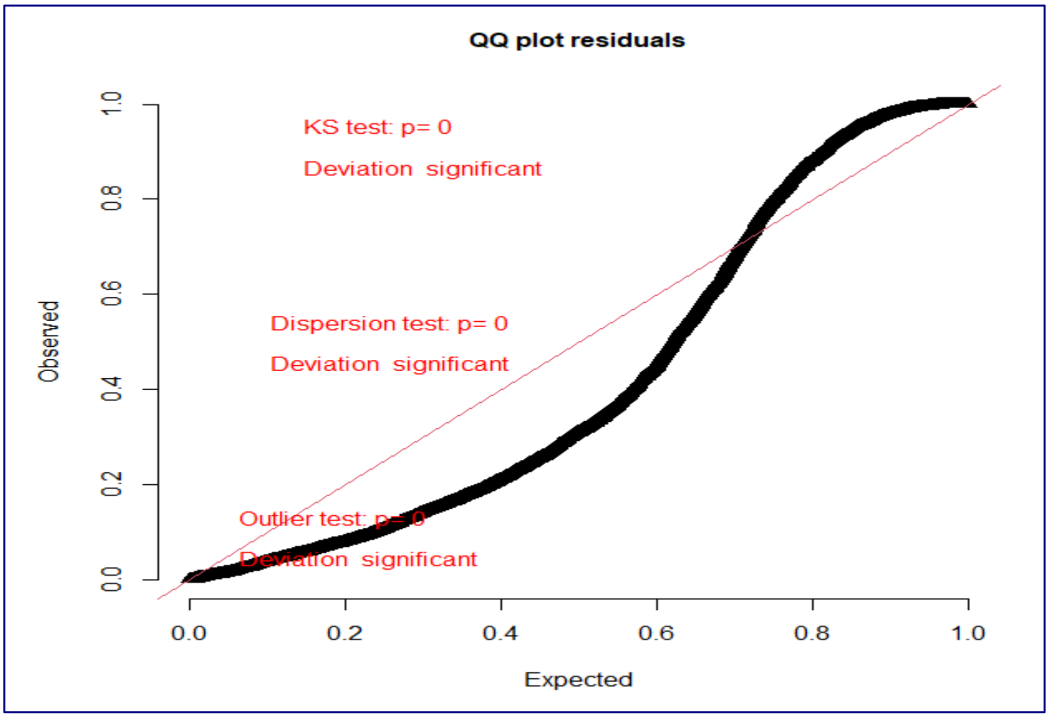

Figure 3 – Overdispersion test

Source: own processing

Thus, we check the validity of the estimates reported by Model 7 using a ZIP regression.

Table 2

ZIP regression estimates

Variables	Coefficients	P-values
Size	-0.1202	0.0000
Indebtedness	0.5683	0.0000
Profitability	-0.8258	0.0000
Liquidity	-0.0004	0.9410
R&D expenditures	-0.0030	0.5111

CEO structure	0.6371	0.0000
Intercept	2.4540	0.000
AIC	19237	

Source: own calculation

The results reported in Table 2 indicate that all the coefficients remain stable, except for R&D expenditures. However, the standard Poisson regression, which does not account for overdispersion, is overestimating their impact. Indeed, if the size of the firm increases with 1 unit, the number of years when the firm choose not to pay dividend decreases on average with $1-e^{-0.1202}$=11.33%. In terms of AIC, the ZIP regression is superior to standard Poisson regression.

Conclusions

In this paper, we extract from ORBIS Bureau van Dijk database a sample of 4815 companies operating in various sectors of activity in EU countries to study the firm-related factors influencing the frequency of dividend payments. The Poisson regression coefficients indicate that the frequency of dividends payouts is influenced by the size of the firm, its profitability, indebtness, and ownership structure. Additionally, we find inconclusive results relating the frequency of the dividend payouts to the liquidity of the firm. When accounting for overdispersion problems via a ZIP regression, the coefficients remain stable as sing and statistical significance, but their impact is diminished. The conclusions of the paper might be interesting for traders when shaping their strategies on stock exchanges in order to maxime their profitability on longer time horizons.

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