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Self-Selection Models in Determination of Target Dividend Payout Ratio of Real Estate Domestic Companies Quoted on the Warsaw Stock Exchange

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Abstract

Real estate companies listed on the Warsaw Stock Exchange in recent years have changed their policy to pro-dividend and more and more often make decisions to pay increasing dividends. Hence a question arises about the target dividend payout ratio of these companies. In the article the Heckman model was proposed for estimating the target dividend payout ratio. It derives from the self-selection concept, which consists of two equations: probit equation of propensity to pay dividend and Lintner's partial adjustment equation. The conducted research has shown that Heckman's self-selection model proved to be a very good tool for analyzing dividend decisions not only because of formal properties ensuring the consistency of the parameters estimator but also because of an accurate description of the decision process, which is of a two-step nature (decision on payment — determining the payout level). This led to the conclusion that more willing to pay dividends for a given year were real estate domestic companies, which paid dividends for the previous year (sticky dividend effect) and were more profitable and that the relation between the market value to book value of assets ratio (Tobin's q *ratio), and the propensity to pay dividends has an inverted* U *shape. The calculated target dividend payout ratio was 66,7% and the calculated speed of adjustment* $\alpha = 0{,}626$ *indicates relatively slow reaching of the target.*

Keywords: real estate domestic companies, Warsaw Stock Exchange, self-selection model, propensity to pay dividends, target dividend payout ratio

JEL: C35, C58, G35, R3

> "Yet dividends remain one of the most contested and thorniest puzzles in corporate finance"
>
> Allen, Bernardo, and Welch (2000)

Introduction

Real estate companies in developed capital markets are associated with large and systematic payments of dividends, which results from special legal solutions[1] releasing these companies from corporate income tax and allowing them to avoid double taxation in exchange for the payment of significant (usually over 85% of net profit) dividends. The introduction of such solutions resulted from the specificity of the real estate market (low liquidity, low price elasticity of demand and

1. For example, in the US, these solutions were first introduced in 1960 using the REIT Act, in the Netherlands in 1969, in Belgium in 1995, in Germany and the United Kingdom in 2007. Currently, REITs operate in 40 countries around the world (Mizerski 2016, 142, 213–215).

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supply, high unit value of transactions and a large scale of commitment of funds that are frozen for many years) and the entities involved. This allowed the dynamic development of real estate companies in many countries, as well as the increase in their importance on the capital markets. There are no similar solutions in Poland, although in recent years there has been a discussion on the introduction of mechanisms enabling the functioning of Real Estate Investment Trusts (Mizerski 2016, 11–313 passim). The real estate companies listed on the Warsaw Stock Exchange (WSE) are not awaiting the introduction of appropriate regulations and in recent years have been changing their policies towards a pro-dividend trend, increasingly making decisions to pay bigger and bigger dividends. Hence a question arises about the target dividend payout ratio of real estate domestic companies quoted on the WSE.

For more than sixty years, Lintner's partial adjustment model has been the best tool for determining the target dividend payout ratio (Lintner 1956). As observed in the developed financial markets, as well as on the WSE, only some companies pay dividends. As a consequence, a dividend is observed only when the company decides to pay it (self-selection). Firms self-selecting is not a random process. Hence, the usual OLS/GLS estimators applied to the Lintner model are no longer consistent (Kai and Prabhala 2007, 42). This is the so-called self-selection problem, whose solution was proposed by, the laureate of the Nobel Memorial Prize in Economic Sciences, James J. Heckman. To this end, Heckman (1976) applied a model with two equations, where the first one describes the process of selecting objects (in our case companies paying dividends) and the other describes the development of the studied phenomenon (in our case, the dividend).

The aim of the work is to attempt to estimate the Lintner model using the Heckman self-selection method and, on this basis, determine the target dividend payout ratio of real estate domestic companies quoted on the WSE.

1 Literature review

Dividend decisions researches already has over 60 years of tradition. In 1956, Lintner proposed a partial adjustment model in which the value of the dividend for year t depends on the profit in year t and the dividend for the year $t-1$. This model, modified[2] (enriched by variables controlling the economic and financial situation of the company and the economic situation of the economy in which the company operates) and estimated using better and better methods, has become one of the most frequently used tools for analyzing the level of payments (Kowerski and Wypych 2016, 182).

Research on the factors determining the decision on whether or not to pay dividends was initiated by Fama and French (2001), who proposed logit models to assess propensity to pay dividends. As determinants of decisions on dividend payments, they adopted profitability measured with ROA, investment opportunities measured by the market value of assets to their book value and assets growth rate, as well as the size of the company measured by the percentage of companies listed on the NYSE with less or equal capitalization than the capitalization of the given company. The estimates for the US market showed that more profitable and larger companies, yet with smaller investment opportunities, were more willing to pay dividends. The next authors increased the set of variables adopted by Fama and French. DeAngelo, DeAngelo, and Stulz (2006) verified the hypothesis for the US markets of the positive influence of the company's maturity measured by retained earnings as a proportion of total equity and of total assets and the ratio of dividend stickiness measured by the values of the discrete variable describing the payment of dividends for the year $t-1$ on the propensity to pay dividends. The hypothesis about the positive influence of the company's maturity measured by the number of years of listing on the New York Stock Exchange on the propensity to pay dividends was confirmed by Salas and Chahyadi (2006).

The hypothesis expressed by Rozeff (1982, 249) of the negative impact of financial leverage on the dividend tendency has been confirmed quite often, as well as the negative impact of risk measured by the standard deviation of monthly share price returns over the last year (Booth and Zhou 2008), or the beta factor.

2. An example may be the proposition of Ha, Im, and Kang (2017) — a generalized partial adjustment model of dividends in which managers set target dividends based on adaptively-formed earnings prospects.

The influence of ownership structures was also analyzed, both on dividend payment decisions — Kuhlmann and Rojahn (2017) for Germany — as well as on the level of payments — e.g., Renneboog and Trojanowski (2004) for UK, and Kowerski and Wypych (2016) for Poland. But the research did not give an unambiguous answer to the question about the direction and strength of dependence between the ownership structure and dividend strategies. The dependencies discovered on the New York stocks were usually similar for other developed capital markets — e.g., Denis and Osobov (2008) for France, Japan, Canada, Germany, and UK; and von Eije and Megginson (2008) for 15 countries of the so-called "old European Union," as well as developing markets — e.g., Al-Malkawi (2008) for Jordan; Fairchild, Guney, and Thanatawee (2014) for Thailand; Mehdi, Sahut, and Teulon (2017) for East Asian countries (i.e., Malaysia, Thailand, Taiwan, and Indonesia) and for GCC countries (i.e., Bahrain, Saudi Arabia, Kuwait, and Oman). In recent years, it has become more and more common to estimate models of factors determining dividend decisions based on panels of companies from many countries around the world — Jacob and Jacob (2013) for 25 countries in 1990–2008 period, Ijaz (2013) for 21 European countries, Hail, Tahoun, and Wang (2014) for 49 countries in the years 1993–2008, He et al. (2017) for 29 countries in the years 1990–2010. Also, in these cases determinants found in developed markets in the first decade of the 21st century proved to be important.

In Poland pooled cross sectional probit models of decisions on dividend payments by a balanced panel of 110 non-financial companies listed on the WSE in the years 1998–2004 were built by Kowalewski, Stetsyuk, and Talavera (2007). The main research problem of the authors was the assessment of the impact of corporate governance, especially the rights of minority shareholders, on dividend payment decisions. Apart from commonly used control variables (profitability, investment opportunities, company size and its maturity, financial leverage and the stickiness of dividend decisions) they considered a number of variables describing the degree of control of the company by minority shareholders. To this end, they constructed a Transparency Disclosure Index (TDI) that measures shareholder rights. Companies paying dividends have proven to be more profitable, larger, more mature and with lower financial leverage than companies that do not pay dividends. However, no substantial differences were found between companies paying dividends and not paying them in the case of their investment opportunities. Both the average value of the TDI index and its components calculated for companies paying dividends is significantly higher than for companies that do not pay dividends, and the level of significance does not exceed 0,005.[3]

Kowerski (2011), based on a logit model built on an unbalanced panel of companies listed on the WSE between 1995–2009 (2263 observations), identified 10 important factors determining the decisions to pay dividends. This model comprises most variables considered in different research analyses as significant factors of dividend decisions on the developed capital markets:

- variable describing companies' dividend decisions for the year $t-1$ which is the measure of the stickiness of dividend introduced by Lintner
- variables proposed by Fama and French (2001): profitability measured by return on equity in the year $t-1$, size of the company measured with natural logarithm of total assets in fixed prices at the end of year $t-1$, as well as investment opportunities measured by the ratio of market value to equity at the end of year $t-1$
- measure of company maturity as the ratio of share capital to equity at the end of year $t-1$, proposed by Raaballe and Hedensted (2008)
- measure of financial leverage as the ratio of equity to total assets at the end of year $t-1$, proposed by DeAngelo, DeAngelo, and Stulz (2006)
- risk measured by prices variability coefficients of the companies' share prices in the year $t-1$
- discrete (0–1) variable defining the belonging of a given company to a banking sector in the year t
- tax preference ratio for dividends in the year t

Signs of estimated parameters are consistent with those estimated for the companies listed on the developed capital markets. In the years 1996–2009 companies which had been more profitable,

3. [In the journal European practice of number notation is followed — for example, 36 333,33 (European style) = 36 333.33 (Canadian style) = 36,333.33 (US and British style). — Ed.]

larger, more mature, with lower investment opportunities and financial leverage, and characterized by lower risk associated with investing in their shares in the previous year were more prone to decide to pay dividends. Banks were more prone to pay dividends than other companies. Companies were more prone to pay out dividends in periods of a more profitable dividend tax policy.

The impact of the majority of factors identified by Kowerski is of a lasting character, which is confirmed by the results of research conducted by Kaźmierska-Jóźwiak (2016), who analyzed the propensity to pay dividends of non-financial companies listed on the WSE for the 2008–2014 period (1 202 observations). A significant positive impact on the propensity to pay dividends was noted for the size of the company measured by the value of total assets and profitability measured by ROA, while a significant negative impact was observed for the investment opportunities measured by total assets dynamics index, the risk factor measured by the beta coefficient and leverage measured by the debt rate. Kowerski (2013) also made a more detailed analysis of the impact of investment opportunities — measured by the market value to the book value of assets (Tobin's q ratio) — on the propensity to pay dividends and showed that this relation has the shape of an inverted U. The low propensity to pay dividends is characteristic not only for companies with very high investment opportunities but also for companies with very low investment opportunities, while large and mature companies with intermediate q-values are characterized by high propensity to pay dividends.

The research on dividend decisions was most often carried out for all non-financial companies, slightly less frequently for banks, but rarely for other sectors. In the case of Poland, Gostkowska-Drzewicka (2016), using the methods of descriptive statistics analyzed the dividend decisions of real estate companies listed on the WSE in the years 2007–2013.

The research presented above treated the decisions on dividend payment and decisions on the level of payment separately. An attempt to jointly analyze both decisions made by WSE-listed companies in the years 1995–2009, using Heckman models, was undertaken by Kowerski (2012). A similar approach to the analysis of companies listed on two Vietnamese stock exchanges in 2006–2011 (2 131 non-financial observations) was performed by Alphonse and Tran (2014).

2 Data and methodology

2.1 Data

The first real estate company — ECHO — debuted on the WSE on 5 March 1995. The next company — GTC — had to wait 9 years for listing. In 2007, eight companies appeared with six that became real estate companies as a result of the sector change. In total, as a result of the changes of the sector, twelve companies became real estate companies in the course of their WSE listing. Starting in 2010, the number of companies was systematically growing (by 3–4 companies per year). In the years 2015–2016, two companies — GANT and ALTERCO — were excluded. Thus, the number of real estate domestic companies ever quoted on the Warsaw Stock Exchange was 39, with 37 at the end of 2017. Share of real estate domestic companies in all domestic companies quoted on the WSE increased from 1,5% in 1995 to 3,4% in 2007, and 8,6% in the end of 2017. Real estate companies listed on the WSE were active in the field of property sales (subsector 141) — 23 companies, property rental (subsector 142) — 14 companies and other (subsector 149) — 2 companies.

In the first stage, the research covered all 39 companies, which allowed a study of the propensity to pay dividends and the value of paid dividends of the entire real estate sector at the WSE. The companies that were listed on the stock exchange in 2006–2017 for at least two years, in periods when equity was positive were used to model the decision on dividend payments. After analyzing the economic and financial indicators of the examined companies, PLATYNINW was removed due to outlier values of profitability and Tobin's q ratio. As a result, an unbalanced panel consisting of 28 companies and 162 observations was obtained, 50 of which concerned dividend payers (30,9%).

The sources for data were: companies Annual General Meeting resolutions, balance sheets and income statements, and WSE.[4] The micro-level data was then merged with data on the macroeco-

4. As published by Bankier.pl at https://www.bankier.pl/gielda/notowania/akcje.

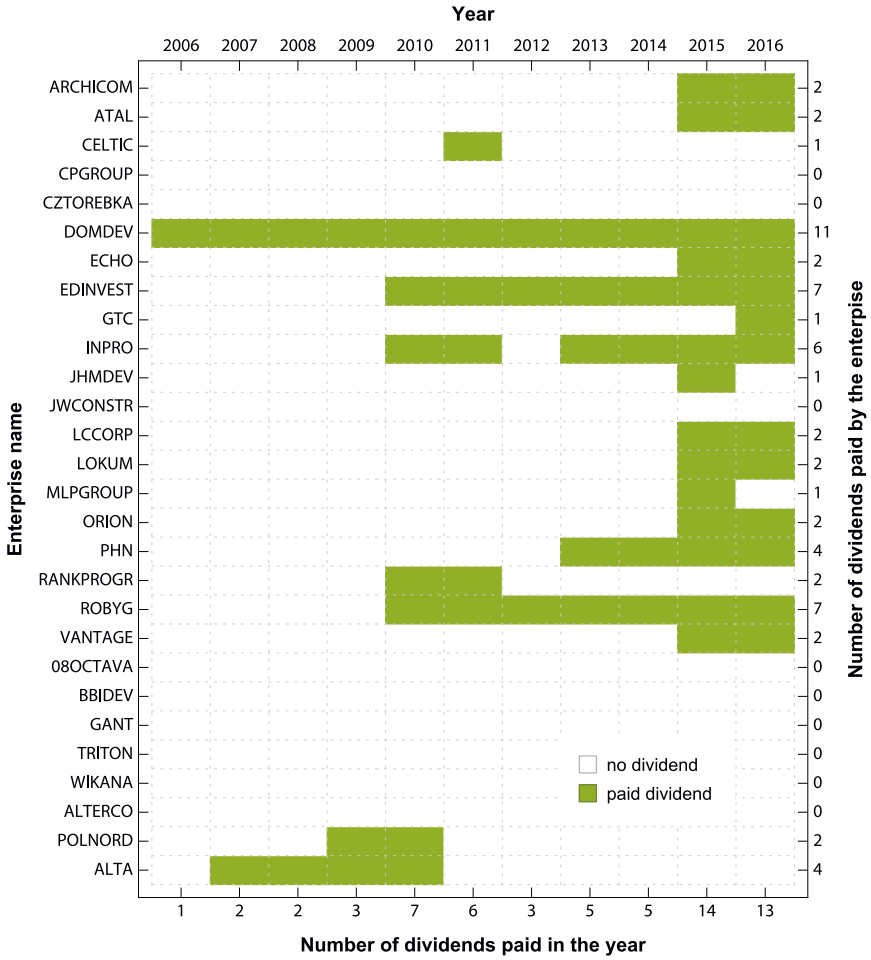

Fig. 1. Graphical representation of data used for modelling

nomic level: the growth of GDP and the rate of inflation in Poland, which came from the Central Statistical Office of Poland publications.

2.2 Model Specification

To determine the target dividend payout ratio of real estate domestic companies quoted on the WSE, Lintner's partial adjustment model was used:

$$D_{it} = \alpha_0 + \alpha_1 D_{it-1} + \alpha_2 P_{it} + \varepsilon_{it}, \tag{1}$$

where:

D_{it} — dividend paid by the i-th company for the fiscal year t in relation to the assets in the end of the year t,

D_{it-1} — dividend paid by the i-th company for the fiscal year $t-1$ in relation to the assets in the end of the year $t-1$,

P_{it} — profit for the fiscal year t in relation to the assets in the end of the year t of the i-th company,

ε_{it} — random disturbances,

$i = 1, 2, ..., n$ — number of analyzed companies,

$t = 1, 2, ..., T$ — number of years under studies.

Equation (1) allows for calculating target dividend payout ratio

$$\tau = \frac{\alpha_2}{1 - \alpha_1} \tag{2}$$

and speed of adjustment

$$\alpha = 1 - \alpha_1. \tag{3}$$

Only a fraction of the real estate companies quoted on the WSE pay dividends. The decision of whether or not to pay dividends is not random, but rather determined by a number of micro- and macroeconomic factors. This makes the usual OLS/GLS estimators applied to the Lintner model no longer consistent (Kai and Prabhala 2007, 8). This is called a self-selection problem, the solution of which was proposed by Heckman. To this end, Heckman (1976) used a two-equation model.

The first equation (participation) describes the process of selecting objects, in our case companies paying dividends:

$$Y_{it}^{*} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \cdots + \beta_k X_{kit} + \mu_{it}, \tag{4}$$

where:

Y_{it}^{*} — dependent variable represents unobservable propensity to pay dividend by i-th company for the year t,

X_{jit} — value of j-th independent variable for i-th company in the year t,

μ_{it} — random disturbances,

$j = 1, 2, ..., k$ — number of independent variables.

Each company is characterized by a propensity to pay dividends, however they will pay dividends only when the propensity is strong enough to exceed a threshold level C, according to formula:

$$Y_{it} = \begin{cases} 1, & \text{when } Y_{it}^{*} \geq C = 0 \\ 0, & \text{when } Y_{it}^{*} < C = 0 \end{cases}, \tag{5}$$

where Y_{it} is an observable nominal variable for which we can assume that if it exceeds a threshold, the company will pay (it will not otherwise) (Maddala 2006, 371–372). Y_{it} assuming the values of 1 if i-th company pays the dividend, or 0 otherwise. Hence, to test the relations between Y_{it} and the set of selected independent variables, we used a binomial probit regression model having the following specification:

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \cdots + \beta_k X_{kit} + \mu_{it}. \tag{6}$$

The estimated probit model provides a calculation of probability of paying dividends, which can be used as a proxy of the propensity to pay dividends by i-th company.

The second equation is outcome equation, which in our case is the Lintner's partial adjustment model (1).

2.3 Model estimation

In self-selection models, the central issue is that unobserved attributes that lead firms to self-select could explain variation in outcomes (Kai and Prabhala 2007, 24). In the estimation process of the two-equation Heckman model, the assumption is that the random elements ε and μ have a normal distribution. Because of this, it is possible to calculate the expected value of the variable explained outcome equation under the condition of selection (Owczarczuk 2010, 206). When ε and μ have standardized normal distributions, the correlation coefficient of random components ρ can be calculated. If it turns out to be statistically insignificant, then random components ε and μ are uncorrelated, so there is no problem of selection and outcome equation can be estimated using the OLS method. The greater the correlation of both random components, the stronger the impact of self-selection and OLS ceases to be the correct estimation method. The LR test based on chi-square statistics is used to measure the significance of correlation of random disturbances (i.e., correlation of both equations). To estimate the structural parameters of the above model, Heckman proposed a two-stage method. Currently, the parameters of the self-selection model are estimated using the maximum likelihood method.

2.4 Variable selection for participation equation

When choosing independent variables for participation equation (propensity to pay dividends), the results of previous research, carried out especially on developed capital markets, were mainly used. To select the variables in the participation model, a backward stepwise method was used.

The following set of potential independent variables has been specified:

- company profitability:
  ROA_t — return on assets (net profit in the year t to total assets in end of the year t)
  ROE_t — return on equity (net profit in the year t to equity in end of the year t)
- company size:
  $Size1_t$ — natural logarithm of assets in the end of the year t (constant prices of 2017)[5]
  $Size2_t$ — natural logarithm of equities in the end of the year t (constant prices of 2017)
- company investment opportunities:
  $InvOp1_t$ — market value to book value (Tobin q) in the end of the year t
  $InvOp2_t$ — market capitalization to equities in the end of the year t
  $InvOp1_t^2$ — square of $InvOp1_t$
  $InvOp2_t^2$ — square of $InvOp2_t$
- company leverage:
  Lev_t — debt ratio — debt to total assets in the end of the year t
- risk of investment in company's shares:
  $Risk1_t$ — [(max price of share in the year t) − (min price of share in the year t)] / (max price in the year t)
  $Risk2_t$ — [(max price of share in the year t) − (price of share in the end of the year t)] / (max price in the year t)
- company maturity:
  Mat_t — number of quoted years in the end of the year t
- company subsector:
  Sub_t — binary variable: 0 if company belongs to subsector 142, 1 if company belongs to subsector 143 or subsector 149
  $Change_t$ — binary variable: 0 if company changed sector into real estate, 1 if company belonged to real estate sector from the first year of being listed on the WSE
- time:
  Time — natural numbers for consecutive years: 1 for 2006, 2 for 2007, ..., 11 for 2017

3 Results

3.1 Dividends paid by real estate companies on the WSE

The first domestic real estate companies on the WSE that paid dividends were DOMDEV and ALTA, and it was in 2007.[6] In the years 2007–2017, real estate domestic companies made 63 payments of dividends (4,4% of all payments made by domestic companies quoted on the WSE) with an overall amount in constant prices of 2017 PLN 4 435,6 million (2,4% of all dividends paid by domestic companies quoted on the WSE). However, a significant increase in both the number and the amount of payments in the last two years can be observed. In the years 2016–2017 real estate companies paid dividends, which make 82,2% of all dividends paid in the analyzed period. The main reason for this increase was a very large payment made in 2016 by ECHO — PLN 2 220,6 million (50,1% of all dividends paid by real estate companies). Although this payment had a decisive impact on the entire sector's result, there was also an increase in payments by other companies. In 2016, the share of companies paying dividends in the total number of real estate companies amounted to 45,2% and was higher than the average for the entire stock exchange (40,6%). In 2017, it dropped to 37,8% (the entire stock exchange to 41,2%), but confirmed that the high propensity to pay dividends continued. Share of the number of real estate companies paying dividends in all of the quoted on the WSE companies paying dividends rose from 2,9% in 2015 to 8,0% in 2016. In 2017 it was 7,9%. In 2011, real estate companies paying dividends for the first time used their retained earnings and apart from 2015, they paid not only part of their net profits for the last fiscal year

5. Constant prices were calculated with the yearly Polish consumer price index (CPI).

6. Gostkowska-Drzewicka (2016, 68) states that POLNORD paid out the first dividend in 2000, but from our data it appears that POLNORD at that time belonged to the construction sector and it changed sector in 2007.

Tab. 1. Dividend policy of real estate domestic companies quoted on WSE in the years 2007–2017

	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2007–2017**
Number of real estate companies in the end of the year	11	12	12	18	20	22	26	26	28	31	37	*243*
Share of the number of real estate companies in all domestic companies quated on WSE in the end of the year (%)	3,4	3,4	3,4	4,8	5,2	5,6	6,5	6,2	6,5	7,1	8,6	*5,6*
Capitalization of real estate companies in the end of the year (current prices, PLN million)	2 689,9	600,5	1 180,1	1 876,4	1 878,0	1 958,2	1 872,0	3 041,6	3 174,8	9 153,7	14 580,7	n/a
Share of the capitalization of real estate companies in capitalization of all domestic companies quated on WSE in the end of the year (%)	0,8	0,3	0,7	0,5	0,6	0,6	0,4	0,6	1,0	2,5	3,4	n/a
Number of real state estate companies paid dividends	2	2	2	3	7	6	3	5	5	14	14	*63*
Share of the number of real estate companies paid dividends in all real estates companies (%)	18,2	16,7	16,7	16,7	35,0	27,3	11,5	19,2	17,9	45,2	37,8	*25,9*
Share of the number of companies quated on WSE paid dividends in all quated domestic companies in the end of year (%)	24,7	27,2	25,1	23,9	30,2	34,4	34,0	36,7	40,0	40,6	41,2	*33,1*
Share of the number of real estate companies paid dividends in all domestic companies quated on WSE paid dividends (%)	2,5	2,1	2,2	3,4	6,0	4,4	2,2	3,2	2,9	8,0	7,9	*4,4*
Sum of net profits and losses of real estate companies in the last fiscal year (constatnt prices of 2017, PLN million)	151,3	311,0	168,7	159,4	156,7	−93,7	111,4	199,6	222,5	3 337,6	1482,3	*6 206,7*
Sum of profits for distribution of real estate companies (constant prices of 2017, PLN million)	151,3	311,0	168,7	159,4	163,2	200,7	114,9	200,7	222,5	3 463,9	1790,2	*6 946,4*
Dividend paid by real estate companies (constant prices of 2017, PLN million)	6,8	61,9	23,0	43,4	73,2	133,3	113,0	181,1	154,2	2 575,3	1070,4	*4 435,6*
Share of the dividends paid by real estate companies in dividends paid by all domestic companies quated on WSE companies (%)	0,0	0,5	0,3	0,4	0,4	0,6	0,6	0,8	0,9	15,6	7,2	*2,4*
Relation of dividend to sum of net profits and losses in last fiscal year (%):												
• real estate companies paid dividends	4,5	19,9	13,6	27,2	46,7	n/a	101,4	90,7	69,3	77,2	72,2	*71,5*
• all companies paid dividends	72,6	54,8	69,9	52,7	67,3	57,8	60,8	64,8	74,0	81,2	68,1	*64,7*
Dividend payout ratio (%):												
• real estate companies paid dividends	4,5	19,9	13,6	27,2	44,9	66,4	98,4	90,2	69,3	74,3	59,8	*63,9*
• all companies paid dividends	67,8	49,4	60,5	51,8	63,2	56,0	58,0	63,3	58,5	65,9	51,5	*58,5*
Dividend yield (%):												
• real estate companies paid dividends	0,2	8,8	1,7	2,1	3,7	6,7	6,0	5,9	4,8	27,6	7,3	n/a
• all companies paid dividends	3,6	5,7	4,2	3,1	5,5	6,4	4,3	4,4	5,0	4,4	3,5	n/a

Tab. 2. Propensity to pay dividend by domestic real estate companies quoted on WSE

Company name	Year of enter to WSE as real estate company	Subsector	Company changed the sector	Number of paid dividends until 2017	Number of possible dividends until 2017	Propensity to pay dividend until 2017	Sum of net profits and losses in the last fiscal year (constatnt prices of 2017, PLN million) [c]	Profits for distribution (constatnt prices of 2017, PLN million) [c]	Dividend (constatnt prices of 2017, PLN million)	Relation of dividend to last fiscal year profit (%)	Dividend payout ratio (%)
DOMDEV	2006	141	no	11	11	100,0	1 201,9	1 202,1	578,1	48,1	48,1
EDINVEST	2010	141	no	7	7	100,0	35,3	35,3	9,9	28,1	28,1
ROBYG	2010	142	no	7	7	100,0	242,5	261,5	246,4	101,6	94,2
PHN	2013	142	no	4	4	100,0	288,1	289,0	194,2	67,4	67,2
ARCHICOM	2016	141	no	2	2	100,0	50,2	50,2	40,3	80,3	80,3
ATAL	2015	141	no	2	2	100,0	167,6	167,6	89,2	53,2	53,2
LOKUM	2015	141	no	2	2	100,0	−4,7	25,4	25,4	n/a	100,0
ORION	2015	141	no	2	2	100,0	10,7	10,7	3,8	35,2	35,2
I2DEV	2016	141	no	1	1	100,0	37,0	37,0	18,4	49,8	49,8
INPRO	2011	141	no	6	7	85,7	113,0	113,0	46,5	41,2	41,2
ALTA	2007	141	yes	5	11	45,5	76,6	76,6	8,4	11,0	11,0
VANTAGE	2012	141	no	2	5	40,0	12,2	19,7	19,7	161,8	100,0
RANKPROGR	2010	142	no	2	7	28,6	52,3	62,6	62,6	119,6	100,0
MLPGROUP	2013	142	no	1	4	25,0	6,9	42,5	42,5	612,5	100,0
LCCORP	2007	141	no	2	10	20,0	48,7	113,6	113,6	233,4	100,0
POLNORD	2007	141	yes	2	10	20,0	109,0	109,0	29,0	26,6	26,6
JHMDEV	2011	141	no	1	6	16,7	3,1	3,1	2,1	68,2	68,2
CELTIC	2010	142	no	1	7	14,3	−280,9	3,5	3,5	−1,2	100,0
ECHO	1995	142	no	2	22	9,1	3 296,2	3 583,0	2 777,7	84,3	77,5
GTC	2004	142	no	1	13	7,7	741,0	741,0	124,3	16,8	16,8
08OCTAVA	2007	141	yes	0	10	0,0	n/a	n/a	n/a	n/a	n/a
BBIDEV	2007	141	yes	0	10	0,0	n/a	n/a	n/a	n/a	n/a
JWCONSTR	2007	141	no	0	10	0,0	n/a	n/a	n/a	n/a	n/a
TRITON	2007	141	yes	0	10	0,0	n/a	n/a	n/a	n/a	n/a
PLATYNINW	2008	149	no	0	9	0,0	n/a	n/a	n/a	n/a	n/a
GANT [a]	2007	141	yes	0	7	0,0	n/a	n/a	n/a	n/a	n/a
WIKANA	2010	141	yes	0	7	0,0	n/a	n/a	n/a	n/a	n/a
ALTERCO [b]	2010	141	yes	0	5	0,0	n/a	n/a	n/a	n/a	n/a
CZTOREBKA	2012	142	no	0	5	0,0	n/a	n/a	n/a	n/a	n/a
CPGROUP	2013	142	no	0	4	0,0	n/a	n/a	n/a	n/a	n/a
IBSM	2013	141	no	0	4	0,0	n/a	n/a	n/a	n/a	n/a
BIK	2016	142	no	0	1	0,0	n/a	n/a	n/a	n/a	n/a
SOHODEV	2016	141	yes	0	1	0,0	n/a	n/a	n/a	n/a	n/a
CCENERGY	2017	149	yes	0	0	n/a	n/a	n/a	n/a	n/a	n/a
ELKOP	2017	142	yes	0	0	n/a	n/a	n/a	n/a	n/a	n/a
GPRE	2017	142	no	0	0	n/a	n/a	n/a	n/a	n/a	n/a
IDEON	2017	142	yes	0	0	n/a	n/a	n/a	n/a	n/a	n/a
MAVRIPOL	2017	142	no	0	0	n/a	n/a	n/a	n/a	n/a	n/a
TOWERINVT	2017	141	no	0	0	n/a	n/a	n/a	n/a	n/a	n/a

[a] Company excluded from WSE in 2015; [b] Company excluded from WSE in 2016

[c] Only for years when company paid dividend

but also profits accumulated on their supplementary and reserve capitals. This means that in the analyzed period the relation of dividend to sum of net profits and losses in last fiscal year for real estate companies (71,5%) was higher than this ratio for all companies (64,7%). The situation with the dividend payout ratio was similar (63,9% and 58,5% respectively). The above data show an increase in real estate companies activity in the field of dividend payments in recent years (tab. 1).

3.2 Propensity to pay dividends by the domestic real estate companies quoted on the WSE

Propensity to pay dividends, calculated for nine real estate domestic companies, which is the ratio of the number of payouts realized to the total number of possible payouts,[7] was 100%, which means that these companies always paid dividends. DOMDEV paid the dividend for the longest term (11 years), EDINVEST and ROBYG continued to pay for seven years. The propensity to pay dividends calculated for all analyzed real estate companies amounted to 28,3% in 2017, but was 5 percentage points lower than the propensity to pay of the all domestic companies quoted on the WSE. At the same time, there was a large difference between the propensity to pay dividends by companies that were listed in the real estate sector from IPO (36,8%) and companies that changed their sector to the real estate sector (9,9%). By far the largest payer was ECHO, which in 2016–2017 paid dividends of PLN 2 777,7 million in 2017 prices (62,2% of all payments). The second one in the order, DOMDEV, paid out PLN 578 million (13,0%) over 11 years (tab. 2).

3.3 Results of estimation of Heckman model

Mann-Whitney U test (Wackerly, Mendenhall, and Scheaffer 2008, 758–762)[8] confirms significant differences[9] between payers and non payers of dividends in the case of: dividend yield (D), profitability (ROA and ROE), investment opportunities (InvOp1 and InvOp2) and risk (Risk1) (tab. 4).

Tab. 3. Descriptive statistics of selected variables

	DA	ROA	ROE	Size1	Size2	InvOp1	InvOp2	LEV	RISK1	RISK2
Minimum	0,00	−0,61	−1,26	10,99	10,47	0,10	0,14	0,17	0,15	0,00
1st quartile	0,00	−0,01	−0,01	12,30	12,05	0,48	0,63	9,11	0,35	0,05
Median	0,00	0,01	0,02	13,43	12,97	0,70	0,82	31,31	0,46	0,11
Average	0,01	0,00	0,00	13,25	12,80	1,02	0,94	32,12	0,49	0,17
3rd quartile	0,01	0,04	0,07	14,22	13,62	1,14	1,08	50,37	0,62	0,25
Maximum	0,41	0,70	0,81	15,71	15,41	7,19	4,11	86,11	0,91	0,58
Standard deviation	0,04	0,14	0,20	1,18	1,13	1,01	0,59	22,45	0,19	0,15
Skewness	7,14	−0,61	−1,73	−0,12	0,01	2,93	2,24	0,18	0,31	0,98
Kurtosis	65,48	13,63	14,98	2,11	2,58	14,04	10,11	2,09	2,31	3,06
Cramer-von Mises[a]	6,98	3,19	2,57	0,33	0,21	2,61	1,39	0,23	0,14	1,05
P-value[b]	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	0,03	< 0,01

[a] Cramér-von Mises test of normality based on order statistics from sample data; see details in (Bagdonavičius, Kruopis, and Nikulin 2011, 77–91)

[b] P-value for Cramér-von Mises test

Tab. 4. Mann-Whitney U test on differences between payers and non payers

	DA	ROA	ROE	Size1	Size2	InvOp1	InvOp2	LEV	RISK1	RISK2
U	5 600	4 391	4 338	3 206	3 271	3 526	3 395	3 108	1 770,5	2 818,5
P-value	< 0,001	< 0,001	< 0,001	0,1405	0,0873	0,0084	0,0308	0,2633	0,0002	0,9451

7. The number of possible payouts is the number of years of listing on the stock exchange, not counting the year of entering the stock exchange, unless the company paid out the dividend in this year. If the company was excluded from the stock market before 30 June, this year is not included in the number of possible payouts, unless the company paid dividend in the first half of the this year (Kowerski 2011, 111).

8. Mann-Whitney U test was used due to violated assumption of normal distribution of the samples data.

9. That is, the distributions of populations I and II have different locations.

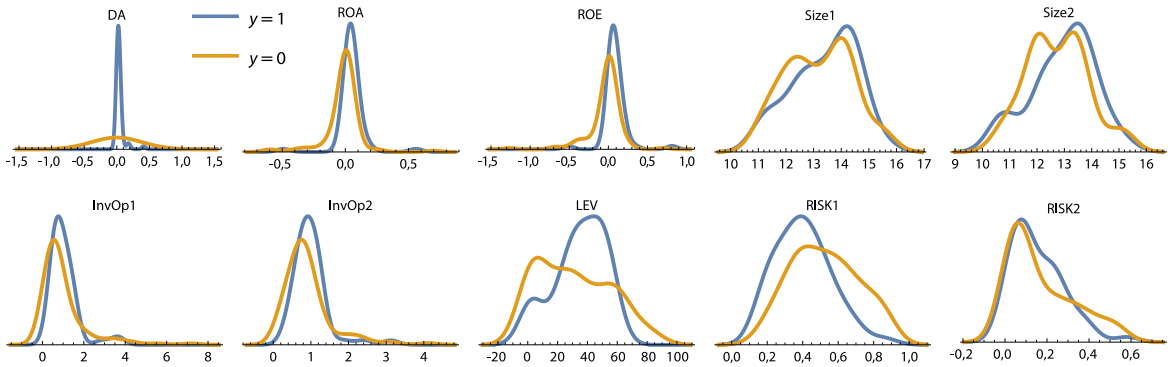

Fig. 2. Probability density function of variables by payers ($y = 1$) and non payers ($y = 0$) of dividends

As a result of using the backward stepwise method, the following was selected as the best set of variables describing the propensity to pay dividends in the probit model:

Y_{it-1} — describing the phenomenon of stickiness of dividends,
ROE_t — return on equity,
Time — describing the changes in time of the propensity to pay dividends, and
$\mathrm{InvOp1}_t$ and $\mathrm{InvOp1}_t^2$ — describing the impact of investment opportunities on the propensity to pay dividends.

Apart from the intercept in outcome equation, the parameters of variables in both models are significant at the level of 0,05. The significance of the inverse of the Mills ratio is noteworthy, which confirms the validity of the two-step Heckman estimation method. In other words, a non-random method of making decisions about paying or not paying dividends had an impact on the dividend level.

Tab. 5. Results of estimation of the two-step Heckman model

Probit participation equation		Outcome (Lintner) equation	
Variable	**Parameter**	**Variable**	**Parameter**
Intercept	$-3{,}358^{***}$	Intercept	$-0{,}006$
Y_{t-1}	$2{,}508^{***}$	DA_{t-1}	$0{,}374^{**}$
ROE_t	$1{,}912^{*}$	ROA_t	$0{,}417^{***}$
Time	$0{,}135^{*}$	mills ratio	$0{,}034^{***}$
$\mathrm{InvOp1}_t$	$1{,}473^{*}$	sigma	$0{,}047^{a}$
$\mathrm{InvOp1}_t^2$	$-0{,}341^{*}$	rho	$0{,}726^{a}$
McFadden's likelihood ratio: 0,58		Adjusted R-Squared: 0,52	

$^{*}p < 0{,}05$; $^{**}p < 0{,}01$; $^{***}p < 0{,}001$
^{a}p-values non applicable here

4 Discussion

Heckman's self-selection model proved to be a very good tool for analyzing dividend decisions not only because of the formal properties that ensure the consistency of the parameters estimator but also because of an accurate description of the decision-making process. Decisions on whether to pay the dividend and what the payout amount should be are related. During the Annual General Meeting, the resolution on payment of the dividend also contains information about its level. Of course, if a company does not make a decision to pay a dividend, the dividend level is zero. The estimated participation equation shows that in a given year more likely to pay dividends are real estate domestic companies that are more profitable and that paid dividends in the previous year (sticky dividend effect). Positive value of the parameter on the time variable indicates a growing tendency to pay dividends by the analyzed companies.

Negative, significant value of the parameter on the variable InvOp2_t^2 confirms the hypothesis proposed by Kowerski (2013) on the inverted U relationship between the market value to book value of assets ratio (Tobin's q ratio) and the propensity to pay dividends. Both the theoretical considerations and most empirical research (presented above in the Literature review section) indicate the negative linear relationship between investment opportunities measured with the market to book value of assets ratio and propensity to pay dividends. Therefore, companies with low Tobin's q ratio should be more prone to pay dividends, because they are mature, have gathered a lot of free cash but have no effective investment opportunities. However, there are companies which are in a difficult situation at a particular moment — they sell less than in the previous year, the value of their assets does not grow and sometimes even declines. Investors realize that and evaluate them very poorly, which means that the market to book value of assets ratios are also very low. Such companies, having usually negative financial results, do not pay dividends. It is not because they have a lot of investment opportunities, but quite the opposite — they do not have enough cash to pay. Both companies with very low and very high values of Tobin's q ratio show low propensity to pay dividends, while high propensity characterizes companies with intermediate values of the q ratio, that is those with relatively not high investment opportunities but in a stable situation — large, profitable, and mature companies.

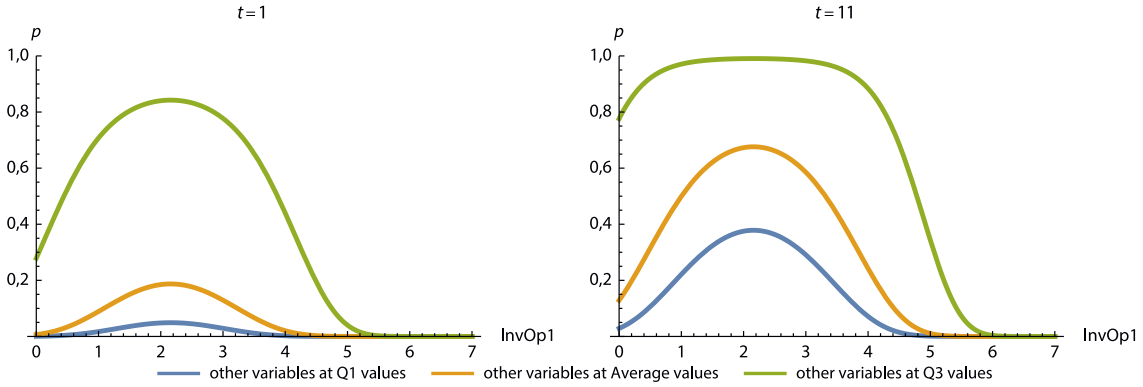

Fig. 3. Inverted U relationship between the market value to book value of assets ratio (Tobin's q ratio) and the propensity to pay dividends (p), if Time variable equals 1 (on the left) or 11 (on the right)

In the case of the analyzed real estate domestic companies, the optimal (ensuring the highest propensity to pay dividends) Tobin's q ratio ($q_{\max}$) equals $-1{,}47 \,/\, [2 \cdot (-0{,}34)] \approx 2{,}16$. Therefore, the tendency to pay dividends increases with Tobin's q increase to 2,16, while after reaching that value it decreases. It should be noted that the value is much higher than the third quartile (1,13), so only a few companies with very large investment opportunities achieve it. This means that the resignation from dividend payments due to the possibility of dynamic development concerns only very few companies. Calculated on the basis of the second equation — Lintner's partial adjustment model — the target dividend payout ratio (τ) equals $-0{,}41 \,/\, (1 - 0{,}37)] \approx 0{,}667$. Ultimately, the analyzed real estate companies intend to pay 66,7% of the net profit from the last fiscal year. Speed of adjustment (α) equals 0,626 and indicates relatively slow reaching of the target dividend payout ratio.

Conclusions

The conducted research allows us to formulate two conclusions. The first, of a practical nature, is that real estate domestic companies will continue the policy of sharing with shareholders more and more of the net profit earned in the last fiscal year. The second is of a methodological nature, referring to the self-selection concept. It seems to be a very good tool for analyzing dividend decisions of public companies. In the article the Heckman model was estimated on pooled data. Attempts to estimate models with the panel data did not bring the expected results, which, according to the authors, is a consequence of a sample which is too small. As the sample grows over time, the authors intend to continue the research using dynamic panel models.

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