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ESTIMATING ACCRUAL-BASED MODELS IN POLAND: THE TIME SERIES DATA APPROACH AND THE CROSS-SECTIONAL DATA APPROACH

The analysis of accruals can be considered as an important tool for examining the level and the patterns of earnings management phenomenon in an enterprise. This paper compares the empirical features of different accrual-based models within industrial public companies listed on the Warsaw Stock Exchange in the period 2002-2017. The conducted research is focused not only on examining the empirical validity of the original Jones model, the modified Jones model and the ROA-matched Jones model. It also submits the alternative regression model used for the detection of earnings management practices, taking into account the following independent variables: operational expenses as a proxy for the current components of non-discretionary accruals, as well as intangible assets as a proxy for the noncurrent components of non-discretionary accruals. Then, the authorexamined the probability of occurrence of small increases in net income or big bath charges in companies reporting specific values of discretionary accruals. The conclusions drawn in this paper are part of practical research concerning the use of informational and decision-making features of accruals analysis in the Polish post-transitional capital market, acting simultaneously as a prerequisite for further research in this field.

Keywords: earnings management, discretionary accruals, Jones model, modified Jones model, ROA-matched Jones model, industrial companies.
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1. INTRODUCTION

Although companies from all over the world can select accounting methods and procedures to make estimations which reflect in the best neutral way their financial position, business practice does not always prove that during the decision-making process for choosing accounting treatments the aspect of faithful representation has been placed at the centre of attention. All of this means that the financial statement does not have to reflect the true financial position of a company and the estimations implemented by managers can be

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primarily aimed at showing the financial standing of enterprise in a better light from the perspective of various stakeholder groups (Healy and Wahlen, 1999; De Fond, 2010).

In finance and accounting literature it is generally emphasized that the analysis of accruals is an important tool for examining the falsification of financial statements of business entities, and also for estimating the scope of the earnings management phenomenon in these units (Healy, 1985; DeAngelo, 1986; Jones, 1991). Researchers dealing with these issues argue that the greater the difference between the net income generated during the financial year and the cash flows from its operations, the lesser the credibility of entity's presentation in its financial statements. This view may be due to the fact that most earnings management practices (EM) are accomplished through a manipulation of accruals, which are subjective and very easy to adjust. What is more, since accrual adjustments are made after year-end, managers know exactly what they want to modify in the financial statement in order to satisfy the participants of financial markets or fulfil some analysts' forecasts. Ultimately, accrual management affects neither cash flows nor company operations, so it can be accomplished without compromising the company's real performance (Zarowin, 2015).

This paper compares the empirical features of different accrual-based models within industrial public companies listed on the Warsaw Stock Exchange (WSE) in the period 2002-2017.The study presents an analysis of the essential methodical measurement of the processes of the intentional stimulation of financial results based on the estimation of operational and discretionary accruals. However, it focused not only on examining the empirical validity of the Jones model, the modified Jones model and the ROA-matched Jones model, but also submits an alternative regression tool used to detect EM practices. Consequently, the research proposes a new approach in extracting discretionary accruals, by taking into account the operating expenses as a variable for current components of non-discretionary accruals, as well as the intangible assets as a proxy for the non-current components of normal accruals. The research considered both the time-series and cross-sectoral dimension, thereby making it possible to examine whether the average values of discretionary accruals in companies implementing EM practices (or not) differ statistically from the perspective of selected branches of industry. Furthermore, the paper underlines the significance of discretionary accruals in the context of detecting various techniques of EM (small net income increases *vs* big bath), whilst maintaining the theses of the great importance of abnormal accruals in assessing the quality of the financial results.

2. THEORETICAL BACKGROUND

2.1. The essence of the earnings management phenomenon

The first occurrence of earnings management behaviour was observed by Hepworth in 1953. He surveyed and documented some of the accounting techniques which would be applied to affect the assignment of net income to consecutive accounting periods (Kighir et al., 2014). Since then, research in the field of earnings management has evolved considerably.

In general, earnings management concerns the ability to use accounting procedures that allow to make a distortion in a company's profitability. However, over the years, researchers have introduced several definitions of earnings management, reflecting different points of view and explaining this phenomenon in distinct paths. Davidson et al. (1987) describe EM as "the process of taking deliberate steps within the constraints of generally accepted accounting principles to bring about a desired level of reported earnings". In turn, according to Schipper (1989), EM can be identified as "disclosure management" in the sense of a purposeful intervention in the external financial reporting process, with the intent of obtaining private gain. Healy and Wahlen (1999) recognize EM as "the manipulation of the companies' financial statements by managers based on their own judgment, with the purpose of confusing users about the company's real economic situation, or to influence contracts that can rely on financial statements". It is noticeable that the citied definitions perceive EM in a relatively negative way. However, Ronen and Yaari (2008), demonstrating a comprehensive approach to the problem of financial reporting manipulation, point out that EM can be interpreted in a beneficial (white), a neutral (grey) or a pernicious (black) perspective. According to these assumptions, a beneficial EM enhances the transparency of reports and takes the form of using flexibility in the choice of accounting treatment to signal the manager's private information on future cash flows. A neutral EM is strictly connected with choosing accounting methods that provide either opportunistic or economic efficiency. Finally, the pernicious interpretation of EM describes it as a practice of using tricks to misrepresent or reduce the transparency of the financial reports. In many cases, it is difficult to unambiguously, without a thorough examination of the circumstances, classify the used EM methods to one of these indicted groups. Irrespective of the ethical assessment of EM such practices result also in a deterioration in the quality of information provided to stakeholders by financial statements (Hanlon et al., 2008). Including in the expectations of stakeholders and the time-changing multiplicity and importance of different EM objectives can be seen as one of the basic factors determining the need to make the financial performance of an enterprise more favourable, both in the forecasting and planning layer, as well as *ex post* evaluation.

It is worth stating that researchers indicate earnings manipulation by comparing two EM strategies: real earnings management (REM) and accrual-based earnings management (AEM). The first one takes the form of manipulating financial statements through real (operational) activities. REM involves management decisions regarding investing and operating strategies (Kothari et al., 2005) that consequently affect company's cash flows. The practical application of REM commonly comes down to the following techniques of earnings upward, namely: deliberately reducing expenses, sales manipulation and overproduction (Roychowdhury, 2006). In turn, AEM is strictly connected with the choice of accounting principles or estimates. While the accounting principles determine the entity's selected and applied solutions permitted by the accounting regulations, ensuring the required quality of financial statements (such as depreciation methods or inventory valuation methods), the estimates relate in particular to periods of economic usability, the residual value of assets and the valuation of benefits for managerial staff.

2.2. Discretionary accruals as a tool for assessing the quality of financial results

The thesis about the occurrence of large significance of accruals in the assessment of the tools and methods of EM practices is widely confirmed in studies on the quality of financial results (Beest et al., 2009; Gaio and Raposo, 2011; Albu et al., 2014; Nogueira, 2019). There is no generally accepted method to measure earnings quality, however, EM is proxied with discretionary accruals (Lizińska and Czapiewski, 2018).

All accruals appearing in the financial statements of companies can be divided into two types. Thus it becomes possible to distinguish the category of normal or expected accruals (referred to as non-discretionary, *NDACC*), which arise from transactions made in the current period and are a result of company performance level, business strategy, industry conventions or economic conditions events, as well as to differentiate the category of abnormal or unexpected accruals (referred also as discretionary, *DACC*), that occur from transactions made or accounting treatments chosen in order to manage earnings (Arkan, 2015). The main aspect of the problem is to identify the discretionary components of total accruals in order to assess the scope and directions of EM activities.

Most theoretical reviewers on the subject matter focus on investigating EM by using differential accrual-based models in various approaches. Until the 1980s, scholars have presented random contending paradigms on EM detection modeling, such as: graphical modeling of specific accruals (Gordon, 1964) or mathematical modelling of accruals (Copeland, 1968). Healy (1985) and DeAngelo (1986) conducted more holistic research, dividing total accruals into two subcomponents (discretionary and non-discretionary accruals). Healy (1985) tested for EM by comparing mean total accruals (scaled by lagged total assets) across the EM partitioning variable. DeAngelo (1986) tested for EM by computing first differences in total accruals, and by assuming that the first differences have an expected value of zero under the null hypothesis of no EM. Finally, Jones (1991) proposed a decomposition of total accruals into the current components and noncurrent components, and used a regression model in which a change in revenue was a proxy for the current components and property, while plant and equipment was a proxy for the noncurrent components. From this point on, there has been a constant development of EM modelling using time-series-data and cross-sectional-data. Following a similar path, afterwards there followed further transformations of the Jones model, such as: the modified Jones model, introduced by Dechow et al. (1995), or other models made by: Kasznik (1999), Kothari et al. (2005), Larcker and Richardson (2004), Yoon et al. (2006), Pae (2011) etc. As stated by McNichols (2000), they may sometimes be biased, because their formulas still include non-discretionary elements other than the result of management's discretion.

2.3. The use of accrual models in research on EM issues in the context of the Polish capital market – selected problems

The presented outline of selected research regarding accrual models in Polish listed companies reflects the diverse and multi-faceted aspects of studies on the processes of intentional influence on the financial result of enterprises. Special attention should be given to Wójtowicz (2010), who examined the scale of EM in the Polish capital market and proved that managers of companies listed on the WSE manage earnings to an extent similar to their foreign counterparts. Specifically, in the cross-section distributions of earnings, unusually low frequencies of small losses were found, as well as unusually high frequencies of small positive income. What is more, he gathered evidence that the use of IFRS in Poland, which formulates the principles-based accounting system, caused EM to grow. However, this phenomenon can be considered as a natural reaction of the managers taking advantage of the wide range of freedoms ensured by IFRS. Brzeszczyński et al. (2011) showed an asymmetric distribution of earnings around the thresholds along with a relative deterioration of earnings in the year following the year in which the company was suspected of conducting EM practices that seemed to provide evidence that this phenomenon exists among the Polish stock market companies. Piosik et al. (2013) tested the impact of applying accounting regulations on the processes of shaping balance sheet results and the quality of the financial statements. These authors made an empirical analysis of the relationship between the implementation of IAS/IFRS and AEM of economic entities, using various econometric models (including the Jones model and its derivative versions, based on cash flows or changes in sales revenue and using leading variables) and in relation to different earnings management techniques (such as income smoothing, big bath charges, small profits etc.). What is more, they also examined the relationship between discretionary accruals and unexpected changes in net income. Piosik (2016) conducted research on the determinants of EM in Poland. In particular, three groups of determinants of financial result shaping processes were analysed. The first were management factors and those related to the ownership structure (changes in management, ownership structure, nature of investors, the participation of managers in ownership). Another group were reporting factors, mainly reflected in the reporting system (application of national and international accounting standards, respectively), audit quality and the preparation of consolidated financial statements. The third group included economic factors related to the size of the enterprise, profitability, the achievements of the industry in which the entity operates, liquidity and changes in net non-monetary current assets. In his research he referred to various analytical formulas of accruals models. Lizińska and Czapiewski (2018) studied the pervasiveness of EM and described its consequences for company short-term market pricing. EM was measured with discretionary accruals proxied with the application of cross sectional accrual models. The empirical research provided evidence that EM practices were also reported for Polish companies around IPO. However, strong differences in aggressive EM among IPO firms were revealed during the subperiods of a stable or bull versus bear market. Researchers proved that EM approximated by discretionary accruals had informative power in explaining first-day IPO returns. A year later the same authors, using among others the Jones model, the modified Jones model or the McNichols model (2000), gathered evidence that investors might not be able to discount pre-IPO abnormal accruals and could be overoptimistic. Once the true EM is revealed over time, the market makes downward price corrections (Lizińska and Czapiewski, 2019). Comporek (2018) examined the relationship between the implemented reserves policy and the value of discretionary accruals reported in the financial statements of public companies listed on the Warsaw Stock Exchange. He proved that a company's reserves and provisions are slightly more correlated with the category of operational accruals than with their intentional counterparts. However, in-depth empirical analysis showed significant fluctuations in the strength and direction of the relationship between these variables, depending on the nature of the business undertaken. Comporek (2019) showed that the inclusion of operating cash flows into the original version of the Jones model (as an exogenous variable explaining the value of the *TACC* coefficient) may significantly increase the prognostic value of the analytical models used to estimate individual sub-categories of accruals.

3. RESEARCH FRAMEWORK

3.1. Methodology of extracting discretionary accruals in accrual models

As mentioned earlier, studies on EM require the extraction of individual categories of accruals, and mean that total accruals include both discretionary components as well as nondiscretionary components. The improper separation of discretionary subcomponents of accruals can lead to improper inferences, so a crucial part of modelling is the evaluation of whether the given model describes the dependent variable sufficiently. In this article the extraction of individual categories of accruals follows the steps shown below (Yoon et al., 2012):

(1) Calculating total accruals by equation:

$$TACC_{i,t} = NI_{i,t} - CFO_{i,t} \tag{1}$$

where: $TACC_{i,t}$ represents total accruals of company i in year t, $NI_{i,t}$ stands for net income of company i in year t and $CFO_{i,t}$ indicates cash flows from operations of company i in year t.

(2) Decomposing total accruals into discretionary and non-discretionary accruals by equation:

$$TACC_{i,t} = NDACC_{i,t} + DACC_{i,t}, \tag{2}$$

assuming at the same time that:

$$NDACC_{i,t} = CACC_{i,t} + NCACC_{i,t}, \tag{3}$$

where: $NDACC_{i,t}$ marks non-discretionary accruals of company i in year t, $DACC_{i,t}$ denotes discretionary accruals of company i in year t, $CACC_{i,t}$

represents current components of non-discretionary accruals of company *i* in year *t* and $NCACC_{i,t}$ denotes non-current components of non-discretionary accruals of company *i* in year *t*.

(3) Deriving a statistical model and standardizing model to control for heteroscedasticity by lagged total assets:

$$\frac{TACC_{i,t}}{TA_{i,t-1}} = \left(\frac{CACC_{i,t}}{TA_{i,t-1}} + \frac{NCACC_{i,t}}{TA_{i,t-1}}\right) + \frac{DACC_{i,t}}{TA_{i,t-1}}, \qquad (4)$$

where: $TA_{i,t-1}$ marks total assets of company *i* in year *t*–1.

(4) Selecting proxy variables – at this stage there occurs the need for selecting the most suitable proxy variables that explains in the best way the values of dependent variable (*TACC*) and generates the best predictions.

The original method for computing total accruals (e.g. in the Jones model and its derivates) refers to the balance sheet approach, that measures accruals as the change in accounts from successive balance sheets and relies on the presumed articulation between changes in working capital balance sheet accounts and the accrual components of revenues and expenses on the income statement (Bešlić et al., 2015), as follows:

$$TACC_{i.t} = (\Delta CA_{i,t} - \Delta CASH_{i,t}) - \left(\Delta CL_{i,t} - \Delta STD_{i,t}\right) - DEP_{i.t}, \qquad (5)$$

where: $\Delta CA_{i,t}$ is the change in current assets in period *t* from period *t*-1 for company *i*; $\Delta CASH_{i,t}$ is the change in cash and cash equivalents in period *t* from period *t*–1 for company *i*; $\Delta CL_{i,t}$ is the change in current liabilities in period *t* from period *t*–1 for company *i*; $\Delta STD_{i,t}$ is the change in short-term debt included in current liabilities in period *t* from period *t*–1 for company *i*; $DEP_{i,t}$ is depreciation and amortization expense in period *t* for company *i*; other designations – as above.

As underlined by Hribar and Collins (2002), the use of the balance sheet approach introduces significant measurement error into accrual estimates because the partitioning variable is often correlated with the occurrence of non-operating events such as reclassifications, acquisitions, divestitures, accounting changes, and foreign currency translations. Thus this paper uses the cash flow approach (direct method) in the measurement of total accruals, broadly consistent with the construction of financial statements pursuant to the Polish Accounting Act.

The Jones model (1991) assumes that non-discretionary accruals are a function of the relationship: of total assets (*TA*), the change in revenues (*ΔREV*) and the depreciation expenses (*PPE*). Similarly, in the modified Jones model (Dechow et al., 1995), the change in cash-accompanying revenue *(*Δ*REV*–Δ*REC*) is considered as a proxy for current accruals arising from changes in the economic environment of the enterprise, while gross property, plant and equipment (*PPE*) controls any changes for non-discretionary accruals related to depreciation expense[1]. In both cases discretionary accruals are the residues of regression models, as underlined in the formulas below:

$$\frac{TACC_{i,t}}{TA_{i,t-1}} = \alpha_1\left(\frac{1}{TA_{i,t-1}}\right) + \alpha_2\left(\frac{\Delta REV_{i,t}}{TA_{i,t-1}}\right) + \alpha_3\left(\frac{PPE_{i,t}}{TA_{i,t-1}}\right) + \varepsilon_{i,t}^{Jones}, \quad (6)$$

$$\frac{TACC_{i,t}}{TA_{i,t-1}} = \alpha_1\left(\frac{1}{TA_{i,t-1}}\right) + \alpha_2\left(\frac{\Delta REV_{i,t} - \Delta REC_{i,t}}{TA_{i,t-1}}\right) + \ldots$$
$$+\alpha_3\left(\frac{PPE_{i,t}}{TA_{i,t-1}}\right) + \varepsilon_{i,t}^{Dechow}, \quad (7)$$

where: $\Delta REV_{i,t}$ indicates a change in revenues in period *t* from period *t*–1 of company *i*; $\Delta REC_{i,t}$ stands for a change of net account receivables in period *t* from period *t*–1 of company *i*; $PPE_{i,t}$ points out gross property, plant and equipment of company *i* in year *t*; a_i, *i* = 0,1, ..., *k* are specific regression parameters while $\varepsilon_{i,t}$ denotes error term in regression model; other designations – as above.

Kothari et al. (2005) presented an estimation procedure for the Jones model which incorporates company performance (ROA) into the estimation of discretionary accruals. In the assumption, this regression model confines the relationship between performance and accruals, which is essentially non-linear, into a linear equation and, as stated by the authors, yields "erratic performance improvement". However, Kothari et al. (2005) proposed ROA matched models to estimate discretionary accruals for samples skewed toward

[1] Dechow et al. (2005) point out that original Jones (1991) model does not include potential managerial manipulation of revenues. For this reason they have entered into the model the cash-accompanying revenue variable *(*Δ*REV*–Δ*REC*) instead of sales revenue variable *(*Δ*REV*) preferred by Jones. Notwithstanding this, the modified Jones model assumes no manipulation of credit sales during the estimation period, so any changes in accounts receivables are adjusted to changes in revenue from sales (Lee and Vetter 2015).

firms with good or poor performance (in order to reduce the frequency of Type I errors). On account of the small sample size, the paper used the approach that tests this model for incomparable sample[2].

$$\frac{TACC_{i,t}}{TA_{i,t-1}} = \alpha_1\left(\frac{1}{TA_{i,t-1}}\right) + \alpha_2\left(\frac{\Delta REV_{i,t}}{TA_{i,t-1}}\right) + \ldots \\ + \alpha_3\left(\frac{PPE_{i,t}}{TA_{i,t-1}}\right) + \alpha_4 ROA_{i,t} + \varepsilon_{i,t}^{ROA-matched}, \quad (8)$$

where: $ROA_{i,t}$ – Return-On-Assets coefficient of company *i* in year *t*; other designations – as above.

With a view to ensuring a good explanatory power in detecting EM practices, this paper contains a proposal of a further development of the ROA-matched Jones model by taking into account new variables, namely intangible assets and operating expenses.

Firstly, in order to more precisely control for any changes in non-discretionary accruals arising from the depreciation charge, a variable describing the level of intangible assets (*INT*) has been included in the model. As Yoon et al. (2012) observed, the significance of intangible assets normatively should increase for the information and knowledge-prone modern business environments. In economic reality, companies seek solutions that help them survive in the market or achieve a better competitive position. This process often involves introducing innovative approaches in different areas of business operations. The costs incurred for innovation in part include intangible assets (the purchase of knowledge from external sources, software acquisition, research and development etc.)[3]. Incidentally, it is worth noting that intangible assets are one of those categories that may be grounds for implementing EM practices. One of the basic problems related to the activation of costs is the determination and settlement of research and development costs. According to international accounting standards (US GAAP, IAS, Polish Accounting Act), all research was period-related and may be disclosed at the time they are incurred. On the other hand, some of the these standards require that development works, after meeting certain conditions, should be presented in the balance sheet on the asset side as intangible assets. However, it is often

[2] This methodological solution was used, among others, by Chen et al. (2006); Jo and Kim (2007); Cohen and Zarowin (2008).

[3] Empirical evidence of relationship between intangible assets and EM was provided by, among others: Koch (1981), Callimacy and Landry (2003), Sevin and Schroeder (2005), Markarian et al. (2008), Korošec et al. (2016).

difficult to find out whether these conditions are met and if they are subjective. In some cases, when the appropriate supporting documents fulfil a specific condition, they can be initially prepared.

The inclusion in the regression model of the operating expenses variable[4] ($\Delta COST$) is motivated by the fact that costs belong to the basic criteria on which decisions regarding the functioning of business entities are made. The analysis of operating expenses (by function) covers primarily the costs associated with the sale of finished goods and services (the sphere of manufacturing activity), the costs of materials sold (the sphere of trading activity) as well as the costs of sales and general and administrative costs (the sphere of functioning an enterprise as a whole)[5]. In the analysis of the techniques used by companies within the framework of EM, operations related to cost manipulation play a special role. The practice of capitalizing costs consists in showing certain categories of costs at the moment they are incurred as assets of the balance sheet, which, as a consequence, enables not to show them in the profit and loss account for the current period. As a result, it becomes possible to defer the date of their recognition as a cost in the profit and loss account for subsequent periods, thanks to their alternative disclosure in the appropriate balance sheet items. In special cases their permanent exclusion outside the circle of costs may occur.

According to the above arguments, after appropriate transformations, the final form of the new model was proposed, as below:

$$\frac{TACC_{i,t}}{TA_{i,t-1}} = \alpha_1\left(\frac{1}{TA_{i,t-1}}\right) + \alpha_2\left(\frac{\Delta REV_{i,t}}{TA_{i,t-1}}\right) + \alpha_3\left(\frac{\Delta COST_{i,t}}{TA_{i,t-1}}\right) + \cdots + \alpha_4\left(\frac{PPE_{i,t} + INT_{i,t}}{TA_{i,t-1}}\right) + \alpha_5 ROA_{i,t} + \varepsilon_{i,t}^{New\ Model}, \tag{9}$$

where: $\Delta COST_{i,t}$ indicates the change of operating expenses in period t from period t–1 of company i; $INT_{i,t}$ points out the value of intangible assets of company i in year t; other designations – as above.

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[4] Without depreciation and amortisation – taking them into account would be a kind of 'double counting', since the *PPE* and *INT* variables should pay for the amount of depreciation and amortization expenses.

[5] Several authors have proven empirically the influence of cost manipulation on the scope and behaviour of EM. For example, Anderson et al. (2003) and Koo (2011) reported that abnormal selling, general and administrative expenses are generally used for earnings management, whereas Jeong-Ho et al. (2015) indicated that cost stickiness of companies with higher EM incentives is weaker than that of firms with lower ones.

3.2. Methodology for measuring relationships between discretionary accruals and EM practices

In the literature on the subject, the taxonomy of the processes and practices aimed at the intentional shaping of the financial results is presented in a rather ambiguous way. The appropriate classification of EM techniques is difficult because any accounting method or estimate can have its integral relationship with EM. Moreover, in many cases the implementation (one-time or aggregate) of these activities may be aimed at achieving various goals, current from the perspective of a specific moment of the company's operation. In this paper particular attention was paid to two EM techniques, namely: big bath charges and small net income increases.

The big bath technique is defined as an attempt to increase reported earnings in subsequent periods by charging items that may have a negative future impact to expenses in the current period, further worsening the current period's business results in an accounting period in which the results are bad (Tokuga and Yamashita, 2011). The dominant approaches to identifying big bath operations are associated with the assessment of the effects of using specific accounting instruments in the following financial years after a significant reduction in the results (e.g. reversal of unused reserves, reversal of accrued expenses, impairment losses on non-current assets, etc.) or the analysis of the reduction of results based on the measurement of the achievements of the period in which the great cost bath was carried out. The study using the logistic regression examined the relationship between discretionary accruals and the frequency of showing large losses. It was assumed that a net loss greater than 20% of the total assets would testify about the big bath. For this purpose, the Piosik model (2013) was adopted and developed, using the following variables:

$$BIGBARTH_{i,t} = \alpha_0 + \alpha_1 DACC_{i,t} + \alpha_2 \ln TA_{i,t} + \alpha_3 \left(\frac{CFO_{i,t-1}}{TA_{i,t-1}} \right) + \ldots$$
$$+ \alpha_4 \left(\frac{CFO_{i,t}}{TA_{i,t}} \right) + \alpha_5 \left(\frac{\Delta REV_{i,t}}{TA_{i,t}} \right) + \alpha_6 LEV_{i,t} + \alpha_7 FD_{i,t} + \ldots \quad (10)$$
$$+ \alpha_8 \left(\frac{\Delta LTL_{i,t}}{TA_{i,t}} \right) + \alpha_9 \left(\frac{\Delta EQE_{i,t}}{TA_{i,t}} \right) + \alpha_{10} \left(\frac{NI_{i,t} - IND_{i,t}}{TA_{i,t}} \right) + \varepsilon_{i,t},$$

where: $BIGBATH_{,t}$ – dummy variable (1 indicates a large loss, higher than 20% of total assets in period *t* of company *i*; 0 – otherwise); $DACC_{i,t}$ points out the value of discretionary accruals of company *i* in year *t*; $LEV_{i,t}$ indicates the percentage of liabilities in total assets of company i in year t; $FD_{i,t}$ means potential bankruptcy trajectory of company i in year t (dummy variable: –1 indicates that the value of the artificial variable FD according to the discriminatory model of Hamrol et al. (2004) is negative; 0 – otherwise); $\Delta LTL_{i,t}$ indicates the change in long-term liabilities in period t from period t–1 of company i; $\Delta EQE_{i,t}$ means the change in equity less net profits earned in period t from period t–1 of company i; $IND_{i,t}$ denotes average relation of the financial result to the sum of assets in the industry in which a given company conducts economic activity in year t; other designations – as above.

The small net income increase technique is based on the deliberate elimination of 'ups and downs' in the company's normal level of net income by reducing and retaining profits in years of prosperity, and by using it during periods of downturn. Its implementation can be oriented to ensure the realization of incomes in the long run, signalling to shareholders the potential for increasing the value of a business entity and emphasizing the stability of performance. In the paper, net income growth is considered small if it constitutes from 0 to 0.5% of the total assets. The frequency of small net income increase is tested using the following logistic regression:

$$\begin{aligned} SMALL\_NI_{i,t} &= \alpha_0 + \alpha_1 DACC_{i,t} + \alpha_2 lnTA_{i,t} + \alpha_3\left(\frac{\Delta CFO_{i,t}}{TA_{i,t}}\right) + \cdots \\ &+ \alpha_4\left(\frac{\Delta REV_{i,t}}{TA_{i,t}}\right) + \alpha_5 LEV_{i,t} + \alpha_6\left(\frac{ONCA_{i,t}}{TA_{i,t}}\right) + \cdots \\ &+ \alpha_7\left(\frac{\Delta LTL_{i,t}}{TA_{i,t}}\right) + \alpha_8\left(\frac{\Delta EQE_{i,t}}{TA_{i,t}}\right) + \ldots \\ &+ \alpha_9\left(\frac{NI_{i,t} - IND_{i,t}}{TA_{i,t}}\right) + \varepsilon_{i,t}, \end{aligned} \tag{11}$$

where: $SMALL\_NI_{,t}$ – dummy variable (1 indicates the income growth in period t of company i constitutes from 0 to 0.5% of the total assets; 0 – otherwise); $ONCA_{i,t}$ points out the result on the sale of property, plant and equipment and intangible assets in period t of company i; other designations – as above.

Additionally, the relationships between discretionary accruals and the frequency of EM practices were examined by using the Wilcoxon-Mann-

Whitney test, which is a nonparametric test of the null hypothesis that the probability that a randomly selected value from one population is lesser than a randomly selected value from a second population is equal to the probability of being greater.

3.3. Research sample and the stated hypothesis

Empirical research was carried out among industrial public companies listed on the WSE, whose shares were permanently traded for at least twelve years within the 2002-2017 reference horizon. Additionally, the sample selection was based on the following criteria:

- the fiscal year of the company should end on 31 December;
- companies do not conduct business activity in the finance and insurance sectors;
- all financial required data must be available.

Consequently, the study was conducted within 79 listed companies that provided a sample of 1129 observations. Empirical research based on financial information was taken from the Notoria Serwis database.

In the research, the following hypotheses were examined:

- *Hypothesis* 1: In the tested population, the values of discretionary accruals differ in a statistically significant manner from the perspective of enterprises implementing big bath strategies and companies that do not increase substantial net loss.
- *Hypothesis* 2: In the examined sample, discretionary accruals differ statistically significantly in the case of enterprises implementing small net income increases and companies that do not use the mentioned technique of EM practices.

4. EMPIRICAL RESULTS

4.1. The assessment of accrual models using the time series data approach

The aim of the study was to answer the question of which model best describes non-discretionary accruals among public industrial companies. The first step of evaluation of the research aptitude of accrual-based models was associated with the use of the time series data approach (separately for each firm). This approach is preferred among the researchers, because sample firms can maintain individualized accrual patterns over time and even companies within a branch of industry have varying characteristics. Hence the model's parameters are likely not constant in the sample but rather are functions of firm and/or time characteristics (Pae, 2011). On the other hand, this approach is characterized by a significant limitation, because it accepts the temporal stationarity of coefficients. In order to find out whether accrual-based models can statistically explain the phenomenon of earnings management, the study performed different ordinary-least-square regressions (OLS). To limit the problem of heteroscedasticity, the estimated variables were scaled with lagged assets.

Table 1 shows the descriptive statistics of all endogenous and exogenous variables used in the study with a simultaneous analysis of Pearson's linear correlation coefficients between the presented variables. These observations apply to all the enterprises included in the research sample. Special attention should be paid to the high value of the standard deviation of the ΔREV variable, which indicates its strong dispersion around the mean (large variation). Other cells in Table 1 indicate that variables: property, plant and equipment (*PPE*)

Table 1

Correlations analysis and descriptive statistics of the variables included in the tested accrual models

Descriptive statistics				
Variable	*N*	*Mean*	*Std. deviation*	*Variance*
$TACC_t/TA_{t-1}$	1129	-0.007	0.387	0.150
$1/TA_{t-1}$	1129	0.000	0.000	0.000
$\Delta REV_t/TA_{t-1}$	1129	0.154	2.377	5.652
ΔREV_t-$\Delta REC_t/TA_{t-1}$	1129	0.104	1.342	1.801
PPE_t/TA-1	1129	0.404	1.440	2.074
$(PPE+INT_t)/TA_{t-1}$	1129	0.421	1.444	2.085
$\Delta COST_t/TA_{t-1}$	1129	0.065	0.310	0.096
ROA_t	1129	0.044	0.123	0.015

Correlations between variables

Variable	$TACC_t$	ΔREV_t	ΔREV_t-ΔREC_t	PPE_t	$PPE+INT_t$	$\Delta COST_t$	ROA_t
$TACC_t$	1	**.201****	**.154****	**-.437****	**-.440****	**.104****	**.121****
ΔREV_t	**.201****	1	**.988****	**.103****	**.098****	**.918****	0.042
ΔREV_t-ΔREC_t	**.154****	**.988****	1	**.092****	**.087****	**.933****	0.032
PPE_t	**-.437****	**.103****	**.092****	1	**1.000****	0.042	0.039
$PPE+INT_t$	**-.440****	**.098****	**.087****	**1.000****	1	0.038	0.039
$\Delta COST_t$	**.104****	**.918****	**.933****	0.042	0.038	1	0.014
ROA_t	**.121****	0.042	0.032	0.039	0.039	0.014	1

** correlation significant at the 5% level (two-sided test)

Source: own study based on financial information from the Notoria Serwis database.

and property, plant and equipment plus intangible assets (*PPE+INT*) have consistent, negative relationships with total accruals (*TACC*). Meanwhile absolute growths of operating expenses ($\Delta COST$) confirmed their expected positive correlations with total accruals (*TACC*). Consistently with the previous studies (Matis et al., 2010), there were observed positive relationships between the difference amid changes in sales revenues and changes in net account receivables (ΔREV-ΔREC) and total accruals (*TACC*).

The results of the research indicate that the goodness-of-fit of the tested models in the assessment of shaping non-discretionary accruals (*NDACC*) varies considerably between the examined models (see Table 2). For the Jones model and the modified Jones model, the studies showed the highest percentages of observations with very poor fitting (respectively: 26.6% and 27.8%), which underlines that regressors such as: sales revenues (ΔREV), receivables (ΔREC) and plant, property and equipment (*PPE*) are not powerful enough at explaining the values of the dependent variable in the sample of data at hand. What is more, based on the output of Table 2, it becomes possible to infer that the Jones model seems to be a better starting point for making all modifications to the analytical formulas of accrual models. Given the values of adjusted R-square coefficients for the ROA-matched Jones model and the new model emphasize that in most of the company observations(respectively: 46.8% and 30.4%), the variability of non-discretionary accruals can be explained by regression models with very good fitting degree.

Table 2

Statistics for the goodness-of-fit of tested accrual based models computed by OLS regression

Model		Jones model	Modified Jones model	ROA-matched Jones model	New model
Goodness-of-fit of considered accrual models	Very poor fit ($0 \geq$ adj.R^2)	26.6%	27.8%	7.6%	7.6%
	Poor fit ($0 \leq$ adj.$R^2 < 0.2$)	19.0%	22.8%	13.9%	7.6%
	Average fit ($0.2 \leq$ adj.$R^2 < 0.4$)	26.6%	24.1%	7.6%	20.3%
	Good fit ($0.4 \leq$ adj.$R^2 < 0.6$)	21.5%	17.7%	24.1%	34.2%
	Very good fit (adj.$R^2 \geq 0.6$)	6.3%	7.6%	46.8%	30.4%
Stat. sign. observations (at the level = 0.05)		35.4%	30.4%	67.1%	70.9%

Source: own study based on financial information from the Notoria Serwis database.

Table 3

Descriptive statistics for individual categories of discretionary accruals computed by OLS regression

Statistical dispersion measure	Jones model	Modified Jones model	ROA-matched Jones model	New model
Mean	-0.004	-0.004	-0.001	-0.004
First quartile	-0.047	-0.048	-0.034	-0.030
Median	-0.006	-0.006	-0.003	-0.001
Third quartile	0.041	0.040	0.029	0.030
Std. deviation	0.118	0.117	0.074	0.093
Positive observations	46.15%	46.41%	48.10%	49.42%

Source: own study based on financial information from the Notoria Serwis database.

Table 3 presents the descriptive statistics of discretionary accruals which were separated for all Polish listed companies in the period 2002-2017. The decomposition of total accruals into discretionary (*DACC*) and nondiscretionary accruals (*NDACC*) leads to the conclusion that regardless of the models used for the detection of EM practices, the percentage of positive values of abnormal accruals is similar (about 50%). This allows for the presumption that the manipulation of financial statements in the surveyed companies was directed towards increasing and reducing the financial results in congruous terms.

4.2. The analysis of relationships between discretionary accruals and the frequency of big bath and small net income increases estimated for the whole sample

To determine the relevance of the extracted discretionary accruals in the context of the EM practices prediction, logistic regressions of the relationship between the probability of big bath occurrence and the abnormal accrual values were used. The shape of these relationships was estimated using discretionary accruals separated by individual accrual models, as well as control variables such as: cash flows, industry profitability, and financing structure. Analysis of Table 4 indicates several findings worthy of comment. First of all, the practices of a significant reduction of net loss were recorded in the case of 3.1% of observations (35 out of 1129 observations). A high degree of matching of the distracted models to empirical data was noticeable. Regression analysis indicates that parameter α_1 turned out to be statistically significant (at a level of significance = 0.05) only in relation to *DACC* extracted by the Jones model and the modified Jones model. In relation to the

ROA-matched Jones model and the new model, the results of the empirical studies conducted do not confirm the supposition of statistically significant relationships between the tested variables. It is worth emphasizing that the assessment of the α_1 parameter was negative in each of the considered cases.

Table 4

The results of a regression analysis examining the relationship between discretionary accruals and the frequency of occurrence of big bath in industrial public companies (logistic regression)

I. Endogenous variables *BIGBATH*, *DACC* extracted by the Jones model
No. of observations = 1129 [N (0) = 1094; N (1) = 35]

Variables	B	S.E.	Wald	df	sig.	exp(B)
Constant	-4.48	3.28	1.87	1.00	0.173	0.01
$DACC_{Jones}$	**-15.87***	**6.48**	**5.99**	**1.00**	**0.014**	**0.00**
ln*TA*	-0.29	0.26	1.19	1.00	0.276	0.75
OCF_{t-1}/TA_{t-1}	**7.85**	**3.91**	**4.02**	**1.00**	**0.045**	**2566.45**
OCF_t/TA_t	**-16.34**	**6.46**	**6.41**	**1.00**	**0.011**	**0.00**
$\Delta REV_t/TA_t$	-0.77	0.97	0.63	1.00	0.430	0.46
LEV_t	**-6.39**	**2.11**	**9.20**	**1.00**	**0.002**	**0.00**
FD_t	**-3.45**	**0.97**	**12.65**	**1.00**	**0.000**	**0.03**
$\Delta LTL_t/TA_t$	1.99	2.88	0.48	1.00	0.491	7.31
$\Delta EQE_t/TA_t$	-0.86	2.03	0.18	1.00	0.673	0.42
$NI_t–IND_t$	**-62.88**	**11.93**	**27.76**	**1.00**	**0.000**	**0.00**

Model summary		*Hosmer and Lemeshow test*		
Cox &Snell R-square	Nagelkerke R-square	Chi-square	df	sig.
0.342	0.919	0.831	8	0.999

II. Endogenous variables *BIGBATH*, *DACC* extracted by the modified Jones model
No. of observations = 1129 [N (0) = 1094; N (1) = 35]

Variables	B	S.E.	Wald	df	sig.	exp(B)
Constant	-4.78	3.35	2.04	1.00	0.153	0.01
$DACC_{Dechow}$	**-16.54**	**6.42**	**6.63**	**1.00**	**0.010**	**0.00**
ln*TA*	-0.27	0.27	1.04	1.00	0.307	0.76
OCF_{t-1}/TA_{t-1}	5.86	3.43	2.92	1.00	0.088	350.64
OCF_t/TA_t	-13.86	6.18	5.03	1.00	0.025	0.00
$\Delta REV_t/TA_t$	-0.55	1.07	0.26	1.00	0.610	0.58
LEV_t	**-6.31**	**2.13**	**8.76**	**1.00**	**0.003**	**0.00**
FD_t	**-3.38**	**0.98**	**11.89**	**1.00**	**0.001**	**0.03**
$\Delta LTL_t/TA_t$	2.35	3.00	0.62	1.00	0.433	10.53
$\Delta EQE_t/TA_t$	-0.69	2.12	0.11	1.00	0.744	0.50
$NI_t–IND_t$	**-63.26**	**12.07**	**27.45**	**1.00**	**0.000**	**0.00**

Model summary		*Hosmer and Lemeshow test*		
Cox &Snell R-square	Nagelkerke R-square	Chi-square	df	sig.
0.343	0.920	0.664	8	1

III. Endogenous variables *BIGBATH*, *DACC* extracted by the ROA-matched Jones model No. of observations = 1129 [N (0) = 1094; N (1) = 35]						
Variables	B	S.E.	Wald	df	sig.	exp(B)
Constant	-4.26	3.05	1.95	1.00	0.163	0.01
$DACC_{ROA\text{-}matched}$	-0.71	3.20	0.05	1.00	0.823	0.49
ln*TA*	-0.34	0.24	1.95	1.00	0.163	0.71
OCF_{t-1}/TA_{t-1}	5.67	4.11	1.90	1.00	0.170	288.78
OCF_t/TA_t	-9.06	6.14	2.18	1.00	0.140	0.00
$\Delta REV_t/TA_t$	-0.94	1.33	0.50	1.00	0.480	0.39
LEV_t	**-5.87**	**1.91**	**9.43**	**1.00**	**0.002**	**0.00**
FD_t	**-4.41**	**0.97**	**20.65**	**1.00**	**0.000**	**0.01**
$\Delta LTL_t/TA_t$	2.64	3.02	0.76	1.00	0.382	13.96
$\Delta EQE_t/TA_t$	-0.89	1.64	0.29	1.00	0.588	0.41
$NI_t\text{–}IND_t$	**-66.34**	**12.09**	**30.09**	**1.00**	**0.000**	**0.00**

Model summary		*Hosmer and Lemeshow test*		
Cox &Snell R-square	Nagelkerke R-square	Chi-square	df	sig.
0.337	0.906	6.816	8	0.557

IV. Endogenous variables *BIGBATH*, *DACC* extracted by the new model No. of observations = 1129 [N (0) = 1094; N (1) = 35]						
Variables	B	S.E.	Wald	df	sig.	exp(B)
Constant	-4.71	3.14	2.25	1.00	0.134	0.01
$DACC_{NewModel}$	-14.24	7.95	3.21	1.00	0.073	0.00
ln*TA*	-0.36	0.25	1.99	1.00	0.158	0.70
OCF_{t-1}/TA_{t-1}	5.86	3.43	2.92	1.00	0.088	350.64
OCF_t/TA_t	**-13.86**	**6.18**	**5.03**	**1.00**	**0.025**	**0.00**
$\Delta REV_t/TA_t$	-0.55	1.07	0.26	1.00	0.610	0.58
LEV_t	**-6.21**	**1.97**	**9.97**	**1.00**	**0.002**	**0.00**
FD_t	**-4.65**	**1.03**	**20.23**	**1.00**	**0.000**	**0.01**
$\Delta LTL_t/TA_t$	3.31	3.06	1.17	1.00	0.280	27.49
$\Delta EQE_t/TA_t$	-0.72	1.67	0.19	1.00	0.665	0.49
$NI_t\text{–}IND_t$	**-72.99**	**14.01**	**27.14**	**1.00**	**0.000**	**0.00**

Model summary		*Hosmer and Lemeshow test*		
Cox &Snell R-square	Nagelkerke R-square	Chi-square	df	sig.
0.339	0.911	6.895	8.000	0.548

* bold font marks statistically significant parameters (at significance level = 0.05)

Source: own study based on financial information from the Notoria Serwis database.

The values of discretionary accruals (separated by the Jones model and the modified Jones model) in the group of companies implementing a big bath were statistically lower than among enterprises that did not implement EM practices by increasing significant net losses. This observation is confirmed by the results of the Mann-Whitney-Wilcoxon test used to check whether the distribution of samples taken from two independent populations are equally large (see Table 5).

Table 5

The results of the Mann-Whitney-Wilcoxon non-parametric test examining the relationship between discretionary accruals and the frequency of occurrence of big bath in industrial public companies

Ranks					Test statistics	
DACC extracted by the Jones model		N	Mean rank	Sum of ranks	Mann-Whitney U	6498.00
No. of observations	no big bath	1094	576.56	630757.00	Wilcoxon W	7128.00
	big bath confirmed	35	203.66	7128.00	Z	-6.66
	total	1129	-		p-value	**0.00**
DACC extracted by the modified Jones model		N	Mean rank	Sum of ranks	Mann-Whitney U	5594.00
No. of observations	no big bath	1094	577.39	631661.00	Wilcoxon W	6224.00
	big bath confirmed	35	177.83	6224.00	Z	-7.14
	total	1129	-		p-value	**0.00**
DACC extracted by the new model		N	Mean rank	Sum of ranks	Mann-Whitney U	16798.00
No. of observations	no big bath	1094	562.85	615763.00	Wilcoxon W	615763.00
	big bath confirmed	35	632.06	22122.00	Z	-1.24
	Total	1129	-		p-value	0.22
DACC extracted by the ROA-matched Jones model		N	Mean rank	Sum of ranks	Mann-Whitney U	17034.00
No. of observations	no big bath	1094	563.07	615999.00	Wilcoxon W	615999.00
	big bath confirmed	35	625.31	21886.00	Z	-1,11
	Total	1129	-		p-value	0.27

Source: own study based on financial information from the Notoria Serwis database.

A similar research procedure was carried out to determine whether in the tested population there are statistically significant relationships between discretionary accruals and the frequency of small net income increases. It is assumed that the net losses occurring less frequently, but to a larger extent, are associated with the intentional shaping of financial results by the management staff. The occurrence of low increases in net income was recorded in relation to 6.3% of the tested observations (71 out of 1129 observations). The results of research indicate a low degree of goodness-of-fit of the analysed logit model to the data at hand. Other results of the empirical studies presented in Table 6 underline that only the discretionary accruals separated by the new model disclosed statistically significant correlations with the dependent variable (SMALL_NI). This implies that inclusion in the analytical formula of the ROA-matched model such variables as: intangible assets and operating expenses can boost the relevance of the tested model within the scope of the prediction of EM practices *via* small net income increase. As regards the big bath analysis, also in the case of relationship between discretionary accruals and the frequency of small net income increasing the assessment of the α_1 parameter is negative. This may testify to the lower average values of discretionary accruals in the sample of companies which implemented the above mentioned technique of EM.

Table 6

The results of logistic regression examining the relationship between discretionary accruals and the frequency of occurrence of small net income increases in industrial public companies

I. Endogenous variables *SMALL_NI, DACC* extracted by the Jones model No. of observations = 1129 [N (0) = 1058; N (1) = 71]						
Variables	B	S.E.	Wald	df	sig.	exp(B)
Constant	**-2.86***	**1.02**	**7.81**	**1.00**	**0.005**	**0.06**
$DACC_{Jones}$	-1.08	1.44	0.56	1.00	0.455	0.34
$\ln TA$	0.01	0.08	0.03	1.00	0.874	1.01
$\Delta OCF_t/TA_t$	-1.16	1.44	0.65	1.00	0.419	0.31
$\Delta REV_t/TA_t$	1.02	0.52	3.87	1.00	0.049	2.77
LEV_t	-0.83	0.77	1.16	1.00	0.28	0.44
$ONCA_t/TA_t$	0.66	0.74	0.80	1.00	0.371	1.94
$\Delta LTL_t/TA_t$	0.71	1.53	0.22	1.00	0.642	2.04
$\Delta EQE_t/TA_t$	0.37	0.84	0.19	1.00	0.660	1.44
NI_t–IND_t	0.44	1.40	0.10	1.00	0.752	1.56

Model summary		*Hosmer and Lemeshow test*		
Cox &Snell R-square	Nagelkerke R-square	Chi-square	df	sig.
0.006	0.017	9.136	8.000	0.331

II. Endogenous variables *SMALL_NI, DACC* extracted by the modified Jones model No. of observations = 1129 [N (0) = 1058; N (1) = 71]						
Variables	B	S.E.	Wald	df	sig.	exp(B)
Constant	**-2.86**	**1.02**	**7.83**	**1.00**	**0.005**	**0.06**
$DACC_{Dechow}$	-1.12	1.42	0.62	1.00	0.431	0.33
$\ln TA$	0.01	0.08	0.03	1.00	0.869	1.01
$\Delta OCF_t/TA_t$	-1.13	1.42	0.64	1.00	0.424	0.32
$\Delta REV_t/TA_t$	**1.05**	**0.52**	**4.14**	**1.00**	**0.042**	**2.86**
LEV_t	-0.84	0.77	1.19	1.00	0.276	0.43
$ONCA_t/TA_t$	0.66	0.74	0.79	1.00	0.373	1.94
$\Delta LTL_t/TA_t$	0.73	1.53	0.22	1.00	0.635	2.07
$\Delta EQE_t/TA_t$	0.37	0.84	0.20	1.00	0.656	1.45
NI_t–IND_t	0.45	1.39	0.10	1.00	0.748	1.56

Model summary		*Hosmer and Lemeshow test*		
Cox &Snell R-square	Nagelkerke R-square	Chi-square	df	sig.
0.006	0.017	5.212	8.000	0.735

Tabela 6, cont.

III. Endogenous variables *SMALL_NI, DACC* extracted by the ROA-matched Jones model No. of observations = 1129 [N (0) = 1058; N (1) = 71]						
Variables	B	S.E.	Wald	df	sig.	exp(B)
Constant	**-2.85**	**1.02**	**7.78**	**1.00**	**0.005**	**0.06**
$DACC_{\text{ROA-matched}}$	-0.07	0.26	0.07	1.00	0.798	0.93
ln*TA*	0.01	0.08	0.03	1.00	0.873	1.01
$\Delta OCF_t/TA_t$	-0.73	1.28	0.33	1.00	0.565	0.48
$\Delta REV_t/TA_t$	**1.04**	**0.52**	**4.05**	**1.00**	**0.044**	**2.84**
LEV_t	-0.84	0.77	1.18	1.00	0.276	0.43
$ONCA_t/TA_t$	0.67	0.74	0.81	1.00	0.367	1.95
$\Delta LTL_t/TA_t$	0.61	1.52	0.16	1.00	0.687	1.85
$\Delta EQE_t/TA_t$	0.29	0.81	0.13	1.00	0.719	1.34
$NI_t–IND_t$	-0.02	1.24	0.00	1.00	0.988	0.98

Model summary		*Hosmer and Lemeshow test*		
Cox &Snell R-square	Nagelkerke R-square	Chi-square	df	sig.
0.006	0.015	6.018	8.000	0.645

IV. Endogenous variables *SMALL_NI, DACC* extracted by the new model No. of observations = 1129 [N (0) = 1058; N (1) = 71]						
Variables	B	S.E.	Wald	df	sig.	exp(B)
Constant	**-2.88**	**1.03**	**7.85**	**1.00**	**0.005**	**0.06**
$DACC_{\text{New Model}}$	**-4.49**	**1.90**	**5.60**	**1.00**	**0.018**	**0.01**
ln*TA*	0.01	0.08	0.04	1.00	0.848	1.01
$\Delta OCF_t/TA_t$	-2.18	1.46	2.22	1.00	0.137	0.11
$\Delta REV_t/TA_t$	**1.02**	**0.50**	**4.07**	**1.00**	**0.044**	**2.77**
LEV_t	-0.90	0.78	1.34	1.00	0.247	0.41
$ONCA_t/TA_t$	0.67	0.75	0.79	1.00	0.374	1.95
$\Delta LTL_t/TA_t$	0.77	1.54	0.25	1.00	0.616	2.16
$\Delta EQE_t/TA_t$	0.40	0.84	0.22	1.00	0.637	1.48
$NI_t–IND_t$	0.05	1.32	0.00	1.00	0.969	1.05

Model summary		*Hosmer and Lemeshow test*		
Cox &Snell R-square	Nagelkerke R-square	Chi-square	df	sig.
0.011	**0.029**	**7.641**	**8.000**	**0.469**

* bold font marks statistically significant parameters (at significance level = 0.05)

Source: own study based on financial information from the Notoria Serwis database.

The results of the Mann-Whitney-Wilcoxon test show that the differences in the distribution of *DACC* variables (extracted by the new model) in N(0) and N(1) subpopulations can be considered as statistically significant only at the assumed significance level of 0.1 (see Table 7). In the case of abnormal accruals estimated using the other three models, the studies have not proved that the differences in the values of discretionary accruals in both subpopulations were statistically significant.

Table 7

The results of the Mann-Whitney-Wilcoxon non-parametric test examining the relationship between discretionary accruals and the frequency of occurrences of net income small increases in industrial public companies

Ranks					Test statistics	
DACC extracted by the Jones model		N	Mean rank	Sum of ranks	Mann-Whitney U	36807.00
No. of observations	no small net income increase	1058	565.71	598522.00	Wilcoxon W	39363.00
	small net income increase	71	554.41	39363.00	Z	-0.28
	Total observations	1129	-		p-value	0.777
DACC extracted by the modified Jones model		N	Mean rank	Sum of Ranks	Mann-Whitney U	37091.00
No. of observations	no small net income increase	1058	565.44	598238.00	Wilcoxon W	39647.00
	small net income increase	71	558.41	39647.00	Z	-0.18
	Total observations	1129	-		p-value	0.860
DACC extracted by the new model		N	Mean rank	Sum of ranks	Mann-Whitney U	33014.00
No. of observations	no small net income increase	1058	569.30	602315.00	Wilcoxon W	35570.00
	small net income increase	71	500.99	35570.00	Z	-1.71
	Total observations	1129	-		p-value	0.087
DACC extracted by the ROA-matched Jones model		N	Mean rank	Sum of ranks	Mann-Whitney U	35276.00
No. of observations	no small net income increase	1058	562.84	595487.00	Wilcoxon W	595487.00
	small net income increase	71	597.15	42398.00	Z	-0.86
	Total observations	1129	-		p-value	0.391

Source: own study based on financial information from the Notoria Serwis database.

4.3. The analysis of relationships between discretionary accruals and the frequency of big bath and small net income increases – cross-sectional dimension

In-depth empirical studies were aimed at answering the question of whether the character of the business activity undertaken by Polish listed companies affects the scope of EM practices. The proposed cross-sectional approach in detecting EM seems to be important because economic activity is an extremely diversified and complex process of acquiring, collecting and using assets by an enterprise[6]. This process is differentiated by the nature of the production, the type of asset involved, the life of the product, the technical progress or technological solutions and the size and type of satisfying social needs.

The first stage of the research consisted in the determination of the structural parameters and examination of goodness-of-fit of the tested accrual

[6] This approach was used, among others, by DeFond and Jiambalvo (1994), DuCharme et al. (2004), Dopuch et al. (2012).

Table 8

Structural parameters and statistics for the goodness-of-fit of tested accrual-based models – industrial sector specification

Accrual model			Branch of industry										
			chemical i ndustry	*wood industry*	*electro-mechanical industry*	*pharma-ceutical industry*	*light industry*	*metal industry*	*building materials industry*	*automotive industry*	*food industry*	*plastics industry*	*fuel and raw materials industry*
No. of observations			56	73	188	53	88	126	177	57	167	83	61
the Jones model	*parameters*	α_1	**137114.8**	225.8	911.8	-74.3	-977.8	-13.5	**2124.8**	197.6	-583.7	651.1	116177.7
		α_2	0.103	**0.149**	**0.096**	0.073	0.077	**0.183**	**0.070**	-0.006	**0.252**	0.020	0.054
		α_3	**-0.219**	**-0.123**	**-0.082**	-0.083	-0.028	**-0.086**	**-0.126**	**-0.082**	**-0.069**	**-0.104**	**-0.076**
	goodness-of-fit	R^2	0.186	0.193	0.087	0.083	0.057	0.187	0.094	0.181	0.320	0.201	0.139
		adj. R^2	0.140	0.159	0.072	0.030	0.024	0.167	0.078	0.136	0.308	0.171	0.093
		F	4.032	5.592	5.856	1.549	1.710	9.446	6.002	3.987	25.765	6.706	3.062
		sign. F	0.012	0.002	0.001	0.213	0.171	0.000	0.001	0.012	0.000	0.000	0.035
the modified Jones model	*parameters*	α_1	**143100.5**	183.3	1226.8	126.4	-1127	11.7	**2295.0**	311.3	-414.5	639.3	128788.3
		α_2	-0.152	0.090	**0.018**	-0.014	-0.069	**0.198**	0.054	-0.013	**0.247**	-0.001	0.046
		α_3	**-0.178**	**-0.108**	**-0.078**	-0.080	-0.019	**-0.078**	**-0.120**	**-0.082**	-0.050	**-0.097**	**-0.076**
	goodness-of-fit	R^2	0.215	0.143	0.034	0.069	0.056	0.166	0.071	**0.182**	0.273	0.197	0.125
		adj. R^2	0.170	0.106	0.018	0.014	0.023	0.145	0.055	0.137	0.259	0.166	0.079
		F	4.837	3.879	2.160	1.251	1.695	8.135	4.444	4.016	20.497	6.525	2.709
		sign. F	0.005	0.013	0.094	0.301	0.174	0.000	0.005	0.012	0.000	0.001	0.054

the ROA-matched Jones model	*parameters*	α_1	**98087.7**	904.9	360.2	516.5	417.4	183.4	**1779.5**	2152.3	-271.8	443.5	78947.1
		α_2	0.054	-0.024	**0.057**	-0.027	0.001	**0.056**	0.019	-0.043	**0.238**	-0.005	0.039
		α_3	**-0.202**	**-0.180**	**-0.132**	**-0.117**	**-0.114**	**-0.113**	**-0.181**	**-0.165**	**-0.095**	**-0.131**	**-0.127**
		α_4	**0.276**	**0.707**	**0.560**	**0.784**	**0.512**	**0.647**	**0.795**	**0.513**	**0.200**	**0.549**	**0.350**
	goodness-of-fit	R^2	0.276	0.637	0.207	0.655	0.403	0.414	0.339	0.420	0.349	0.348	0.373
		adj. R^2	0.221	0.616	0.190	0.627	0.374	0.394	0.323	0.376	0.333	0.315	0.329
		F	4.965	30.242	12.023	23.701	14.170	21.162	21.764	9.581	21.807	10.527	8.345
		sign. F	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
the new model	*parameters*	α_1	-6919.9	907.8	220.6	-131.1	-37.1	241.4	**2049.8**	7171.7	-476.1	-213.9	82550.9
		α_2	-0.034	-0.050	**0.262**	**-0.207**	0.102	-0.074	0.072	-0.096	**0.301**	**0.078**	0.072
		α_3	0.060	0.028	**-0.254**	**0.305**	**-0.167**	**0.179**	-0.033	0.054	-0.067	**-0.118**	-0.035
		α_4	-0.176	**-0.176**	**-0.121**	**-0.068**	**-0.103**	**-0.114**	**-0.146**	**-0.186**	**-0.084**	**-0.110**	**-0.127**
		α_5	**0.700**	**0.710**	**0.529**	**0.711**	**0.586**	**0.625**	**0.505**	**0.522**	**0.179**	**0.602**	**0.341**
	goodness-of-fit	R^2	0.508	0.637	0.272	0.551	0.431	0.555	0.333	0.437	0.346	0.435	0.378
		adj. R^2	0.459	0.610	0.252	0.504	0.397	0.536	0.314	0.382	0.326	0.399	0.321
		F	10.324	23.845	13.662	11.771	12.598	30.169	16.903	7.915	17.164	12.033	6.675
		sign. F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

* bold font marks statistically significant parameters (at significance level = 0.05)

Source: own study based on financial information from the EMIS database.

models. Summary statistics for the regression analysis included in Table 8 show that the highest values of adjusted R-square coefficient are distinctive for models with ROA as the independent variable. Generally, differences in the values of measures describing the degree of matching the tested models to the empirical data were minor, although noticeable. Further analysis of Table 8 indicates that goodness-of-fit of the tested models varies significantly, depending on the type of undertaken business activity. For example, from the perspective of the Jones model the predictive suitability of a model explaining the values of non-discretionary accruals by R-square coefficient is within the scope from 5.7% (light industry) to 32% (food industry). In general, the statistical usefulness of four described accrual-based models in detecting EM seems not to be congruent for all industrial enterprises: the degree of goodness-of-fit to the empirical data of selected accrual-based models clearly differs from the point of view of the industry in which the investigated companies operate.

On the basis of the designated structural parameters, discretionary accruals were computed in a cross-sectional data analysis. For this purpose, the sectoral affiliation of companies listed on the WSE was determined. The analytical procedure for assessing the relationship between discretionary accruals and EM practices was narrowed down to the use of the Mann-Whitney-Wilcoxon test in each sub-population. The research is an example – for the analysis qualified only companies operating in these subpopulations (branches of industry) that provided at least 100 observations (four samples).

The Mann-Whitney-Wilcoxon test was carried out to confirm the significance of differences between the average discretionary accruals values in the N0 and N1 subpopulations (companies that do not implement big bath *vs* firms implementing strategies to increase large net loss). According to the research results, grounds to reject the null hypothesis claiming that the distribution of the *DACC* variable between examined populations is equal were observed in two out of the four tested industry sectors (namely: electromechanical and building materials industries). These relationships are not confirmed by the tests of significance of the differences in average discretionary accruals values from the perspective of food industry companies. The research results for metal sector companies proved to be ambiguous; it was observed that the differences in *DACC* values between the examined subpopulations were statistically significant only for discretionary accruals extracted by the Jones model and by the modified Jones model.

At the final stage of the analysis, discretionary accruals distributions were tested among companies implementing small net income increases and firms

Table 9

The results of the Mann-Whitney-Wilcoxon non-parametric test examining the relationship between discretionary accruals and the frequency of occurrence of big bath in selected branches of industry

Electromechanical industry								
No. of observations [N(0)=181; N(1)=7]	$DACC_{Jones}$		$DACC_{Dechow}$		$DACC_{ROA\text{-}matched}$		$DACC_{New\ Model}$	
	Wilcoxon	44.000	Wilcoxon	39.000	Wilcoxon	28.000	Wilcoxon	41.000
	Z	-4.371	Z	-4.407	Z	-4.485	Z	-4.393
	p-value	**0.000**	p-value	**0.000**	p-value	**0.000**	p-value	**0.000**
Metal industry								
No. of observations [N(0)=122; N(1)=4]	$DACC_{Jones}$		$DACC_{Dechow}$		$DACC_{ROA\text{-}matched}$		$DACC_{New\ Model}$	
	Wilcoxon	30.000	Wilcoxon	18.000	Wilcoxon	289.000	Wilcoxon	342.000
	Z	-3.218	Z	-3.336	Z	-0.661	Z	-.138
	p-value	**0.001**	p-value	**0.001**	p-value	0.508	p-value	0.890
Building materials industry								
No. of observations [N(0)=173; N(1)=4]	$DACC_{Jones}$		$DACC_{Dechow}$		$DACC_{ROA\text{-}matched}$		$DACC_{New\ Model}$	
	Wilcoxon	10.000	Wilcoxon	10.000	Wilcoxon	52.000	Wilcoxon	58.000
	Z	-3.395	Z	-3.395	Z	-2.811	Z	-2.727
	p-value	**0.001**	p-value	**0.001**	p-value	**0.005**	p-value	**0.006**
Food industry								
No. of observations [N(0)=164; N(1)=3]	$DACC_{Jones}$		$DACC_{Dechow}$		$DACC_{ROA\text{-}matched}$		$DACC_{New\ Model}$	
	Wilcoxon	170.000	Wilcoxon	170.000	Wilcoxon	174.000	Wilcoxon	172.000
	Z	-0.988	Z	-0.988	Z	-0.940	Z	-.964
	p-value	0.323	p-value	0.323	p-value	0.347	p-value	0.335
Grouping variable: *BIGBATH*								

Source: own study based on financial information from the EMIS database.

not practicing the mentioned EM technique. The grounds for rejection of the null hypothesis were observed only in relation to food companies (see Table 10). In this industry, regardless of the adopted method of separating individual subcomponents of accruals, differences in *DACC* values in the two tested groups (N0 and N1) turned out to be statistically significant. In turn, the enterprises classified in the other three branches of industry are characterized by similar values (on average) of discretionary accruals, regardless of the implementation of small net income increases. A significant feature of the results presented in Tables 9 and 10 is the fact that the use of a specific accrual model (in a cross-sectional approach) generally has no major impact on the scope and directions of the relationships between the frequency of EM practices and the values of abnormal accruals.

Table 10

The results of the Mann-Whitney-Wilcoxon non-parametric test examining the relationship between discretionary accruals and the frequency of small net income increases in selected branches of industry

Electromechanical industry								
No. of observations [N(0)=177; N(1)=11]	$DACC_{Jones}$		$DACC_{Dechow}$		$DACC_{ROA\text{-}matched}$		$DACC_{new\ model}$	
	Wilcoxon	16565.00	Wilcoxon	16527.00	Wilcoxon	16625.00	Wilcoxon	16563.0
	Z	-0.92	Z	-1.139	Z	-0.580	Z	-0.934
	p-value	0.360	p-value	0.255	p-value	0.562	p-value	0.350
Metal industry								
No. of observations [N(0)=115; N(1)=11]	$DACC_{Jones}$		$DACC_{Dechow}$		$DACC_{ROA\text{-}matched}$		$DACC_{new\ model}$	
	Wilcoxon	15002.00	Wilcoxon	15036.0	Wilcoxon	15144.00	Wilcoxon	15112.0
	Z	-1.759	Z	-1.483	Z	-0.608	Z	-0.867
	p-value	0.079	p-value	0.138	p-value	0.543	p-value	0.386
Building materials industry								
No. of observations [N(0)=171; N(1)=6]	$DACC_{Jones}$		$DACC_{Dechow}$		$DACC_{ROA\text{-}matched}$		$DACC_{new\ model}$	
	Wilcoxon	7238.00	Wilcoxon	7230.00	Wilcoxon	644.00	Wilcoxon	7277.0
	Z	-0.557	Z	-0.627	Z	-0.471	Z	-0.220
	p-value	0.577	p-value	0.531	p-value	0.638	p-value	0.826
Food industry								
No. of observations [N(0)=155; N(1)=12]	$DACC_{Jones}$		$DACC_{Dechow}$		$DACC_{ROA\text{-}matched}$		$DACC_{new\ model}$	
	Wilcoxon	623.00	Wilcoxon	630.00	Wilcoxon	652.00	Wilcoxon	674.0
	Z	-2.386	Z	-2.342	Z	-2.206	Z	-2.070
	p-value	**0.017**	p-value	**0.019**	p-value	**0.027**	p-value	**0.038**
Grouping variable: *SMALL_NI*								

Source: own study based on financial information from the EMIS database.

5. DISCUSSION

Most of the research on the processes of the intentional shaping of financial results in listed companies is based on the methodology for determining discretionary accruals, which are usually the difference between the actual and estimated values of total accruals. Dilemmas about measuring discretionary accruals can be linked to two issues. The first is the methodology for estimating the non-discretionary accruals, which generally separates two alternatives. Based on the balance sheet approach, changes in all non-cash components of working capital can be more effectively tracked, but the effects of other performance instruments (such as the establishment and release of long-term reserves and provisions or write-downs of fixed assets) are ignored. In turn, the approach based on the use of the cash flow statement, applied in this paper, is closer to Polish accounting standards, but omits some of the effects on the reported results related to the financial activity of the enterprise. In addition, the dual dimension of estimating non-discretionary accruals can lead to erroneous conclusions in comparing research results on EM practices.

The selection of independent variables to consider in the estimation of non-discretionary accruals is also a problematic issue in EM analyses. This paper documents evidence that the Jones model and the modified Jones model suffer misspecification and goodness-of-fit problems. A similar position, regarding various economies, is presented by a whole range of authors. Yoon et al. (2006) document that the modified Jones model is not effective in measuring discretionary accruals for Korean firms. Bešlic et al. (2015), analysing the predictive power of the modified Jones model in the Serbian economic environment, show that this model is not sufficient and there is a need for its further modification. Comparable conclusions were reached by Matis et al. (2010) who compared the existing accrual-based models to detect manipulation of financial reporting on a sample of companies listed on the Bucharest Stock Exchange, and Islam et al. (2011) who examined the modified Jones model to detect earnings management in the context of the Bangladesh capital market.

Therefore, in the study the examined ROA-matched Jones model was developed by including in its formula additional variables, namely operational expenses and intangible assets. This allowed for the extraction of discretionary accruals, which in regression analysis turned out to be statistically correlated with the endogenous variable *SMALL_NI*. It can therefore be concluded that a more effective instrument in detecting small net income increasing technique for companies from the WSE was obtained (as compared to the extended models used in this study). However, one may wonder if its 'usefulness' would be the same if net income growth was considered in a smaller (larger) range. Hence, it should be emphasized that the achieved research results should be treated with caution. This remark applies in particular to cross-sectoral analyses, which included small research samples. Nonetheless it seems indispensable to continue looking for accrual models that will as much as possible refer to the nature of real economic transactions in a given country (economy).

CONLUSIONS

Due to its accrual-accounting character, complexity and multidimensionality, the financial results are a highly susceptible category to the shaping process. The reported financial performance in particular segments of its determination is not always solely the result of accounting methods and practices adopted by the entity from the perspective of the preparation of financial statements. In many cases, it is also the result of management's emphasis aimed at the intentional manipulation of earnings that is inconsistent with the principle of presenting a true and fair view of an entity in its financial statements and is not covered by existing or anticipated business operations.

The results of the empirical research do not allow to support the hypothesis that the values of discretionary accruals differ in a statistically significant manner from the perspectives of enterprises implementing big bath strategies and companies that do not increase a significant net loss. This assumption was confirmed by using the Wilcoxon-Mann-Whitney test only in cases where discretionary accruals were extracted (for each of the considered companies considered, separately) by using the Jones model and the modified Jones model. Additionally, the regression analysis indicates that the structural parameter of the *DACC* variable turned out to be statistically significant only in relation to *DACC* extracted by the Jones model and the modified Jones model. In relation to the ROA-matched Jones model and the new model, the results of the empirical studies do not confirm the supposition of statistically significant relationships between variables: *BIGBATH* and *DACC*. Moreover, the obtained results point out that there is no basis for supporting the second research hypothesis, stating that in the examined sample, discretionary accruals differ statistically significantly in the case of enterprises implementing small net income increases and companies that do not use the mentioned technique of EM practices. Primarily, the results of the Wilcoxon-Mann-Whitney test showed that regardless of the method used for the extraction of discretionary accruals in industrial companies listed on the WSE, the distribution of the *DACC* variable in examined populations is equal.

The findings in this paper are subject to some limitations that need to be considered. Most of all, the presented research results may not fulfil the conditions of generalization and should be extended on the basis of a larger number of investigated companies, as well as in relation to a longer period of research. However, it seems that they extend the existing empirical research on the EM issues in post-transitional countries.

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