# THE IMPACT OF REAL EARNINGS MANAGEMENT ON INVESTMENT EFFICIENCY IN THE NASDAQ BALTIC LISTED COMPANIES

*Silva Katutytè[1], Danutè Zinkevičienè[2]*

[1]*PhD student, Vytautas Magnus University, Universiteto 10, Akademija, Kaunas dist., Lithuania, E-mail address: silva.katutyte@vdu.lt*

[2]*Prof. Dr., Vytautas Magnus University, Universiteto 10, Akademija, Kaunas dist., Lithuania, E-mail address: danute.zinkeviciene@vdu.lt*

**Abstract**

The aim of this study is to reveal the impact of real earnings management on the investment efficiency in Baltic joint-stock companies. The empirical study used data from companies listed on the Nasdaq Baltic Stock Exchange for the period 2010–2023. In order to investigate the impact of real earnings management on the investment efficiency, multiple panel regression was used, applying a fixed-effects model, and F, Breusch–Pagan and Hausman tests were performed. The results of the study revealed that there is a statistically significant negative relationship between real earnings management and the investment efficiency in companies listed on the Baltic Stock Exchange. This means that the more companies manage real earnings, the lower the efficiency of investment decisions is. Larger companies tend to make more efficient investment decisions, while the investment decisions of older companies and companies generating higher cash flows are less efficient. This empirical study may be useful for investors, regulatory authorities and policymakers. It complements the currently scarce research on the impact of real earnings management on investment efficiency, provides insights for listed companies in the Baltics on how to improve investment decisions.

## Introduction

Investment decisions have a direct and significant influence on the financial performance of entities. On the one hand, investors seek to receive the maximum return. On the other hand, they also want to minimise risk as much as possible. Therefore, investors must thoroughly analyse the information available to them before making their decisions so to compare potential investment decisions by assessing the returns to be obtained and the risks ahead.

Data of financial statements is one of the essential sources of information on which investors base their investment decisions. The quality of financial reporting is a determinant of investment efficiency: the higher the quality of financial reporting, the better investment efficiency (Biddle, Hilary, and Verdi, 2009; Chen, Hope, Li, and Wang, 2011). The results of the study by Dinh, Nguyen, and Gan (2022) revealed that the quality of financial reporting is positively related to the efficiency of investment decisions and negatively related to overinvestment and underinvestment. Meanwhile, the findings of Houcine, Zitouni, and Srairi (2022) show that the quality of financial reporting plays an important role in reducing overinvestment but does not affect underinvestment. According to Wang, Zhu and Hoffmire (2015), the quality of financial reporting is related to the investment efficiency in several ways. First, financial reporting provides specific information to investors and reduce information asymmetries between entity and investor, as well as

among investors. This, in turn, lowers the expenditure on investment choices and the expenditure on raising capital. Second, the quality of financial reporting is important to mitigate the facilitation issues between managers and investors. Third, the information provided in financial statements is used to monitor financial markets and is an important source of information about entities. Thus, if the quality of financial reporting reduces the issues of facilitation between managers and investors, this information can increase investment efficiency by enhancing the ability of shareholders of entities to control managers, thereby reducing the cost of financing and improving the process of choosing investment projects (Verdi, 2006; Biddle et al., 2009; Chen et al., 2011; Cherkasova and Rasadi, 2017; Houcine, 2017; Oswald, Ryu, and Zarowin, 2022).

Earnings management is one of the quality indicators of financial statements that is most analysed in the academic literature. According to Healy and Wahlen (1999), managers manage earnings by applying financial accounting policy and changing the structure and timing of transactions in a way that financial statements would provide misinformation on the entity's economic indicators to stakeholders or influence contractual transactions that are interdependent on financial performance. Giordino (2023) states that earnings management is a strategic use of accounting principles to manipulate financial statements and influence external stakeholders' awareness of the entity's financial situation. Thus, earnings management is seen as a negative phenomenon that impairs the quality of financial reporting, thus reducing investment efficiency (Eissa, Elgendy and Diab, 2023). Less often, earnings management is also treated as a positive phenomenon that allows an entity more accurately disclose its financial performance (Watts and Zimmerman, 1990; Fields, Lys, and Vincent, 2001; Beneish, 2001; Gunny, 2010; Zhao, Chen, Zhang, and Davis, 2012). In this study, earnings management is treated more as a negative phenomenon, as most previous studies show that earnings management harms investment efficiency.

The academic literature distinguishes between two approaches to earnings management: accruals management and real earnings management. While the impact of accruals management on investment efficiency has been quite widely studied (Verdi, 2006; Biddle et al., 2009; Chen et al., 2011; Cherkasova and Rasadi, 2017; Houcine, 2017; Zhou and Zhang, 2019; Ellili, 2022), there is a shortage of researches analysing the impact of real earnings management on investment decisions (Assad, Jaafar, and Zervopoulos, 2023; Priscilia and Trisnawati, 2023; Khan, Irfan, and Naveed, 2024). Moreover, most of the research to date studying the impact of earnings management on investment efficiency has been dominated by the analysis of US companies and several researches are performed on Asia and Europe companies. Meanwhile, there is a lack of comprehensive research exploring the impact of earnings management on investment efficiency in European companies, while in the Baltic States, such research is completely missing. A study assessing the extent of earnings management in socially responsible companies in Lithuania was found (Bachtijeva, Tamulevičienė, and Tvaronavičienė, 2023). The authors analysed both accruals management and real earnings management and found that socially responsible companies manage profits using both methods to a lesser extent and less aggressively than other companies. However, it should be noted that in the case of accruals management, the difference between socially responsible companies and other companies is much more significant than that of real earnings management. This suggests that companies are more cautious using accruals management than real earnings management. The results of previous studies also support this assumption. Studies by Hastuti, Setiawan, and Widagdo (2020) and Graham, Harvey, and Rajgopal (2005) have shown that managers are more likely to use real earnings management than accruals management because auditors can detect the latter. Accruals are also more challenging to manage due to accounting rules and controls.

Meanwhile, real earnings management is more complicated to detect and can result from

business decisions rather than deliberate manipulation of a entity's operations to mislead owners, potential investors and other stakeholders (Gunny, 2010; Braam, Nandy, Weitzel and Lodh, 2015; Kothari, Miznik and Roychowdhury, 2016). Thus, it is apparent that the impact of real earnings management on the stakeholders' decisions related to the entity based on the available financial information is more difficult to disclose and, therefore, more dangerous. Therefore, the originality of our study is that it strives to shed light on the impact of real earnings management on investment efficiency. The study aims to determine whether these companies apply real earnings management and, if so, whether real earnings management influence investment efficiency. We are evaluating investment efficiency, real earnings management and its impact on investment efficiency by applying panel regression models. This study contributes to developing research on the impact of real earnings management on the assessment of investment decisions by expanding the research geography and adding to the limited body of existing research on this topic.

The study is organised as described below. First, the essence of real earnings management and investment efficiency is described to reveal the link between these two economic phenomena. A literature review is presented to identify the research gap in the study of real earnings management at public limited companies in the Baltic Countries. Further on, the research methodology is developed, enabling the assessment of the impact of real earnings management on investment efficiency. The developed methodology is then empirically tested. Finally, the study results are summarised, and potential guidelines for further research are identified.

**Literature Review**

The analysis of the academic literature reveals several approaches to the essence of real earnings management. Schipper (1989) relates real earnings management to investment and financing planning, whereby the financial performance of an

entity is changed in a preferable direction. Real earnings management is challenging to identify, as it is often not easy to distinguish the actual purpose of individual investments and the rationale behind the choice of funding, i.e. whether they seek a genuine expansion of the economic entity's activities or serve to showcase a more attractive financial performance. Roychowdhury (2006) refers to real earnings management as the deviation from usual operating practices due to the managers' desire to improve the operating result by creating the false impression that results have been achieved by applying usual accounting procedures. The author assumes that in some cases, real earnings management is unavoidable in certain economic situations, such as when discounting or reducing discretionary expenditure. However, under normal conditions, according Roychowdhury (2006), real earnings management is a negative phenomenon. Gunny (2010) and Zang (2012) argue that real earnings management is introduced when managers tendentiously adjust the timing and structure of business transactions, investments and/or financing transactions to influence financial performance.

Typical examples of real earnings management include reducing discretionary expenditure, reducing production costs, and applying unjustified sales discounts. The most common reductions in discretionary expenditure relate to reductions in general and administrative, research and development, and fixed asset maintenance costs to increase the profit for the current year (Roychowdhury, 2006). Earnings are also boosted by reducing production costs through overproduction and allocating fixed production costs to a more significant number of produced units. Unjustified additional discounts to customers may increase sales on the one hand but, on the other hand, reduce cash flows from operating activities. Opportunistic decisions by managers concerning real earnings management can improve the current year's financial performance. However, by doing so, managers risk the performance of future periods, future cash flows and lost opportunities to bring new products and services to the market.

The academic literature is twofold regarding real earnings management's positive and negative aspects. Some scholars (Watts and Zimmerman, 1990; Fields et al., 2001; Gunny, 2010; Zhao et al., 2012) view real earnings management not only as a negative economic phenomenon but also as a tool used by entities' managers to share with existing and potential investors inside information about the entity's financial standing and expectations about the company's future performance. A more significant number of scholars (Schipper, 1989; Healy and Wahlen, 1999; Roychowdhury, 2006; Cohen and Zarowin, 2010; Kothari et al., 2016) view real earnings management as a more negative phenomenon, arguing that managers of entities pursue self-interested objectives in managing real earnings by providing investors with misleading information about the entity. It is clear that real earnings management, like earnings management in general, can be viewed both positively and negatively, depending on the incentives that drive companies' managers to apply real earnings management in the first place.

The analysis of the research result has shown that real earnings management adversely impacts the entity's future financial performance (Gunny, 2010; Braam et al., 2015; Kothari et al., 2016; I Putu, Sutrisno, and Endang, 2019; Jeong and Choi, 2019; Comporek, 2020), cash flows (Gunny, 2010; Zang, 2012; Francis, Hasan, and Li, 2016; Jeong and Choi, 2019), and the entity's market value (Gunny, 2010; Kothari et al., 2016; Jeong and Choi, 2019). Managers manage real earnings to achieve their objectives (Baker, Lopez, Reitenga and Ruch, 2019). However, this distorts information about the entity's financial standing, operating results, and cash flows. As a result, users of financial information rely on inaccurate data in making economic decisions. An entity may appear more profitable, generate more cash flows, and face less risk than it is now. Thus, there is a growing asymmetry in the information available to managers and investors (Abad, Cutillas-Gomariz, Sanchez-Ballesta, and Yague, 2018), which affects the rationale for investment decisions and threatens to under-represent the true needs and capabilities of the entity.

Neoclassical economic theory states that entities invest to increase their value until the marginal benefit equals the marginal investment expenditure. Unfortunately, there are no ideal conditions in the market. Agency theory argues that capital market imbalances cause entities to deviate from their optimal level of investment, which translates into either overinvestment or underinvestment (Jensen ir ir Meckling, 1976; Chen, El Ghoul, Guedhami, and Wang, 2014). In the case of overinvestment, managers invest inefficiently by choosing the wrong projects to use up all the entity's available resources. In the case of underinvestment, entities faced with capital market imperfections reject suitable projects because of the high cost of capital raising, split incentives or risk aversion.

Verdi (2006) points out that investment efficiency can be seen in two dimensions. First, entities need to raise capital to finance investment projects. Under ideal market conditions, all projects generating a positive net present value should be financed. However, in actual market conditions, entities face various constraints, such as the high cost of capital raising, which makes them reluctant to finance even projects with a positive net present value. This leads to underinvestment. Second, the proper implementation of an investment project cannot be guaranteed. The decision-maker may make an error when choosing an investment project, using additional funds to finance it, or not using sufficient funds. In this case, overinvestment occurs. However, according to Verdi (2009), such conditions may sometimes lead to underinvestment too. Underinvestment and overinvestment are also caused by a mismatch of information between the investor and the entity and between the promoter and the intermediary.

Biddle et al. (2009) define an efficiently investing entity as one that implements investment projects that generate positive net present value without market disturbances, such as intermediation costs or bad options. In the case of underinvestment, the entity misses the opportunity to undertake a project that generates a positive net present value. In the case of overinvestment, the entity invests in projects that generate a negative net present value.

This definition of investment decisions is also supported by other scholars (Chen et al., 2011; Gorgieva-Trajkovska and Kostadinovski, 2012; Wang et al., 2015).

Research (Biddle et al., 2006; Verdi, 2006; John, Litov, and Yeung, 2008; Biddle et al., 2009; Chen et al. 2011, Biddle, Callahan, Hong, and Knowles, 2016) analysis shows that when assessing investment efficiency, researchers look at the presence of overinvestment or underinvestment, the investment-cash flow sensitivity, or the riskiness of the investment decisions. The impact assessment model for overinvestment and underinvestment measures the likelihood of overinvestment and underinvestment. It is assumes that agency issues between managers and external investors lead to investment inefficiencies because managers and external investors have access to the entity's financial information of varying granularity (Biddle et al., 2009). The assessment model for investment-cash flow sensitivity assumes that entities' investments deviate from their optimal level due to information asymmetries between managers and external investors. It also reflects investment inefficiency due to cash surpluses or shortages. Reducing information asymmetries improves investment efficiency (Biddle et al., 2006). The essence of the risk assessment model of managers' investment decisions is that, as information asymmetry decreases, managers invest in riskier but value enhancing investment projects (John et al., 2008; Biddle et al., 2016). In the empirical studies analysed, the overinvestment and underinvestment model is significantly more frequently used to assess investment efficiency than the models of investment-cash flow sensitivity and the riskiness of investment decisions.

An analysis of the concepts of real earnings management and investment efficiency has shown that these two economic phenomena are linked by disturbances related to information asymmetries. On the one hand, by managing real earnings, entities distort the information presented in the financial statements. On the other hand, existing and potential investors risk making inappropriate investment decisions based on such distorted financial information, either by failing to take full advantage of all opportunities or simply overestimating the entity's ability to generate future cash flows and financial performance that justifies the investors' risk.

The academic literature severely lacks empirical studies assessing the impact of real earnings management on investment efficiency. The impact of accruals management on investment efficiency has been studied in much more detail. Most studies show that accruals management reduces investment efficiency. For example, Zhou and Zhang (2019) found that accrual management increases both overinvestment and underinvestment in Chinese firms. Ellili (2022) found a positive correlation between sustainable financing, the quality of financial reporting, and investment efficiency in UAE companies. To determine the quality of the financial reporting, this study used an assessment of accruals management, i.e. the more accruals are managed, the lower the quality of the financial reporting. The study of Gaio, Tiago and João (2023), which analysed accruals management in nineteen European countries, found that investment efficiency is higher in companies with lower levels of accruals management. As both accruals management and real earnings management are earnings management techniques, it can be assumed that real earnings management has a similar impact on investment efficiency as accruals management. The limited research on the impact of real earnings management on investment efficiency confirms this.

Assad, Jaafar and Zervopoulos (2023), who investigated the impact of real earnings management of US companies on investment efficiency and overinvestment or underinvestment, found a significant negative correlation between real earnings management and investment efficiency. This means that real earnings management is an important factor influencing investment efficiency. Reducing real earnings management would allow entities to make more optimal investment decisions.

The negative impact of real earnings management on investment efficiency is also evidenced by the study by Priscilia and Trisnawati (2023), who analysed the impact of real earnings management, fraud and earnings informativeness on investment decisions in Indonesian manufacturing companies.

The study of Khan et al. (2024) linked real earnings management to the quality of the financial statements and analysed its impact on investment efficiency in developing Asian countries. According to these authors, the higher the real earnings management is, the lower is the quality of the financial reporting. The results of this study showed that the smaller the real earnings management, the higher the investment efficiency.

Previous research results also suggest that real earnings management is more detrimental than accruals management, as it has a long-term impact on both cash flow and financial performance (Cohen, Dey, and Lys, 2008; Braam et at., 2015). Moreover, real earnings management is much more difficult to detect than accruals management, which can be identified by applying auditing methodologies developed for this purpose. In contrast, real earnings management requires a sophisticated expert assessment of whether the decisions are optimal and necessary to achieve the entity's best performance (Chi, Lisic, and Pevzener, 2011; Hastuti et al., 2020).

After summarising the results of the research analysis and assessing the impact of real earnings management on the financial information quality that serves as a basis for investors to make investment decisions, the hypothesis of this research is formulated below:

$H_1$ *Real earnings management makes a negative impact on investment efficiency.*

Assad et al. (2023) carried out panel data analysis using the generalised method of moments and multiple logistic regression to assess the impact of real earnings management on investment efficiency. Priscilia and Trisnawati (2023) also analysed the panel data and used the generalised method of least squares, as the survey data were heteroscedastic. Most of the studies assessing the impact of earnings management on investment efficiency used regression analysis with panel data. To assess real earnings management, the authors of both studies used the model proposed by Roychowdhury (2006), calculating abnormal cash flows from ordinary activities, abnormal production cost, and abnormal discretionary expenditure. Priscilia and Trisnawati (2023) additionally analysed the impact of fraud and income informativeness on investment efficiency, using both factors as independent variables. Priscilia and Trisnawati (2023) used Biddle, Hilary and Verdi (2009) model to assess investment efficiency. Meanwhile, Assad et al. (2023) assessed the efficiency of investment decisions as a change in investment volume, assuming that increasing investment volumes may signal overinvestment, and decreasing investment volumes may signal underinvestment. They also used Biddle et al. (2009) as an alternative to test this research model. The model robustness tests showed that very similar research results are obtained when measuring investment efficiency in both ways. Both Assad et al. (2023) and Priscilia and Trisnawati (2023) studies differ in the choice of the number of control variables. Priscilia and Trisnawati (2023) chose three control variables often used in studies of the impact of earnings management on investment efficiency. At the same time, the study by Assad et al. (2023) is distinguished by the large number of control variables, eleven in total. It should be noted that the research period of Priscilia and Trisnawati (2023) covers only three years, whereas Assad et al. (2023) analysed data of twenty-one years. A more extended period is more reliable because it allows the identification of long-term trends and causal links between economic phenomena, significantly when these phenomena may have lagged effects on each other. To compare the results with previous studies, the authors of this study also used the model proposed by Roychowdhury (2006) to assess real earnings management and the model of Biddle et al. (2009) to assess investment efficiency. The fourteen year period chosen for the study is long enough to assume that the results indicate long-term trends in Baltic companies listed on the stock exchange.

Analysis of previous scientific publications revealed that accruals management is more often analysed in the researches of accruals management impact on the investment efficiency. Meanwhile, the impact of real earnings management is more often analysed when assessing the quality of financial reporting. Studies assessing the impact of real earnings management on the investment efficiency have been performed only in the USA and Asian countries. Our study aims to reveal the impact of real earnings management on the investment efficiency in companies listed on the stock exchange in the Baltic States. Thus, we close the gap in this research area.

## Research Methods
### Research Data

The study analysed the financial information of companies listed on Nasdaq Baltic stock exchange from 2010 to 2023. 72 Lithuanian, Latvian and Estonian companies are listed on this stock exchange. The 25 companies in the financial services, real estate development and utilities sectors were excluded from the study because their activities are specific and distinct from those of companies in other sectors or because their investment decisions and pricing are regulated at the state level. Further, 14 companies whose financial statements lacked the data for the study were eliminated, too. The study, therefore, analyses the financial information of 33 companies for 14 years period. As not all companies were listed for the entire period under consideration, data for some companies have been collected for less than 14 years. In total, 355 observations have been generated.

The study used panel data analysis. Time series and cross-sectional analysis of the panel data allows for more inferences about the data; less collinearity and more variability are expected between variables, and a higher number of degrees of freedom makes models more accurate. The panel data analysis can detect and assess the influence of variables that simple time series or cross-sectional analysis cannot (Shahzad, 2016). Therefore, the results of panel data analysis can provide more detailed and accurate insights into the correlations between the economic phenomena under study.

### Investment Efficiency Assessment

Investment efficiency is the dependent variable in this study. Investment efficiency is assessed using the model suggested by Biddle et al. (2009), which allows for assessing the direction of deviation from optimal investment, i.e. whether an economic entity is overinvesting or underinvesting relative to its investment opportunities. It is by far the most widely used model in research to assess investment efficiency (Chen and kt., 2011; Cherkasova and Rasadi, 2017; Houcine, 2017; Oswald et al., 2022; Assad et al. 2023) due to its simplicity of application and its suitability for use in both listed and unlisted companies. Both overinvestment and underinvestment are not efficient. According to Biddle et al. (2009), investment efficiency increases when investment decreases in the companies with a higher probability of overinvestment and increases in those with a higher probability of underinvestment.

To calculate the variation of actual investment from the expected investment volume, Biddle et al. (2009) suggest the following regression equation:

$$\frac{Investment_{i,t+1}}{Assets_{i,t-1}} = \beta_0 + \beta_1 SalesGrowth_t + \varepsilon_{i,t} \qquad (1)$$

where $Investment_{i,t+1}$ – all the company's $i$ actual investment in the year $t$, $Assets_{i,t-1}$ – all the company's $i$ actual assets in the year *t-1*; $SalesGrowth_{i,t}$ – the change in the company's $i$ sales revenue (%) in the year $t$, compared to the year *t-1*; $\beta_n$ – coefficient; $\varepsilon_{i,t}$ – random error.

This equation calculates the values of the random errors $\varepsilon_{i,t}$, representing the variation of the actual investment from the expected level of investment. Those companies with negative estimated random errors are treated as underinvesting, i.e. not exploiting the potential

investment volume. Companies with positive random errors are treated as overinvesting.

*Measuring Real Earnings Management*

To assess real earnings management, the model proposed by Roychowdhury (2006) is used, which is based on the calculation of abnormal cash flows from ordinary activities, abnormal production cost, and abnormal discretionary expenditure. It is the primary model researchers use as the basis for assessing real earnings management, with a high degree of model robustness. It should be noted that other researchers (Gunny, 2010; Srivastava, 2019; Cohen, Pandit, Wasley, and Zach, 2020) suggested improving the model for measuring real earnings management by including additional variables and proposing more complex calculations. However, these improvements do not appear in subsequent research. It can be assumed that the model proposed by Roychowdhury (2006) is sufficiently robust and that the complexity of the proposed modifications to this model does not provide the advantage that would lead researchers to choose other models for assessing real earnings management.

To measure the management of cash flows from ordinary activities $(REM_{CFOi,t})$, Roychowdhury (2006) proposes the following equation:

$$\frac{CFO_{i,t}}{Assets_{i,t-1}} = \alpha_0 + \alpha_1 \frac{1}{Assets_{i,t-1}} + \alpha_2 \frac{Sales_{i,t}}{Assets_{i,t-1}} + \alpha_3 \frac{\Delta Sales_{i,t}}{Assets_{i,t-1}} + \varepsilon_{i,t} \quad (2)$$

where $CFO_{i,t}$ – the company's $i$ cash flows from ordinary activities in the year $t$; $\Delta Sales_{i,t}$ – the change in the company's $i$ sales revenue in the year $t$; compared to the year $t$-1; $Sales_{i,t}$ – the company's $i$ sales revenue in the year $t$; $Assets_{i,t-1}$– the company's $i$ assets in the year $t$-1.

Negative random errors indicate abnormal cash flows from ordinary activities due to manipulating selling prices and payment terms.

To identify the production cost $(REM_{PRODi,t})$ management, Roychowdhury (2006) suggests the following equation:

$$\frac{PROD_{i,t}}{Assets_{i,t-1}} = \alpha_0 + \alpha_1 \frac{1}{Assets_{i,t-1}} + \alpha_2 \frac{Sales_{i,t}}{Assets_{i,t-1}} + \alpha_3 \frac{\Delta Sales_{i,t}}{Assets_{i,t-1}} + \alpha_4 \frac{\Delta Sales_{i,t-1}}{Assets_{i,t-1}} + \varepsilon_{i,t} \quad (3)$$

where $PROD_{i,t}$ – the company's $i$ cost of products sold in the year $t$; $\Delta Sales_{i,t}$ – the change in the company's $i$ sales revenue in the year $t$, compared to the year $t$-1; $Sales_{i,t}$ – the company's $i$ sales revenue in the year $t$; $\Delta Sales_{i,t-1}$ the change in the company's $i$ sales revenue in the year $t$-1, compared to the year $t$-2; $Assets_{i,t-1}$ the company's $i$ assets in the year $t$-1.

Positive random errors indicate overproduction due to the manipulation of production volumes that are too high compared to actual demand to reduce the cost of products sold.

To identify the discretionary expenditure $(REM_{DISXi,t})$ management, Roychowdhury (2006) suggests the following equation:

$$\frac{DISX_{i,t}}{Assets_{i,t-1}} = \alpha_0 + \alpha_1 \frac{1}{Assets_{i,t-1}} + \alpha_2 \frac{Sales_{i,t}}{Assets_{i,t-1}} + \varepsilon_{i,t} \quad (4)$$

where $DISX_{i,t}$ – the company's $i$ discretionary expenditure in the year $t$, calculated as the sum of sales, general and administrative, and research and development expenses; $Sales_{i,t}$ – the company's $i$ sales revenue in the year $t$; $Assets_{i,t-1}$– the company's assets $i$ in the year $t$-1.

Negative random errors indicate that the company is reducing its discretionary expenditure to show a better result.

Once the abnormal cash flows from ordinary activities, abnormal cost price, and abnormal discretionary expenditure have been determined, the formula provided by Cohen and Zarowin (2010) is used to calculate the real earnings management *REM* using the following equation:

$$REM_{i,t} = -REM_{CFOi,t} + REM_{PROD\,i,t} - REM_{DISXi,t} \quad (5)$$

A positive result indicates that the company applies real earnings management.

*Assessment of Real Earnings Management Impact on Investment Efficiency*

After assessing investment efficiency and real earnings management, the impact of real earnings management investment efficiency is further assessed using an equation constructed based on previous research assessing the impact of earnings management on investment efficiency (Verdi, 2006; Biddle et al., 2009; Chen et al., 2011; Cherkasova and Rasadi, 2017; Ellili, 2022):

$$InvEff_{i,t+1} = \alpha + \beta_1 REM_{i,t} + \beta_2 LnSales_{i,t} + \beta_3 LnAge_{i,t} + \beta_4 Tang_{i,t} + \beta_5 Lev_{i,t} + \beta_6 ROA_{i,t} + \beta_7 CFO_{i,t} + \varepsilon_{i,t}$$

(6)

where $InvEff_{i,t+1}$ – the company's $i$ investment efficiency in the year $t+1$; $REM_{i,t}$– the company's $i$ real earnings management in the year $t$; $LnSales$ – the company's size, for which the natural logarithm of sales is calculated; $LnAge$ – the company's age, for which the natural logarithm from the beginning of the company's operations. $Tang$ – the ratio of fixed assets to total assets; $Lev$ – the ratio of fixed liabilities to equity capital; $ROA$ – the ratio of net profit to total assets; $CFO$ – the ratio of cash flows to assets.

As our hypothesis assumes that real earnings management reduces investment efficiency, it is expected that the regression analysis will result in $\beta_1$ a negative and statistically significant value.

The selection of control variables in this study is based on those most commonly used in previous studies to assess the potential influence of factors besides real earnings management on investment efficiency. Table 1 shows the control variables, their descriptions, and the authors of the studies where they are used.

**Table 1. Description of the Control Variables Used in the Research Model**

| Control variables | Justification for the Inclusion of the Variable in the Research Model | Author(s) |
|---|---|---|
| LnSales | Smaller companies tend to manipulate financial information more often than larger companies. Therefore, the larger the company, the higher the investment efficiency. | Verdi, 2006; Biddle et al., 2009; Cherkasova and Rasadi, 2017; Houcine, 2017; Zhou and Zhang, 2019; Assad et al., 2023; Gaio et al., 2023; Khan et al., 2024 |
| LnAge | Growing companies are more prone to manipulate financial information than mature companies. Therefore, the older the company, the higher the investment efficiency. | Biddle et al., 2009; Cherkasova and Rasadi, 2017; Houcine, 2017; Gaio et al., 2023; Assad et al., 2023; Khan et al., 2024 |
| Lev | Studies show that the higher the ratio, the bolder the companies are in making risky investment decisions and the more likely they are to manipulate financial information to avoid lenders' constraints. | Zhou and Zhang, 2019; Gaio et al., 2023; Priscilia and Trisnawati, 2023 |
| ROA | According to the agency theory, corporate managers will likely make less efficient investment decisions when the company performs well. | Biddle and Hilary, 2006; Zhou and Zhang, 2019 |
| Tang | The higher the ratio of fixed assets to total assets, the bolder the companies make risky investment decisions and the more likely they are to manipulate financial information to avoid lenders' constraints. | Biddle and Hilary, 2006; Biddle et al., 2009; Cherkasova and Rasadi, 2017; Gaio et al., 2023; Khan et al., 2024 |

| | | |
|---|---|---|
| CFO | Managers of companies with sizeable free cash flow tend to overinvest, expanding the business beyond its optimal size. | Richardson, 2006, Biddle and Hilary, 2006; Biddle et al., 2009; Cherkasova and Rasadi, 2017; Houcine, 2017; Zhou and Zhang, 2019; Assad et al., 2023; Gaio et al., 2023; Khan et al., 2024 |

*\*(Source: Compiled by authors).*

## Research Results and Discussion

An initial data analysis was carried out to assess the numerical characteristics of the variables in the research model, the results of which are presented in Table 2.

**Table 2. Numerical Characteristics of the Variables in the Research Model**

| Variable | Average | Median | Standard Deviation | Min | Max |
|---|---|---|---|---|---|
| InvEff | 0.0000 | 0.0005 | 0.0292 | -0.0809 | 0.1038 |
| REM | 0.0182 | 0.0316 | 0.3775 | -1.2008 | 1.0190 |
| LnSales | 4.2563 | 4.5357 | 1.4832 | 0.0178 | 6.8742 |
| LnAge | 3.1954 | 3.0910 | 0.6334 | 0.0693 | 4.8040 |
| Lev | 0.1537 | 0.1199 | 0.1365 | 0.0000 | 0.6397 |
| ROA | 0.0522 | 0.0481 | 0.0707 | -0.3153 | 0.3139 |
| Tang | 0.5331 | 0.5705 | 0.2360 | 0.0588 | 0.9723 |
| CFO | 0.0947 | 0.0790 | 0.0871 | -0.2615 | 0.3832 |

*\*(Source: Compiled by authors).*

During the period analysed half of the variables, i.e. investment decision efficiency (InvEff), real earnings management (REM), company size (LnSales) and long-term assets to total assets ratio (Tang), is lower than their median. Meanwhile, the average of the variables of company age (LnAge), long-term liabilities to equity ratio (Lev), cash flow to assets ratio (CFO) and ROA is higher than their median. This means that the distribution is asymmetric. The variable of company size (LnSales) varied the most from the average, and the variable of investment decision efficiency (InvEff) varied the least. The average size of the studied companies, measured by the natural logarithm of sales, is about 4.26. It varies in the interval from 0.0178 to 6.8742. This shows that the studied companies are of very different sizes, and larger companies are more dominant. The average age of a company, measured by the natural logarithm from the date of its establishment, is about 3.2. There is a large gap between the oldest and youngest companies, which is more than 4.7. The asymmetric age distribution indicates the dominance of older companies. Meanwhile, although the variable for the of investment efficiency (InvEff) deviated the least from the average, it varied in the range from – 0.0809 to 0.1038. This means that companies were both underinvesting and underinvesting. Although the standard deviation of ROA was also small, which means a small dispersion of ROA data, this indicator varied in the range from minus 31,5 percent to almost 31.4 percent. This indicates that the return on assets in the studied companies is very different. The standard deviation of the REM variable is very large compared to the mean and median. This indicates a large dispersion of the data. Since the values of this variable vary from negative to positive, this means that some companies manage real performance, while others do not.

Table 3 shows the calculated Pearson correlation coefficients between the variables.

**Table 3. Correlation Matrix of Variables**

|          | InvEff  | REM     | LnSales | LnAge   | Lev     | ROA     | Tang   | CFO |
|----------|---------|---------|---------|---------|---------|---------|--------|-----|
| InvEff   | 1       |         |         |         |         |         |        |     |
| REM      | -0.0637 | 1       |         |         |         |         |        |     |
| LnSales  | 0.0294  | -0.0907 | 1       |         |         |         |        |     |
| LnAge    | 0.0101  | 0.0970  | -0.2208 | 1       |         |         |        |     |
| Lev      | -0.0543 | 0.0268  | 0.1612  | -0.1530 | 1       |         |        |     |
| ROA      | 0.0150  | -0.3748 | 0.0053  | 0.0354  | -0.2834 | 1       |        |     |
| Tang     | -0.0437 | -0.0758 | 0.1384  | -0.1846 | 0.6191  | -0.1692 | 1      |     |
| CFO      | -0.0723 | -0.5391 | 0.0848  | -0.0651 | -0.1240 | 0.5543  | 0.0519 | 1   |

*(Source: Compiled by authors).*

The correlation between the investment efficiency and the dependent and control variables is very weak. InvEff is very weakly negatively correlated with REM, Lev, Tang and CFO. This allows us to conclude that there is no multicollinearity problem between the variables. Meanwhile, REM is statistically significantly negatively correlated with CFO and moderately negatively with ROA. Real earnings management has a negative long-term impact on cash flow and performance. Lev is statistically significantly positively correlated with Tang.

For evaluation of the regression model, the F, Breusch–Pagan, and Hausman tests performed indicate that a fixed effects model is appropriate for the regression analysis of panel data. Two-dimensional clustering at the time series and cross-sectional levels are used to address the issue of heteroscedasticity and cross-sectional correlation. Petersen (2009) proposed this approach as the most appropriate method for estimating standard errors in financial data studies using panel data. It allows us to consider the unobserved effects of the company and the time needed to solve the listed issues, ensuring the results' reliability and reducing the likelihood of erroneous conclusions. Table 4 shows the statistics of the combined regression model.

**Table 4. Results of regression model of the Impact of Real Earnings Management on Investment Efficiency**

| Variables | InvEff |
|-----------|--------|
| *Constant* | 0.0214 |
| REM | -0.0185** |
| LnSales | 0.0188** |
| LnAge | -0.0193* |
| Lev | -0.0210 |
| ROA | -0.0038 |
| Tang | -0.0529 |
| CFO | -0.0828* |
| $R^2$ | 0.0804 |
| *Prob (F-statistics)* | 0.002 |
| *** $p<0.01$; ** $p<0.05$; * $p<0.10$ | |

*(Source: Compiled by authors).*

The estimated significance of the regression model is less than 0.05, which means that the model is statistically significant, and the independent and control variables explain the changes in investment efficiency. The determination coefficient of the model is 0.0804, indicating that the independent variables explain more than 8% of the dependent variable.

The coefficient of the independent variable REM is negative and significant as $p<0,05$, confirming the hypothesis that real earnings management negatively affects investment efficiency and is consistent with the findings of previous studies (Assad et al., 2023; Priscilia and Trisnawati, 2023). The obtained result is also consistent with agency theory that suggests that managers' opportunistic behaviour in managing real earnings can lead to sub-optimal use of available economic resources. The negative impact of real earnings management on investment efficiency can be explained in several ways. Managers may postpone or, on the contrary, advance certain managerial decisions to achieve short-term objectives. However, this may undermine the sustainable growth of the value added generated by the company (Gunny, 2010; Kothari et al., 2016; Jeong and Choi, 2019; Comporek, 2020). Real earnings management also increases information asymmetries between managers and stakeholders (Abad et al., 2018; Assad et al., 2023; Priscilia and Trisnawati, 2023). Thus, the risk arises that investment decisions will not align with the companies' capabilities and needs for future investment projects.

The study results show that LnSales (5% level of significance), LnAge and CFO (10% level of significance) are significant among the control variables. The positive correlation between the company's size (LnSales) and investment efficiency suggests that larger companies tend to make more efficient investment decisions. It can be assumed that larger companies have adequate internal control systems that limit the scope for specific manipulation by managers. Large companies are continuously audited, so the additional external scrutiny can also lead to a lower application of real earnings management. In addition, such companies pay more attention to risk management, leading to more beneficial investment choices by putting managers in a specific frame of reference for making investment decisions.

The results show that investment decisions are less efficient for longer-operating companies with higher cash flows. The result of the analysis indicating significant negative correlation between the company's age and investment efficiency is in line with the results of study by Assad et al. (2023), which also found a negative statistical relation between the two variables. Meanwhile, studies analysing the impact of the quality of financial reporting on investment efficiency more often find the opposite result. It can be explained by the established investment decision-making practices of companies listed on the Nasdaq Baltic Stock Exchange. It can be assumed that younger companies, although less experienced, may be more flexible in making investment decisions, as they can adapt more easily and quickly to changing market conditions. However, it is not necessarily true that older companies are more experienced and, therefore, able to make more efficient investment decisions. They may have developed complex and cumbersome decision-making mechanisms, making it more time consuming, and thus, they struggle to adapt to a changing environment. Two notable aspects exist about the significant negative correlation between cash flows and investment efficiency. On the one hand, higher cash flows provide more significant investment opportunities, allowing companies to implement investment decisions without significant constraints and exploit potential opportunities. On the other hand, there is a risk that corporate managers will too quickly invest in investment projects that have not been thoroughly assessed because a lack of financial resources does not constrain them. This can lead to investment in the wrong projects, thus undermining investment efficiency.

The impact of control variables Lev, ROA and Tang on investment efficiency is not statistically significant. However, the calculated coefficients confirm the assumptions described in Table 1. It can be assumed that these variables do not significantly impact the companies listed on the

Nasdaq Baltic Stock Exchange because they are emerging market companies that are more influenced by factors other than those included in the model of this study when making investment decisions. For example, it is possible that the return on assets (ROA) indicator is not relevant for investment decisions, as companies consider future performance rather than past performance when assessing investment projects. Priscilia and Trisnawati (2023) used return on equity (ROE) as a control variable in their study, which was not statistically significant either. Thus, although the variables presented by Lev, Roa and Tang have not shown a statistically significant impact on investment efficiency in the context of this study, this does not mean that they have not been taken into account when making investment decisions.

In summary, the empirical results of the study confirm the results of previous limited studies (Assad et al., 2023; Priscilia and Trisnawati, 2023) that real earnings management reduces investment efficiency in the companies listed on the Nasdaq Baltic Stock Exchange. Applying real earnings management can lead to sub-optimal investment decisions, both because of self-interested behaviour by corporate managers and increased information asymmetries. Putting the results in the context of the agency theory, it can be argued that when managers are not effectively controlled, information asymmetries can help them take advantage of the opportunity to seek personal gain instead of focusing on the company's increasing value.

### Conclusions

This empirical study assesses the impact of real earnings management on the investment efficiency in companies listed on the Nasdaq Baltic stock exchange by applying regression analysis. The study was dominated by larger and older companies. The return on assets in the studied companies was both positive and negative, but the spread of this data was moderate. Not all companies invested efficiently, there were companies that both underinvested and overinvested. The empirical study revealed that joint-stock companies in the

Baltic States manage real earnings. However, the variance of the data for the variable of real earnings management was high. The results of the study have confirmed the hypothesis that real earnings management has a negative impact on investment efficiency. The results coincide with the previous research (Assad et al., 2023; Priscilia and Trisnawati, 2023). This means that the more companies manage real earnings, the less efficient investment is. The results of the study revealed that larger companies tend to make more efficient investment decisions. Meanwhile, the investment decisions of older companies and companies generating higher cash flows are less efficient. When analysing the age of the company and the efficiency of investment decisions, a negative relationship was also found by Assad et al. (2023).

The results of this study may be of interest to investors, regulators and policymakers as they reveal the potential impact of real earnings management on investment decisions of companies in the Baltic States. Investors are interested in the quality of financial statements. As a result, it acts as a governance mechanism, reducing information asymmetry, intermediation problems and improving companies' investment decisions. This empirical study complements the limited research on the impact of real earnings management on investment decision efficiency by extending it to Baltic companies. It is also based on previous research as the regression equation includes control variables commonly used in previous studies. Our study has certain limitations. Only listed companies were analysed, therefore, the results of unlisted companies may differ from the results of this empirical study. Another limitation of the study is that not all companies listed on the Nasdaq Baltic stock exchange could be used due to lack of data. In the empirical study, the impact of real earnings management on the investment efficiency is analysed without grouping companies by industry, which may also affect the results obtained. Future studies could be aimed at assessing the impact of real performance management on the efficiency of investment decisions in individual industries and in

unlisted companies. It would be worthwhile to compare the situation of companies in the Baltic States and other EU countries.

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