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Association between earnings management and non-GAAP measures

Asociación entre la gestión de resultados y las medidas no GAAP

Associação entre o gerenciamento de resultados e medidas não GAAP

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Abstract

Purpose: To investigate the association between Abnormal Book-Tax Differences (ABTD) and the measures of Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA), and Adjusted EBITDA, as reported by Brazilian publicly traded companies.

Methodology: Use of canonical correlation on data manually collected from Reference Forms regarding EBITDA and Adjusted EBITDA, as well as information from financial statements needed to estimate ABTD, which were obtained from the Economatica® platform, analyzing the behavior of the variables during the period from 2012 to 2021.

Results: The study's results reveal significant associations between the variables, highlighting that ABTD has a greater influence on EBITDA than on Adjusted EBITDA. This finding suggests that accounting and tax earnings management practices, which can be simultaneously captured in ABTD, go beyond mandatory financial information, making them not directly observable in the values disclosed by companies in measures such as EBITDA.

Contributions of the Study: The study contributes to the literature by demonstrating that ABTD can be used for the joint assessment of financial performance measures, revealing possible indications of earnings manipulation. The analysis of the association between ABTD and EBITDA alerts investors and other users to the need for caution when interpreting mandatory and voluntary information disclosed by companies. The study also paves the way for the development of more sophisticated models in future research, deepening the understanding of ABTD's influence on measures beyond EBITDA.

Keywords: Canonical correlation; EBITDA; Adjusted EBITDA; Earnings management; Non-GAAP measures; Earnings quality.

Resumen

Objetivo: Investigar la asociación entre la gestión de resultados contables y fiscales, reflejada en las *Book-Tax Differences* Anormales (BTDA), y las medidas *Earnings Before Interest, Taxes, Depreciation and Amortization* (EBITDA) y EBITDA ajustado, divulgadas por las compañías de capital abierto brasileñas.

Metodología: Utilización de la correlación canónica en datos recopilados manualmente de los Formularios de Referencia sobre el EBITDA y el EBITDA ajustado, y en la información de los estados contables necesaria para estimar la BTDA, obtenidos en la plataforma Economatica®, observando el comportamiento de las variables analizadas en el período de 2012 a 2021.

Resultados: Los resultados del estudio revelan asociaciones significativas entre las variables, destacando que la BTDA ejerce una mayor influencia sobre el EBITDA que sobre el EBITDA ajustado. Este hallazgo sugiere que las prácticas de gestión de resultados contables y fiscales que pueden ser capturadas simultáneamente en la BTDA van más allá de la información contable obligatoria, de manera que no son directamente observables en los valores divulgados por las compañías en medidas como el EBITDA.

Contribuciones del Estudio: El estudio contribuye a la literatura al demostrar que la BTDA puede ser utilizada para evaluar conjuntamente medidas de desempeño financiero, revelando posibles indicios de manipulación de resultados. El análisis de la asociación entre la BTDA y el EBITDA alerta a los inversores y demás usuarios sobre la necesidad de cautela al interpretar la información obligatoria y voluntaria divulgada por las empresas. El estudio también abre el camino para el desarrollo de modelos más sofisticados en futuras investigaciones, profundizando la comprensión de la influencia de la BTDA en otras medidas además del EBITDA.

Palabras clave: Correlación canónica; EBITDA; EBITDA ajustado; Gestión de resultados; Medidas no GAAP; Calidad de los resultados.

Resumo

Objetivo: Investigar a associação entre o gerenciamento de resultados contábeis e tributários, refletido na *Book-Tax Differences Anormal* (BTDA), e as medidas *Earnings Before Interest, Taxes, Depreciation and Amortization* (EBITDA) e EBITDA ajustado, divulgadas por companhias abertas brasileiras.

Metodologia: Utilização da correlação canônica em dados coletados manualmente nos Formulários de Referência sobre o EBITDA e o EBITDA ajustado, e em informações das demonstrações contábeis necessárias para estimar a BTDA foram obtidas na plataforma Economatica®, observando o comportamento das variáveis analisadas no período de 2012 a 2021.

Resultados: Os resultados do estudo revelam associações significativas entre as variáveis, destacando que a BTDA exerce maior influência sobre o EBITDA do que sobre o EBITDA ajustado. Essa constatação sugere que práticas de gerenciamento de resultados contábeis e tributários, que podem ser capturadas simultaneamente na BTDA, ultrapassam as informações contábeis

obrigatórias, de maneira que não são diretamente observáveis nos valores que são divulgados pelas companhias em medidas como o EBITDA.

Contribuições do Estudo: O estudo contribui para a literatura ao demonstrar que a BTDA pode ser utilizada para avaliar conjuntamente medidas de desempenho financeiro, revelando possíveis indícios de manipulação de resultados. A análise da associação entre a BTDA e o EBITDA alerta investidores e demais usuários sobre a necessidade de cautela ao interpretar informações obrigatórias e voluntárias divulgadas pelas empresas. O estudo também abre caminho para o desenvolvimento de modelos mais sofisticados em pesquisas futuras, aprofundando a compreensão da influência da BTDA em outras medidas além do EBITDA.

Palavras-chave: Correlação canônica; EBITDA; EBITDA ajustado; Gerenciamento de resultados; Medidas não GAAP; Qualidade dos lucros.

1 Introduction

Financial performance measures, as defined by the Generally Accepted Accounting Principles (GAAP), are referred to as GAAP measures. Conversely, those that are not covered by these principles are known as non-GAAP measures and can be used by managers in the presentation of results that they consider to be more representative (Brown, 2020; Marques, 2017). Nevertheless, as managers have a certain degree of freedom to prepare them (Andrade & Murcia, 2022), these measures can become “traps” when the goal is to disclose more favorable results than those obtained based on GAAP (Brown, 2020). This flexibility raises questions about the subjectivity involved in developing these measures and the potential for manipulation of results, which could mislead investors and other users.

Earnings Before Interest, Taxes, Depreciation and Amortization (EBITDA), a non-GAAP measure that reflects the companies’ cash generation potential (Andrade & Murcia, 2022), has led the Securities and Exchange Commission of Brazil (*Comissão de Valores Mobiliários – CVM*) to establish guidelines for its disclosure. This need arose due to the frequent use of EBITDA and the particularities observed in the practices of Brazilian publicly-held companies (*Explanatory Note to CVM Instruction No. 527, 2012*). *CVM Instruction No. 527* (2012), later updated by *CVM Resolution No. 156* (2022), aims to standardize the reporting of EBITDA and its variants, such as adjusted EBITDA, guiding companies that choose to present these measures in their financial reports (*CVM Resolution No. 156, 2022*).

Studies on the disclosure of EBITDA in Brazil have revealed possible informational biases. For example, Maragno et al. (2014) observed that, in the first years following the implementation of *CVM Instruction No. 527* (2012), companies that failed to comply with the standard reported higher than expected EBITDA values. Moreover, Kistner and Platt (2023) found inconsistencies in the reconciliations of EBITDA with the financial statements in later periods, raising doubts regarding the origin of the identified errors. Additionally, Pontes et al.. (2023) showed that the increase in non-compliance regarding *CVM Instruction No. 527* (2012) in EBITDA reconciliations may be associated with Abnormal Book-Tax Differences (ABTD), which account for abnormal differences between accounting profit and tax profit. Specifically, ABTD serves as a proxy for possible accounting and tax earnings management practices. The authors, however, did not

investigate whether ABTD can be considered a predictor variable of EBITDA or its variant adjusted EBITDA. Thus, the main theoretical gap in this research consists in exploring whether managed accounting and tax earnings are captured by non-GAAP measures, represented in this study by EBITDA and adjusted EBITDA.

Black and Christensen (2009) highlight the difficulty in discerning whether the use of non-GAAP measures to achieve strategic goals not achieved based on GAAP is opportunistic in nature. In the Brazilian context, the voluntary disclosure of EBITDA, despite being regulated by the CVM, raises questions regarding possible informational biases, as noted by Maragno et al. (2014), Kistner and Platt (2023), and Pontes et al. (2023). Given this scenario, this study sought to answer the following research question: **Which non-GAAP measures, EBITDA and adjusted EBITDA, are associated with the management of accounting and tax results reflected in ABTD?**

This study investigates the association between the management of accounting and tax results, reflected in ABTD, and the EBITDA and adjusted EBITDA measures, using data manually collected from the Reference Forms made available by CVM, covering the period from 2012 to 2021. The ABTD estimate was prepared based on data from the financial statements obtained on the Economatica® platform. The canonical correlation analysis was used as a method to assess the variables, as it comprises an appropriate technique to identify the variables that are most strongly related to each other, considering more than one predictor present (Fávero & Belfiore, 2017).

Researchers have highlighted the need for more specific studies on EBITDA, despite its relatively wide use in the market. Bouwens et al. (2019) and Rozenbaum (2019) note that there is a shortage of in-depth academic studies on this financial measure. Additionally, Mey and Lamprecht (2021) highlight the lack of research on the topic, particularly with regard to the reasons for low-quality disclosures and the relationship between non-GAAP and GAAP measures, which remain little explored.

The research is justified by adding new discussions on the disclosure of EBITDA and adjusted EBITDA, considering the Brazilian environment, in which these measures are voluntary and widely adopted by publicly-traded companies (Brazilian Institute of Corporate Governance [*Instituto Brasileiro de Governança Corporativa* – IBGC], 2020; KPMG, 2016). Moreover, there is a low concentration of studies on their disclosure in this scenario (Andrade & Murcia, 2022), which reinforces the importance of a more detailed analysis of these measures and their relationship with earnings management practices.

Studies such as those by Tang and Firth (2011), Brunozi, Kronbauer, Martinez et al. (2018) and Moraes and Macedo (2021) show the association between ABTD and earnings management. These findings highlight the relevance of ABTD as an indicator for low-quality earnings, serving as a “red flag” for investors. According to Tang and Firth (2011), the origin of ABTD may be related to factors such as information asymmetry, conflicts of interest, and the search for different types of rewards by managers. This behavior is supported by Agency Theory, as proposed by Jensen and Meckling (1976), which suggests that managers may act in their own interest, distorting financial information. This perspective indicates that the biases present in profits, reflected in ABTD, may extend to non-GAAP measures, such as EBITDA, distorting the perception of a company’s performance.

The study contributes to the literature by complementing that of Pontes et al. (2023), investigating whether ABTD is more strongly associated with EBITDA or adjusted EBITDA, which may strengthen the argument that ABTD can be used as a warning sign both in the assessment of accounting and taxable profits and in the assessment of these non-GAAP measures.

In the Brazilian context, tax legislation has a strong influence on corporate accounting (Iudícibus et al., 2005). The complexity of the tax system, which involves various taxes, state, and municipal legislation, and a high tax burden – particularly on consumption and production – contributes to the prevalence of Book-Tax Differences (Brunozi, 2016). Although convergence to the International Financial Reporting Standards (IFRS), since 2010, has sought to reduce this influence, evidence suggests that tax legislation still plays a significant role.

Recent studies point to aggressive tax practices (Martinez & Dalfior, 2015; Martinez & Silva, 2019; Santos & Oliveira, 2020), as well as the association between ABTD and reduced earnings quality (Brunozi, Kronbauer, Alves et al., 2019; Brunozi, Kronbauer, Martinez et al., 2018; Morais & Macedo, 2021), reinforcing the need to dedicate special attention to possible biases in the accounting information of Brazilian publicly-traded companies.

2 Literature Review

2.1 Non-GAAP Measures and Calculation of EBITDA and Adjusted EBITDA

The Agency Theory, proposed by Jensen and Meckling (1976), considers the existence of a contract in which the principal delegates power to the agent, assuming that both act rationally aiming to maximize their personal utility. It is also assumed that there is a process of risk aversion, associated costs such as monitoring costs, and information asymmetry, as the agent's behavior is not fully observable by the principal. Consequently, these factors may lead to agency problems (Jensen & Meckling, 1976; Scott, 2015).

In order to mitigate conflicts of interest, based on agency problems, efforts are made to promote the disclosure of regulatory and/or voluntary information that improves the decision-making process by users (Core, 2001; Healy & Palepu, 2001; Scott, 2015). Conversely, decisions that result in the concealment of information can lead managers to appropriate investors' resources for their own benefit, revealing opportunistic behaviors that are detrimental to the information reported in the capital market (Dye, 2001; Shleifer & Vishny, 1997; Verrecchia, 2001). Although voluntary information can complement mandatory information, with the aim of reducing information asymmetry, their combination does not completely eliminate the possibility of management manipulation (Core, 2001).

Scott (2015) highlights that accounting information continuously competes with alternative sources, such as websites, other forms of media, management disclosures, and even financial institutions. Non-GAAP measures refer to information regarding a company's past or future financial performance, resulting from adjustments to a traditional accounting measure (GAAP or IFRS) through the exclusion or inclusion of certain values (Brown, 2020). Some of the most common include "core or adjusted operating income, adjusted earnings per share (EPS), earnings before interest, taxes, depreciation and amortization (EBITDA), adjusted EBITDA, free cash flow, and, to some extent, adjusted revenue" (Brown, 2020, p. 146). Despite the competition, accounting information is still a major factor, although it is complemented by non-GAAP measures.

The use of non-GAAP measures by companies stems from the understanding that information based on GAAP or IFRS is not the only way to communicate corporate results (International Accounting Standards Board, 2011), but there is controversy about the best way to make such communications. From one perspective, managers may choose to improve performance information by excluding transitory revenues or expenses (Marques, 2006). Nevertheless, another

perspective suggests that the elimination of non-transitional items may be intended to mislead stakeholders (Marques, 2006; Heflin & Hsu, 2008).

Studies conducted in the United States indicates that Regulation G, the standard applicable to non-GAAP measures in that country, brought benefits to the quality of this information, such as higher returns, higher quality exclusions, and greater consistency and comparability (Marques, 2006; Heflin & Hsu, 2008; Zhang & Zheng, 2011). Results, however, are not unanimous, suggesting that non-GAAP measures can be used opportunistically to achieve strategic profit targets (Black & Christensen, 2009), exceed analysts' forecasts (Doyle et al., 2013), and be applied aggressively in association with earnings management involving operational activities and accruals (Black et al., 2017).

Specifically regarding EBITDA disclosure, Bouwens et al. (2019) analyzed U.S.-based companies listed on the S&P 1500 index between 2005 and 2016, aiming to identify possible opportunistic motivations behind this practice. The authors concluded that EBITDA disclosure is associated with unfavorable business characteristics, such as smaller size, higher debt, intensive use of capital, longer operating cycles, and greater dispersion in analysts' forecasts. They also indicated that, although the disclosure of EBITDA can improve the perception of corporate results, this measure may not reflect the financial reality of companies (Bouwens et al., 2019).

In the South African context, Mey and Lamprecht (2021) examined the quality of EBITDA disclosure in companies listed on the Johannesburg Stock Exchange (JSE) in 2014 and 2016. Using an adaptation of the Zhang and Zheng (2011) model to assess EBITDA and considering attributes such as emphasis, higher EBITDA performance, and adjustments to expenses with stock-based compensation, the authors investigated the possibility of opportunistic disclosure by companies. The negative association observed between EBITDA reconciliations and attributes considered opportunistic led them to conclude that the information on EBITDA disclosed by companies is of higher quality (Mey & Lamprecht, 2021).

In Brazil, studies point to the relevance of EBITDA disclosure and its content in transmitting information to the market, although other studies warn of the possibility of bias in the use of this measure. Andrade and Murcia (2019) analyzed companies listed on the IBrX 100 index between 2014 and 2015 and observed that most of the adjustments that increased adjusted EBITDA resulted from the application of IFRS principles and rules to profit. Error corrections, equity income results, and impairment tests exemplify these adjustments. Based on these findings, the authors concluded that EBITDA adjustments contribute to improving financial reporting in accounting statements.

Andrade and Murcia (2022) investigated the factors that influence the disclosure of EBITDA by companies listed on the IBrX 100 index in 2014 and 2015. The authors found evidence of greater disclosure of EBITDA, particularly in cases of strong corporate governance, lower net revenues, and larger balances of fixed assets. This practice, according to the authors, can be interpreted as a way of transmitting relevant information to investors and other capital market participants.

In contrast to studies that point to the relevance of EBITDA disclosure, evidence suggests that a number of companies listed on the IBrX-100 used this measure opportunistically between 2010 and 2012, disclosing inflated values when they were not in compliance with *CVM Instruction No. 527* (2012). This questionable practice was observed in the early years of the standard's implementation in Brazil (Maragno et al., 2014).

Kistner and Platt (2023) investigated EBITDA data disclosed by 35 Brazilian publicly-traded companies between 2018 and 2020, with the aim of assessing methodological divergences in the calculation of this measure. They identified inconsistencies regarding *CVM Instruction No. 527* (2012) and their financial statements, with frequent errors related to depreciation, amortization, and depletion. The authors warn of the relevance of this evidence, highlighting the susceptibility of non-GAAP measures to errors and manipulations, even though they are widely used.

Corroborating the aforementioned investigations, Pontes et al. (2023) considered the period from the implementation of *CVM Instruction No. 527* (2012) to the year 2021, seeking to examine the compliance of EBITDA reconciliations with this standard by publicly-traded companies that chose to disclose them as “non-accounting measures” in their Reference Forms, also standardized by the CVM. Moreover, the study assessed whether disclosures that failed to comply with the CVM Instruction were associated with the management of accounting and tax results, reflected in ABTD. As their main finding, the authors demonstrated that ABTD increases the probability of non-compliance in the disclosure of EBITDA, suggesting that managers may manipulate results for misleading purposes. Despite this finding, the authors did not show whether manipulations in accounting and tax profits, reflected in ABTD, are captured by non-GAAP measures, which would corroborate the results, pointing to a possible cascade management of GAAP and non-GAAP measures.

Regarding the disclosure of EBITDA in accordance with *CVM Instruction No. 527* (2012) (replaced by *CVM Resolution No. 156*, 2022), it should be clarified that said instruction establishes the need to reconcile this non-GAAP measure with the information contained in the financial statements of Brazilian companies (*CVM Instruction No. 527*, 2012). Therefore, the disclosure of EBITDA can be considered to be in compliance with the CVM regulation if the company presents quantitative reconciliations that demonstrate the nature of the accounts and the amounts related to the net income for the period, such as: i) income taxes; ii) financial expenses net of financial income; and iii) depreciation, amortization, and depletion.

The CVM regulation instructs companies to present three groups of required information related to EBITDA, where applicable. In addition to quantitative reconciliations, in the event that companies have discontinued operations, it is necessary to disclose EBITDA with or without the net results linked to these operations. Finally, if there are other adjustments to EBITDA, the standard instructs companies to disclose them, indicating the nature of the adjusted accounts and the sequential values to the reconciled EBITDA, as well as informing that the number disclosed refers to the adjusted EBITDA (*CVM Instruction No. 527*, 2012). Therefore, in the event that companies fail to comply with all the rules mentioned, it can be inferred that the disclosure of EBITDA or adjusted EBITDA is not in compliance with the aforementioned instruction.

Table 1 presents an example of the disclosure structure of EBITDA and adjusted EBITDA, considering the CVM standard, which refers to *CPC Technical Pronouncement No. 26* (2011).

Table 1
EBITDA and Adjusted EBITDA Disclosure Structure

Revenues
(-) Cost of goods and services sold
(=) Gross profit
Other revenues
(-) Selling, administrative or other expenses
(=) Income before taxes
(-) Income taxes
(=) Net income for the period
(+) Income taxes
(+) Financial expenses net of financial income
(=) EBIT
(+) Depreciation, amortization and depletion expenses
(=) EBITDA
(+/-) Net income linked to discontinued operations
(=) EBITDA with or without net income linked to discontinued operations
(+) Error correction
(+) Equity income
(+) Impairment test
(=) Adjusted EBITDA

Source: Prepared based on CVM Instruction No. 527 (2012) and CPC Technical Pronouncement No. 26 (2011).

2.2 ABTD and Research Hypothesis

The accounting standards applicable to companies for the recognition, measurement and disclosure of economic events establish an accounting standard that differs from tax standards in countries where corporate and tax legislation present different levels of financial and fiscal compliance (Costa, 2012; Hanlon & Heitzman, 2010; Koubaa & Anis, 2015). This divergence between the standards and/or the discretionary accounting choices of managers, involving the company's operations, results in a phenomenon known as Book-Tax Differences (BTD) (Ávila et al., 2017).

Studies on BTD have sought to understand the origin of the differences between profits, exploring both normative arrangements and opportunistic behaviors of managers. These differences are categorized into normal and abnormal components (Brunozi, 2016). Normal BTD (NBTD) is estimated to explain the portion of the difference between earnings associated with non-discretionary trends, arising from the application of accounting and tax standards to events and transactions (Brunozi, Kronbauer, Alves et al., 2019; Brunozi, Kronbauer, Martinez et al., 2018). Conversely, ABTD reflects the portion of the difference that cannot be explained by purely normative factors, suggesting the influence of possible accounting and tax earnings management practices (Tang & Firth, 2011). Thus, ABTD may indicate the possibility of discretionary execution of accruals on an accrual basis. Simultaneously, it can point to the use of artifices in accounting standards and tax strategies to obtain specific results (Tang, 2005; Tang & Firth, 2011; Brunozi, Kronbauer, Martinez et al., 2018). According to Tang and Firth (2011), ABTD is a key warning for users of accounting information, indicating that reported profits may not reflect a company's economic reality.

Tang (2005) presented evidence that Chinese companies subject to higher income tax rates, or which have issued new shares in the capital market, demonstrated higher ABTD. The author emphasizes that, in a certain countries, the informational content of BTDs on taxable income often exceeds the relevance of the accounting profit itself (Tang, 2005). In the context of Brazilian companies, studies have shown that the abnormal component of BTDs is associated with earnings management, discretionary accruals and lower-quality earnings (Brunozi, Kronbauer, Martinez et al., 2018), as well as with lower persistence of accounting results (Brunozi, Kronbauer, Alves et al., 2019). These various findings reinforce the idea, in this study, that ABTD can be considered a metric of earnings quality.

The opportunistic behavior of managers, seeking to achieve their interests through discretionary accounting choices, is supported by Agency Theory. From this perspective, incentive contracts, such as compensation linked to targets, debt agreements and share prices may inadvertently encourage earnings management (Tang & Firth, 2011). This manipulation of earnings, reflected in ABTD, raises suspicions about the veracity of reported earnings, suggesting that the numbers may have been adjusted for the managers' own benefit.

In view of the above and considering the theoretical framework that allows establishing an association between ABTD and EBITDA, as well as its adjusted EBITDA variant, disclosed by the companies, the following hypothesis is proposed for this research:

H_a: Possible biases in profits, resulting from the management of accounting and tax results reflected in ABTD, are captured by EBITDA and adjusted EBITDA.

3 Methodological Procedures

This research covers non-financial publicly-traded companies in Brazil that were traded on the [B]³ Stock Exchange in the period from 2012 to 2021. Those in the financial sector were excluded due to the nature of their operations and the specific accounting regulations of the Brazilian Central Bank (*Banco Central do Brasil* – BACEN). Thus, the universe investigated encompasses 340 listed companies, with information on EBITDA and adjusted EBITDA during the period, and active on [B]³, totaling 2,069 and 1,021 observations, respectively.

Table 2 presents the criteria adopted in defining the observations analyzed.

Table 2

Definition of the observations analyzed

	n
Number of observations of non-financial companies for the period 2012-2021	2,649
(-) Number of observations of companies that did not disclose EBITDA	580
(=) Number of observations of companies that disclosed EBITDA	2,069
(-) Number of observations of companies that did not disclose adjusted EBITDA	1,151
(+) Number of observations of companies that disclosed only adjusted EBITDA	103
(=) Number of observations of companies that disclosed adjusted EBITDA	1,021

Source: Research data.

EBITDA and adjusted EBITDA data were collected manually from the companies' Reference Forms, available on the CVM website. To estimate ABTD and NBTD (additional test),

data obtained from the Economatica® platform were used, which include the values on equity and income accounts included in the financial statements.

When estimating the components of BTd, this study adopted an extrapolation procedure, in line with previous research that investigated ABTD in the Brazilian context (Brunozi, Kronbauer, Alves et al., 2019; Brunozi, Kronbauer, Martinez et al., 2018; Sant'anna & Brunozi, 2019). As an additional test, NBTD was obtained by the difference between Total BTd (TBTd) and ABTD. Because it refers to non-discretionary trends, NBTD is able to provide robustness to the analysis of whether EBITDA values are opportunistic or otherwise. Equations 1, 2 and 3 present the formulations and variables used to calculate TBTd, ABTD and NBTD, respectively.

$$TBTd_{it} = \frac{PBIT_{it} - TP_{it}}{TA_{it}} \quad (1)$$

Where:

TBTd_{it} = Total difference between accounting and taxable income of company i in year t.

PBIT_{it} = Profit before income tax of company i in year t.

TP_{it} = Expense with current income tax and social contribution on net income of company i in year t, divided by the maximum rate of 34%.

TA_{it} = Total assets of company i in year t.

$$TBTd_{it} = \alpha_i + \beta_1 EQUIV_{it} + \beta_2 \Delta REV_{it} + \beta_3 FIX_{it} + \beta_4 INT_{it} + \beta_5 JCI_{it} + \beta_6 DTL_{it} + \varepsilon_i \quad (2)$$

Where:

TBTd_{it} = Total difference between accounting and taxable income of company i in year t (Equation (1)).

EQUIV_{it} = Equity income of company i in year t.

ΔREV_{it} = Variation in net revenue of company i from year t-1 to year t, scaled by total assets.

FIX_{it} = Balance of fixed assets of company i in year t, scaled by total assets.

INT_{it} = Remaining balance of deferred assets and balance of intangible assets of company i in year t, scaled by total assets.

JCI_{it} = (A) Equity of company i in year t-1 multiplied by the Long-Term Interest Rate (LTIR) accumulated up to t. (B) Calculation of 50% of the net income of company i in year t. If the result of (A) is lower than (B), (A) is considered; if the result of (A) is higher than (B), (B) is considered.

DTL_{it} = Dummy for tax losses. Binary variable equal to 1 if the IR and CSLL provisions are positive; otherwise, it assumes a value equal to 0.

ε_i = Residuals of the regression that are used to estimate the ABTD as an explanatory variable in the canonical correlation model.

$$NBTD_{it} = TBTd_{it} - ABTD_{it} \quad (3)$$

The panel data technique was used to generate the ABTD and NBTD, assessing the most appropriate regression method among the pooled, fixed and random effects models, in line with the mentioned variables. The choice between these methods was based on Chow, Breusch-Pagan Lagrange Multiplier (LM) and Hausman tests, with a nominal significance level of 5%, according to Gujarati and Porter (2011). Additionally, the data from the model in Equation (2) were subjected to the Breusch-Pagan and Variance Inflation Factor (VIF) tests. If the Breusch-Pagan test indicated heteroscedastic (different) error variances, the estimation of the regression model coefficients was performed based on robust and clustered standard errors (Fávero & Belfiore, 2017).

Regression with multiple dependent variables, or canonical correlation models, allows the formulation of more robust constructs when the explanatory variables are not known a priori (Fávero & Belfiore, 2017). Based on this approach, the technique was used to examine the dependent variables EBITDA and adjusted EBITDA, identifying the one that presents the greatest association with ABTD and NBTDA. This method helped to determine the most relevant variables, offering a statistically significant understanding of the behavior of the dependent variables.

The canonical correlation model of this research includes the canonical variables u_1 , v_1 , u_2 and v_2 , which represent linear combinations of two sets of dependent and explanatory variables. Canonical variables are used to assess whether more than one dimension is necessary to study the proposed relationships (Fávero & Belfiore, 2017). Due to the different metrics in the selected variables, they were normalized using Z-scores. Thus, this modeling aims to maximize the percentage of variance between pairs of canonical variables (Fávero & Belfiore, 2017). The corresponding equations are shown in Equations 4 through 8.

$$ebitda, adjusted_ebitda = f(abtd, nbtd) \quad (4)$$

$$u_{1i} = \cos \theta_{11} \cdot zebitda_i + \sin \theta_{11} \cdot zadjusted_ebitda_i \quad (5)$$

$$v_{1i} = \cos \theta_{21} \cdot zabtd_i + \sin \theta_{21} \cdot znbtd_i \quad (6)$$

$$u_{2i} = \cos \theta_{12} \cdot zebitda_i + \sin \theta_{12} \cdot zadjusted_ebitda_i \quad (7)$$

$$v_{2i} = \cos \theta_{22} \cdot zabtd_i + \sin \theta_{22} \cdot znbtd_i \quad (8)$$

The statistical significance of each parameter in the canonical models was assessed using the t-test. The relevance of the canonical dimensions was analyzed using the Wilks' lambda, Pillai's trace and Lawley-Hotelling trace tests (Fávero & Belfiore, 2017). In all analyses, a nominal significance level of 5% was adopted.

In the identification of outliers in the research data, values with high dispersion and asymmetry in the scalar variables were examined. Subsequently, the 1% winsorization procedure was used, using the Stata 13® software (Costa, 2012; Ávila et al., 2017). After these steps, the relative frequency, minimum value, median, maximum value, mean and standard deviation were calculated. Additionally, the variables corresponding to the BTDA were generated, and the canonical correlation analyses were performed.

4 Results and Analyses

Table 3 presents the descriptive statistics of the quantitative variables of the research.

Table 3*Descriptive statistics of quantitative variables*

Variables	n	Mean	Standard deviation	Minimum	Median	Maximum
EBITDA	2,069	0.094	0.348	-14.597	0.102	2.505
Adjusted EBITDA	1,029	0.846	12.378	-0.400	0.102	282.269
ABTD	924	-0.011	0.054	-0.391	-0.011	0.776
NBTD	924	-0.003	0.138	-1.728	0.018	0.717

Note. EBITDA and adjusted EBITDA: Values disclosed by Brazilian publicly-traded companies scaled by total assets; ABTD and NBTD: Abnormal and normal differences between accounting and taxable profits.

Source: Research data.

It can be seen that the range of results is much greater in adjusted EBITDA than in EBITDA, although the median is the same for both (0.102). The average for adjusted EBITDA (0.846) exceeds that for EBITDA (0.094), indicating the influence of extreme values. This result suggests that companies are beginning to reflect more individualized characteristics of adjustments made to adjusted EBITDA, which should contribute to the cash generation potential. Nevertheless, it is worth noting that, in order to comply with *CVM Instruction No. 527* (2012), a description of the nature and motivation for the adjustments is required, as well as reconciliation with the result for the period (*CVM Instruction No. 527*, 2012; *CVM Resolution No. 156*, 2022). These findings corroborate the study by Andrade & Murcia (2019), which noted that the main adjustments in adjusted EBITDA were the result of accounting principles and rules.

With regard to BTDs, the accounting information of the companies analyzed is influenced by both non-discretionary and discretionary trends. The average obtained in this research for ABTD, with a negative magnitude, is close to the ABTDs found by Brunozi, Kronbauer, Martinez et al. (2018), and Sant'anna and Brunozi (2019). This pattern reveals a propensity for the management of accounting and tax results in the context of Brazilian companies, possibly differing from the international scenario, as highlighted by Silva et al. (2022), who identified a ABTD of positive magnitude, close to zero. Furthermore, it is noted that the standard deviation of ABTD was lower than that of NBTD ($0.054 < 0.138$), which may be related to the fact that manipulation practices are carried out in small magnitudes, precisely to avoid attracting attention. Higher values could attract more attention.

Table 4 presents the results of the canonical correlation model, considering the EBITDA and adjusted EBITDA disclosed by the companies in relation to ABTD and NBTD.

Table 4*Canonical correlation model results*

PANEL A – Linear combinations for canonical correlations					
	Variables	Coefficient	Standard Deviation	t	P>t
u₁	zebitda	5.860	0.780	7.520	0.000***
	zadjusted ebitda	-61.093	29.739	-2.050	0.041**
v₁	zabtd	0.260	0.111	2.350	0.020**
	znbtd	1.838	0.135	13.650	0.000***
u₂	zebitda	8.894	51.538	0.170	0.863

	zadjusted_ebitda	-401.728	1.966.165	-0.200	0.838
v ₂	zabtd	1.491	7.325	0.200	0.839
	znbtbd	-0.097	8.905	-0.010	0.991
Canonical correlation between u ₁ and v ₁ = 0.6465 and between u ₂ and v ₂ = 0.0128					
PANEL B – Significance tests of all canonical correlations					
Tests	Statistic	df1	df2	F	Prob>F
Wilks' lambda	0.582	4	518	40.257	0.000***
Pillai's trace	0.418	4	520	34.362	0.000***
Lawley-Hotelling trace	0.718	4	516	46.327	0.000***
Roy's largest root	0.718	2	260	93.351	0.000***
PANEL C – Significance test of canonical correlations 1-2					
Testes	Statistic	df1	df2	F	Prob>F
Wilks' lambda	0.582	4	518	40.257	0.000***
PANEL D – Significance test of canonical correlation 2					
Testes	Statistic	df1	df2	F	Prob>F
Wilks' lambda	1.000	1	260	0.043	0.836

Note: zebitda and zadjusted_ebitda: Standardized values of EBITDA disclosed by Brazilian publicly-traded companies, scaled by total assets; zabtd and znbtbd: Standardized values of abnormal and normal differences between accounting and taxable profits. Statistical significance level: * p-value < 0.10; ** p-value < 0.05; *** p-value < 0.01.

Source: Research data.

The results in Table 4 show the parameters of the standardized coefficients to form the canonical variables. Notably, variables EBITDA and adjusted EBITDA are statistically significant at a 5% level, contributing to the formation of the variable u₁. Conversely, explanatory variables ABTD and NBTD play a key role in the formation of the variable v₁. The correlation between u₁ and v₁ is substantial, reaching 0.6465, while the correlation between u₂ and v₂ is only 0.0128. Thus, the results of the significance tests of the canonical correlations (Panel B) indicate that a single canonical dimension is sufficient to describe the association between the pairs of dependent and explanatory variables. This finding is relevant, as it suggests the lack of association between NBTD and EBITDA, pointing to possible evidence of a discretionary trend between the profits and EBITDA of the companies examined.

Table 5 shows the canonical loadings, illustrating the hierarchy of influences of the non-standardized variables on the canonical variables u₁ and v₁.

Table 5
Canonical loadings on variables u₁ and v₁

Variables	1	2
zebitda	0.989	-0.150
zadjusted_ebitda	0.835	-0.550
zabtd	0.053	0.999
znbtbd	0.985	-0.172

Note: zebitda and zadjusted_ebitda: Standardized values of EBITDA disclosed by Brazilian publicly-traded companies, scaled by total assets; zabtd and znbtbd: Standardized values of abnormal and normal differences between accounting and taxable profits.

Source: Research data.

Table 5 reveals that the canonical loadings on u_1 and v_1 show that EBITDA exerts the greatest influence on the formation of u_1 (0.989), while ABTD has the greatest impact on v_1 (0.999). This implies that EBITDA plays a more relevant role in this association than adjusted EBITDA, while, similarly, ABTD has a greater influence than NBTDA. Although adjusted EBITDA is more flexible in representing the potential for cash generation, given the adjustments allowed by *CVM Instruction No. 527* (2012), in companies where adjustments do not necessarily improve performance, there seems to be a bias towards EBITDA. In turn, possible biases present in earnings, reflected in ABTD, can be captured by the resulting EBITDA. Therefore, these results do not allow us to reject the research hypothesis.

It should be noted that earnings management practices can extend beyond mandatory accounting information, including non-GAAP measures such as EBITDA. This reinforces Core's (2001) argument that voluntary disclosure does not entirely eliminate information asymmetry and management manipulation. Moreover, these results corroborate the findings of studies on opportunistic disclosures of non-GAAP measures (Black & Christensen, 2009; Black et al., 2017; Doyle et al., 2013), which indicate that managers may adopt different practices to influence users' perceptions, in a way that is not directly observable in the values and accounts that are disclosed by companies as non-GAAP.

Given the association between ABTD and EBITDA, there is a possibility, as evidenced in the study by Kistner and Platt (2023), that the discrepancies in the EBITDA disclosed by companies, compared to the EBITDA expected according to *CVM Instruction No. 527* (2012), may extend beyond simple inconsistencies, constituting intentional manipulation of this measure. Regarding the study by Pontes et al. (2023), which showed that ABTD increases the probability of non-compliance regarding *CVM Instruction No. 527* (2012) in terms of reconciliations, this research complements that study by showing that manipulated values of accounting and taxable profits are captured by EBITDA, which reveals the possibility of multiple forms of management.

5 Final Remarks

The purpose of this study was to investigate the association between the management of accounting and taxable results, reflected in ABTD, as well as the non-GAAP EBITDA and adjusted EBITDA measures disclosed by Brazilian public companies. To this end, a canonical correlation model was used to analyze the data manually collected from Reference Forms and financial statement data obtained on the Economatica® platform, in order to estimate the ABTD of 340 non-financial companies, covering the period from 2012 to 2021.

Based on the assumptions of Agency Theory, which suggests that managers may act in their own interest, harming the transparency of financial information, the study explored whether the biases present in accounting and tax profits, resulting from earnings management practices and reflected in ABTD, are associated with EBITDA and adjusted EBITDA. The findings of this research indicate that ABTD is significantly associated with EBITDA, but not with adjusted EBITDA, suggesting that these measures may not be fully reliable indicators of a company's financial performance. This implies that such metrics may not reduce information asymmetry between managers and investors, failing as effective mechanisms for monitoring the agent by the principal.

The identification of this association between ABTD and EBITDA, as opposed to adjusted EBITDA, suggests that, in the absence of adjustments that favor the potential for cash generation,

managers may choose to disclose EBITDA to mask practices of accounting and tax earnings management. This finding reinforces the need for a critical and in-depth analysis by users of financial statements of the non-GAAP measures disclosed, since manipulations in these metrics may not be easily detectable.

The contribution of this study lies in highlighting the capture of manipulations in accounting and tax earnings by non-GAAP measures, represented in this research by EBITDA and adjusted EBITDA, filling the theoretical gap identified in the literature. From a practical standpoint, by demonstrating that ABTD can be used as an indicator of possible informational biases in disclosed EBITDA, this research provides support for investors, analysts, and regulators to improve their assessments of companies' financial performance. This may influence accounting and regulatory practices, encouraging greater rigor in the disclosure of non-GAAP measures and promoting greater transparency in the capital markets.

The results also point to directions for future research. It is suggested that more sophisticated models be developed that better capture the complex relationship between ABTD and non-GAAP measures, considering other sectors, different periods or incorporating additional variables that may influence EBITDA and adjusted EBITDA. The association found between earnings management and EBITDA allows the study to be replicated using other earnings management metrics, to provide robustness to the existence of this relationship.

A limitation of this research is related to the use of the canonical correlation model, which may simplify the complex relationship between the variables studied, thereby failing to capture all the nuances and factors that influence EBITDA.

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