

Weaknesses in Internal Controls: impacts of investment, information quality, performance, and corporate governance

Kelly Cristina Mucio Marques¹  José Braz Hercos Junior²  Andréa Lúcia Doná³  Ademir Massahiro Moribe⁴ 

^{1,2,3,4} Universidade Estadual de Maringá (UEM), Maringá, Paraná, Brasil



¹kcmmarques@uem.br

²jbhjunior@uem.br

³aldona@uem.br

⁴ammoribe@uem.br

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Abstract

Objective: This study examines how investment, information quality, performance, and corporate governance behave in Brazilian publicly traded companies with material weaknesses (MW).

Method: A logistic regression model was used, with a final sample of 985 observations, in a panel, pooled, and cross-sectional model.

Results: The results showed that, as expected, companies with lower financial performance (ROA) and higher earnings management, i.e., lower information quality, had a higher probability of presenting MW. Contrary to expectations, companies with higher levels of corporate governance showed a higher probability of MW, which theoretically should reflect better governance and more reliable internal controls.

Contributions: The relevance of the study is to bring to the debate, in an emerging country, factors that can impact the reliability of mandatory financial accounting information, playing a role in reducing information asymmetry. The implication of the results is to highlight points that increase the probability of material failures in internal controls, which can help improve them and reduce recurrences. As well as showing regulators that, although companies with higher levels of governance are more likely to have material weaknesses, the regulations may be putting pressure on these issues, as evidenced by a reduction in the percentages of MW occurrences in 2024.

Keywords: Internal Control Weakness; Internal Control; Explanatory Factors.

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Introduction

The disclosure of internal control deficiencies (MWs) is always associated with negative aspects in companies. Ge and McVay (2005) found that MWs are generally related to poor revenue recognition policies, lack of segregation of duties, inappropriate accounting reconciliations, among others, which can compromise the quality of financial statements.

According to Ge and McVay (2005), companies that disclose MWs have more complex businesses, are smaller, and have lower financial performance (ROA: return on assets). Doyle et al. (2007a) examined the determinants of MW and found that companies with these problems tend to be smaller, younger, financially weaker, more complex, rapidly growing, or undergoing restructuring. In Brazil, Maquiaveli (2023) found that larger companies with higher market-to-book ratios, losses, and audited by the Big Four are more likely to disclose MWs; older companies with increased sales are less likely to disclose MWs. These studies analyzed company characteristics and some indicators together as determinants of MWs.

Individually, research also shows that the quality of accounting information, financial decisions, and company performance can impact MW. Ashbaugh-Skaife et al. (2008) found evidence that the quality of internal control affects the quality of accruals, an important component of reliable financial statements. Feng et al. (2015) report that studies have documented negative consequences of maintaining ineffective internal controls, such as lower earnings quality, higher cost of equity and debt, increased management and analyst forecasting errors, and inefficient investments. Feng et al. (2015) empirically verified that companies with MW had lower operating performance than those with effective controls.

Biddle et al. (2009) found that companies with higher quality financial reports show fewer deviations in expected investment levels. Cheng et al. (2013) found that investment efficiency improves significantly after the disclosure of MWs. For Heitzman and Huang (2019), the evidence suggests that high-quality financial reports reduce information asymmetry between insiders and outsiders, controlling moral hazard and adverse selection problems that prevent efficient investment.

Jensen (1993) mentions that substantial research-based data supports the proposition that the internal control systems of publicly traded companies have generally failed to make managers maximize the efficiency and value of the firm and highlights that aspects of corporate governance can help solve problems related to internal controls.

In this sense, Hoitash et al. (2009) found that characteristics of the board and audit committee are associated with the

quality of internal control. Ji et al. (2015) found that the probability of Chinese companies voluntarily disclosing MWs is not only associated with company characteristics such as profitability, age, and business complexity, but is also strongly related to corporate governance and ownership structure.

Chen et al. (2011) mention studies that show that the quality of financial reports is lower in countries with low investor protection, where financial systems are bank-oriented and there is greater compliance between tax and financial reporting rules. This scenario is very similar to that of emerging countries such as Brazil.

In Brazil, only with NBC TA 265 of December 3, 2009, and the inclusion of this content in the Reference Form, through CVM Instruction 480/2009, now revoked, did the disclosure of MW by independent auditors become mandatory. A few years after this requirement came into force, Façanha et al. (2021) concluded, after analyzing information disclosed regarding risk management and internal control of companies involved in corruption and money laundering scandals, that laws and regulations do not seem to inhibit such practices. Recent news reports cases of companies listed on B3 (Brazilian Stock Exchange, over-the-counter market) that have had accounting problems, such as Americanas (Infomoney, 2023) and Magazine Luiza (MoneyTimes, 2023).

The results of Perazzolli et al. (2020) showed that companies issuing American Depositary Receipts (ADRs) with shares traded on the New York Stock Exchange, including Brazilian companies, have serious internal control problems with the risk of significant distortions, which may affect investors' decisions. These facts reveal the importance of analyzing some determinants related to the disclosure of MW in Brazilian companies.

Together, these results indicate that the presence of MWs is a risk factor for increased information asymmetry and may be associated with several factors within companies. Although several studies mentioned have analyzed the determinants of MWs, they generally focus on company characteristics (Doyle et al., 2007a; Perazzolli et al., 2020; Maquiaveli, 2023), such as age, size, complexity, among others, and some indicators.

Given the context outlined above, there remains a gap regarding the influence of factors such as the quality of accounting information, corporate governance, investment, and performance as determinants of the presence of MWs, especially in a developing country such as Brazil, with differences in compliance with capital market rules compared to more developed markets. Several studies cited analyzed these factors in isolation in American companies, where there is

enforcement of the Sarbanes-Oxley Act (SOX) of 2002, with severe penalties for non-compliance with its requirements.

In order to complement these results, the objective is to verify how investment, information quality, performance, and corporate governance behave in Brazilian publicly traded companies with significant MWs.

The relevance of this study is to bring to the debate, in an emerging country, the importance of internal control for the reliability of mandatory financial accounting information, with the role of reducing information asymmetry and increasing information transparency.

The results obtained showed that, as expected, companies with lower financial performance (ROA) and greater earnings management, i.e., lower information quality, were more likely to have significant MW. Furthermore, contrary to what Jensen (1993) proposes and the results of Hoitash et al. (2009), companies that are at higher levels of corporate governance on B3 are more likely to have significant MW.

This finding shows that being at different levels of corporate governance, even after the new version of the new market regulation, which requires companies to have an audit committee, internal audit, implement compliance functions, internal controls, and corporate risks, may still present a higher incidence of MW in these companies. However, a reduction in the percentage of MWs in 2024 was also observed at these levels of governance, which may indicate that the enforcement of CVM Resolution 80/2022 and, more specifically, the new market regulations, are helping to address these issues.

This study makes several contributions. First, the findings complement previous studies that sought to verify the determinants of MWs, expanding the analysis with factors previously considered in isolation, confirming that, in an emerging market, financial performance, information quality, and governance level are determining factors for the presence of significant MWs. Second, unlike previous studies, the analysis addresses only significant MWs.

These results have implications for managers, investors, and auditors, as they highlight relevant points that may impact MW, and for regulators, as they show that, although companies with higher levels of governance are more likely to have significant MW, regulations may be putting pressure on these issues, as evidenced by a reduction in the percentage of MW in 2024.

2 Literature Review

2.1 Material Weaknesses (MW)

The disclosure of MWs exposes previously undisclosed internal company information and signals the existence of problems in such controls. This movement began in the United States with the Sarbanes-Oxley Act (SOX) of 2002, following accounting fraud scandals.

In Brazil, only with NBC TA 265 of December 3, 2009, and the inclusion of this content in the Reference Form, through Instruction 480/2009 of the Brazilian Securities and Exchange Commission (CVM), amended by Instruction 552/2014 and, which in turn was revoked by CVM Resolution 80/2022, such information became mandatory for publicly traded companies. For Silote et al. (2021), the identification of MWs is linked to the risk they pose to the reliability of financial statements, as their presence may indicate potential distortions.

According to NBC TA 265 (Items 7, 8, and 9), the auditor must verify whether, based on the audit work performed, MWs have been identified and whether they constitute, individually or collectively, significant deficiencies, promptly communicating in writing the significant MWs identified during the audit to those responsible for governance.

A MW, according to NBC TA 265 (item 6), exists when: (i) the control is planned, implemented, or operated in such a way that it fails to prevent, or detect and correct in a timely manner, misstatements in the financial statements; or (ii) a control necessary to prevent, or detect and correct in a timely manner, misstatements in the financial statements is missing; Significant internal control deficiency is a deficiency or combination of internal control deficiencies that, in the auditor's professional judgment, is of sufficient importance to warrant the attention of those responsible for governance.

Based on this standard, stakeholders in the reports of companies belonging to B3 now have access to information regarding the reliability of published accounting information.

According to Lenard et al. (2016), with the approval of SOX, it was postulated that information asymmetry would be reduced. However, contemporary research has provided mixed results on whether or not accounting quality improved after the required disclosures. This finding is relevant, since accounting information is used in decision-making by managers, analysts, investors, and other stakeholders. The following are the results of research used as the basis for the hypotheses of this investigation.

2.2 Previous Studies and Development of Hypotheses

Since the mandatory disclosure of MWs in the United States and Brazil came into effect, empirical studies have evaluated the impacts of such disclosures on various

factors. Doyle et al. (2007a) analyzed the determinants of American companies that disclosed MWs, finding that these companies tend to be smaller, younger, financially weaker, more complex, rapidly growing, or undergoing restructuring.

In Brazil, Maquiaveli (2023) investigated explanatory factors for MW in companies listed on B3; the results showed that companies with a higher probability of recurring MW disclosures are older and have losses; companies with increased sales are less likely to recur; in terms of the amount of MW disclosures, older companies with sales growth and better profitability disclose more MWs; larger and more indebted companies disclose fewer MWs.

In addition to these determinants, which encompass company characteristics and certain indicators, other studies have delved deeper into the analysis of isolated factors, generally in developed markets, where compliance and enforcement differ from those in developing markets. Brazilian studies have tested some of these factors, such as ROA and corporate governance, but have obtained conflicting or statistically insignificant results. The purpose of this study is to test, based on previous studies, the factors of investment, information quality, financial performance (ROA), and level of corporate governance as determinants of MW.

2.2.1 Investment

Biddle et al. (2009) examined whether higher-quality financial reporting is associated with a reduction in overinvestment or underinvestment and found evidence of both. Chen et al. (2011) found, in a sample of unlisted companies in emerging markets, that the quality of financial reporting positively affects investment efficiency. Cheng et al. (2013) found that, after the disclosure of MWs, the investment efficiency of these companies improves significantly.

These results indicate that the presence of MWs impacts investment decision-making in companies. Biddle et al. (2009) argue that the quality of financial reporting, by reducing adverse selection costs, may be associated with investment efficiency, explained by reduced external financing costs and the probability of a company obtaining excessive funds due to a temporary mispricing. This reasoning leads to the understanding that companies with MW problems may have higher external financing costs. Huang et al. (2015) found that cash reserves are more valuable for companies that disclose MWs, i.e., the favorable impact of increased financial flexibility for companies with MWs likely outweighs the adverse effect of cash retention.

Pevzner and Gaynor (2016) found similar evidence that MWs increase companies' dependence on internal financing and uncertainties about future uses of cash,

reducing the positive impact of high cash balances on stock liquidity. Kim et al. (2011) found that banks increase loan rates charged to firms with MWs after their disclosure and reduce these rates after companies correct their reported MWs.

These results indicate that companies with MWs have higher capital costs and seek cash reserves to minimize financial risks. Therefore, they would also be less inclined to invest than companies without MWs, since the financial risk is greater. So, the hypothesis for investment is:

H1: Companies with MWs are less inclined to invest in fixed assets.

2.2.2 Information quality

Information quality, sometimes referred to as earnings quality, accruals quality, or earnings management, can be analyzed from different perspectives and measures and, in general, according to Ashbaugh-Skaife et al. (2008), is an important component of reliable financial statements.

Earnings management occurs when managers use judgment in financial reports and transactions to alter performance in financial reports to mislead stakeholders or influence contractual outcomes (Healy & Whalen, 1999). The analysis of earnings management generally focuses on discretionary accruals by managers, and the most common techniques for measuring it attempt to isolate the discretionary part of the accrual component of earnings (Dechow et al., 2012). This measure shows that the presence of discretionary accruals, both positive and negative, negatively affects the quality of information. In this study, the modified Jones measure was used (Dechow et al., 1995).

Weak control environments have the potential to allow both intentionally biased accruals, through earnings management, and unintentional errors in estimating these accruals (Doyle et al., 2007b). Doyle et al. (2007b) found that MWs are generally associated with poorly estimated accruals that are not realized as cash flows.

Ashbaugh-Skaife et al. (2008) found that companies reporting MWs have lower quality accruals than companies without reports, and conclude after further analysis that MWs increase the likelihood of unintentional errors in accrual, showing that the quality of internal control affects the quality of accruals.

Chan et al. (2008) found moderate evidence of the existence of more positive and absolute discretionary accruals in companies that report MWs. Epps and Guthrie (2010) concluded that the presence of MWs has a negative, moderate, and significant effect on

discretionary accruals, allowing for greater manipulation of profits with the use of these accruals, regardless of their direction, whether increasing or decreasing.

According to the results of these studies, it is expected that companies with MW will have lower information quality, so:

H2: Companies with MWs have higher discretionary accruals.

2.2.3 Return on assets (ROA)

Ge and McVay (2005) argue that good internal control requires time and financial resources, which may not be a priority in companies with unsatisfactory financial performance. Thus, an inverse relationship between ROA and the presence of ICAs is expected.

Previous studies have found that companies with MWs were associated with lower ROA (Ge & McVay, 2005; Ji et al., 2015; Feng et al., 2015). In Brazil, Perazzolli et al. (2020) found opposite results, in which ROA positively influenced the occurrence of material weaknesses. Maquiaveli (2023) investigated the issue, without statistically significant results. It is therefore expected that companies with MWs will have a lower ROA, so:

H3: Companies with MWs have lower ROA.

2.2.4 Corporate governance

Krishnan and Visvanathan (2007) mention that the quality of governance and external auditors play important roles in maintaining good internal controls, which are critical to the integrity of financial reports. Doyle et al. (2007a) argued that companies with better corporate governance would have fewer MWs; however, the overall results did not show statistical significance; they found a negative relationship between governance and the presentation of MWs only in revenue recognition.

Hoitash et al. (2009) found a negative relationship between aspects of corporate governance and the reporting of MWs. Ji et al. (2015) found a negative relationship between some corporate governance factors and MWs, and a positive relationship for others. In Brazil, Lopes et al. (2019) obtained a negative association in the correlation matrix between the level of corporate governance and the absence of MWs, reinforcing a greater tendency for MWs in companies listed at higher levels of governance. Maquiaveli (2023) tested the relationship between governance and the existence of MWs, without statistically significant results.

In Brazil, in 2018, the New Market Regulation, approved by the CVM, came into force. In this document, several items related to corporate governance became mandatory

for companies to remain in this listing segment, such as: the need for an audit committee, with a minimum number of independent members and the presence of a specialist in corporate accounting; the need for internal auditing, implementing compliance functions, internal controls, and corporate risks. These points increase oversight and control by minority shareholders, improving transparency and acting as enforcement for companies that are part of the new market, giving them a level of corporate governance that is different from the others.

In addition to these, other items were already part of the New Market Regulations, such as: participation of independent members on the board of directors and the provision in the bylaws that the positions of chairman of the board of directors and chief executive officer or chief executive of the company cannot be held by the same person.

These requirements serve to reduce the risk of problems in internal controls and improve the reliability of information disclosed by companies in the new market. Therefore, it is to be expected that companies in this segment will be less likely to file MWs. This is especially true after 2018, with the changes in the new market regulations. It is important to note that the objective of analyzing the corporate governance segment in this study is not to verify whether these companies are disclosing more MWs, but rather to verify whether they have more or fewer MWs in relation to other companies that also disclose this information.

Considering the New Market Regulation, which can act as enforcement to reduce risks in the internal controls of companies in the new market compared to other segments, the hypothesis that emerges follows the relationship found in international studies, that companies with higher levels of corporate governance, especially in the new market, present fewer MWs:

H4: Companies with higher levels of governance have fewer MWs.

3 Methodological Aspects

This research aimed to verify how investment, information quality, financial performance, and corporate governance are presented in companies with some type of significant MW. To this end, the population consists of active publicly traded companies listed on B3, excluding the following sectors: "financial," due to its particularities; and "others," which lack specific categorization and do not have the "sales revenue" variable. A single stock per company was considered, the one with the highest liquidity.

To compose the sample, the availability of annual information for two distinct periods was considered:

(1) 2016 to 2024 and (2) exclusively the year 2024, with companies that did not have MW data during the analyzed period, as well as observations with missing data, i.e., that did not report MW in the reference form, item 5.2, letter d (according to resolution 80/2022 – CVM) or in any item in group 5, especially 5.3 (before 2022), were excluded. The choice of 2016 was based on Instruction 552/2014, which made the disclosure of information on MWs mandatory from that year onwards.

The sample started with 3,058 observations and 374 companies; the exclusion of the “financial” and “other” sectors reduced the sample to 2,550 observations and 310 companies; when considering only companies that disclose information about the audit report, the final sample resulted in 985 observations and 142 companies. For the year 2024, the final sample resulted in 118 observations.

The quantitative variables were winsorized. To define the winsorization percentages for each variable, the *iqr* command in Stata was used to capture medium-severity outliers whose values are (1) below or (2) above the cutoff points, calculated according to the following formulas: (1) 25th percentile – [(75th percentile – 25th percentile) x 1.5] and (2) 75th percentile + [(75th percentile – 25th percentile) x 1.5].

For the collection of the MW variable, NBC TA 265 – Communication of Internal Control Deficiencies of the

Federal Accounting Council was considered, which mentions that the deficiencies that must be communicated by the auditor are those that are significant; therefore, these deficiencies were considered in the study.

Thus, the company/period that reported in the reference form, item 5.3, letter d (from 2016 to 2022, according to Instruction 552/2014) or in item 5.2, letter d (according to Resolution 80/2022), the presence or absence of significant deficiencies or material weaknesses in the audit report, in an explicit manner. Companies that did not report whether the deficiencies were significant or not were excluded from the sample. Subsequently, according to Ge and McVay (2005) and Doyle et al. (2007a), the variable was operationalized as a binary dummy, in companies that do not present deficiencies (no) and companies that do (yes).

All variables collected by absolute value in currency were adjusted for inflation during the period using the NCPI. The data were collected from the websites: B3 (presence of MW) and Economatica (other variables), always from the consolidated financial statements.

Stata® software was used to organize the data and run the statistical models. Regarding the structure of the statistical model, companies that did not present MW were categorized, year by year, with the code “no,” and those with MW were categorized with the code “yes.” The variables used are shown in Table 1.

Table 1. Variables used in the models

Type of variable	Variables	Formula	Authors
Dependent	Material Weaknesses (MW)	Binary variable: assumes the category “yes” if the company presented MW; and “no” otherwise.	Ge and McVay (2005); Doyle et al. (2007a)
Explanatory	Earnings management (used as a proxy for information quality)	Calculated based on the Modified Jones model and used in two ways: (1) categorized into three levels: below the 0.3333 percentile (low management); between the 0.3333 and 0.6666 percentiles (medium management) and above the 0.6666 percentile (high management), (2) and absolute management in module	Dechow et al. (1995)
Explanatory	Corporate Governance	Dummy variable categorized into levels of corporate governance according to the B3 classification.	Lopes et al. (2019); Maquiaveli (2023)
Explanatory	Return on assets (ROA)	Formula: Ebit/average assets	Ge and McVay (2005); Perazzolli et al. (2020); Maquiaveli (2023)
Explanatory	Investment	Formula: Capex (investment)/depreciation, amortization, and depletion	Biddle et al. (2009); Cheng et al. (2013)
Capex = Investment in Fixed Assets – Sales of Fixed Assets	Biddle et al. (2009); Cheng et al. (2013)	Variável dummy, categorizada de acordo com a classificação setorial da B3.	Maquiaveli (2023)
Control	Industry	Dummy variable, categorized according to the B3 industry classification.	Maquiaveli (2023)
Control	Free cash flow	Formula: free cash flow/assets	
Free cash flow = cash generated by operations – capex	Qtobin (proxy for market performance)	Fórmula: qtobin=[(dividas onerosas de curto e longo prazo + valor de mercado das ações)]/valor contábil do ativo.	Cheng et al. (2013); Biddle et al. (2009)
Assets = balance at the end of the period.	Huang et al. (2015)	Endividamento oneroso=(empréstimos de curto e longo prazo)/ativo x 100	Ji et al. (2015); Cheng et al. (2013)
Control	Context	Year. Presented as a dummy variable.	
Control	Qtobin (proxy for market performance)	Formula: qtobin=[(short- and long-term debt + market value of shares)]/book value of assets.	Cheng et al. (2013); Biddle et al. (2009)
Control	Debt (proxy for leverage)	Costly debt = (short- and long-term loans)/assets x 100	Ji et al. (2015); Cheng et al. (2013)
Control	Sales growth	Sales variation = [(sales for the current period divided by sales for the previous period)] x 100] - 100	Doyle et al. (2007a); Ji et al. (2015)

Source: Prepared by the authors.

Based on the studies by Doyle et al. (2007b) and Chan et al. (2008), the proxy for earnings management (information quality) is discretionary accruals, calculated using the Modified Jones model (Dechow et al., 1995), as follows.

The calculation of discretionary accruals covered the period from 2010 to 2024. Initially, total accruals were estimated using the balance sheet, according to the formula:

$$\frac{(\Delta AC - \Delta cxequiv) - (\Delta PC - \Delta empr) - Deprec}{Ativo_{t-1}}$$

Where: ΔAC = change in the balance of current assets of company i , from the end of period $t-1$ to the end of period t ; ΔCx and $equiv$ = change in the balance of cash and cash equivalents of company i , from the end of period $t-1$ to the end of period t ; ΔPC = change in the balance of current liabilities of company i , from the end of period $t-1$ to the end of period t ; $\Delta empr$ = change in the balance of short-term financing and loans of company i , from the end of period $t(-1)$ to the end of period t ; $Deprec$ = amount of depreciation and amortization expenses of company i during period t ; $Assetst-1$ = total assets of the company at the end of $t-1$.

Next, the Modified Jones model was run:

$$TA_{it} = \alpha \left(\frac{1}{Ativo_{t-1}} \right) + \beta_1 (\Delta Rec_{it} - \Delta CR_{it}) + \beta_2 (Imob_{it})$$

Where: TA = total accruals; ΔRec = change in company i 's net revenues from period $t-1$ to period t , weighted by total assets at the end of period $t-1$; ΔCR = change in company i 's accounts receivable (customers) from period $t-1$ to period t , weighted by total assets at the end of period $t-1$; $Imob$ = balances of fixed assets and deferred assets (gross) of company i at the end of period t , weighted by total assets at the end of period $t-1$; $Assets$ = Total assets of the company at the end of period $t-1$; α , β_1 , and β_2 = estimated regression coefficients. In this model, the residuals are discretionary (abnormal) accruals.

To obtain answers to the research objective, the logistic regression model was used, with being suitable for modeling the variation of a binary categorical dependent variable as a function of a set of independent variables (Fernandes et al., 2020). The equation was as follows:

$$DCI = \ln(P_i/1-P_i) = \alpha_0 + \beta_1 INV + \beta_2 accruals + \beta_3 fFCL + \beta_4 ROA + \beta_5 tam + \beta_6 endiv + \beta_7 vendas + \beta_8 GC + \beta_9 Setor + \beta_{10} Ano + \varepsilon \quad (3)$$

Where MW is internal control deficiency; INV is the level of investment; $accruals$ are discretionary accruals; FCL is free cash flow; ROA is return on assets; tam is company size, $endiv$ is debt, $vendas$ is sales variation, and GC is the level of corporate governance. The dependent variable MW was categorized as "no" (no MW) and "yes" (MW). The "yes" category is part of the model, while the "no" category was left out of the model and used as a comparison parameter. As for the dummy variables, in the GC variable, the "Traditional" category was left out of the model for comparison purposes, as were the "Health" industry and the year "2016." The year variable was incorporated into the model due to the fact that several crises occurred during the period, such as the economic crisis of 2016 and the COVID crisis in 2020 and 2021, representing the context.

Considering the particularities of the variable "Earnings management" in the regression, the discretionary accruals generated by the Modified Jones model were converted into a module and also used categorically in tertiles: Low, Medium, and High.

To obtain the best-fit equations for the period between 2016 and 2024, the following sequence was followed: the statistical model was run in "panel data" format; using the Hausman test, with $prob=0.000$, the fixed effects (fe) model was considered the most appropriate. Next, a more robust model was run, using the bootstrap option.

However, the fixed effects model presents a difficulty for this type of data (binary), which is the fact that it automatically excludes all companies that did not have a change in the dependent variable (MW) in the period. Thus, all companies that did not present MW or that presented it in all years were excluded from the model. Therefore, following the models used by Doyle et al. (2007a), Ashbaugh-Skaife et al. (2008), Hoitash et al. (2009), and Epps and Guthrie (2010), we chose to present the results also in the pooled model (2016 to 2024) and also in cross-section for the most recent year of the sample, 2024.

For the grouped models, two logit models were run, using two metrics for result management. Throughout the process, adjustment statistics were generated, such as: estat classification (percentage of correctly classified

observations); estat ic (Bayesian information criterion, from Akaike's and Schwarz's); pseudo R² (percentage of variation in the dependent variable explained by the model) and, finally, linktest (test for model specification, whose logic is: a regression is adequately specified if no additional independent variables are significant; the linktest redoes the model, creating two new predictor variables: the predicted variable, $\hat{y}$, and the squared prediction variable, $\hat{y}^2$. The variable $\hat{y}$ should be significant since it is the predicted value. On the other hand, $\hat{y}^2$ would not be, because if the model is correctly specified, the squared predictions do not have much explanatory power).

The chi-square statistic was used for comparison in descriptive statistics. This test serves to show whether the variables analyzed are independent between groups (Favero, 2017). The results of the tests and models are presented below.

4 Presentation of Results and Discussions

4.1 Presentation of Results

The descriptive statistics are presented below. Table 1 shows that of the companies that presented MW in the period, most are at level 2 of B3 corporate governance, followed by the organized over-the-counter market and the new market. In 2024, level 2 is repeated with the largest number of companies with MW, followed by the new market.

Level 2 corporate governance does not have transparency and internal control risk reduction rules as strict as those of the new market. For example, there is no requirement for an audit committee, internal audit, or compliance, these points being optional. The results show that companies in this segment are seeking greater compliance with CVM (80/2022) standards on risk information and internal controls in the reference form.

Most companies that do not report significant MW are in the traditional market, a result that differs from that of Lopes et al. (2019), who found these companies in the new market. It is important to mention that companies that did not report significant MW in the reference form were excluded from the sample; therefore, those that mention not having significant MW refer to this explicitly in the reference form.

Overall, 28.12% (295) of the 1,049 observations in the study presented MW, and 71.88% did not present significant MW in the period. In 2024, 78.69% had

no MW, and 21.31% had MW. This result differs from Lopes et al. (2019), in which 51% between 2010 and 2015 reported relevant weaknesses, and Maquiaveli (2023), who found 38.92% of observations with MW.

Regarding international studies, Doyle et al. (2007a) found 13.37% of the sample with MWs between 2002 and 2005. Ashbaugh-Skaife et al. (2008) analyzed 2003 to 2005 with 20% of the sample with MW, a result that was closest to the present research. Huang et al. (2015) analyzed American companies between 2004 and 2010, finding a rate of 8.2%.

Table 1. Relative frequency of the presence or absence of MW, according to the level of corporate governance and chi-square statistics

Corporate governance	2016 to 2024		2024	
	No	Yes	No	Yes
Organized counter	66.67	33.33	100.00	0
New Market	68.49	31.51	72.73	27.27
Level 1	69.15	30.85	81.82	18.18
Level 2	57.78	42.22	66.67	33.33
Traditional	83.39	16.61	92.31	7.69
Total observations	754 (71.88)	295 (28.12)	96 (78.69)	26 (21.31)
Pearson chi ² – Probability:	0.000		0.113	

Source: Research data.

The chi-square statistic measures the discrepancy between observed and expected frequencies. If the actual frequency distribution of the variables is equal to or very close to the expected distribution, the variables are considered independent, i.e., one does not influence the other (Favero, 2017). Looking at Table 1, there would be independence between the variables "level of governance" and "existence or non-existence of MW" if the number of observations for each sector were distributed more or less equally between the two categories: "no" (no MW) and "yes" (MW exists).

The result in Table 1 shows that the chi-square statistic with a probability equal to 0.000 leads to the conclusion that the existence or non-existence of MWs is influenced by the level of corporate governance of companies, with a dependency between the variables. For 2024, the probability of 0.113 indicates independence between the variables.

Table 2. Relative frequency of the presence or absence of MW, according to industry and chi-square statistics

Industry	2016 to 2024		2024	
	No	Yes	No	Yes
Health	71.43	28.57	80.00	20.00
Industrial goods	75.21	24.79	86.67	13.33
Cyclical consumption	71.12	28.88	75.00	25.00
Communications	58.82	41.18	100.00	0.00
Basic materials	82.48	17.52	81.25	18.75
Non-cyclical consumption	88.17	11.83	92.31	7.69
Oil	58.82	41.18	25.00	75.00
Information technology	61.11	38.89	100	0
Public utilities	58.03	41.97	73.08	26.92
Pearson chi2 – Probability:	0.000		0.173	

Source: Survey data.

Table 2, with a chi-square probability of 0.000 for the entire period, leads to the conclusion that the existence or absence of MW is influenced by the sector in which companies operate, with a dependency between the variables. For 2024, the results point to independence between the variables.

In the entire sample, the sector with the highest number of observations with MW is public utilities, followed by communications and information technology. The sector with the lowest number of observations with MW was non-cyclical consumption, followed by basic materials and health. The result differs from Maquiaveli (2023), in which the highest incidence of MW was in cyclical consumption, followed by public utilities, and the lowest was in others, followed by communications. For 2024, the sectors with the highest incidence of MW were oil, public utilities, and cyclical consumption; those without MW were communications and information technology, with 100% in both, followed by non-cyclical consumption.

Table 3. Average quantitative variables according to the presence or absence of MW

Indicator	2016 to 2024		2024	
	No	Yes	No	Yes
Return on assets	8.64	6.07	9.86	6.53
Earnings management	0.058	0.057	0.05	0.07
Free cash flow	6.15	5.22	11.38	6.58
Investment	153.32	141.98	157.26	148.76
Size	15.57	16.13	15.75	16.09
Q Tobin	0.89	0.86	0.74	0.54
Sales variation	5.42	4.28	6.18	2.68
Indebtedness	32.18	32.83	32.35	30.03

Source: Survey data.

The results in Table 3 show that, over the entire period, the average levels of ROA, free cash flow, investment in fixed assets, Tobin's Q, and sales variation are higher in companies that did not have MWs, while size and indebtedness are higher in companies with MWs. For 2024, the results follow the same pattern, with the exception of indebtedness, which is higher in companies without MWs.

Earnings management in the total sample is, on average, similar across observations, showing that both companies with and without MWs practice similar levels of earnings management. In 2024, however, a higher average level of earnings management was found in companies with MWs.

Table 4 shows the frequency of significant MW by type of disability in the total sample.

Table 4. Relative frequency of the presence of MW in the total sample by type of deficiency

Type of Disability	2016-2024	
	Frequency	%
Staff	14	2,49
Financial	29	5,16
Inventory	26	4,63
Equity	20	3,56
Investment	6	1,07
System (ERP/SAP)	159	28,29
Accounting	206	36,65
Other	102	18,15
Total observations	562	100

Source: Research data.

Table 4 shows that the highest incidence of significant MWs is in the accounting (36.65%) and system (28.29%) categories, followed by others (18.15%). The total number of observations (562) is lower than the total sample (985) because several companies report having significant MWs but do not mention what type. It can be seen that even among companies that report significant MWs, only 57% mention where the problem lies.

Table 5 shows the results of the regression models used to verify the hypotheses raised. Five models were run: (1) fixed effects panel, according to statistical tests; (2) grouped Logit for the entire period with the earning management variable categorized into tertiles; (3) grouped Logit for the entire period with the earning management variable in absolute values; (4) grouped Logit for 2024 with the earning management variable categorized into tertiles; and (5) grouped Logit for 2024 with the earning management variable in absolute values.

Table 5. Logistic regression results (dependent variable MW: Yes)

Variables	Panel – Fixed effect				Grouped logit					
	2016-2024 (1)		2016-2024(2)		2016-2024(3)		2024 (4)		2024(5)	
	coef	prob	coef	prob	Coef	prob	coef	prob	coef	prob
Quantitative										
Earning management					1.653	0.246			11,846	0.000
ROA	-0.048	0.078	-0.072	0.000	-0.071	0.000	-0.090	0.313	-0.070	0.450
Free cash flow	0.002	0.714	0.003	0.607	0.003	0.579	-0.023	0.230	-0.021	0.222
Investment	0.000	0.850	0.000	0.715	0.000	0.707	0.001	0.568	0.001	0.772
Size	0.926	0.110	0.124	0.041	0.131	0.022	-0.236	0.220	-0.241	0.139
Qtobin	-0.127	0.785	0.359	0.157	0.361	0.162	-1.602	0.009	-1.799	0.001
Sales variation	0.006	0.387	0.003	0.538	0.003	0.578	-0.029	0.001	-0.033	0.002
Debt	-0.025	0.200	-0.008	0.186	-0.009	0.179	-0.027	0.039	-0.021	0.137
Dummies										
Result										
Average	-0.025	0.927	0.273	0.000			1.121	0.049		
High	-0.192	0.466	0.224	0.074			1.219	0.136		
(low - basis for comparison)										
Context year										
2017	0.182	0.637	0.069	0.622	0.069	0.612				
2018	-0.356	0.342	-0.124	0.608	-0.156	0.523				
2019	-0.344	0.477	-0.165	0.571	-0.179	0.538				
2020	-0.573	0.243	-0.401	0.361	-0.398	0.372				
2021	-0.548	0.289	-0.115	0.819	-0.113	0.825				
2022	-0.371	0.505	-0.005	0.992	-0.014	0.976				
2023	-0.977	0.075	-0.440	0.436	-0.439	0.427				
2024	-1.295	0.007	-0.501	0.047	-0.497	0.048				
(2016 – basis for comparison)										
Governance										
New Market			0.630	0.164	0.630	0.172	2.928	0.001	2.943	0.002
Level 1			0.760	0.161	0.725	0.182	2.312	0.124	1,970	0.111
Level 2 (Traditional – basis for comparison)			0.827	0.006	0.801	0.007	2.757	0.000	2,681	0.001
Industry										
Industrial goods			-0.144	0.310	-0.115	0.412	0.073	0.870	-0.385	0.413
Cyclical consumption			-0.185	0.015	-0.167	0.007	-0.110	0.866	-0.583	0.104
Common			-0.248	0.635	-0.195	0.702	0.000		0.000	
Basic wage			-0.812	0.005	-0.774	0.005	-0.194	0.652	-0.383	0.465
Cons not cic			-1.033	0.000	-1.006	0.00	-0.927	0.277	-1,274	0.009
Oil			0.264	0.188	0.257	0.162	3.857	0.000	3,063	0.000
IT Tech			0.199	0.003	0.243	0.000	0.000		0.000	
Public utilities			0.679	0.030	0.689	0.027	1.823	0.000	1.268	0.007
(Health – basis for comparison)										
_cons			-2,793	0.001	-2,837	0.000	1,596	0.519	2,202	0.299
Robustness tests										
No. of obs	637		985		985		118		118	
LR chi2(28)	71.17 p=0.000		112.15 p=0.000		110.86 p=0.000		35.38 p=0.009		35.50 p=0.005	
Pseudo R2			0.0952		0.0941		0.2843		0.2852	
Aic			1081.656		1082.941		101.0759		100.9527	
Accuracy			73.60		73.20		80.51		81.36	
Linktest										
_hat			0.000		0.000		0.001		0.001	
_hatsq			0.640		0.963		0.781		0.989	

Source: Research data

Table 5 shows that the models are relevant, i.e., the individual variables, when acting together, are statistically significant in explaining the presence or absence of MW. The explanatory power of the models is respectively: 9.52%, 9.41%, 28.43%, and 28.52%. The accuracy level ranges from 73.20% to 81.36%. All four grouped models showed adequate specification, according to the linktest.

Due to its characteristics, the fixed effects model does not present results for the corporate governance variable. There is also a reduction in the number of observations in this model, as discussed in section 3, due to the automatic exclusion of companies that did not present changes in the dependent variable. Therefore, following previous studies that used the logit model, we also present grouped models to answer all the hypotheses of the study.

The explanatory variable investment did not show a statistically significant relationship in the models, making it impossible to draw inferences about H1.

Earnings management in absolute values showed a positive and statistically significant coefficient at 1% only in model 5. When analyzed categorically in tertiles, model 2, for the entire period, shows a positive and significant relationship at the 1% level for the medium level and at the 10% level for the high level. Model 4 for 2024 confirms the result for the medium level at 5% significance. These results indicate that the more discretionary accruals, i.e., the lower the quality of information, the greater the probability of presenting MW, supporting H2, especially those with medium levels of discretionary accruals.

ROA showed an inverse and significant relationship in models 1, 2, and 3, all referring to the total sample period, confirming that companies with lower ROA are more likely to present MW, supporting H3.

The governance level showed a positive and significant signal at 1% for both level 2 in models 2, 3, 4, and 5 and for the new market in models 4 and 5, showing that these levels are more likely to have significant MW than the traditional level. This result does not support H4, since the expected relationship was negative.

As for the control variables, Table 5 shows that free cash flow was not statistically significant. Size was positive and statistically significant at 5% in models 2 and 3. Tobin's Q and sales variation were negative and statistically significant at 1% in models 4 and 5. Debt was negative and significant at 5% only in model 4.

The year 2024 was statistically significant in the three models that considered the entire sample. Some industry were statistically significant in models 2, 3, 4, and 5.

4.2 Discussions

Regarding earnings management, a proxy for information quality, there was a positive relationship with MW: the greater the earnings management, the greater the probability of presenting MW. This result is similar to those of Doyle et al. (2007b), Ashbaugh-Skaife et al. (2008), and Chan et al. (2008). In Brazil, no studies investigating these two variables for comparison purposes were found in database searches.

It is important to note that earnings management showed the same behavior both in absolute terms and in terms of the categorized value for 2024 and for the categorized value for the total period. These similar results lend robustness to the analysis, since the variable was used in different ways.

Another relevant point is that the average of the result management variable was similar between companies with and without MW, as shown in Table 3 (values of 0.058 and 0.057, respectively). This may explain why the absolute value of the variable failed to capture the expected effect in several of the models tested, with only the 2024 model showing a significant result. The average values arranged in tertiles, on the other hand, were significant in two models (grouped logit of the total sample and of 2024), which may indicate that the relationship is better captured when considering the intensity of earnings management.

Doyle et al. (2007b) found that the presence of MWs is related to lower accrual quality and explain that one of the contributions of this result is to show that, conceptually, it makes sense that a good internal control system is the basis for producing high-quality financial reports, since it is likely to reduce both procedural and estimation errors, as well as earnings management. Therefore, companies with MW have lower information quality.

Ashbaugh-Skaife et al. (2008) conclude that weaknesses in internal control are more likely to lead to unintentional errors, which add noise to accruals, than to intentional distortions that increase profits; thus, regardless of whether the distortions are intentional or not, the quality of accruals is likely to be diminished for companies with weak internal controls.

Another variable that proved to be decisive for the presence of MW was ROA, in an inversely proportional manner. This result is similar to that of Ge and McVay (2005) and Feng et al. (2015) in the United States, corroborating the idea that companies with unsatisfactory financial performance may not spend time and financial resources on a good control system (Ge & McVay, 2005). Ji et al. (2015)

found a similar result in a sample of companies with voluntary disclosure of internal control problems in China.

Perazzoli et al. (2020) found positive results, unlike the findings in this study. Maquiaveli (2023) tested this relationship but found no statistical significance. Thus, the result found in this study for ROA differs from previous studies conducted in Brazil and is consistent with studies in other countries.

Regarding corporate governance, a negative relationship was expected, that is, the greater the aspects of corporate governance, the lower the probability of MW, following the arguments of Jensen (1993). However, the results found a positive relationship, in which companies belonging to different categories of governance of B3 had a higher probability of MW.

This result differs from Doyle et al. (2007a), who found no statistically significant relationship; Hoitash et al. (2009), considering aspects of governance that are mandatory for companies in the new market, such as more members on the audit committee, members with expertise in corporate accounting, and other aspects that strengthen governance on the board, with a negative relationship; and Ji et al. (2015), with a positive relationship for some governance indicators and a negative relationship for others; and Maquiaveli (2023), who found no statistical significance in this relationship.

The results are partly similar to those of Lopes et al. (2019), in which governance levels had a mitigating effect on the overall volume of deficiencies, but a positive effect on specific deficiencies. However, the result was confirmed by a test of differences between means and not by regression. Lopes et al. (2019) also found a negative correlation (Spearman) between governance and the absence of deficiencies, and argued that this reinforces the greater tendency toward transparency among companies listed at higher levels of governance.

CVM Resolution 80/2022 refers to the reporting of information that makes the risk of internal control problems more transparent, which is an enforcement measure for the disclosure of information on internal controls and MW. On the other hand, as discussed in the literature review, the new market regulation requires, as of 2018, several aspects of corporate governance that seek to reduce internal control failures. The period analyzed in this study is from 2016 to 2024, therefore mostly after the regulation in question. However, what was empirically verified is that companies in the new market are more likely to have MW, which was not expected, according to the findings of Hoitash et al. (2009).

This result was even more pronounced for companies in the level 2 segment, as shown in Tables 1 and 4. Although it is also a differentiated segment, it does not have the same requirements for reducing the risk of internal control problems as the new market, which may be an explanation for the occurrence of MWs.

It is also important to note that when comparing the percentages of MW presence (Table 1) for the entire period in relation to 2024, there is a reduction in the presence of MW in all segments, specifically for companies in the new market, a reduction from 31.51% to 27.27%, and for those in level 2, a reduction from 42.22% to 33.33%. This may be an indication that the enforcement of CVM Resolution 80/2022 and, more specifically, the new market regulation, are helping to address these issues.

Taken together, these determinants show that companies with MW, when compared to those without MW, have factors that do not indicate advantages for them; on the contrary, they confirm expected associations with deficient control systems.

Effective internal control, imposed by a governance mechanism, can reduce the adverse effect of agency problems on reported accounting figures, as internal controls are designed to promote the reliability of reported financial information and financial statements, in accordance with generally accepted accounting principles (Mitra & Hossain, 2011).

The findings indicates that being at different levels of corporate governance does not necessarily mean more reliable financial reports or less information asymmetry, since, according to Lobo et al. (2020), the lower accuracy of reporting due to the presence of MW facilitates the retention of negative information by managers, which increases information asymmetry between managers and external investors. However, there is a trend toward a reduction in MW in both the new market and level 2.

5 Conclusions and Recommendations

This study analyzed how investment, information quality, performance, and corporate governance are presented in Brazilian publicly traded companies with significant MW. In general, the results confirm that lower information quality (H2), lower ROA (3), and contrary to expectations (H4), higher levels of corporate governance increase the probability of presenting MW. Of the control variables, it is observed that size increases the probability of presenting MW, while Tobin's Q, variation in sales, and indebtedness reduce this probability. The investment

variable did not show statistical significance in any model.

These findings complement previous studies in several ways: they address the issue of internal control deficiencies only for those that the external audit classified as significant; they verify determinants in an emerging market, not addressed together in previous studies, that may probabilistically impact the presence of significant MWs, highlighting points of attention and risk for such occurrences.

The findings for ROA and earnings management were consistent with those of studies of developed markets. However, in relation to corporate governance, the results showed unexpected behavior, especially after the implementation of standards (CVM Resolution 080/2022 and the new version of the new market regulation in 2018) that act to reduce internal control problems. It should be noted that this study did not verify the percentage of companies that are or are not disclosing MWs, but rather how certain factors impact MWs in those that disclosed data on the reference form on significant deficiencies. Thus, it is not a matter of disclosure, but rather of risk in internal controls (enforcement and compliance).

The results contribute to points of attention related to MWs and may help reduce failures and recurrences in future audits, especially considering that reducing information asymmetry depends, in part, on the quality of the information reported. The relevance of the study is to bring to the debate, in an emerging country, factors that can impact the reliability of mandatory financial accounting information, with the role of reducing information asymmetry.

The results have implications for managers, investors, and auditors, showing points that increase the likelihood of significant failures in internal controls, which can help improve them and reduce recurrences. It also has implications for regulators, informing them that, although companies with higher levels of corporate governance are those with the most significant MW, the percentages of MW presence decreased in 2024, the most recent period of the analysis, which may indicate that such problems are being adjusted by companies in these segments.

One limitation is that the results are only valid for the sample studied, since it was chosen for convenience. Another limitation is that we considered what was reported in the reference form (presence or absence of significant MWs) without checking the content of the audit report.

As a suggestion for future research, study the behavior of the determining variables for the presentation of MWs, only in the group with MWs, separating companies that have recurrences from those that have adjusted the failures. Furthermore, it is important to conduct a study

that analyzes the percentage of MWs disclosed at the new market and level 2 levels, as well as to explore the reasons for the higher incidence at these levels.

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