

Effects of Intangibility, Working Capital, and Working Capital Management on Multilevel Corporate Financial Distress

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Abstract

Objective: To analyze whether intangibility, working capital, and working capital management influence the companies' level of financial distress.

Method: Unlike the literature that only distinguishes between companies facing financial distress and not facing financial distress, this study used a financial distress metric to allocate the companies into 3 levels of financial distress. An Ordered Probit model for Panel Data was used to address 1,968 observations of companies listed on B3 from 2011 to 2020.

Results: The higher a company's working capital and the better its management, the smaller the likelihood of it facing financial distress. Increasing working capital and improving management decreases the company's likelihood of facing severe and potentially irreversible financial distress. No evidence was found regarding intangibility.

Contributions: These results contribute to the literature, considering a lack of empirical evidence on the subject in a country with low competition among financial institutions, and to accounting consulting professionals, entrepreneurs, and regulators who can use these results to avoid, mitigate, or deal better with unfavorable financial situations with the potential to affect the financial market as a whole.

Keywords: Levels of Financial Distress; Business Risk; Intangible Assets; Financial Crises; B3.

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1. Introduction

This study's objective was to test whether intangibility, working capital, and working capital management impact the companies' level of financial distress. In times of high volatility and uncertainty, such as financial crises, companies must take precautions and signal positive and negative aspects to ensure their robustness and perpetuity (Zarb, 2018; Exame, 2023a). Hence, the professionals assessing the market demand must be capable of distinguishing between financially healthy and unhealthy companies to ensure the proper supply of resources, as this is when financing institutions determine the allocation of resources, risks, and returns (Lizares & Bautista, 2020; Exame, 2023a). Hence, the results of empirical research can support the identification of companies more likely to experience financial distress, facilitating the development of skills among professionals to select companies before providing resources, including risk pricing, considering that financial crises and changes in interest rates can affect both debtors and those providing financial resources (Lizares & Bautista, 2020; Exame, 2023a).

The economy depends on the success of companies (Gregova, Valaskova & Adamko, 2020; Zanon & Dantas, 2020). However, the rapid development of economic globalization and the environment in which companies operate has become increasingly complex and unpredictable, occasionally leading companies to experience unfavorable financial events (Zhang & Wang, 2014).

A company's financial distress is strongly linked with undesirable consequences, such as layoffs, defaults, no dividend distribution, a drop in share prices, and difficulties raising funds and getting credit from financial institutions (Gregova et al., 2020). Additionally, compared to other countries, the Brazilian market has a small number of banks, which may increase the cost of capital in the business environment. In addition to the borrower's financial health, Radebaugh and Gray (1993) state that the cost of capital for companies may also be a function of inflation, international issues, accounting regulation, economic growth, the level of education of the parties involved, social and environmental issues, code-law/common-law environment, taxation, shareholder protection, and the political system. Vieira Filho and Funchal (2016) note that, besides corruption issues, there are few credit options for businesses in the Brazilian market, and it is an environment in which the interests of minority shareholders are less recognized than those of majority shareholders. Considering this context, Brazil is a favorable environment for studies addressing the companies' financial problems, as its capital market is less expressive, few sectors have access to resources with subsidies from the Brazilian government and, as noted by Vieira Filho and Funchal (2016), the high-interest rates applied in Brazil. Duarte et al. (2020) agree with Vieira Filho and Funchal (2016) when analyzing the credit supply during the pandemic when companies with financial difficulties were penalized with a higher cost of capital than that applied to companies enjoying better financial health (Duarte et al., 2020). Companies with sound financial health are more easily approved for credit and, for this reason, shrink the credit market, leaving companies in financial distress with credit options that present a higher cost of capital (Duarte et al., 2020)

Such a negative context requires managers and financial analysts to study the companies' financial difficulties to understand the factors leading to financial problems and how to avoid or counter them (Gregova et al., 2020; Exame, 2023a). The motivation to study such a topic is that by understanding an unfavorable situation better, economic agents can prepare for difficult times by considering more precise actions, creating alternatives and protective measures (Exame, 2023a) by allocating capital according to the projected context, whether expanding or restructuring businesses (Kovacova & Kliestik, 2017; Sant'Anna et al., 2022) or monitoring interest rates (Exame, 2023a; Exame 2023b).

Note that the literature addresses financial distress considering only two possibilities: the company is either dealing with financial distress or not (Glover, 2016). However, as Farooq, Qamar, and Haque (2018) note, there are levels of financial distress, and it is important to classify these levels to conduct studies more aligned with reality. Hence, Farooq et al. (2018) introduced a new perspective on measuring financial distress. This new method has not yet been tested in the Brazilian market; however, it can help regulators discuss the actions of financial institutions in implementing contractual clauses among Brazilian companies to help mitigate risks to the Brazilian financial market.

Farooq et al. (2018) presented financial distress but did not develop a model to study the factors leading companies to experience financial adversities. Therefore, there is a gap in the literature due to a lack of Brazilian studies addressing the factors leading companies to experience different levels of financial problems. Another gap concerns verifying whether the method Farooq et al. (2018) proposed also works in Brazil, a market where there is less competition between the suppliers of financial resources. Hence, the scale proposed by Farooq et al. (2018) and not yet applied in Brazil classifies levels of financial distress into four: (zero) – companies not facing financial difficulties, (one) – mild level of financial distress, (two) – intermediate level of financial distress, and (three) – severe level of financial distress. In other words, studying the different levels of financial distress and understanding the determinant factors is justified in a developing country with restricted banking resources. Additionally, this is a context yet to be addressed in the literature. Hence, this study is intended to seek evidence on the factors (intangibility, working capital, and working capital management) that may lead companies to experience different levels of financial distress.

Intangibility is represented by the amount of intangible assets with respect to the companies' total assets. Examples of intangible assets include brands, patents, software, and technologies developed internally. Some sectors and sizes demand more attention and new monitoring mechanisms from lawmakers and banks supplying capital (Exame, 2023a). Higher amounts of intangible assets provide a competitive edge, given its ability to generate products, processes, and solutions that can optimize a company's operation, making it more competitive and financially healthier, hence, less vulnerable to financial adversities (Lizares & Bautista, 2020; Bhattacharya, 2021).

Working capital provides information regarding short-term liquidity, which is essential for shareholders and creditors to observe the degree of short-term solvency when comparing a company's rights and most immediate obligations (Rajendran, 2019). Companies with higher working capital indicators tend to be healthier and face fewer financial adversities because they are less centered on passive than on assets in the short term (Nobanee & Abraham, 2015).

Finally, this study's last factor of interest is the management of working capital represented by the cash cycle, measured by the difference between the operating cycle and the average payment period. The longer the cash cycle, the longer the company finances itself and its customers with its own resources. Otherwise, the longer the period the company has its operation financed by third-party resources. The longer a company's cash cycle, the worse the working capital management is because it more frequently finances itself and its customers than its creditors (Talonpoika et al., 2017). An Ordered Probit for Panel Data was estimated in this study considering 1,968 observations of active companies listed on the stock exchange *Brasil, Bolsa, Balcão (B3)*. Financial data were obtained from the Economatica database from 2011 to 2020.

The results indicate that intangibility does not influence a company's likelihood of experiencing different levels of financial adversities. Even though the literature shows evidence that intellectual capital can make a company less vulnerable to financial distress (Shahwan & Habib, 2020), intangible assets (including licenses, patents, etc.) do not seem to have the same effect in the Brazilian market. The higher the working capital and the better its management, the higher the likelihood of a company not experiencing financial difficulties, and even if experiencing financial problems, more working capital and better management decrease the chance of a company facing irreversible financial problems. Therefore, both working capital and its management are essential to keep a company's health and robustness and prevent financial adversities, indicating a greater ability to honor its obligations and manage its resources in the short term.

The interest in studying such relationships in Brazil concerns the particularities of developing countries, with few bank options for raising funds, which may increase the likelihood of companies facing financial adversities. For example, the level of economic development and legal and capital costs for companies experiencing financial distress are comparatively higher in less developed countries, such as Brazil, than in more developed countries, like the United States. (Céspedes, González & Molina, 2010). Financial distress processes are longer, more bureaucratic, and more expensive due to a less robust code of law than that of more developed countries, where there is a better established legal framework (common law). Such a characteristic may add new conclusions to the literature (Céspedes et al., 2010) and the market assessing resource demand (Lizares & Bautista, 2020).

This study contributes to the literature with empirical evidence on financial distress models proposed by Farooq et al. (2018), and also verifies the determinants of financial distress (intangibility, working capital, and working capital management) of Brazilian companies. The purpose is to provide a more comprehensive explanation of the factors affecting the likelihood of companies experiencing different levels of financial distress. Studying financial distress and its determinants provides a practical contribution to regulators, financial institutions, and companies so they have more tools and empirical evidence to develop contracts that enable mitigating risks in the market as a whole (Farooq et al., 2018; Lizares & Bautista, 2020; Exame, 2023a; Exame, 2023b).

2. Theoretical framework

2.1 Financial difficulties

Corporate financial distress is usually characterized by a decrease in headcount, delays in the payment of obligations, delayed and lower dividend payments to shareholders, and decreased product quality (Safiq, Selviana, & Kusumastati, 2020). Financial adversities concern a situation in which a company's operating cash flow is constantly below its financial expenses (Geng et al., 2015).

Farooq et al. (2018) and Inekwe, Jin, and Valenzuela (2018) agree that financial distress does not emerge from a one-step process but from multiple heterogeneous adverse events. Many businesses fail due to external factors, such as a local or global economic crisis, or internal factors, such as governance or capital management failures (Inekwe, Jin, & Valenzuela, 2018). In this sense, Gregova et al. (2020) highlight the need to study corporate financial distress, as it is strongly linked to undesirable consequences, even in developing countries: employee layoffs, defaults, adverse effects on the distribution of dividends and the companies' shares price (Gregova et al., 2020) and even the bankruptcy of financial institutions (Exame, 2023a; Exame, 2023b).

The risks for companies in financial distress may be even more significant in the Brazilian market than in other countries because of the small number of banks in Brazil, which may increase the cost of capital for the business environment (Radebaugh & Gray, 1993). Fundraising and the cost of raising funds is a function of inflation, international affairs, accounting regulation, economic growth, education of the parties involved, social and environmental issues, legal environment (code law/common law), taxation, shareholders protection, political system (Radebaugh & Gray, 1993), and the risks inherent to the sector (Exame, 2023a) besides governance practices (Exame, 2023b).

The literature addresses different ways of measuring financial distress, either by identifying a significant decrease in cash reserves (Moreno-Bromberg & Vo, 2017) or by allocating companies under different classifications: judicial recovery - Brazil or in special treatment - China (Geng et al., 2015); lowering expectations; and according to shareholders' interest in the company, represented by a significant drop in the price of shares (Tandiontong & Sitompul, 2017) or identifying companies constantly operating with a negative cash flow (Geng et al., 2015). Some industries are more exposed to risks and, therefore, demand more attention from financial institutions and regulators (Exame, 2023a).

Farooq et al. (2018) recommend that future studies not define financial distress using a single criterion but classify it as mild, medium, or severe. Such a classification brings a new factor, expanding the range of what financial distress is considered to be (Farooq et al., 2018). The design of degrees of financial distress considered that healthy companies initially face profitability problems, which is when the first level of financial distress is defined. The continuity of such problems results in liquidity problems; hence, the second level of financial distress concerns a situation in which the company experiences constant losses and liquidity problems. When severe liquidity is reached, i.e., when a company does not have sufficient assets to meet its financial obligations, it has reached the third level of financial distress (Farooq et al., 2018). According to Exame (2023), some sectors may experience a higher level of financial distress, which does not necessarily represent a risk of default. In other words, other factors need to be monitored depending on the company's sector.

Generally, the more indebted, the more likely a company finds itself in financial distress, consequently increasing its financial risk; such a risk interests creditors, shareholders, and managers, as it supports decision-making (Tandiontong & Sitompul, 2017). Pamplona et al. (2020) studied Brazilian family and non-family businesses and concluded that the different levels of indebtedness may affect the probability of experiencing financial distress. A company's total debt increases the likelihood of experiencing financial distress, while long-term debt decreases its chance of facing financial distress (Pamplona et al., 2020).

Farooq et al. (2018) analyzed the likelihood of companies in different financial distress levels to recover. They noted that companies classified at level zero are not in financial distress, while there is a high level of financial distress at level three. Healthy companies are more likely to face severe liquidity problems when they face moderate liquidity problems as the first level, and they may recover from any level of financial distress. However, recovery is less likely when facing severe liquidity (Farooq et al., 2018).

When a company is in financial distress, its board of directors tries to avoid bankruptcy by restructuring its assets and liabilities by redistributing resources and obligations (Cardoso & Peixoto, 2019); however, capital costs may be higher in this context. Vieira Filho and Funchal (2016) found evidence that there are few credit options for the Brazilian business community, generally with high-interest rates that are applied in Brazil. Duarte et al. (2020) studied credit supply during the pandemic and concluded that companies facing financial adversities were penalized with higher capital costs and lack of resources. Duarte et al. (2020) concluded that companies with good financial health are more easily approved for credit and, as a result, shrink the credit market, leaving companies in financial distress with more costly credit options.

2.2 Intangibility

Intangible assets consist of the stock of intangible resources that enter the production process and are necessary for creating and selling new or improved products and processes (Arrighetti, Landini & Lasagni, 2014). By definition, these assets do not have tangibility but have value, and based on this value, they compose the companies' body of non-current assets (Azin & Alias, 2019). Intangible assets include those produced internally, such as construction projects and internal software, and assets acquired externally, such as licenses and patents (Arrighetti et al., 2014).

A substantial and growing portion of corporative assets consists of intangible assets, and researchers have long recognized that intangible assets are critical for a company's value, influencing financial policies, results, and failures (Lim, Macias & Moeller, 2020). The role of a company's intangible assets is to strategically increase its competitiveness, value, and management capacity, hence minimizing the risk of financial distress (Shahwan & Habib, 2020). Intangible assets have been increasingly relevant in the modern economic globalization context, where there is a greater demand for information, as it influences the competitiveness in the market organization (Osinski, Selig, Matos & Roman, 2017).

The literature has sought to examine the role of intangible assets in improving financial performance and, therefore, decreasing the companies' likelihood of facing financial distress (Shahwan & Habib, 2020). The results of Shahwan and Habib (2020) suggest verifying whether intangible assets can affect a company's operation, making them less vulnerable to financial adversities. Therefore, considering a context of corporative competitiveness and potential financial distress with the potential to constantly demand performance and resilience from companies (Osinski, Selig, Matos & Roman, 2017), the objective is to test whether the higher the value of a company's assets, the lower its level of financial distress. Therefore, the first hypothesis is proposed:

H1: The higher a company's intangibility, the lower its likelihood of facing financial distress.

2.3 Working capital

Working capital is an accounting indicator measured by the difference between current assets and liabilities (Pouraghajan & Emamgholipourarchi, 2012). This relationship between short-term assets (e.g., cash and inventories) and short-term financing sources (e.g., suppliers and short-term financing) brings information regarding a company's short-term investment and strategies and short-term financing (Kayani, Silva & Gan, 2020).

Such an indicator indicates a company's solvency of short-term obligations; hence, the higher this indicator is, the more comfortable the company is to pay its obligations using its short-term resources (Almansour, 2015). High working capital can allow companies to increase their sales by granting longer payment terms to their customers (Baños-Caballero, García-Teruel & Martínez-Solano, 2014). However, to increase working capital, the company can opt for long-term debt, consequently facing higher financial expenses - which, if not well managed, may lead the company to financial distress (Baños-Caballero et al., 2014). This strategy, however, is less risky than raising money through short-term debt (Safiq et al., 2020).

The decision to finance the level and sources of investment together with working capital financing sources is a matter of working capital policy (Altaf, 2020). A company can be aggressive or conservative in its approach to working capital financing (Altaf, 2020). If a company can sustainably generate profits, it is more likely to make an efficient and efficacious use of working capital (Safiq et al., 2020). However, a company with incompetent management, with low working capital levels, presenting more current liabilities than current assets is likely to threaten its survival (Safiq et al., 2020). Therefore, high working capital levels increase the likelihood of companies avoiding financial distress in the short term (Shahdadi, Rostamy, Sadeghi Sharif, & Ranjbar, 2020). Given the importance of working capital, we seek to relate it to different levels of financial distress and verify its impact on a company's likelihood of facing different levels of financial distress. Hence, the second hypothesis is presented:

H2: The higher a company's working capital, the lower its likelihood of facing higher financial distress levels

2.4 Working capital management

In addition to the working capital itself, another essential component of a company's financial attributes is the management of working capital, which, according to Pouraghajan and Emamgholipourarchi (2012), directly impacts a company's financial indicators. Managing working capital is relevant because it influences the business profitability and risk, consequently influencing its financial health (García-Teruel & Martínez-Solano, 2007).

Efficient working capital management includes planning and controlling current assets and liabilities to mitigate the risk of not meeting short-term obligations and preventing excessive asset investments (Pouraghajan & Emamgholipourarchi, 2012). For this reason, working capital management is a priority in the corporate world, and companies using its components effectively are highly likely to have a competitive advantage over their competitors (Al-Qudah & Al-Afeef, 2015). Such an advantage is often generated from the company's growth capacity, which can be achieved through operational efficiency and the optimization of working capital management (Botoc & Anton, 2017); when working capital is optimized, financial resources are generated to foster growth (Boțoc & Anton, 2017).

The cash cycle is used to measure working capital management, as it implicitly contains the company's payment, receipt, and inventory terms. The higher this indicator, the more a company is financed by third parties instead of financing them, and its terms are more efficient (Pouraghajan & Emamgholipourarchi, 2012). This indicator seeks to capture the quality of management of short-term resources that make up working capital; on average, the longer the cash cycle, the worse the working capital management (Kayani et al., 2020). Therefore, it is expected that the better the working capital management is, the better the company's short-term resources are applied, the better its deadlines are optimized, and the lower its financial distress. Thus, the third hypothesis is presented:

H3: The better a company's working capital, the lower its likelihood of facing higher financial distress levels

3. Method

3.1 Sample

Data were collected from the companies listed on the Brazilian stock exchange, Brasil, Bolsa e Balcão (B3), using the secondary database Economatica. Data from the companies' balance sheets and income statements were collected annually and corrected for inflation. Data on macroeconomic control variables, such as interest, exchange rate, and inflation (Extended National Consumer Price Index - *IPCA*), were taken from the Central Bank, and annual growth from the Gross Domestic Product from the Brazilian Institute of Geography and Statistics (IBGE).

The analysis covers from 2011 to 2020. It composes an unbalanced panel basis because the International Accounting Standards (IFRS) were only adopted in Brazil from 2010 onwards. Table 1 shows the sample treatment in detail. The initial database comprises 4,532 company-year observations from 2010 to 2020 without filters or discarding data. The financial companies were excluded because the characteristics of their financial balances require a different interpretation. After disregarding the missing and invalid values in all the metrics proposed in this study and the control variables, the final sample remained with 1,968 company-year observations from 2011 to 2020. The continuous variables were winsorized at 1%, in both tails, to mitigate bias caused by outliers when estimating the coefficients of the model proposed.

Table 1
Sampling

Action	Observations Excluded	Total observations
Data collected	0	4,532
Companies from the financial sector excluded	407	4,125
Observations missing information on financial distress excluded	1,248	2,877
Observations missing information on intangibility excluded	564	2,313
Observations missing information on working capital and working capital management excluded	338	1,975
Observations missing information on control variables excluded	7	1,968
Final sample		1,968

Source: developed by the authors.

3.2 Model and variables

The model used to meet the study's objective is presented in Equation (1):

$$DF_{it} = \beta_0 + \beta_1 Intangibilidade_{it} + \beta_2 CG_{it} + \beta_3 Gest\tilde{a}o_CG_{it} + \sum \beta_k Controles_{it} + \varepsilon_{it} \quad (1)$$

Where: DF_{it} represents the multilevel measure of financial distress of company i in year t , which ranges from zero to three, where zero translates into less financial distress and 3 into more financial distress. $Intangibilidade_{it}$ represents the intangibility measure of company i in year t . CG_{it} represents the measure of working capital of company i in year t , and $Gest\tilde{a}o_CG_{it}$ represents the measure of working capital management of company i in year t . Ordered Probit for Panel Data was used, considering that financial difficulty is a discrete variable ranging from 0 to 3.

According to hypotheses H1, H2, and H3, $\beta_1, \beta_2, \beta_3$ are expected to be negative, indicating that the more intangibility, the more working capital, and the better a company's working capital management, the less likely a company is to face financial distress or potentially irreversible high levels of financial distress.

Regarding the explained variable, according to Farooq et al. (2018), financial distress can be classified into four levels:

$$DF_{it} = \begin{cases} 0; & \text{if company } i \text{ is not facing financial distress in year } t \\ 1; & \text{if company } i \text{ is facing mild financial distress in year } t \\ 2; & \text{if company } i \text{ is facing an intermediate level of financial distress in year } t \\ 3; & \text{if company } i \text{ is facing severe financial distress in year } t \end{cases}$$

Mild financial distress, called declining earnings, occurs when a company reports yearly losses or records declining earnings for two consecutive years. **Intermediate** financial distress, called moderate liquidity, occurs when a company does not generate enough funds to comply with its obligations to creditors. The Interest Coverage Ratio (ICR), measured by the ratio between EBIT (earnings before interest and taxes) and financial expenses, is analyzed to verify this condition. Thus, a company is said to be at an intermediate level of financial distress if its ICR is less than 1 for 2 consecutive years or less than 0.8 in the current year. Finally, **severe** financial distress, or severe liquidity, occurs when a company's net worth is negative, i.e., when liabilities exceed total assets.

As for the explanatory variable, corresponding to the first hypothesis – intangibility –, the definition by Ji and Lu (2014) was used: the ratio between intangible assets and the total assets of company i in year t , according to Equation (2):

$$Intangibilidade_{it} = \frac{Intangíveis_{it}}{Ativo Total_{it}} \quad (2)$$

Regarding working capital – the second hypothesis, CG_{it} –, is defined by the difference between the current assets and liabilities of company i in year t (Altaf, 2020). However, this variable was divided by the total assets of company i in year t , as shown in Equation (3), to control for working capital according to the company's size and treat companies of different sizes, as performed by Ohlson (1980). Without this control, larger companies would naturally present more extreme working capital values than smaller companies.

$$CG_{it} = \frac{(Ativo Circulante_{it} - Passivo Circulante_{it})}{Ativo Total_{it}} \quad (3)$$

Working capital management (third hypothesis), $Gestão_CG_{it}$ is based on the Cash Cycle value, as studied and defined by Fernández-López, Rodeiro-Pazos, and Rey-Ares (2020); the longer the cash cycle, the worse the working capital management. Therefore, the variable $Gestão_CG_{it}$ was defined as the negative value of the Cash Cycle of company i in year t . Thus, the longer the Cash Cycle, the lower the $Gestão_CG_{it}$ will be, indicating worse working capital management, according to Equation (4):

$$Gestão_CG_{it} = (-1) * (Ciclo de Caixa_{it}) \quad (4)$$

The Cash Cycle is the difference of the Operating Cycle and the Average Payment Period. The Operating Cycle is measured by the sum of the Average Inventory Term and the Average Receipt Period, and the Average Payment Term is the ratio between the Supplier's account and the Purchasing account multiplied by 360 (days). The Average Inventory Term is the ratio between the inventory account and the Cost of Goods Sold multiplied by 360 (days). The Average Collection Period is the ratio between Accounts Receivable and Net Revenue multiplied by 360 (days).

Regarding the control variables, these were included in this study to mitigate the risk of potential bias from variables omitted in the model. Additionally, dummy variables of sector (according to B3 classification) and year were included to remove potential sectoral and temporal trends. The companies' long-term indebtedness (*Endividamento*), calculated by the ratio between the total long-term indebtedness and the total assets, while being an important element of leverage to generate growth, must also be taken into account in the financial distress models, as it is a fundraising modality that generates financial burden and negatively affects results via financial expenses (Sarkar, 2020).

In addition to the conventional variables, the companies' volatility of profits (*Vol_Lucros*), measured by the standard deviation of net profits over net revenues, was included; this control is essential in models dealing with financial distress (Zarb, 2018).

The size of a company (*Tamanho*) can be related to the financial distress variable, considering that the larger the company, the more resources it may have to avoid financial distress – such as, for example, having more accessible credit and bargaining power with suppliers. It indicates that the larger a company's size, the less likely it will get into financial distress. Hence, it is recommended to include it in the model as a control, measured by the natural logarithm of total assets (Situm, 2015).

The company's revenue growth (*Cresc_Receita*), measured by the percentage change in the net revenue for a given year compared to the previous year, should also be considered a relevant factor to avoid financial distress. The reason is that the greater the growth, the better the projection of a company's long-term financial situation and, therefore, the less likely it is to get into financial distress (Baños-Caballero et al., 2014).

The macroeconomic environment is important when analyzing financial distress, considering that companies are directly exposed to external factors that can potentially lead them, their customers, investors, or suppliers to change their behavior in the market, thus changing the course of their business. (Kliestik, Misankova, Valaskova & Svabova, 2018). Therefore, control variables with macroeconomic information – such as the exchange rate (*Cambio*), measured at the end of the period, of the Real on the Dollar, and the interest rate (*Selic*), measured by the basic interest rate of the Brazilian economy – may directly affect the revenue and/or costs of companies which, consequently, may affect their investments and the cost of raising funds, thus possibly making access to capital more difficult and increasing the cost of borrowing, imposing a burden more significant than expected and leading companies to experience financial distress (Mok, 1993).

Inflation (*Inflacao*) is a variable that represents the monetary stimulus, measured by the IPCA accumulated in the period, which may bring unpredictability in future prices or increase the cost of production, often without passing it on to the customers' final price (Tandiontong & Sitompul, 2017). The growth of the gross domestic product, calculated as a percentage change, represents an improvement in the macroeconomic environment that boosts businesses. In a growing environment, the greater the business opportunities, the more customers may be willing to buy products, and the greater the opportunities may be to avoid financial distress (Inekwe et al., 2018).

4. Data Analysis

4.1 Descriptive Statistics

Table 2 presents the frequency of observations according to year and level of financial distress. Note that the number of observations increases in an unbalanced panel. Most companies have faced no financial distress ($DF=0$) over the years, except for 2011. The intermediate level of financial distress ($DF=2$) follows with the second highest frequency per year.

Table 2

DF frequency according to year.

YEAR	DF				Total
	0	1	2	3	
2011	0	0	54	13	67
2012	88	22	61	15	186
2013	95	22	56	18	191
2014	87	34	56	19	196
2015	50	36	84	26	196
2016	55	24	95	27	201
2017	85	13	80	26	204
2018	98	11	75	31	215
2019	115	17	70	34	236
2020	139	17	79	41	276
Total	812	196	710	250	1.968

Source: developed by the authors.

Table 3 presents the descriptive statistics of the variables of the model proposed. Note that all variables have the same number of observations. It is worth noting that the variables *Cambio*, *Selic*, *Inflacao*, and GDP present 1,968 observations, but only 10 different values repeated for all companies in the same year.

Table 3

Descriptive Statistics

Variable	N	Minimum	Q1	Mean	Median	Standard deviation	Q3	Maximum
<i>Intangibilidade</i>	1.968	0	0,0026	0,1134	0,0226	0,1778	0,1560	0,7824
<i>CG</i>	1.968	-2,1171	-0,0010	0,0599	0,1081	0,4194	0,2623	0,7410
<i>Gestão_CG</i>	1.968	-6,784	-171,33	-238,24	-66,49	965,52	-17,19	2,966
<i>Endividamento</i>	1.968	0	0,0532	0,1990	0,1709	0,1765	0,2934	0,8933
<i>Vol_Lucros</i>	1.968	0,0071	0,0429	4,2000	0,0877	23,0566	0,2776	153,48
<i>Tamanho</i>	1.968	10,21	13,42	14,76	14,90	1,86	16,06	18,67
<i>Cresc_Receita</i>	1.968	-83,80	-10,51	7,53	1,24	58,86	12,27	469
<i>Cambio</i>	1.968	1,68	2,35	3,30	3,33	1,01	3,95	5,16
<i>Selic</i>	1.968	2,00	4,50	8,28	7,25	4,03	11,75	14,25
<i>Inflacao</i>	1.968	2,95	4,31	5,55	5,84	2,05	6,29	10,67
<i>PIB</i>	1.968	-4,06	-3,28	-0,10	1,32	2,68	1,78	3,97

Source: developed by the authors.

Note that the companies have an average level of 11.34% of intangible assets, with a minimum of 0% and a maximum of 78.24% of intangibility. The *CG* variable has a mean of 0.0599, indicating that, on average, the companies had 5.99% of their total assets in working capital. The minimum was -211.71%, and the maximum was 74.10% of total working capital assets. The variable *Gestão_CG* presented a mean of -238.24, which means that out of 360 days, the companies had 238 positive cash cycle days on average. The third quartile of the *Gestão_CG* variable is -17.19 (negative), implying that less than 25% of the companies presented a (positive) *Gestão_CG*, that is, they had a negative Cash Cycle (Table 3).

The Pearson correlation between the model's variables was calculated (results not listed). The statistically significant correlations (at 10%) between the model's independent variables range from -0.666 (*Cambio* and *PIB*) to 0.734 (*Selic* and *Inflation*). The only strong correlation (below -0.7 or above 0.7) found was between *Selic* and *Inflation*, which may indicate a perfect collinearity problem. However, the maximum value of the VIF (Variance Inflation Factor) of the model's independent variables was 7.15 for the *Cambio* rate variable, followed by the VIF of 5.68 for the GDP variable, the others had a VIF lower than 5. The model was estimated without the variables *Cambio* and *PIB* (results not listed), and the results were similar, not changing the conclusions regarding this study's hypotheses. Therefore, we chose to keep the variables.

4.2 Estimated model's results

The model shown in Equation (1) was estimated to test the hypotheses using an Ordered Probit model for Panel Data estimated by the Maximum Likelihood Method, controlling for sector and year-fixed effects. The results are presented in Table 4. Table 5 presents the estimated probabilities of a company facing different financial distress levels according to working capital and working capital management.

According to the results of the Breusch–Pagan/Cook–Weisberg test for heteroscedasticity ($p\text{-value} = 0.00\% < 1\%$), Table 4 shows evidence that the model has a heteroscedasticity problem; hence, errors robust to heteroscedasticity were estimated.

Table 4
Probit Ordenado

	DF	
	Coef.	Estat. Z
<i>Intangibilidade</i>	-0,3562	(-0,82)
<i>CG</i>	-3,4322	(-11,85)***
<i>Gestão_CG</i>	-0,0003	(-4,39)***
<i>Endividamento</i>	2,7340	(7,17)***
<i>Vo_Lucros</i>	0,0153	(5,79)***
<i>Tamanho</i>	-0,3324	(-6,75)***
<i>Cresc_Receita</i>	-0,0030	(-3,31)***
<i>Cambio</i>	-0,3851	(-1,44)
<i>Selic</i>	0,0356	(0,40)
<i>Inflacao</i>	0,1241	(2,22)**
<i>PIB</i>	-0,1156	(-2,80)***
<i>Sector Fixed Effect</i>		Sim
<i>Year Fixed Effect</i>		Sim
<i>Number of Observations</i>		1.968
<i>P-Value of Breusch–Pagan/Cook–Weisberg test for Heteroscedasticity</i>		0,0000

Note: *, **, and *** indicate significance levels at 10%, 5% and 1%, respectively.
Source: developed by the authors.

In this study, examples of intangible assets include: brands, patents, software, and technologies developed internally and which may give companies a competitive advantage, making them financially healthier and, therefore, less vulnerable to financial distress (Lizares & Bautista, 2020; Bhattacharyay, 2021). Table 4 shows that the coefficient of the *Intangibilidade* variable was not statistically significant ($p\text{-value} > 10\%$). Therefore, we have no evidence that *Intangibilidade* is related to the likelihood of companies facing different levels of financial distress; hence, hypothesis 1 (H1) was not confirmed. Thus, intangible assets can strategically increase a company's competitiveness, its value and management capacity, leading it to perform better (Osinski, Selig, Matos & Roman, 2017; Shahwan & Habib, 2020). However, it was not relevant in decreasing the companies' probability of facing different financial distress levels. According to Shahwan and Habib (2020), a company's intellectual capital makes it less vulnerable to financial distress, which does not seem to be the case when we look at intangible assets as a whole, including licenses, patents, etc.

Table 4 shows that the estimated coefficient of the variable is negative and statistically significant at 1% ($p\text{-value} < 1\%$), confirming hypothesis 2 (H2), i.e., the greater a company's working capital, the less likely it is to face higher levels of financial distress. This finding is in line with those of Baños-Caballero, García-Teruel and Martínez-Solano (2014) and Shahdadi, Rostamy, Sadeghi Sharif and Ranjbar (2020), indicating that greater working capital allows companies to increase their sales by granting longer payment terms to their customers and such an increase in sales reduces the likelihood of a company getting into financial distress. Even if a company gets into financial distress, more working capital reduces its chance of facing severe and potentially irreversible financial distress.

Panel A of Table 5 presents the estimated probabilities of companies facing different financial distress levels according to different levels of working capital (*CG*). Companies are more likely to face irreversible financial distress (99.89%) when there are lower *CG* levels ($CG = -2.11$). As *CG* increases ($CG = -0.11$), the chance of a company facing financial distress is even more significant, but it reduces the chance of it facing very severe financial distress (14.83%). The highest probability at the highest *CG* level ($CG = 0.89$), is the company not facing financial distress (89.12%).

Thus, there is a greater probability that a company faces severe financial distress at very low levels of working capital ($CG = -2.11$). At an intermediate level of working capital ($CG = -1.11$ and -0.11), the probability of facing severe financial distress decreases. However, it is highly likely to face an intermediate level of financial distress. Only when the working capital is positive, at its highest level, does the company have greater chances of not getting into financial distress.

Therefore, before working capital reaches very low levels, which may lead to severe financial distress, it will reach an intermediate level, taking the company to an intermediate level of financial distress. When it happens, the company may take measures to increase working capital and avoid severe and potentially irreversible financial distress.

Table 5

Average marginal effect

Panel A: Working capital average marginal effect								
CG	DF							
	0		1		2		3	
	Prob.	Z Statistics	Prob.	Z Statistics	Prob.	Z Statistics	Prob.	Z Statistics
-2,11	0,00003%	(0,47)	0,0001%	(0,51)	0,1090%	(0,79)	99,8909%	(722,69)***
-1,11	0,2178%	(1,40)	0,2705%	(1,63)	16,3423%	(3,41)***	83,1694%	(16,33)***
-0,11	22,5434%	(12,34)***	8,4795%	(9,75)***	54,1454%	(24,47)***	14,8317%	(8,55)***
0,89	89,1186%	(39,24)***	3,7463%	(5,25)***	6,8388%	(4,41)***	0,2962%	(2,49)**

Panel B: Working capital average marginal effect								
Gestão_CG	DF							
	0		1		2		3	
	Prob.	Z Statistics	Prob.	Z Statistics	Prob.	Z Statistics	Prob.	Z Statistics
-6,8	41,1366%	(26,52)***	9,2253%	(11,05)***	38,3486%	(23,50)***	11,2896%	(12,13)***
-3,6	41,1546%	(26,52)***	9,2252%	(11,05)***	38,3363%	(23,49)***	11,2839%	(12,13)***
-0,4	41,1725%	(26,51)***	9,2252%	(11,05)***	38,3240%	(23,48)***	11,2783%	(12,13)***
2,8	41,1905%	(26,51)***	9,2251%	(11,05)***	38,3117%	(23,47)***	11,2727%	(12,13)***

Note: *, ** e *** indicate levels of significance at 10%, 5% and 1%, respectively.
Source: developed by the authors.

As for the results regarding working capital management (*Gestão_CG*), Table 4 shows that the coefficient of the variable *Gestão_CG* is negative and statistically significant at 1% (p-value < 1%). This percentage indicates that, the better the working capital management, the less likely a company is to be in financial distress, and the less likely it is to experience higher financial distress levels, confirming hypothesis 3 (H3). These results corroborate the findings of Boçoc and Anton (2017), García-Teruel and Martínez-Solano (2007), Pouraghajan and Emamgholipourarchi (2012), and Qudah & Al-Afeef (2015), showing that working capital management is an important factor for a company's financial health.

Table 5, Panel B shows that, regardless of the *Gestão_CG*, the company has a higher estimated probability of not being in financial distress ($DF=0$). The worse the , the estimated probability of a company not facing financial distress reduces from 41.1905% to 41.1366%, and the probability of it facing severe ($DF=3$), intermediate ($DF=2$), or mild ($DF=1$) distress increases by 0.0169%, 0.0368%, and 0.0002%, respectively. Therefore, the estimated probability of a company facing certain levels of financial distress increases as working capital management worsens; such probability changes depending on the level of financial distress.

Therefore, reducing the volume of working capital without a counterpart that justifies such a decrease may render the company more vulnerable to financial distress. A very sharp decrease will make the company more susceptible to irreversible financial distress, as it will consume resources relevant to its financial health. Worsened working capital management, such as important changes in financial and operational terms that impact the cash cycle, may lead to a greater probability of financial distress, and more accentuated deterioration increases the probability of a company facing higher levels of financial distress.

5. Final Considerations

This study aimed to analyze the impact of intangibility, working capital, and working capital management on the likelihood of companies facing different financial distress levels. The results indicate that the greater the working capital and the better its management, the lower the probability of a company facing higher levels of financial distress. Additionally, the results indicate that before working capital reaches very low levels and leads the company to experience severe financial distress, it will reach an intermediate level of working capital and impose the company an intermediate level of financial distress. When this happens, the company may take measures to increase its working capital, avoiding severe and potentially irreversible financial distress.

The results do not indicate a relationship between intangibility and the likelihood of a company facing different financial distress levels. In general, the results on intangibility can support the market and regulators involved in the adjustment of contractual clauses of companies with the profile addressed here. As the results focus on intangibility in general in the Brazilian market, future studies are suggested to investigate the sectors with a high concentration of intangible assets precisely because these items need attention on the part of managers, financial market, and regulators when it comes to contractual monitoring in the case of financing.

This study contributes to the literature on the determinants of financial distress in Brazilian companies by applying a multilevel variable developed by Farooq et al. (2018) to assess the companies' different levels of financial distress. This approach differs from studies only investigating companies that are either facing or not facing financial distress. Empirical results related to working capital and working capital management provide practical contributions by showing that monitoring working capital and its management can mitigate the risk of companies facing financial distress. The results allow creditors to analyze a company's balance sheet over time and decide whether to finance its activities according to the working capital policy observed during different periods and what is believed to shield against severe financial distress. Thus, these results also support the improvement of more assertive contractual clauses, the monitoring of companies' risk, and regulators when considering the contexts experienced by Brazilian companies and financial institutions. Another contribution is that companies can better allocate the cost of capital in the Brazilian market through contractual clauses involving the application of these results. Thus, this study's results contribute to monitoring the risk of financial distress and severe and potentially irreversible situations in the Brazilian market. Finally, this study can help mitigate the cost of capital for less risky companies.

In practice, the managers of companies in developing countries, like in the case of the Brazilian market, have few bank options for raising funds. Considering this study's results, managers can observe their companies' financial distress level and decide how to allocate the resources that make up the working capital according to the level of financial distress. Managers can also seek long-term financing, change the company's capital structure, include more equity capital to replace short-term liabilities for financing, and increase working capital. Regarding working capital management, managers can restructure their cash cycle by negotiating deadlines with suppliers and customers, investing in logistics or internal machinery, and optimizing their processes to reduce the cash cycle.

Although intangible assets can be strategic to increase competitiveness (Osinski, Selig, Matos & Roman, 2017; Shahwan & Habib, 2020), they did not prove relevant in explaining the different levels of financial distress. In this sense, Shahwan and Habib (2020) argue that intellectual capital makes the company less vulnerable to financial adversities. A relationship between intangibility and financial difficulty levels was not found here, possibly because of the different characteristics of different intangibles. Therefore, the relationship between the different types of intangibles (e.g., human capital, licenses, patents, etc.) and the likelihood of a company facing different financial distress levels should be tested. Additionally, a suggestion is that these relationships be analyzed in different economic contexts since these relationships may be more pronounced in times of financial crisis. Finally, the possibility of controlling for the managers' educational level is suggested, as it may also directly interfere with companies' financial policies and potentially lead to different levels of financial distress over time.

Additionally, this study brings a discussion that adds to the market of resources suppliers, companies, and regulators, presenting an additional mechanism that managers, financial institutions, and Brazilian regulators can use to monitor companies; the crises affecting companies and financial institutions may affect the entire market (Exame, 2023a; Exame, 2023b).

One of this study's limitations concerns the unavailability of data, which prevented individual analyses of human capital, licenses, and patents as intangible assets. Future studies are suggested to address these variables in addition to exchange rate variations among companies operating in other markets, interest rates, startups, and small and medium-sized companies, as the results may differ in such contexts. Finally, this new multilevel financial distress metric is suggested to predict bankruptcy, non-payment, or debt renegotiation.

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