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ORIGINAL ARTICLE

Financial slack and environmental expenditures: Value relevance in the Brazilian stock market

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ABSTRACT

The objective of this article is to evaluate the effect of financial slack on the value relevance of environmental expenditures in Brazilian capital market firms. The Brazilian literature, unlike the foreign literature, has neglected to investigate the value relevance of environmental performance information. The study addresses the combination of environmental information with the financial condition of firms within the scope of value relevance, obtaining evidence not yet contemplated in the literature on the Brazilian capital market. It is noteworthy that the financial perspective strongly influences the valuation of firms in terms of the environmental dimension. Companies that engage in environmental spending and are in a better financial position are better valued and considered economically interesting. The same is not true for firms in a worse financial position. The study shows how the environmental dimension, which is not a priority from the shareholder's point of view, can be the object of investor attention if the financial condition requirement is met. The market monitors environmental expenditures in order to assess much more the extent of the effects of these expenditures on the generation of future cash flows rather than the company's environmental commitment. The sample includes 52 companies whose shares were traded on the B3 S.A. in the period 2009-2018, totaling 252 observations. The model proposed by Ohlson was used, adapted according to the literature, and operationalized in POLS models. In addition, analyses were reproduced considering the possible moderating effect of financial slack measures on the environmental spending proxy. The results indicate that environmental spending contributes to reducing the valuation of firms, signaling to investors only future economic costs. Financial slack was found to be an important element in the valuation of firms with environmental expenditures, and companies with environmental expenditures and greater financial slack had higher valuations than those with less financial slack.

Keywords: financial slack, environmental expenditures, informational relevance, emerging markets.

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Folga financeira e gastos ambientais: value-relevance no mercado acionário brasileiro

RESUMO

O objetivo deste artigo é avaliar o efeito da folga financeira no value-relevance de gastos ambientais em firmas do mercado de capitais brasileiro. A literatura nacional tem negligenciado a abordagem de investigações sobre value-relevance de informações ambientais de desempenho, diferentemente do que ocorre na literatura estrangeira. O estudo aborda a combinação de informações ambientais com a condição financeira das firmas no escopo do value-relevance, obtendo evidências ainda não contempladas na literatura acerca do mercado de capitais brasileiro. Destaca-se que a perspectiva financeira influencia fortemente a avaliação das firmas no tocante à dimensão ambiental. A empresa que realiza gastos ambientais e detém melhor condição financeira passa a ser mais bem avaliada e considerada economicamente interessante. O mesmo não ocorre com firmas em condição financeira inferior. O estudo possibilita demonstrar como a dimensão ambiental, não prioritária na visão do shareholder, poderá ser objeto de atenção de investidores, se o requisito condição financeira é atendido. O mercado monitora gastos ambientais a fim de avaliar muito mais a extensão dos efeitos derivados desses dispêndios na geração de fluxos de caixa futuros, e menos o comprometimento ambiental da empresa. A amostra reúne 52 empresas com ações negociadas na B3 S.A. no período 2009-2018, totalizando 252 observações. Foi usado o modelo proposto por Ohlson, adaptado seguindo a literatura, e operacionalizado em modelos POLS. Ademais, análises foram reproduzidas considerando-se o possível efeito moderador das medidas de folga financeira na proxy dos gastos ambientais. Os resultados indicam que os gastos ambientais contribuem para reduzir a avaliação das firmas, sinalizando para os investidores apenas custos econômicos futuros. Observou-se que a folga financeira constitui elemento importante na avaliação das firmas com gastos ambientais, e que, nas empresas com gastos ambientais e maior folga financeira, a avaliação foi superior à daquelas com menor folga financeira.

Palavras-chave: *folga financeira, gastos ambientais, relevância informacional, mercados emergentes.*

1. INTRODUCTION

This article addresses the value relevance of environmental expenditures in combination with financial slack in the Brazilian capital market. Environmental expenditures can be relevant to the market, either by indicating how firms have protected themselves against environmental risks, improving their image and seeking future competitive advantage (Baboukardos, 2018; Hassel et al., 2005; Iatridis, 2013; Middleton, 2015), or simply by reducing profitability with non-priority activities (Friedman, 1970; Jaggi & Freedman, 1992).

In this study, environmental spending is defined as the economic sacrifice that the company makes to finance activities or assets with the purpose of preventing, correcting or minimizing the environmental impacts caused by its activities. Environmental spending has been recommended in the literature as a proxy for environmental performance because it reflects the ability to mitigate environmental risks (Clarkson et al., 2004; Iatridis, 2013; Lys, Naughton, & Wang, 2015; Mayor & Martel, 2015).

Baboukardos (2018) explains that, despite the various studies conducted on the value relevance of environmental information, the results are inconclusive. Derwall, Koedijk and Horst (2011) support this position, arguing that it is costly to engage in activities that can prevent, correct or minimize environmental impacts. In addition, most of the economic value generated by expenditures – in cases where value is created – is often intangible in nature and is barely recognized in accounting.

Auer and Schuhmacher (2016), Borghesi et al. (2014), and Renneboog et al. (2008) argue that environmental commitments must be economically viable even if investors agree to lower returns, assuming that the firm's objective function provides for environmental spending. In this case: (i) environmental objectives are linked to economic objectives; and (ii) resources are expected to be available to finance environmental spending without jeopardizing the firm's main economic objectives. In this way, this study is based on the theoretical tension between the views of the firm centered on shareholders and on stakeholders.

According to Barnett and Salomon (2012), Derwall et al. (2011), and Renneboog et al. (2008), investors seek information about the economic benefits of environmental expenditures, and also analyze whether there are resources to finance these expenditures without compromising the firm economically. This raises questions about the relevance of environmental spending in terms of the firm's financial capacity as a whole.

Some scholars (Boso et al., 2017; Campbell, 2007; Hong et al., 2012; Lys et al., 2015; Wruck, 1990) argue that firms engage in environmental spending due to greater financial slack. This is because there would be greater flexibility in spending cash on activities that are inherently different from the main economic activity.

Financial slack can be defined as the generation of available or potential cash, which allows for funds to be spent on activities that can generate some kind of return for the firm and its investors (Daniel et al., 2004; Wruck, 1990). In this context, environmental spending would depend on financial surplus, since it represents a waste of firm resources (Lys et al., 2015), as suggested by the theory of the firm, which focuses on shareholders (Boaventura et al., 2009; Friedman, 1970). According to Hong et al. (2012), even if expenditures such as those of an environmental nature are driven by economic motivations or altruistic reasons, they may be constrained by the degree of the firm's financial slack. The lower the financial constraint, the greater the propensity to invest, which may signal better future performance (Daniel et al., 2004; Hong et al., 2012; Waddock & Graves, 1997).

It is therefore argued that, in the assessment of investors, the relevance of environmental spending is affected by financial slack (Burke & Wieland, 2017; Campbell, 2007; Hong et al., 2012). In addition, environmental spending is not considered to be a form of corporate "charity" as the firm expects stronger future financial performance (Lys et al., 2015). In light of this, the following question is posed: What is the effect of financial slack on the value relevance of environmental spending for investors?

The objective of this study is to evaluate the effect of financial slack on the value relevance of environmental expenditures in Brazilian capital market firms. To this end, the Ohlson (1995) model was applied, adapted in multiple linear regression estimations, with data from the period 2009-2018. Environmental spending was weighted by the share of the companies' revenues, and financial slack was studied from three perspectives: cash, cash generation, and financial condition. According to the results obtained in the research, the financial perspective has an influence on the assessment of the firm in terms of the environmental dimension. Companies that engage in environmental spending and are in better financial condition are better valued and considered economically interesting. This is not the case for firms in a worse financial position.

This study relates to an important area of research that has documented the relevance of drawing inferences about the informativeness of environmental reporting (Iatridis, 2013; Middleton, 2015), with a focus on emerging markets. In this area of research, there is a lack of studies on the role of financial slack as a moderator of the relevance of firms' environmental expenditures. Baboukardos (2018) and Hassel et al. (2005) argue that disagreements on the relevance of information explaining environmental performance are related to the fact that this performance is associated with the generation of future economic costs and benefits. Thus, by exploring this research gap, this study brings together elements that explain whether financial slack acts as a driver of environmental spending and contributes to the analysis of potential future economic benefits.

From a practical point of view, this research brings together evidence that supports the shareholder-centric theoretical view. Thus, if investors' economic orientation is based solely on maximizing their individual utility, the stocks of companies that engage in spending on the environment should not be part of their portfolio. Thus, the study is relevant for supporting investors' decisions, as it highlights the value relevance of environmental spending.

2. THEORETICAL FRAMEWORK AND HYPOTHESIS DEVELOPMENT

The environmental information that explains the variability in stock prices is of great importance to the capital markets. However, there is still uncertainty about how investors evaluate this information, as they may anticipate future economic benefits or costs. After all, this information reflects the environmental risk component (Elshandidy, 2014; McGuire et al., 1988; Siekkinen, 2016).

In general, investors monitor firms' practices by evaluating their ability to convert environmental spending into future economic benefits or to reduce the risk of the environmental component (Barnett & Salomon, 2012). According to Lys et al. (2015), this is known as the "investment hypothesis" because the market expects firms to engage in environmental spending and thus generate positive economic returns in the future. This premise is consistent with the profit-seeking orientation and the shareholder-focused approach.

According to Lys et al. (2015), firms may engage in environmental spending without the intention of increasing their value, simply because they are environmentally responsible as a matter of principle. This logic is called the "charity hypothesis," since the firm and the market do not expect positive economic returns from environmental spending. This premise

is consistent with the value-driven orientation and the stakeholder approach.

The profit-seeking and value-driven orientations of investors consider the firm from two different perspectives: maximizing the interests of shareholders and maximizing the interests of stakeholders. In this sense, environmental spending can be valued based on different expectations in the capital markets. These differences are reflected in the value relevance of environmental information, as can be seen in the studies of Baboukardos (2018), Jaggi and Freedman (1992), Lys et al. (2015), and Middleton (2015).

Financial slack can be interpreted by investors as the firm's willingness to finance various activities, including environmental commitments (Boso et al., 2017; Campbell, 2007; Daniel et al., 2004; Hong et al., 2012; Waddock & Graves, 1997). Thus, in addition to pointing out to managers the most appropriate equity and financial structure in a scenario of uncertainty (Souza et al., 2022), financial slack is speculated to have an incremental effect on the valuation of equity securities (Burke & Wieland, 2017).

According to Barnett and Salomon (2012), there is much uncertainty about the generation of future economic benefits related to environmental expenditures. These expenses are assumed to be investments with uncertain returns over long-term horizons. Given this attribute, Martin and Moser (2016) argue that investors value environmental spending positively when they believe that it signals positive cash flows or cost savings in the future.

In this sense, the usefulness of financial slack is assumed, since it indicates management's ability to allocate resources to non-operational activities (Daniel et al., 2004; Shahzad et al., 2016; Waddock & Graves, 1997). The assessment of financial slack may be reflected in the assessment of environmental spending because, from the perspective of shareholders, such expenses merely indicate a sacrifice of scarce resources (Jaggi & Freedman, 1992).

Environmental spending reveals the extent of the firm's commitment to corporate environmental responsibility, suggesting a long-term vision. The allocation of resources to environmental practices responds to pressures from investors and changes in the external context (Cho et al., 2012; Derwall et al., 2011; Heikkurinen & Bonnedahl, 2013; Renneboog et al., 2008).

This discussion aims to deconstruct the company's emphasis entirely on the figure of the shareholder-owner (Friedman, 1970; Jaggi & Freedman, 1992), assuming that there are other stakeholders in the business and that there are objectives beyond those that are strictly financial (Boaventura et al., 2009; Freeman, 1994). In this sense, environmental practices are aimed at improving the company's image and social legitimacy (Anzilago et al., 2022; Santos et al., 2022).

According to Dixon and Whittaker (1999), environmental expenditures are becoming increasingly important in the operational structure of firms. This leads to a demand for reports that include environmental performance information, and it is appropriate to investigate the relevance of environmental spending (Ashcroft & Smith, 2008). Alewine and Stone (2013) argue that greater attention to environmental performance information is important from an accounting perspective, as it encourages the inclusion of environmental reporting in investment evaluations.

The market monitors environmental expenditures in order to assess not only the firm's environmental commitment, but also the extent to which these expenditures affect the generation of future cash flows. This is because resources are scarce and it is up to the company to balance the interests of shareholders and other stakeholders (Barnett & Salomon, 2012; Fatemi et al., 2015; Pekovic et al., 2018).

Thus, higher levels of financial slack are thought to operate by signaling efficient opportunities to invest in activities that have a positive environmental impact (Waddock & Graves, 1997). On the other hand, financial constraints force resources to be directed toward activities that invariably prioritize maximizing shareholder returns. In this scenario, lower levels of financial slack would cause management to reconsider its actions, resulting in a reduction or the abandonment of funding for environmental spending (Wruck, 1990).

According to Bhandari and Javakhadze (2017), investors need to be informed about firms' environmental spending because environmental commitments may limit growth opportunities by reducing future investments in other areas. This would lead to a distortion in the efficiency of capital allocation. In this way, financial slack could moderate the contribution of environmental spending to maximizing firm value.

This logic is reasonable because financial slack can protect firms from threats or instability and facilitate the timely selection of investments that meet the goal of maximizing firm value (Daniel et al., 2004). Financial slack is suitable for assessing the effect of organizational flexibility on environmental spending because it is relatively easy to invest when resources are available (Lee, 2015).

Bhandari and Javakhadze (2017), Boso et al. (2017), and Lys et al. (2015) argue that strong stakeholder involvement in environmental issues puts pressure on the firm to increase environmental expenditures. This pressure eventually leads to the neglect of investments that maximize shareholder value, which harms their interests.

Faced with this conflicting objective, management's efforts to align the utilities in these two groups can help reduce distortions in expenditure efficiency, including environmental spending (Bhandari & Javakhadze, 2017; Lys et al., 2015). However, the market struggles to evaluate environmental information and environmental performance (Dilla et al., 2016).

Financial slack informs investors about the company's investment capacity. Thus, it can be positively reflected in the price of equity securities, signaling to the market the ability to timely finance investments or strategic positions that maximize the firm's value (Boso et al., 2017; Lee, 2015). According to Lee (2015), financial slack can positively affect firm value if management uses it to finance activities that are essential for performance and economic growth.

Under conditions of resource scarcity, financial constraints, the search for accelerated economic growth, and limitations in the institutional environment of emerging markets (capital constraints and weak capital market development) (Boso et al., 2017; Lee, 2015), higher levels of financial slack can facilitate environmental spending (Waddock & Graves, 1997; Wruck, 1990).

Bhandari and Javakhadze (2017) corroborate Daniel et al. (2004) and Lee (2015) by stating that a reduction in environmental spending may reflect the existence of strong managerial incentives to identify and finance more profitable and robust strategic alternatives.

In order to minimize environmental expenditures with more economically efficient options, investors are pushing for monitoring mechanisms and the alignment of interests to prevent managers from shifting investments to environmental commitment strategies, thereby reducing shareholder wealth (Borghesi et al., 2014; Lee, 2015; Shahzad et al., 2016).

According to Shahzad et al. (2016), financial slack is a crucial factor in financing environmental responsibility. Considering that environmental expenditures involve the discretionary allocation of resources to serve other stakeholders, it can be assumed that financial slack is an obvious prerequisite. Therefore, understanding the level of financial slack can help manage the firm's relationship with its stakeholders.

Lys et al. (2015) and Qiu et al. (2016) show that a company's environmental commitment is related to expectations of strong future economic and financial performance. According to Lys et al. (2015), firms do not invest in the environment to generate environmental benefits for society, but to seek positive economic returns.

Fatemi et al. (2015) point out that environmental spending drains immediate cash flows and, in return, medium- or long-term economic benefits are expected to compensate for the current financial sacrifice. In addition to time horizons, attention should be paid to the risk of management assuming environmental expenditures while ignoring resource-constrained conditions (Borghesi et al., 2014; Shahzad et al., 2016).

This study identifies a marginal concern with the economic perspective to the detriment of the environmental perspective. Thus, even when considering investors with strictly opposite economic orientations, the shareholder's objective function is assumed to be hierarchically superior to that of the other stakeholders, even though environmental and financial concerns may coexist (Derwall et al., 2011). Thus, the hypotheses are:

H_1: Higher levels of financial slack have a positive effect on the relevance of environmental expenditures.

H_2: Lower levels of financial slack have a positive effect on the relevance of environmental expenditures.

3. METHOD

The data on the companies in the sample come from the Thomson Reuters™ secondary database. The research universe covers the Brazilian capital market, including companies listed on the B3 S.A. – *Brasil Bolsa Balcão*. The sample includes companies that engaged in environmental spending in the period 2009-2018. Regarding the period, it is worth clarifying the aspects that justify it, given the scope of the study: accounting value relevance.

The 2009 financial year is the first following the enactment of Law No. 11,638 (2007) and Provisional Measure No. 449/2008, which updated Brazilian corporate law. Provisional Measure 449/2008 later became Law 11,941 (2009). Therefore, this first cut provides evidence in accordance with this change. In addition, Resolution 849 (2020) established new deadlines for the filing of financial statements. This was postponed due to the spread of the new coronavirus that causes covid-19 and its impact on economic activity. It was recommended that companies make efforts to present the effects of the economic crisis associated with the pandemic, if measured, as early as in the 2019 financial statements.

In this sense, the 2019 financial year was not included in the analysis because of the evidence of Liu et al. (2020) and Liu and Sun (2022), which shows an increase in negative

abnormal returns, a reduction in discretionary accruals and a loss of earnings relevance in the pandemic period. In addition, Franzotti (2020) points out that investment decreases and debt increases in crisis periods. These issues are consistent with the literature on financial slack and environmental spending (Boso et al., 2017; Campbell, 2007; Daniel et al., 2004; Lee, 2015; Hong et al., 2012; Lys et al., 2015; Waddock & Graves, 1997; Wruck, 1990).

Of the 410 companies in the secondary database, 53 were identified as having engaged environmental spending in at least one of the financial years in the study period, totaling 386 observations. This was followed by the verification of the absence of essential data to measure the study variables (cash, operating cash flow, etc.), leaving 308 observations. Finally, it was found that some of the companies' market value quotation data (at least one company per year) necessary for the value relevance model was unavailable, reducing the sample to 52 firms, 252 observations and ten financial years (2009-2018).

It should be noted that, as in Santos and Coelho (2018), the stocks with the highest trading liquidity were considered in the filtering and selection process. Thus, based on the database, the "primary issue" in the screener filter was used, and the platform returned the stocks with the highest historical trading volume in the firms' active markets. Thus, if there were two or more stock options for a company, the price considered would be that of the most heavily traded stock in the historical series, so that it would be possible to measure the predicted relationship.

Following studies on the value relevance of environmental information (Baboukardos, 2018; Iatridis, 2013; Middleton, 2015), we considered Ohlson's (1995) Residual Income Valuation (RIV) model, as detailed in Equation 1.

$$P_t = y_t + \alpha_1 x_t^a + \alpha_2 v_t + \varepsilon_t \quad (1)$$

According to this model, the value of the firm (P_t) is a function of equity (y_t), abnormal profits (x_t^a), and other information (v_t) that changes the market's expectations about the firm's future profitability.

The RIV model, according to Equation 1, was adjusted for application purposes, as in Baboukardos (2017, 2018), Burke and Wieland (2017), Franzen and Radhakrishnan (2009), and Potin et al. (2016), who applied the Ohlson (1995) model modified by Collins et al. (1997), using net income instead of abnormal profits. These studies show that this specification produces consistent results and eliminates distortions in the estimation of abnormal profits when the firm presents a loss or negative equity.

Santos and Coelho (2018) report the need for adaptation to ensure a better fit in the models, since Ohlson's (1995) theory assumes that the change in value is due to other information that explains abnormal profit. This, in turn, exceeds the expected profit conditional on the firm's residual equity. If the company has overdrawn liabilities, the application of a risk-free rate or the cost of capital distorts this profit. In this sense, Collins et al. (1997) and Franzen and Radhakrishnan (2009) point out that observations with a loss/negative equity can lead to distortions in the assessment of value relevance. These authors also opted to exclude negative values from their analysis, similar to this study.

The values of $Mv_{i,t+1}$ (market value four months after the end of the financial year – similar to Rezende (2005) and Collins et al. (1997) – calculated by multiplying the stock price by the volume), $Eq_{i,t}$ (shareholders' equity) and $In_{i,t\_}$(i,t) (net income) are transformed by their natural logarithm (Santos & Coelho, 2018), in order to reduce heteroscedasticity problems and avoid scale effects that could lead to misinterpretations of the model (Baboukardos, 2018; Brown, et al., 1999; Ohlson, 1995). In addition, negative numbers are excluded from this selection (Collins et al., 1997; Franzen & Radhakrishnan, 2009), as they can generate interpretative distortions in the model. It should be noted that this methodological choice imposes limitations on the use of the data and must be taken into account when analyzing and interpreting the research results.

Although Ohlson's (1995) model allows for the market value at the end of year *t*, it assumes that on this date the accounting figures may not be reflected in the price, since the financial statements have not yet been released. This approach is based on the premise of linear information dynamics in the capital market (Feltham & Ohlson, 1995; Ohlson, 1995). Thus, P_t was taken to be the four months following the year-end.

Dummies ($SECT_{i,t}$ and $YEAR_{i,t}$) were included to control for fixed effects by sector and year (Baboukardos, 2017; 2018; Matsumara, et al., 2014). $SECT_{i,t}$ identifies whether the firm belongs to a potentially polluting sector according to Law 10,165 (2000) (National Environmental Policy), while $YEAR_{i,t}$ refers to the period. Some studies support the idea that these sectors engage in more environmental spending (Clarkson & Richardson, 2004; Clarkson, et al., 2013).

As proposed by the RIV model, the coefficients β_1 and β_2 are positive, suggesting that the accounting figures are informative and useful in predicting the value of the firm.

Equation 2 is used to test hypotheses H_1 and H_2:

$$Mv_{i,t} = \beta_0 + \beta_1 Eq_{i,t} + \beta_2 In_{i,t} + \beta_3 EE_{i,t} + \beta_4 FS_{i,t} + \beta_5 EE_{i,t} FS_{i,t} + \beta_6 SECT_{i,t} + \beta_7 \sum_{2010}^{2018} YEAR_{i,t} + \varepsilon_{i,t} \quad (2)$$

$EE_{i,t}$ is the first variable of interest and represents the environmental expenditures of firm *i* in year *t*. The variable was collected from the Thomson Reuters™ secondary database, under the heading "environmental expenditures," for the period under study. The variable $EE_{i,t}$, as it appears in the database, does not differentiate between the nature of the expenditure (expenses, costs, investments and environmental losses), which is a limitation of the study. To avoid scale problems (Brown et al., 1999; Ohlson, 1995), the variable $EE_{i,t}$ is equated with $NR_{i,t}$, which is the net revenue of company *i* in year *t*, a measure based on the studies by Boso et al. (2017) and Pekovic et al. (2018). This approach assesses the magnitude of the financial effect of environmental spending on firm value, where, according to Ohlson's (1995) model, environmental spending would be "other information" capable of sending signals to the market based on the size of this expenditure in relation to revenues (Boso et al., 2017; Pekovic et al., 2018). In Equation 2, net income ($In_{i,t}$) was adjusted by the variable $EE_{i,t}$, thus isolating the effect of this measure of interest on the companies' results (Franzen & Radhakrishnan, 2009).

$FS_{i,t}$ is the second variable of interest, a measure of the financial slack of company *i* in year *t*. Daniel et al. (2004), Hadlock and Pierce (2010), Kaplan and Zingales (1997), Lee (2015), Li et al. (2006), and Shahzad et al. (2016) note that financial slack as a construct has several variants. The ability to finance marginal expenditures (investments) can be assessed by considering multiple aspects of the firm that indicate greater or less financial slack.

Financial slack can be analyzed from three perspectives: cash and cash equivalents, cash generation, and financial constraints (Daniel et al., 2004; Lamont, Polk & Saá-Requejo, 2001; Lee, 2015). Thus, $FS_{i,t}$ is represented by $FS1_{i,t}$, $FS2_{i,t}$ and $FS3_{i,t}$. The first two variants consider unique aspects of the firm: $FS1_{i,t}$ includes the value of cash and cash equivalents in relation to assets; $FS2_{i,t}$ refers to the value of operating cash flow in relation assets. The proxies cover each company *i* in year *t*, individually. $FS3_{i,t}$ is based on the $KZ\ Index_{i,t}$ metric, which assesses financial slack from a broader perspective. The $KZ\ Index_{i,t}$ is measured according to Equation 3 (Kaplan & Zingales, 1997; Lamont et al., 2001). Ames, Nunes and Silva (2022) also used this measure when investigating the relationship with the market performance of Brazilian firms, as adopted in this study.

$$KZ\ Index_{i,t} = -1.002CF_{i,t} - 39.368DIV_{i,t} - 1.135C_{i,t} + 3.139LD_{i,t} + 0.283Q_{i,t} \quad \textbf{3}$$

$CF_{i,t}$ is operating cash flow; $DIV_{i,t}$ refers to dividends; $C_{i,t}$ is cash; $LD_{i,t}$ is liabilities due, both for company *i* in year *t* and adjusted by $Assets_{i,t-1}$; $Q_{i,t}$ is a proxy for future investment opportunity, calculated as market value added to liabilities due adjusted by $Assets_{i,t}$.

It is assumed that the combination of environmental expenditures ($EE_{i,t}$) and financial slack ($FS_{i,t}$) affects the firm's valuation. To test hypotheses H_1 and H_2, this study uses the moderation mechanism. According to Faia and Vieira (2018), in this mechanism, if the moderating variable is continuous, it must be transformed into a dummy, according to the established analysis criterion. In this study, a higher level of financial slack is expected to have a positive effect on the evaluation of environmental spending, while a lower level is expected to have a negative effect.

Kaplan and Zingales (1997), Khatami, Marchica and Mura (2015), and Lamont et al. (2001) also classified companies into groups using the level of financial slack as a criterion. In general, these studies used the percentiles of their distributions. Based on this literature, four interaction scenarios are examined, as shown in Table 1.

Table 1
Operationalization of the moderation mechanism of financial slack

Interaction	Operationalization	Variables and Moderators	Expected Effect
1	A "1" is assigned if $FS_{i,t}$ is greater than the 75th percentile; and "0" in other cases	$FS_{75i,t}$; $Mod1_{i,t} = (EE_{i,t}FS_{75,i,t})$	+
2	A "1" is assigned if $FS_{i,t}$ is greater than the median; and "0" in other cases	$FS_{50+i,t}$; $Mod2_{i,t} = (EE_{i,t}FS_{50+i,t})$	+
3	A "1" is assigned if $FS_{i,t}$ is less than the median; and "0" in other cases	$FS_{50-i,t}$; $Mod3_{i,t} = (EE_{i,t}FS_{50-i,t})$	-
4	A "1" is assigned if $FS_{i,t}$ is less than the 25th percentile; and "0" in other cases	$FS_{25i,t}$; $Mod4_{i,t} = (EE_{i,t}FS_{25,i,t})$	-

$FS_{75,i,t}$ = value above the 75th percentile of the financial slack variable; $FS_{50+,i,t}$ = value above the median of the financial slack variable; $FS_{50-,i,t}$ = value below the median of the financial slack variable; $FS_{25,i,t}$ = value below the 25th percentile of the financial slack variable; $Mod1_{i,t}$, $Mod2_{i,t}$, $Mod3_{i,t}$ and $Mod4_{i,t}$ = moderating variables; $EE_{i,t}$ = environmental expenditures.
Source: *Prepared by the authors.*

Moderation is confirmed if β_5 is statistically significant in Equation 2, which is treated with the three approaches to financial slack. The application of moderation is common in the accounting literature on value relevance

(Baboukardos, 2017, 2018; Burke & Wieland, 2017; Potin et al., 2016), but no studies were identified with the same purpose as this research.

Following Campbell et al. (2014), Elshandidy (2014), Elshandidy and Zeng (2022), and Peixoto and Martins (2021), the models were run using multiple linear regression estimations with stacked data – pooled ordinary least squares (POLS), including dummies by sector and year, in order to control for fixed effects of this order. According to the authors, this approach is appropriate considering that high and very discrepant environmental expenditures do not occur for the same company. The Jonckheere-Terpstra test was performed and showed no trends in this variable of interest. In addition, the limited availability of observations may favor this scenario of variable behavior.

Peixoto and Martins (2021) and Elshandidy (2014) studied value relevance in emerging markets. Elshandidy and Zeng (2022) analyzed the United Kingdom. Baboukardos (2018) (including sector and period controls), Clarkson et al. (2004, 2013), and Machado, Macedo and Machado (2015) looked at value relevance in specific countries: France, the United States, and Brazil, respectively.

Adherence tests were performed on the estimated models and adjustments, such as White's correction for heteroscedasticity, were made when appropriate. The values of the variance inflation factors were found to be within the limits and there was no correlation between the errors and the predictors. The residuals of the models were also subjected to the Shapiro-Francia test to verify the normality assumption. The *W'* statistic of the models (*W'*>0.960) was always higher than the critical values of W_c for the 5% significance level with large samples (*N=252; N>30*). Thus, there is no evidence to reject the hypothesis of normality of the residuals. The continuous variables were winsorized at the 1st and 99th percentiles in order to reduce the influence of outliers in the sample. The tests described were performed using the STATA® software.

4. RESULTS AND DISCUSSION

Table 2 shows the descriptive statistics and the analysis of the correlation between the variables.

Table 2
Descriptive statistics and correlation test of the variables for the value relevance models

Panel A: Descriptive statistics – Sample of value relevance models						
Variable	**No. of observations**	**Mean**	**Standard deviation**	**Minimum**	**Median**	**Maximum**
(1) $Mv_{i,t+1}$	252	22.8653	1.2575	20.0036	22.6618	26.0028
(2) $Eq_{i,t}$	252	22.2733	1.3615	19.8061	22.0954	25.8614
(3) $In_{i,t}$	252	20.2778	1.4179	16.8489	20.2344	24.0507
(4) $EE_{i,t}$	252	0.0083	0.0142	4.9E-07(a)	0.0039	0.0994
(5) $FS1_{i,t}$	252	0.0904	0.0757	2.9E-05(a)	0.0667	0.3231
(6) $FS2_{i,t}$	252	0.0876	0.0596	-0.0293	0.0796	0.3022
(7) $FS3_{i,t}$	252	-0.9560	1.9441	-4.9574	-1.0739	8.1523
Panel B: Correlation test – Sample of value relevance models						
	(2)	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
(1)	0.6871	0.5927	-0.0991	-0.0179	-0.0937	-0.1616
p-value	***	***	NS	NS	NS	NS
(2)		0.7829	0.0034	-0.0827	-0.1956	-0.1633
p-value		***	NS	NS	***	***
(3)			-0.0491	0.0129	0.0405	0.1135
p-value			NS	NS	NS	*
(4)				-0.1202	-0.1018	0.0238
p-value				*	NS	NS
(5)					0.0471	-0.0770
p-value					NS	NS
(6)						0.6161
p-value						***

Notes: *(a) very low values; (***), (**), (*) indicate significance at the 1%, 5%, and 10% levels, respectively; NS=not significant. $Mv_{i,t+1}$ = market value; Eq= net equity; $In_{i,t}$ = net income; $EE_{i,t}$ = environmental expenditures; $FS1_{i,t}$ = financial slack based on cash and cash equivalents; $FS2_{i,t}$ = financial slack based on cash generation; $FS3_{i,t}$ = financial slack based on financial constraint.*
Source: *Prepared by the authors.*

It should be noted that the behavior of the metrics over the period is mixed. On average, market value, profit, and shareholders' equity increased between the first and last years of the analysis. The financial slack measures, on the other hand, declined over the period. In the case of the measures related to cash generation, this indicates less availability of resources or greater consumption of cash and cash equivalents. However, the financial constraint index improved. As for environmental expenditures, they halved on average over the period. The analysis of variance of the measures between the years reveals that the population averages are not different from the others in this group (Prob>F=0.76; 0.70; 0.63; 0.78; 0.82; 0.53; 0.44 – following the order in Table 2).

The impact of environmental spending on revenue is only 0.8% on average, ranging from 0.3% to 9.9%. This could indicate that even among firms that are concerned with financing environmental activities, the availability of resources for this purpose is not so high. With regard to financial slack, the ratio of cash and cash equivalents to assets varies between 9% and 32%. Cash generated from operations varies between 8% and 30% of assets. These discrepancies may be the result of sectoral differences, but also of the analysis period.

The correlation tests indicate a positive and significant association, at the 1% level, between the original variables of the model adapted from Ohlson (1995): $Mv_{i,t+1}$, $Eq_{i,t}$ and $In_{i,t}$. Environmental expenditures do not show a statistically significant correlation with these variables. There is also no correlation between firm value and the financial slack proxies.

Tables 3, 4 and 5 reproduce the results of the analysis of the moderation of financial slack on environmental spending, which refer to the testing of the hypotheses. It was found that in all statistical models the coefficients of $Eq_{i,t}$ and $In_{i,t}$ are positive and less than 1, as recommended by Ohlson (1995) in his theory on accounting value relevance. Based on this, it should be noted that the accounting figures are informative, which supports the theory for the emerging Brazilian market. Not all studies comply with this premise, as in the case of Hassel et al. (2005), where the coefficients are greater than 1. Peixoto and Martins (2021) found similar results in this respect. In general, the inclusion of other information in the RIV model leads to perturbations in the coefficients.

Table 3
Moderation of financial slack based on available funds ($FS1_{i,t}$)

Model 1	$Mv_{i,t+1} = \beta_0 + \beta_1 Eq_{i,t} + \beta_2 In_{i,t} + \beta_3 EE_{i,t} + \beta_4 FS1_{75i,t} + \beta_5 Mod1_{i,t} + \beta_6 SECT_{i,t} + \beta_7 \sum_{2010}^{2018} YEAR_{i,t} + \varepsilon_{i,t}$
Model 1a	$Mv_{i,t+1} = \beta_0 + \beta_1 \mathrm{Eq} + \beta_2 In_{i,t} + \beta_3 EE_{i,t} + \beta_4 FS1_{50+i,t} + \beta_5 Mod2_{i,t} + \beta_6 SECT_{i,t} + \beta_7 \sum_{2010}^{2018} YEAR_{i,t} + \varepsilon_{i,t}$
Model 1b	$Mv_{i,t+1} = \beta_0 + \beta_1 Eq + \beta_2 In_{i,t} + \beta_3 EE_{i,t} + \beta_4 FS1_{50-i,t} + \beta_5 Mod3_{i,t} + \beta_6 SECT_{i,t} + \beta_7 \sum_{2010}^{2018} YEAR_{i,t} + \varepsilon_{i,t}$
Model 1c	$Mv_{i,t+1} = \beta_0 + \beta_1 Eq_{i,t} + \beta_2 In_{i,t} + \beta_3 EE_{i,t} + \beta_4 FS1_{25i,t} + \beta_5 Mod4_{i,t} + \beta_6 SECT_{i,t} + \beta_7 \sum_{2010}^{2018} YEAR_{i,t} + \varepsilon_{i,t}$

Variables	**Parameters**			
	Model 1	**Model 1a**	**Model 1b**	**Model 1c**
Constant	6.68***	6.44***	6.55***	7.10***
t	(6.44)	(5.75)	(5.92)	(6.89)
$Eq_{i,t}$	**0.49*** **	**0.50*** **	**0.50*** **	**0.48*** **
t	(5.58)	(5.61)	(5.61)	(5.36)
$In_{i,t}$	**0.24****	**0.24****	**0.23****	**0.24****
t	(2.52)	(2.52)	(2.52)	(2.51)
$EE_{i,t}$	**-8.85*** **	**-7.99*** **	2.20	-5.40
t	(-3.31)	(-2.81)	(0.23)	(-1.15)
$FS1_{75i,t}$	-0.03	-	-	-
t	(-0.19)	-	-	-

Table 3
Cont.

Variables	Parameters			
	Model 1	**Model 1a**	**Model 1b**	**Model 1c**
$Mod1_{i,t}$	**23.32****	-	-	-
t	(2.31)	-	-	-
$FS1_{50+i,t}$	-	0.12	-	-
t	-	(0.93)	-	-
$Mod2_{i,t}$	-	10.20	-	-
t	-	(1.01)	-	-
$FS1_{50-i,t}$	-	-	-0.12	-
t	-	-	(-0.93)	-
$Mod3_{i,t}$	-	-	-10.20	-
t	-	-	(-1.01)	-
$FS1_{25i,t}$	-	-	-	**-0.29****
t	-	-	-	(-2.10)
$Mod4_{i,t}$	-	-	-	-0.45
t	-	-	-	(-0.07)
Fixed effect – Year	Yes	Yes	Yes	Yes
Fixed effect – Sector	Yes	Yes	Yes	Yes
F test	33.15***	32.66***	32.66***	33.22***
R^2	59.99	0.5991	0.5991	0.6017
Adjusted R^2	57.45	0.5736	0.5736	0.5764
Maximum VIF	3.29	3.41	5.79	3.25
Breusch-Pagan	16.47***	19.47***	19.47***	20.66***
No. of observations	252	252	252	252

Notes: *(***), (**), (*) indicate significance at the 1%, 5%, and 10% levels, respectively. Standard errors estimated with White's correction for heteroscedasticity. No statistically significant correlations were found between the residuals of the equations and the predictors (Gujarati & Porter, 2011). The Variance Inflation Factor (VIF) test did not reveal any significant multicollinearity problems (Hair et al., 2009).*
$Mv_{i,t+1}$ = market value; $Eq_{i,t}$ = net eqiuty; $In_{i,t}$ = net income; $SECT_{i,t}$ = sector dummy; $YEAR_{i,t}$ year dummy; $EE_{i,t}$ = environmental expenditures; $FS1_{i,t}$ = dummy for cash-based financial slack; $Mod1_{i,t} = EE_{i,t}FS1_{75i,t}$; $Mod2_{i,t} = EE_{i,t}FS1_{50+i,t}$; $Mod3_{i,t} = EE_{i,t}FS1_{50-i,t}$; $Mod4_{i,t} = EE_{i,t}FS1_{25i,t}$.
Source: *Prepared by the authors.*

The results in Table 3 show that the inclusion of moderating variables affects the informational relevance of environmental spending at one of the extremes of the distribution, as the β_5 coefficient is statistically significant at the 5% level. Thus, the combination of environmental spending and financial slack produces incremental informational content. At the upper end of the tail, there is a positive effect on the relevance of environmental spending. This happens where the level of financial slack based on cash and cash equivalents is highest, according to Model 1. Since the coefficient is considered high (23.32), it is speculated that investors do not evaluate $EE_{i,t}$ only as the prospect of incurring future economic costs, which are not expected for firms with future economic benefits (Baboukardos, 2017; 2018; Hassel et al., 2005; Jaggi & Freedman, 1992). The evidence suggests that this market is cautious about environmental spending, and that the increase in firm valuation is explained by the increase in financial slack. Table 4 reproduces the results of the analysis of the moderation of financial slack on environmental spending in $FS2_{i,t}$.

Table 4
Moderation of financial slack based on cash generation ($FS2_{i,t}$)

Model 2	$Mv_{i,t+1} = \beta_0 + \beta_1 Eq_{i,t} + \beta_2 In_{i,t} + \beta_3 EE_{i,t} + \beta_4 FS2_{75i,t} + \beta_5 Mod1_{i,t} + \beta_6 SECT_{i,t} + \beta_7 \sum_{2010}^{2018} YEAR_{i,t} + \varepsilon_{i,t}$
Model 2a	$Mv_{i,t+1} = \beta_0 + \beta_1 Eq_{i,t} + \beta_2 In_{i,t} + \beta_3 EE_{i,t} + \beta_4 FS2_{50+i,t} + \beta_5 Mod2_{i,t} + \beta_6 SECT_{i,t} + \beta_7 \sum_{2010}^{2018} YEAR_{i,t} + \varepsilon_{i,t}$
Model 2b	$Mv_{i,t+1} = \beta_0 + \beta_1 Eq_{i,t} + \beta_2 In_{i,t} + \beta_3 EE_{i,t} + \beta_4 FS2_{50-i,t} + \beta_5 Mod3_{i,t} + \beta_6 SECT_{i,t} + \beta_7 \sum_{2010}^{2018} YEAR_{i,t} + \varepsilon_{i,t}$
Model 2c	$Mv_{i,t+1} = \beta_0 + \beta_1 Eq_{i,t} + \beta_2 In_{i,t} + \beta_3 EE_{i,t} + \beta_4 FS2_{25i,t} + \beta_5 Mod4_{i,t} + \beta_6 SECT_{i,t} + \beta_7 \sum_{2010}^{2018} YEAR_{i,t} + \varepsilon_{i,t}$

Variables	**Parameters**			
	Model 2	**Model 2a**	**Model 2b**	**Model 2c**
Constant	6.99***	7.18***	7.17***	7.24***
t	(6.63)	(6.74)	(6.96)	(6.90)
$Eq_{i,t}$	**0.50*** **	**0.47*** **	**0.47*** **	**0.44*** **
t	(5.24)	(5.29)	(5.29)	(4.91)
$In_{i,t}$	**0.22** **	**0.24** **	**0.24** **	**0.27*** **
t	(2.16)	(2.58)	(2.58)	(2.77)
$EE_{i,t}$	**-6.94** **	**-10.78*** **	-0.59	**-5.03***
t	(-2.53)	(-2.59)	(-0.12)	(-1.91)
$FS2_{75i,t}$	0.12	-	-	-
t	(0.98)	-	-	-
$Mod1_{i,t}$	**27.62*** **	-	-	-
t	(3.09)	-	-	-
$FS2_{50+i,t}$	-	-0.003	-	-
t	-	(-0.03)	-	-
$Mod2_{i,t}$	-	10.17	-	-
t	-	(1.58)	-	-
$FS2_{50-i,t}$	-	-	0.003	-
t	-	-	(0.03)	-
$Mod3_{i,t}$	-	-	-10.18	-
t	-	-	(-1.58)	-
$FS2_{25i,t}$	-	-	-	0.21
t	-	-	-	(1.38)
$Mod4_{i,t}$	-	-	-	**-12.30***
T	-	-	-	(-1.63)
Fixed effect – Year	Yes	Yes	Yes	Yes
Fixed effect – Sector	Yes	Yes	Yes	Yes
F test	30.66***	31.15***	31.15***	31.69***
R^2	0.6034	0.5964	0.5964	0.5963
Adjusted R^2	0.5782	0.5707	0.5707	0.5706
Maximum VIF	3.46	3.39	3.39	3.22
Breusch-Pagan	25.00***	20.87***	20.87***	16.78***
No. of observations	252	252	252	252

Notes: *(***), (**), (*) indicate significance at the 1%, 5%, and 10% levels, respectively. Standard errors estimated with White's correction for heteroscedasticity. No statistically significant correlations were found between the residuals of the equations and the predictors (Gujarati & Porter, 2011). The VIF test did not reveal any significant multicollinearity problems (Hair et al., 2009).* $MV_{i,t+1}$ *= market value;* $Eq_{i,t}$ *= net equity;* $In_{i,t}$ *= net income;* $SECT_{i,t}$ *= sector dummy;* $YEAR_{i,t}$ *= year dummy;* $EE_{i,t}$ *= environmental expenditures;* $FS2_{i,t}$ *= dummy for financial slack based on cash generation;* $Mod1_{i,t} = EE_{i,t}FS2_{75i,t}$; $Mod2_{i,t} = EE_{i,t}FS2_{50+i,t}$; $Mod3_{i,t} = EE_{i,t}FS2_{50-i,t}$; $Mod4_{i,t} = EE_{i,t}FS2_{25i,t}$.

Source: *Prepared by the authors.*

Treating the estimates based on the interactive variables of financial slack reinforces the idea that the Brazilian capital market does not value environmental spending favorably (models 2, 2a and 2c). The results are the opposite of those obtained by Iatridis (2013) and Middleton (2015) in emerging markets, but the proxy they used was based on indices reflecting corporate responsibility.

Nevertheless, the results are similar to those of Baboukardos (2018), Hassel et al. (2005), and Jaggi and Freedman (1992), all of which are based on more economically developed countries than Brazil. This strengthens the inference on the relevance of environmental spending. However, a comparison of the studies suggests that the economic utility of investors varies substantially across markets, as argued by Barnett and Salomon (2012), Derwall et al. (2011), Lys et al. (2015), and Renneboog et al. (2008). This can be seen by analyzing the different relationships found in studies on the topic.

The most interesting aspect of Table 4 concerns the β_5 coefficient. There is a moderating effect of financial slack in relation to environmental spending at both ends of the distribution. Firms with environmental expenditures and a higher level of financial slack based on operating cash flow are better valued by the market (27.62) than those with lower financial slack (-12.30).

This result is particularly similar to that of Baboukardos (2018), according to which the recognition of environmental provisions in balance sheets increases the value relevance of the environmental performance of French companies. This provides suggestive evidence for the joint use of accounting, financial and other data in the firm valuation process (Amir & Lev, 1996; Baboukardos, 2018; Ohlson, 1995).

Table 5 summarizes the analyses related to the testing of the hypotheses, with an emphasis on the moderating effect of financial slack given the financial constraint.

Table 5
Moderation of financial slack based on financial constraint ($FS3_{i,t}$)

Model 3	$Mv_{i,t+1} = \beta_0 + \beta_1 Eq_{i,t} + \beta_2 In_{i,t} + \beta_3 EE_{i,t} + \beta_4 FS3_{75i,t} + \beta_5 Mod1_{i,t} + \beta_6 SECT_{i,t} + \beta_7 \sum_{2010}^{2018} YEAR_{i,t} + \varepsilon_{i,t}$
Model 3a	$Mv_{i,t+1} = \beta_0 + \beta_1 Eq_{i,t} + \beta_2 In_{i,t} + \beta_3 EE_{i,t} + \beta_4 FS3_{50+i,t} + \beta_5 Mod2_{i,t} + \beta_6 SECT_{i,t} + \beta_7 \sum_{2010}^{2018} YEAR_{i,t} + \varepsilon_{i,t}$
Model 3b	$Mv_{i,t+1} = \beta_0 + \beta_1 Eq_{i,t} + \beta_2 In_{i,t} + \beta_3 EE_{i,t} + \beta_4 FS3_{50-i,t} + \beta_5 Mod3_{i,t} + \beta_6 SECT_{i,t} + \beta_7 \sum_{2010}^{2018} YEAR_{i,t} + \varepsilon_{i,t}$
Model 3c	$Mv_{i,t+1} = \beta_0 + \beta_1 Eq_{i,t} + \beta_2 In_{i,t} + \beta_3 EE_{i,t} + \beta_4 FS3_{25i,t} + \beta_5 Mod4_{i,t} + \beta_6 SECT_{i,t} + \beta_7 \sum_{2010}^{2018} YEAR_{i,t} + \varepsilon_{i,t}$

Variables	**Parameters**			
	Model 3	**Model 3a**	**Model 3b**	**Model 3c**
Constant	7.35***	7.62***	7.20***	7.29***
t	(7.09)	(7.12)	(6.93)	(6.57)
$Eq_{i,t}$	**0.43*** **	**0.40*** **	**0.40*** **	**0.43*** **
t	(4.65)	(4.53)	(4.53)	(5.05)
$In_{i,t}$	**0.28*** **	**0.31*** **	**0.31*** **	**0.28*** **
t	(2.81)	(3.33)	(3.33)	(3.11)
$EE_{i,t}$	**-10.31*** **	**-15.49** **	-1.64	**-4.56***
t	(-3.39)	(-2.26)	(-0.58)	(-1.87)
$FS3_{75i,t}$	**-0.30** **	-	-	-
t	(-2.22)	-	-	-
$Mod1_{i,t}$	**18.19***	-	-	-
t	(1.85)	-	-	-
$FS3_{50+i,t}$	-	**-0.43*** **	-	-
t	-	(-3.61)	-	-
$Mod2_{i,t}$	-	**13.86***	-	-
t	-	(1.83)	-	-

Table 5
Cont.

Variables	Parameters			
	Model 3	Model 3a	Model 3b	Model 3c
$FS3_{50-i,t}$	-	-	**0.43*** **	-
t	-	-	(3.61)	-
$Mod3_{i,t}$	-	-	**-13.86***	-
t	-	-	(-1.83)	-
$FS3_{25i,t}$	-	-	-	**0.43*** **
t	-	-	-	(2.77)
$Mod4_{i,t}$	-	-	-	-8.03
t	-	-	-	(-0.55)
Fixed effect – Year	Yes	Yes	Yes	Yes
Fixed effect – Sector	Yes	Yes	Yes	Yes
F test	30.70***	31.73***	31.73***	34.06***
R^2	0.6015	0.6118	0.6118	0.6100
Adjusted R^2	0.5761	0.5871	0.5871	0.5852
Maximum VIF	3.47	4.26	3.33	3.42
Breusch-Pagan	17.32***	14.56***	13.56***	9.20***
No. of observations	252	252	252	252

Notes: *(***), (**), (*) indicate significance at the 1%, 5% and 10% levels, respectively. Standard errors estimated with White's correction for heteroscedasticity. No statistically significant correlations were found between the residuals of the equations and the predictors (Gujarati & Porter, 2011). The VIF test did not reveal any significant multicollinearity problems (Hair et al., 2009). $Mv_{i,t+1}$ = market value; $Eq_{i,t}$ = net equity; $In_{i,t}$ = net income; $SECT_{i,t}$ = sector dummy; $YEAR_{i,t}$ = year dummy; $EE_{i,t}$ = environmental expenditures; $FS3_{i,t}$ = dummy for financial slack based on financial constraint; $Mod1_{i,t} = EE_{i,t}FS3_{75i,t}$; $Mod2_{i,t} = EE_{i,t}FS3_{50+i,t}$; $Mod3_{i,t} = EE_{i,t}FS3_{50-i,t}$; $Mod4_{i,t} = EE_{i,t}FS3_{25i,t}$.*

Source: *Prepared by the authors.*

The reported data suggest an alignment between the results presented in tables 3 and 4. models 3 and 3a show that the increase in the valuation of firms is explained by increases in financial slack based on the financial constraint (-18.19 and 13.86; evidence accepted at the 10% level, according to the β_5 coefficient of the equations).

It is shown that the Brazilian market values firms with environmental expenditures more favorably, as long as they have satisfactory financial slack in the three perspectives considered in the research. This is a gap that has not yet been explored, which makes this evidence a generator of new insights for the field of study.

Given the evidence reported on the moderating effect of financial slack on environmental spending for the variants $FS1_{i,t}$, $FS2_{i,t}$ and $FS3_{i,t}$, hypotheses H_1 and H_2 cannot be rejected. The models suggest that financial slack based on cash and cash equivalents, operating cash flow, and financial constraint at levels considered satisfactory to investors cushions the negative effects of environmental spending on firm value.

It cannot be ignored that these are companies with environmental expenditures, and that different pricing suggests a combination of economic-financial and environmental information. Studies by Amir and Lev (1996) and Baboukardos (2018) show that the combination of performance information improves the valuation of the company.

One important point about the models presented in Table 4 that does not appear in the other models tested: the financial slack dummy is statistically significant at the 1% and 5% levels in models 3, 3a, 3b, and 3c. At the upper end of the tail, there is a negative impact on the value of these firms. On the other hand, at the lower end, the opposite is true, i.e. there is a positive impact on the value of the firms.

Considering the dummy, higher levels of financial slack based on the financial constraint proxy reduce firm value, contrary to what scholars such as Daniel et al. (2004), Lee (2015), Waddock and Graves (1997), and Wruck (1990) suggest.

These data are consistent with the idea that the market prefers that managers do not access financial surpluses, fearing that they will finance activities classified as non-essential (Borghesi et al., 2014; McGuire et al., 1988; Shahzad et al., 2016). This evidence can be directly related to the coefficients represented by environmental

expenditures in the models, which are always negative or non-significant.

In the midst of this, the main conclusion of this research stands out: financial slack can act as a differentiating factor in the valuation of firms with environmental expenditures. All the models that included the moderating variable indicated that firms with environmental spending and higher levels of financial slack have higher valuations. In addition, lower levels of financial slack explain decreases in the value of firms with environmental expenditures. Thus, it is assumed that investors will tolerate environmental spending as long as management demonstrates financial slack to support it. Therefore, the combination of accounting, environmental and financial information may be decisive for investment decisions, confirming the role of other information accompanied by accounting aggregates (Amir & Lev, 1996; Baboukardos, 2018; Hassel et al., 2005; Ohlson, 1995).

Additional tests were performed to verify the extent of the results. The model adopted by Cormier and Magnan (2007) was reproduced, using the market-to-book premium as the dependent variable (ratio between market value and equity value) and adjusted equity (1/equity) and adjusted earnings (earnings/equity) as independent variables, in order to test whether the accounting figures explain the premium paid by the market on the shareholders' residual equity. In addition, adjusted earnings act as a proxy for companies' cost of capital (Cormier & Magnan, 2007). The variables of interest in this study were added to the model: environmental expenditures, financial slack, and the moderator. The results of the additional tests are summarized in Table 6.

Table 6
Tests with the Cormier and Magnan (2007) model: Market-to-book$_{i,t}$ = 1/equity$_{i,t}$ + earnings/equity$_{i,t}$

	Model 1 (*β*: sign/sig.)	**Model 1a (*β*: sign/sig.)**	**Model 1b (*β*: sign/sig.)**	**Model 1c (*β*: sign/sig.)**
1/*equity*	+/***	+/***	+/***	+/***
earnings/equity	+/*	+/*	+/*	+/**
$EE_{i,t}$	–/No	–/No	+/**	+/No
$FS1_{i,t}$	+/No	+/No	–/No	–/No
$Mod_{i,t}$	+/***	+/**	–/**	–/**
	Model 2 (*β*: sign/sig.)	**Model 2[a] (*β*: sign/sig.)**	**Model 2b (*β*: sign/sig.)**	**Model 2c (*β*: sign/sig.)**
1/*equity*	+/***	+/***	+/***	+/***
earnings/equity	+/**	+/**	+/**	+/**
$EE_{i,t}$	–/No	–/No	+/No	+/No
$FS2_{i,t}$	–/No	–/*	+/*	+/No
$Mod_{i,t}$	+/No	+/No	–/No	–/No
	Model 3 (*β*: sign/sig.)	**Model 3[a] (*β*: sign/sig.)**	**Model 3b (*β*: sign/sig.)**	**Model 3c (*β*: sign/sig.)**
1/*equity*	+/***	+/***	+/***	+/***
earnings/equity	+/***	+/***	+/***	+/***
$EE_{i,t}$	–/No	–/No	+/No	+/No
$FS3_{i,t}$	–/***	–/***	+/***	+/***
$Mod_{i,t}$	–/*	+/No	–/No	–/No

Notes: *(***), (**), (*) indicate significance at the 1%, 5% and 10% levels, respectively.*
Estimation: Market-to-book$_{i,t}$ = 1/equity$_{i,t}$ + earnings/equity$_{i,t}$ + $EE_{i,t}$ + $FS_{i,t}$ + $Mod_{i,t}$
Market-to-book$_{i,t}$ = market value/net equity; equity$_{i,t}$ = net equity; earnings/equity$_{i,t}$ = net earnings/net equity; $EE_{i,t}$ = environmental expenditures; $FF_{i,t}$ = dummy for financial slack based on cash, cash flow and financial constraint; $Mod_{i,t}$ = moderation variable.
Source: *Prepared by the authors.*

The results indicate that financial slack can alter the ability of environmental spending to explain firm value, controlling for all aspects of the sample. The evidence is even more robust in relation to the dimension of financial slack based on cash (readily available reserves). This complementary analysis, in addition to adding robustness to the results of the study, reiterates the ability of the financial slack measure to modify the valuation of

companies, especially when the measure reflects a broad perspective for considering this ability ($FS3_{i,t}$).

These results also show that, in the context of the Brazilian stock market in the period studied, the evaluation of environmental expenditures and financial slack, even as combined reports, is in line with the precepts of shareholder theory, which emphasizes the (non-)existence of "corporate charity" detached from economic purpose. The structure of the firm tends to restrict the free flow of financial resources available to managers due to the risk of using them for non-primary activities, such as environmental spending.

The combination of the evidence discussed here makes it possible to construct an empirical model (Figure 1) that can guide other investigations with a similar object of study to this research in different economic contexts, generating comparative analyses.

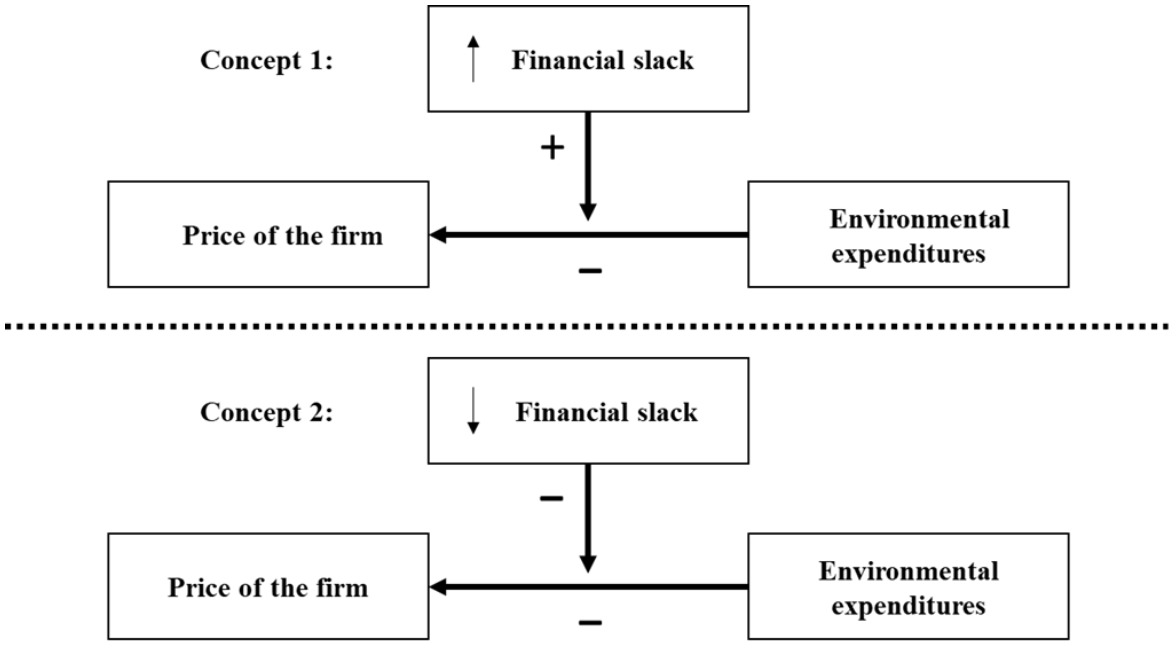

Figure 1. *Empirical model based on research evidence*
Source: *Prepared by the authors.*

According to the empirical model, environmental spending explains lower company values. On the other hand, at higher levels, financial slack can influence and modify the evaluation of environmental spending. Thus, companies with environmental spending and a higher level of financial slack have a higher valuation than those with a lower level.

5. CONCLUSION

This study was based on research and evidence according to which environmental spending should reach an optimal level to avoid inefficient use of resources. Given the evidence presented here, it is likely that the market will evaluate the impact of these expenditures on firm value differently depending on the financial slack. It may be that the combination of objectives together satisfies the conflicting interests of shareholders and stakeholders.

The conclusion is that, in terms of valuation on the Brazilian stock market, it seems promising that firms do not disclose their environmental spending in order to obtain a better price unless they have a financial situation compatible with investors' expectations regarding the realization of these expenditures.

Investors who are solely concerned with maximizing returns should not include companies with environmental expenditures in their portfolios. It can be observed that such expenditures contribute to reducing the positive effect of accounting figures on firm value, indicating a reduction in future cash flows.

From the perspective suggested by stakeholder theory, environmental spending can explain the long-term increase in firm value as a result of a good image and protection against environmental risks. However, the study contributes significantly to supporting shareholder theory, since environmental spending explains reductions in company value, and the financial perspective positively affects the role of these expenditures in the valuation. Therefore, environmental expenditures would be valued as expected by stakeholder theory, as long as the logic derived from shareholder theory is followed.

As a main contribution, the results help to reduce uncertainties about the relationship between economic and financial performance and environmental performance, where the research is still far from reaching a consensus. The validation of environmental spending and financial slack as differentiating aspects in the firm valuation process will be of great value in supporting the decisions of investors in emerging markets, assuming the influence of the economic orientation of the players on the choice of investments.

Although few investors are concerned about the benefits of environmental spending, while others are averse to it because they are concerned with maximizing firm value and shareholder value, the interest in company perpetuity should be common to both groups. In this case, financial slack can be an intersection of the different economic interests of the parties involved, further increasing firm valuation, as shown here.

The problem underlined is part of the field of accounting study circumscribed by the shareholder and stakeholder theories, and by the discussion of the consequences of the economic utilitarianism of the market in the profit-seeking and value-driven views. The problem touches on aspects related to the behavioral hypotheses of investment and charity.

The main limitation of the study is the amount of data. Despite a long analysis period, few observations were collected, so future studies with different approaches are suggested, such as analyzing whether environmental spending is related to favorable or unfavorable aspects of companies, as stated in accounting reports. It is also suggested that research be conducted that includes other emerging Latin American economies, as well as further discussion of the aspects that are characteristic of these markets. As indicated in the literature (Franzotti & Valle, 2020; Liu et al., 2020; Liu & Sun, 2022), the loss of informativeness of accounting figures, the reduction of discretionary accruals, the increase of negative abnormal returns, and the restriction of investments are events generated by the new coronavirus pandemic. Future studies could analyze this period in a specific way, complementing but not excluding the evidence provided in this evaluation.

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