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# FINANCIAL DETERMINANTS FOR PUBLICLY TRADED BRAZILIAN COMPANIES TO SET UP TAX INSTALLMENT PAYMENT AGREEMENTS

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## ABSTRACT

This research aims to verify the relationship between the financial situation of companies and their decision to set up tax installment payment agreements. The object of the study was the Special Tax Payment Regularization Program (*Programa Especial de Regularização Tributária*, PERT), whose current discussions point to its possible renewal. The initial sample was composed by 300 Brazilian publicly traded companies listed on Brasil, Bolsa, Balcão (B3). To assess the financial situation of the companies, 44 financial and market indicators were considered eligible. The statistical technique of logistic regression was used along with the Akaike information criterion (AIC), Akaike weights (AIC<sub>w</sub>) and the strength of evidence ratio to assess the goodness of fit of the models applied. The results showed that liquidity, profitability, debt, and market, which were analyzed individually, are the factors that help explain why companies usually set up tax installment payment agreements. When combined within the same model, “return on average equity” and “short-term debt-to-gross debt” are the indicators that best explain the odds of a company setting up an agreement without the need to include the other indicators under analysis. This research is expected to contribute to identifying explanatory variables for the construction of predictive models by the government, thus allowing for the identification of the real impacts on tax collection, which is fundamental when planning future tax installment payment programs.

**Keywords:** PERT. Tax regularization. Tax installment. Tax amnesty.

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# DETERMINANTES FINANCEIROS DA ADERÊNCIA DAS EMPRESAS BRASILEIRAS DE CAPITAL ABERTO AOS PROGRAMAS DE PARCELAMENTOS TRIBUTÁRIOS

## RESUMO

O objetivo desta pesquisa foi verificar a relação entre a situação financeira das empresas e a aderência aos programas de parcelamentos tributários especiais. O objeto do estudo foi o Programa Especial de Regularização Tributária (PERT), cuja discussão atual caminha para uma possível reabertura do programa. A amostra inicial foi composta por 300 companhias brasileiras de capital aberto listadas na Brasil, Bolsa, Balcão (B3). Para aferir a situação financeira das empresas, foram considerados elegíveis 44 indicadores financeiros e de mercado. Foi utilizada a técnica estatística da regressão logística, com aplicação do critério de informação de Akaike (*Akaike information criterion*, AIC), dos pesos de Akaike (*Akaike weights*, AIC<sub>w</sub>) e da força da evidência (*evidence ratio*) para aferir a qualidade do ajuste dos modelos aplicados. Os resultados apontaram que os fatores financeiros de liquidez, rentabilidade, endividamento e mercado, analisados individualmente, ajudam a explicar a aderência aos programas de parcelamentos. Quando combinados no mesmo modelo, os indicadores “retorno sobre o patrimônio líquido médio” e “dívida de curto prazo sobre dívida bruta” são os que melhor explicam as chances de aderência, sem a necessidade da inclusão dos outros indicadores testados. A contribuição esperada da pesquisa está na identificação de variáveis explicativas para construção de modelos preditivos pelo governo, permitindo a identificação dos reais impactos na arrecadação, fundamental para o planejamento de lançamentos de programas futuros.

**Palavras-Chave:** PERT. Regularização fiscal. Parcelamento tributário. Anistia fiscal.

## 1 INTRODUCTION

The governments of many countries around the world, when faced with a high tax gap<sup>1</sup> after a period of economic recession, often grant tax amnesties to delinquent taxpayers as an opportunity for them to regularize their tax debts (Bayer et al., 2015). In Brazil, this fiscal benefit is given through programs that offer installment payment agreements, and whose fiscal incentive policy has been recurrently established and apparently diverted to serving other purposes and interests, such as tax planning practices and corporate financing strategies (Rezende et al., 2018). Even today, the renewal of the Special Tax Payment Regularization Program (*Programa Especial de Regularização Tributária*, PERT), which is the object of this study, is being discussed and processed. It is argued that the program can mitigate the economic impacts caused by the Covid-19 pandemic (Machado & Oliveira, 2022), stimulating the debate about this kind of measure.

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<sup>1</sup> It refers to the difference between the expected tax revenue and the revenue that was actually collected, either due to evasion or delayed payment (Gemmell & Hasseldine, 2012).

International studies generally concentrate their efforts on understanding, in a broad sense, the impacts of tax amnesties on compliance, government credibility, and revenue (Shevlin et al., 2017; Damayanti et al., 2020; Yücedoğru & Sarısoy, 2020). Studies conducted in Brazil, on the other hand, besides addressing the effects on taxpayers' behavior (Paes, 2012; Fontes, 2019) and tax revenue collection (Paes, 2014), have also analyzed the relationship between participation and net working capital (Segura et al., 2012) and the use of these programs as a source of indirect financing (Lima et al., 2017). Recently, they have explored the characteristics of companies that have benefited from tax installment payment agreements (Campagnoni & Ruiz, 2020) and the differences in the composition of provisions and contingent liabilities between participating and non-participating companies (Alves & Campagnoni, 2021). Additionally, they have assessed the effectiveness of the programs from the perspective of corporate solvency (Borges & Rech, 2021).

Previous studies have not yet investigated the determining factors for publicly traded Brazilian companies to set up tax installment payment agreements. Given the above, the following research problem arises: What determining financial factors lead companies to request this kind of agreement? Accordingly, the objective of this study is to examine the relationship between the financial situation of Brazilian publicly traded companies and their participation in special tax installment payment programs.

The study is justified by the billion-dollar estimates of tax revenue foregone annually due to this kind of agreement (RFB, 2017; Rodrigues & Paludo, 2020), which significantly reduces the country's budget. This amount could otherwise be invested in social welfare. In this sense, it is expected that this research will contribute to identifying explanatory variables for the construction of predictive models by the government, thus, allowing to understand the real impacts on revenue, which is crucial when planning future programs. Contrary to previous studies (Borges & Rech, 2021; Campagnoni & Ruiz, 2020), the results of this research align with the Public Interest Theory and oppose the Capture Theory, although it is not possible to rule out the involvement of unidentified interest groups. However, it is still too early to determine which of the two theories best encompasses and explains the creation of programs of this nature.

This article is divided into five sections, including this introduction that provides some contextualization and presents the research gap, as well as the objective, justification, and contributions. The next section presents the theoretical framework and establishes the research hypotheses, which, in turn, will be assessed in the following section. The third section describes the methodology, highlighting the sample and the analysis methods. As for the fourth section, it presents the results and their analysis. Finally, the fifth section brings the final considerations and their implications, besides listing the limitations faced by the study and making suggestions for future research.

## 2 LITERATURE REVIEW

Until the mid-1980s, tax amnesty programs resulted in increased revenue growth rates for states that implemented them, even though they already

represented a potential relaxation of tax enforcement efforts (Leonard & Zeckhauser, 1987). It was expected that amnesties would cease to generate additional revenue, especially when evaluated in light of the potential danger of reducing tax compliance (Stella, 1991). Until then, there was no evidence that governments granting tax amnesties to their taxpayers were under fiscal stress (Dubin et al., 1992). After repeated concessions, fiscal stress finally surpassed potential yield (Luitel & Tosun, 2014), and companies became more aggressive in tax planning as taxpayers' perception of the possibility of facing tax enforcement changed, along with the expectation of new installment payment programs (Shevlin et al., 2017).

At that point, tax amnesty was considered a viable and fiscally attractive solution compared to conventional sanctions in combating tax evasion (Pommerehne & Zweifel, 1991). Even though there were concerns about the risk of negatively affecting future tax compliance, the overall impact of tax amnesties on tax collection was uncertain. Compliance and tax revenue could be positively affected if taxpayers viewed tax payment as a norm and assumed that future amnesties would be stricter in terms of enforcement than the regime in force at the time (Alm & Beck, 1990). Therefore, there was concern about an increase in tax fraud and the fact that compliant taxpayers would feel wronged. Yet, it was believed that amnesties could potentially enhance the efficiency and equity of the tax system (Andreoni, 1990). To achieve that, the revenue policy would require the government to balance the cost of lost tax revenue with the income made possible by the amnesty (Malik & Schwab, 1991).

Subsequently, studies started to be conducted to specifically assess the budgetary impacts caused by tax amnesties. Given the frequency installment agreements were granted by the same entities, it came to light that the high demand would lead to a short-term reduction in revenues and increase the trend of long-term losses due to a lack of incentive for taxpayers to remain compliant (Luitel & Sobel, 2007). In Brazil, it was observed that spontaneous tax collection declines by up to four percentage points after debt refinancing offers, and spontaneity rates only go back to normal after nine years when taxpayers no longer expect new installment agreements to be offered (Paes, 2014). It should be mentioned that although the success of a tax amnesty should not be measured solely by its revenue collection, governmental credibility and compliance are minimum conditions to preserve the development of tax enforcement (Stella, 1991).

Governmental credibility is undermined by taxpayers' perception. If they consider that it is fair to grant someone a tax amnesty, then they will be more willing to be compliant than those who feel wronged (Damayanti et al., 2020). However, tax compliance and state credibility can be compromised when the cost of installment agreements is lower than that of obtaining funds from third parties, which supports the idea of using tax installment programs as an indirect financing source for Brazilian companies and tax planning practices (Lima et al., 2017; Rezende et al., 2018). A recent study demonstrates that, despite the negative impact on the perception of those who do not benefit from amnesties, surprisingly, compliance is positively affected, which shows that tax amnesty is a highly controversial fiscal policy and, therefore, requires further research (Yücedoğru & Sarisoy, 2020).

These counterpoints raise doubts about the effectiveness of installment payment agreements, which may be affected depending on their purpose. While tax amnesties abroad can make tax enforcement less aggressive and cause the aforementioned damages, in Brazil, given the specific characteristics of the country's installment payment programs, this is an even more latent issue. From the first federal program, named Fiscal Recovery Program (*Programa de Recuperação Fiscal*, REFIS) to the latest (PERT), payment deadlines have been excessively prolonged, varying from 60 to 180 months, while in other countries, they tend to range from 12 to 24 months, except for a few very specific cases which are subject to even stricter conditions (OECD, 2014; RFB, 2017). PERT, specifically, allowed up to 175 installment payment agreements, reducing interest rates up to 90% and penalties up to 70%. That enabled a significant part of the debt to be settled through the use of tax loss credits, negative net income for the Social Contribution on Net Income (*Contribuição Social sobre o Lucro Líquido*, CSLL), as well as other types of credit, besides allowing the inclusion of debts from previous installments (Brasil, 2017).

According to Borges and Rech (2021), the reasons why programs of this nature are implemented can be explained by both the Public Interest Theory and the Capture Theory. According to the authors, the former theory assumes that these programs serve the collective interests by preventing supposedly insolvent companies from declaring bankruptcy, which could lead to external effects such as mass unemployment and potential monopoly. The latter, on the other hand, considers the possibility of distorting the public interest in favor of private interests. From this perspective, these programs are created to benefit certain groups. This theory can be justified by the lack of financial requirements for companies to benefit from PERT and other installment payment programs.

In this regard, Borges and Rech (2021) examined the effectiveness of PERT in the solvency of companies and found that the program did not achieve the expected results. This suggests that vested interests prevail in the creation of tax regularization programs, as stated by the Capture Theory, as suggested also by Campagnoni and Ruiz (2020). It was also observed that participating companies tend to join multiple tax amnesty programs simultaneously. Nevertheless, in general, their economic and financial situation was similar to that of companies that did not set up an agreement. Yet, it does not apply to privately held companies since the sample considered only companies listed on the Ibovespa index (Campagnoni & Ruiz, 2020).

Setyorini et al. (2019), conversely, argues that there are differences in corporate financial performance after the enactment of tax amnesties. In this case, the performance indicators considered were liquidity, profitability, and leverage, measured respectively by current ratio, return on assets, and debt ratio. Segura et al. (2012), while analyzing the relationship between the net working capital of publicly traded companies and their participation in REFIS, a program similar to PERT, based on indicators evaluated together (in this case, net working capital, net working capital requirement, and treasury), found that the companies that benefited from the program showed less favorable financial ratings than those that did not.

In light of the foregoing, this research proposes the following hypotheses:

**Hypothesis 1 (H<sub>1</sub>):** “There is an association between companies' financial indicators and their participation in PERT”.

**Hypothesis 2 (H<sub>2</sub>):** “When combined, companies' financial indicators increase the ability to explain why they decide to join PERT”.

The next section addresses the methodological procedures to test the research hypotheses.

### 3 METHODOLOGY

#### 3.1 Research sample

The research sample was composed of Brazilian companies listed on the Brasil, Bolsa, Balcão (B3) stock exchange. The list was extracted from the Economática database in November, 2021. After previously identifying the active companies on the Brazilian stock exchange from 2016 (the year prior to the implementation of PERT) to 2017, an analysis of the content disclosed to the market was carried out. Companies were separated into two groups: (i) participating companies (the ones that benefited from PERT); and (ii) non-participating companies (the ones that did not benefit from PERT). Notices to the market, economic and financial data, relevant events, and explanatory notes were analyzed. Table 1 presents the research sample, separated by sector classification.

**Table 1**  
Research sample

Sector classification	Participating companies (Participating=1)		Non-participating companies (Participating=0)		Total	
	n°	%	n°	%	n°	%
	Industrial goods	27	9.00	19	6.33	46
Communications	2	0.67	1	0.33	3	1.00
Cyclical consumption	21	7.00	53	17.67	74	24.67
Non-cyclical consumption	11	3.67	9	3.00	20	6.67
Financial	26	8.67	28	9.33	54	18.00
Basic materials	12	4.00	14	4.67	26	8.67
Others	0	0.00	3	1.00	3	1.00
Oil, gas, and biofuels	7	2.33	3	1.00	10	3.33
Healthcare	4	1.33	12	4.00	16	5.33
Information technology	1	0.33	4	1.33	5	1.67
Public utility	16	5.33	27	9.00	43	14.33
Total	127	42.33	173	57.67	300	100.00

Note: Percentage values relative to the entire research sample.  
Source: The authors.

#### 3.2 Eligible financial performance indicators

The use of financial indicators is widely reported by the literature. They are used, for instance, as proxies for characteristics that can affect companies' stock

returns (Hou et al., 2020) and to segregate features commonly presented by insolvent companies for bankruptcy prediction (Soares & Rebouças, 2014; Altman et al., 2016). In the context of this research, financial indicators were used as a means to measure various aspects of companies' financial performance in the year prior to their respective installment payment agreements.

To overcome the limitations of previous studies on tax installment payment programs, which focused on restricted sets of indicators, this study was based on a comprehensive selection. Therefore, all financial indicators available on Economática database for at least 80% of the initial sample were considered eligible. With the exception of market capitalization (*MarCap*), indicators presented as monetary values were considered non-eligible. This type of indicator has limited comparability or can be even meaningless when used in isolation. For example, earnings before interest and taxes (*Ebit*), like other adjusted profit metrics, are not suitable for measuring economic performance as it disregards the assets that generate the profit, i.e., it overlooks factors such as size and how efficiently companies make use of their resources. The category "per-share data", which is another example, was not considered eligible due to the lack of comparability of the measure across different companies with different numbers of shares, rendering the indicators in this group unsuitable for performance comparison between companies. Any relationship between these measures and participation in PERT would be a spurious correlation.

In most cases, although they were not included in the analysis, non-eligible indicators were used for formulating other eligible indicators. This is the case, among others, of invested capital (*InvCap*). *InvCap*, presented in Brazilian Reais, was not considered an eligible financial indicator, whereas return on invested capital (*RetInvCapF*, *RetInvCapA*, and *RetInvCapB*) was.

Financial indicators can be understood as a reorganization of information available in financial statements aimed at highlighting relevant aspects of a company's operations. Thus, relying solely on financial indicators, in their strictest sense, would constrain the analysis to the information provided by the companies. Therefore, market indicators were also included. In this way, external information that influences stock prices, used for calculating market indicators, was incorporated into the analysis.

**Table 2**  
The 44 eligible indicators

Group	Indicator	Description	Unit	Measurement
Liquidity	<i>LiqGen</i>	General liquidity	Quotient	$(AstCur+AstONC)/(LiaCur+LiaNonCur)$
	<i>LiqCur</i>	Current liquidity	Quotient	$AstCur/LiaCur$
	<i>LiqQui</i>	Quick liquidity	Quotient	$(AstCur-Ivt)/LiaCur$
Activity	<i>DayIvt</i>	Days sales in inventory	Days	$Ivt \times 360 / COGS$
	<i>DayRec</i>	Days sales in receivable	Days	$CusST \times 360 / RevNet$ or $RecST \times 360 / RevNet$
	<i>DayPay</i>	Days payable outstanding	Days	$SupST \times 360 / COGS$
	<i>CycOpe</i>	Operating cycle	Days	$DayIvt + DayRec$
	<i>CycCas</i>	Cash conversion cycle	Days	$CycOpe - DayPay$

**Table 2**  
The 44 eligible indicators

Group	Indicator	Description	Unit	Measurement
Profitability	<i>TurAst</i>	Asset turnover	Quotient	$RevNet/AstTot$
	<i>TurEqu</i>	Equity turnover	Quotient	$RevNet/Equ$
	<i>MrgGro</i>	Gross margin	Percentage	$ProGro/RevNet \times 100$
	<i>MrgEbit</i>	Ebit margin	Percentage	$Ebit/RevNet \times 100$
	<i>MrgNet</i>	Net margin	Percentage	$IncNet/RevNet \times 100$
	<i>MrgEbitda</i>	Ebitda margin	Percentage	$Ebitda/RevNet \times 100$
	<i>RetAst</i>	Return on assets	Percentage	$IncNet/AstTot \times 100$
	<i>RetEquF</i>	Return on final equity	Percentage	$IncNet/Equ \times 100$
	<i>RetEquA</i>	Return on average equity	Percentage	$IncNet_i / [(Equ_i + Equ_{i-1})/2] \times 100$
	<i>RetEquB</i>	Return on beginning equity	Percentage	$IncNet_i / Equ_{i-1} \times 100$
	<i>RetInvCapF</i>	Return on final invested capital	Percentage	$Ebit \times (1 - IncTax) / InvCap \times 100$
	<i>RetInvCapA</i>	Return on average invested capital	Percentage	$Ebit_i \times (1 - IncTax_i) / [(InvCap_i + InvCap_{i-1})/2] \times 100$
	<i>RetInvCapB</i>	Return on beginning invested capital	Percentage	$Ebit_i \times (1 - IncTax_i) / InvCap_{i-1} \times 100$
	<i>EbitDebG</i>	Ebit-to-gross debt	Percentage	$Ebit/DebG \times 100$
	<i>EbitDebN</i>	Ebit-to-net debt	Percentage	$Ebit/DebN \times 100$
Structure	<i>EbitInt</i>	Ebit-to-interest expenses	Quotient	$Ebit/ExpInt$
	<i>EbitNetInt</i>	Ebit-to-net interest expenses	Quotient	$Ebit / (IncInt + ExpInt)$
	<i>LevFin</i>	Financial leverage	Quotient	$IncNet \times AstTot / Equ / [IncNet - (IncInt + ExpInt)]$
	<i>LevOpe</i>	Operating leverage	Quotient	$(RevNet - COGS) / (RevNet - COGS - ExpSel - ExpAdm)$
	<i>DebGAst</i>	Gross debt-to-assets	Percentage	$DebG/AstTot \times 100$
	<i>DebGEqu</i>	Gross debt-to-equity	Percentage	$DebG/Equ \times 100$
	<i>DebNEqu</i>	Net debt-to-equity	Percentage	$DebN/Equ \times 100$
	<i>CapStr</i>	Capital structure	Percentage	$DebG / (DebG + Equ) \times 100$
	<i>DebGEbitda</i>	Gross debt-to-Ebitda	Quotient	$DebG/Ebitda$
	<i>DebSTDebG</i>	Short-term debt-to-gross debt	Percentage	$DebST/DebG \times 100$
	<i>LiaAst</i>	Liabilities-to-assets	Percentage	$(AstTot - Equ) / AstTot \times 100$
	<i>LiaEqu</i>	Liabilities-to-equity	Percentage	$(AstTot - Equ) / Equ \times 100$
	<i>LiaRev</i>	Liabilities-to-revenue	Percentage	$(AstTot - Equ) / RevNet \times 100$
	<i>PP&amp;EEqu</i>	Property, plant, and equipment-to-equity	Percentage	$PP\&E/Equ \times 100$
	<i>InvAscEqu</i>	Investments in associates and joint ventures-to-equity	Percentage	$InvAsc/Equ \times 100$
Market	<i>PriEar</i>	Price-to-earnings per share	Quotient	Price/Earnings per share
	<i>PriBVPS</i>	Price-to-book value per share	Quotient	Price/Equ per share
	<i>EarPri</i>	Earnings per share-to-price	Percentage	$1/PriEar \times 100$
	<i>MarCap</i>	Market capitalization	Log(R\$)	$\text{Log}(\text{MarCap})$



**Table 2**  
The 44 eligible indicators

Group	Indicator	Description	Unit	Measurement
	<i>CapexDD&amp;A</i>	Capex (including <i>InvAsc</i> )-to-depreciation, depletion, and amortization	Percent	$Capex/DD\&A$
Others	<i>DD&amp;APP&amp;EInt</i>	Depreciation, depletion, and amortization-to-property, plant, equipment, and intangible	Percentage	$DD\&A \times 100 / (PP\&E + Int)$

Caption: *AsfCur* stands for current assets. *AsfONC* refers to other non-current assets. *AsfTot* means total assets. *COGS* is the cost of goods sold. *CusST* stands for short-term customers. *DD&A* is depreciation, depletion, and amortization. *DebG* is gross debt. *DebN* is net debt. *DebST* is short-term debt. *Equ* is equity. *EBT* refers to earnings before tax. *Ebit* means earnings before interest and taxes ( $EBT + ExpInt - IncInt$ ). *Ebitda* stands for earnings before interest, taxes, depreciation, depletion, and amortization ( $EBT + DD\&A$ ). *ExpAdm* refers to administrative expenses. *ExpInt* represents interest expenses. *ExpSel* stands for selling expenses. *IncInt* is interest income. *IncNet* is net income. *IncTax* is income tax rate. *Int* refers to intangible assets. *Ivt* means inventories. *InvAsc* stands for investments in associates and joint ventures. *InvCap* is invested capital. *LiaCur* represents current liabilities. *LiaNonCur* refers to non-current liabilities. *PP&E* is property, plant and equipment. *R\$* is Brazilian real. *ProGro* is gross profit. *RecST* is short-term receivables. *RevNet* is net revenue. *SupST* means short-term suppliers.

Source: The authors.

Based on the eligibility method applied, 44 eligible indicators capable of explaining companies' participation in PERT were considered, as presented in Table 2. A group of indicators to be included in the tests were selected from 44 indicators. Those that showed no association with the binary dependent variable *Participating*, which indicates if the company set up an agreement in 2017 ( $Participating=1$ ) or not ( $Participating=0$ ), were ruled out. To ensure that the selection process did not significantly reduce the eligible indicators, a 10% significance level was considered in the Pearson correlation test. Additionally, since the Pearson correlation coefficient assumes a linear relationship between variables, which is not true in logistic regression models, as is the case of this research, relaxing the significance level of correlation for variable selection becomes a conservative procedure.

After the filtering procedure based on the linear correlation between the dependent variable and the independent variables, 14 eligible indicators remained with a significant correlation with the response variable *Participating*, as can be seen in Table 3.

**Table 3**  
The 14 selected indicators

Group	Indicator	Observations	Correlation with <i>Participating</i>	P-value
Liquidity	<i>LiqGen</i>	295	-0.1988	0.0006***
	<i>LiqCur</i>	295	-0.1554	0.0075**
	<i>LiqQui</i>	272	-0.1545	0.0107*

**Table 3**  
The 14 selected indicators

Group	Indicator	Observations	Correlation with Participating	P-value
Profitability	<i>MrgGro</i>	286	-0.1231	0.0374*
	<i>RetEquB</i>	254	-0.1182	0.0599•
	<i>RetEquA</i>	247	-0.1111	0.0814•
	<i>EbitDebG</i>	248	-0.1407	0.0025**
Debt	<i>DebGAst</i>	272	0.1823	0.0153*
	<i>DebGEqu</i>	272	0.147	0.0248*
	<i>DebNEqu</i>	272	0.1361	0.0131*
	<i>CapStr</i>	272	0.1503	0.0267*
	<i>DebSTDebG</i>	248	0.1097	0.0848•
	<i>LiaAst</i>	299	0.1469	0.011*
Market	<i>EarPri</i>	239	-0.1072	0.0983•

Note: The symbols “•”, “\*”, “\*\*”, and “\*\*\*” indicate significant values at the 10%, 5%, 1%, and 0.1% levels. The indicators were winsorized between the 5<sup>th</sup> and 95<sup>th</sup> percentiles.

Source: The authors.

The following selected indicators presented correlation coefficients equal to or higher than 0.9 among themselves: *LiqCur* and *LiqQui* ( $r=0.9459$ ,  $p<0.0001$ ), *RetEquA* and *RetEquB* ( $r=0.9907$ ,  $p<0.0001$ ), and *DebGEqu* and *DebNEqu* ( $r=0.9546$ ,  $p<0.0001$ ). High correlations between independent variables, as is the case of these indicators, can lead to multicollinearity issues when multivariate models are used. To address this problem, those indicators with coefficients showing unexpected signs will be excluded from the final set of fitted multivariate models.

### 3.3 Models

Logistic regression is a widely used technique in bankruptcy prediction, and it was introduced for this purpose by Ohlson (1980). In the context of this research, the effect of an indicator on the probability of companies benefiting from PERT was considered a good measure of its explanatory power. Thus, aiming to capture the isolated effect of the indicators on the probability of participation ( $H_1$ ), while holding everything else constant, the following logistic regression model was fitted for each of the 14 selected indicators:

$$P(\text{Participating}_t = 1 | X_{t-1}) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X_{t-1} + \beta_2 \text{Industrial} + \beta_3 \text{Financial} + \beta_4 \text{Utilities} + \beta_5 \text{Others} + \varepsilon_t)}} \quad (1)$$

Where  $X_{t-1}$  represents one of the 14 selected indicators (*LiqGen*<sub>*t-1*</sub>, *LiqCur*<sub>*t-1*</sub>, *LiqQui*<sub>*t-1*</sub>, *MrgGro*<sub>*t-1*</sub>, *RetEquB*<sub>*t-1*</sub>, *RetEquA*<sub>*t-1*</sub>, *EbitDebG*<sub>*t-1*</sub>, *DebGAst*<sub>*t-1*</sub>, *DebGEqu*<sub>*t-1*</sub>, *DebNEqu*<sub>*t-1*</sub>, *CapStr*<sub>*t-1*</sub>, *DebSTDebG*<sub>*t-1*</sub>, *LiaAst*<sub>*t-1*</sub>, *EarPri*<sub>*t-1*</sub>) in the year prior to the PERT installment payment agreement (dependent variable *Participating*<sub>*t*</sub>). *Industrial*, *Financial*, *Utilities*, and *Others* are dummies that capture, respectively, the specificities of the industrial goods, financial, utilities, and other sectors, with the cyclical consumption sector as the reference sector.

The research  $H_1$  will be supported if, at least, one financial indicator is capable of influencing the odds of Brazilian publicly traded companies setting up an installment payment agreement through PERT. Alternatively,  $H_1$  will be rejected

if all the financial indicators, tested individually, are incapable of influencing the odds.

Additionally, aiming to obtain the model with the highest explanatory power, we proposed models that capture the effect of different combinations of indicators on the probability to compare them with models that capture the isolated effect of the indicators ( $H_2$ ). To make that possible, aiming to identify models in which all included regression coefficients are statistically significant at the 5% level (referred to as "significant models" for this research),  $2^{15}$  models were fitted using the 14 selected indicators, resulting in 32,768 models, including the null model (with only the intercept and dummies indicating the sectors).

To assess the goodness of fit of the models, the Akaike Information Criterion (AIC) was used. Proposed by Akaike (1973), AIC was the first model selection technique to gain statistical prominence and remains one of the most well-known and widely used methods today (Cavanaugh & Neath, 2019). Its main characteristic is the penalization of models with unnecessary parameters, favoring models with a better balance between goodness of fit and parsimony, as indicated by lower AIC values.

In order to facilitate the interpretation of AIC, once all significant models have been obtained, they will be sorted in ascending order based on their AIC values, and these AIC values will be transformed into Akaike weights ( $AIC_w$ ).  $AIC_w$  can be interpreted as the conditional probability of each model being the best among all the significant models tested (Burnham & Anderson, 2002; Silva & Pessanha, 2022). The evidence ratio in favor of a given model compared to another can be obtained by dividing their Akaike weights.

Research hypothesis  $H_2$  will be supported if at least one indicators combination model (multivariate models) demonstrates higher explanatory power than the models tested in  $H_1$ . Similarly,  $H_2$  will be refuted if none of the models that include these combinations show higher explanatory power.

Due to potential outliers, whether originating from data errors or not, data were winsorized for all the presented statistics, setting the values between the 5<sup>th</sup> and 95<sup>th</sup> percentiles. This is a common procedure when dealing with Brazilian publicly traded companies (Moura & Norden, 2019).

## 4 RESEARCH RESULTS

### 4.1 Descriptive statistics

Table 4 presents the descriptive statistics of the 14 selected indicators in the year before the PERT agreement was set up. The minimum and maximum values of the indicators, measured before variable winsorization, showed a wide range of data, indicating the presence of potential outliers. Additionally, the maximum value of 425.2868 for the *MrgGro* indicator, measured as the ratio of gross profit to net revenue, indicates a potential error on the database since, by definition, the indicator should not exceed 100. However, only one company in the sample had this indicator with a value higher than 100.

**Table 4**  
Descriptive statistics

Indicators	Participating companies (Participating=1)				Non-participating companies (Participating=0)			
	Minimum	Median	Mean	Maximum	Minimum	Median	Mean	Maximum
<i>LiqGen</i>	0.0235	0.7791**	0.8449***	3.4468	0.0000	1.0176	1.1224	11.7168
<i>LiqCur</i>	0.0121	1.1723**	1.4133**	24.5808	0.0000	1.4277	1.7764	17.3942
<i>LiqQui</i>	0.0006	0.9779**	1.1857**	22.4968	0.0000	1.2226	1.5178	17.3942
<i>MrgGro</i>	-293.5562	26.3020*	29.9440*	425.2868	-570.6313	30.2447	36.0369	100
<i>RetEquB</i>	-20,054.7620	3.9263	-0.7294•	8,582.7183	-399.1720	7.0057	4.1841	129.3362
<i>RetEquA</i>	-147.6819	4.1586	0.5038•	64.2595	-115.5112	7.3015	4.7395	120.4571
<i>EbitDebG</i>	-1,226.1779	11.9937•	20.5857*	1,042.7617	-616.0613	17.1938	44.3673	36,808.4381
<i>DebGAst</i>	0.0000	31.5724**	33.7986**	3,616.3105	0.0000	26.8231	26.0383	769.6145
<i>DebGEqu</i>	-388.6609	60.9176	96.8669*	1,355.8977	-1,322.1581	43.9847	61.6435	11,167.8513
<i>DebNEqu</i>	-371.6395	35.7357	62.8892*	1,323.3091	-1,209.7612	19.4177	32.8585	8,643.3170
<i>CapStr</i>	-995.3539	45.5985**	44.5873*	343.9197	-1,116.7801	35.1398	33.3585	1,946.9622
<i>DebSTDebG</i>	0.0000	37.7462	42.2669•	100	0.0000	32.0269	36.1876	100
<i>LiaAst</i>	0.7206	73.1864***	84.0842*	4,079.6296	8.3299	57.3120	69.2549	1,485.1789
<i>EarPri</i>	-9,067.2028	3.8388	-73.6225	213.8371	-3,539.8689	3.4463	-35.7795	1,146.6677

Note: The symbols “•”, “\*”, “\*\*”, and “\*\*\*” indicate significant values at the 10%, 5%, 1%, and 0.1% levels of the t-test and the Wilcoxon rank-sum test, which test the null hypothesis of equality of means (t-test) and equality of medians (Wilcoxon) for the indicators of participating (*Participating=1*) and non-participating (*Participating=0*) companies, respectively. The mean was winsorized between the 5<sup>th</sup> and 95<sup>th</sup> percentiles.

Source: The authors.

On average, the group of companies taking part in the program has lower liquidity (*LiqGen*, *LiqCur*, and *LiqQui*), lower profitability (*MrgGro*, *RetEquB*, *RetEquA*, and *EbitDebG*), and higher debt (*DebGAst*, *DebGEqu*, *DebNEqu*, *CapStr*, *DebSTDebG*, and *LiaAst*) compared to the group of non-participating companies. The indicator *EarPri* is a particular case. On average, it was considerably lower for the group of participating companies. However, this indicator is higher for a larger number of companies in this group. Except for the market indicator *EarPri*, the differences observed in means and medians are statistically significant at the 5% level for at least one proxy of each financial characteristic (liquidity, profitability, and debt).

In general, the values presented by the indicators in 2016 are in line with the premise that new installment payment programs are launched to assist companies in a fragile financial situation, comprising the majority of those that would later benefit from PERT, in 2017.

#### 4.2 H<sub>1</sub>: “There is an association between companies' financial indicators and their participation in PERT”

To evaluate H<sub>1</sub>, the significance of the estimated coefficients for the 14 selected financial indicators was individually tested to ascertain the explanatory power of each one of them in isolation, as shown in Table 5.

**Table 5**

Results of the 14 selected indicators

Indicators	Observations	$\beta_1$	Industrial	Financial	Utilities	Others	AIC
<i>LiqGen</i>	295	-0.5917**	1.1052**	0.8013*	0.2406	0.5827•	392.0207
<i>LiqCur</i>	295	-0.2819*	1.1855**	0.8213*	0.3069	0.7565*	395.1727
<i>LiqQui</i>	272	-0.3574**	1.2345**	1.2365*	0.4255	0.7893*	362.1946
<i>MrgGro</i>	286	-0.0105•	1.1498**	0.9952*	0.3037	0.7655*	386.7566
<i>RetEquB</i>	254	-0.0142*	1.2536**	1.2193**	0.8019•	1.0066*	337.4648
<i>RetEquA</i>	247	-0.0153*	1.5411**	1.4308**	1.0215*	1.2829**	323.1854
<i>EbitDebG</i>	248	-0.0034•	1.0827**	0.8666	0.2312	0.7167*	337.4276
<i>DebGAst</i>	272	0.0177**	1.1364**	1.185*	0.3876	0.7427*	361.5999
<i>DebGEqu</i>	272	0.0023*	1.1699**	1.074*	0.3468	0.6869*	365.1317
<i>DebNEqu</i>	272	0.0023•	1.1718**	1.07*	0.3229	0.6844*	365.8239
<i>CapStr</i>	272	0.0089*	1.2717**	1.121*	0.3784	0.7200*	363.1951
<i>DebSTDebG</i>	248	0.0127*	1.3636**	1.1874*	0.5839	0.9603*	335.7570
<i>LiaAst</i>	299	0.0057*	1.2268**	0.8981*	0.4670	0.6926*	401.7298
<i>EarPri</i>	239	-0.0016*	1.4759**	0.9213*	0.7684	0.9601*	323.4485
Null model	300		1.2772**	0.8517*	0.4025	0.7080*	406.2875

Note: *Industrial*, *Financial*, *Utilities*, and *Others* are dummies that identify, respectively, the sectors of industrial goods, financial, utilities, and other sectors, with the cyclical consumption sector as the reference sector. The symbols “•”, “\*”, “\*\*”, and “\*\*\*\*” indicate significant values at the 10%, 5%, 1%, and 0.1% levels.

Source: The authors.

Out of the 14 selected indicators, only *MrgGro*, *EbitDebG*, and *DebNEqu* showed non-significant coefficients at the 5% level. However, it is not possible to rule out the possibility that these indicators, together with one or more other indicators, may have a combined explanatory effect that renders them significant, as will be assessed in  $H_2$ .

The indicators of debt, *DebGAst*, *DebGEqu*, *DebNEqu*, *CapStr*, *DebSTDebG*, and *LiaAst* showed a positive relationship with *Participating*, with only the *DebNEqu* indicator presenting a non-significant coefficient. Therefore, it is possible to affirm that an increase in debt, when considered in isolation and measured by different proxies, increases the odds of companies setting up a PERT agreement.

The liquidity measures, *LiqGen*, *LiqCur*, and *LiqQui*, showed a negative relationship with *Participating*, as well as the profitability measures, *MrgGro* (non-significant), *RetEquB*, *RetEquA*, and *EbitDebG* (non-significant), and the only selected market measure, *EarPri*. It is possible to assert that an increase in liquidity, measured by different proxies, and an increase in profitability, measured by *RetEquB* or *RetEquA*, when considered individually, decrease the odds of companies benefiting from PERT. Similarly, there is a decrease in the odds when there is an increase in the *EarPri* indicator.

The coefficient of the dummy indicating the industrial goods sector (*Industrial*) was positive and significant for all the tested financial indicators. Similarly, the coefficient of the dummy indicating the financial sector (*Financial*) was not significant only for the *EbitDebG* indicator. Therefore, it is possible to assert that, in general, companies in the industrial goods sector and in the financial sector are more likely to participate in the program, regardless of their financial situation, compared to companies in the cyclical consumption sector.

The coefficient of the dummy indicating the utilities sector (*Utilities*) was also positive for all the financial indicators. However, except for the *RetEquA* indicator, the *Utilities* coefficient was not significant for any other financial indicator. Therefore, it is possible to assert that, in general, the odds of companies in the utilities sector participating in the program compared to companies in the cyclical consumption sector are similar. When it comes to how likely companies are to set up an agreement offered by the program, their individual financial characteristics are more important than the characteristics of the sector itself.

Regarding the indicators that were excluded, they were also tested using the model of Eq. (1). However, none of the 30 eligible non-selected indicators showed a relationship with the odds of companies joining PERT. Additionally, 29 out of these 30 indicators would not be statistically significant even in case of a 10% significance level, with the exception being the *InvAscEqu* indicator ( $p=0.0612$ ).

In summary, the results obtained in Table 5 corroborate  $H_1$  of this research, as a statistically significant relationship was found between liquidity and profitability indicators with a decrease in the odds of companies joining the program, and a similarly statistically significant relationship between debt indicators and an increase in such odds. Furthermore, the absence of association between the excluded indicators and these odds was also confirmed, thus, justifying their exclusion from the tests conducted to investigate  $H_2$ .

#### **4.3 H2: “When combined, companies' financial indicators increase the ability to explain why they decide to join PERT”**

From the 14 selected indicators, 32,768 models were fitted, including the null model (model with only the intercept and sector dummies). As shown in Panel A of Table 6, out of these 32,768 fitted models, only 50 presented significant coefficients for all the indicators, and no multivariate model with more than 3 indicators was found to be significant.

Panel B of Table 6 shows that the *LiqGen* is the indicator that most often proved to be significant when combined with other indicators, thus, adding marginal explanatory power to a larger number of models. However, this does not necessarily mean that it is the indicator with the highest explanatory power, either individually or when combined with other indicators. The importance of sector-specific characteristics in explaining why companies join PERT was also reinforced. The dummy indicating the industrial goods sector was significant in 96.88% of the 16,384 cases where it was included in the fitted models, and the dummy indicating the financial sector was significant in 88.06% of the cases.

**Table 6**

Models evaluated and significant indicators at the 5% level

Panel A: Evaluated and selected models			Panel B: Frequency of indicators in the models			
N° of indicators	Fitted models	Models whose all indicators were significant	Indicators	How many times they were included	How many times they were significant	%
0	2	0	<i>LiqGen</i>	16,384	6,760	41.26
1	28	21	<i>DebSTDebG</i>	16,384	6,611	40.35
2	182	24	<i>LiaAst</i>	16,384	1,243	7.59
3	728	5	<i>DebGEqu</i>	16,384	902	5.51
4	2,002	0	<i>MrgGro</i>	16,384	721	4.40
5	4,004	0	<i>LiqQui</i>	16,384	670	4.09
6	6,006	0	<i>LiqCur</i>	16,384	515	3.14
7	6,864	0	<i>CapStr</i>	16,384	404	2.47
8	6,006	0	<i>DebNEqu</i>	16,384	103	0.63
9	4,004	0	<i>DebGAst</i>	16,384	87	0.53
10	2,002	0	<i>EarPri</i>	16,384	43	0.26
11	728	0	<i>RetEquA</i>	16,384	12	0.07
12	182	0	<i>RetEquB</i>	16,384	11	0.07
13	28	0	<i>EbitDebG</i>	16,384	2	0.01
14	2	0	<i>Industrial dummy</i>	16,384	15,873	96.88
			<i>Others dummy</i>	16,384	15,262	93.15
			<i>Financial dummy</i>	16,384	14,428	88.06
			<i>Utilities dummy</i>	16,384	3,687	22.50
Total	32,768	50	Total	294,912	67,334	

Source: The authors.

Out of the 50 identified significant models, 23 have no sector dummies, a number that comprises 10 models with only 1 indicator, 12 models with 2 indicators, and 1 model with 3 indicators. Although none of these 23 models ranked as the ones with the best explanatory power, they were excluded from the final list of significant models to avoid the omitted variable bias since the sectors were shown to capture characteristics that are not fully incorporated by financial indicators.

Table 7 presents the 27 remaining significant models, arranged in descending order of the goodness of fit. All the indicators included in the significant models showed the expected signs for the estimated  $\beta$  coefficients, consistent with the findings in Tables 3 and 5.

The best univariate model, in terms of AIC, ranked fourth. The top three models included two variables. However, as it alone accumulated 99.91% of the Akaike weights, the best model renders the application of the others obsolete.

Although the two best models include highly correlated profitability indicators, *RetEquA* and *RetEquB* ( $r=0.9907$ ,  $p<0.0001$ ), the difference in goodness of fit between these models is not small. In comparative terms, the evidence ratio between model 4 and model 5 is only 1.1406. An evidence ratio close to 2 is a weak indication of a model's superiority over another, which suggests that variations in the sample could alter one's perception of the best model (Burnham & Anderson, 2002). On the other hand, the evidence ratio between model 1 and model 2 is over a thousand, which indicates the superior goodness of fit of the first model.

**Table 7**

The 27 models whose all indicators were significant

Models	Indicators	AIC	$\Delta(\text{AIC})$	$\text{AIC}_{wi}$	Cumulative $\text{AIC}_{wi}$	$\text{AIC}_{wi}/\text{AIC}_{wi-1}$
1	<i>RetEquA+DebSTDebG</i>	261.8316	0.0000	0.9991	0.9991	1,094.4467
2	<i>RetEquB+DebSTDebG</i>	275.8277	13.9960	0.0009	1.0000	7,177.6638
3	<i>DebGEqu+EarPri</i>	293.5851	31.7535	0.0000	1.0000	2,676,836.2653
4	<i>RetEquA</i>	323.1854	61.3538	0.0000	1.0000	1.1406
5	<i>EarPri</i>	323.4485	61.6169	0.0000	1.0000	2.9521
6	<i>LiqGen+DebGEqu+DebSTDebG</i>	325.6135	63.7819	0.0000	1.0000	1.0309
7	<i>DebGEqu+DebSTDebG+LiaAst</i>	325.6744	63.8427	0.0000	1.0000	1.9522
8	<i>CapStr+DebSTDebG+LiaAst</i>	327.0123	65.1807	0.0000	1.0000	1.4132
9	<i>LiqGen+DebSTDebG</i>	327.7039	65.8723	0.0000	1.0000	1.0801
10	<i>DebNEqu+DebSTDebG+LiaAst</i>	327.8581	66.0264	0.0000	1.0000	5.9048
11	<i>DebGAst+DebSTDebG</i>	331.4096	69.5780	0.0000	1.0000	1.0196
12	<i>CapStr+DebSTDebG</i>	331.4485	69.6169	0.0000	1.0000	1.4457
13	<i>DebGEqu+DebSTDebG</i>	332.1857	70.3540	0.0000	1.0000	2.0095
14	<i>DebNEqu+DebSTDebG</i>	333.5814	71.7498	0.0000	1.0000	2.9677
15	<i>DebSTDebG</i>	335.7570	73.9253	0.0000	1.0000	2.3488
16	<i>RetEquB</i>	337.4648	75.6331	0.0000	1.0000	41,028.3733
17	<i>CapStr+LiaAst</i>	358.7088	96.8772	0.0000	1.0000	1.2584
18	<i>DebGEqu+LiaAst</i>	359.1685	97.3368	0.0000	1.0000	2.1659
19	<i>DebNEqu+LiaAst</i>	360.7142	98.8825	0.0000	1.0000	1.5572
20	<i>DebGAst</i>	361.5999	99.7683	0.0000	1.0000	1.3463
21	<i>LiqQui</i>	362.1946	100.3630	0.0000	1.0000	1.6491
22	<i>CapStr</i>	363.1951	101.3635	0.0000	1.0000	2.6334
23	<i>DebGEqu</i>	365.1317	103.3001	0.0000	1.0000	48.3259
24	<i>LiqGen+MrgGro</i>	372.8876	111.0560	0.0000	1.0000	14,278.5118
25	<i>LiqGen</i>	392.0207	130.1890	0.0000	1.0000	4.8357
26	<i>LiqCur</i>	395.1727	133.3411	0.0000	1.0000	26.5372
27	<i>LiaAst</i>	401.7298	139.8982	0.0000	1.0000	9.7653
Null	None	406.2875	144.4558	0.0000	1.0000	n/a

Source: The authors.

Although *LiqGen* was the indicator that most often proved to be significant when combined with other indicators, it was not included in any of the top five models. Nevertheless, the combination of *RetEquA* and *DebSTDebG* incorporates information about companies' liquidity into the best model. When considered in isolation, the *RetEquA* indicator carries information about profitability, but does not include information about the companies' debt or liquidity, factors that are significantly associated with the odds of them joining PERT. Since companies' debt is captured by the *DebSTDebG* indicator, *RetEquA* starts to add information not only about profitability but also about liquidity, thus, making the model encompass all the operational factors identified as associated with the odds (liquidity, profitability, and debt). Companies that simultaneously present low levels of the *DebSTDebG* and high levels of *RetEquA* indicators are more likely to show higher levels of liquidity (high profits with low debt, generating cash surplus). Something similar happened with the second and third best models presented, where the combination of indicators capturing companies' profits (*RetEquB* and *EarPri*) with indicators capturing debt (*DebSTDebG* and *DebGEqu*) adds information about companies' liquidity in these models.



In summary, the results obtained in Table 7 corroborate H<sub>2</sub> of this research, since the top three models with the highest explanatory power are models that combine two indicators, and none of the significant models combined more than 3 indicators.

## 5 FINAL CONSIDERATIONS

The objective of this research was to verify the relationship between the financial situation of companies and their participation in tax installment payment programs in Brazil. For that purpose, 44 financial indicators were selected to explain why companies join a particular installment payment program, of which only 14 were found to be truly associated with their participation in PERT. These 14 indicators represent liquidity, profitability, debt, and market. When considered individually, a relationship was observed between liquidity and profitability with a decrease in the odds of joining the program. On the other hand, debt indicators showed to have a relationship with an increase in the odds. Tests conducted with combinations of indicators showed that, when combined in the same model, the indicators "return on average equity" and "short-term debt-to-gross debt" are the best to be used together for explaining the odds. The model with these two indicators alone incorporates the financial factors of liquidity, profitability, and debt.

The results are in line with previous research (Segura et al., 2012), and they indicate that the companies that would benefit from PERT were those in a worse financial situation. Additionally, the findings made it possible to identify that this fragile financial situation was determining for the companies' to take part in the program, which is in line with the Public Interest Theory. While the results support the reasons for the creation of this type of program, given its intention to minimize the impact of economic crises on society, which, in turn, is evident in the financial situation of the companies that would set up an agreement, much is still being discussed about the effectiveness of such programs (Borges & Rech, 2021). Studies on the subject differ, with some indicating improvements in certain financial aspects of the companies (Viana et al., 2023). However, it is premature to dismiss the effectiveness of these programs in a short-term analysis. In this sense, as a suggestion for future research, it is recommended to monitor the companies that have benefited from them in the long term to verify whether their financial situation has improved or worsened. Additionally, further studies could investigate the impact on society of the cost of the bankruptcy of participating companies in terms of job losses and tax revenue.

The main limitations faced by this research relate to the analysis of only one tax installment payment program, that is, PERT, and its sample, which includes only Brazilian publicly traded companies. These companies constitute a small fraction of all the companies that benefited from the program. The results point to models that could serve as a starting point in privately held companies as they do not depend on market variables. Nonetheless, their explanatory power requires further research, which is another suggestion for future studies.

## REFERENCES

- Akaike, H. (1973). Information theory and an extension of the maximum likelihood principle. In B. N. Petrov & F. Csáki (Eds.), 2nd international symposium on information theory (267–281). Budapest, Hungary: Akadémia Kiadó.
- Alm, J., & Beck, W. (1990). Tax amnesties and tax revenues. *Public Finance Quarterly*, 18(4), 433-453. <https://doi.org/10.1177/2F109114219001800404>
- Alves, D. B., & Campagnoni, M. (2021). Parcelamento tributário e endividamento com provisões e contingências em empresas de relevância nacional. *Contabilometria - Brazilian Journal of Quantitative Methods Applied to Accounting*, 8(2), 1-18.
- Altman, E. I., Iwanicz-Drozowska, M., Laitinen, E. K., & Suvas, A. (2016). Financial distress prediction in an international context: a review and empirical analysis of Altman's Z-score model. *Journal of International Financial Management & Accounting*, 28(2), 131-171. <https://doi.org/10.1111/jifm.12053>
- Andreoni, J. (1991). The desirability of a permanent tax amnesty. *Journal of Public Economics*, 45(2), 143-159. [https://doi.org/10.1016/0047-2727\(91\)90037-3](https://doi.org/10.1016/0047-2727(91)90037-3)
- Bayer, R-C., Oberhofer, H., & Winner, H. (2015). The occurrence of tax amnesties: theory and evidence. *Journal of Public Economics*, 125, 70-82. <http://doi.org/10.1016/j.jpubeco.2015.02.006>
- Borges, S. R. P., & Rech, I. J. (2021). Effectiveness of tax refinancing programs for corporate solvency in Brazil. *Advances in Scientific and Applied Accounting*, 14(1), 72-89. <https://doi.org/10.14392/asaa.2021140103>
- Burnham, K. P.; & Anderson, D. R. Model selection and multimodel inference: a practical information-theoretic approach. New York: Springer-Verlag, 2002.
- Brasil. (2017). *Lei nº 13.496, de 24 de outubro de 2017*. Disponível em: [http://www.planalto.gov.br/ccivil\\_03/\\_ato2015-2018/2017/lei/l13496.htm](http://www.planalto.gov.br/ccivil_03/_ato2015-2018/2017/lei/l13496.htm)
- Campagnoni, M., & Ruiz, K. S. (2020). Características das empresas que pedem perdão tributário no Brasil. *Revista de Contabilidade e Gestão Contemporânea*, 3(1), 3-19. Disponível em: <https://periodicos.uff.br/rcgc/article/view/46445>
- Cavanaugh, J. E., & Neath, A. A. (2019). The Akaike information criterion: Background, derivation, properties, application, interpretation, and refinements. *Wiley Interdisciplinary Reviews: Computational Statistics*, e1460. <https://doi.org/10.1002/wics.1460>

- Damayanti, T. W., Nastiti, P. K. Y., & Supramono, S. (2020). Does tax amnesty influence intention to comply? If students are taxpayers already. *Business, Management and Education*, 18, 1-13. <https://doi.org/10.3846/bme.2020.10292>
- Dubin, J. A., Graetz, M. J., & Wilde, L. L. (1992). State income tax amnesties: causes. *The Quarterly Journal of Economics*, 107(3), 1057-1070. <https://doi.org/10.2307/2118374>
- Fontes, T. V. (2019). Os programas de parcelamento tributário e os impactos no comportamento dos contribuintes. *FGV Direito SP Research Paper Series*, n. TL021. <https://doi.org/10.2139/ssrn.3442220>
- Gemmell, N., & Hasseldine, J. (2012). The tax gap: a methodological review. *Advances in Taxation*, 20, 203-231. [https://doi.org/10.1108/S1058-7497\(2012\)0000020011](https://doi.org/10.1108/S1058-7497(2012)0000020011)
- Hou, K., Xue, C., & Zhang, L. (2020). Replicating Anomalies. *The Review of Financial Studies*, 33(5), 2019–2133. <https://doi.org/10.1093/rfs/hhy131>
- Leonard, H. B., & Zeckhauser, R. J. (1987). Amnesty, enforcement, and tax policy. *Tax Policy and the Economy*, 1, 55-85. Disponível em: <https://www.jstor.org/stable/20061763>
- Lima, B. R. T., Wilbert, M. D., & Serrano, A. L. M. (2017). Parcelamento de tributos federais como forma de financiamento indireto. *RACE – Revista de Administração, Contabilidade e Economia*, 16(3), 1079-1108. <https://doi.org/10.18593/race.v16i3.13405>
- Luitel, H. S., & Sobel, R. S. (2007). The revenue impact of repeated tax amnesties. *Public Budgeting & Finance*. <https://doi.org/10.1111/j.1540-5850.2007.00881.x>
- Luitel, H. S., & Tosun, M. S. (2014). A reexamination of state fiscal health and amnesty enactment. *International Tax and Public Finance*, 21(5), 874-893. <https://doi.org/10.1007/s10797-013-9278-8>
- Organisation for Economic Cooperation and Development (OECD). (2014). Working smarter in tax debt management, *OECD Publishing*. <http://dx.doi.org/10.1787/9789264223257-en>
- Paes, N. L. (2012). O parcelamento tributário e seus efeitos sobre o comportamento dos contribuintes. *Revista EconomiA*, 13(2), 345-363.
- Paes, N. L. (2014). Os efeitos dos parcelamentos sobre a arrecadação tributária. *Estudos Econômicos*, 44(2), 323-350. <https://doi.org/10.1590/S0101-41612014000200004>

- Pommerehne, W. W., & Zweifel, P. (1991). Success of a tax amnesty: At the polls, for the fisc? *Public Choice*, 72(2/3), 131-165. Disponível em: <https://www.jstor.org/stable/30025528>
- Receita Federal do Brasil (RFB). (2017). *Estudo sobre impactos dos parcelamentos especiais*. Secretaria da Receita Federal. Disponível em: <https://www.gov.br/receitafederal/pt-br/aceso-a-informacao/dados-abertos/arquivos-e-imagens/20171229-estudo-parcelamentos-especiais.pdf>
- Rezende, A. J., Dalmácio, F. Z., & Rathke, A. A. T. (2018). Avaliação do impacto dos incentivos fiscais sobre os retornos e as políticas de investimento e financiamento das empresas. *Revista Universo Contábil*, 14(4), 28-49. <https://doi.org/10.4270/ruc.2018426>
- Rodrigues, H. T., Paludo, V. (2020). Remissões e anistias fiscais sob o enfoque da moral tributária: uma análise das renúncias concedidas pelo governo federal brasileiro nos anos 2017 e 2018 e suas projeções para 2019 e 2020. *Revista Argumentum*, 21(2), 687-705.
- Segura, L. C., Formigoni, H, & Grecco, M. C. P. (2012). Um estudo sobre a relação entre adesão das companhias abertas ao REFIS e o seu capital de giro líquido. *Advances in Scientific and Applied Accounting*, 5(3), 427-446.
- Setyorini, R., Daengs, G. S. A., Mahjudin, Reni, A., Susilo, D. E., & Hidayat, R. (2019). Knowledge management of financial performance for tax amnesty policy. *Journal of Physics: Conference Series*, 1175(1). <https://doi.org/10.1088/1742-6596/1175/1/012215>
- Shevlin, T., Thornock, J., & Williams, B. (2017). An examination of firms' responses to tax forgiveness. *Review of Accounting Studies*, 22, 577-607. <https://doi.org/10.1007/s11142-017-9390-6>
- Silva, S. F. P. da; & Pessanha, J. F. M. Identificação de indicadores para previsão de insolvência das distribuidoras de energia elétrica por meio de regressão logística para dados em painel. *Contabilometria - Brazilian Journal of Quantitative Methods Applied to Accounting*, 9(1), 73-91.
- Soares, R. A., & Rebouças S. M. D. P. (2014). Avaliação do desempenho de técnicas de classificação aplicadas à previsão de insolvência de empresas de capital aberto brasileiras. *Revista do Mestrado em Administração e Desenvolvimento Empresarial da Universidade Estácio de Sá*, 18(3), 40-61.
- Stella, P. (1991). An economic analysis of tax amnesties. *Journal of Public Economics*, 46(3), 383-400. [https://doi.org/10.1016/0047-2727\(91\)90013-R](https://doi.org/10.1016/0047-2727(91)90013-R)

- Machado, R., & Oliveira, M. (2022). Comissão aprova proposta que abre prazo para renegociação de dívidas tributárias na pandemia. *Câmara dos Deputados*. Disponível em: <https://www.camara.leg.br/noticias/874837-comissao-aprova-proposta-que-abre-prazo-para-renegociao-de-dividas-tributarias-na-pandemia/>
- Malik, A. S., & Schwab, R. M. (1991). The economics of tax amnesties. *Journal of Public Economics*, 46(1), 29-49. [https://doi.org/10.1016/0047-2727\(91\)90063-8](https://doi.org/10.1016/0047-2727(91)90063-8)
- Moura, L., & Norden, L. (2019). Does good corporate governance pay off in the long run? Evidence from stock market segment switches in Brazil. *Brazilian Review of Finance*, 17(3), 1-25. <https://doi.org/10.12660/rbfin.v17n3.2019.79874>
- Viana, R. K. T., Campagnoni, M., & Esteves, H. S. (2023). Parcelamento tributário no Brasil: quem se beneficia? *Revista de Gestão e Secretariado*, 14(1), 855-878. <https://doi.org/10.7769/gesec.v14i1.1558>
- Yücedoğru, R., & Sarisoy, I. (2020). Are tax amnesties good for us all? Understanding influence of tax amnesties on benefiter and non-benefiter. *CESifo Economic Studies*, 66(3), 285-300. <https://doi.org/10.1093/cesifo/ifz020>