

EFFECTIVENESS OF TAX REFINANCING PROGRAMS FOR CORPORATE SOLVENCY IN BRAZIL

Sabrina Rafaela Pereira Borges¹

Ilírio José Rech²

Abstract

Objective: Renegotiation of tax debts has been justified under focus on insolvency, whose purpose is to "save" companies and recover tax credits. This research aims to verify effectiveness of tax installments for solvency of Brazilian public companies' insolvency.

Method: Z-scores insolvency level were compared to 140 publicly traded companies joined the Special Tax Regularization Program (PERT) with a similar sample of companies did not join. To control effect of other factors, industry, state in judicial recovery and size of the companies were used. For the analysis of the sample, tests of means and quantile regression were used in the Z-scores measure level of insolvency of the model of Altman (2016).

Results or Discussion: Tests of averages were not conclusive for the relationship between the insolvency's level of companies with adherence to tax installments. However, through the regressive model, improvements were found in the solvency Z-scores of the companies joined the PERT program, differing from the other companies did not join the program depending on the industry.

Contributions: Findings suggesting the lack of effectiveness of the programs due to the inefficiency in "saving" companies in financial difficulties. These results contribute to draw attention to the need to review the criteria for adhering to tax refinancing programs taking into account the financial needs of companies. Otherwise, these mechanisms serve only to favor the groups that capture the government, and losing their effectiveness of the programs helping companies in financial difficulties.

Keywords: PERT; Corporate Insolvency; Tax Debts.

¹ sabrinarpb@yahoo.com.br. Universidade Federal de Uberlândia, Uberlândia-MG. Brazil. <https://orcid.org/0000-0002-7110-0784>

² ilirio.jose@ufg.br. Universidade Federal de Goiás, Goiânia-GO. Brazil. <https://orcid.org/0000-0001-7027-737X>

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INTRODUCTION

In financially difficult moments, companies look for options to solve their problems through tax refinancing programs (Christensen Flor, Lando & Miltersen, 2014). When it comes to tax debts, tax amnesty given by tax refinancing programs work as a way to solve tax problems. With it, organizations postpone their payments and, in some cases, reduce interests and fines costs, which can improve their financial condition (Andreoni, 1991).

The high number of insolvent companies and their negative effects in society has taken scientific research to focus studies on analyzing factors that take companies to the insolvency state (Chung, Tan & Holdsworth, 2008). According to Bezerra, Lagioia and Pereira (2019), some of the main factors that worsen companies financial difficulty are unstable economy, strong competition, high cost of money and tax debts.

According to Dias (2012), understanding the role of tax debts is important to understand the corporate insolvency state, given the organizational tax debt increase. Corrêa (2019) noticed that companies debt with the government increased 84% from 2013 to 2019, according to the National Treasury Attorney's Office (PGFN), to which judicial processes, justice slowness (decisions take ten years, on average), bankruptcy and lack of assets are the main justifications for not paying Brazilian tax debts (Takar, 2019).

When in insolvency state, many companies cease to pay taxes. Thus, tax refinancing programs are seen with the purpose of "saving" companies and as a possibility of repatriation of tax credits to public coffers by insolvent taxpayers (Somavilla & Lobato, 2009).

In this regard, the analysis of tax refinancing effectiveness, concerning improvement in the level of insolvency of companies that joined the tax regularization programs, is relevant for public administrators so that they can identify situations in which the State needs to intervene. Besides, in certain situations, creating tax refinancing programs may be the way to enable the receipt of credits without compromising companies' financial-economic viability.

Such factor was pointed out by State Minister Henrique de Campos Meirelles in the Explanatory Memorandum (EM 00060/2017 MF) to present the provisional measure that later became Law no. 13.496/2017. According to the Explanatory Memorandum, the proposal is justified by the need to provide companies with conditions to face the economic crises and return to generating income, jobs and paying their taxes. Such justifications fit the markets regulation theories, specifically the Public Interest Theory (Beaver, 1998).

However, studies evidence that tax refinancing is not essential for companies' tax recovery, and that they join the programs for strategic reasons rather than financial needs (Alm, Mckee & Beck, 1990; Paes, 2012; Alm, Bruner & Mckee, 2016). Based on this perspective, there are evidences that the regularization programs are the result of pressure by interest groups on the government, aligned to what is ensured by the Theory of Capture or Interest Group (Scott, 2014).

To meet the objective, the Z-score of the insolvency level of 140 publicly-held companies that joined the Special Tax Regularization Program (PERT) was compared to a similar sample of companies that did not join PERT. To control the effect of other factors, the industry, judicial recovery state and size of the company were used as control variables. The Altman, Iwanicz-Drozdzowska, Laitinen & Suvas (2016) model was used to calculate the Z-scores, due to the fact that it is a worldwide known model and applicable in publicly-held companies (Andrade & Lucena, 2018).

The research contributes by demonstrating the effect of tax debts refinancing on companies insolvency. After analyzing the tax refinancing effectiveness, it is clear that the benefit provided by society fulfills the purpose of “saving” companies with financial difficulties.

This study innovates by analyzing companies in tax regularization from the perspective of insolvency, individualizing analyses from the perspective that joining regularization programs would be exclusive to companies that need to improve their solvency state, given the risk of bankruptcy. So, this research helps governments take political decisions regarding the establishment of new tax refinancing programs. Besides, the research helps by identifying the need to prepare for situations in which joining tax refinancing programs may represent an opportunity to restore companies’ solvency.

This article is structured in five sections, including the introduction with topic contextualization, objective, justification and contributions. The second section brings the theoretical background about corporate insolvency and its relationship with tax debts. The third section describes the research methodology, which shows the study sample and analysis methods used. The fourth section presents the results and analyses. Finally, the fifth section brings final considerations and implications, as well as suggestions for further research.

2 THEORETICAL BACKGROUND

2.1 Corporate Insolvency

Corporate insolvency happens when the company can no longer afford its commitments, once its assets are economically below its liabilities (Guimarães & Moreira, 2008). Andrade and Lucena (2018) state that insolvency is seen as an economic fact belonging to equity that differs from non-payment. The latter is characterized by a failure in complying with a certain obligation, even when one has conditions to comply (Guimarães & Teixeira, 2012). Therefore, insolvency is a state, while non-payment is an act (Guimarães & Teixeira, 2012).

The main approach used in the models is the use of accounting indicators, obtained in financial demonstrations, for insolvency prediction. From the analysis of indicators of bankrupted companies or companies that have been through judicial recovery, the accounting indicators are applied to the many economic industries to verify the solvency situation or the predictability of the indicators for the industry.

However, Altman et al. (2016) highlight the need to update insolvency models, once coefficients and variables lose their predictability. Changes in macroeconomic scenarios may affect the relationship between the financial-economic variables over time and decrease the models ability to predict insolvency situations.

In this regard, Altman et al. (2016) assessed the performance of their Z-score model on global scale. For that, they analyzed 34 countries, 31 of them European. The study found the same data that had been stated in preliminary research with publicly-held companies in the late 1960’s and, afterwards, in private companies in 1983. It is important to stress that the insolvency models developed and tested by Altman and other researchers do not consider the effect of taxes in the indicators.

On the other hand, although taxes are not analyzed in the models, Santos and Machado (2019) verified that, normally, judicial recovery plans in bankruptcy situations presented possibility of installment payment, amnesty and/or reduction of tax debt to justify the judicial recovery request. However, it is

questionable if the debts “relief” improves the condition that took the company to the recovery request, in which tax debts are part of their insolvency state.

2.2 Tax Regularization Programs and Corporate Solvency

Tax regularization programs offer defaulting taxpayers the possibility to pay fully or partially due taxes without the risk of being prosecuted or fined (Bayer, Oberhofer & Winner, 2014).

From the insolvency perspective, without regularization programs companies would not be able to pay their debts (Takar, 2019). However, there is no agreement in research regarding the relationship of the companies financial-economic situation and tax regularization programs joining (Segura, Formigoni & Grecco, 2012; Ruiz & Campagnoni, 2019).

Segura et al. (2012), after assessing the financial-economic situations of the companies that joined the World Cup Tax Recovery Program in 2012, came to the conclusion that joining the program does not change profitability, liquidity and level of indebtedness of companies. Ruiz and Campagnoni (2019) show that neither financial-economic indicators nor corporate governance affect the decision to join PERT, but there are significant differences from one industry to another, revealing that some sectors are more benefited by the program.

In this respect, Horta, Alves and Carvalho (2014) show that companies discontinuity in the cyclical consumption industry is associated with companies indebtedness, as well as liquidity and solvency aspects. In the basic materials industry, however, companies are insolvent due to the indebtedness level and operational difficulty to generate cash flow (Horta, Borges & Santos, 2015).

Companies taxation affects companies’ capital structural decisions, leading them to seek balance between debt tax benefits and financial difficulty costs (Langedijk Nicodème, Pagano & Rossi, 2014). About this debt and tax benefits balance, Carvalho (2015, p. 1) states that “if executives have to cease payment, the government will be the first victim”. Therefore, more than financial need, tax non-payment and subsequent regularization through regularization programs may be a company’s strategic move, without the actual need for such resources.

2.3 Regulation Theories as Principle for Establishing Tax Refinancing

In Economy and Law, there are many theories regarding market regulation (Beaver, 1998). Among the many regulation theories, this study will focus on the Public Interest and Capture theories.

In the Public Interest Theory, regulation is an answer to public demands, seeking to look after the public interest and avoid negative externality or natural monopolies. From the point of view of this theory, tax refinancing is established to avoid companies’ bankruptcy, which would affect social welfare (Andreoni, 1991; Christensen et al., 2014; & Pêgas, 2017). For that, when the economy or companies signal economic or financial difficulties, the State, as tax regulation entity, should intervene to avoid that negative externalities and unbalance affect the market functioning.

According to the Theory of Capture or Interest Group, regulation answers to demands of groups interested in boosting their members’ profit. Thus, politically or economically powerful groups seek to capture the regulator to meet their interests (Scott, 2014). Within this context, the interested groups, aware of their potential to intervene in the regulatory power, “await” the creation of tax amnesty programs, often incentivating taxpayers to avoid paying taxes and use public resources to finance their financial needs (Plutarco, 2012).

The perspective of establishment of new regularization programs leads to more tax payment delays by companies (Alm, 1998), increasing the chance of insolvency. Such situation can be evidenced by companies that joined the first Tax Recovery Program in 2000. According to Pegas (2017), most companies lost the programs benefits due to non-commitment to monthly payments. That fact supports the idea that the non-paying individuals tend to maintain such condition (Pêgas, 2017).

According to Marchese & Cassone (2000), unstable political regimes tend to have more tax amnesty, once these regimes are more susceptible to “being captured”. Politically or economically powerful industries pressure public administrators to establish tax refinancing programs. Such pressure was observed in Brazil in 2018, when, in the agribusiness sector, debts of rural producers and agricultural industries that had ceased to pay the Assistance to the Rural Worker Program (Funrural) were granted amnesty (Zala, 2018).

According to the suppositions of the Theory of Capture, the effects of capturing public administrators by interested groups affect public interest to boost their members’ profit. Thus, most tax amnesty programs do not truly verify if there is need for this kind of public financing. Somavilla and Lobato (2009) state that tax refinancing programs gather funds to public coffers that should have been collected previously. The lack of collection in due time affects social welfare, also harming the public planning of “captured” public administrators.

2.4 Research Hypotheses

Tax regularization programs are expected to decrease insolvency levels. They can be interpreted as an external or assistance aid of resources, reducing companies’ payment flows and, subsequently, improving their insolvency level (Andreoni, 1991; Neumayer, 2002; Takar, 2019). Therefore, the first hypothesis comes up:

H1: Companies improved their insolvency level after joining tax regularization programs.

Horta et al. (2014) and Horta et al. (2015) evidenced that cyclical consumption and basic materials industries behavior similarly when it comes to insolvency levels. Lennox (1989) had shown before that the sector is a decisive factor for companies insolvency. The author also considers that profitability, leverage, liquidity and company size are factors that affect the corporate insolvency level. The insolvency prediction model by Altman et al. (2016) used in this research considers all these factors except for sector and size. Hence, insolvency levels are expected to be influenced by each industry particularities and by the companies’ size, making the following hypotheses:

H2: The companies’ activity sector affects the effectiveness of tax refinancing for Brazilian publicly-held companies’s solvency.

H3: The companies’ size affects the effectiveness of tax refinancing for Brazilian publicly-held companies’s solvency.

Pereira and Luz (2018) state that companies would rather not pay taxes during the judicial recovery period so they can later on seek tax refinancing programs, which can compromise their financial situation even more. Thus, the condition of being in judicial recovery may also affect insolvency levels of companies after opting for joining tax refinancing programs. Hence, the following hypothesis comes up:

H4: The condition of being in judicial recovery affects the effectiveness of tax refinancing for Brazilian publicly-held companies’s solvency.

3 METHODOLOGICAL ISSUES

This research is quantitative since it statistically compares the Z-score that measures the insolvency level of companies that joined the tax regularization program with the ones that did not join to verify the effectiveness of tax refinancing in Brazilian publicly-held companies' solvency. The research can also be classified as documentary, since the companies' financial data were collected in financial demonstrations archived on the Brazil Stock Exchange and Over-the-Counter Market (B3) website.

The research sample comprises 140 publicly-held companies that joined PERT in 2017 and 164 publicly-held companies that did not join the program. Accounting data from the companies from 2015 to 2019 were collected with the purpose of evaluating the companies' Z-score insolvency two years before the program creation, in the year of joining and two years after. The analysis is developed through a short period, since insolvency is associated with loss of indebtedness capacity in a short period of time (Horta et al. 2014).

Regarding the analysis and classification of insolvency level Z-scores, the model by Altman et al. (2016) was used, initially developed by Altman (1968), that amplifies for the publicly-held companies. According to the model used in the research, the Z-score that measures the insolvency level of a company can be calculated through Equation 1:

$$\text{(Equation 1): } Z\text{-score} = 3,25 + 6,56X1 + 3,26X2 + 6,72X3 + 1,05X4$$

According to Equation 1, 6.56, 3.26, 6.72 and 1.05 involve the values to be multiplied by indexes. X1 is the Net Working Capital (NWC)/Total Asset ratio; X2 is the index of Profit Reserves/Total Asset; X3 is the Pre-Tax Profit(EBIT)/Total Asset ratio; and X4 is Net Equity/Total Repayable. The Z-score interpretation says that $Z > 0$ means solvent company while $Z < 0$ means insolvent company.

Regarding sectors, the B3 classification, that separates industries into ten groups, was adopted. The Financial sector was removed from the sample due to its particularities of operations and effects on accounting data that can affect the indicators and skew the comparisons made between sectors. The category "Others" was created to incorporate sectors with low amount of companies, such as Communications, Oil and Gas, and Information Technology. Therefore, as control variables, in addition to sector, the companies' size and judicial recovery state variables were included. The companies' natural logarithm of total assets of the company was used as size variable, separated into quartiles to analyze this variable's effect.

To compare insolvency levels Z-scores of the companies, median difference tests were applied, supported by packages of the statistical softwares R and BioEstat 5.0. Such tests were based on the Student's t-test for independent samples through Bootstrap, with the purpose of elevating the power of tests made through the process of 3,000 resampling.

Finally, quantile regression was applied to verify the tax refinancing effectiveness on Brazilian publicly-held companies' insolvency when joining the tax regularization program, controlling the effect by sector, size and judicial recovery. The Z-score that measures the insolvency level was used as dependent variable and other variables were used as independent. For the model, a dummy of separation between companies that joined or did not join PERT in 2017 was used.

Quantile regression was chosen due to the fact that insolvency level Z-scores are discrepant, generating normality and heterogeneity problems in the residues. The abnormality may skew the results obtained through the application of the ordinary least squares method. To overcome the OLS limitations, quantile regression is used, whose estimates are made through quantiles based on median, which ensures robustness in the model when there are asymmetric distributed residues (Koenker, 2005).

The estimated model met the assumptions of residues independence regression (Durbin-Watson test), multicollinearity (Variance Inflation Factor – VIF test < 10) and endogeneity (Hausman test), all to level of significance of 5%. From the tests, no abnormalities were identified. Therefore, the tests are not presented since they do not require specific data treatment.

4 RESULTS

The analyses were divided into three parts. First, the insolvency level Z-score of companies that joined and companies that did not join PERT is analyzed. Then, the insolvency Z-score comparisons segregated by sector, size and judicial recovery state are presented, and finally, the proposed model of estimate to meet the specific purposes of this study is shown.

4.1 Insolvency Analysis

Table 1 depicts the distribution of companies that joined PERT 2017, classified as solvent and insolvent based on the Z-scores, distributed by sector and year.

Table 1 – Distribution of the companies that joined PERT

Sector	Solvent Companies					Insolvent Companies				
	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
Industrial Goods	27	27	26	27	27	4	4	5	4	5
Cyclical Consumption	25	25	24	24	24	4	4	5	5	5
Non-cyclical Consumption	15	16	16	16	14	2	1	1	1	2
Basic Materials	21	20	20	20	20	0	1	1	1	1
Health	10	10	10	10	10	0	0	0	0	0
Public Utility	21	20	20	21	19	1	2	2	1	3
Others	9	9	9	9	9	1	1	1	1	1
Total	128	127	125	127	123	12	13	15	13	17

Source: Author's Elaboration (2020).

According to the data in Table 1, in the year of PERT adhesion, based on the Z-scores, 125 companies were classified as solvent and 15 companies were classified as insolvent. According to Horta et al. (2014), it is normal that the amount of insolvent companies is lower than solvent companies, which justified the insolvency only in 11% of the analyzed cases.

Table 2 shows the distribution of the companies that did not join PERT 2017, classified as solvent and insolvent based on Z-scores, distributed by sector and year.

Table 2 – Distribution of the companies that did not join PERT

Sector	Solvent Companies					Insolvent Companies				
	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
Industrial Goods	43	42	42	39	41	2	3	3	6	4
Cyclical Consumption	43	42	41	40	40	2	3	4	5	5
Non-cyclical Consumption	7	7	7	7	7	1	1	1	1	1
Basic Materials	8	9	8	7	8	1	0	1	2	1
Health	7	7	7	7	7	1	1	1	1	1
Public Utility	37	37	37	37	37	0	0	0	0	0
Others	10	10	11	10	12	2	2	1	2	0
Total	155	154	153	147	152	9	10	11	17	12

Source: Author's Elaboration (2020).

It is noticeable in Tables 1 and 2 that the amount of solvent and insolvent companies in Public Utility, Industrial Goods and Cyclical Consumption industries are very close. The lowest number of insolvent companies is in the Public Utility sector (did not join) and Health (joined). The number of insolvent companies that joined PERT, on average, is higher than those that did not join the program. Besides, in companies that did not join PERT, the number of companies with insolvent Z-scores in 2017 grew, which may derive from the acknowledgment or reclassification of tax debts after joining the program.

Tables 3 and 4 depict the results of the analysis of solvency and insolvency Z-scores of the analyzed companies that joined PERT and those that did not.

Table 3 – Z-scores of the companies that joined PERT

	Solvency Z-score					Insolvency Z-score				
	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
Minimum	0,85	0,67	0,47	0,44	0,52	-12,83	-18,69	-27,57	-25,69	-23,58
Maximum	19,55	19,48	51,51	20,43	22,22	-0,14	-0,04	-0,07	-0,52	-0,29
Median	5,27	5,23	5,14	5,34	5,31	-1,73	-2,14	-2,95	-4,42	-4,92
Z average	5,26	5,26	6,02	5,67	5,69	-4,41	-4,79	-6,14	-6,94	-7,64
Z-scores of the companies that did not join PERT										
	Solvency Z-score					Insolvency Z-score				
	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
Minimum	1,21	1,19	0,14	1,52	0,17	-43,98	-20,06	-33,30	-297,65	-44,48
Maximum	30,93	25,10	47,02	27,83	31,29	-0,35	-2,91	-0,20	-0,14	-0,82
Median	5,62	5,50	5,55	5,68	5,24	-3,57	-6,46	-9,56	-5,48	-7,50
Z average	6,25	6,14	6,40	6,64	6,23	-9,82	-8,43	-10,90	-25,08	-10,80

Source: Author's Elaboration (2020).

Based on Table 3, companies that joined PERT maintain the average of solvency level Z-scores, which suggests the program has no relation to the companies' solvency score. However, the Z-scores of the companies classified as insolvent increases from the year they joined the program. Preliminarily, such result suggests the program tends to disfavor insolvent companies.

Such situation could be worsened if we consider that, after renegotiating tax debts, liabilities must be classified according to the settled due date and recognized to fair value based on the established interest rate. That, theoretically, decreases tax debts and the reclassification may affect the companies' short term indicators.

In the companies that did not join PERT, the solvent companies' Z-score average remains the same along the period. Based on the average descriptive analysis, the insolvency levels of the companies that did not join the program are higher than those found in companies that joined PERT.

To verify Z-scores behaviors before and after joining PERT, statistical comparisons were made between solvency and insolvency Z-scores before and after joining the program. The Student's t-test was applied in independent samples. Table 5 depicts a summary of the results.

Table 5 – Student's t-test in pre and post-PERT periods

	p-value	Average Before	Average After
Solvent Companies	0,2513	5,37	5,77
Insolvent Companies	0,2190	-2,35	-5,07

Source: Author's Elaboration (2020)

According to Table 5, despite the solvency and insolvency average Z-score visibly increasing in companies that joined PERT, there were no significant statistical differences to level of trust of 95% before and after the companies joined the program. These results imply the expectation that tax debt

regularization programs do not affect, statistically, the companies' insolvency level, which would reject hypothesis H1 of this research.

Table 6 compares solvency and insolvency data before and after joining tax recovery programs, divided into improvement, maintenance and worsen of Z-score

Table 6 – Comparison of companies pre and post-joining

Solvency	Quantity	%
Companies that improved Z-score	74	60,65
Companies that worsened Z-score	44	36,07
Companies that maintained Z-score	4	3,28
Total	122	100
Insolvency	Quantity	%
Companies that improved Z-score	7	38,88
Companies that worsened Z-score	11	61,12
Companies that maintained Z-score	0	0,00
Total	18	100

Source: Author's Elaboration (2020).

60.65% of solvent companies increased the Z-score after joining PERT, while 36.07% of them worsened it. Such evidences suggest that companies join tax regularization programs for strategic reasons instead of financial needs, which corroborates to the findings of Alm, Mckee and Beck (1990); Paes (2012) and Alm, Bruner and Mckee (2016); and contradict the affirmations of Takar (2019) regarding the programs' feasibility in terms of financial recovery of the companies.

On the other hand, 61.12% of the companies classified as insolvent had their Z-scores worsened, which demonstrates that joining PERT, for these companies, worsen their indicators. Such results corroborate with the perception that there is a public resources transference to companies that apparently would not need refinancing for their solvency.

4.2 Companies Characteristics Analysis

To verify if the forementioned results differ according to the companies' characteristics, the following analyses confront the behavior of companies that joined PERT according to their size and judicial recovery situation.

Table 7 depicts the results separated into the companies that joined and those that did not join the program according to their characteristics.

Table 7 – Comparison of Z-scores based on the size and judicial recovery in quartiles

		Joined PERT				Did not join PERT			
		Solvent		Insolvent		Solvent		Insolvent	
Size	Quartile	nº	%	nº	%	nº	%	nº	%
	1st	22	18%	12	67%	34	23%	7	37%
	2nd	31	25%	5	28%	32	22%	7	37%
	3rd	35	29%	1	6%	39	27%	4	21%
	4th	34	28%	0	0	40	28%	1	5%
	Total	122	100%	18	100%	145	100%	19	100%
Judicial Recovery	Yes	9	2%	9	50%	2	1%	8	42%
	No	113	117%	9	50%	143	99%	11	58%
	Total	122	100%	18	100%	145	100%	19	100%

Source: Author's Elaboration (2020).

In Table 7, it is possible to see that 67% of the insolvent companies that joined PERT are classified in the first quartile of the sample, which suggests a possible correlation between the companies' size and insolvency levels of companies that joined tax debt regularization programs. Therefore, 18 of the companies that joined PERT (12.86%) have been or still are in judicial recovery process, from which 50% are insolvent.

Another characteristic is highlighted in literature that influences in joining tax renegotiation programs and insolvency levels is the companies' activity sector (Lennox, 1989; Horta et al. 2014; Horta et al. 2015).

Table 8 shows a summary of the solvent companies's sectorial Z-scores.

Table 8 – Solvent companies Z-score average by sector

Sector	Joining	Z-score Average							
		2015	2016	2017	2018	2019	Deviation	Average	p-value
UTI	Y	4,77	4,88	4,82	4,77	5,10	1,3460	5,5410	0,0013**
	N	6,18	6,04	5,68	6,52	6,65			
HEAL	Y	6,84	6,53	6,49	7,07	6,40	0,1580	6,7450	0,4907
	N	7,25	6,11	6,69	7,34	6,73			
BM	Y	4,52	4,34	5,46	6,06	5,96	2,5780	6,5570	0,0060**
	N	7,46	7,01	8,07	9,40	7,29			
NCC	Y	5,58	5,45	5,71	5,19	5,41	0,5620	5,7490	0,0120**
	N	6,43	6,13	5,71	6,21	5,67			
CC	Y	6,43	6,32	7,44	6,94	6,77	0,0140	6,7730	0,0557*
	N	6,69	6,74	6,83	6,85	6,72			
IG	Y	4,35	4,56	6,30	4,56	4,65	0,8680	5,3180	0,0630*
	N	5,19	5,34	6,52	6,11	5,60			
OTH	Y	5,32	5,54	5,69	6,05	6,30	0,4340	5,9970	0,3117
	N	7,42	6,60	5,76	6,21	5,08			

*Significance level of 10%. **Significance level of 5%.

UTI = Public Utility; HEAL = Health; BM = Basic Materials; NCC = Non-cyclical Consumption; CC = Cyclical Consumption; IG = Industrial Goods; OTH = Others; Y = Yes; N = No.

Source: Research Data (2020).

In Table 8 it is possible to see that solvency levels are statistically different between companies that did and did not join PERT in the Public Utility, Non-cyclical Consumption and Cyclical Consumption sectors. It is important to stress that PERT makes no distinction regarding the companies' characteristics to allow the program joining. However, joining PERT may affect the companies' solvency level differently depending on the sector.

Therefore, the average solvency level in companies that joined PERT tends to converge to the average shown by companies that did not join the program. The exception is the Non-cyclical Consumption sector, in which the solvency level of companies that joined PERT showed an inverse behavior when compared to those that did not join the program.

Table 9 depicts a summary of the results of the average test made in the analyzed sectors to find insolvency Z-scores.

Table 9 – Average Z-score of insolvent companies by sector

Sector	Joining	Average Z-score							
		2015	2016	2017	2018	2019	Standard deviation	Overall average	p-value
UTI	Y	-1,46	-1,40	-2,69	-4,42	-5,56	1,8399	-3,1060	-
	N	-	-	-	-	-			
HEAL	Y	-	-16,24	-	-	-	133,73	-97,793	-
	N	-43,98	-	-33,30	-297,65	-			

BM	Y	-	-0,61	-0,07	-0,87	-1,96	20,608	-11,181	0,0390**
	N	-3,15	-	-18,94	-19,37	-44,48			
NCC	Y	-0,53	-0,04	-5,10	-10,87	-13,85	2,7560	-7,4560	0,3093
	N	-6,32	-7,44	-9,56	-10,78	-10,07			
CC	Y	-6,93	-7,52	-8,31	-7,95	-8,81	1,9620	-6,9230	0,0193**
	N	-5,76	-7,98	-5,06	-5,61	-5,30			
IG	Y	-4,07	-2,52	-3,54	-7,10	-8,77	4,2098	-7,3049	0,0130**
	N	-9,17	-9,57	-11,34	-7,99	-8,97			
OTH	Y	-6,49	-18,69	-22,28	-5,94	-4,08	-7,7100	8,5185	0,0730*
	N	-2,55	-3,98	-3,80	-1,58	-			

*Significance level of 10%. **Significance level of 5%.

UTI = Public Utility; HEAL = Health; BM = Basic Materials; NCC = Non-cyclical Consumption; CC = Cyclical Consumption; IG = Industrial Goods; OTH = Others; Y = Yes; N = No.

Source: Research Data (2020).

Table 9 shows that insolvency levels are statistically different between companies that joined and those that did not join PERT in Basic Materials, Cyclical Consumption, Industrial Goods and Other sectors.

The year of joining tends to worsen the insolvency level of companies that joined PERT. Despite the Cyclical Consumption and Basic Materials sectors being the most negatively affected by insolvency, as shown by Horta et al. (2014) and Horta et al. (2015), when companies join tax refinancing programs, the Health sector appears to be the most insolvent.

The results may suggest that joining PERT, besides disfavoring insolvent companies, as previously evidenced, highlights influences of sectorial peculiarities, which are indication for non-rejection of hypothesis H2 of this research, that the companies' sector of activity affects the effectiveness of tax refinancing in Brazilian publicly-held companies' solvency.

4.3 Quantile Regression and Results Analysis

To verify if the companies' characteristics, jointly, affect the effectiveness of tax refinancing in Brazilian-publicly-held companies' solvency, tests were performed based on quantile regression. Analyses considered the interaction between variables and the selection criterion of backward variables for the model. To avoid external values interference, quantile regression was based on median. Table 10 shows the estimate model.

Table 10 - Quantile Regression: Median

Variable	Estimate	Standard deviation	t Value	P-value
Intercept	5,39	0,06983	77,18	0,0000**
Cyclical Consumption Sector	-0,02	0,07760	-0,26	0,7966
Non-cyclical Consumption Sector	-0,09	0,08937	-1,01	0,3141
Basic Materials Sector	0,11	0,09784	1,12	0,2611
Others Sector	-0,02	0,81391	-0,02	0,9804
Health Sector	-0,18	0,10889	-1,65	0,0985
Public Utility Sector	-0,05	0,10104	-0,49	0,6208
Size – 2nd Quartile	0,74	0,07239	10,22	0,0000**
Size – 3rd Quartile	1,27	0,08130	15,62	0,0000**
Size – 4th Quartile	1,76	0,07964	22,10	0,0000**
Judicial Recovery (Yes)	-0,15	0,03812	-3,94	0,0001**
Adhesion: Cyclical Consumption Sector	0,15	0,06286	2,38	0,0171*
Adhesion: Non-cyclical Consumption Sector	0,05	0,1430	0,35	0,7267
Adhesion: Basic Materials Sector	0,07	0,07126	0,98	0,3261

Adhesion: Others Sector	0,39	0,54541	0,71	0,4747
Adhesion: Health Sector	0,26	0,07615	3,41	0,0066**
Adhesion: Public Utility Sector	0,20	0,07319	2,73	0,0064**
Cyclical Consumption Sector: Size 3rd Quartile	0,03	0,08295	0,36	0,7177
Non-cyclical Consumption Sector: Size 2nd Quartile	0,09	0,12750	0,71	0,4804
Basic Materials Sector: Size 2nd Quartile	-0,25	0,13543	-1,85	0,0651
Others Sector: Size 2nd Quartile	-0,21	1,07472	-0,20	0,8451
Health Sector: Size 2nd Quartile	0,13	0,15652	0,83	0,4064
Public Utility Sector: Size 2nd Quartile	-0,03	0,15699	-0,19	0,8485
Cyclical Consumption Sector: Size – 3rd Quartile	-0,05	0,09320	-0,54	0,5917
Non-cyclical Consumption Sector: Size – 3rd Quartile	0,18	0,17055	1,06	0,2914
Basic Materials Sector: Size – 3rd Quartile	-0,25	0,10668	-2,34	0,0192*
Others Sector: Size – 3rd Quartile	-0,11	0,81673	-0,13	0,8929
Health Sector: Size – 3rd Quartile	0,06	0,11792	0,51	0,6110
Public Utility Sector: Size – 3rd Quartile	-0,04	0,11422	-0,35	0,7262
Cyclical Consumption Sector: Size – 4th Quartile	-0,03	0,11224	-0,27	0,7893
Non-cyclical Consumption Sector: Size – 4th Quartile	0,20	0,16364	1,22	0,2218
Basic Materials Sector: Size – 4th Quartile	0,21	0,13285	1,58	0,1142
Others Sector: Size – 4th Quartile	0,09	1,10730	0,08	0,9352
Health Sector: Size – 4th Quartile	1,98	0,19474	10,17	0,0000**
Public Utility Sector: Size – 4th Quartile	-0,08	0,11933	-0,67	0,5027

Source: Author's Elaboration (2020). *Significant to level of 5% **Significant to level of 1%.

Results shown in Table 10 suggest that the fact that companies belong to Cyclical Consumption, Health and Public Utility and joined PERT positively affects their insolvency level. In the period from 2015 to 2017, it is important to stress that Brazil went through political instability and economic crisis increase, which may also have affected the results presented.

Considering such limitations, the results found in quantile regression confirm the non-rejection of hypothesis H2-, confirming that the sector of activity affects the effectiveness of tax refinancing in solvency of Brazilian publicly-held companies.

According to Lennox (1989), size is a factor that positively affects the solvency and insolvency indicators, mainly in medium and large size companies. Quantile regression results show this variable has no significant effect on the Z-score of companies classified in the sample first quartile, not even in those that joined PERT. Hence, there are evidences to support the rejection of hypothesis H3, that the companies' size affects the effectiveness of tax refinancing in Brazilian publicly-held companies.

Companies in judicial recovery present negative effects to effectiveness of tax refinancing in companies' solvency. Thus, according to expected, the fact that the company has financial problems results in lower solvency levels and corroborates with Pereira and Luz's findings (2018) regarding the compromise of financial situation in companies that join tax refinancing programs. However, there is no significant association between judicial recovery and joining PERT 2017 according to the insolvency quantile, which reveals the program would not play the role of financial help in companies with greater financial difficulties. Therefore, there are evidences to reject hypothesis H4, that judicial recovery affects effectiveness of tax refinancing in companies' solvency.

In short, the results found point that there are positive influences of tax debt regularization programs on the Z-score of companies classified as solvent, but they depend mostly on the sector. Thus, solvent organizations of Cyclical Consumption, Health and Public Utility sectors improved their insolvency Z-scores by joining tax regularization programs. On the other hand, joining the programs affected the

insolvency level of the Basic Materials, Cyclical Consumption and Industrial Goods sectors when companies are insolvent. Subsequently, based on the regression results, it is possible to state that the sector is a decisive factor for the effectiveness of tax refinancing in companies' solvency.

Alm (2018) stresses the importance of understanding the taxpayers' segments and their behavior for tax compliance. That is due to the sector being a decisive factor for corporate insolvency, according to Lennox (1989). In addition, the sectors influence the refinancing joining, which can be explained by the Capture Theory. Thus, evidences suggest certain sectors push public administrators into establishing tax refinancing programs, as well as specific refinancing to such sectors.

Regarding size, the findings evidence that most corporations (4th sample quartile) with better economic conditions are the most benefited by the program. However, it is not possible to consider the influence of judicial recovery and size of the companies in the effectiveness of tax regularization programs. The lack of statistical significance may be influenced by the amount of companies in the sample with insolvency Z-score.

Generally, the programs do not represent financial aid to insolvent companies. Subsequently, the results found refuse the hypothesis of effectiveness of tax refinancing to improve Brazilian publicly-held companies' insolvency, which in turn rejects hypothesis H1.

Such result indicates that companies do not join tax debts renegotiation programs due to financial needs. Considering that taxes are a part of the companies' cash flow, renegotiation becomes a strategy to maintain financial capability with resources from lower lending demands.

The lack of effectiveness of tax refinancing in companies' solvency strengthens the assumptions of the Capture Theory, in which public administrators are pushed by interested groups into creating tax regularization programs, pressure in turn evidenced in Marchese and Cassone's (2000) and Zala's (2018) studies.

5 FINAL CONSIDERATIONS

This research sought to verify the effectiveness of tax refinancing in Brazilian publicly-held companies. Through comparison of Z-scores that measure the level of insolvency of a sample of companies that joined PERT, as well as the analysis of the companies' characteristics, it is possible to suggest that PERT 2017 significantly improved the solvent companies' Z-score, depending on the sector.

On the other hand, evidences suggest that, in contrast to what is used to justify tax refinancing programs, they have no effectiveness in "saving" companies, as it is claimed in law approval justifications and Public Interest Theory. The findings reveal that tax regularization programs fail since the State does not protect social welfare, once the companies in financial difficulties are not benefited from the collective effort to maintain jobs, income and services. Thus, the evidences shown in this research suggest that other interests that not the public or social welfare prevail in tax regularization programs creation.

The pressure by interest groups, as asserted by the Capture Theory, may be a reason for lack of credits to join a refinancing benefit. Considering refinancing programs retain public resources in company's cash flow, that are supposedly destined to public interests, tax refinancing should be based on necessity and priority criteria. However, there are no evidences of such debate in the refinancing established by PERT 2017, which demonstrates evidences of public administrators capture by interest groups that seek to boost their profits.

Economically speaking, the evidences suggest the programs are being strategically used by companies for other ends, such as reducing their tax expenses or improving access to credit, without undergoing the demands imposed by the credit market, once PERT does not impose any financial criteria for joining.

Based on the above considerations, debt renegotiation programs become an inexpensive financing source and low enforcement for payment by companies, affecting the State revenues. However, the conditions established in tax regularization programs make them a resource transference to interest groups, according to the Capture Theory. The lack of effectiveness of the refinancing programs to improve companies' solvency verified in this study suggest that the programs become financing methods for private groups.

In addition to the programs ineffectiveness, the interest groups also put pressure so that the information is not taken into public knowledge. Along the research, there are evidences for the lack of transparency by both the companies and the taxing entity regarding tax information. For this research, there was a need to resort to the information access law, whose data were provided in an unfriendly way to be treated. Besides, it was not possible to compare private companies due to lack of access to accounting data.

In this respect, we must stress the disparity of transparency credits between the emergency aid concession during the COVID-19 pandemic and tax refinancing. While in the former the benefited people have free access to publicly available data, in the latter it is necessary to appeal to the law to have access to public interest data and should be available for analysis and access, the same way the emergency aid data were. The argument for tax secrecy by the companies must not overlay the accountability of public resources duty.

With that in mind, the study suggests that new refinancing programs have joining criteria that allow society to check their effectiveness in reaching goals. Among these criteria, compulsory transparency and availability of data to public access must be included; that would allow studies to analyze the tax debt renegotiation programs with higher volume of data and information. Furthermore, tax refinancing programs must insert clear and objective conditions based on accounting and financial data that allow to ensure and verify the results expected from the tax debt renegotiation program, and actually fulfill the public interest.

This research limits to analyzing insolvency Z-scores considering the Altman model. Further research may expand analyses using other insolvency prediction models and expand the sample to private companies. In addition, other criteria, such as income and jobs generation and social investment may be considered to analyze the effectiveness of tax refinancing. On the other hand, further research may analyze which interest groups exercise their power to push public administrators into establish regularization programs, according to assured by the Capture Theory.

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