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Budget Revenue Forecasts, Errors and Impact on the Indebtedness of the Municipalities of Maranhão

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ABSTRACT

This study aimed to identify the factors that lead to the indebtedness of the municipalities of Maranhão. The study covers the years 2014-2016. Economic methods with panel data and socioeconomic variables were used: municipal GDP per capita, FIRJAN tax management index (IFGF), and level of education of the public manager. In the results, it was possible to observe that the budget revenue forecast error positively affects the 1% level of debt significance in the year, which means implications for one unit of Real (BRL) of budget revenue, incorrectly predicted in the LOAs of the municipalities Maranhão, leads to an increase between BRL 0.49 and BRL 0.62, in the debt of the relevant financial year. As variables such as GDP per capita, the IFGF and the dummies and the level of education were not statistically significant to explain the increase in debt, allowing to deduce the forecast error (planning) of budget revenue by itself, it is an important determinant that contributes, with high statistical significance, which impacts on the increase of the indebtedness of the municipalities of Maranhão.

Keywords: *Public Sector Accounting, Public Budget, Budgetary Revenue of the Municipalities of Maranhão*

Introduction

Public managers live with the need to maintain the balance between public revenues and expenses and to control indebtedness. On this occasion, they must develop actions whose results can meet the growing needs of the population without causing public debt. The sustainability of a nation's internal funded debt is an important factor for long-term economic growth, as it depends on the growth of that debt, the country may enter a vicious circle in which a large part of the public budget will have to be used to pay interest on the public debt (Clements, Bhattacharya, & Nguyen, 2003; Nguyen, Suardi, & Chua, 2017). Furthermore, according to Engen and Hubbard (2004), public deficits can lead to an increase in domestic interest rates, which would intensify the effect of debt on economic growth.

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In this perspective, the analysis of the budget revenue forecast error represents an important tool for the application of public resources. Generally the control of fiscal policy and monitoring of budget forecasts, when prepared by the control bodies that assess public spending, obeys the constitutional principles, setting within the established goals, with the inclusion of actions that can bring the essential services established by the Federal Constitution to the population, also, encourages economic growth, so that its collection and spending can be balanced, thus avoiding an increase in long-term debt (Alesina & Perotti, 1996).

When political parties intervene in budgeting, they tend to report a more optimistic revenue outlook than their competitors. When this happens, it may bring a downturn to the economy, as it makes it impossible for the manager to take the necessary decisions to avoid increasing public spending (Drazen, 2000). Koening, Dolmas, and Piger (2003) affirm that the Budget Balance is a necessary piece for the managers to verify the expected and realized revenues and is considered a determining factor for identifying the impacts resulting from the budget forecast error, as well as a guiding source for decision-making by public managers, within the scope of economic policy, provided that the information has been provided in real-time.

The effect of fiscal performance on socioeconomic indicators can also be seen at the municipal level (Fialho & Fialho, 2016). According to the authors, part of the variance in the growth indicators of Brazilian municipalities is explained by fiscal management. Therefore, it is necessary to use instruments that favor the improvement of the fiscal management of the municipalities. In the 2000s, with the advent of the Fiscal Responsibility Law (Complementary Law nº 101/2000), greater control over public accounts began being demanded. Since then, several studies have been developed in the scope of Public Accounting, such as Macedo and Corbari (2009) and Gerick, Clemente, and Ribeiro (2014), who studied the debt pattern Brazilian municipalities.

Since adopting the Fiscal Responsibility Law in 2000, Brazil has had clear legislative instruments that establish limits for public spending. One of these tools links public spending for a given year to expected revenue for that year. According to the Fiscal Goals annex to the Fiscal Responsibility Law, there is the projection of nominal and primary results and the amount of public debt for the year to which it refers. For the subsequent two, anticipated revenues for a given year can be anticipated (Luque & Silva, 2004). Thus, as the public deficit for a given period is calculated from the difference between the budget revenue collected and the expenditure, an error in the forecast of revenues can compromise the budget balance and, with that, cause an increase in spending beyond the actual revenues collected and, as a consequence, increases the debt stock throughout the deficit years.

According to Fioravante, Pinheiro, and Vieira (2006), although the FRL has set clear limits concerning the execution of the public budget, at the time, these limits did not take into account the real financial situation of most Brazilian municipalities. That is, imposing limits based only on Current Net Revenue (CNR), having implied, at the beginning of the law mentioned above, an increase in personnel expenses and the debt limit of most municipalities.

A natural question that arises concerning what was previously described is whether art. The 9th of the LRF, which deals with the limitation of commitment, is having a real effect on the dynamics of the debt and, therefore, if the forecast errors are significantly affecting

the current year's debt of a given municipality. In this scenario, the present research has the problem of answering the following question: Do the errors in budgetary revenue planning methodologies, as provided for in the Budget Laws of the Municipalities of Maranhão, impact the indebtedness of the municipalities? To answer it, the objective of the research was to identify the factors that explain the indebtedness of the municipalities in Maranhão. In addition, to the econometric model, other variables were added, such as GDP, FIRJAN index, manager's education, as control variables. The results show that the budget revenue forecast error positively affects, at the level of 1% of significance, the debt for the year of operation. The econometric calculations showed that the increase of one unit of Real (Brazilian currency) error of budget revenue forecast, increase between BRL 0.49 and BRL 0.62 unit of Real, the debt stock in the respective financial year.

The study covers observations of budget revenues (planned and executed) in the municipalities of Maranhão in the years 2014 to 2016. For this purpose, econometric methods were used with panel data and socioeconomic variables, such as Municipal GDP per capita, FIRJAN tax management index (IFGF), and data on the level of education of the public manager.

This article was structured as follows: in addition to this introduction, topic 2 presents the literature review; topic 3 discusses the data and the methodology used; the results are presented in topic 4. Finally, the final considerations are given in topic 6.

Literature review

This section presents a review of the literature associated with public budget management and control and its effects on debt dynamics. In this sense, the question of how public debt is formed is addressed in section 2.1. Also, section 2.2 presents the effects of the FRL on the debt dynamics of the municipalities that were addressed by the literature.

Public indebtedness and its determinants

The public indebtedness of the States and the Municipality has been providing a significant increase in the reporting of the country's economy, supporting studies for researchers in the area of Public Finance due to the political and fiscal insecurity that the country has been facing, reflecting public accounts. For public agencies, the probability of indebtedness makes the budget more flexible, allowing managers to use a mechanism to increase their revenues by anticipating revenues and maintaining expenses (Santana, 2017, p. 1).

The issue of public indebtedness is important when analyzing the economic development of a federative entity. Panizza and Presbitero (2013) survey the literature on the relationship between total public debt and growth in developed countries and conclude that, even though most works show the relationship between public debt and economic growth, no work has managed to convincingly establish the causal direction of this relationship: Does less economic growth generate greater debt or does greater debt generate less economic growth? However, it is established in the literature that, regardless of whether the initial factor generates the binomial "debt and low growth," a country with a high public debt will be limited by public policies, which will hinder long-term growth (Clements et al., 2003).

Furthermore, when dealing with the correlation between debt and contemporary economic growth, it became impossible to clarify the temporal dynamics in the relationship between debt and growth. Finally, the criticism by Irons and Bivens (2010) proves through

studies that there is no theoretical evidence for a contemporary negative relationship between debt and growth. However, after correcting errors, their main result, the existence of limits, is no longer observed as this is an exercise in descriptive statistics. Little or no light is shed on the question of causality in this relationship.

The way of calculating the indebtedness showed an increase in the indebtedness of the previous year, that is to say, the increase in the indebtedness of a financial year that can cause indebtedness of the subsequent year. The increase in the indebtedness of a financial year can cause the level of indebtedness of the subsequent year. By determining the debt, a positive link with the municipal debt is expected, since most indebted municipalities would be the most willing to new indebtedness to fund the maintenance of their activities (Santana, 2017, p.16).

It is understood that the tax forecast error, in the first place, is subject to a persistence of the effect called backward-looking, as well as the effect of bias in economic growth forecasts. In terms of literature, electoral cycles are sources of optimistic forecasts, and behold forecasts are overestimated. Second, making budgetary forecasts with cyclically adjusted data can lessen the effect of business cycles on fiscal forecasting errors, notably when the presence of the backward-looking effect is identified. Third, it is vitally important to strengthen legal frameworks and institutions to avoid bias caused by electoral cycles.

The FRL impacts on municipal debt

At first, the Fiscal Responsibility Law (FRL) was instituted to avoid these deviations concerning realized budget revenue. According to Kalife (2004, p.269): With regard to budgetary risks, the Law of Fiscal Responsibility, in its article 9° provides that, if at the end of a two-month period, the realization of the revenue does not include the fulfillment of the results targets established in the Attachment of Tax Targets, the Powers and the Public Ministry will promote, by their own act and in the necessary amounts, in the subsequent thirty days, limitation of commitment and financial movement. This mechanism allows deviations from forecasts to be corrected throughout the year not to affect the achievement of the result targets (Kalife, 2004, p. 269).

FRL was a milestone in the country's political-economic scenario that brought more transparency and greater rationality in managing the public budget. In this sense, public policies started to be exercised with greater responsibility, implying greater efficiency in allocating public expenditures. In the words of Kalife (2004, p. 269): The momentum given in the implementation of the current Brazilian budget and the fiscal regime is a hallmark of the economic policy of recent years, constituting important support for the current scenario of economic growth. Followed by price stability, this growth became self-sustainable. In addition to the improvement in budgetary and fiscal results, meaning a greater commitment to results for society, there were several institutional changes, with the objective not only of allowing public sector solvency in the long term by stabilizing public indebtedness, but also to increase fiscal transparency, given the importance given to budget planning (Kalife, 2004, p. 269).

For Almeida and Ferreira (2005), FRL emerged as a response to the fiscal and financial imbalance of state and municipal governments, caused in the authors' view, by a bad application of public resources. Thus, by creating control tools, the law aimed to prevent the increase of the public deficit to make the dynamics of municipal debt sustainable. The exercise of control is essential to the management of any entity as it aggregates actions that

aim to guarantee, as a priority, the fulfillment of the objectives for which the law was created, assuming, over time, a more active character, due to the improvement of the social organization, the strengthening of its institutions, which naturally start to demand a more effective performance from the controlling bodies.

The application of accounting tools on public administration, in addition to the notable gains in terms of efficiency in public management, is evolving rapidly (Coelho, Costa, & Sousa, 2016). This is being documented in several articles that study the effects of FRL on municipal public budget management. Fioravante et al. (2006) studied the impact of FRL on municipal public finances. Although the authors show the importance of FRL, they emphasize that FRL established limits inconsistent with the reality of most municipalities, providing scope for increasing municipal indebtedness. According to the authors' results, personnel expenditure as a proportion of net current revenue increased in most municipalities, causing an increase in the debt of these municipalities.

Coelho et al. (2016) made a bibliographic review of the need to implement internal control in municipal accounting. The authors document that public administration uses outdated internal control mechanisms when compared to mechanisms used by private institutions. The authors still show that the LRF, despite its importance, is still not being fully implemented.

Better execution of FRL and improvement in budget forecasts can have significant effects on public accounts. Deus and Mendonça (2017) pointed out that forecasting errors are important factors to understand the dynamics of public debt, stressing that the forecast error can be considered a measure of the transparency of public accounts. According to the authors' results, forecasts do not come close to reality, indicating a low quality of public transparency. The authors also reinforce a certain trend with respect to forecast errors due to backward-looking factors and errors in forecasting business cycles. In addition, in an election year, there is a significant increase in forecasting errors. Alt and Lassen (2006) explained that fiscal policy management depends on a combination of factors closely linked to the quality of budgetary budget forecasting. According to the authors, in general, there is a tendency to overestimate economic growth, which, in turn, leads to an increase in public debt.

Giambiagi and Além (2000), according to Rezende (2001), explained that the 1988 Constitution increased transfers to states and municipalities without establishing spending criteria at government levels. Government programs were implemented without a rigorous assessment of costs and benefits, leading to inefficiency of public resources. For Giambiagi and Além (2000, p. 318), this happened as a result of decentralization, as the Federal Government did not administer it, but attributed to the states and, essentially, by the municipalities, through its representatives of the Federal Legislative Power, and consequence of a process marked by the lack of coordination, distortions, and conflicts. Thus, they attributed the lack of organized and managerial national planning for the Federal Government to transfer to the states and municipalities the resources, resulting in a process marked by incoordination, distortions, and conflicts.

For Giambiagi and Além (2001, p. 177), the scenario that preceded the FRL – Fiscal Responsibility Law – established as rules of insufficient budget control restrictions. Given the high expenses above real revenue, it can be paid by third parties; in relation to Brazilian

municipalities, it would normally happen by state banks with the support of federal and state governments.

For Menezes (2006), the largest portion of the primary and proven deficit after the implementation of the Real fell to the municipalities and, in particular, to the states, which accounted for an increase in expenses with personnel expenses due to the readjustments provided for pensions before the period due by law. Giambiagi confirms this confirmation, and Além (2001, p. 164), proves that the "allowance of wage adjustments above the allowed" and "the high increases of the inactive in the formation of the payroll of the states" and aggravating the fiscal management of the GSM, proves that the "allowance of wage adjustments above the allowed" and "the high increases of the inactive in the formation of the payroll of the states" and aggravating the fiscal management of the GSM.

The Fiscal Responsibility Act (FRA) decided to create transparency procedures (Menezes, 2005), introducing accounting uniformity and creating managerial accounting statements to provide economic administrators and the reliable information society to choose the correct path to be traced. The form of responsible fiscal management used by Brazil, through the FRL (BRAZIL, 2000), the form presented by the models adopted by the countries specified above, aiming at more transparency in government actions, is proposed, also that are well designed and monitored.

From this point of view, maintaining control is directed at obedience and compliance with legality and the bureaucratic routine and focused on achieving the objectives of a new approach. According to Kickler and Stillmann (1999 *apud* Matias-Pereira, 2007), public administration is not simply a method of achieving efficiency and effectiveness; moreover, we can be guided by the principles of legality and legitimacy and, with the intuition of bringing restrictive values to the private business. Being able to be qualified only by the norms of the private scope being compromised its knowledge of transforming, making accessible to all social classes.

Souza (2006), in his research on its institutional location and fiscal results, writing about the tax restriction standards advocated by the great countries of Europe and America and ensuring that the essence and conditions of the rules that change from country to country. In most cases, the purpose has been to narrow the subjectivity of those responsible for making fiscal decisions, considering that, in general, the rules are imposed as a result of accentuated fiscal crises or are defined as the purpose of reducing the instability of new crises.

Mendonça (2017), in his study, pointed out that the fiscal forecast error can also be used as an important source of public debt balance and as a measure of fiscal transparency, this is because the low quality of the budget forecast error generates possible deficits, in reverse, the high quality of the forecast error generates a surplus. Thus, it is necessary to seek a balance point for the sustainability of public debt. Also, it appears that the budget forecasting error is subject to cyclical fluctuations and an apparent effect, since it may not show the real situation of the public budget. In the electoral period, the budget forecast error is an overestimated source of revenue, given the high quality of the budget forecast.

Rezende (2001, p. 53) stated that "[...]the mismatch between the competence to exercise the function and the available financial resources has been seen as a factor that prevents the expansion of municipal competence [...]".For the author, the public power

must provide the basic services necessary for life in society. Thus, the lack of financial resources to meet the basic demands of society can bring great popular dissatisfaction.

Given the Brazilian political scenario, the situation tends to worsen, reflecting mainly on the budgetary units responsible for developing the fiscal adjustment, given that stipulating limits has not been effective in controlling debt and public spending. Budget units have rules and guidelines which budgets are prepared, approved, and executed (Alesina & Perotti, 1996); thus, the person responsible for making the necessary restrictions in the budget, who will be able to define whether it was effective or ineffective, and the public manager must have the responsibility to ensure that the resources are invested to benefit the population as a whole.

The study presented by Pimenta and Pessoa (2015, p. 2) pointed to the need for a discussion on the conduct of public spending and, at the same time, the need to create elements that can increase greater management of fiscal policies, increasing efficiency in institutions, providing greater responsibility, transparency in public policies. Having as a structural base the public budget, which consists of adapting to opportunistic political motivations on budget forecasts, providing greater public visibility for budget forecasting. A country like Brazil, the data of the fiscal forecasts is subject to political party pressure. Other Latin American countries are increasing their efficiency in public policies, increasing the credibility of information, and integrating it into more efficient management.

Methodology

This section describes the database used and the econometric tool used to obtain the results.

Data

The Maranhão State Court of Auditors website (TCE-MA) was the main source of data for this research. On this basis, we find all the data related to the rendering of accounts of each Municipality in Maranhão. In total, there were 217 municipalities, among them, São Luís, Imperatriz, São José de Ribamar, Caxias, and Codó, with the largest economic activity in the state.

The selected data from the TCE-MA cover the period 2014 and 2016. This was due to the execution of the Multi-Year Plan (MYP), which started in 2014 and ended in 2016. Because in the following period, there was the implementation of Accounting Standards Applied in the Public Sector (NBCASP), which provided new guidelines for the execution of public accounts.

In addition to the information regarding the public accounts of the municipalities in Maranhão, this work also used socioeconomic variables to support the econometric analysis. GDP per capita, FIRJAN tax management index (IFGF), and information regarding the education level of the public manager. The GDP per capita and the level of education of the public manager were extracted on the Brazilian Institute of Geography and Statistics (IBGE). At the same time, the IFGF was obtained through the Federation of Industries of the State of Rio de Janeiro (FIRJAN). Finally, it is worth mentioning that all the data used were deflated using the general price index (IGP-DI) built by the Getúlio Vargas Foundation.

Description of the variables

The main variables of the work are the forecast of budget revenue, the budget revenue realized (collected), and the debt for a given financial year. The forecast error is defined as

the difference between the amount provided for in the Budget Law and the realized value of budget revenue. Thus, the three previous variables are summed up in error in forecasting budget revenue and debt for the year of exercise.

Per capita GDP is a relevant variable when studying the quality of institutions in a municipality. Indeed, Pereira, Nakabashi, and Sachsida (2011) analyze the impact of institutions on the difference in GDP per capita observed between Brazilian municipalities and conclude, using econometric methods, that the quality of institutions measured by the Municipal Institutional Quality Indicator explains part of the difference in GDP per capita of Brazilian municipalities. In this sense, GDP per capita can be used as a proxy for the quality of institutions and can help explain the municipalities' founded debt. The FIRJAN tax management index, in turn, is important to understand the debt dynamics of a municipality because it measures, among other factors, the quality of the application of public expenditure and budget management. This fact is presented by Lanis and Bueno (2018). The authors study the factors that influence annual budget management and conclude that the municipalities with the best IFGF tend to have higher quality in relation to the management of municipal revenue and expenditure.

The IFGF index is defined on the FIRJAN website as follows:

To contribute to an efficient and democratic public management, the FIRJAN System developed the FIRJAN Tax Management Index (IFGF). A social control tool that aims to stimulate the culture of administrative responsibility, enabling greater improvement in the fiscal management of municipalities and improving the decisions of public managers regarding the allocation of resources. (FIRJAN, 2018).

In addition to these variables, the training of professionals involved in public management is also relevant to explain the efficiency of public resource management; Varela et al. (2010) documented that the education of individuals in the cities of São Paulo is positively correlated with technical efficiency in the application of public resources directed to health. In this sense, the level of education of the public manager can also positively affect the quality of fiscal management in a municipality.

All variables are theoretically continuous, except for the variable that indicates the level of education of the public manager. The set of possibilities for this variable is given by: "Read and write", "Incomplete Elementary School", "Complete Elementary School", "Incomplete High School", "Complete High School", "Incomplete Higher Education" and "Complete Higher Education". Thus, to transform this variable into something quantitative, "dummies" are defined for each of these possibilities.

In addition, it is not necessary to define a "dummy" for all categories. If there is a certain natural number "N" of categories, we need to create a dummy for "N-1" categories. The other will be automatically defined due to the linear dependence between these categories. Thus, in the present work, a "dummy" is defined for each category of the educational level of the public manager, except for the "Read and write" category. Table 1 presents the variables used in work and the respective sources.

Table 1. Description of variables

Variables	*Description*	*Source*
DEXERC	Fiscal year debt	TCE – MA
EPREV	Budget revenue forecast error	TCE – MA
Y	GDP per capita	IBGE
IFGF	FIRJAN tax management index	FIRJAN
D_ESC	Complete Higher Education	IBGE
D_ESI	Incomplete Higher Education	IBGE
D_EMC	Complete high school	IBGE
D_EMI	Incomplete high school	IBGE
D_EFC	Complete primary education	IBGE
D_EFI	Incomplete Elementary School	IBGE

Source: Adapted from TCE-MA (2014-2016).

Table 2 presents the descriptive statistics of the variables used in this study between 2014 and 2016.

Table 2. Descriptive statistics

	DEXERC	*EPREV*	*Y*	*IFGF*	*D_S*	*D_SI*	*D_M*	*D_MI*	*D_F*	*D_FI*
Mean	8145538.00	14149756.00	7178.83	0.42	0.49	0.07	0.22	0.01	0.05	0.03
Median	2396947.00	7860426.00	5482.31	0.43	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	652000000.00	627000000.00	96920.08	0.81	1.00	1.00	1.00	1.00	1.00	1.00
Minimum	-4289266.00	-45983678.00	2926.92	0.09	0.00	0.00	0.00	0.00	0.00	0.00
Standard Deviation	37942751.00	38726130.00	6942.31	0.11	0.50	0.25	0.41	0.10	0.21	0.18
Sum	5290000000.00	9180000000.00	4666241.00	217.35	318.00	45.00	140.00	6.00	30.00	21.00
Observations	650	649	650	523	650	650	650	650	650	650

Source: Adapted from TCE-MA (2014-2016).

Table 2 shows that, with respect to quantitative variables, only the IFGF variable has an average close to the median. For the other three variables, DEXERC, EPREV, and Y, data distribution is asymmetric on the right. The lowest value of the variable DEXERC is due to the Municipality PaulinoAlves for the year 2016. The value of the variable EPREV refers to the Municipality Coelho Neto for the year 2016. The highest value of the DEXERC and EPREV variables belongs to the Municipality of São Luís and observed for the years 2015 and 2014, respectively. With respect to GDP per capita, the highest and lowest values were from the municipalities of Tasso Fragoso in 2014 and Nina Rodrigues in 2016. The index varies between 0 and 1, and the closer to 1, the better the fiscal management of the Municipality. As can be seen in Table 2, the mean and median of the distribution of the index of the next section, indicating a symmetry of the distribution of the index. In addition, Santo Antônio dos Lopes in 2014 was the Municipality with the best tax management, while São Vicente Ferrer in 2015 was the Municipality with the worst tax management.

Qualitative variables are also shown in Table 2. As can be seen, the maximum and minimum values of the variables are 1 and 0, respectively. Something interesting to note is concerning the number of municipalities with managers who have completed higher education. The sum of the variables indicates how many times that particular category appeared in the sample. Thus, the variable “Complete Higher Education” is the largest

when looking at an average of 0.49%, shown in Table 2. Soon most municipalities in Maranhão have public managers with complete higher education. Concerning the "Read and write" category that is not explicitly described in Table 1, there are four municipalities with public managers belonging to this category. They are: Centro Novo do Maranhão, Igarapé do Meio, Igarapé Grande, and São Pedro da ÁguaBranca.
Table 3 presents the matrix and correlation between the quantitative variables.

Table 3. Correlation matrix

	DEXERC	*EPREV*	*IFGF*	*Y*
DEXERC	1.00			
EPREV	0.88	1.00		
IFGF	0.02	0.01	1.00	
Y	0.16	0.18	0.08	1.00

Source: Adapted from TCE-MA (2014-2016).

According to Table 3, there is a high positive correlation between the debt for the year and the forecast error. Besides, there is also a correlation between GDP per capita and forecast error, which justifies the introduction of GDP per capita as a control variable. The high correlation between the exercise debt and the forecast error may suggest a common component between the two series and that this component could explain much of the variation in each of these series. To have a conclusion with greater statistical rigor, it is necessary to use econometric techniques that are designed to work with panel data.

Econometric model

This section is based on Wooldridge (2010). When analyzing a database, there may be variations at the level of the individual "i" (also called cross-section) – in this case, the individual is widely thought of, for example, people, municipalities, countries, etc. -, over time "t", or we can have both of the previous cases. When the database varies both in the temporal dimension and in the cross-section, there is what is known as a panel. Thus, the panel data is very informative because, for each individual "i" we have a series of data over time.

Thus, one can have variations to the type of effect (whether fixed or random) and whether the effect is at the individual level or is a time effect. Thus, all possible cases will be analyzed in this dissertation. As the research intends to analyze the effect of the error of forecast of the budget revenue on the debt of the year of exercise for the municipalities of Maranhão, four different econometric equations that combine the different control variables of the article will be studied. They are:

$$DEXERC_{i,t} = \beta_0 + \beta_1 EPREV_{i,t} + u_{i,t}. \quad (3)$$

$$DEXERC_{i,t} = \beta_0 + \beta_1 EPREV_{i,t} + \beta_2 Y_{i,t} + u_{i,t.} \quad (4)$$

$$DEXERC_{i,t} = \beta_0 + \beta_1 EPREV_{i,t} + \beta_2 Y_{i,t} + \beta_3 IFGF_{i,t} + u_{i,t}. \quad (5)$$

$$DEXERC_{i,t} = \beta_0 + \beta_1 EPREV_{i,t} + \beta_2 Y_{i,t} + \beta_3 IFGF_{i,t} + \sum_j \beta_j D_{i,t}^{j} + u_{i,t}, in\ which\ j \in \{D_S, D_{SI}, D_{M,} D_{MI}, D_F, D_{FI}\}. \quad (6)$$

In these equations, the "i" index refers to the Municipality, and the "t" index per year ($t \in \{2014, 2015, 2016\}$); DEXERC refers to the year-end debt deflated by the index IGP-DI; EPREV is constructed by subtracting the expected revenue from the revenue realized deflated by index IGP-DI; Y indicates the Municipality's GDP per capita deflated by the IGP-DI index; IFGF is the FIRJAN tax management index; The variable. "D^j" is a dummy

for the level of education of the public manager, which is equal to 1 if the public manager has a higher education (D_S), incomplete higher education (D_{SI}), high school (D_M), incomplete high school (D_{MI}), elementary school (D_F) or incomplete elementary school (D_{FI}). It is worth mentioning that there is an additional category to the level of education of the public manager called "Read and write", but to avoid multicollinearity, this category is not explicitly included in the regression (4). Therefore, the methodology adopted will be estimated by Ordinary Least Squares equations 1 to 4, considering the fixed and random effects of both time and city.

Results

As previously discussed, econometric analysis with panel data allows controlling unobservable effects that vary in the "cross-section" and/or "time"". In this sense, the equations (1) to (4) will also be analyzed according to the variations (a) without fixed effect, (b) fixed municipality effect, (c) random effect of the Municipality, and (d) Fixed municipality effect and fixed effect of year. It is necessary to introduce these variations, as several factors are common among municipalities that are not explicitly included in previous regressions.

Table 4 presents the results of the regression by Ordinary Least Squares without controlling by the fixed effect. According to the results, the error in forecasting the city's budget revenue positively affects, at the 1% level of significance, the year-end debt. The values found also indicate that the increase of one unit of the budget forecast error increases the debt for the year between BRL 0.84 and BRL 0.92 units of Real. Given the results found to resolve any doubts, the GDP per capita variables were included, IFGF and dummies, educational level of municipal managers. After including the variables, we can infer that there was no change in the data.

Table 4. Estimates by OLS without the fixed effect of Municipality and time

	(1)	*(2)*	*(3)*	*(4)*
C	-375520***	-3472627***	-6084897*	-3977406
	[813958.8]	[1106266]	3379789	3961499
EPREV	0.84***	0.84***	0.91***	0.92***
	[0.02]	[0.02]	[0.022]	[0.022]
Y	--	-42.62	-17.3	-21.8352
		[112.9]	[117.3]	[118.2]
IFGF	--	--	5149192	5912464
			[7746199]	[7805734]
D_ESC	--	--	--	-4869391
				[3987737]
D_ESI	--	--	--	-1969933
				[2650119]
D_EMI	--	--	--	-901520
				[10146444]
D_EMC	--	--	--	-3841638
D_EFI	--	--	--	2282359
				[5204029]
D_EFC	--	--	--	-7346070
				[4518932]

*** indicates statistically non-zero estimates at the 1% significance level. Standard error in square brackets.
Source: Adapted from TCE-MA (2014-2016).

Table 5 presents the results of regressions from (1) to (3) controlling by the fixed effect of the Municipality. Here it is important to note that the public manager's education level dummies are not included. This is done because if these dummies were included in the

regression with the fixed effect of Municipality, there would be multicollinearity, and the regression coefficients could not be calculated.

Table 5. Estimates by OLS with Fixed Municipality Effect

	(1)	*(2)*	*(3)*
C	1045866	658383.4	4728941
	[1045866]	[1648863]	[5966255]
EPREV	0.5***	0.5***	0.63***
	[0.06]	[0.062]	[0.08]
Y	--	55.94	3.35
		[174.29]	[198.43]
IFGF	--	--	11352182
			[13501532]

*** indicates statistically non-zero estimates at the 1% significance level. Standard error in square brackets.
Source: Adapted from TCE-MA (2014-2016).

The results found in Table 5 confirmed the results shown in Table 3; thus, a greater error in forecasting budget revenue leads to greater public spending, enabling an increase in fiscal year debt. It is worth noting that when controlling for the fixed effect of the Municipality, the effect of the forecast error on the debt is less than in the case where it is not controlled by the fixed effect (between 0.5 and 0.63). Also, the GDP per capita and IFGF variables are not statistically significant.

Table 6 presents the results of the previous regressions but taking into account the random effect of the municipalities. The results are also in line with what has already been found, indicating that the budget revenue forecast error affects less than proportionally the debt of the Municipality, that is, a one-year increase in forecasting error increases the year-end debt by less than one unit.

Table 6. Estimates by OLS with Random Effect of Municipality

	(1)	*(2)*	*(3)*	*(4)*
C	-3551468***	-3439493***	-6103082*	-3988861
	[0.83]	[1197519]	[3356845]	[3942952]
EPREV	0.83***	0.83***	0.91***	0.914***
	[0.02]	[0.02]	[0.022]	[0.022]
Y	--	-16.9	-16.62	-21.09
		[116.44]	[116.53]	[117.47]
IFGF	--	--	5197262	5956840
			[7690452]	[7757618]
D_ESI	--	--	--	-1972064
				[2643234]
D_ESC	--	--	--	-4882834
				[3977800]
D_EMI	--	--	--	-3856161
				[2994644]
D_EMC	--	--	--	-915342
				[10115504]
D_EFI	--	--	--	-7338714
				[4508283]
D_EFC	--	--	--	2265753
				[5193279]

*** indicates statistically non-zero estimates at the 1% significance level. Standard error in square brackets.
Source: Adapted from TCE-MA (2014-2016).

In Table 7, regressions 1 to 3, the results indicate that the budget revenue forecast error positively affects, at the level of 1% of significance, the debt for the year of exercise. The econometric calculations show that the increase of one unit of Real (BRL) in the error of

forecasting LOAs budget revenues, they increase between BRL 0.49 and BRL 0.62 unit of Real, in the debt of Maranhão municipalities in the financial year.

Table 7. Estimates by OLS with Fixed Effect of Municipality and Fixed Effect of Time

	(1)	*(2)*	*(3)*
C	1185905	957992.1	-4956542
	[1124048]	[1660948]	[6665069]
EPREV	0.49***	0.49***	0.62***
	[0.063]	[0.063]	[0.082]
Y	--	32.72	-3,37
		[175.37]	[199.95]
IFGF	--	--	12239288
			[15135450]

*** indicates statistically non-zero estimates at the 1% significance level. Standard error in square brackets.
Source: Adapted from TCE-MA (2014-2016).

As noted between Tables 4 and 6, the results vary marginally between the fixed and the random effect. However, in order to have a decision regarding the type of effect to be used, a Hausman test was performed. Table 8 presents the results of the Hausman test (P-value) for models from (1) to (4). The null hypothesis is that the model with a random effect is appropriate. Thus, the results in Table 7 indicate that in no case analyzed was the random effect appropriate.

Table 8. Hausman test

	(1)	*(2)*	*(3)*	*(4)*
Prob.	0	0	0.0034	0.0078

Null Hypothesis: Random effect is appropriate. Alternative Hypothesis: Fixed effect is appropriate.
Source: Adapted from TCE-MA (2014-2016).

The results point to the need to improve the quality of budget forecasts; only then can it significantly affect public accounts. It is worth saying that forecast errors are relevant factors to understand the dynamics of public debt, and can be considered a measure of the transparency of public accounts. The analysis of the effect of the budget revenue forecast error on the Municipality's debt showed the poor fiscal management of the municipalities in Maranhão. As already pointed out, for each Real unit in the error of forecasting LOAs budget revenue, the debts of the municipalities, in the financial year, increase between BRL 0.49 and BRL 0.62.

In this sense, it is necessary that managers and technicians who participate in the preparation of the public budget, that is based on the history of executed revenue and expenses and use the programmed budget to achieve the goals set out in the Multi-Year plan (MYP), only then will municipalities be able to reduce their indebtedness, and comply with the FRL.

Among several studies by authors, in this work, the thoughts of those who seek to answer the cause of debt, which correlate some expenses with personnel expenses and current expenses. In another round, other authors also took part, putting the Budget Balance Sheet as an important piece for decision-making by the public manager. This is what can be seen in these statements: the revenues, expenses, and the remainders to be paid are presented in a very visible way, making them a source of guidance and assistance to the manager, in a way that allows him to identify which expense can be reduced, thus, a way

for the Municipality to return to invest and, in this step, to generate employment and income in the essential areas of Public Administration.

Other studies show that the Fiscal Responsibility Law is broad and equal for all municipalities, the legislator did not have, when it was enacted, care to verify the peculiarities and difficulties faced by each Municipality, such as qualified staff, location, internet, and several other factors that are necessary for good public management. Thus, while some municipalities are privileged, others are harmed because they do not have favorable conditions for good management, making law enforcement ineffective. The Fiscal Responsibility law for municipalities that already had control over their spending was more efficient, as it helped public managers to reduce expenses, notably personnel expenses, and directed resources to public investments in the areas of health, education, and infrastructure, improving the quality of people's lives.

In this work, we sought to present the causes of indebtedness that may lead Maranhão municipalities to enter into a total collapse in essential government areas. It has been demonstrated that the most effective way to combat public debt is through planning, in order to allow the manager the equalized and adequate distribution of public resources within limits established by legislation; this ideal way to promote investments in essential areas, such as education, health, and safety. Only in this way will the municipal manager provide the population with a better quality of life and a reduction in the indebtedness of the municipalities.

This time, with the managers as a parameter the forecast error of Maranhão municipalities, the budget balance, as well as the representative tables showing the real situation of the debt in 10 years, they will be able to use them to adjust the expenses and revenues collected, reduce or even eliminate debt with public spending, and still have them as gauging thermometers to direct resources to the most sensitive areas where the population most complains (health, safety, and education).

In Table 9, the results indicate that the calculations present the following formulas (early 2016 debt, being added to the coefficient, multiplying by the forecast error); we have the following values represented, for the years 2016 to 2025, using data to build values representing the debt each year. We understand that the debt is growing and that there is a lack of control on municipal managers with the poor management of public resources. Furthermore, in this perspective, managers have to decide to reduce their expenses through planning consistent with their reality, executing government actions that can attract investment, both public or private.

Table 9. With Fixed Effect on Municipality and Time

Municipality	*Forecast Error*	*Marginal increment in DEBT due to forecast error*									
		2016	*2017*	*2018*	*2019*	*2020*	*2021*	*2022*	*2023*	*2024*	*2025*
São Luis	139.645	86.580	173.160	259.740	346.320	432.900	519.479	606.059	692.639	779.219	865.799
Imperatriz	135.461	83.986	167.972	251.957	335.943	419.929	503.915	587.901	671.887	755.872	839.858
Paço DoLumiar	157.549	97.680	195.361	293.041	390.722	488.402	586.082	683.763	781.443	879.123	976.804
Pinheiro	6.257	3.879	7.759	11.638	15.517	19.397	23.276	27.155	31.035	34.914	38.793
Chapadinha	21.177	13.130	26.259	39.389	52.519	65.649	78.778	91.908	105.038	118.168	131.297
ItapecuruMirim	9.846	6.105	12.209	18.314	24.418	30.523	36.627	42.732	48.836	54.941	61.045

Source: Adapted from TCE-MA (2014-2016).

Final considerations

This study sought to identify the factors that lead to the indebtedness of Maranhão municipalities, affected by errors or technical deficiencies in the budget revenue planning

methodology. The results indicate that the budget revenue forecast error positively affects the debt for the year at the 1% level of significance. The econometric calculations show that the increase of one real unit in the error of forecasting the budget revenue of the LOAs of the Maranhão municipalities causes an increase of between BRL 0.49 and BRL 0.62 Real unit in the annual indebtedness of the municipalities. In addition, the GDP per capita, IFGF, and education level dummies were not statistically significant to explain the increase in debt, making it possible to deduce that planning errors in budget revenues, in LOAs, are significantly motivating to increase the debts of the surveyed municipalities.

Most municipalities had a high degree of indebtedness and, according to the survey results, the error in forecasting budget revenue has an impact on the indebtedness of Maranhão municipalities. In this sense, the managers and technicians that participate in the elaboration of the public budget must have as a base, in addition to the history of information on revenues collected and expenses executed, also use the information on the Municipality's macroeconomic performance and forecasts regarding the country's economic activity.

Debt is a consequence of uncontrolled public management. In the face of this mismanagement, several disastrous implications are imposed on the population and the government, among them: the increase in interest rates, the uncontrolled growth of indebtedness, the reduction of investments in essential areas such as education, health, social assistance, and infrastructure. The social impact is predictable, which can cause unemployment, a reduction in household consumption, directly affecting companies in the industrial areas, trade, and services, and also the drastic reduction in tax collection.

In this sense, it is suggested, as a contribution, that both in the preparation of fiscal forecasts and in the monitoring of the result of the municipal budget, public managers must detect a primary problem consisting in verifying the existence of an overestimation of tax revenue and transfers from the Municipality, problems related to the accuracy and quality of technical data of budget forecasts, this in order to be able to take preventive measures, attack the cause in real-time, based on the budget balance, seen as a fundamental piece to check their income and expenses, the forecast error and the degree of indebtedness of the Municipality in 10 (ten) years, which will enable them to assess the Municipality's level of indebtedness in the context of economic policy in a more authentic way.

This study also opens the opportunity for future research to explore in greater detail how budget forecasts are made in municipal government. Some natural issues that can be raised for such purposes can be: is there a relationship between the information on the budget execution of municipalities and state and federal governments to improve budget forecasting techniques? What are the national and international cases that work with more realistic forecasting models? Is it possible to use a success story to build a standard model with respect to public revenue forecasts in such a way as to avoid discretion and reduce the effects of public mismanagement?

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