
AN ANALYSIS OF THE EXPLANATORY FACTORS OF THE FISCAL SITUATION IN THE MUNICIPALITIES OF MINAS GERAIS

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ABSTRACT

The fiscal situation of a federated entity can be affected by economic, fiscal, demographic and political conditions, among others. This study aimed to identify the municipal factors that influence the fiscal situation of the municipalities of Minas Gerais, in the period from 2013 to 2018. Therefore, we conducted a study with dynamic panel data, whose proxy of fiscal situation was the Fiscal Management Index of the Federation of Industries of the State of Rio de Janeiro, which includes four indicators – Autonomy, Personnel Expenses, Liquidity and Investments. The results show that, over the period analyzed, the mean Fiscal Management Index decreased by 2,57% per year, mainly caused by the Personnel Expenses and Investments indicators. From the estimation of the model, we found that the fiscal situation of the past period tends to contribute to a better future budget management, and that the *per capita* Gross Domestic Product and urbanization rate variables are those that contribute positively to explain fiscal management. On the other hand, a greater budget effort in education, an increase in the proportion of elderly people, as well as of the young population tend to worsen the fiscal situation of the analyzed municipalities. We conclude that the factors considered are relevant in explaining the management of public accounts, and should be considered by public agents in decisions aimed at budget planning and execution.

Keywords: Public finances. Municipal fiscal management. Dynamic panel.

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UMA ANÁLISE DOS FATORES EXPLICATIVOS DA SITUAÇÃO FISCAL NOS MUNICÍPIOS DE MINAS GERAIS

RESUMO

A situação fiscal de um ente federado pode ser afetada por condições econômicas, fiscais, demográficas, políticas, entre outras. Este estudo teve como objetivo identificar os fatores municipais que influenciam a situação fiscal dos municípios de Minas Gerais, no período de 2013 a 2018. Para tanto, foi realizado um estudo com dados em painel dinâmico, cuja *proxy* de situação fiscal foi o Índice de Gestão Fiscal da Federação das Indústrias do Estado do Rio de Janeiro que contempla quatro indicadores – Autonomia, Gastos com Pessoal, Liquidez e Investimentos. Os resultados apontam que, ao longo do período analisado, o Índice de Gestão Fiscal médio apresentou uma queda de 2,57% ao ano, ocasionada, principalmente, pelos indicadores de Gasto com Pessoal e Investimentos. A partir da estimação do modelo, constatou-se que a situação fiscal do período passado tende a contribuir para uma melhor gestão orçamentária futura, e que as variáveis Produto Interno Bruto *per capita* e taxa de urbanização são as que contribuem positivamente para explicar a gestão fiscal. Por outro lado, um maior esforço orçamentário em educação, aumento na proporção de idosos, bem como da população jovem, tendem a piorar a situação fiscal dos municípios analisados. Conclui-se que os fatores levados em consideração são relevantes na explicação da gestão das contas públicas, devendo ser considerados pelos agentes públicos nas decisões voltadas para o planejamento e execução orçamentária.

Palavras-chave: Finanças públicas. Gestão fiscal municipal. Painel dinâmico.

1 INTRODUCTION

Decentralization in Brazil emerged with the search by federated entities for more independence in the creation of government actions and decisions, with the aim of transferring competences and powers from the central body to subnational governments, in order to allow greater participation and autonomy of the population in government decisions (Alcântara, 2011; Oliveira, Barbosa & França, 2013).

Fiscal decentralization occurs from tax collection and intergovernmental transfers, which, through typical characteristics, tend to determine the pattern of fiscal federalism, as well as the improvement in public services, with the purpose of delegating powers to governments over tax and fiscal competences and budget execution. (Oliveira, Diniz, Bispo, Lima & Santos, 2017; Sousa & Monte 2019).

In Brazil, public financial management, both at the federal, state and municipal levels, is governed by Law No. 4,320 of 1964, as well as by the Fiscal Responsibility Law (FRL), enacted in 2000. Legislation aimed at imposing restrictions on government have become important to improve fiscal management and ensure fiscal discipline (Afonso & Jalles, 2019; Borkakati & Singh, 2021; Sawhney, 2018), leading several countries, such as Australia, the United Kingdom and the

United States, to adopt tax rules in order to control deficits, debts and expenditures, and thus improve budgetary results, as highlighted by Borkakati & Singh (2021).

The LRF conceives responsibility in fiscal management and public financial guidelines with the objective of guaranteeing the accomplishment of fiscal targets and the transparency of public expenditure, a premise of responsible fiscal management. The Law brought innovations in the process of discussion and elaboration of planning in the public sector, reinforcing the mechanisms of control and transparency of the application of resources, attributing to the administrators the responsibility for the fiscal management, so that the balance of the public accounts can be reached.

According to Cruz, Macedo and Sauerbronn (2013, p. 1376), "fiscal management refers to the relationship between public revenues and expenditures. In Brazil, for a long time, this relationship was unbalanced for many bodies and entities of the Brazilian public administration."

In this sense, in order to assess the performance of fiscal management in municipalities, entities such as the National Confederation of Municipalities (CNM) and the Federation of Industries of the State of Rio de Janeiro (Firjan) have developed indicators capable of assisting in budget management of the municipalities. In this research, the fiscal situation of municipalities is measured by the Firjan Fiscal Management Index (IFGF), which fully displays the situation of municipal public accounts. The aforementioned index currently consists of four indicators: Autonomy, Personnel Expenses, Liquidity and Investments, ranging from zero to one (FIRJAN, 2019a).

A study conducted by Firjan, based on official data, reveals that, in 2018, 73.9% of a total of 5,337 Brazilian municipalities have a difficult or critical fiscal situation, including nine capitals among them. According to the entity, one of the main problems that the municipalities face is the high rigidity of the budget, since 821 of them do not comply with the Law, compromising more than 60% of the Net Revenue (RCL) with the public service payroll, 34.8% of City Halls do not generate enough revenue to fund their administrative structure, 21% of municipalities reached the end of 2018 without funds in cash to cover expenses transferred to the following year, and 47% of them reserved only 3.1% of their total revenue for investments (FIRJAN, 2019b).

IFGF shows that the general mean of the municipalities of Minas Gerais, in 2018, performs below the national average in the four indicators assessed, where 56.5% of the municipalities of Minas Gerais were assessed with critical fiscal management (index below 0.4), 31.2% had a difficult situation (index between 0.4 and 0.6), and only 12.2% of the municipalities had good or excellent fiscal management, with a low percentage of City Halls managing their resources responsibly (FIRJAN, 2019c).

Several factors, such as Gross Domestic Product (GDP), electoral competitions, compliance with the FRL, budget commitment, quality of education, population size, level of collection and decentralization of municipalities, can harm the balance of a municipality's public accounts, obstructing its development (Covre & Mattos, 2016; Klein & Sakurai, 2015; Reis, Almeida & Miranda, 2018; Schaltegger & Togler, 2007; Veloso, Monasterio, Vieira & Miranda, 2011). Given the above, the following question arises: What factors influence the fiscal situation of the municipalities of Minas Gerais, from 2013 to

2018? Thus, among a set of municipal characteristics, this study aims to analyze those that answer this question.

Although there are some studies on the fiscal performance of municipalities (Covre & Mattos, 2016; Cruz *et al.*, 2013; Magalhães, Mattos & Wakim, 2019; Oliveira, Cruz, Barbosa & Francisco, 2019), the topic still lacks debate, when considering a Brazilian state in which it has very heterogeneous municipalities and several with a critical fiscal situation. Furthermore, in this research, we used the new version of the Firjan fiscal management index, consisting of four indicators (Autonomy, Personnel Expenses, Liquidity and Investments), covering aspects related to the limits required by the FRL, as well as budget execution.

The present work aims to contribute to the literature related to public management, especially to the discussion on fiscal responsibility of public entities, by identifying the influencing factors in decisions on government revenues and expenditures. In this sense, the research results may indicate, for public decision-makers, factors that should be considered in the planning and budget management process, in addition to stimulating the realization of new research to support the debate of such an important topic for society, for involving the allocation of public resources.

This study consists of four sections, in addition to this introductory part. The second section addresses fiscal management and its possible determinants, as well as the IFGF methodology. The third deals with the methodological procedures used. The fourth and fifth sections present the discussions of the results and the final remarks, respectively.

2 THEORETICAL REFERENCE

2.1 Fiscal Management

Complementary Law No. 101, of May 4, 2000, called the Fiscal Responsibility Law, was created with the aim of determining public financial guidelines, focused on responsibility in fiscal management, and foresee the planned and transparent action with the objective of preventing risks and mistakes that could destabilize the balance of public accounts. The FRL aims to make the planning process better in the public sector, improving the control and transparency of resources. In this way, it is clear that the Law came with the intention of determining that the accountability of fiscal management is done in a transparent way (Leite, Colares & Andrade, 2015). The adoption of Fiscal Responsibility Laws, as highlighted by Sawhney (2018), has been considered an important instrument for achieving balance in public accounts by both federal and municipal governments.

Fiscal management can be comprehended by activities directed to the budget and aims to analyze, organize and manage the resources of the government sector, covering the process of preparing and approving the budget, as well as the execution and assessment of the budget law, as explained by Magalhães *et al.* (2019). Understanding the administration of public revenues and expenditures, fiscal management becomes responsible for the balance of public accounts, as provided by the FRL (Cruz *et al.*, 2013), aiming to improve the management of public accounts, from the management of the budget and the accounting system (Alsharari & Youssef, 2017).

Thus, fiscal management consists of several rules, defined according to the economic and political environment of each country (Sawhney, 2018), being used to overcome long-term budgetary problems, as stated by Bergman, Hutchison and Jensen (2013). Although accountability-oriented rules in fiscal management have failed in several countries, they are still useful in achieving greater discipline in public finances (Bergman *et al.*, 2013).

From the point of view of the political process, fiscal management begins with the preparation and approval of the public budget (Hansen, Houlberg & Pedersen, 2014), which constitutes an instrument through which entities seek to materialize public actions. According to Giacomoni (2017), the public budget is a competent instrument of political control of the entities representing the Executive Power. Therefore, the budget consists in fixing public expenditures and forecasting revenues in order to materialize the actions of public managers.

According to Kohama (2012), expenditures are expenses incurred by public entities, established in the budget law or in special laws, aimed at providing services and adding patrimony. Regarding revenues, according to the author, they consist of the entry of assets into the public coffers, in order to supply expenditures and stimulate investments.

The budget is directly linked to planning, as revenue needs to be estimated in order to prevent the government from spending more than it collects. Planning, seen as one of the most important mechanisms of public administration, began to be incorporated in companies and public offices, creating a tendency to bring budget and planning closer in a natural way (Giacomoni, 2017). The integrated planning system should be adopted as a means for the government to employ planned and transparent action in fiscal management, thus being able to reduce social and economic problems.

The Federal Constitution (FC) in its art. 174, § 1, provides that the FRL will establish the guidelines and bases for the planning of national balanced development, which will incorporate and make national and regional development plans compatible. To give vision to the idea of planning, in art. 165, the FC established three fundamental instruments: the Pluriannual Plan (PPA), the Budget Guidelines Law (LDO) and the Annual Budget Law (LOA), considered financial control tools (Constituição da República Federativa do Brasil, 1988).

As defined by Kohama (2012), PPA directs government actions at the federal, state and municipal levels for four years, in order to achieve the goals and targets set for this period. LDO establishes the goals and priorities of the public administration, being responsible for guiding the elaboration and execution of the LOA (Giacomoni, 2017), which, in turn, composes the segregation of public revenue and expenditure, with the purpose of highlighting the program of government work and economic-financial policy (Andrade, 2016).

In addition to planning, fiscal management is based on the concepts of control, transparency and responsibility. Control refers to a form of accountability; transparency is a process of disclosing information related to public management, publicizing plans, budgets, LDO and reports; and, finally, accountability takes effect through the requirement of compliance by the public manager with tax rules (Cruz & Afonso, 2018).

FRL brought to the municipal manager a greater responsibility in the sense of establishing rules for the preparation of the budget, stipulating limits for public spending, in order to seek a better management of public revenues and expenditures. Despite the rules imposed, there are several characteristics that can influence the result of fiscal management, since each municipality has its peculiarities.

2.1.1 Municipal Characteristics that Determine Fiscal Management

When performing its functions through its governments, the State is liable to be influenced by several variables, such as regional, political, socioeconomic, institutional and demographic characteristics and environmental conditions, which are able to define government results, as explained by Quintela (2011).

For Cruz *et al.* (2013), the variables economic level, indebtedness and financial autonomy had a positive and significant effect with the level of fiscal responsibility. The management of social, economic and political variables are able to improve the fiscal performance of municipalities, since the social domain can become a way to reduce the political action of rulers (Reis *et al.*, 2018).

Some authors believe that political cycles can influence the fiscal situation of municipalities. In this sense, Covre and Mattos (2016) and Melo, Souza and Bonfim (2015) state that aspects of electoral competition can affect the quality of fiscal management, as they increase costs and can generate governance problems, and in electoral years, the fiscal situation of the municipalities is more favorable, but, with a fiscal cost for the post-election period. Bartoluzzio and Anjos (2020) comment that, aiming at controlling the fiscal balance during the election period, politicians adopt fiscal strategies in order to postpone disbursement to the following year, since that is when the results of the decisions taken by the mayors are presented to the public voters.

Among some factors that can affect the fiscal situation of municipalities, there is decentralization. The decentralization process ends up transferring obligations to municipalities, such as maintaining a balance between revenues and expenses, and charges to sustain the quality of their fiscal management, limiting public spending (Reis *et al.*, 2018).

Silva, Souza, Martins and Câmara (2020) found, through a result assessment research, that the variables *per capita* GDP, Municipal Governance Index and location of municipalities in Brazilian regions were important to explain their fiscal management, and, concerning the population quantity and the Firjan Municipal Development Index, they had no influence on budget management.

Reis *et al.* (2018) believe that investment in education is a conditioning quality of fiscal management in municipalities, since, when the population has a higher level of education, it demands more results from its managers; on the other hand, health expenditures can harm the fiscal management of the municipality. Therefore, the need for preventive actions for the population over 65 years of age, reducing dependence on public management and, mainly, minimizing health expenditures.

Marconato, Parré and Coelho (2021) identified that the collection profile, personnel expenditure, economic wealth and population size are factors that

influence the Financial Execution Result Quotient, a measurement used to measure the fiscal situation of Brazilian subnational units. The first two variables affect the fiscal situation negatively, while the influence of the last two is positive.

We used the IFGF presented below for the analysis of the fiscal situation of the municipalities, in accordance with the compliance of limits foreseen in the FRL, which establishes rules on responsibility in fiscal management.

2.1.2 Firjan Tax Management Index

The IFGF, elaborated based on official data released by the National Treasury Secretariat, covers all municipalities in the country and its main feature is its annual frequency, allowing for permanent monitoring of fiscal management (FIRJAN, 2019a). This index is composed of four indicators, namely: Autonomy, Personnel Expenses, Liquidity and Investments.

The Autonomy indicator assesses the capacity of municipalities to support themselves, by establishing a division of the difference between the Municipality's Revenue from Economic Activity (RAE) (own collection and return transfers of ICMS, IPVA, ITR and IPI-Export) and the Costs of the Structure Administration (CEA) by the RCL. In the calculation of this indicator, the paid stage of the expense is considered. The closer to zero the municipality's autonomy IFGF is, the lower its capacity to generate local revenue and assume the costs of its administrative composition. On the other hand, the closer to one, the greater the capacity to bear the costs of its administrative composition (FIRJAN, 2019a).

The Personnel Expenses indicator measures the amount of personnel payment expenses in relation to the total RCL. As a non-flexible expense, the FRL limited personnel expenses to up to 60% of the RCL in order to ensure allocation of other expenses and weight the budget. In the interpretation of the index result, the closer to the unit, the lower the budget commitment to the municipality's payroll and the better the margin for investment in public policies, according to the parameterization conducted by Firjan (2019a), shown in Figure.

The Liquidity indicator deals with the difference between the total Accrued Liability (RP) accumulated in the year and the Cash and Cash Equivalents (CCE) resources available to cover them in the following year divided by the RCL. At the end of the indicator calculation, a value close to one means that the municipality is not deferring payments to the next year without the proper guarantee (FIRJAN, 2019a).

The Investments indicator measures the share of Total Revenue (TR) of the municipalities allocated to investments, which results in a score between zero and one. From the parameterization summarized in Figure 1, a result closer to one indicates a better fiscal situation of the verified municipality, as more investments were made by the municipalities (FIRJAN, 2019a).

Indicator	Formula	Parametrization
Autonomy (A)	$A = \frac{RAE - CEA}{RCL}$	1) $A > 25\% \rightarrow \text{Firjan A Index} = 1$ 2) $0 < A < 25\% \rightarrow \text{Firjan A Index} = A/25\%$ 3) $A < 0\% \rightarrow \text{Firjan A Index} = 0$
Personnel expenses (GP)	$GP = \frac{GP \text{ (last 12 months)}}{RCL}$	1) $GP < 45\% \rightarrow \text{Firjan GP Index} = 1$ 2) $45\% < GP < 60\% \rightarrow \text{Firjan GP Index} = 1 - \frac{(GP - 45\%)}{(60\% - 45\%)}$ 3) $GP > 60\% \rightarrow \text{Firjan GP Index} = 0$
Liquidity (L)	$L = \frac{CCE - RP}{RCL}$	1) $L > 25\% \rightarrow \text{Firjan L Index} = 1$ 2) $0 < L < 25\% \rightarrow \text{Firjan L Index} = 0,4 + (0,6 * L)/25\%$ 3) $L < 0\% \rightarrow \text{Firjan L Index} = 0$
Investments (I)	$I = \frac{I + \text{Financial Investments}}{TR}$	1) $I > 12\% \rightarrow \text{Firjan I Index} = 1$ 2) $I \leq 12\% \rightarrow \text{Firjan I Index} = I/12\%$

Figure 1 - Indicators that compose the fiscal management index

Source: Based on Firjan (2019a).

Firjan established four categories with reference values that allow a better analysis of the fiscal situation of the municipalities with the objective of grouping them. The classification of municipalities, according to the fiscal situation, can be critical, difficult, good and excellent, according to Table 1.

Table 1

Classification of fiscal management levels

Classification of management	Intervals
Critical	$0 \leq IFGF \leq 0,4$
Difficult	$0,4 < IFGF \leq 0,6$
Good	$0,6 < IFGF \leq 0,8$
Excellent	$0,8 < IFGF \leq 1,0$

Source: Based on Firjan (2019a).

Considering the indicators that compose the Fiscal Management Index (IGF), the ideal is that each one has a value close to one, so that the closer to the unit, the better the fiscal situation of the public entity in that aspect. The general IGF is obtained by the mean of the sub-indicators, which assume the same weight, that is, 25%.

3 METHODOLOGICAL PROCEDURES

3.1 Empirical Model

The present research used panel data, in which cross-section data are combined with time series data to achieve the objective referring to the analysis of the fiscal situation of the municipalities, based on the municipal characteristics. For Gujarati and Porter (2011), the panel data model allows controlling the heterogeneity present in the observations, increases the degrees of freedom and avoids the collinearity between the variables.

Considering the nature of the dependent variable, in which current fiscal management can be influenced by past fiscal management, as a result of the integrated process between planning and budget (Covre & Mattos, 2016;

Magalhães *et al.*, 2019; Ribeiro, 2015), in the present research, we used the Dynamic Panel Data Model, proposed by Arellano and Bond (1991) and improved by Arellano and Bover (1995) and Blundell and Bond (1998), the Systemic Generalized Moments Method (GMM).

The estimated model to identify the determinants of the fiscal situation of the municipalities of Minas Gerais can be described according to the following equation:

$$IGF_{it} = \gamma IGF_{i,t-1} + \beta X_{it} + \alpha_i + v_t + \varepsilon_{it} \quad (1)$$

$i = 1, \dots, 745$ municipalities
 $t = 2013, \dots, 2018$

where IGF_{it} represents the proxy for the fiscal situation of municipality i , in year t ; $IGF_{i,t-1}$ is the lagged fiscal situation (past period); X_{it} are municipal characteristics, such as *per capita* GDP, urbanization rate, proportion of youth and elderly in relation to the total population, percentage of voters in relation to the population, budgetary effort in social areas, such as health and education in the municipalities of Minas Gerais state; γ and β are the parameters to be estimated; α_i is the specific unobserved effect of each municipality; v_t is the specific time effect that does not vary between municipalities; and ε_{it} is the random error. In Figure 2, we described the variables used to explain the fiscal situation of the analyzed municipalities.

The model sought to include variables of an economic, demographic, fiscal and political nature. The economic variable refers to the *per capita* GDP of each municipality. The fiscal variables refers to the Budget Effort in Health activities and the Budget Effort in Education activities. As demographic control variables, we used the percentage of the population aged up to 15 years old, the percentage of the population aged 65 years old and over and the urbanization rate. The political variable concerns the percentage of voters in the municipality. These variables were included based on empirical studies concerning the fiscal behavior of states and municipalities (Covre & Mattos, 2016; Magalhães *et al.*, 2019; Ribeiro, 2015; Reis *et al.*, 2018; Sakurai, 2014; Schaltegger & Torgler, 2007).

We measured the fiscal situation by the IFGF, composed of four indicators, namely: Autonomy, Personnel Expenses, Investments and Liquidity. The IFGF is obtained by the weighted mean of the sub-indicators, whose score oscillates between zero and one, and the closer to one, the better the fiscal management of the municipality (FIRJAN, 2019a). The choice of the aforementioned index as a proxy for the fiscal situation is justified because it includes indicators related to the limits required by the FRL, as well as budget execution. In addition to the IFGF being a synthetic measure of the fiscal situation, its choice considered the recurrence of its use in several studies, such as those by Covre and Mattos (2016), Karruz and Moraes (2020), Louzano, Abrantes, Ferreira and Zuccolotto (2019), Magalhães *et al.* (2019), Ramos and Silva (2016), Reis *et al.* (2018) and Silva (2019).

In addition to the aforementioned variables, we included time dummies, making it possible to consider the specific time effect (v_t) and common to all municipalities. Annual dummies allow to control the effects of shocks over time

(Roodman, 2006), as well as measure the effect of electoral cycles on the fiscal situation (Reis *et al.*, 2018).

Variable	Description	Expected Effect	Theoretical Basis
$IGF_{i,t-1}$	Lagged Fiscal Management Index	+	Covre and Mattos (2016), Magalhães <i>et al.</i> (2019), Ribeiro (2015), Rosenthal and Wolfson (2013) e Silva, Nascimento and Silva (2021)
Elderly	Population aged 65 and over in relation to the total population	+/-	Reis <i>et al.</i> (2018) and Schaltegger and Torgler (2007)
Youth	Population under the age of 15 in relation to the total population	+/-	Covre e Mattos (2016) e Schaltegger and Torgler (2007)
Urbanization Rate (TU)	Relationship between urban population and total population	-	Sakurai (2014) and Reis <i>et al.</i> (2018)
Budget Effort in Health (EOS)	Percentage of budget expenditure on health activities	-	Magalhães <i>et al.</i> (2019), Oto-Peralías, Romero-Ávila and Usabiaga (2013) and Reis <i>et al.</i> (2018)
Budget Effort in Education (EOE)	Percentage of budget expenditure applied to education activities	-	Magalhães <i>et al.</i> (2019)
Per capita Gross Domestic Product (pcGDP)	Value of the municipality's total GDP in the year divided by the population, in current reais	+	Marconato <i>et al.</i> (2021), Magalhães <i>et al.</i> (2019), Oto-Peralías <i>et al.</i> (2013), Reis <i>et al.</i> (2018), Sakurai (2014) and Silva, Nascimento and Silva (2021)
Voters	Percentage ratio between the number of voters in December of each year and the total population	-	Covre and Mattos (2016)
Time Dummies (v_t)	Time representative dummies to capture the fixed effect and influence of the electoral cycle	+/-	Covre and Mattos (2016), Magalhães <i>et al.</i> (2019), Reis <i>et al.</i> (2018) and Ribeiro (2015)

Figure 2 - Description of the variables used in the regression model with panel data
Source: Elaborated by the authors.

Considering the dynamic behavior of the fiscal situation and the insertion of its lag as a regressor, the use of the Dynamic Panel Data Model is necessary to understand the determinants of the object of study, considering the correlation between the past fiscal situation and the model's specific effect (α_i). Therefore, Arellano and Bond (1991) proposed to make the first difference from Equation 1 to avoid this problem. However, when using such an alternative, the specific effect is suppressed from the model, according to Equation 2.

$$\Delta IGF_{it} = \gamma \Delta IGF_{i,t-1} + \Delta \beta X_{it} + \Delta v_t + \Delta \varepsilon_{it} \quad (2)$$

In this sense, from the model presented, Arellano and Bover (1995) and Blundell and Bond (1998) proposed the systemic or augmented GMM, in which there is a combination between the model in level (Equation 1) and in difference (Equation 2). This method is indicated in the case where the panel has few periods and admits to treat the unobservable individual heterogeneity that does not vary over time, the presence of heteroscedasticity and the autocorrelation between the units.

In order to validate the estimates obtained by the systemic GMM, it is recommended to make the residual autocorrelation test, according to Arellano and Bond (1991). The null hypothesis of this test is the absence of first and second order autocorrelation. In the present test, the null hypothesis of first-order serial correlation, unlike the second-order one, must be rejected, indicating the absence of serial autocorrelation in the error. In addition to the residual autocorrelation test, and in order to verify the validity of the instruments, it is necessary to make the Hansen test (1982), which is based on the null hypothesis that the instruments used to avoid endogeneity are valid.

3.2 Source and Treatment of Data

The present study was conducted in municipalities of the state of Minas Gerais, between 2013 and 2018. Although Firjan has been calculating the index since 2006, there has been a recent change in the methodology used. Thus, the final date for the consolidation of the IFGF database occurred in July 2019, for the period from 2013 to 2018. Therefore, the study was based on the data available for the municipalities of Minas Gerais, in this period, on the Firjan portal.

With regard to the explanatory variables, except for the number of voters, obtained from the Superior Electoral Court (TSE) (2020), the others were extracted from the MG Social Responsibility Index database, made available by the João Pinheiro Foundation (FJP) (2020), for each year analyzed.

For the analysis of panel data, of the total of Minas Gerais municipalities (853 cities) that constituted Firjan's database, we excluded those in which IGF data were not included in any of the years of the analyzed period or values for the explanatory variables considered in the model. Thus, 108 municipalities were excluded from the database. Of this total, 101 exclusions are due to the unavailability of information on IFGF. The remainder (7 cities) were excluded because they did not present data on the Budget Effort in Health and Education.

For all variables considered in the model, we used annual values, with *per capita* GDP in *reais*. The nominal values of the economic variable were transformed into *reais* variables using the IGP-DI deflator, made available by Fundação Getúlio Vargas (FGV) (2020).

4 ANALYSIS AND DISCUSSION OF THE RESULTS

4.1 Descriptive Analysis of the Fiscal Situation and Municipal Characteristics

It is noteworthy that IFGF is the mean of four indicators – Autonomy, Personnel Expenses, Liquidity and Investments, ranging between zero and one. As it is composed of revenue and expense indicators, to standardize the analysis, Firjan conducted a parameterization, so that the analysis is, the higher the indicator, the better the result of the municipality.

In the present research, of the total number of municipalities in the state of Minas Gerais, the sample consisted of 745 municipalities, which corresponds to 87.34% of the total. These represent 92.72% of Minas Gerais' GDP and 90.84% of the state's population in 2018.

Table 2 shows the descriptive statistics of the fiscal management index of the analyzed municipalities in Minas Gerais.

Table 2

Descriptive analysis of the Municipalities' Fiscal Management Index

IFGF	Mean	Standard deviation	Minimum	Maximum	Annual Variation (%)
2013	0,421	0,184	0,010	0,964	-
2014	0,449	0,178	0,057	1,000	6,651
2015	0,378	0,175	0,010	0,997	-15,813
2016	0,470	0,167	0,012	1,000	24,339
2017	0,392	0,182	0,008	1,000	-16,596
2018	0,379	0,183	0,017	0,963	-3,316
General	0,415	0,182	0,008	1,000	

Source: Research Result.

During the period studied, considering the classification criteria created by Firjan (Table 1), based on the mean IGF of the municipalities present in the sample, it can be classified as management in difficulty, since they presented a mean of 0.41 and standard deviation of 0.18, according to Table 2. In the period from 2013 to 2018, the lowest value of fiscal management calculated was 0.008, in 2017, by the municipality of Cantagalo, in the region of Rio Doce and Vale do Aço, which has approximately 4,472 inhabitants. The municipalities responsible for the highest rates of fiscal management were, in 2014, the municipality of São Gonçalo do Rio Abaixo, located in the Rio Doce and Vale do Aço regions, with about 10,378 inhabitants, and the municipality of Extrema, located in the southern region, with a population of 32,117 inhabitants, this being the only municipality that achieved excellent fiscal management – equal to 1 – in 2016 and 2017.

Based on the results in Table 2, we can notice that the best fiscal result was observed in 2016, the year of municipal elections, which showed an increase, compared to the previous year, of 24.33%. However, the following year, there was a drop of approximately 8 percentage points. Given the above, there is evidence that the fiscal situation is better in an election year, but, in the post-election period, it tends to get worse.

To better understand the behavior of the fiscal situation over the period, Figure 3 shows the mean fiscal management index and the sub-indicators that comprise it.

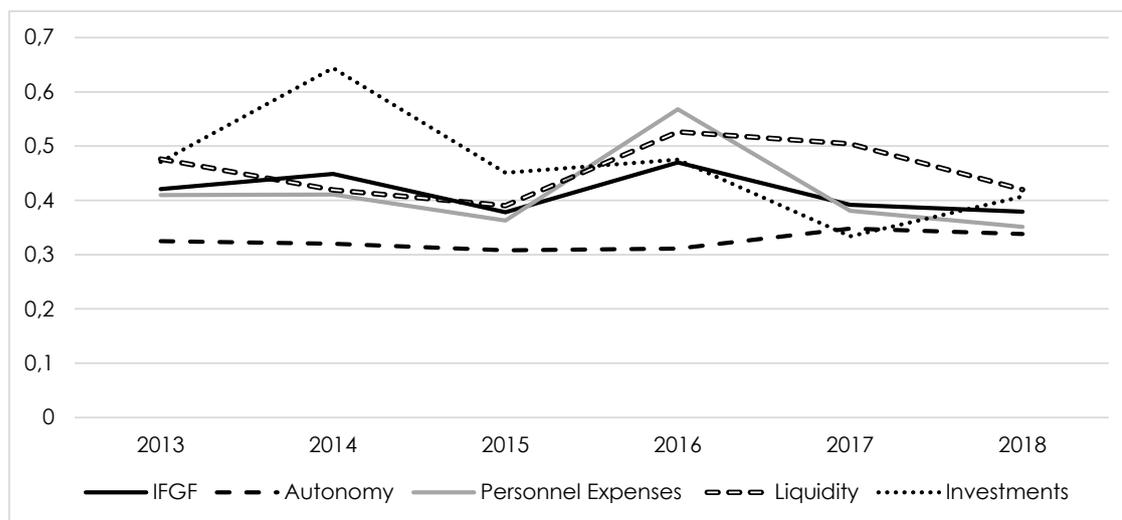


Figure 3 - Municipalities' Fiscal Management Index and its sub-indicators (2013 - 2018)
Source: Research Result.

According to Figure 3, the IFGF Autonomy dimension, which measures the city hall's capacity to generate sufficient resources to cover its costs of existence, had a mean value, in the analyzed period, of 0.32, in 2013, remaining practically constant over the years studied. Based on the results, in the first year analyzed, 245 municipalities were detected (32.89% of the sample) that were not able to bear the costs of their administrative composition, receiving a zero score, falling by around one percentage point in 2018. While the municipalities with an indicator equal to one, which were more able to afford their administrative composition, in 2017, represented 12.62% of the sample.

The Personnel Expenses indicator, which assesses RCL's level of commitment to the public service, that should not exceed 60% of this, according to the FRL, had an overall mean of 0.41. In 2013, 70 municipalities (9.40%) exceeded the spending limit on the payroll, receiving a zero score in this sub-indicator, and in 2018, it dropped to 62 municipalities (8.3%). On the other hand, the number of municipalities with the best mean of Personnel Expenses, which received the maximum score, was only 4.8% of the sample (36 cities), in the first year, falling by two percentage points in the last year analyzed. Considering this scenario, it is evident that the Personnel Expenses indicator deteriorated from 2013 to 2018, from 0.41 to 0.35.

The Liquidity indicator verifies if, at the end of the year, the municipalities have sufficient financial resources in cash to cover the RP of the following year, in accordance with the requirement imposed by the FRL. Thus, if the indicator is close to one, it means that the municipality is not deferring payments to the next fiscal year without due guarantee. By analyzing the data in Figure 3, we can notice that the indicator had a general mean of 0.45, in the years 2013 and 2014, with a total of 89 municipalities (12%) that obtained the maximum coefficient, falling to 75 municipalities (10%), on the last year. On the other hand, in 2013, 194 municipalities did not have resources available to cover the RP for the following year, which

corresponds to 26.04% of the municipalities surveyed. It is noteworthy that this percentage rose to 35.57% in the last year, demonstrating an aggravation in the liquidity of the analyzed municipalities.

The Investment indicator aims to measure the share of investments in municipal budgets, with a score of one being assigned to municipalities that invested more than 12% of their TR. In Figure 3, we can observe a mean index of 0.46, and in 2013, 52 municipalities (7% of the sample) obtained the maximum score, having a high growth in the following year, and falling to 30 municipalities in the last year.

According to the analysis of the sub-indicators, we can observe that the year 2016 presented a good fiscal performance, as well as the best rate of Personnel Expenses, demonstrating a lower budget commitment to the payroll and a better liquidity index, showing that the municipality is bearing its commitments, according to the FRL. Likewise, the years that presented the lowest mean of fiscal management (2015, 2017 and 2018) had the lowest mean rate of Personnel Expenses, as well as one of the lowest means of Liquidity (2015).

Over the analyzed period, we can notice that, from the first to the last year studied, the mean IGF dropped by 2.57% per year, from 0.42 to 0.37. Considering the indicators that compose the IFGF, the results show, when comparing the last year with the first, an improvement only in the Autonomy dimension (3.12%), while the indicators of Personnel Expenses, Liquidity and Investment deteriorate 14.63%, 11.76% and 14.89%, respectively, which may explain the drop in the general index.

According to the concepts established by Firjan (2019) for the IGF, presented in Table 1, Figure 4 details the classification of the 745 municipalities, in the years from 2013 to 2018.

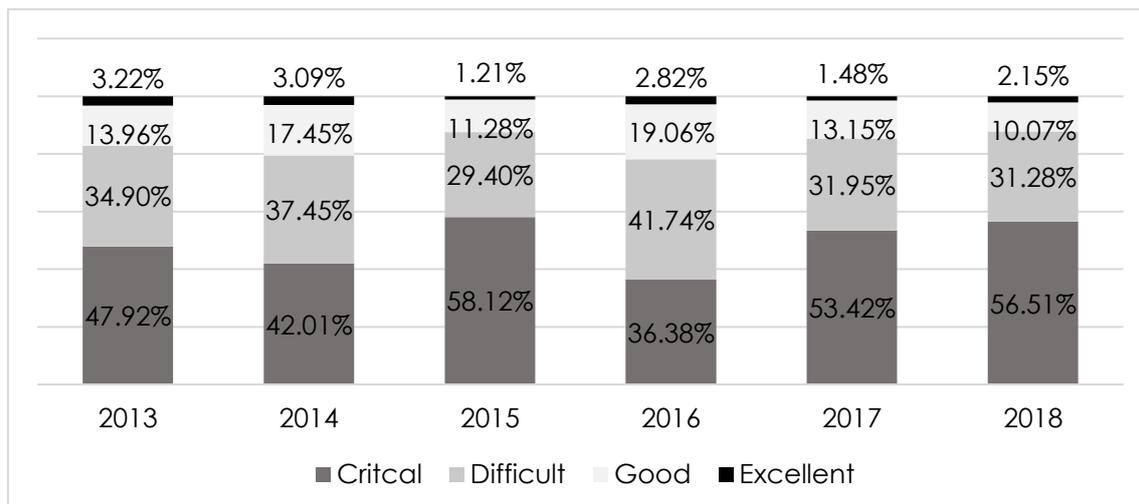


Figure 4 - Classification of municipalities based on criteria defined by Firjan
Source: Research Result.

Figure 4 reveals that, in 2013, 47.92% of the municipalities had a critical situation – IGF below 0.4. This scenario prevailed throughout the analyzed period, highlighting the years 2015 and 2018, whose percentage was almost 60% of the municipalities in the sample. Municipalities classified as excellent fiscal management – IGF above 0.8 – are the minority throughout the analyzed period, ranging from 3.22% (2013) to 2.15% (2018). We can notice that, in these years, most

municipalities in Minas have a critical or difficult fiscal situation, and in 2013, 357 municipalities were in a critical situation, and in 2018 there were 421, out of a total of 745.

The results show a reduction in the number of municipalities with good fiscal management - IGF between 0.6 and 0.8 - and excellent - above 0.8 -, from 2013 to 2018, ranging from 104 to 75 municipalities in good fiscal situation, while the same comparison in relation to excellent fiscal situation had a drop of 8 municipalities, from 24 to 16.

Table 3 shows the descriptive statistics of the variables inserted in the model.

Table 3

Descriptive statistics of model variables (2013 to 2018)

Variables	Mean	Standard Deviation	Minimum	Maximum
IFGF	0,41	0,18	0,00	1,0
Budget Effort in Education (%)	23,27	5,01	5,48	42,01
Budget Effort in Health (%)	24,26	5,76	2,92	52,16
Elderly (%)	10,80	1,08	6,5	13,73
Urbanization rate (%)	71,65	17,48	18,36	100,00
Youth (%)	20,43	1,01	17,19	25,64
Per capita GDP (R\$/Inhab.)	20.684,61	18.390,03	5.853,48	288.733,60
Voters (%)	82,25	11,46	44,11	139,93

Source: Research Result.

According to Table 3, the Budget Effort in Education presents a general mean of 23.27% and a standard deviation of 5.01%. The lowest value of 5.48% occurred in 2018, in the municipality of Grupiara, located in the Northwest and Alto Paranaíba region, with approximately 1,389 inhabitants, and the highest value of 42.01 was identified in 2015, in Silvianópolis, in the South region, with about 6,217 inhabitants. From the results, both for the municipality with minimum value and for the one with maximum value, there was no considerable difference in the IGF.

The Health Budget Effort variable obtained an overall mean of 24.26%, with a standard deviation of 5.76%. The lowest ratio between health activities expenditure and total expenditure of 2.92% was observed in 2013, in the municipality of Belo Vale, in the Central region, which has around 7,705 inhabitants, and the latter had an excellent fiscal situation (0.85), according to Firjan classification criteria. The municipality with the highest value was Japonvar, with 53.26%, in 2014, located in the North region, with 8,524 inhabitants.

The proportion of the population aged 65 years and over has a mean rate of 10.8%, with a minimum value of 6.5%, which occurred in 2014 in Nova Serrana, located in the Midwest and Southeast, with approximately 86,624 inhabitants, and the highest value of 13.73%, identified in 2018, in the city of Senador José Bento, in the South region, with only 1,545 inhabitants.

The urbanization rate presented a mean of 71.65%, with a minimum value of 18.36%, which occurred in 2014, in Frei Lagonegro, in the region of Rio doce and

Vale do Aço, whose population is around 3,400 inhabitants. The maximum index was reached by 24 municipalities, with a mean of 4 municipalities per year.

The variable referring to the young population had a mean of 20.43% and a standard deviation of 1.01%, in which the minimum value was 17.19%, found in 2018, in Juiz de Fora, located in the Mata and Vertentes region, with 564,310 inhabitants. On the other hand, the municipality of São João das Missões presented, in 2018, the highest rate, 25.64%, with a population close to 13 thousand inhabitants.

The *per capita* GDP showed a mean value of R\$20,684.61, with a standard deviation of R\$18,390.03. The lowest value presented was in 2017, by the municipality of Cedro do Abaeté, located in the Central region, with about 1,200 inhabitants, and Belo Horizonte, also in the Central region, presented the highest index, in 2014, whose population is close to 2.5 million people.

The percentage of voters had a general mean of 82.25, and a standard deviation of 11.46, and in 2013, the municipality of Serra da Saudade, located in the Midwest and Southeast regions, had the lowest value, with approximately 817 inhabitants. The maximum value was identified in 2013 in Belo Horizonte.

4.2 Effect of Municipal Characteristics on the Fiscal Situation

In order to meet the objective of analyzing the determinants of the fiscal situation, Table 4 shows the main results obtained by estimating the model specified in Equation 1.

Table 4
Results of the Dynamic Panel Data Model estimates

Variables	OLS	Fixed Effect	Systemic GMM
Fiscal Management Index $(t-1)$	0,6872*** (0,0124)	0,1251*** (0,0205)	0,3529*** (0,0374)
<i>Per capita</i> GDP	0,0000*** (0,0000)	0,0000** (0,0000)	0,0000*** (0,0000)
Elderly	-0,0081*** (0,0028)	-0,0883 ^{NS} (0,0709)	-0,0223*** (0,0051)
Youth	-0,0070*** (0,0026)	-0,0337*** (0,0122)	-0,0119*** (0,0039)
Urbanization Rate	0,0002** (0,0001)	0,0002 ^{NS} (0,0002)	0,0003** (0,0001)
Budget Effort in Education	-0,0005 ^{NS} (0,0004)	-0,0025** (0,0011)	-0,0012*** (0,0006)
Budget Effort in Health	0,0002 ^{NS} (0,0003)	-0,0019** (0,0009)	0,0002 ^{NS} (0,0005)
Voters	-0,0056** (0,0003)	-0,0012 ^{NS} (0,0009)	-0,0010*** (0,0004)

Variables	OLS	Fixed Effect	Systemic GMM
2015	-0,0899*** (0,0062)	-0,0590*** (0,0197)	-0,0782*** (0,0060)
2016	0,0512*** (0,0066)	0,0555 ^{NS} (0,0354)	0,0423*** (0,0063)
2017	-0,0912*** (0,0074)	-0,0204 ^{NS} (0,0528)	-0,0656*** (0,0084)
2018	-0,0495*** (0,0074)	0,0039 ^{NS} (0,0784)	-0,0472*** (0,0089)
Constant	0,4044*** (0,0711)	2,1786** (0,9732)	0,8222*** (0,1185)
First-order autocorrelation	-	-	<i>P-value</i> = 0,000
Second-order autocorrelation	-	-	<i>P-value</i> = 0,071
Number of municipalities	745	745	745
Number of instruments	-	-	19
Hansen's Test	-	-	<i>P-value</i> = 0,013

Notes: i. *** Significant at 1%; ** Significant at 5%; NS not significant; ii. Two-stage systemic GMM estimates, with sample correction proposed by Windmeijer (2005) for bias in standard errors; iii. 745 municipalities were considered in the period from 2013 to 2018; iv. In the estimate, time dummies were included, in which the year 2014 was the reference.

Source: Research Result.

Considering that the dynamic panel is sensitive to residual autocorrelation, we applied Arellano and Bond (1991) test of first and second order autocorrelation. Based on the results, this test rejects the null hypothesis of absence of first-order autocorrelation, but, it does not reject the hypothesis of absence of second-order autocorrelation, as desired in the estimation of the model.

The use of instruments to control the endogeneity problem also requires the performance of tests, in order to verify their validity – not being correlated with the error term. In this case, we applied the Hansen's test, in which the null hypothesis is the joint validity of the instruments. According to Table 4, the null hypothesis is not rejected, indicating that the instruments used are appropriate.

In order to confirm the consistency of the estimates by the systemic GMM, in addition to meeting the tests of absence of autocorrelation and validity of the instruments, a common way is to verify if the coefficient of the autoregressive term of the model, $IGF_{i,t-1}$ is among the parameter estimates, using the Ordinary Least Squares Method (OLS) and the Fixed Effect Method. Thus, in addition to estimating the model by the systemic GMM, by Arellano and Bover (1995) and Blundell and Bond (1998), the fiscal management function was also estimated by the OLS and Fixed Effect, as shown in Table 4. From the results, we verified that the first-order autoregressive term, estimated by the systemic GMM, is situated between the limits obtained for γ through OLS and Fixed Effects, indicating robustness of the estimated dynamic model.

In Table 4, the statistics show that most of the explanatory variables inserted in the model proved to be significant, where only the Health Budget Effort variable did not show statistical significance.

In the analysis of the model, considering the lagged dependent variable, we can notice that the coefficient of the autoregressive term was positive and

significant at 1%, keeping the other variables constant. Therefore, it is possible to identify that the current fiscal management is influenced by the decisions made by the managers in the previous year. Thus, the findings show that a one-unit increase in the current IGF has an increase of approximately 0.35 in the following year's index.

The results prove the dynamic behavior of fiscal management in municipalities, showing that a good fiscal management in the past tends to contribute to better budget management in the future. This result is due to the fact that municipal budgets are repeated from year to year, with only a small percentage variation in the amount allocated to different areas of government from one period to the next. Although there are not many studies regarding the behavior of fiscal management that consider lagged dependent variable estimation, some studies, such as those by Covre and Mattos (2016), Magalhães *et al.* (2019) and Klein and Sakurai (2015), reinforce the results of the present research, showing a positive effect of past fiscal management on the current one.

The *per capita* GDP variable, which represents a wealth proxy, showed a positive and significant coefficient at 1%, indicating that municipalities with a higher level of wealth tend to have a better fiscal situation. We can notice that an increase in municipal income tends to improve the results of public revenue and expenditure management. Magalhães *et al.* (2019) and Cruz *et al.* (2013) conducted research with a similar purpose, identifying a positive and significant effect between GDP and the fiscal behavior of municipalities.

When analyzing the percentage of the population aged 65 or over, we can notice a significant and negative effect of its coefficient on fiscal management, indicating that an increase in this portion of the population requires greater expenditure of resources from governments, especially in the health area, which tends to harm the fiscal situation of the municipality. In research on municipal fiscal management, Reis *et al.* (2018) also identified that the higher the proportion of elderly people, the worse the fiscal result.

By the coefficient of the percentage of the population under 15 years of age, we verified a significant and negative effect, and the larger the population of youth, the greater the contribution of resources in education, which may interfere with fiscal performance.

The variable urbanization rate showed a positive and significant coefficient at 5%, demonstrating that municipalities with a larger urban population tend to have a better fiscal situation. Although the evidence found by Sakurai (2014) was that a greater population concentration in the urban environment demands higher government expenditures due to the complexity of the services provided, deteriorating the situation, this result was not observed for the municipalities studied.

As for the variable Budget Effort in Education, it presented a significant and negative coefficient. The results indicate that the greater the budget effort in education, the worse the fiscal situation of the municipality. A similar result was found by Magalhães *et al.* (2019), when analyzing the influence of the relationship between expenditure in the area of education and total revenue on the fiscal situation.

A political variable inserted in the estimated model was represented by the relationship between the number of voters and the population of each municipality, which had a negative influence on the object of study. According to Covre and Mattos (2016), this variable seeks to measure how the “vote offering” affects the fiscal situation. In this sense, the greater the number of voters, the worse the fiscal situation of the municipality, since, according to the aforementioned authors, mayors have incentives to increase expenditures to obtain a greater amount of votes, in order to try to remain in power.

Considering the results obtained for the time dummies, which are useful to control the fixed effect over time and test the existence of political budget cycles in the municipalities, we noticed that these were all significant and with a negative sign, except for the dummy representative of the year 2016, the year in which the municipal elections na. The positive effect in the election year shows that there was na improvement in the fiscal situation of the municipalities. This finding is similar to some studies that corroborate the idea that in electoral years there is na improvement in fiscal management, and the manager tends to present good results trying the reelection (Covre & Mattos, 2016; Magalhães *et al.*, 2019; Reis *et al.* 2018). The result is plausible, given that the FRL establishes fiscal rules for election years, among them, there is a ban on increasing personnel expenses, as well as on the acquisition of obligations that cannot be paid in the election year itself or that have installments to be paid in the following year without cash availability.

On the other hand, the year after the election had a negative effect on the municipal fiscal situation, corroborating the results found in Figure 4, which shows na increase in municipalities in a critical situation and a decrease in those in good and excellent fiscal situation compared to the previous year. This result is corroborated by Reis *et al.* (2018), indicating that there is a greater concern with political factors than with the result of the budget execution of city halls, since greater post-election expenditures increases the probability of reelection and of electing someone from the same coalition.

5 FINAL REMARKS

The research aimed to analyze the municipal characteristics that influence the fiscal situation of the municipalities of Minas Gerais, in the period from 2013 to 2018. The analysis of the Fiscal Management Indexes allows the managers of the municipalities to use them as a management tool, with the purpose of exercising social control and inspection of public spending, which can result in excellent fiscal management.

Over the period analyzed, there was a drop in the IGF of the municipalities studied, and, according to the mean, the municipalities of Minas have a difficult fiscal situation. This drop in the IGF is mainly due to the increase in Personnel Expenses, a worsening in Investments and a decrease in Liquidity, which reduces the availability of resources to cover the Accrued Liability for the following year.

By estimating the Dynamic Panel Data Model, we could prove that the variables analyzed are capable of influencing the fiscal situation of the municipality. Based on the research findings, we can infer that the fiscal situation persists over time, evidencing that the fiscal situation of the previous year constitutes a relevant indicator of the fiscal result of the current year. We also

found, when analyzing the existence of an electoral cycle, that, in an electoral year, the manager seeks to observe the fiscal rules, but, on the other hand, in the post-election period, with the expectation of being reelected in the future, there is a trend of increased expenditures, demonstrating the need to encourage the population to monitor the management of public accounts.

According to the analyzed municipal characteristics, we verified that only the *per capita* GDP and the urbanization rate had a positive influence on the IGF, and the greater the wealth per individual, the better the quality of fiscal management, as well as a greater concentration of people in urban centers tend to improve the fiscal situation. The Budget Effort in Health did not show statistical relevance to explain the fiscal result. The other variables – percentage of the population aged 65 and over, percentage of the population under 15 years of age, Budget Effort in Education and percentage of voters – had no effect in the sense of worsening the result resulting from budget execution.

The limitation of the present study was the short period analyzed, only seven years, as the IFGF methodology was updated, presenting information available only for the period studied.

Therefore, for future work, we suggest to expand the period of analysis, expand the scope to the national level, allowing to establish a comparison between states and consider other variables, such as those related to the provision of public goods. Besides, as the state of Minas Gerais is divided into mesoregions, we suggest to separate the municipalities in this way, by mesoregions, in order to verify the behavior of the explanatory factors of the fiscal situation.

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ⁱ To obtain the growth/decrease rate, the regression was used $\ln Y = \alpha + \beta t + u_t$. Based on the trend coefficient, the rate was obtained by the equation: $[\text{antilog}(\beta) - 1] * 100$ (Gujarati & Porter, 2011).