Public Sector Financial Fragility Index: an analysis of the Brazilian federal government from 2000 to 2016

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Abstract: This article analysis the Brazilian federal government financial posture over 2000-2016 based on an adaptation of the Public Sector Financial Fragility Index. This Index is a tool for examining public finances based on the financial fragility hypothesis developed by Minsky (1986). Three analyses are conducted in the paper: one explores the budget execution series in a context that comprises all governmental cash flows, including the financial revenues and expenses; another one examines the budget execution dataset considering the cash the government borrowed as new public debt; and finally, to allow comparisons with the budget execution dataset, it analyzes the federal government financial fragility with the borrowing requirements data, which is the standard series to analyze public finances. The empirical tests show that, in its public sector borrowing requirements, the Brazilian government's performance was *Speculative* over 2000-2013, and *Ponzi* from 2014 to 2016. Moreover, applying the Index to the budget execution data, Brazil's performance throughout the period was *Speculative*. When considering the budget execution added with credit operations, Brazil was mostly *Hedge*, although artificially, because built on new debt. Finally, the Index enables analyzing the type of the fiscal policy, if pro or countercyclical and it reported that the Brazilian fiscal policy was chiefly procyclical, maintaining *Speculative* and *Ponzi* postures whilst there was GDP growth, a diverse behavior in relation to Minsky's (1986) Big Government proposition.

Key-words: Public Finances; Public Sector Financial Fragility Index; Brazilian Economy; Fiscal Policy.

Resumo: Este artigo analisa a postura fiscal do governo federal brasileiro entre 2000 e 2016, baseado em uma adaptação do Índice de Fragilidade Financeira do Setor Público. Este Índice é uma ferramenta para se examinarem as finanças públicas a partir da hipótese de fragilidade financeira desenvolvida por Minsky (1986). Três análises são realizadas: uma explora as séries da execução orçamentária, que envolvem todos fluxos orçamentários das finanças públicas, inclusive as receitas e despesas financeiras; outra análise examina a execução orçamentária incluindo a dívida nova que o governo federal aderiu a seu caixa; por fim, para permitir comparações com as séries da execução orçamentária, há um teste com os dados das necessidades de financiamento do setor público, que é o método padrão para se analisarem as finanças públicas. Os testes empíricos mostram que, nas séries de necessidade de financiamento do setor público, o governo federal foi *Especulativo* entre 2000 e 2013 e *Ponzi* 2014 e 2016. Ademais, aplicando o Índice para a execução orçamentária, o Brazil foi *Especulativo* por todo o período. Quando consideradas as operações de crédito que se tornam dívida no caixa do governo, as finanças públicas nacionais foram predominantemente *Hedge*, porém de maneira artificial, pois tal postura foi construída a partir de endividamente. Finalmente, o Índice permite que se analise o tipo de política fiscal conduzido no País, se pró ou contra-cíclico. A análise concluiu que a política fiscal brasileira foi sobretudo procíclica, mantendo-se em posições *Especulativa* ou *Ponzi* enquanto houve crescimento do PIB, um comportamento diferente daquele proposto pelo *Big Government* de Minsky (1986).

Palavras-chave: Finanças Públicas; Índice de Fragilidade Financeira do Setor Público; Economia Brasileira; Política Fiscal.

Jel Classification: E12, E60, E62.

1. Introduction

As if being in an unprecedented economic crisis since 2014 were not enough, the Brazilian economy simultaneously faces a severe fiscal crisis at all levels of government (federal, state and municipalities).[1] Despite the fact there was a set of factors causing the Brazilian crisis, such as China's New Normal and the Federal Reserve Bank and European Central Bank's quantitative easing, which have affected negatively the Brazilian exports, the fiscal deterioration from 2014 on in Brazil has, on the one hand, generated a crisis of confidence in the private sector about the future path of the public accounts, and, on the other hand, left the federal government without public resources to finance a countercyclical fiscal policy based on rising up public investments, as Keynes (1980) and Minsky (1986) strongly suggested as the basis of a fiscal policy framework.

In a context of its fiscal crisis, the Brazilian government has decided to embrace the argument of fiscal austerity, that is, public spending cuts are seen as essential for regaining economy stability and growth.[2] This argument is not a novelty. In the aftermath of the Great Financial Crisis of 2007/2008, austerity was widely proposed by the economic mainstream as the remedy to balance countries' budget deficits and stabilize increasing public debts. Chiefly in the Euro Zone countries austerity policies were largely undertaken, choking the strong role fiscal policy has to face off economic downturns (PELAGIDIES; ARESTIS, 2010).

This article aims at analyzing the fiscal position of the Brazilian federal government from 2000 to 2016.[3] By fiscal position we mean the *Hedge*, *Speculative* and *Ponzi* financial postures coined by Minsky (1975A, 1986 and 1992). Thus, a Minskyian analysis of public finances is conducted according to the Public Sector Financial Fragility Index created and developed, originally, by Ferrari Filho, Terra and Conceição (2010). The Index summarizes public revenues and expenditures flows in numerical parameters that situate the public finances in terms of the three Minsky's (1986) postures. Before going in this direction, a question arises: does it make sense to elaborate a public sector financial fragility index in accordance to Minsky's taxonomy? In our point of view, this is feasible because of three reasons.

First, as Keynes (1980) and Minsky (1986) stated, fiscal policy should operate in a countercyclical manner. Based on Keynes' (1980) capital budget or Minsky's (1986) Big Government, times of prosperity there should be public savings forming funds of public resources

[1] Information from IPEADATA (2017) shows that, between 2014 and 2016, Gross Domestic Product (GDP) fell in the order of 7.2%. In states, the fiscal crisis became dramatic, to the point that Minas Gerais, Rio de Janeiro and Rio Grande do Sul decreed financial calamity.

[2] To that end, it was submitted and approved by the Brazilian Congress a constitutional amendment named the New Fiscal Regime (NFR), whose aim is a tight fiscal consolidation. Over the coming twenty fiscal years, the law limits annual variation in non-financial expenditure to the prior year's variation of the consumer price index (IPCA).

[3] Federal government comprises the National Treasury (NT), non-financial State enterprises, the Social Security System and the Brazilian Central Bank (BCB). Though we call it Federal Government for simplicity, this entity is conventionally called Central Government in the relevant literature.

capable of financing higher public expenditures in moments of economic slump. In this sense, Minsky's postures highlight the type of fiscal policy undertaken by Economic Authorities: procyclical, when there are *Speculative* and *Ponzi* positions along with GDP growth, or countercyclical, cases in which *Hedge* postures emerge together with economic expansion.

Notwithstanding the use of public funds, countercyclical fiscal policy can also be financed through budget deficits, which is a way of mobilizing idle private resources on effective demand. As Minsky (1986) let it clear, public debt is a private wealth. Although the central bank can always guarantee public debt liquidity, once it can print money to repay public liabilities, this expedient should only be used sporadically, otherwise "lender-of-last-resort powers provide the Federal Reserve with powerful medicine, but like most powerful medicines, they can have serious side effects, one is lagged inflationary impacts of increases in liquidity due to lend-of-last-resort operations" (MINSKY, 1986, p. 56). Moreover, despite the fact that a country may not get as deep as becoming insolvent in its own currency, the fiscal policy space can be strongly reduced, and/or its operation may turn very costly when agents start doubting on the financial posture of the fiscal policy. Thus, the second reason for using Minsky's (1986) financial postures in public finances is that, if governments are to undertake a countercyclical prone-to-growth fiscal policy, they need the trust of private agents both for the financing of the public deficit that may occur and for conveying private investments along with the public ones – the desired crowding in effect.

Thereby, agents' confidence in the future stance of the fiscal policy matters and it has to inspire reliability, something that may not happen promptly, like it is exemplified by the fiscal crisis of the Latin America countries in the 1980's and 1990's and the 2011-2013 events in the Euro Zone. Governments have not always got a given trustworthy condition and if the public does not hold confidence on the fiscal situation of a government and, consequently, have no trust on its public bonds – even knowing that a central bank can ensure them at any moment – interest rates would raise to attract lenders, what worsens the fiscal situation because of greater public financial expenses, pushing the government to *Speculative* or *Ponzi* positions and limiting the countercyclical capacity of fiscal policy.

Moreover, countries whose money has international liquidity can issue money to finance countercyclical fiscal policy more easily and frequently. However, considering the asymmetrical international monetary and financial system, only few countries can print convertible currency worldwide (ANDRADE; PRATES, 2013). As a result, a very restricted number of currencies has liquidity and are a store of wealth at the international market.[4] But, diversely, a large number of countries need foreign money to settle any type of international transactions. In this context, the

[4] Eichegreen *et ali* (2007) list only the American Dollar, Euro, British Pound, the Swiss Franc and the Japanese Yen as so.

governments of these countries must build confidence in their fiscal policy if they need to borrow foreign currency on external markets – and they usually do need. Thus, the call for confidence in public accounts stands even stronger for the vast majority of countries because they do not have an 'international currency'. This is even truer in the common case in which public bonds in foreign markets are not denominated in the country's currency considering it is not accepted abroad, culminating on a kind of 'non-sovereign sovereign public debt'. This is the third reason for using Minsky to posit the public finance stance.

If it does make sense to exam public finances through Minsky theoretical framework, why is the Public Sector Financial Fragility Index (PSFFI) important to do so? It has relevant features regarding how fiscal policy has been conducted, depending on its more or less fragile financial posture. First, the Index synthesizes the behaviour of public finance flows, positing them at one of Minsky's financial postures, and so it does not focus only on stocks, as debt sustainability or debt threshold analysis does. Furthermore, the PSFFI is based on budget execution data; thereby, differently from the conventional public sector borrowing requirements, it comprises all financial revenues and expenses and not only the primary balance, the usual, but limited series that credit rate agencies follow closely to assess countries' fiscal stance (in section 3, it is further discussed the differences of the two data sets). Nevertheless, as will be originally done in this article, the Index can be calculated with the public sector borrowing requirements data, allowing comparisons between the primary and budget execution balances, displaying the role of financial flows in budget management as well as their connection to the economic cycle.

Although there are some empirical analyses using the PSFFI in the literature, which we describe later on, this article undertakes another application of it. The innovation of the article is that it applies the Index to the federal government, which no previous study has done; by reason of this, we will call the Index the Federal Government Financial Fragility Index (FGFFI). Assessing the federal government financial position is important because it is the greatest public entity and, chiefly, it is responsible for fiscal management. For instance, in Brazil the nominal federal borrowing requirements were 7.6% of GDP in 2016, against 1.25% of states and municipalities (BCB, 2017). Therefore, more detailed study of the federal government level helps better understanding the conduction of fiscal policy.

In addition, the Index will also be adapted to contemplate data on federal government borrowing requirements, going further than the pioneer study of Ferrari-Filho, Terra and Conceição (2010), which only accounted for the budget execution series. This makes it possible to compare primary balances data, which are the mainstream foundations of fiscal soundness, with that of budget execution, that includes all variables of the borrowing requirements series and more.

This article is divided into five more sections, in addition to this introduction. The next section presents Minsky's financial fragility hypothesis. The third section focuses on presenting the FGFFI. Section four describes the data used to calculate the Index, whereas the fifth section reports the empirical analyses to the Brazil's federal government fiscal positions from 2000 to 2016. Finally, the sixth section presents the main conclusions.

2. Minsky's financial fragility hypothesis

The original idea of Minsky was expressed in his financial fragility hypothesis (MINSKY, 1975A) that thereafter turned into his financial instability hypothesis (1986, 1992). It was designed to explain how economic cycles are conditioned and aggravated by financial cycles, so that "financial relations are major determinants of the behavior of a capitalist economy." (MINSKY, 1975B, p. 6)

The first step of the entrepreneur's decision-making process is the estimation of the internal rate of return of investment plans, which is the ratio between the revenues expected from sales of goods and services produced by the wished capital asset and its investment and operating costs, that is Keynes' (1964) marginal efficiency of capital. If the return rate of a capital asset is greater than the minimum acceptable rate of return offered by other assets in the economy, particularly low-risk and fixed-rent financial assets, the investment is usually made.

Moreover, funding is fundamental for investments and "there are three forms of such finance: cash and financial assets on hand, internal funds (i.e., gross profits after taxes and dividends), and external funds" (MINSKY, 1986, p. 205). Considering the third form, external funding, firms can issue equities and/or borrow money not only selling bonds, but by contracting loans from banks. Different from sharing equities, borrowing entails liabilities that firms pay back only if they collect their planned revenues, "the payment commitments determine the minimum cash flows required to satisfy the legal obligations of the unit doing the financing" (MINSKY, 1986, p. 205). However, according to Minsky (1986), nothing forecasts whether or not there will be demand for the entrepreneur's products: the revenues that are awaited to discharge financial contracts are only expected and they often change with the behavior of the economy.

From the relation between expected revenues and committed financial obligations, Minsky (1986, chapter 9) graded three possible positions for the financial fragility of a unit. Simplifying considerably his framework, the financial positions depend on the safety margin of the unit, i.e., the

distance between its revenues and financial payments.[5] Thus, a greater safety margin relies on generating positive cash flows over time.[6]

In that scenario, the *Hedge* financial posture is the safest one. This unit has a reasonable safety margin between returns and financial payments. The debts of *Hedge* units tend to diminish trough time as they do not need refinancing its liabilities. They also have enough room for cyclic oscillations in revenues to occur. Thus, "hedge financing units are those which can fulfill all of their contractual payment obligations by their cash flows" (MINSKY, 1992, p. 7).

A *Speculative* posture is the intermediate financial fragility. It means that revenues cover financial commitments only partly, and, as a result, "such units need to roll over their liabilities: (e.g. issue new debt to meet commitments on maturing debt)" (MINSKY, 1992, p. 7). Normally, a *Speculative* posture is planned to last briefly, for the time it takes to establish the demand for a new product or to cover higher financial costs resulting from an expansion plan. *Speculative* units have no safety margin in their short-term cash flow, but they bet on having it in the long-term. Owing to that, their debt increases in the short-run, though it tends, depending on the economic conditions, to stabilize in the long-term.

Lastly, the *Ponzi* posture is the one in which the unit fails to raise sufficient revenue to pay even its operating costs. This unit cannot produce safety margins by means of its yields and the only way it builds up safety margins is selling assets, that is, restructuring itself. *Ponzi* units have quickly growing debts and, consequently, higher interest payments that deteriorate their already delicate condition.

How do *Ponzi* units come about? To Minsky (1975A, 1986 and 1992) economies are inherently cyclic, alternating booms and recessions. In a boom, revenues and production are growing, capital gains increase, stocks turn over. Based on a conventional reasoning that the good current conditions will repeat in the future, entrepreneurs are encouraged to develop new business plans and to raise funding to carry them out. Meanwhile, banks' revenues also rise, and they are ready to meet entrepreneurs' loan demand. The economy thus leans into higher-risk overall stance, moving from *Hedge* to *Speculative*. However, over the course of the cycle prices rise and costs expand, leading to more restrictive monetary policy. Furthermore, units become leveraged, modifying banks' risk assessments. Credit thus becomes tighter, new investments are not made, revenues no longer grow, and *Speculative* units turn fast and involuntarily into *Ponzi* positions, intensifying the possibility of a crisis.

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[5] For a deeper debate on margins of safety see: Minsky (1986, chapter 9) and Paula and Alves Jr. (2003).

[6] To Minsky (1986), there are three types of cash flows: income, balance-sheet and portfolio. The first is in-and outflows of money that an economic unit needs for its day-by-day life. The balance sheet cash flow is the money circulating from/to units because of stocks they have on their balance sheet, both on their asset and liabilities sides. The third sort of cash flow is the portfolio, in which money goes around because of the trade of financial and capital assets. To see more, Fazzari *et al* (2008) uses Minsky's cash flow to debate economic cycles.

Although Minsky theorized the financial fragility model regarding the behavior of firms and banks, he had also denoted that it could be expanded to other units. As Minsky (1986, p. 221) stated,

> "to analyze how financial commitments affect the economy it is necessary to look at economic units in terms of their cash flows. The cash flow approach looks at all economic units – be they households, corporations, state and municipal governments, or even national governments – as if they were banks".

Finally, what does a Minskyan analysis mean to the operation of the fiscal policy? Should public finances pursue *Hedge* posture over time? Minsky (1986 and 1992) argued that, in time of crisis, the Big Government should act to stabilize the economy, as well as Keynes (1980) extensively stated the importance of countercyclical fiscal policy, by means of what he called the capital budget, to avoid economic slumps.

A countercyclical conduction of fiscal policy requires that, in Minsky's words, "in truth the government fiscal posture must be in surplus from time to time" (MINSKY, 1986, p. 56). It is expected that the federal government financial fragility oscillates over time, standing at *Hedge* positions when the private initiative is investing and pushing the economy up, and going to more financially fragile posture when signals of crisis pop up – this is the nature of a countercyclical fiscal policy.

Three reasons explain why a *Hedge* public finance is important when the economy is in a normal or boom trend: (i) it helps building funds of resources for times of crisis, at which public revenues go down and liquidity preference prevails; (ii) being *Hedge* for some periods increases people's confidence on the public finances, making them follow the intentions of the government, a key condition for a successful countercyclical fiscal policy; and (iii) as Minsky (1986) alerted, being *Hedge* from time to time avoids the collateral effects that an incessant Big Government can cause, as inflation or pressures over the long-term interest rate when a *Speculative* or *Ponzi* government borrows too much.

3. The Federal Government Financial Fragility Index (FGFFI)

There are some works adapting Minsky to empirical analysis in the Post-Keynesian literature, both in microeconomics and macroeconomics. Torres Filho *et ali* (2017) uses Minsky to check the financial fragility of the electricity distribution companies in Brazil and Tymoigne (2010) creates a model to show the *Ponzi* situation of the American financial system in the 2000s whereas Nishi (2016) uses econometric data to posit non-financial sectors in the Japanese economy into Minsky's financial postures. Paula and Alves Jr. (2000) adapted Minsky's financial postures to Brazil's external financial fragility in the 1990s and Galbraith (2008) remodeled Minsky's ideas to

qualitative compare Nation-States. Lopes (2009) uses Minsky's (1986) *Ponzi* idea to exam the burden that high real interest rates impose to fiscal policy in Brazil. Ferrari-Filho, Terra and Conceição (2010) created the PSFFI to analyze the financial fragility of the Brazilian public sector.

Although the PSFFI was created and applied to Brazil, it is based on the major standard public finance accounting. Thereby, it is neither restricted to Brazil nor to only one level of the public sector. Based on the PSFFI, Argitis and Nikoalidi (2014) and Nikolaidi (2014) presented an analysis of Greece, a recent notorious case of fiscal insolvency. Relying on the PSFFI, they created a further financial posture to adapt the Index to the deepness of the Greek crisis, the *Ultra Ponzi*. Looking into other Brazilian scenarios, Carvalho (2016) replicated the original Index for the Brazilian public sector updating the 2000-2008 years to the 2008-2012 period. Picolotto (2016) used the Index to analyze the subnational finances of the Brazilian state of Rio Grande do Sul, which has been facing one of the most severe fiscal crisis in the country. Padrón (2015) applied the Index to analyzing the overall set of Brazilian states from 1995 to 2013.

Following Ferrari-Filho, Terra and Conceição (2010) model, the PSFFI adapted to the federal government only considers the flows of public revenues and expenditures, without taking stock variables into account, such as the level of the public debt, because the latter results from the behavior of the flows analyzed by the FGFFI. Expenses are of two kinds, current and financial: the first include all those that are neither amortizations nor interest payments as they are the second type of expenditures, the financial ones. In turn, public revenues also arise from both current, mostly taxes, and financial, which comes from various sources.

Starting with the public revenues, the total revenue R_{fg} is given by the sum of the current R_{cfg}, and the financial revenues R_{ffg}. Hereafter, the subscript *fg* holds for federal government, *c* for current and *f* for financial. Thence,

$R_{fg} = R_{cfg} + R_{ffg}$ (1).

Similarly, E_{fg} is the federal government total expenses, E_{cfg} the current and E_{ffg} the financial expenses. In light of Minsky (1986), Ferrari-Filho, Terra and Conceição (2010) segregate E_{ffg} into amortizations (A_{fg}) and nominal interest payments (i_{fg}). Thereby, it is possible to measure the influence of financial commitments on the government cash flow. Accordingly, E_{fg} and E_{ffg} are given by:

$E_{fg} = E_{cfg} + E_{ffg}$ (2)

and

$E_{ffg} = A_{fg} + i_{fg}$ (3).

Considering a balanced budget situation, from (1) and (2), $R_{fg} = E_{fg}$. Therefore,

$R_{cfg} + R_{ffg} = E_{cfg} + E_{ffg}$ (4).

To be consistent with Minsky's less fragile financial posture, *Hedge*, R_{fg} must first cover E_{cfg}, the expenses generated by the State as the provider of basic public services, without incurring in any borrowing for that supply *a priori*. After defraying its non-financial costs, the federal government redeems its A_{fg} and i_{fg} expenses. Subsequently, from (4):

$(R_{cfg} + R_{ffg}) - E_{cfg} = E_{ffg}$ (4.1).

In order to achieve a budget position in which there is no need to incur in debt financing, the difference expressed on the left side of (4.1) has to be exactly equal to E_{ffg}. Hence, both sides of equation (4.1) are multiplied by $\frac{1}{E_{ffg}}$, reaching

$\frac{(R_{cfg}+R_{ffg})-E_{cfg}}{E_{ffg}} = 1$ (5).

Substituting (3) into (5),

$\frac{(R_{cfg}+R_{ffg})-E_{cfg}}{A_{fg}+i_{fg}} = 1$ (6).

Equation (6) is the FGFFI parameterized for a balanced cash flow. This equation can be derived to stipulate the following 'matrix' of financial postures:

$$\begin{cases} \text{Case (i)} \\ \dfrac{(R_{cfg} + R_{ffg}) - E_{cfg}}{A_{fg} + i_{fg}} > 1: \textit{Hedge Posture} \\ \text{Case (ii)} \\ 0 < \dfrac{(R_{cfg} + R_{ffg}) - E_{cfg}}{A_{fg} + i_{fg}} < 1: \textit{Speculative Posture} \\ \text{Case (iii)} \\ \dfrac{(R_{cfg} + R_{ffg}) - E_{cfg}}{A_{fg} + i_{fg}} < 0: \textit{Ponzi Posture} \end{cases}$$

In case (i), a Hedge posture, the safety margin expressed in $(R_{cfg} + R_{ffg}) - E_{cfg}$ is greater than $A_{fg} + i_{fg}$, so that the federal government has a cash flow leftover sufficient to cover its financial expenditures. In case (ii), the *Speculative* posture, financial expenses are only partly covered, and so the difference between R_{fg} and E_{cfg} is positive, but smaller than $A_{fg} + i_{fg}$. As a result, a part of E_{ffg} needs to be debt financed in the short-term. Lastly, in case (iii), the *Ponzi* posture, the federal government fails to cover its current expenses, resulting in mounting public debt from both the total refinancing of A_{fg} and i_{fg} and partly from E_{cfg}. Case (iii) also means greater likelihood of crisis in public finances, as the federal government has no funds and can become

unable to contract new loans and reschedule mature contracts, making it harder to stabilize the public debt and to undertake a countercyclical fiscal policy.

After presenting the FGFFI, the next step is to adapt it to calculate the federal government financial postures using the borrowing requirements series, turning it possible to compare the mainstream way of analyzing public finances and the one used by the FGFFI. For that purpose, the 'matrix' of financial postures for cases (i) to (iii) and the variables specified for equations (1) to (6) remain the same. The necessary changes have to do exclusively with removing R_{ffg} and A_{fg} of equation (6):

$$\frac{(R_{cfg} - E_{cfg})}{i_{fg}} = 1 \qquad (6.1),$$

so that the difference between R_{cfg} and E_{fg} is the primary balance and i_{fg} is the nominal interest payments.

The differences between the two series that are used in calculating the FGFFI can be seen comparing (6) and (6.1). Equation (6) contemplates all the accounts that enter into the public budget and, therefore, comprises a larger set of revenues and expenses than (6.1). Accordingly, the main differences are that (6) addresses all items in the public accounts. In turn, (6.1) refers, in the difference between R_{cfg} and E_{cfg}, to primary accounts, excluding R_{ffg} and A_{fg} flows.

Before continuing, it is important to present some comments about the data methodology. They are internationally set, calculated in most of the countries and both deal with public accounts, however through different lens: the public sector borrowing requirement is a below the line methodology that reports the fiscal net debt variation, (which is equal to the nominal balance). So, it intends to show the efforts a government must take to stabilize its debt (i.e., to equilibrate the nominal balance) by using no other means than what it ideally should 'count on', its tax gathering, the main and most regular source of governmental income. That is why the borrowing requirements data does not account for financial revenues in its primary balance, they are not seen as recurrent revenues. Amortizations are also disregarded because they are considered an update of the debt value, a patrimonial change that comes out from the confront between the primary balance and the interest payments. Lastly, the latter is in both series considered a current spending, and not a financial one.

The budget execution data is part of the national public sector accounting balance sheet. It embraces all kinds of public sector flows and stocks, including real assets (like state owned companies and real estate) and financial assets; that is, it expresses the real dimension of the state. Because of that, the budget execution data includes all the State's revenues and expenditures (in MINSKY's (1986) terms, portfolio and balance sheet cash flows).

An analysis using both datasets has a broader picture of the fiscal stance of an economy. In this general portrait, it is possible to observe both flows, the more regular primary balance, and the financial balance, whose magnitude may broadly vary from country to country. Also, it is possible to measure the relevance of both to the financial position occupied by the federal government along with the economic cycle. At the policy level this wider analysis is relevant too. For instance, the greater and more constant are the differences in the postures caused by financial revenues over time, the larger is the room for using them to fund public policies. Still, if some economy reaches fragile postures because of amortization payments, something that the Index does not report by means of the public sector borrowing requirements, but through the budget execution data it does, fiscal policy can set measures to offset the higher financial expenditures.[7]

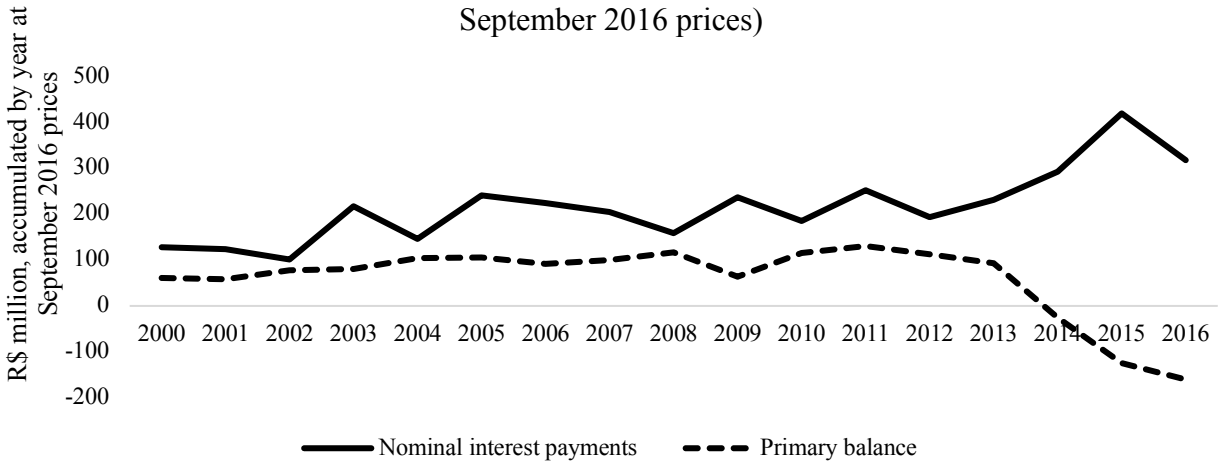
4. Descriptive data analysis

The data of the empirical analysis are the borrowing requirements calculated by the BCB, which offer data on the primary balance and nominal interest accumulated until December of each year in the period 2000-2016. The source of the data is IPEADATA (2017). The budget execution data from 2000 to 2012 were taken from the Consolidated Public Accounts, and over 2013-2015, from the National Public Sector Accounting Balance Sheet, both published by the NT (2012, 2014A, 2015A and 2016A). Specific data on public debt amortization from 2013 to 2015 were drawn from the Summary Central Government Budget Execution Reports (NT, 2013, 2014B and 2015B). Revenues were calculated on a cash basis and expenses on an accrual basis. Data were deflated using the IPCA to September 2016 prices for borrowing requirements, and to December 2015 prices for budget execution. The period starting year, 2000, is due to the availability of budget execution data, which is also the reason for a year-end difference between the two datasets.

Graph 1 shows government borrowing requirements. Over all period interest payments grew, although the gradient becomes steeper from 2013 onwards, because of the deteriorating fiscal conditions in Brazil, which are expressed in the primary balance from 2014 on. From 2000 to 2013 the federal government engaged in primary saving, but after 2014 the fiscal situation decayed rapidly, leading to worse risk assessing of buyers of federal bonds and, as a result, there was greater interest payment over 2013-2016. In addition, the BCB raised its basic interest rate (Selic) to mitigate inflation, that reached 10.5% in 2015, whilst there was also an increase in exchange rate swap disbursements that accounted for just over one third of the variation of interest payments in 2015 (BCB, 2017).

[7] Specific differences happen from country to country. In the Brazilian case, for example, there are the following relevant peculiarities: the financial accounts are not nominated *financial*, but capital revenues and expenses. Moreover, credit operations are financial revenue coming from public debt and it can finance current expenses only to the limit expressed by the Constitutional 'golden rule', that prohibits borrowings to exceed the total volume of capital expenses.

Graph 1 - Federal government borrowing requirements: primary balance and nominal interest rates, 2000-2016 (R$ million, accumulated by year at September 2016 prices)

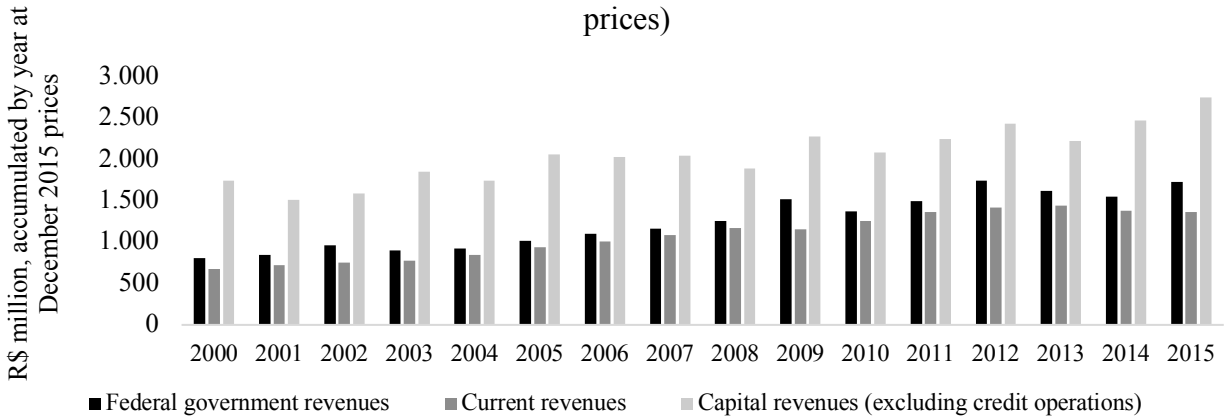


Source: produced by the authors from IPEADATA (2017).
Note: primary borrowing requirements calculated as primary balance. A negative balance is deficit and positive is surplus.

Regarding the budget execution data, Graph 2 reports the overall revenue of the federal government, deducting credit operations, which are borrowed money and thus not proper public revenues. Graph 2 displays that the revenues were growing throughout the period, except for 2009, 2013, 2014 and 2015. Current receipts also went up over time, apart from 2009, 2013 and 2014. The financial income of the government, discounted from credit operations, is modest over the period, although not so in 2002, 2009 and 2015, years when the exchange rate devaluation afforded the BCB better financial returns because of its positive effects on the value of the Brazilian international reserves, whose gains are transferred to the NT as financial income.[8]

[8] Since 2008, there has been legislation regulating relations between the BCB and the NT about the BCB's losses and gains regarding oscillations in the value of forex reserves, the cost of purchasing and of maintaining them – what is known as exchange equalization. Under those regulations, any gains transferred to the NT, which are R_{ffg}, can only be used to amortize federal public debt. For more details, see Brasil (2008), Higa and Afonso (2009) and Leister and Medeiros (2012).

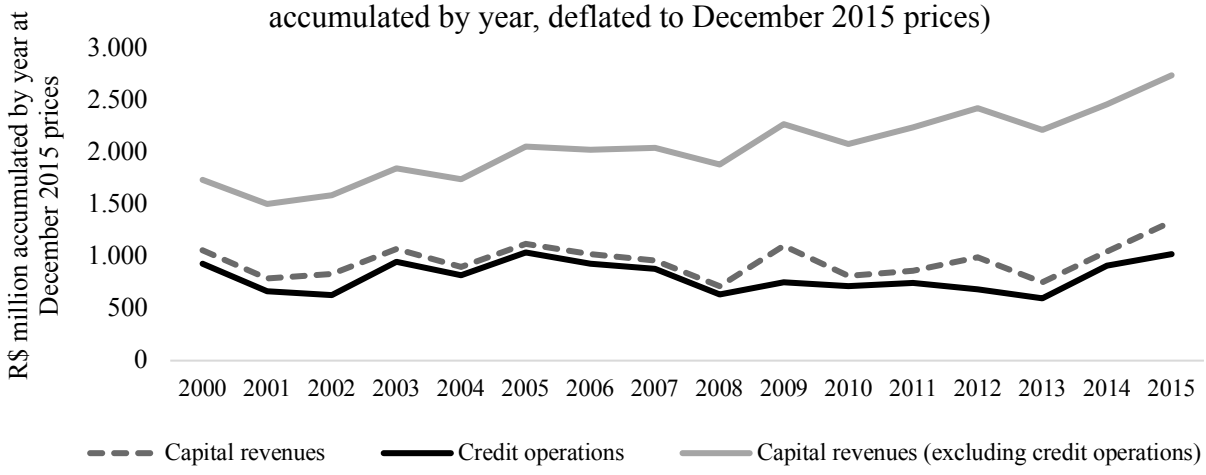
Graph 2 - Federal government current and capital revenues (excluding credit operations), 2000 to 2015 (R$ billion, accumulated by year at December 2015 prices)



Source: produced by the authors from NT (2012, 2014A, 2015A and 2016A).
Note: other sources of revenue are not separately in the Graph, because they involve small amounts. They represent a null balance from 2000 to 2008 and, in R$ billion accumulated by year at December 2015 prices, equal R$ 16.000 in 2009, R$ 17.000 in 2010, R$ 19.000 in 2011, R$ 22.000 in 2012, R$ 31.000 in 2013, R$ 42.000 in 2014 and R$ 48.000 in 2015. Nonetheless, these amounts form part of R_{fg} on the Graph.

To better represent all the possibilities of financial revenues, Graph 3 shows the trajectory of credit operations, which are debt contracted by the federal government, specifically for two purposes. On the one hand, the aim of almost all credit operations it to rollover public debt at maturity. On the other hand, the portion that exceeds such refinancing is used by the federal government to cover its current expenses, always in compliance with the constitutional provision that credit operations must not be greater than overall capital expenses.[9] It is clear from Graph 3 that financial revenues accompany credit operations, except when the former's expansion was due to exchange rate devaluation, 2002, 2009, 2012 and 2015. Worth noticing the intensity of credit operations between 2014 and 2015, as the primary balance deteriorated, and interest payments increased (Graph 1), while current revenues stagnated (Graph 2).

Graph 3 - Revenues from capital and credit operations, 2000-2015 (R$ billion, accumulated by year, deflated to December 2015 prices)

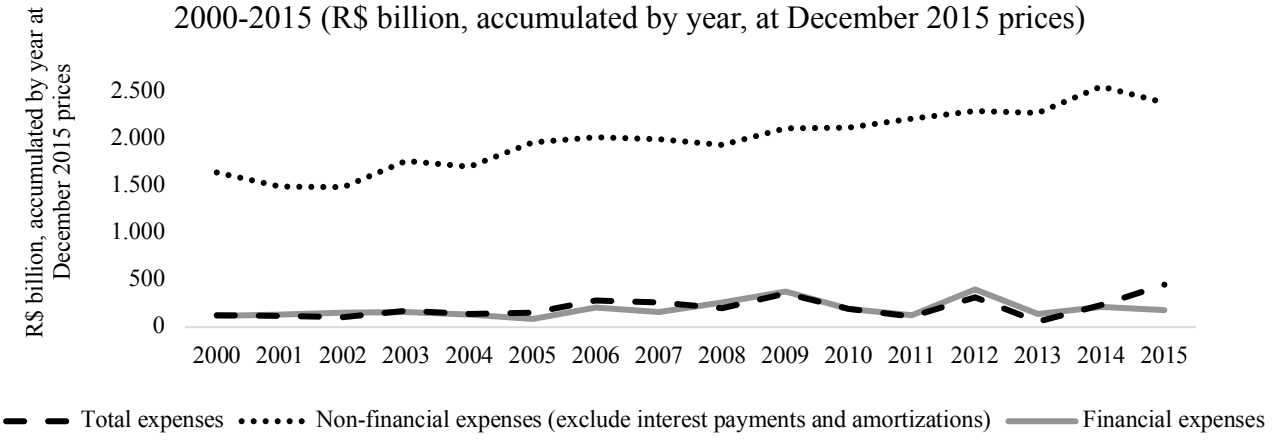


Source: produced by the authors from NT (2012, 2014A, 2015A and 2016A).

[9] For further details, see Brasil (1988).

Graph 4 reports budget execution expenses in three categories: overall expenditures, including debt refinancing, current non-financial outgoings, which are total expenses less the financial (amortization and interest) ones. Graph 4 illustrates the constant growth of current and overall expenses, and the continuous, although slower, expansion of financial expenses. It is noticeable both the ongoing rising trend of the total expenses, particularly caused by the current outgoings, whose level modifies continuously over 2000-2015, and the change of financial expenses level after 2005. In 2006, interest payments explain the shock on the financial expenditure curve, though in the other peak years, 2009 and 2012, amortizations determine the series' behavior. After 2009, financial outgoings also have a higher level because of the greater financial expenses to outlay the loans that capitalized Brazil's national development bank (BNDES), whose NT subsidized by R$ 220 billion from 2009 to 2014 (CASTRO; TERRA, 2016).

Graph 4 - Federal government expenses: total, non-financial and financial, 2000-2015 (R$ billion, accumulated by year, at December 2015 prices)



Source: produced by the authors from NT (2012, 2013, 2014A, 2014B, 2015A, 2015A and 2016A).
Note: Total expenses are different from the sum of non-financial and financial expenses. Total expenses embrace debt refinancing; however, it is not an effective disbursement of cash, but only debt rollover inscribed as an expenditure. Thereby, debt rollover is withdrawn from non-financial and financial expenses series.

Another important item concerns the variation rate of total revenues, current and financial expenditures, amortization and interest payments, from which the dynamics of the variables of the FGFFI can be seen clearer. Table 1 shows these data. Note that current expenditures are the only flow that increases constantly, apart from 2014 to 2015, because of the 2015 attempt of implementation austerity policies for fiscal consolidation in Brazil. Moreover, this variable has the smallest standard deviation of all series whereas all data display considerable standard deviation, so reporting volatility in their trends. Two further aspects are worth noticing. First, financial expenditures have especially high values. Second, the average expansion of total revenues is smaller than that of the current and financial expenses, meaning that the former grew at a slower pace than the latter and signaling evidences of safety margin absence.

Table 1 – Variation of total revenues, current expenditures, interest and amortization, 2000-2015 (% annual variation)

Year	R_{fg}	E_{cfg}	i_{fg}	A_{fg}	$E_{ffg} = (i_{fg}$ and $A_{fg})$
2000/2001	4.27	10.14	26.31	15.59	17.10
2001/2002	14.24	1.40	-7.02	12.17	2.66
2002/2003	-6.14	1.15	8.79	5.54	6.53
2003/2004	2.46	6.20	5.20	-16.35	-7.07
2004/2005	10.04	11.28	14.29	-34.92	-10.92
2005/2006	8.06	8.96	63.12	138.06	47.27
2006/2007	6.01	9.45	-11.13	-23.14	-19.72
2007/2008	7.48	8.03	-25.84	66.51	10.65
2008/2009	21.28	7.87	8.41	41.25	22.11
2009/2010	-9.94	5.97	-7.24	-47.37	-51.74
2010/2011	9.49	4.69	0.57	-34.58	-22.28
2011/2012	16.42	5.79	-2.68	210.09	46.90
2012/2013	-7.09	3.47	15.72	-65.44	-70.74
2013/2014	-4.23	5.14	-3.17	53.07	16.81
2014/2015	10.99	-3.49	10.39	-14.24	-2.72
Mean	5.56	5.74	6.38	20.42	-1.01
Standard Deviation	8.51	3.67	18.89	69.03	29.99

Source: produced by the authors from NT (2012, 2013, 2014A, 2014B, 2015A, 2015B and 2016A).

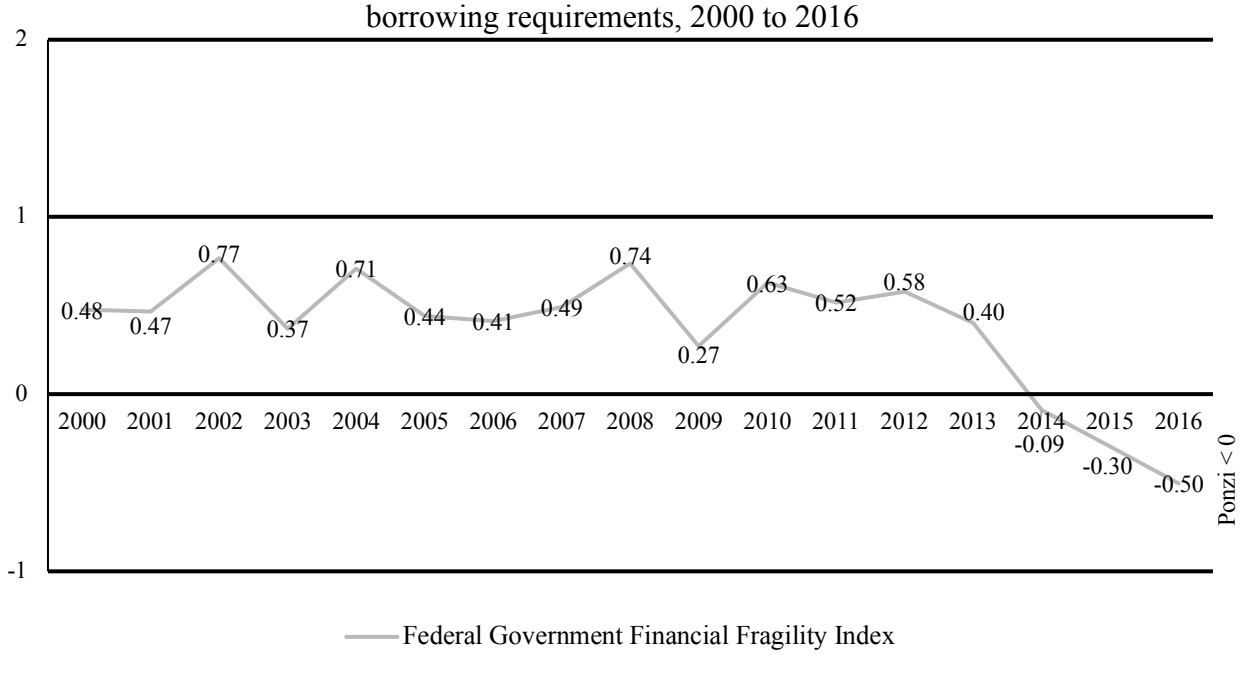
5. An analysis of Brazilian federal government public finances through the FGFFI

This section comprises three applications of the FGFFI: (i) the first using the federal government borrowing requirements (FGFFI 1), (ii) the second based on the budget execution data, but excluding credit operations completely (FGFFI 2) and (iii) the third adding to financial revenues the credit operations discounted from debt refinancing, a variable that works as a proxy for the part of the public debt that entered the federal government cash flow (FGFFG 3).

Graph 5 shows the FGFFI based on the federal government borrowing requirements. The federal government was *Speculative* over 2000-2013; thereby, it covered its current expenses, but not all of financial expenses. Given the lack of safety margin, when current revenues declined from 2012 onwards the federal government endogenously became *Ponzi* with the worst financial positions in 2015 (-0.30) and 2016 (-0.50) – the years of the Brazilian economic crisis. This is a rather weak fiscal situation in which the federal government was left with no choice but to borrow in order to finance current expenditures, a fact displayed on Graph 3 through the growing credit operations from 2013 onwards. In light of a *Ponzi* federal government, agents' confidence on the public finances declined and, as a result, lenders asked higher premiums on public debt purchases: interest payments rose from 3.5% of the GDP in December 2013 to 7.22% in January 2016 whereas the NT bonds were paying 15.71% per year in January 2016 against 10.69% in December 2013, reporting the agents' greater risk perception (IPEADATA, 2017).[10]

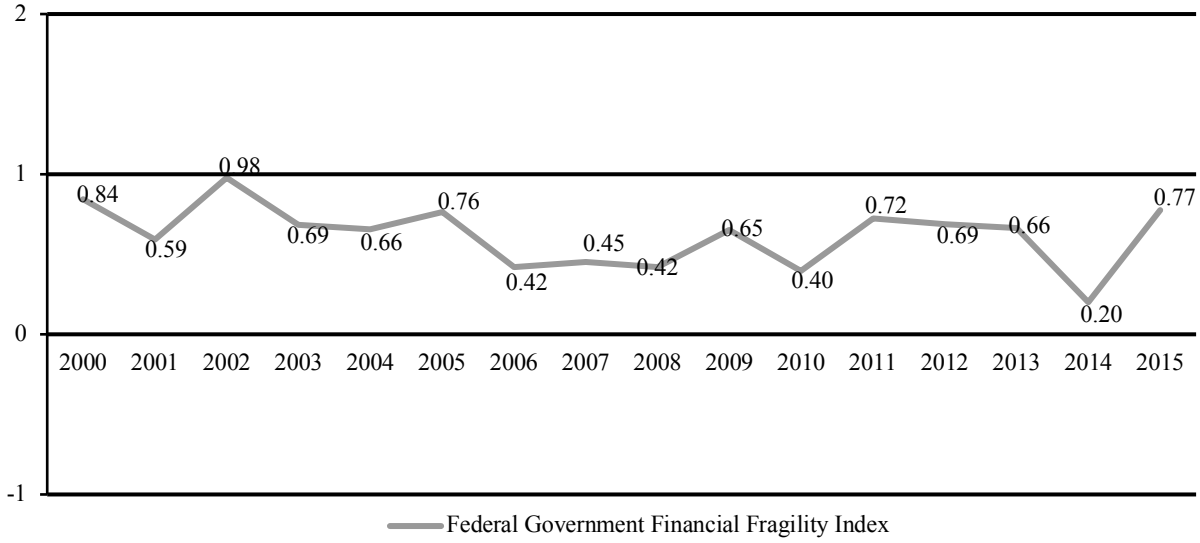
[10] Lopes (2009), using Minsky's (1986) *Ponzi* posture to highlight the burden of interest rate payments but without using any model that creates numerical parameters to define what a *Ponzi* posture was, denotes how financial expenses constrained fiscal policy in Brazil over the 1990's corroborating our argument that more fragile postures bring together higher interest rate and less policy space for fiscal measures. Moreover, it is worth noticing that the 2015 and 2016

Graph 5 - Financial fragility index of the federal government, based on borrowing requirements, 2000 to 2016



Graph 6 reports the FGFFI calculated with the budget execution data so that it includes both financial revenues and amortizations. This FGFFI displays a *Speculative* federal government throughout the period, diverse from the previous outcome, in which the federal government was *Ponzi* over 2014-2016. Note that not only the postures in the series' best years, 2000 (0.84) and 2002 (0.98), were almost *Hedge*, but also that 2015 is a *Speculative* year, displaying the importance of the financial revenues to fiscal policy, something not seen in the FGFFI calculated with the borrowing requirements.

Graph 6 - Federal government fragility index (without credit operations), 2000 to 2015

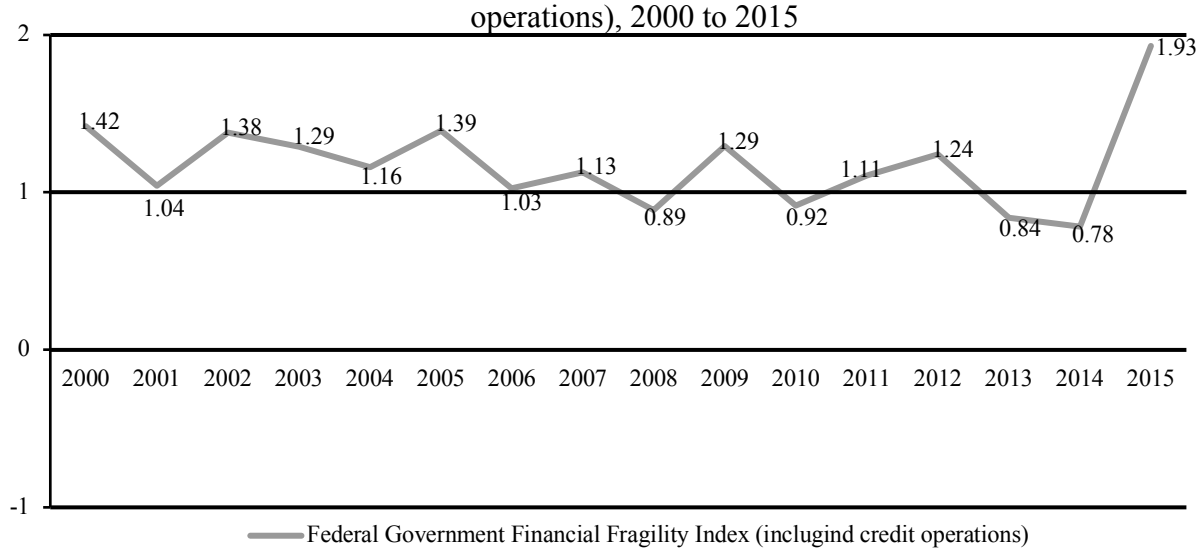


borrowing requirements FGFFI report Brazil's financial fragility equivalent to the Greek one between 1994 and 2002, calculated by Agirtis and Nikolaidi (2014).

Source: produced by the authors from NT (2012, 2013, 2014A, 2014B, 2015A, 2015B and 2016A).

Graph 7 shows the FGFFI considering the new debt added to financial revenues. In this case, the FGFFI reports a *Hedge* federal government almost all the period, except for 2008, 2010, 2013 and 2014. The financial posture of 2014 is worth highlighting as it clearly presents the federal government descending into its fiscal crisis. Then, there was the greatest public borrowing of the period, responding to falling revenues and increasing interest payments and current expenses. Notwithstanding the sizable volume of new debt, the Brazilian federal government was still *Speculative* in 2014 with the worst financial fragility over 2000-2015 in this sort of FGFFI calculation. The FGFFI so displays the deep of the fiscal crisis in Brazil.

Graph 7 - Federal government financial fragility index (with credit operations), 2000 to 2015



Source: produced by the authors from NT (2012, 2013, 2014A, 2014B, 2015A, 2015B and 2016A).
Note: credit operations calculated by subtracting total credit operations from the amounts of debt refinancing. Thus, it is the new debt contracted by the federal government in excess of the amount expended on debt rollover.

FGFFI also allows to categorize the fiscal policy undertaken in Brazil as pro, or countercyclical, the latter being the manner Minsky (1986) and Keynes (1980) prescribed it should be. Table 2 reports the fiscal policy type in relation to the FGFFI in all its three calculations. The FGFFI was mostly procyclical. So, the federal government was *Speculative*, spending more than saving, when the GDP was increasing. In 2009, the year the Great Financial Crisis affected Brazil, the fiscal policy was countercyclical. Moreover, after 2014 all three FGFFI reports countercyclical fiscal policy. Hence, even in face of austerity measures, Brazil was unable to reach a true fiscal consolidation. The reason for that is to be found on the strength of the country's recession: revenues were slumping faster than spending cuts, causing a kind of 'forced countercyclical fiscal policy'. Lastly, in 2009 and 2015 we call the fiscal policy type *indebting*. In both years, the FGFFI 3, considering credit operations, goes *Hedge* whereas the other two are *Speculative* or *Ponzi* and so

countercyclical. This puzzle let it clear that the fiscal policy is undertaking a countercyclical fiscal policy not owing to funds raised during economic growth periods but to borrowing, that is we term these years *indebting*.

Table 2 – Brazilian fiscal policy type 2000-2016 (GDP % annual variation)

Year	Δ% GDP	FGFFI (1)	FGFFI (1) fiscal policy type	FGFFI (2)	FGFFI (2) fiscal policy type	FGFFI 3	FGFFI (3) fiscal policy type
2000	4.39	*Speculative*	Procyclical	*Speculative*	Procyclical	*Hedge*	Countercyclical
2001	1.39						
2002	3.05						
2003	1.14						
2004	5.76						
2005	3.2						
2006	3.96						
2007	6.07						
2008	5.09					*Speculative*	Procyclical
2009	-0.13		Countercyclical		Countercyclical	*Hedge*	Indebting
2010	7.53		Procyclical		Procyclical	*Speculative*	Procyclical
2011	3.97					Hedge	Countercyclical
2012	1.92						
2013	3.0					Speculative	Procyclical
2014	0.5	*Ponzi*	Countercyclical		Countercyclical	Speculative	Countercyclical
2015	-3.55					Hedge	Indebting
2016	-3.46						

Source: produced by the authors from NT (2012, 2013, 2014A, 2014B, 2015A, 2015B and 2016A) and BCB (2018).

Finally, the analysis of all three FGFFI enables inferences on Brazil's fiscal crisis. The 2014-2016 dip of the FGFFI both with borrowing requirements and budget execution without credit operations data meant that the federal government was unable to build up safety margins to cover the its expenditures sustainably. As a result, on the one hand, when the first symptoms of the recessive cycle began in 2014, in the borrowing requirements analysis the federal government weakened fast from *Speculative* to *Ponzi*. In the budget execution analysis, the federal government financial posture also reached its worst *Speculative* level in 2014, both considering the credit operations (0.20) and disregarding them (0.78). Minsky (1986) explained that the financial fragility characteristically intensifies cyclically, exactly what the FGFFI shows in the period after 2013.

On the other hand, borrowing was constant over the period, which is typical for a *Speculative* posture, because without safety margins, financial expenditures have to be refinanced. As shown above, although credit operations oscillated, they were positive throughout the period, to the point that, when included in the FGFFI calculation, the federal government posture is chiefly *Hedge*, albeit artificially because funded by borrowings. Also, were it not for the financial revenues, Brazil's financial fragility would be even greater, as the difference between the FGFFI calculated with the borrowing requirements and the one using the budget execution data reported.

In addition to debt, therefore, the federal government needed financial revenues to manage its public finances as a whole. In the case of Brazil, the federal government gained from exchange devaluations, mainly in 2002 and 2015, but these financial revenues are not under the control of the Economic Authorities, but they are volatile and when depending on them, the Brazilian fiscal policy

could have become *Ponzi* quickly. In the middle of its 2015 fiscal crisis, Brazil had to count on luck to gather financial revenues from exchange rate devaluation, otherwise it would have needed even more credit operations what would have brought higher financial charges.

6. Conclusion

Three analyses of the Brazilian federal government financial fragility were undertaken using the FGFFI. The models based on both borrowing requirements and budget execution showed that the federal government, by far the greatest and most substantial entity in public finances and responsible for fiscal policy, assumed a fragile financial posture throughout the research period. To judge from its borrowing requirements, it was *Speculative* from 2000 to 2013 and *Ponzi* from 2014 onwards. Regarding the FGFFI calculated with budget execution data, it was *Speculative* the whole period. In the third model, which accounted for the debt that entered the government cash flow, Brazilian fiscal policy was mostly *Hedge*, although this was an artificial less fragile posture, given that credit operations made the federal government's positive margin of safety.

The factors influencing FGFFI show that all the variables are significant in explaining the federal government financial fragility. Current expenses grew steadily and at a higher mean rate than total revenues that, in turn, are quite sensitive to the economic cycle – just as Minsky (1986 and 1992) argued extensively. Financial expenses are rather volatile, and this intensifies the federal government fragility, particularly at moments of crisis.

Also, 2014 was emblematic to the federal government financial fragility. The FGFFI indicates a rapidly attained *Ponzi* posture in 2014, even though 2013 was not at odds with the other study years. That is a clear expression of Minsky's (1986) financial fragility. Although the federal government does not closure as a firm, its fiscal policy space to push up the economy, or to stabilize it during a recession, disappears when it is *Ponzi* and it may quickly lose agents' confidence, as happened in Brazil in 2015-2016.

In addition, the FGFFI derived from budget execution data shows the importance of financial revenues to sustaining less fragile financial postures over 2000-2015. The same appeared when analyzing the impacts of borrowing on the financial posture taken by the federal government: at *Speculative* postures, it needed to issue debt continuously. No less important, credit operations expanded during all period, which is an explanatory factor for Brazil's gross debt having grown so worryingly, particularly after 2013 – it went from 51.1% of the GDP in December 2013 to 70.0% in December 2016 (BCB, 2018). This is precisely the outcome of the worse Brazilian federal government financial fragility from 2013 onwards, in all three FGFFI.

The last analysis that emerged from the FGFFI was related to the type of fiscal policy Brazil engaged in, pro or countercyclical. Differently from the Post Keynesian prescription, public

finances in Brazil was essentially procyclical, the greater the GDP increased, the more fragile was its financial posture. As so, the Brazilian fiscal policy has not built public funds to finance expansionary policies in recessive moments. In 2015 the FGFFI appointed a countercyclical fiscal policy, but it was done by means of issuing public debt at an interest of more than 15% per year, the price that agents' confidence charged to lend to a untrustworthy non-*Hedge* federal government.

Finally, from the FGFFI some words about the Brazilian austerity plan, the 2016 NFR, can be said. Austerity is problematic by its very nature, but the one implemented in Brazil, an expenditure cap rule, is even more questionable for four reasons. First, it does not address total revenues, in that it does not implement mechanisms either to smooth its cycles or minimally adjust the dynamics of current expenses to total revenues. Second, it makes no provision for financial expenses. Third, it constrains the fiscal policy of the next five governments as the constitutional amendment was approved to last for twenty years. Fourth, it prevents any countercyclical use of current expenses, particularly during crisis. This will only be possible in the wake of NFR by reducing expenditures in other areas of the federal budget.

NFR seems to consider both the total revenues and financial expenses as givens, as long as it just limits current outgoings. Yet, the former two accounts respond elastically to the economic cycle and can undermine the federal government finances. Brazil needs a fiscal regime that controls not only non-financial expenditures, but all the factors that condition the financial fragility of the federal government, that is, revenues as a whole, amortizations and interest payments. As this was not the case with the NFR, what it has ensued is a new mechanism for controlling the expansion of current outgoings, and not in fact a new fiscal regime.

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