

Does the accounting framework affect the operational capacity of the Central Bank? Lessons from the Brazilian experience*†

João Pedro Scalco Macalós‡

Abstract

This paper analyzes how the accounting framework can affect the operational capacity of the central bank. The separation of realized and unrealized results, for instance, can create inflated revaluation buffers next to persistent losses in developing economies. The consolidation and transfer of these results to the government, on the other hand, gives flexibility to intervene in foreign exchange markets but might lead to undesired monetized financing. By analyzing the Brazilian experience, we show that the law 13,820 synthesizes these dilemmas: it provides flexibility to the central bank without allowing the transfer of unrealized gains to the government. Yet, a simulation of the Brazilian Central Bank's (BCB) accounts under this framework reveals that the virtual absence of losses covered by the government would have had the unexpected consequence of preventing the transfer of securities to the BCB when the Brazilian real appreciated, forcing the treasury to replenish the portfolio of the BCB at the height of the 2015-16 crisis.

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‡ *Centre d'Économie de l'Université Paris Nord (CEPN), Université Sorbonne Paris Nord.* E-mail: joaomacalos@gmail.com.

1. Introduction

The last three decades witnessed the deregulation of financial markets and the growing integration of many developing economies to the global markets. However, many of these newly integrated economies (NIEs)¹ experienced a severe economic crisis at the end of the 1990s due to an abrupt reversal of capital flows that wreaked havoc in these economies – particularly in those indebted in foreign currencies. As a response to these developments, many of these NIEs accumulated significant stocks of international reserves in the 2000s to insure themselves against such market reactions. This paper deals with one important but often neglected side effect of these hoardings: the expansion of central banks' balance sheets in these countries.

As we are going to see, this expansion creates two problems to central banks: they require the adoption of compensatory measures to keep the operational interest rate on target, which in turn depends on the availability of instruments at the central bank; and they increase the volatility of the results of the central bank. Given the special nature of central banks, the only technical restriction that can arise is related to the availability of instruments to absorb liquidity from the economy. Nonetheless, persistent losses might impair the reputation of central bankers and affect their credibility to undertake costly monetary policies. These problems place the accounting framework – understood broadly to include also the profit distribution scheme and the loss coverage arrangements (Schwarz et al., 2015) – in the center of the stage. As these authors argue, financial reporting and accounting are crucial because they affect the financial buffers and the overall profitability of the central banks. Through these channels, “accounting can influence the decisions made by central banks, their credibility, and, hence, the successful implementation of monetary policy” (Ibid, 2015, p. 5). Therefore, the main objective of the paper is to understand how different accounting frameworks can affect the autonomy of the central bank to implement its policies.

We illustrate these issues with a detailed analysis of the Brazilian experience since 2008. This case is relevant because the accumulation of international reserves and the developments that followed led to two important reforms of the local

¹ Economies that meet some criteria of integration to the global markets but do not meet the requirements to be classified as a developed economy are usually classified internationally as “emerging” economies (MSCI, 2019). Yet, we prefer the term newly integrated economies to refer to these economies, emphasizing their integration to the global markets without implicitly arguing that they are emerging to a new status. This definition is indebted to the Latin American structuralist definition of underdevelopment as a specific structural state of many economies today that the developed economies did not necessarily experience in the past (Furtado, 1961).

accounting framework since 2008. The first assured an adequate provision of government securities to the Brazilian Central Bank (BCB) and also solved the issue of the profitability by transferring the foreign exchange related results directly to the Brazilian Treasury (BT) without recognizing them in the income statement. Furthermore, the consolidation of the realized with the unrealized results of the foreign exchange operations of the BCB under this framework enhanced its room of maneuver to undertake countercyclical foreign exchange rate policies. However, this framework opened a backdoor possibility of monetized financing of the BT, an issue that was fixed by the second reform in 2019. The main lesson to take from the Brazilian experience is that the accounting framework is not neutral and should, therefore, be tailored to address the specificities of each central bank. The paper is structured in seven sections, together with this introduction. In the second section, we review the main reason behind the accumulation of international reserves in NIEs. In the third, fourth and fifth sections we deal with the monetary policy implementation framework in central banks, the role of capital in these institutions and review the main accounting frameworks adopted by them. The sixth section analyzes the Brazilian case in detail and the seventh section concludes the paper.

2. Precautionary accumulation of reserves

The economic crisis of the 1990s triggered an important debate about the external vulnerability of NIEs economies. Since then, many authors came to recognize the structural asymmetries in the international monetary and financial system. Eichengreen and Hausmann (1999) and Eichengreen et al. (2007), for example, argue that most of the NIEs are unable to borrow internationally in their own currencies – the “original sin” hypothesis. For these authors, the reasons behind this inability are independent of the macroeconomic fundamentals of each economy and in fact related to the imperfections of the global financial markets and the transaction costs involved in a diversified portfolio of currencies. Another line of explanation emphasizes the existence of a currency hierarchy in the global financial markets. According to this interpretation, the centrality of some currencies in the global financial and commercial markets – particular of the U.S. dollar (USD) – entails these currencies with a liquidity premium. The convenience of holding other currencies are measured against the convenience of holding the most important currencies of the system. Therefore, most of the currencies worldwide must pay a bonus to attract foreign investors in the form of higher interest rates (De Conti et al., 2014; Kalttenbrunner, 2015; Prates, 2015, 2017). These authors also emphasize that regardless of the interest rate differential, in times of global financial distress international investors would prefer the safety of liquid currencies

like the USD and would stop flowing to NIEs. Therefore, the currency hierarchy literature emphasizes the role of the liquidity preference of international investors in the determination of capital flows, providing an explanation about the nature of sudden stops, a fact that had been identified by many authors as very harmful to NIEs – particularly when their governments were indebted in foreign currencies (Calvo, 1998; Eichengreen et al., 2007; Goldstein and Turner, 2004; Reinhart and Calvo, 2000). Another consequence of the lower liquidity premium of the currencies in the periphery is that, in the absence of active exchange rate policies, market forces will tend to make them more volatile than the currencies in the apex of the pyramid².

The recognition of these challenges is behind the overall acceptance of the precautionary demand for reserves in NIEs internationally (Dhar, 2012; IMF, 2011). Fischer (2001), for example, argued in his opening remarks at the IMF and World Bank joint forum about international reserves in the aftermath of the 1990s turmoil that crisis prevention became the most important motive for accumulating international reserves. This was especially true for NIEs open to international capital flows. Furthermore, he noted that countries with higher reserves did better during the 1990s. For Rodrik (2006), one important consequence of the 1990s crisis was a wide recognition that the sound macroeconomic policies recommended by multilateral institutions were not sufficient to shield these economies from the global turmoil and that these institutions failed to provide an adequate support to NIEs during the 1990s crises. Therefore, the policymakers in these countries concluded that they could only rely on their own foreign currency reserves to bridge eventual external liquidity shortages. The acceleration of the hoarding of international reserves in the 2000s should be understood as a market-friendly strategy adopted by these countries to integrate themselves into the global markets. For Aizenman (2008) and Aizenman and Lee (2007), the accumulation of foreign exchange reserves is like an insurance that allows emerging markets to act as “lender of last resort” in foreign currencies, allowing them to reduce the output costs of sudden stops. The crisis of 2008 vindicated the precautionary demand for reserves in NIEs. The works of Aizenman et al. (2012) and (Bussière et al., 2015), for instance, present evidence that the countries that had previously accumulated significant amount of international reserves fared better during the 2008 crisis than the countries that did not implement this policy, a perception that was shared by many NIEs policymakers (IEO, 2012).

² See Prates (2015, Chapter 1) for an extensive discussion of this literature.

Nonetheless, the accumulation of reserves resulted in the expansion of the balance sheets of central banks in these economies (Erhart et al., 2013; Filardo and Yetman, 2012). Before analyzing the consequences of this development, we must first understand how central banks implement their policies. This is the objective of the next section.

3. Keeping the interest rate on target

Nowadays it is widely accepted that central banks' main operational target is the short-term interest rate and not monetary aggregates (Bindseil, 2004), an old claim made by horizontalist post-Keynesian authors (Lavoie, 2014). In a nutshell, modern central banks execute their monetary policy by intervening in the interbank market of reserves to keep the overnight interbank rate around the desired target. Since the demand for and supply of bank reserves is highly interest-rate inelastic, even small shortages of reserves would push the interest rate high up, while small surpluses would push it towards zero. As a consequence, central banks have to behave in a defensive manner, supplying or absorbing the necessary amount of reserves to keep the interest rate around its target. In general, this defensive behavior means the announcement of a corridor of liquidity facilities that determines the interest rates at which it will absorb or supply bank reserves around the desired target (Bindseil, 2004; Lavoie, 2014).

The width of the corridor determines the amount of fluctuation around the target interest-rate that the central bank is willing to accept. However, it might be the case that the monetary system operates within a structural, i.e., a persistent shortage of reserves in the interbank market³. In this case, we say the economy is running on an “overdraft” system, as banks are being systematically forced to borrow at the lending facility. This happens in particular when central banks do not purchase or hold government bonds. On the other hand, when the monetary authorities, on a regular basis, do hold securities issued by the government, we say that the economy is running on an “asset-based” system since the central bank is either absorbing or providing liquidity in the interbank market by selling or purchasing government securities (or doing so through repos and reverse repos). Banks do not need to take advances from the central bank when they need additional bank reserves. In such asset-based systems, the easiest way to achieve the operational target is to provide an excess amount of reserves (as happens with

³ Banks may need central bank money and reserves to fulfill their minimum reserve requirements, to provide cash to its customers and to settle payments in the interbank market (Nagel, 2012).

quantitative easing policies) and to set the return on reserves equal to the target interest rate (Lavoie 2014).

According to Macedo e Silva (2016), the main variations in the banks' demand for reserves are explained by changes in the autonomous factors, i.e., assets or liabilities in the central bank balance sheet⁴ that fluctuate independently of liquidity management operations. Among these autonomous factors, one is highly relevant for this paper: the management of foreign exchange reserves. Whenever a central bank purchases international reserves in the foreign exchange market, it is also injecting bank reserves in the system, which would, *ceteris paribus*, drive interest rates down in the interbank market. If this central bank wants to sustain its monetary policy target, the acquisition of foreign exchange reserves must be compensated by some other change in the central bank balance sheet. If the economy is in an overdraft system, the banks will themselves decide to use their reserves at the central bank to reduce the advances that they had taken in the past from the central bank and the compensation will require no central bank intervention. The central bank may also decide to move government deposits from commercial banks to the central bank, thus also removing the excess bank reserves from the market without offering any interest-rate earning liability to the markets. However, the steady growth of foreign assets in the balance sheet of the central bank will exhaust, at some point, these two compensation mechanisms, and from then on central banks must actively intervene to maintain their operational interest-rate target. The latter type of compensation is commonly known as "sterilization" and can be implemented in many ways. It is important to emphasize that, from this point onwards, we will assume an economy running in an asset-based system, as they are the norm in countries that accumulated significant international reserves. In this situation, "sterilization is not a matter of choice; it is a necessity as long as the central bank wants to keep the interest rate at its target level" (Lavoie 2014, p. 468). The most common ways that a central bank can compensate the accumulation of international reserves is by selling government securities from its own portfolio – known as open market operations –; by selling these securities within a repurchase agreement – known shortly as reverse repos –; by offering remunerated deposits' facilities at the central bank and also by the issue of central

⁴ Commercial banks can individually become more or less liquid but they cannot, as a whole, change the liquidity of the interbank market, since the increase of one bank's assets is matched by another bank's increased liabilities. Therefore, only transactions with an "outside" agent – the central bank in this case – can affect the liquidity of this market (Lavoie, 2014). This fact was already outlined by Keynes (1930 [1971]).

bank bonds. The case of compensation through open-market operations is summarized in Table 1.

Table 1. Compensation of the acquisition of international reserves through open-market operations

Steps	Central bank		Commercial bank	
	Assets	Liabilities	Assets	Liabilites
1	+ Foreign assets	+ Reserves owned by commercial bank	- Foreign assets + Reserves at the central bank	
2	- Govt. Securities	- Reserves owned by commercial bank	- Reserves at the central bank + Govt. Securities	
F	+ Foreign assets - Govt. securities		- Foreign assets + Govt. securities	

Source: Author's elaboration.

Table 1 breaks down the different steps involved in the acquisition of international reserves by a central bank in an asset-based system. The first act is the acquisition of foreign assets by the central bank from a commercial bank by issuing bank reserves and depositing them on the accounts of this bank at the central bank. If the intervention was terminated at this stage, the commercial bank would be left with unwanted bank reserves and would try to sell them in the interbank market, driving interest rates in that market down. Since the central bank also wants to keep the interbank interest rate on its target, it intervenes in a second moment by selling some of its government securities to commercial banks through open-market operations, thereby removing the excess liquidity from the interbank market. The final result of the operation is that the central bank swapped some of its treasuries for foreign assets.

This example highlights the first challenge posed by the acquisition of international reserves to monetary policy implementation: the availability of suitable instruments for monetary policy implementation. If the central bank is allowed to issue its own bonds or to offer remunerated deposit facilities, this will pose no problem as it will be able to continuously expand its liabilities. However, it might be the case – like in Brazil – that the central bank is legally forbidden to issue its own interest-earning liabilities⁵. In such a situation, the central bank must have an adequate stock of treasuries in its own portfolio to keep absorbing the reserves created during the acquisition of foreign assets – be it through open-market operations or through reverse repos. If not properly institutionalized, the

⁵ This prohibition was formalized in the Fiscal Responsibility Act (complementary law 101, widely known as “Lei de Responsabilidade Fiscal”) in 2000.

transfer of treasuries to the central bank will occur in an ad hoc manner, politically subordinating the central bank to the treasury and possibly undermining its ability to keep the interest-rate on target.

4. Profits, losses and the capital needs of central banks

According to Vaez-Zadeh (1991), central banks were historically profitable institutions as a consequence of the seigniorage gains they made by issuing the national currency and of the almost inexistent interest expenses they had on their liabilities. This configuration arises whenever central banks maintain a lean balance sheet in which banknotes and compulsory unremunerated reserves make the bulk of their liabilities (Nagel, 2012). One important consequence of the expansion of central banks' balance sheets after the accumulation of international reserves was that they increased substantially the possibility of losses in these institutions, which could eventually lead to negative equity. It, therefore, raises an important question: can central banks go bankrupt?

To understand the issue of profitability in central banks and answer this question, we derive a “profits” equation from a stylized central bank' balance sheet⁶ (Table 2) in order to identify the major sources of potential losses that might arise.

Table 2: Stylized central bank balance sheet

Assets	Liabilities
Foreign assets (claims on non-residents)	Foreign liabilities
Domestic government securities	Currency in circulation
Claims on domestic banks	Bank reserves
Other financial assets	Government deposits
	Central bank bonds
	Equity capital (own funds)

Source: Adapted from Lavoie (2014, p. 467)

$$P = i_f FXA + i_1 GS + i_2 DB + i_3 OFA - (i_f FXL + i_4 BR + i_5 GD + i_6 CB) - OC + \Delta FV \quad (1)$$

Where P is profits, FXA is foreign exchange reserves, GS is domestic government securities, DB is claims on domestic banks and OFA is other financial assets; FXL is foreign liabilities, BR is bank reserves, GD is government deposits and CB is central

⁶Many authors did derive similar “profit equations” from a central bank balance sheet (e.g. Bindseil et al., 2004; Buiter, 2007; Mendes, 2016; Sweidan, 2011; Vaez-Zadeh, 1991). Our work in this section is indebted to these authors.

bank bonds; i_f is the relevant foreign interest rate; i_1 to i_6 are the respective interest rate related to each interest-rate-related item in equation (1); OC are the operational costs of the central bank and ΔFV is the fair value variation of items in the balance sheet. In Table 2, this last item would affect mainly the foreign currency-denominated items and the other financial assets.

Equation (1) can be divided into three parts. The first comprehends the interest rates-related incomes and expenses and will be profitable whenever $i_f FXR + i_1 GS + i_2 DB + i_3 OFA > i_f FXL + i_4 BR + i_5 GD + i_6 CB$. The second and third part corresponds to the operational costs of the central bank and the fair value variation (capital gains or losses) of the central bank on its assets and liabilities. It is clear that if unremunerated bank reserves and currency in circulation are the main components of the liabilities of a central bank it will most likely be a profitable institution. Nonetheless, foreign assets and liabilities and other financial assets not only increase the chance of losses on the interest rate bill but also increase the variability of the fair value component of the central bank's results.

Until the 2010s the literature emphasized the importance of quasi-fiscal activities⁷ – that included capital losses derived from foreign exchange variations but also the acquisition of non-performing assets to rescue insolvent financial institutions, for instance – as the main source of central bank losses. The main conclusion of this early literature was that central bank losses would not only impair the reputation of central bankers but could also force an expansion the monetary base with deleterious effects to anti-inflationary policies (Robinson and Stella, 1993; Stella, 2005; Teijeiro, 1989; Vaez-Zadeh, 1991). It is important to note that most of the cases analyzed by this early literature focused on the central bank losses in the inflationary context of the late 1980s and early 1990s⁸, particularly in Latin America, in which the central banks incorporated to their balance sheets many non-performing assets from the private sector and significant foreign liabilities in the aftermath of the external debt crisis of the 1980s. One important consequence of this older balance sheet structure is that the exchange rate risk was concentrated on the liability side of the central bank' balance sheet, and a

⁷ According to Vaez-Zadeh (1991, p. 74), quasi-fiscal activities refer to the activities of the central bank that are not directly related with preserving price stability. They include: “domestic debt management, foreign reserves and exchange rate management, prudential supervision and deposit insurance, financial sector development, economic development, and income distribution.”

⁸ Not surprisingly, there was a surge in the literature about losses and accounting in central banks in the end of the 1980s and early 1990s (Fry, 1993; Robinson and Stella, 1993; Stella, 1997; Teijeiro, 1989; Vaez-Zadeh, 1991).

depreciation of the domestic currency would not only increase the necessary amount of domestic currency to fulfill interest rate obligations in foreign currency but would also increase the value in domestic currency of foreign currency-denominated liabilities. As we are going to see, this situation changed considerably with the accumulation of international reserves in NIEs.

In any case, it was this early literature that triggered the debate about the importance of capital in central banks, with a new surge in the 2010s after the expansion of the balance sheets of central banks in developed countries as a consequence of quantitative easing policies⁹. One of the first conclusions of this literature is that, from a technical perspective, negative capital in central banks does not impair their ability to achieve their monetary policy operational targets. As Bindseil et al. (2004, p. 23) argue, as long as the central bank does not have any liability in foreign currency and retains the privilege of legal tender,

Central bank capital [...] does not seem to matter for monetary policy implementation, in essence, because negative levels of capital do not represent any threat to the central bank being able to pay for whatever costs it has. Although losses may easily accumulate over a long period of time and lead to a huge negative capital, no reason emerges why this could affect the central bank's ability to control interest rates (Bindseil et al., 2004, p. 23).

The fact that central banks retain the legal right to issue the domestic currency rules out the possibility of the central bank becoming illiquid or insolvent in the domestic currency. Bunea et al (2016, p.14), in an ECB working paper, synthesizes the point: “[c]entral banks are protected from insolvency due to their ability to create money and can, therefore, operate with negative equity.” Therefore, if central banks are not indebted in foreign currencies, they cannot become insolvent¹⁰.

However, permanent losses could impair the reputation of central bankers, which could, in turn, affect their capacity or their independence to implement their desired monetary policy. Vaez-Zadeh (1991), for instance, noted that the authority of the central bank to regulate the financial system could be eroded if the markets perceived their finances to be unsound. This line of argument would be later developed by many authors, particularly by Stella (e.g. 1997, 2005), a researcher from the IMF who emphasizes that only a financially strong central bank could credibly commit to anti-inflationary policies if they were to generate losses for the

⁹ See, for instance, Buiters (2008); Chiacchio et al. (2018) and De Grauwe and Ji, (2013).

¹⁰ This point was noted by many authors from different theoretical backgrounds (Archer and Moser-Boehm, 2013; Bell, 2001; Chiacchio et al., 2018; Lavoie, 2014; Robinson and Stella, 1993; Schwarz et al., 2015; Sweidan, 2011; Vaez-Zadeh, 1991, among others).

central bank. Therefore, if central banks are not financially strong their policies are going to be tested by market agents empowered with rational expectations, and persistent losses would lead to expectations of higher future inflation. There would also be a concern that losses at the central bank would require the recapitalization of the bank by the local treasury. For Stella (2005), even automatic schemes of recapitalization would politically subordinate the central bank to the government and could harm its independence¹¹. Therefore, central bankers incurring in persistent losses would finally relax their anti-inflationary stance in order to reduce the losses at the central bank and preserve their independence. One should note the circularity of this argument: it is the fear that losses will impair the autonomy of the central bank to pursue anti-inflationary policies that triggers the relaxation of the anti-inflationary stance, and not the losses per se. Another perspective on this issue was raised by Archer and Moser-Boehm (2013) and Caruana (2013), from the BIS. According to these authors, negative capital is a problem for central banks not because they threaten their operational capacity but because important stakeholders – notably the government and market participants – can fail to recognize the difference between a central bank and a commercial bank and react to losses in such ways that would damage the transmission mechanism of central bank policies or undermine the political independence of the central bank. As Caruana (2013, p. 1), a former General Manager of the BIS argues, “the problem is that not everyone appreciates that a central bank’s accounting equity can be negative without any reason for alarm bells to ring. Markets may instead react badly in the false belief that losses imply a loss of policy effectiveness.”

Therefore, the literature seems to agree that financial strength in central banks is important to successfully achieve their policies, even if the reasons for it is a misperception of the main stakeholders about the nature of a central bank. There is an important but unexpected development that followed the accumulation of international reserves in NIEs in the 2000s and 2010s that is connected to this issue: it looks like that the link between central banks’ results and price stability in many of these countries was reversed and central banks that were being successful in reducing inflation were also experiencing losses in their accounts¹². To understand this development, it is important to keep in mind that inflation rates have dropped worldwide since the end of the 1990s and that the accumulation of

¹¹ This last point is not consensual, however. For Bindseil et al. (2004, p. 30), a clear recapitalization rule is a “full substitute for capital in so far as it is unconditionally automatic.”

¹² Archer and Moser-Boehm (2013) cites Mexico, Israel, Chile and Czechia as examples of this development.

international reserves means that central banks reduced their foreign liabilities to insignificant levels and raised substantially their foreign assets. Furthermore, non-performing assets in the balance sheets of NIEs' central banks were also reduced to unimportant levels in many cases. On the other hand, the importance of interest-rate earning liabilities increased as a consequence of the compensation of this accumulation. To see the effect of these changes, we can rewrite equation (1) with some simplifying assumptions: i) the economy is running in an asset-based system in which the central bank holds no claim on domestic banks ($DB = 0$) nor any other financial asset ($OFA = 0$); ii) that the central bank holds no liabilities denominated in foreign currencies ($FXL = 0$); and iii) that the operational costs of the central bank are equal to zero, for simplicity. We also aggregate the remunerated bank reserves at the central bank and the central bank bills as "interest-earning liabilities" (IEL) at the central bank, in order to have only one liability that is not related to other entities of the public sector. These liabilities are remunerated by the weighted average interest-rate between i_4 and i_6 , that we will refer to as i_d . Therefore, the profits of this stylized central bank are equal to:

$$P = i_f FXA + i_1 GS - (i_d IEL + i_5 GD) + \Delta FV \quad (2)$$

However, since interest-rate income on government securities and the interest-rate expenses on government deposits are closed inside the overall public sector, we could derive from equation (2) a profits equation of the central bank with the non-public sector, that is equal to:

$$PNPS = i_f FXA - i_d IEL + \Delta FV^* \quad (3)$$

Where $PNPS$ stands for profits with the non-public sector and the star means that the fair value variation relates only to FXA and IEL items. In the Brazilian case, for example, the i_d is closely related to the operational interest-rate target of the BCB and the IEL liabilities are mostly price invariant. In such cases the ΔFV^* item can be assumed to concern only the foreign assets held by the central bank.

The central bank' profits with the non-public sector can then be divided between its interest-rate-related component ($i_f FXA - i_d IEL$) and the fair value variation on its foreign assets – which is largely determined by the variation of the

exchange rate¹³. Since the relevant foreign interest rate is generally lower than the domestic operational interest rate, the interest rate component – which mainly represents the carrying costs of the international reserves¹⁴ – is usually negative¹⁵. However, in countries with significant foreign exchange reserves and floating exchange rate regimes, the overall result of the central banks tends to be dominated by the fair value component given the relative size of the foreign assets in the balance sheet. The results of NIEs' central banks thus became more volatile and connected to the variability of their currencies. It is important to emphasize that, contrary to what was common at the end of the 1980s and 1990s, a depreciation of the domestic currency nowadays generally implies higher profits of the central bank as it increases the value of its foreign assets while an appreciation of the domestic currency implies unrealized losses for the central bank.

Since the exchange rate is also associated with the variation of domestic prices through the price of imports, this new situation led many researchers to claim that NIE's central banks that successfully achieved price stability would attract foreign capital and, as a consequence, would experience an appreciation of their currencies that would lead to “good” or “benign” losses while central banks that failed to achieve price stability would also see their currencies depreciate in nominal terms, generating “bad” retranslation profits as a consequence (Archer and Moser-Boehm, 2013; Bholat and Darbyshire, 2016; Frait and Holub, 2010). Or it could be the case that some governments took advantage of the recent financial integration to the world economy to open their financial accounts and set relatively high-interest rates in order to attract financial flows, expecting that it would lead to the appreciation of their currencies and help them to achieve their anti-inflationary policies. Regardless of the direction of the causation, a negative association between central banks' results and the success of inflation targeting emerged in many NIEs in the 2000s and 2010s. Figure 1 shows this relationship in

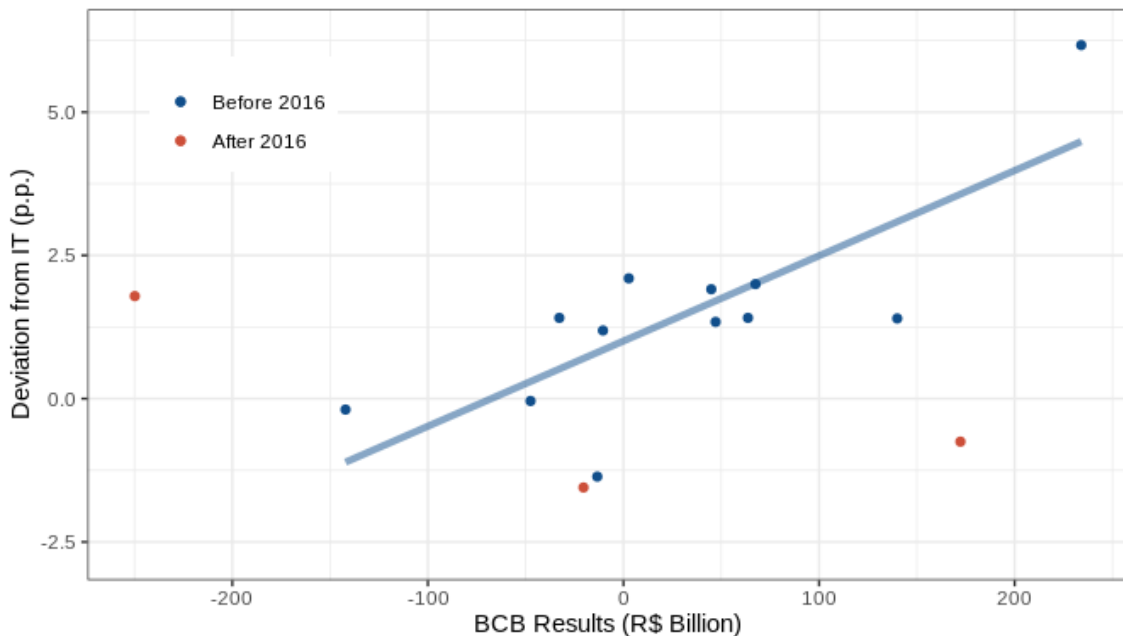
¹³ We define the exchange rate in its direct quotation, i.e., the price of a unit of foreign currency in units of domestic currency.

¹⁴ For the sake of precision, it is important to note that the **IEL** stocks also includes liabilities that were not created to compensate the accumulation of reserves. Government expenditures not funded by tax income nor debt issuing would also entail, *ceteris paribus*, the expansion of **IEL** at the central bank. Similarly, the remuneration of the **IEL** itself will also need to be compensated, leading to further increases of **IELs** at the balance-sheet of the central bank that are not technically carrying costs.

¹⁵ The interest rate component depends not only on the interest rate differential but also on the difference between the **FXA** and **IEL** stocks. If a central bank compensates the acquisition of international reserves by increasing the non-remunerated reserve requirements at the central bank, for example, the relative size of **FXA** in relation to **IEL** might outweigh the effect of the interest rate differential and the interest rate component might turn positive.

the Brazilian economy between 2004, the start of the rise in international reserves, until the crash of the economy in 2015¹⁶.

Figure 1. Bad profits and good losses? BCB results (2004 – 2018)



Source: Author's elaboration from BCB. **Note:** "IT" means inflation target and the "BCB results" are the annual sum of the operational results and the foreign exchange results of the BCB.

Therefore, it is difficult to foresee a situation in which the outcome of this type of central bank losses would be inflationary. As was argued above, most of the central banks' losses in NIEs are connected to carrying costs of international reserves and negative fair value variation of foreign assets. These sources of losses are not likely to be related to inflationary pressures since the former is a consequence of high base interest rates and the latter a consequence of an appreciation or valorization of the local currency. Furthermore, if central bank losses are not realized, they cannot directly threaten price stability, since there is no change whatsoever in the overall liquidity of the economy¹⁷. Nonetheless, it is almost consensual among central bankers that they should be concerned with the financial strength of their institutions. Accounting practices are not neutral in this regard as they affect the volume of profits and losses that are reported by the central banks. Before moving to the details of the Brazilian experience, we are going to

¹⁶ This relationship appears to be broken since 2016. However, it is important to note that the last half of the 2010s was marked by a profound recession in the Brazilian economy and high levels of unemployment that are keeping prices under control more or less independently of the exchange rate.

¹⁷ This point was early recognized by Vaez-Zadeh (1991, p. 77), who, although working within a monetary targeting framework, emphasized that, from a macroeconomic perspective, losses are a problem only if they cause an injection of liquidity in the economy.

review the main differences between the most common accounting frameworks in their treatment of international reserves and foreign exchange operations.

5. The main accounting frameworks

The objective of this section is to compare the different treatment given by the main accounting frameworks in central banks to international reserves and the profits and losses derived from their management. The most common accounting frameworks are the International Financial Reporting Standards (IFRS), often adapted to local specificities, and the European System of Central Banks (ESCB) accounting system, that is adopted mainly in Europe (Archer and Moser-Boehm, 2013; Bunea et al., 2016; KPMG, 2012).

In general, the balance sheets of central banks are denominated in their local currency. The main problem that concerns us is how to account for the assets and liabilities denominated in foreign currencies. One way would be to record these values at their historical cost, i.e., the price in the local currency of these assets or liabilities when they were added to the balance sheet of the central bank. Another option is the implementation of the fair value method that uses market prices in every period to recognize those assets and liabilities. Nowadays, fair value accounting is widespread among central banks (Archer and Moser-Boehm, 2013; Bunea et al., 2016). However, as we saw in the previous section, the adoption of fair value methods in central banks increase the volatility of their profits and losses due to the exchange rate retranslations of their assets¹⁸. The main difference between the IFRS-based and ESCB-based accounting frameworks is that the former recognizes these variations directly in the income statement while the latter transfers them to a buffer account that is depleted in the case of future unrealized losses¹⁹.

How these different accounting frameworks will affect the capacity of central banks to undertake their policies will depend on the nature of the relationship between the central bank and the treasury – particularly on how profits and losses of the central bank are distributed to the government. According to Bunea et al. (2016), the distributional arrangements between central banks and treasuries are generally asymmetrical, in the sense that profits are paid out to the government while losses are held at the central bank, sometimes implying negative

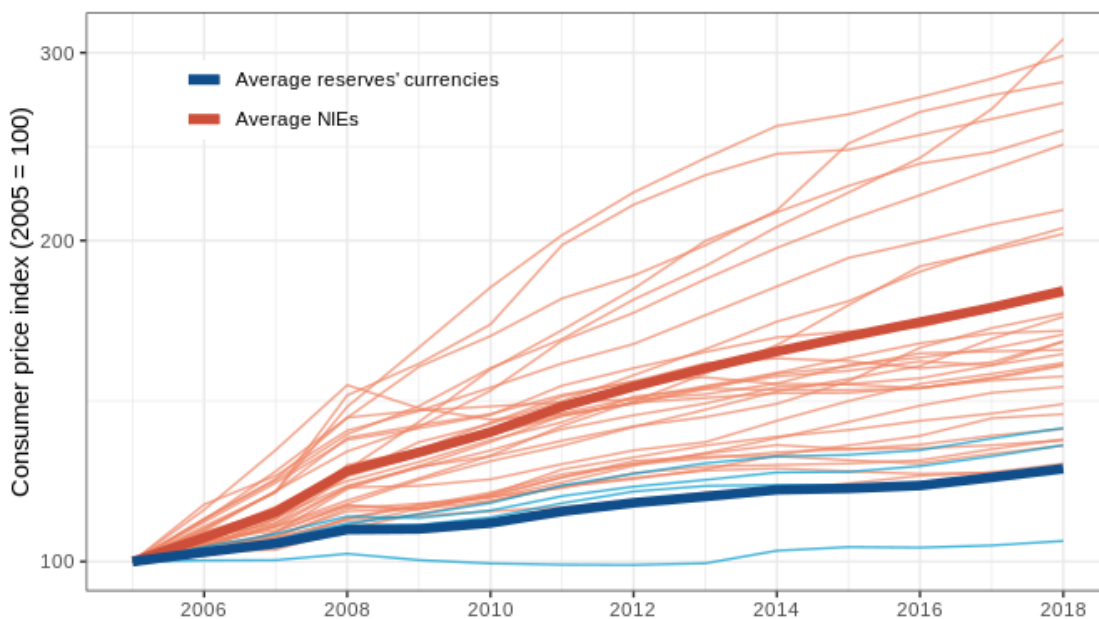
¹⁸ International reserves are mainly hoarded in safe short-term foreign government securities. As a consequence, their value in foreign currency is not subject to significant price risk.

¹⁹ These are also referred as the “income approach” and the “equity/liability approach”, respectively (KPMG, 2012).

equity for these institutions. From the 57 central banks analyzed in their work, only 20 have mechanisms that ensure a direct recapitalization of the central bank by the treasury. Even in these cases the recapitalization usually occurs only after all buffers, including the capital of the central bank, have been depleted.

Therefore, one important consequence of the recognition of unrealized results in the income statement is that it increases the distribution of profits to the government, on the one hand, and the necessity to recapitalize the central bank if it is not allowed to run with negative equity, on the other. Historically, central bankers argued that the adoption of fair value methods would not only increase the transparency of their accounts but also would foster their credibility by adopting standards that are common to the private sector (Archer and Moser-Boehm, 2013). However, as many authors pointed out, the distribution of unrealized gains can lead to monetized financing of fiscal expenditures (e.g. Cervantes (2007)). Therefore, Sullivan (2000), a researcher from the IMF, recommends as a good practice that unrealized losses should be recognized in the income statement but ring-fenced from distribution to the treasury.

Figure 2. Evolution of consumer price indices, several countries, 2005-2018



Source: Author's elaboration from IMF and BIS.

In other central banks, especially those that adopt the ESCB accounting framework, the income statement only recognizes profits and losses that are realized. Unrealized results, in this framework, are transferred to a revaluation account. The ESCB framework also imposes its own asymmetrical treatment of profits and losses, based on the prudence principle that guides the legal and financial reporting of the central banks in this system. According to guidelines of

the European Union (2016, p. 347/38), the prudence principle implies that “unrealized gains shall not be recognized as income in the profit and loss account, but shall be recorded directly in a revaluation account and that unrealized losses shall be taken at year end to the profit and loss account if they exceed previous revaluation gains registered in the corresponding revaluation account.” Therefore, unrealized losses that cannot be covered by the existing revaluation buffers must be covered by the respective treasuries. On the other hand, all realized results are recognized immediately in the income statement. In this case, the bulk of the variability of the central bank results would be transferred to revaluation accounts, and the final accounting results become less volatile as a consequence (Schwarz et al., 2015). However, nations and their central banks in the Eurozone (more so in the periphery of the Eurozone like in Greece) lack full political sovereignty over their money²⁰ and face constraints that are similar to those faced by central banks indebted in foreign currencies (Lo Vuolo and Pereira, 2018). More prudence is desirable in this situation.

The adoption of a plain ESCB accounting framework may also have unintended consequences in NIEs and other developing economies. As we can see in Figure 2, NIEs’ currencies usually present higher inflation rates than the currencies in which foreign assets are denominated²¹. Therefore, even if real exchange rates trajectories are unpredictable, it is likely that, in the long run, nominal exchange rates will depreciate more than appreciate in NIEs, leading to inflated financial buffers in their central banks if they adopt the ESCB framework. A simple estimation of the capital gains on international reserves in a group of NIEs corroborates this intuition²². According to Godley and Lavoie (2007, p. 135), capital gains can be calculated as the price variation of an asset multiplied by its stocks in

²⁰ Wray (2015, p. 43) goes as far as to argue that the “Euro is effectively a ‘foreign’ currency from the perspective of the individual nation.”

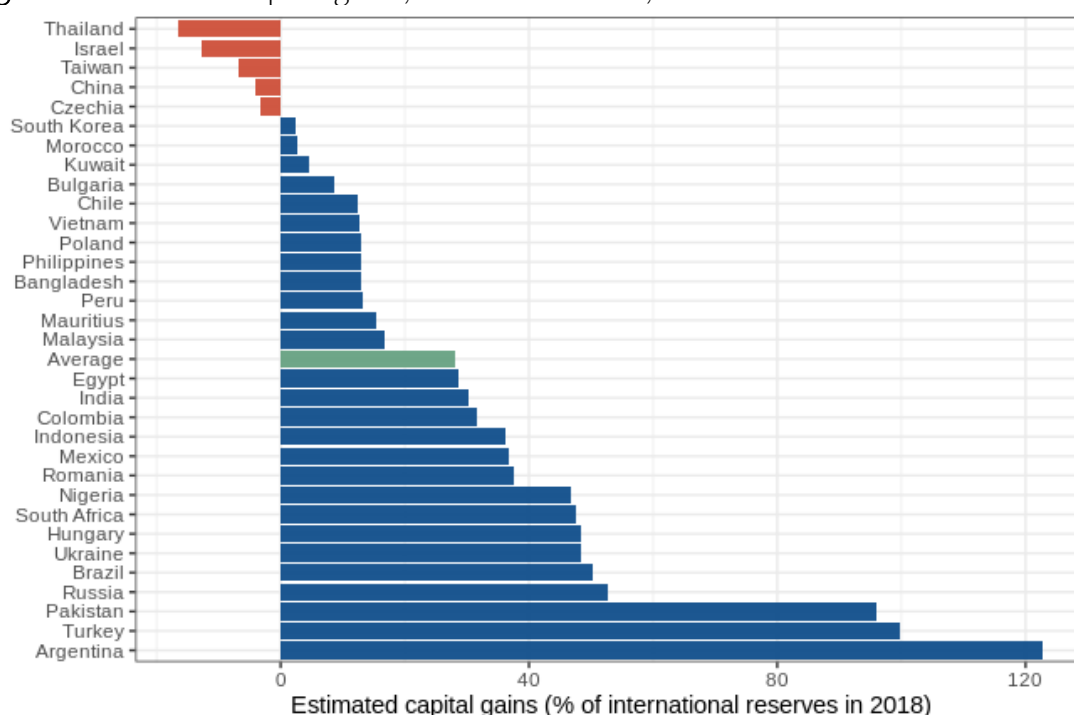
²¹ International reserves are meant to be safe, and, thus, it is not reasonable to save them in inflation-prone currencies. The sample starts in 2005 and finishes in 2018. The NIEs group includes: Argentina, Bangladesh, Bulgaria, Brazil, Chile, China, Colombia, Czechia, Egypt, Hungary, Indonesia, Israel, India, Iran, Korea, Kuwait, Mexico, Malaysia, Nigeria, Oman, Peru, Philippines, Pakistan, Poland, Qatar, Romania, Russia, Saudi Arabia, South Africa, Taiwan, Thailand, Turkey, Ukraine, United Arab Emirates, Venezuela, Vietnam. The countries with the 4 highest consumer price indices in 2015 (Argentina, Egypt, Ukraine and Nigeria) were excluded, as well as the Iran, Taiwan and Venezuela due to lack of data. The reserves’ currencies group are the United States, United Kingdom, Japan and the Eurozone. The consumer price index for the Eurozone was calculated as the average consumer price index of all member countries at the respective year.

²² We use the same group of NIEs as before. Venezuela was excluded due to missing data and Qatar, Oman and Saudi Arabia were excluded given the absence of any nominal exchange-rate variation in the period.

the previous period. We use this definition to make a rough estimation of the yearly capital gains stemming from the international reserves in a group of NIEs, which is presented in Figure 3. It is important to note that we assumed that all reserves were held in US dollars to simplify the estimation. The initial stocks were the ones verified in 2002, in order to capture the commodity boom of the 2000s²³.

As it is clear from Figure 3, almost all of the NIEs in the sample experienced positive capital gains in the period. It is also interesting to note that 3 of the 4 countries that experienced negative accumulated capital gains – Israel, Czechia, and Thailand – are among the 4 countries with the lowest consumer price indices in 2018²⁴. This evidence suggests that the implicit hypothesis of symmetrical nominal foreign exchange rate shocks behind the ESCB rule of setting aside all unrealized gains – a reasonable hypothesis for the euro – should be relaxed in NIEs in order to avoid the creation of inflated financial buffers.

Figure 3. Estimated capital gains, several countries, 2002-2018



Source: Author's elaboration from IMF.

Before finishing this section, it is important to summarize the main aspects of the discussion so far. First, it should be clear that unrealized central bank's profits

²³ The capital gains were measured annually, and the total accumulated at the end of 2018 was converted back to US dollars by the exchange rate of the end of 2018. This value was then compared to the total stocks of international reserves at the end of 2018.

²⁴ And China does not fall far behind, being the country with the seventh lower value of the consumer price index in 2018.

will only have an objective impact on the economy if they are spent in the economy. In this case, the central bank will have to compensate and remove the extra liquidity from the system in order to keep the short-term interest rate on target. A similar type of compensation will be necessary if the central bank is incurring realized losses (e.g. the carrying costs of international reserves). If the central bank is allowed to issue its own interest-earning liabilities or to remunerate deposits held by commercial banks in its own accounts, this compensation would not require the participation of the treasury and the central bank would not be constrained even by negative equity – although reputational issues might arise in this case.

However, if the central bank is not allowed to issue interest-earning liabilities, it must rely on an adequate supply of bonds by the government to keep the interest rate on target. In this case, problems may arise. Even though we think that the central bank and the government should be aligned to implement the best mix of economic policies, in many cases the central bank is formally independent of the treasury and free to execute the monetary policy at its will. If an independent central bank needs treasury bonds to achieve its operational target, the compensation of the accumulation of foreign exchange reserves and other realized expenses might exhaust its portfolio of free treasury bonds. If, in this case, the authorities at the treasury think that the target interest rate is higher than it should be, they could delay the recapitalization of the central bank and force a reduction of the target interest-rate. Although this possibility is emphasized by Stella (2005), we think that such an open conflict of interest would severely harm not only the reputation of the central bank but also of the treasury and would be avoided in most cases. In any case, transparent and unconditional rules governing the recapitalization of the central bank would minimize these risks (Bindseil et al., 2004).

Beyond this objective constraint, it is true that political conflicts between the government and the central bank over what is the adequate monetary and exchange rate policies mix can arise, especially if the central bank is having persistent losses – which increases the overall public sector debt – that must be covered by the treasury. In general, the losses of central banks are covered by the issue of government securities that are automatically and costlessly transferred to the central bank, thus raising its equity, without passing through the market (Bunea et al., 2016). This scheme minimizes the burden on the treasury since it is technically unconstrained to issue new bonds. However, a transfer scheme in which the treasury must cover the losses of the central bank by using its liquid

resources could technically constrain the treasury since it could require the utilization of tax receipts or the issuance of primary debt to cover for those losses. This would in turn place the monetary policy expenses at par with other governmental expenses and would arguably increase the political pressure of the treasury on the central bank to modify its policies in order to reduce its losses, impacting the autonomy of the central bank to properly implement its foreign exchange policies.

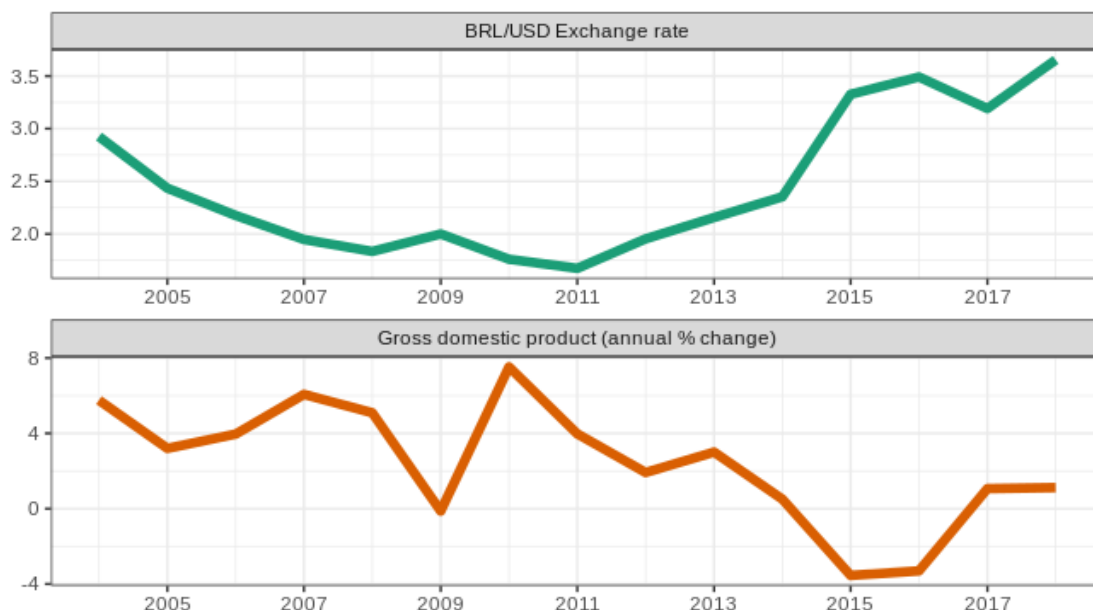
6. The Brazilian experience

Since the rise of international reserves held by the Brazilian Central Bank in the mid-2000s, the Brazilian authorities changed twice the accounting framework that regulates the accounting of the foreign exchange rate policies of the Brazilian Central Bank and its relationship with the Brazilian Treasury. The objective of this section is to understand what motivated these changes, and how different accounting frameworks would affect the autonomy of the BCB to undertake its policies. To achieve this objective, the section starts with a brief contextualization of the Brazilian economy in which these changes took place. We will then detail the main aspects of the accounting framework implemented in 2008 and summarize the debate around its failures, which ultimately led to the new legislation implemented in 2019. To illustrate some of the points we make and to understand the implications of the different accounting frameworks, we use the available data on the realized and unrealized results of the central bank to simulate how the developments would have been under the new accounting framework, as well as how it would have been under the ESCB framework, commonly referred as the best international standard by the literature.

6.1 Context

As we can see in Figure 4, the Brazilian economy experienced a fairly stable growth rate between 2004 and 2013. However, the deterioration of the domestic and international conditions in 2014 led to the dramatic fall of the GDP growth rate in 2015. In this same period, the BRL/USD exchange rate appreciated steadily until 2011 when the trend changed towards the depreciation of the BRL. Although this depreciation was somehow moderated until 2014, the percentage variation of the average exchange rate from 2014 to 2015 alone was bigger than 40%. It remained at a fairly depreciated level since then.

Figure 4. Evolution of the BRL/USD exchange rate and of the Brazilian GDP



Sources: IMF-IFS and WB.

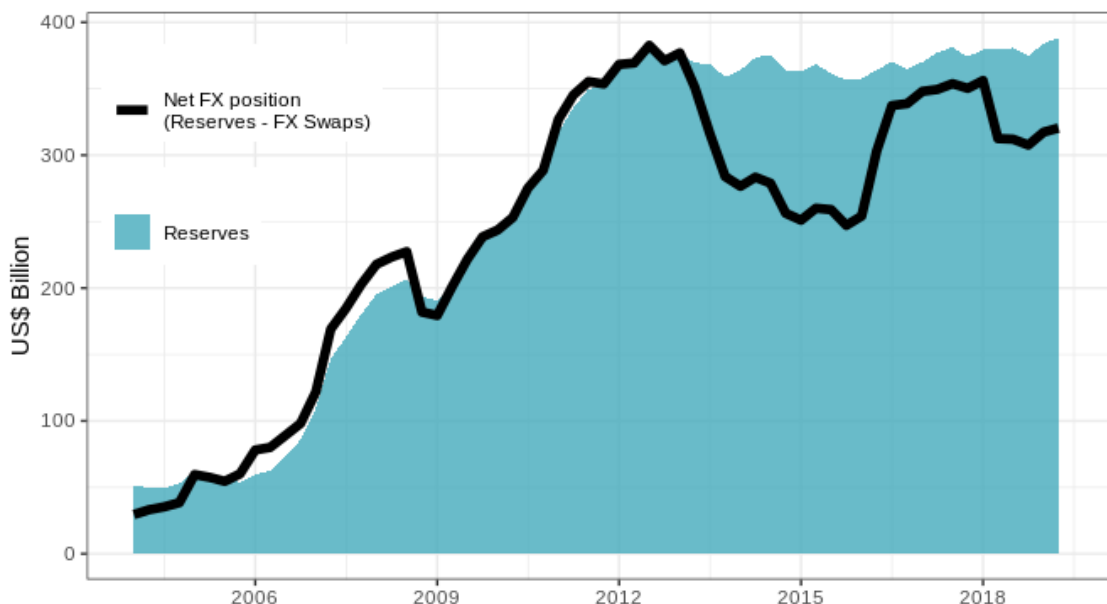
During this period, the Brazilian authorities hoarded a significant amount of foreign assets. As we can see in Figure 5, this expansion was particularly marked between 2006 and 2011. The BCB also intervened significantly in the future foreign exchange markets through the issue of foreign exchange swaps (FX swaps), particularly between 2013 and 2015, when the notional value of the exposition of the BCB in U.S. dollars in these contracts amounted to more than 100 billion. The official reason behind the utilization of the FX swaps is the necessity to provide hedge opportunities to market participants indebted in foreign currency, preserving the financial stability of the economy. These policies had a significant impact on the balance sheet of the BCB, as can be seen in Table 3. The value of foreign assets jumped from 6.5% of the Brazilian GDP in 2005 to 23.5% in 2018, peaking at almost 25% in 2015. The acquisition of these foreign assets was mainly compensated by the issuance of reverse repos that increased steadily in the period under investigation and were, at the end of 2018, equivalent to more than 17% of the Brazilian GDP (Macedo e Silva, 2016).

Table 3. BCB balance sheet, selected items (% of the GDP)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Assets														
Foreign assets	6.5	8.3	13.2	16.5	12.9	12.8	15.4	16.3	16.9	17.5	24.5	20.6	20.8	23.5
Government securities	13.0	12.6	13.2	16.0	19.2	18.1	17.2	18.9	17.9	19.3	21.3	24.2	25.4	26.3
Liabilities														
Bank reserves	4.8	4.9	5.4	2.9	2.9	9.8	9.7	6.6	6.9	5.6	6.1	6.5	6.9	6.5
Reverse repos	2.9	3.2	7.0	11.1	13.6	7.4	8.0	12.4	10.7	14.5	16.1	17.3	16.7	17.2
Government deposits	9.7	9.4	10.2	14.1	12.4	10.6	13.2	13.2	12.9	12.1	17.3	16.8	16.7	19.1
Currency in circulation	3.2	3.6	3.8	3.7	4.0	3.9	3.7	3.9	3.8	3.8	3.8	3.7	3.8	3.9
Equity capital	0.4	0.6	0.0	0.5	0.6	0.4	0.4	0.4	0.3	0.3	1.7	2.0	1.9	1.9

Source: Author's elaboration from BCB.

Figure 5. Stocks of international reserves and net FX position (international reserves - notional value of open FX swaps contracts) held by the BCB, 2004-2018.



Source: Author's elaboration from BCB.

6.2 The evolution of the Brazilian accounting framework

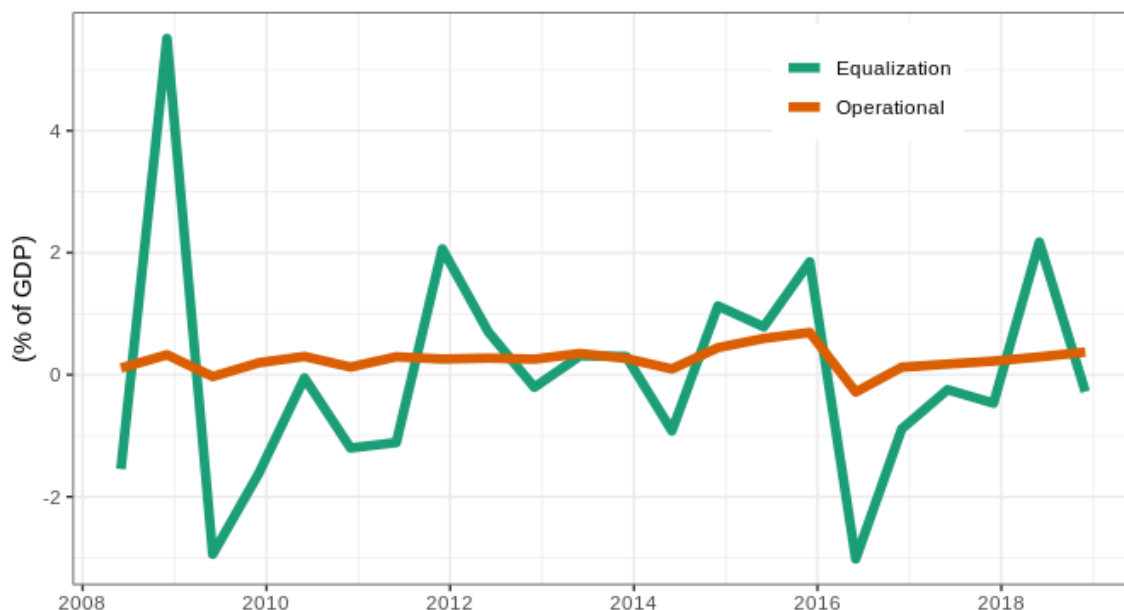
It was only in 2007 that the BCB finished implementing the IFRS framework. However, the authorities at the BCB and at the BT soon realized that the recognition of the fair value variation of the foreign assets held by the BCB in its income made its results “excessively volatile” (Brasil, 2008, paragraph 9). In the same document, the authorities also expressed the concern that the monetary operations aimed to compensate for the accumulation of foreign assets would deplete the BT bonds on the portfolio of the BCB. Therefore, they proposed an amendment to the existing legislation that would insulate the BCB’s results from its foreign exchange operations and would also provide the necessary volume of bonds to keep the central bank operational. This legislation was approved later in

2008 as the law 11,803 and had important consequences that shaped the relationship between the BCB and the BT between 2008 and 2019.

To fix the excessive variability of the BCB results and avoid the potential damage to its reputation, the law 11,803 defined that, from 2008 onwards, the semiannual results of the BCB would be divided between the results related to all the foreign exchange operations and the rest of the operational results of the central bank. The foreign exchange results should also be explicitly divided between everything that was related with the management of the international reserves – including the fair value variation of these assets and the carrying costs involved in holding these assets – on the one hand, and the expenses and earnings associated with the operations of the central bank with foreign exchange derivatives – mainly with foreign exchange swaps –, on the other hand. The two parts of the foreign exchange operations would then be discounted from each other and entirely transferred to the BT through the equalization operation. In the case of profits, the BT account at the BCB would be credited; in the case of losses, the BT would have to cover the losses. The remaining results of the central bank after the equalization operation would then be the result of the BCB as reported in its financial statements and would also be transferred to BT. The law also determined that up to 25% of the operational result could be used to feed financial buffers for rainy days at the central bank²⁵. One can see in Figure 6 that the introduction of the equalization operation effectively insulated the BCB results from the volatile foreign exchange results in the period.

²⁵ Mendes (2016) criticizes this rule for being inconsistent with the variability of the foreign exchange operations. This critique ignored that the equalization operation was created exactly to shield the result of the BCB from its foreign exchange operations and that it would not make sense to constitute any additional buffer for it.

Figure 6. Equalization and operational results of the BCB, 2008-2019



Source: BCB.

To provide an adequate portfolio of treasury bonds at the BCB, the law 11,803 allowed the BT to issue securities that could be used in monetary policy operations and transfer them directly to the BCB. The BT was also allowed to cover the losses of the BCB – be it on the equalization or on the operational account – with the issuance of bonds under the same conditions. This is the second important aspect of the law 11,803. The law 11,803 also established – although in an imperfect manner – that whenever the stocks of free government securities (i.e., securities not dedicated to any reverse repo) in the BCB portfolio were below a certain threshold, the BT would issue bonds and transfer them to the BCB. This regulation was further clarified in 2009 when a floor-threshold of 20 billion BRL in BT bonds was defined as the level that would trigger an automatic recapitalization of the BCB (Tesouro Nacional, 2013). On the other hand, any profits made at the central bank would be transferred to the BT in the form of money, that would be deposited in the account of the government at the central bank. Although an obvious choice – doing otherwise would deprive the central bank of government bonds that it would later need to execute its monetary policies –, this asymmetry, tied to the full transfer of the equalization operation, was responsible for the increase of the government deposits in the balance sheet of the BCB, as can be seen in Table 3 above (De Conti, 2016; Mendes, 2016). Even if often criticized for enabling the BCB to unintentionally finance the BT (Carvalho Jr., 2016; Garcia and Afonso, 2016; Guardia, 2016; Mendes, 2016), we think that allowing the BT to issue government securities and to transfer them to the BCB without passing through

markets was crucial to guarantee the autonomy of the BCB to undertake its policies.

Nonetheless, the developments that followed the implementation of the law 11,803 raised important criticism among Brazilian economists (see, for instance, the book edited by Bacha (2016) that gathers many papers devoted to the issue) and led to the reform of the legislation in 2019. As we hinted before, the main criticism was that the transfer of unrealized results to the BT through the equalization operation provided an undesired source of financing to the government, softening its budget constraint. Although these resources were ring-fenced – they could only be used to pay for expenses related to the management of the public debt –, Mendes (2016) shows that these restrictions were by-passed in two ways: i) the government could shift sources of expenditures, using the unrealized profits of the BCB to pay for the interests on the government debt, liberating other resources to fund primary expenditures; and ii) even if the government deposits were not used, they were being remunerated by the operational interest rate at the central bank, and this remuneration was not as strictly ring-fenced as the deposits that originated them. One should note, however, that the practical consequence of this bypassing was the expansion of reverse repos in the liability side of the central bank, shortening the maturity of the overall public sector debt (Carbone and Gazzano, 2016).

The second criticism raised was that the equalization operation reduced the transparency of the BCB accounts (Mendes, 2016; Viana, 2018). Although claimed otherwise in the notes attached to the financial statements of the BCB²⁶, there is little controversy about this criticism. It is clear from Figure 6 that the equalization operation was hiding the volatility of the BCB results and what would they have been if there was no separation between the foreign exchange operations and the rest of its operations. The actual numbers can also be seen in column h of Table 4.

Another critique against the law 11,803' framework questioned the consolidation of the realized and unrealized results inside the equalization account (Gallo, 2016; Garcia and Afonso, 2016; Mendes, 2016; Viana, 2018). These authors emphasize the importance of the prudence principle outlined in the ESCB framework that recommends that all unrealized losses should be held in a revaluation account while the realized results should be immediately recognized in the profits and losses statement. However, with the exception of Viana (2018) and Gallo (2016), the literature abstained to suggest something different. In Mendes'

²⁶ See, for instance, (BCB, 2015, fl. 19)

(2016) policy proposal, for example, the crucial aspect was to prevent the transfer of unrealized results to the treasury, and the division between realized and unrealized results was conveniently ignored. This might point to some form of pragmatism from the central bankers, that always noted that the consolidation of the different foreign exchange operations provided an important accounting hedge for the BCB to undertake its FX swaps operations in times of stress (BCB, 2015; Farhi et al., 2018).

Table 4. Detailed results of the BCB (% of the GDP), 2008-2019

Period	Foreign exchange rate operations										Total	Cost rate (% p.y.) ⁹	Var. exchange rate (%) ¹⁰
	Swaps ¹		International reserves										
	Notional value ²	Swaps results	Avg. reserves ³	Gross results ⁴	Carrying costs ⁵	Net results ⁵	Realized FX results ⁷	Equa- lization	Opera- tional ⁸				
a	b	c	d	e	e	g = b - e	h	i	i	k	l		
2008-01	0.8	-0.2	11.3	-0.9	0.4	-1.4	-0.6	-1.5	0.1	-1.4	-7.7	-10.1	
2008-02	-0.4	0.3	12.8	5.9	0.7	5.2	-0.3	5.5	0.3	5.8	-10.5	46.8	
2009-01	0.0	0.1	13.7	-2.5	0.5	-3.0	-0.5	-2.9	0.0	-3.0	-7.3	-16.5	
2009-02	0.0	0.0	12.1	-1.2	0.4	-1.6	-0.4	-1.6	0.2	-1.4	-6.6	-10.8	
2010-01	0.0	0.0	12.2	0.4	0.4	-0.1	-0.4	-0.1	0.3	0.2	-7.1	3.5	
2010-02	0.0	0.0	12.1	-0.7	0.5	-1.2	-0.5	-1.2	0.1	-1.1	-7.9	-7.5	
2011-01	0.2	0.0	12.5	-0.5	0.6	-1.1	-0.6	-1.1	0.3	-0.8	-8.8	-6.3	
2011-02	0.0	0.1	13.7	2.6	0.6	2.0	-0.6	2.1	0.3	2.3	-8.6	20.2	
2012-01	-0.1	0.0	14.8	1.3	0.6	0.7	-0.6	0.7	0.3	1.0	-8.1	7.8	
2012-02	0.0	0.0	16.0	0.3	0.6	-0.2	-0.6	-0.2	0.3	0.0	-6.8	1.1	
2013-01	-0.4	0.0	15.1	0.9	0.5	0.3	-0.5	0.3	0.3	0.7	-6.9	8.4	
2013-02	-1.4	0.0	16.0	1.0	0.6	0.3	-0.7	0.3	0.3	0.6	-7.8	5.7	
2014-01	-3.6	0.4	15.5	-0.8	0.5	-1.3	-0.1	-0.9	0.1	-0.8	-6.1	-6.0	
2014-02	-4.9	-0.5	15.7	2.6	1.0	1.7	-1.5	1.1	0.4	1.6	-11.9	20.6	
2015-01	-5.7	-0.6	18.7	2.7	1.3	1.4	-1.9	0.8	0.6	1.4	-12.8	16.8	
2015-02	-7.1	-1.1	22.8	4.8	1.8	2.9	-2.9	1.9	0.7	2.5	-15.1	25.9	
2016-01	-3.2	1.3	22.6	-3.8	0.5	-4.3	0.8	-3.0	-0.3	-3.3	-4.2	-17.8	
2016-02	-1.4	0.1	19.6	0.0	0.9	-1.0	-0.9	-0.9	0.1	-0.8	-9.4	1.5	
2017-01	-1.4	0.1	18.6	0.6	0.9	-0.3	-0.8	-0.2	0.2	-0.1	-9.1	1.5	
2017-02	-1.2	0.0	18.5	0.2	0.7	-0.5	-0.6	-0.5	0.2	-0.2	-7.1	0.0	
2018-01	-3.8	-0.3	19.5	3.1	0.7	2.4	-0.9	2.2	0.3	2.5	-6.8	16.6	
2018-02	-3.8	0.0	21.5	0.4	0.7	-0.3	-0.6	-0.3	0.4	0.1	-6.2	0.5	
2019-01	-3.7	0.1	20.9	0.4	0.6	-0.2	-0.5	-0.1	0.3	0.2	-5.6	-1.1	

Sources: BCB - *Estatísticas fiscais*, BCB - *demonstrações financeiras* and BCB - SGS.

Authors' elaboration.

1/ operations realized through auditions and registered at the B3.

2/ Notional value of the BCB exposition in USD. Negative values mean that the BCB has a short-USD position.

3/ Average international reserves in the period.

4/ Includes gains and losses from exchange rate retranslation, from the variation of the underlying asset in USD and the interest income received on foreign assets.

5/ Measured as the cost rate (in semiannual terms) multiplied by the average amount of international reserves in the period (in BRL).

6/ Profitability of reserves minus its carrying costs.

7/ The interest income received on foreign assets is ignored due to missing data.

8/ BCB's results as recognized in its financial statements.

9/ Average interest rate remunerating the liabilities of the central bank, in annualized terms.

10/ Semiannual variation of the BRL/USD exchange rate, based on end of the period values of the sale rate (sgs code: 1).

An understanding of the FX swap instrument is enough to drive home this point. In these contracts what is exchanged is the variation of the BRL/USD

exchange for the interest rate differential between the domestic and the relevant foreign interest rate in a given period. Therefore, interventions with traditional FX swaps – the ones in which the central bank assumes the short position in exchange rate variation – are covered by the financial returns on the international reserves. It is easier to see this coverage in Table 5 where the financial results that derive from the international reserves next to the returns arising from a traditional FX swap are visualized together. One can see that the central bank has a capital gain ($+\Delta E$) on its international reserves when the BRL depreciates but have an equivalent loss with an FX swap contract ($-\Delta E$). At the same time, the central bank must pay the effective domestic interest rate in some of its liabilities that were created to sterilize the accumulation of reserves ($-i$), but it is active on the local interest rate on the FX swap contract ($+i$). Finally, it receives the international interest rate in its foreign assets (i^*) but must pay the “cupom cambial” (q), a synthetic interest rate in USD that reflects the libor plus a country risk-premium, on its FX swaps contracts.

Table 5. Profitability of international reserves and FX swaps (central bank’s balance sheet)

International reserves		FX Swaps		
Gains	Losses	Gains	Losses	
$+\Delta E^a$	$-i$	$+i$	$-\Delta E$	
	(carrying costs)			
$+i^*$			$-q$	

Source: Author’s elaboration. a/ Unrealized retranslation gains.

Therefore, as long as the central bank has enough foreign assets to cover the FX swaps operations, they will be fully hedged in an accounting sense. In any case, Mendes (2016) and Viana (2018) are right to point out that the financial expenses of the FX swaps are realized in the economy whereas the capital gains on the international reserves are not. The consequence is that the central bank will have to compensate for these expenses. However, one should also note that the financial results involved in the FX swaps interventions are completely settled in BRL. As we saw in section 3, in such circumstances one cannot apply the same constraints to a central bank as he or she would to a commercial bank. In particular, the concerns raised by Bignon et al. (2009) and Biondi (2011) about the utilization of unrealized profits in private entities should be relaxed since the central bank is not liquidity-constrained in its own currency.

Finally, one aspect that is surprisingly ignored by the literature critical to the law 11,803 is the role of the carrying costs of reserves. The carrying costs are measured by the BCB as the product of the stock of international reserves in the domestic currency multiplied by the average interest rate that remunerates its liabilities (the cost rate). As we can see in Table 4 above, they were positive in every semester from the beginning to the end of the period regulated by the law 11,803. Moreover, with the exception of the first semester of 2016, they always dominated the realized results and implied in a negative realized result in the foreign exchange operations of the BCB. Furthermore, the carrying costs tend to be procyclical, increasing together with the depreciation of the exchange rate. This procyclicality has two reasons: i) the cost rate (column k) tends to increase if the central bank adopts a contractionary policy stance, as was the case in 2015; and ii) the total stocks of international reserves, measured in BRL, also increase with the depreciation of the BRL, even if the foreign exchange reserves are stable in USD. These effects, together with the expressive losses with FX swaps in 2015 generated substantial realized losses from the end of 2014 to the end of 2015.

This debate culminated with the law 13,820 that was approved in the first semester of 2019 and will reshape the accounting framework that governs the relationship between the BT and the BCB from the second semester of 2019 onwards. The new legislation addressed the main criticism to the law 11,830, i.e., that it allowed the implicit financing of the treasury by unrealized gains at the central bank and determines that all positive results in the equalization operation will be transferred to a revaluation account created to hold these results. Therefore, there will be no more transfers of foreign exchange results to the BT²⁷. In the case of foreign exchange-related losses, they will first consume the resources available at the revaluation account, then they will draw upon the capital of the central bank, and only when the capital of the central bank falls below a certain threshold (1.5 % of assets of the BCB) the BT will cover up the losses. The rules governing the operational results of the BCB remained virtually the same. The new law also addressed the criticism that the previous framework was not sufficiently rigorous in determining the conditions in which the BT would recapitalize the BCB (Carvalho Jr., 2016; Mendes, 2016) and determined that the BT must automatically recapitalize the BCB whenever its equity falls below 0.25% the value of its total assets. Therefore, the law 13,820 introduced a modified version of the prudence

²⁷ The only anticipated exception to this rule is in a situation of “severe” liquidity constraints affecting the BT. In such cases the Brazilian monetary council (CMN in the Portuguese acronym) can authorize the BT to use the resources inside the revaluation account.

principle by creating a revaluation account while pragmatically preserved the consolidation of all foreign exchange operations. Furthermore, it preserved the asymmetric distribution scheme between the BT and the BCB, crucial for the constitution of an adequate portfolio of bonds in the central bank. To fully understand the consequences of the new regulation, it is important to have an idea of how they would have been if the new regulation had been adopted in 2008. It is to simulate the developments under these different accounting frameworks that we turn next.

6.3 Simulation of different accounting frameworks

The objective of this subsection is to simulate how different accounting frameworks would have affected the operation of the BCB²⁸. The simulations use real data from the BCB, and most of the raw data is also presented in Table 5. Furthermore, we only analyze the foreign exchange operations of the BCB. To the best of our knowledge, we are the first to run these simulations for the Brazilian economy²⁹, following the approach of Schwarz et al. (2015) to evaluate the accounting framework of the ECB.

We start with the simulation of the revaluation accounts, which can be seen in Figure 7. For this comparison, it only makes sense to display the results for the ESCB' and the law 13,820' frameworks. As was argued above, in the ESCB framework all of the unrealized results of the BCB would have been transferred to the revaluation account while the realized results³⁰ are immediately would have been recognized in the income account. We can see that this would result in an inflated revaluation account at the BCB, holding more than 800 billion BRL at the end of the simulation. On the other hand, the law 13,820' framework would have led to a significantly smaller revaluation account, although still positive, at the end

²⁸ All of the simulations were implemented using Python. The codes used to run the simulations and all of the data presented in this paper are available at https://github.com/joaomacalos/bkr_accounting_2020.

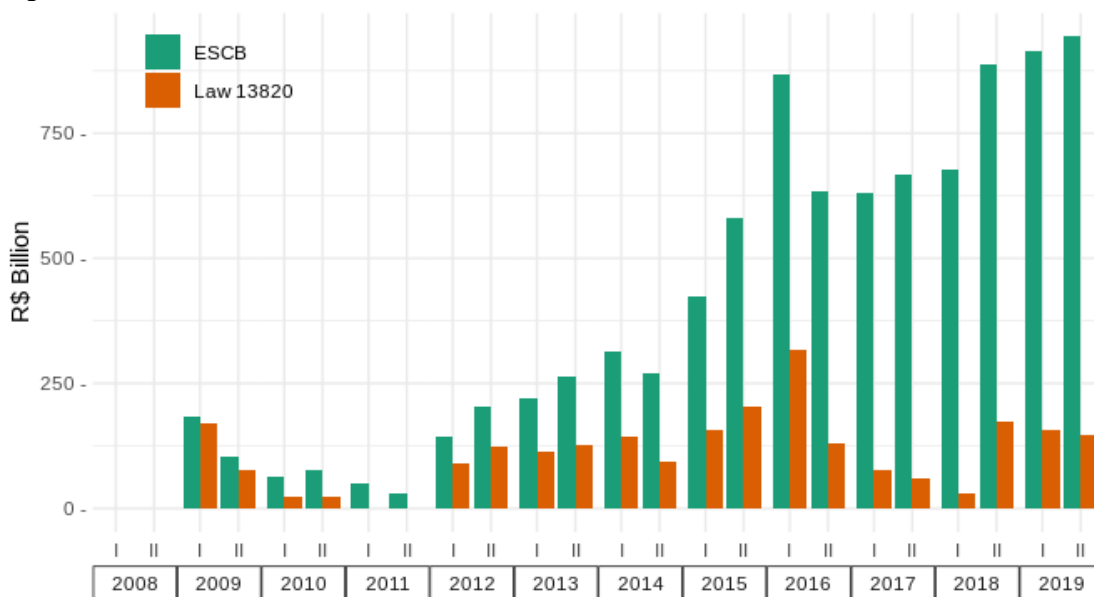
²⁹ One note on the methodology: the developments of period t are added to a revaluation account or will trigger a recapitalization on the period $t+1$. For example, an unrealized profit in the first semester of 2010 is added to the revaluation account in the second semester of 2010. That is why the simulation series end in the second semester of 2019.

³⁰ The interest rate income of the BCB on its foreign assets – a component of the realized results – was only made available from 2011 onwards. We decided to ignore these values, assuming that it was equal to zero in the simulations. Therefore, the revaluation account and the losses that would have been covered under the ESCB framework are slightly overestimated. For the years with available information, the average interest rate received on foreign assets in each quarter was, in annual terms, equal to 1.1% and the accumulated interest rate gains of the BCB on its foreign exchange reserves was approximately equal to 95 billion BRL.

of the simulation. The reason is that the realized costs would be constantly drawing resources from the revaluation account. One can think that there is an uncovered interest rate parity logic behind this rule since there is a sort of compensation between the positive interest rate differential and the unrealized profits deriving from the depreciation of the BRL that more or less compensate each other.

The second item we analyze is the losses that would have to be covered by the BT. These can be seen in Figure 8. In the ESCB framework, these would be the realized losses, while in the law 13,820 case it would be the losses if there were no more buffers available. We also display the results that were observed under the framework of the law 11,803 – where all losses were covered – for comparison. The first striking feature that we can see is that the ESCB framework, despite the size of the revaluation buffer, would be the framework generating the most frequent losses. The framework of the law 13,820, on the other hand, would trigger a loss coverage only three times in the period – all before the rise of the revaluation account from 2012 until 2015. Finally, we see that the law 11,803 framework implied that the BT often had to cover the losses of the BCB, although it did not generally coincide with the periods in which the ESCB framework would demand a loss coverage. For instance, the appreciation of the BRL in the first semester of 2016 led to a huge realized gain in the second semester of 2016 – as a consequence of the gains with FX swaps – and therefore no loss coverage under the ESCB framework. However, under the law 11,803 framework, this semester witnessed, in fact, the highest loss coverage of the period.

Figure 7. Revaluation accounts



Source: Author's elaboration.

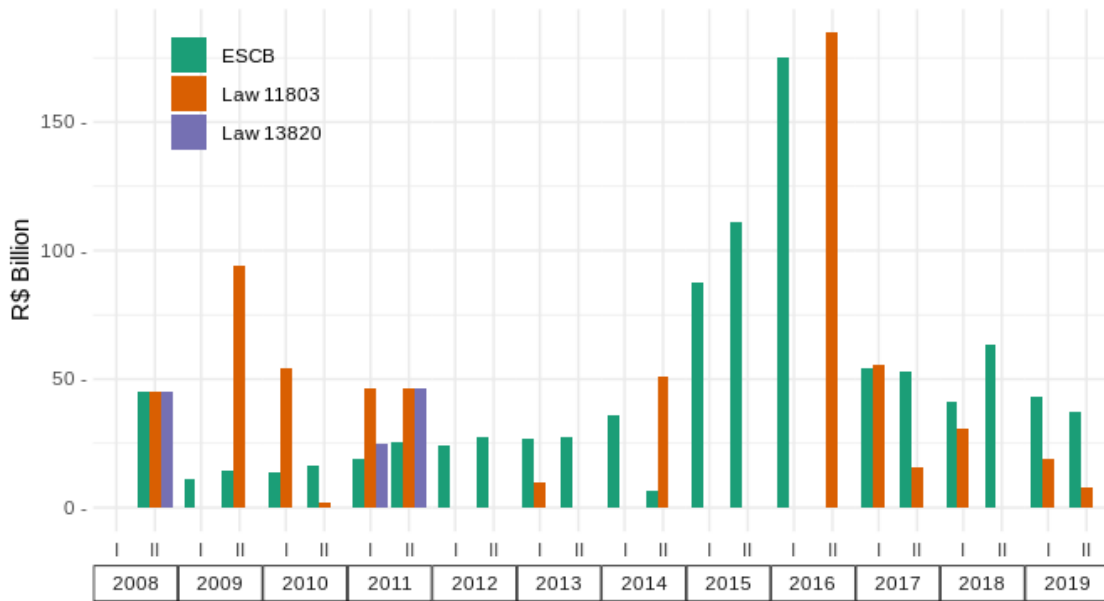
Yet, one should wonder, from seeing Figure 8, how would the BCB get the required treasury bonds to compensate for the substantial realized expenses under the law 13,820 framework if it did not generate any losses that would have been covered by the BT. The answer is simple: the BT would have to replenish the government securities' portfolio at the BCB. To have an idea on the magnitudes³¹, we created a hypothetical account that represented the available bonds for monetary policy at the BCB. Its initial value was set to 160 billion BRL, approximately the same amount of free bonds at the BCB portfolio at the end of 2007³². Since all the realized results should, everything else equal, be compensated by an offsetting monetary policy operation, the realized losses of period t were discounted from the available bonds account in period $t + 1$ while realized profits were added to it. Moreover, all of the losses covered by the BT were added to the available bonds account since those losses were covered by the issue of bonds. The result of this simulation is presented in Figure 9³³. The ESCB framework is not displayed since there would be no need to replenish the portfolio of the BCB under this framework given the frequency of realized losses under that framework. As we can see, if the law 13,820 was in place the BT would have to have recapitalized the BCB quite often, particularly after the significant losses registered in 2015.

³¹ Since we are only considering the foreign exchange results, there is not enough information to make a precise calculation on the minimum threshold of capital as being equal to 0.25 % of the total assets – as defined by the law 13,820.

³² One can find this information in the financial statements of the BCB.

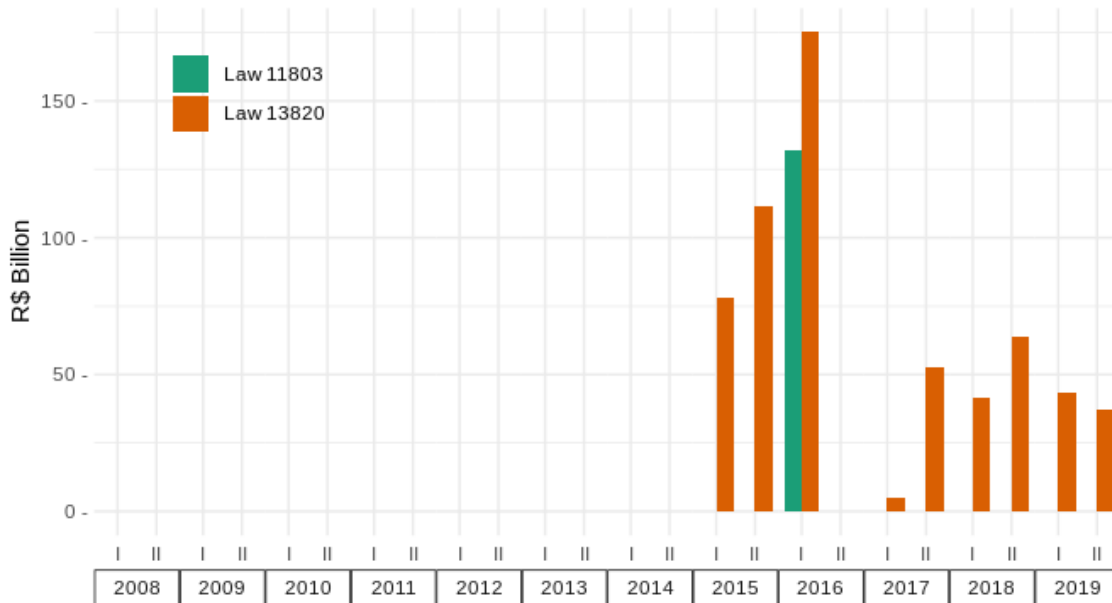
³³ We also added the simulated values under the law 11,803 rule for comparison. As we can see, under this rule, and restricted to the foreign exchange operations and under the hypothesis outlined in the text, we would expect a further recapitalization of the BCB by the amount of 135 billion BRL by the first semester of 2016 to make the available bonds account equal to zero. In reality, the BT replenished the portfolio of the BCB only three times in the whole period, starting in the first semester of 2015 and finishing on the first semester of 2016. The securities transferred to the BCB amounted to 140 billion BRL, a value that is strikingly close to one estimated by our simulations.

Figure 8. Losses covered by the Brazilian Treasury



Source: Author's elaboration.

Figure 9. Portfolio-led recapitalizations of the Brazilian Central Bank by the Brazilian Treasury



Source: Author's elaboration.

Finally, to conclude this subsection, it is important to reflect upon a point made by Stella (2005, p. 355) that the treasury might be less inclined to recapitalize the central bank in periods of fiscal distress. Even if there is an unconditional recapitalization scheme in place, he argues that the treasury might still increase the political pressure on the central bank to curb its losses in a period of fiscal crisis. Since the losses of the central bank under the ESCB framework closely follows the

realized losses – that are procyclical and follow the depreciation of the currency –, such a framework would require a procyclical recapitalization of the central bank by the treasury – the highest realized losses were experienced in 2015, also the most severe year of the Brazilian crisis – together with an inflated revaluation buffer. One could expect that the government would question the rationale of the central bank’s policies under these circumstances. On the other hand, the law 11,803 framework in which the transfers were regulated by the equalization operation that was in turn dominated by the unrealized results of the BCB presented a contrasting countercyclical behavior, feeding the BCB with bonds in tranquil times that backed the expansion of reverse repos in the rainy days of the BRL depreciation³⁴.

The framework of the law 13,820 sits somewhere in between, sharing the characteristics of both frameworks. The consolidation of the realized with the unrealized foreign exchange operations implies that its revaluation account is frequently being depleted, which can trigger the transfer of bonds to the BCB following the appreciation of the BRL, as would have happened in 2011. However, the steady depreciation of the BRL between 2012 and 2016 implied that, if the law 13,820 had been implemented in the period, it would have led to a significant transfer of government securities to the central bank in 2015³⁵ to replenish its portfolio of free securities to back the expansion of reverse repos in the period, although the fact that these transfers would not have been generated by losses would perhaps spare the BCB of some criticism. The replacement of reserves repos by remunerated reserves at the central bank as the monetary policy instrument of the BCB would free its liquidity management operations from the availability of free securities in its portfolio and effectively circumvent this problem.

7 Lessons from the Brazilian experience

After the several crises in newly integrated economies at the end of the 1990s, a consensus emerged in the literature and among policymakers about the importance of the precautionary accumulation of international reserves to shield these economies from the instabilities of the global financial flows. However, one important collateral effect of this hoarding was the increase of the balance sheet of central banks in these economies. This expansion increased the volatility of the

³⁴ It is important to note that the scrutiny over the policies of the BCB, in particular the utilization of the FX swaps, increased in the period, together with the growing criticism over the law 11,803 framework.

³⁵ To be fair, even the law 11,803 entailed a recapitalization in 2015 given the magnitude of the depreciation between 2014 and 2015.

profits and losses of central banks as a consequence of the association between the high-volatility of many of these currencies and the fair value retranslation of their foreign assets to the domestic currency – the dominant accounting paradigm nowadays.

The first point we emphasize is that central banks are not commercial banks. They retain the issuance monopoly of the domestic currency and they cannot go bankrupt. Therefore, except for central banks indebted in foreign currencies, one should not speak about liquidity or solvency constraints in the same way as one would with commercial banks. As a consequence, the problems involved in the distribution of unrealized profits are different: they do not endanger the finances of the central bank, but they could lead to monetized financing of the treasury and hence to the expansion of interest-earning liabilities at the central bank. The only objective constraint that may arise at the central bank is the lack of adequate instruments to manage the liquidity in the economy and thereby keep the interest rate on target if the central bank is forbidden to issue its interest-earning liabilities and depends on the availability of government securities at the central bank's portfolio. Yet, persistent losses can threaten the credibility of the central bankers to achieve their monetary policy objectives. These issues place the legal and accounting framework in center stage, given its importance in the determination of the profits and losses of the central bank and on the regulation of the relationship between the treasury and the central bank.

If the plain IFRS framework is in place, all of the fair value retranslation is recognized in the income statement. Hence, this framework would not only translate the variability of the exchange rate to the results of the central bank but could also provide funding for the treasury that, if used, would demand offsetting operations from the central bank to keep the operational interest rate on target that in turn could depend on the availability of government securities at the central bank's portfolio. The ESCB framework, on the other hand, emphasizes the prudence principle and requires that all unrealized profits be transferred to a revaluation account. This system effectively eliminates the possibility of monetized financing, although it can lead to inflated revaluation buffers and procyclical recapitalizations of the central bank in NIEs. Therefore, even if it is often viewed as the best international practice, we agree with Archer and Moser-Boehm (2013) and Caruana (2013) when they emphasize that there is no one-size-fits-all accounting cookbook that should be adopted by every central bank.

The Brazilian experience is illustrative of many of these problems. Soon after the increase in the foreign assets at the central bank, it was clear that the existing IFRS-

based accounting framework did not provide an adequate portfolio of government securities to the central bank to maintain its operational capability and that it would also increase the volatility of its results. It was to fix these problems that the law 11,803 was approved in 2008. This law created a new accounting framework with two important innovations: it allowed the treasury to issue and directly transfer securities to the central bank, either for covering central bank's losses or to replenish its portfolio; and it created the equalization account at the central bank that would record all of the expenses and incomes associated with the foreign exchange operations and would transfer them to the treasury, shielding the income statement of the central bank from its volatility.

The consolidation of the realized with the unrealized foreign exchange results implied by the equalization account and its full transfer to the treasury enhanced the autonomy of the Brazilian Central Bank to implement its policies in two important ways: i) the correlation of the equalization losses with the appreciation of the BRL provided a countercyclical replenishment of the portfolio of government securities at the BC; and ii) it provided an important accounting hedge to the interventions of the Brazilian Central Bank with foreign exchange swaps – which were important to safeguard the financial stability of the economy. However, the equalization account also led to the distribution of unrealized profits to the government, triggering growing criticism about a possible backdoor channel of monetized financing.

This criticism was behind the approval of a new accounting framework – the law 13,820 – in 2019. The main innovation of the new framework is that it determines that all positive results of the central bank with its foreign exchange operations must be transferred to a revaluation account at the central bank. Therefore, it effectively closed the backdoor channel of monetized financing while preserved the accounting hedge of countercyclical foreign exchange interventions with foreign exchange swaps. Since all the financial flows involved in the FX swaps are settled in the domestic currency, this consolidation cannot lead to a liquidity problem at the central bank.

Furthermore, our simulations indicate that, contrary to what would happen under the ESCB framework, the accounting framework of the law 13,820 would not lead to an inflated revaluation account due to the constant drainage of this account by the carrying costs of the international reserves. It would also minimize the recognition of higher realized losses in the income statement during turbulent times. However, the existence of the revaluation account would also weaken the countercyclical transfer of government securities to the central bank during tranquil

times, which will probably result in more frequent transfer of securities to the central bank in the form of portfolio replenishments during turbulent times when realized losses are higher. Therefore, the law 13,820 is a hybrid between the ESCB framework and the law 11,803 framework that takes advantage of the main benefits of both frameworks while avoiding their main complications.

The lesson to be drawn from the Brazilian experience is that the accounting framework is not neutral: it can either enhance or impair the ability of the central bank to implement its monetary and exchange rate policies. Furthermore, what is adequate for a given country might not be as much for another. Therefore, even if the international experience provides important benchmarks and examples, the accounting framework of a central bank should be tailored to address the specific needs of each central bank.

References

- Aizenman, J. (2008). Large Hoarding of International Reserves and the Emerging Global Economic Architecture, *Manchester School*, vol. 76, no. 5, p. 487–503. <https://doi.org/10.1111/j.1467-9957.2008.01072.x>
- Aizenman, J. and Lee, J. (2007). International Reserves: Precautionary Versus Mercantilist Views, *Theory and Evidence*, *Open Economies Review*, vol. 18, no. 2, p. 191–214. <https://doi.org/10.1007/s11079-007-9030-z>
- Aizenman, J., Lee, J., and Sushko, V. (2012). From the great moderation to the global crisis: exchange market pressure in the 2000s, *Open Economies Review*, vol. 23, no. 4, p. 597–621. <https://doi.org/10.1007/s11079-011-9228-y>
- Archer, D. and Moser-Boehm, P. (2013). Central Bank Finances. Bank for International Settlements BIS Papers n.71., 93 p.
- Bacha, E. (2016). *A Crise Fiscal e Monetária Brasileira*. Rio de Janeiro: Ed. Civilização Brasileira.
- BCB. (2013). Comunicado No 24.370. Banco Central do Brasil.
- BCB. (2015). *Demonstrações Financeiras 2015*. Banco Central do Brasil, 31 p.
- Bell, S. (2001). The Role of the State and the Hierarchy of Money, *Cambridge Journal of Economics*, vol. 25, no. 2, p. 149–63. <https://doi.org/10.1093/cje/25.2.149>
- Bholat, D. and Darbyshire, R. (2016). Accounting in Central Banks. Bank of England Staff working paper n.604.

- Bignon, V., Biondi, Y., and Ragot, X. (2009). An Economic Analysis of Fair Value: Accounting as a Vector of Crisis. *Cournot Centre Prisme* n.15.
- Bindseil, U. (2004). *Monetary Policy Implementation: Theory, Past, and Present*. Oxford: Oxford University Press.
- Bindseil, U., Manzanares, A., and Weller, B. (2004). The role of central bank capital revisited. *European Central Bank* n.392.
- Biondi, Y. (2011). The Pure Logic of Accounting: A Critique of the Fair Value Revolution, *Accounting, Economics, and Law*, vol. 1, no. 1, <https://doi.org/10.2202/2152-2820.1018>
- Brasil. (2008). Exposição de motivos para adoção da medida provisória no 435
- Buiter, W. (2007). Seigniorage, *Economics - The Open-Access, Open-Assessment E-Journal*, vol. 1, p. 1–49. <https://doi.org/10.3336/w12919>
- Buiter, W. H. (2008). Can Central Banks Go Broke? *Centre for Economic Policy Research CEPR Policy Insight* n.24.
- Bunea, D., Karakitsos, P., Merriman, N., and Studener, W. (2016). Profit Distribution and Loss Coverage Rules for Central Banks. *European Central Bank Occasional paper series* n.169., 57 p.
- Bussière, M., Cheng, G., Chinn, M. D., and Lisack, N. (2015). For a few dollars more: Reserves and growth in times of crises, *Journal of International Money and Finance*, vol. 52, p. 127–45. <https://doi.org/10.1016/j.jimonfin.2014.11.016>
- Calvo, G. (1998). Capital Flows and Capital-Market Crises: The Simple Economics of Sudden Stops, *Journal of Applied Economics*, vol. 1, p. 35–54. <https://doi.org/10.1080/15140326.1998.12040516>
- Carbone, C. and Gazzano, M. (2016). Relação entre operações compromissadas, reservas cambiais e a conta única. In: Bacha, E. (ed.), *A crise fiscal e monetária brasileira*, Rio de Janeiro: Civilização Brasileira, p. 315–27.
- Caruana, J. (2013). Preface to Archer and Moser-Boehm. In: Archer, D. and Moser-Boehm, P. (eds.), *Central Bank Finances*, BIS.
- Carvalho Jr., A. C. C. D. (2016). BC e Tesouro: um estudo sobre a Constituição, leis complementares, leis ordinárias e medidas provisórias. In: Bacha, E. (ed.), *A crise fiscal e monetária brasileira*, Rio de Janeiro: Civilização Brasileira, p. 153–86.
- Cervantes, A. R. (2007). La capitalización de los bancos centrales y las normas internacionales de contabilidad, *Boletín*, vol. LIII, no. 1, p. 13–16.

- Chiacchio, F., Claeys, G., and Papadia, F. (2018). Should we care about central bank profits? Bruegel Policy contribution n.13., date last accessed at <https://bruegel.org/2018/08/should-we-care-about-central-bank-profits/>.
- De Conti, B. M. (2016). As Relações Entre o Tesouro Nacional e o Banco Central Do Brasil. IPEA Relatório de pesquisa.
- De Conti, B. M., Prates, D. M., and Plihon, D. (2014). A Hierarquia Monetária e Suas Implicações Para as Taxas de Câmbio e de Juros e a Política Econômica Dos Países Periféricos, *Economia e Sociedade*, vol. 23, no. 2(51), p. 341–72. <http://dx.doi.org/10.1590/S0104-06182014000200003>.
- De Grauwe, P. and Ji, Y. (2013). Fiscal Implications of the ECB's Bond Buying Program, *Open economies review*, vol. 24, no. 5, p. 843–52. <https://doi.org/10.1007/s11079-013-9284-6>
- Dhar, S. (2012). Reserve Accumulation and Global Financial Stability: A Critical Assessment of IMF Concerns. Independent Evaluation Office of the International Monetary Fund IEO background paper n.BP/12/03., 41 p.
- Eichengreen, B. and Hausmann, R. (1999). Exchange rates and financial fragility. National Bureau of Economic Research n.7418., date last accessed at <http://www.nber.org/papers/w7418>.
- Eichengreen, B., Hausmann, R., and Panizza, U. (2007). Currency Mismatches, Debt Intolerance, and the Original Sin: Why They Are Not the Same and Why It Matters. In: *Capital Controls and Capital Flows in Emerging Economies: Policies, Practices and Consequences*, University of Chicago Press, p. 121–70.
- Erhart, S., Kicsák, G., Kuti, Z., Molnár, Z., Monostori, Z., and Others. (2013). Doing It Differently or The Impact of the Financial Crisis on Central Bank Balance Sheets in Emerging Economies, *MNB Bulletin*, vol. 8, no. Special, p. 46–60.
- European Union. (2016). On the legal framework for accounting and financial reporting in the European System of Central Banks.
- Farhi, M., Prates, D. M., and Abouchedid, S. (2018). Derivativos de câmbio e relação Banco Central-Tesouro: o caso do Brasil. In: *O Brasil pós-recessão: das origens da crise às perspectivas e desafios futuros*, Associação Keynesiana Brasileira, p. 13-23.
- Filardo, A. J. and Yetman, J. (2012). The Expansion of Central Bank Balance Sheets in Emerging Asia: What Are the Risks? *Bank for International Settlements BIS quarterly review*.

- Fischer, S. (2001). Opening remarks at the IMF/World Bank international reserves: Policy Issues Forum., Washington D.C.
- Frait, J. and Holub, T. (2010). Exchange Rate Appreciation and Negative Central Bank Capital. In: The capital needs of central banks, Routledge.
- Fry, M. J. (1993). The fiscal abuse of central banks. International Monetary Fund n.93/58.
- Furtado, C. (1961). Desenvolvimento e subdesenvolvimento. Rio de Janeiro: Ed. Fundo de cultura.
- Gallo, R. A. (2016). Banco Central e Tesouro: conjecturas sobre as consequências práticas de um relacionamento íntimo. In: Bacha, E. (ed.), A crise fiscal e monetária brasileira, Rio de Janeiro: Civilização Brasileira, p. 271–93.
- Garcia, M. and Afonso, J. R. (2016). Regras fiscais e volatilidade cambial. In: Bacha, E. (ed.), A crise fiscal e monetária brasileira, Rio de Janeiro: Civilização Brasileira, p. 329–45.
- Godley, W. and Lavoie, M. (2007). Monetary Economics: An Integrated Approach to Credit, Money, Income, Production and Wealth. Palgrave Macmillan.
- Goldstein, M. and Turner, P. (2004). Controlling Currency Mismatches in Emerging Markets. Peterson Institute for International Economics.
- Gonzalez, R. B., Khametshin, D., Peydro, J.-L., and Polo, A. (2019). Hedger of last resort: evidence from brazilian FX interventions, local credit and global financial cycles. Bank for International Settlements n.832.
- Guardia, E. R. (2016). Conta única do tesouro: flexibilidade necessária e seus bons e maus usos. In: Bacha, E. (ed.), A crise fiscal e monetária brasileira, Rio de Janeiro: Civilização Brasileira, p. 297–314.
- IEO. (2012). International Reserves: IMF Concerns and Country Perspectives. Independent Evaluation Office of the International Monetary Fund.
- IMF. (2011). Assessing Reserve Adequacy. International Monetary Fund.
- Kaltenbrunner, A. (2015). A Post Keynesian Framework of Exchange Rate Determination: A Minskyan Approach, Journal of Post Keynesian Economics, vol. 38, no. 3, p. 426–48. <https://doi.org/10.1080/01603477.2015.1065678>
- Keynes, J. M. (1971). Treatise on Money: Pure Theory of Money Vol. I. The collected writings of John Maynard Keynes, London: Macmillan, London.
- KPMG. (2012). Current Trends in Central Bank Financial Reporting Practices. KPMG.

- Lavoie, M. (2014). *Post-Keynesian Economics: New Foundations*. Cheltenham: Edward Elgar Publishing.
- Lo Vuolo, R. and Pereira, J. M. (2018). De la pérdida de soberanía monetaria a la pérdida de soberanía política: Los ejemplos de argentina y grecia. CIEPP Documentos de trabajo n.101.
- Macalós, J. P. S. (2018). 'A relação entre as intervenções cambiais de mercado do Banco Central do Brasil e o ciclo global de liquidez entre 2003 e 2016'. Master Thesis, Universidade Estadual de Campinas.
- Macedo e Silva, A. C. (2016). O Que Mostram as Demonstrações? Balanços e Resultados Dos Bancos Centrais. IPEA Texto para discussão n.2224.
- Marins, J., Araujo, G., and Vicente, J. (2015). As Atuações Cambiais Do Banco Central Afetam as Expectativas de Mercado? Banco Central do Brasil Textos para discussão n.393.
- Mendes, M. (2016). A Lei 11.803/2008 e a Relação Financeira Tesouro-Banco Central. Senado Federal Núcleo de estudos e pesquisas da consultoria legislativa n.189.
- MSCI. (2019). MSCI market classification framework. Morgan Stanley Capital International, date last accessed December 23, 2019, at https://www.msci.com/documents/1296102/1330218/MSCI_Global_Market_Framework_2019.pdf/57f021bc-a41b-f6a6-c482-8d4881b759bf.
- Nagel, J. (2012). Understanding Central Bank Balance Sheets, *The International Economy Magazine*, vol. 26, no. 3
- Prates, D. M. (2015). O Regime de Câmbio Flutuante No Brasil 1999-2012: Especificidades e Dilemas. Brasília: IPEA.
- Prates, D. M. (2017). Monetary sovereignty, currency hierarchy and policy space: a post-Keynesian approach. Instituto de Economia - Unicamp Textos para discussão n.315.
- Reinhart, C. and Calvo, G. (2000). When Capital Inflows Come to a Sudden Stop: Consequences and Policy Options. University Library of Munich, Germany MPRA Paper.
- Robinson, D. J. and Stella, P. (1993). Amalgamating central bank and fiscal deficits. In: Blejer, M. I. and Cheasty, A. (eds.), *How to measure the fiscal deficit*, Washington D.C.: International Monetary Fund, p. 236–58.

- Rodrik, D. (2006). The Social Cost of Foreign Exchange Reserves, *International Economic Journal*, vol. 20, no. 3, p. 253–66. <https://doi.org/10.1080/10168730600879331>
- Schwarz, C., Polychronis, K., Niall, M., and Werner, S. (2015). Why Accounting Matters: A Central Bank Perspective, *Accounting, Economics, and Law: A Convivium*, vol. 5, no. 1, p. 1–42. <https://doi.org/10.1515/ael-2014-0023>
- Stella, P. (1997). Do central banks need capital? *International Monetary Fund* n.97/83.
- Stella, P. (2005). Central bank financial strength, transparency, and policy credibility. *IMF staff papers* n.52(2)., 335–65 p.
- Sullivan, K. (2000). Transparency in central bank financial statement disclosures. *International Monetary Fund* n.00/186.
- Sweidan, O. (2011). Central bank losses: causes and consequences, *Asian-Pacific Economic Literature*, vol. 25, no. 1, p. 29–42.
- Teijeiro, M. O. (1989). Central bank losses: origins, conceptual issues, and measurement problems. *The World Bank* n.293.
- Tesouro Nacional. (2013). *A Relação Entre a Autoridade Fiscal e Autoridade Monetária: Experiência Internacional e o Caso Brasileiro*. Tesouro Nacional.
- Vaez-Zadeh, R. (1991). Implications and remedies of central bank losses. In: Downes, P. and Vaez-Zadeh, R. (eds.), *The evolving role of central banks*, p. 69–92.
- Viana, M. F. (2018). ‘A Lei no 11.803 de 2008 e a relação entre o Banco Central do Brasil e o Tesouro Nacional: o caso brasileiro à luz das experiências internacionais’. Master Thesis, Universidade Estadual de Campinas.
- Wray, L. R. (2015). *Modern Money Theory: A Primer on Macroeconomics for Sovereign Monetary Systems*. Springer.