C Appendix

This appendix describes the data and methodology that were used to compute the government budget constraint that is used in table 1. Also discussed are the different primary deficit series that are available for Brazil.

We follow the same methodology as in chapter 2, with two simplifying assumptions: (1) we assume that the share of the domestic good in the domestic price level is one \( \alpha = 1 \); and (2) we assume that all domestic debt is real because most domestic debt in Brazil is indexed to inflation or nominal interest rates (or both), and we do not have data on interest payments that separate real from nominal debt.

We start by describing how we compute the price level, real GDP, and exchange rate series. An important issue in our case is that stock values are expressed in units of the domestic currency at the end of the period, while the official price statistics report average prices within the period. In periods of high inflation, the difference between end-of-period and average prices is substantial. To overcome that, we deflate stock values by an estimate of end-of-period prices. In addition, for the most recent period (after 1990), we are able to compute the government budget constraint for each month, so we use the twelve-month sum of the budget constraint to compute the annual sequence of government budget constraints. To do that, we also construct a monthly series of real GDP.

**Price index** We use the General Price Index (IGP) from Getulio Vargas Foundation. It is composed of three price indexes: 60 percent Producer Price Index (IPA), 30 percent Consumer Price Index (IPC), and 10 percent Construction Price Index (INCC). Prices are collected from day one to day thirty of the reference month. Data are available at the IPEADATA website, \textit{IGP-DI - geral - índice (ago. 1994 = 100)}. End-of-period values are computed as the geometric average between \( t \) and \( t + 1 \). We normalize the IGP-DI such that its average is equal to the GDP deflator in 1995. The GDP deflator in 1995 is equal to the nominal GDP in 1995 divided by 100 (we normalize real GDP to 100 in 1995). Data on nominal GDP are from IPEADATA, \textit{Produto interno bruto (PIB) a preços de mercado - referência 2000}). Regarding the price index of the foreign good, we use the GDP deflator for the United States for the annual series and the US CPI for the monthly series.

**Real GDP** Data are from the Brazilian Institute of Geography and Statistics (IBGE), series SCN53. It is annual, from 1947 to 2014. The series show the percentage variation in volume. We normalize real GDP in 1995 to 100 and use the variation to construct the series of real GDP. We use the annual variation in real GDP (reference year 2010)

\[ \text{Nominal GDP} = \text{price level} \times \text{real GDP}. \]
between 2015 and 2016 to update the series to 2016. It is available at the IPEADATA website. To construct a monthly series, we assume that the annual values correspond to July values and use linear interpolation to compute real GDP for the other months.

**Exchange rate**  We use the exchange rate (buy price) between the Brazilian currency and US$. Both average and end-of-period series are available at the IPEADATA website.

**Subperiod 1960–1981**

Most series are available at an annual frequency for this subperiod, so we only compute the budget constraint at an annual frequency. We use the sum of three series to compute the stock of domestic debt $P_t b_t$: federal government debt securities out of the central bank, debt securities of states and municipalities, and dívida pública fundada. Data are from IBGE, *Estatísticas do Século XX*. We use the series of monetary base, $M_0$ (end-of-period) from IPEADATA, as our measure of $M_t$.

We use the series of real interest payments on domestic debt divided by nominal GDP as our measure of interest payments on domestic debt $\frac{r_{t-1} - g_t}{g_t} \theta_{t-1}$. We avoid manipulating these series in the first subperiods because the series of interest payments and stock of debt come from different sources. The series of real interest payments is computed as the series of nominal interest payments on domestic debt minus the series of monetary correction, multiplied by the fraction of federal debt securities out of the central bank, all from IBGE, *Estatísticas do Século XX*.

Regarding the net external debt, we assume that $b^*_t$ is zero up to 1972. After that, we use the series of registered public external debt (code 3564) minus foreign reserves (code 3566) as the measure of $P_t^* b_t^*$, both from the Central Bank of Brazil. For the series of interest payments on external debt, we only observe the total payments of interest on gross external debt, which includes both public and private debt. We observe both the series of total gross external debt (code 3682) and public gross external debt, so we assume that interest payments are proportional to the stocks, which gives us a series of interest payments on public external debt, $P_t^* (r_{t-1}^* - 1) b_{t-1}^*$.

The series of primary deficit is computed as expenditures minus tax revenues plus the transfers from the central bank to the Bank of Brazil. Tax revenues include direct and indirect taxes. Expenditures correspond to government consumption, subsidies, transfers, and investment, net of other current net revenues. Data are from IBGE, *Estatísticas do Século XX*. The transfers to Bank of Brazil are computed as the variation in the balance of the Bank of Brazil accounts at the central bank: *Conta de Movimento* and *Conta de Suprimentos Especiais*. The transfers $\tau_t$ are computed as the residual of the government budget constraint.

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56 Codes denote the series codes on the website of the central bank.
Subperiod 1982–1990

In 1981, the Central Bank of Brazil started to publish the series of the public-sector borrowing requirement, which requires the computation of both net domestic and net external debt series of the nonfinancial public sector. We rely mostly on these series to construct the budget constraint after 1981. As our measure of domestic debt, $P_{t}b_{t}$, we use the series of net domestic public debt, available at IPEADATA. However, this series includes the monetary base as liabilities and the accounts of the Bank of Brazil at the central bank as assets, so we adjust the series for that. We subtract the monetary base and add the balance of the Conta de Movimento and Conta de Suprimentos Especias on the balance sheet of the central bank to the series of net domestic debt.

Regarding the series of net public external debt, the central bank does not distinguish between exchange rate adjustments and inventory adjustments; it reports only the sum. We construct the series of exchange rate adjustments and use the difference as the proxy for inventory adjustments on the external debt. We assume that, for the 1981–1990 period, all the adjustments that are made to compute the nominal deficit based on the variation in total net public debt are from adjustments on the net external debt series. The reason is that this period is characterized by a sequence of external debt renegotiations, which could lead to variations in the net external debt figures without being related to nominal deficits.

In order to compute the series of interest payments on external debt, we proceed in a similar fashion as in the previous subperiod, but now we adjust the value of interest payments on external debt for default. We compute the fraction of total interest paid over total interest due relative to total gross external debt and use this fraction to adjust for interest payments that were actually paid. The source of these data is the same as in figure 16.

Regarding the series of interest payments on domestic debt, we use the same method as before up to 1984. After that, the central bank started to publish the series of nominal interest payments. We then subtract the series of interest payments on external debt described above and use the result as our measure of interest payments on domestic debt.

Subperiod 1990–2018

After 1990, the central bank began to publish its fiscal statistics on a monthly frequency. From that point on, we have all the information that is needed to compute the government budget constraint, except for the primary deficit. At this point, we can only compute the sum of primary deficit plus transfers, corresponding to the residual. This is similar to the primary deficit series that the central bank uses. As mentioned above, we proceed by summing the monthly budget constraints to have a annual series for the government budget constraint. We then use the primary deficit series from IBGE and
subtract it from (primary deficit+transfers) to compute the transfers. Finally, note that the series of primary deficits from IBGE is available up to 2000. After that, we use the publications of the consolidated national public-sector accounts available on the website of the National Treasury Secretariat.

C.1 Primary deficit series in Brazil

In Brazil, there are two main sources of data on the public-sector primary deficit: the Brazilian Institute of Geography and Statistics (IBGE) and the Central Bank of Brazil (CBB). The data from IBGE are annual and cover the period from 1947 to the present.\textsuperscript{57} The IBGE data include the federal government, states, and municipalities, and are published in the national accounts—public sector.\textsuperscript{58} The data are based on the executed budget of the government. The data on primary deficits from CBB, on the other hand, are available on an annual frequency since 1985 and on a monthly frequency since January 1991. These data include the federal government, states, and municipalities, as well as the central bank and state-owned enterprises (SOEs). We illustrate both (original) series in figure 30.

There are important differences in the methodology used to compute each of these series. The data from IBGE use the actual data reported on the books of government authorities and can be considered the traditional measure of primary deficit.\textsuperscript{59} The CBB, on the other hand, estimates its data based on the public-sector borrowing requirement. That is, the CBB computes the variation of the stock of net debt and money supply from the federal government, central bank, states and municipalities, and state-owned enterprises. That variation gives a proxy for the fiscal deficit of the government, which includes both interest payments and the primary deficit. CBB then estimates the interest payments based on the characteristics of assets and liabilities and computes the primary deficit as a residual.

In Brazil, there is a preference among economists to use the deficit series from the CBB after 1985.\textsuperscript{60} A few factors explain that preference. First, at the onset of the external debt crisis in the early 1980s, authorities needed to work with recent data, and the statistics on the primary deficit took a long time to be released. The CBB, on the other hand, had the ability to compile debt information for both domestic and external debt in a timely fashion, so it decided to compute its own fiscal statistics based on the

\textsuperscript{57}From 1947 to 2000, the series can be downloaded from the Estatísticas do Século XX from IBGE. We extrapolate it using the annual publications of the public-sector accounts on the website of the National Treasury Secretariat.

\textsuperscript{58}Data on the federal government deficit and central government are also readily available on the website of the Department of the Treasury for the most recent period.

\textsuperscript{59}For example, IBGE uses data from the Balanço Geral da União (Union General Budget) for the federal government.

\textsuperscript{60}See Giambiagi and Alem (2011).
public-sector borrowing requirements. The second factor is the inclusion of SOEs. The debt series used by the CBB covered SOEs, whereas the other deficit series did not. Since SOEs were constantly used by the government to implement its economic policies (see main text), that was considered a significant advantage. Third, there was lack of confidence in the capability of the government to accurately report its finances. The National Treasury Secretariat, for example, was only created in 1986.

Next, we discuss a few points regarding the primary deficit series of the central bank. First, the inclusion (or not) of SOEs in the primary deficit series does not make a big difference after 1985, especially after the 1990s when most privatizations took place (figure 30). Second, the CBB did not take into account privatizations when estimating primary deficits. In other words, if the government sold some of its assets to finance current expenditures, that would not be captured in the deficit series from the CBB. Figure 31a compares both series, with privatization and no privatization, for the period after 1996, which is the year when the data on privatizations used by the CBB become available.

Third, the CBB does not account for defaults. It estimates interest payments on an accrual basis. So if the government defaulted on its interest payments, the CBB would underestimate the primary deficit. The reason is that the CBB assumes that the government paid all the interest that was due. Therefore, it would conclude that the government had the resources to pay for the interest due, which must have come from lower primary deficits (or higher surpluses) according to CBB’s methodology. Remember that the primary deficit is computed as a residual. But if the government defaulted on the interest payments, then it must be the case that deficits were actually higher than the ones reported by the CBB. As the main text mentions, the country accumulated arrears
on interest payments on the external debt for many years, especially in the 1990–1994 period. We use the information on the fraction of interest on external debt that was actually paid to correct for both the interest payments and the primary deficit series.
reported by the CBB. The difference in the primary deficit series is illustrated in figure 31b. Unfortunately, we do not have information regarding defaults on domestic debt.

Fourth, the CBB does not distinguish “bad assets” from the rest of the government’s assets. In these cases, the CBB might conclude that the government is saving, since it is accumulating more assets, when in reality those assets are worthless (the extreme case). One example is the accounts from Bank of Brazil (BB) on the CBB’s balance sheet (see main text) that were used to transfer funds from the CBB to the BB. In figure 32a we show the magnitude of those transfers given by the variation in their balances. By looking at its own assets, the CBB would conclude that it is saving, but those funds were never repaid and represented deficits. We did correct the primary deficit series for the transfers between the CBB and BB through those accounts. However, there might be other cases. Imagine, for example, the case in which the government bails out a public bank by exchanging the “bad assets” that they were holding on their balance sheet. The CBB would conclude that there were no surpluses or deficits, since the government is exchanging assets for liabilities in “equal” amounts, when in reality, they were transfers to finance expenditures.61

Additionally, in some cases, debt recognitions (skeletons) enter the debt series. The CBB does not include those variations when estimating the primary deficit, but it shows that some previous deficits were not taken into account. They are shown in figure 31c.

Finally, note that the IBGE series also misses the transactions between the CBB and BB, so we also need to make that adjustment in the IBGE series. See figure 32b.

**Implications**

As we can see in figure 30, the difference between both series is significant, especially around the time of the Real Plan. However, the main conclusion from our analysis does not change, even when we include the adjustments mentioned above. The low-inflation period (after 1994) is characterized by improvements in fiscal balances. Note that both series show primary surpluses after 1998. The main controversy arises in the period surrounding the implementation of the Real Plan. It is usually emphasized that the government switched from large surpluses to large deficits when the plan was implemented, but given the pitfalls in CBB’s series, one cannot be 100 percent sure of it. If we look at IBGE’s series instead, we observe the opposite: large deficits before the Real Plan and an improvement right after. But again, this series also has its own pitfalls, so one must be careful when drawing conclusions based on these observations.

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61 In other words, the value of those assets on the balance sheet do not represent their true value.
Figure 32: Adjustment regarding Bank of Brazil (BB), percentage of GDP

(a) CBB + BB

(b) IBGE + BB

Sources: Brazilian Institute of Geography and Statistics (IBGE) and Central Bank of Brazil (CBB).