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FISCAL SUSTAINABILITY IN URUGUAY:
A BALANCE SHEET DYNAMICS APPROACH

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Fiscal Sustainability in Uruguay: A Balance Sheet Dynamics Approach

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Abstract

In this paper we evaluate fiscal sustainability beyond the Debt Sustainability Analysis methodology, analyzing the balance sheet dynamics of the consolidated public sector (not just gross debt) and using a more comprehensive data set in institutional coverage (not just central government), debt structure (not only debt level matters) and higher frequency (quarterly) data. We first perform an historical analysis for Uruguay, highlighting important events of debt dynamics and finding the mains strengths and weaknesses of public finances over the last 30 years. Then, we conduct a prospective analysis, where fiscal variables are determined within a macroeconometric model, including an empirical fiscal reaction function. In this context, we simulate different debt paths as a result of macroeconomic scenarios, as well as public finances policy decisions, in a medium-term outlook. We find that the main debt dynamic drivers come from the fiscal-financing perspective (i.e., interest payments, primary deficit, and monetary base) and the macroeconomic framework (i.e., inflation, currency depreciation, and real GDP growth).

JEL Codes: E62, G32, H63, H68.
Keywords: debt dynamics, fiscal sustainability, fiscal policy, debt management.

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1   Introduction

Uruguay is a small open economy, continuously exposed to global and regional shocks, both real and financial. Moreover, historically a key feature of the economy has been its high degree of dollarization, a relevant channel for shock transmission. The public sector has a broad coverage on social security and health systems, resulting on a high tax burden and on deficit biased public finances. In this context, over the last 30 years net public debt-to-GDP ratio fluctuated on the comfortable zone of 20%-40%, peaking 87% in 2002-2003 after the domestic financial crisis, which was a combination of currency, banking and public debt crises, being the major crisis in the last century together with the 1982 Latin American crisis. After the peak, public finances developed new tools for better risk management, such as a long-term policy of de-dollarization and an integrated framework of assets and liabilities management. As a result, Uruguay consolidated a strong macro-financial position, reflected on low sovereign risk premium and the "Investment Grade" status from the three major rating agencies.

The aim of the paper is to evaluate fiscal sustainability in Uruguay in a broad sense, analyzing the dynamics of the balance sheet of the consolidated public sector, finding the mains strengths and weaknesses of public finances in a medium-term outlook.

To perform this analysis, Section 2 describes the conceptual framework, which is based on the debt sustainability analysis (DSA) methodology, summarized in some indicators à la Buiter (1985) and Blanchard (1990), and the liquidity analysis through the "reserve's comfort level" methodology à la Della Mea et al. (2011). Then, in Sections 2.3 and 2.4 the methodology is extended in two dimensions: first, by adding debt composition (assets and liabilities as well as gross debt structure), and second, we present a stock-flow approach through the public sector's balance sheet, exploding a richer dataset of stocks and flows quarterly data with more granular information on assets and liabilities and on currency, instrument and maturity debt composition for different public sector agencies. In Section 3, after presenting the main characteristics of Uruguay's public finances over the last 30 years, we perform a historical debt decomposition using the augmented DSA and the stock-flows analysis (SFA) methodologies with annual data to highlight the main trends and drivers of public debt dynamics. This analysis includes a breakdown of gross debt by currency and term structure, making explicit currency and rollover risks. Next, in Section 4 we set the DSA-SFA methodology for a forward-looking analysis and we discuss debt dynamics and fiscal sustainability over the next 10 years over different policy scenarios. This prospective exercise is performed in a general equilibrium macro-econometric model background, where macroeconomic and fiscal variables are jointly determined for a given set of exogenous (mostly international) variables. Then, fiscal variables are partially exogenous, while an empirical fiscal reaction function à la Bohn (2007) is estimated (reflecting fiscal policy), and partially endogenous (reflecting the effect of the business

cycle). Finally, Section 5 concludes.

The paper's main contributions refer to the construction of the augmented DSA-SFA framework in order to analyze the main features and challenges for Uruguayan public finances in the medium term, such as dollarization, real exchange rate volatility, the determination of debt and assets in an ALM approach, the interaction between fiscal and monetary policy through their balance sheets and the analysis of different fiscal policy alternatives to deal with public sector solvency in a medium-term perspective.

2 The Sustainability of a Given Set of Public Policies: The Conceptual Framework

Our approach to the sustainability issue takes into account specific Uruguay's macro-finances characteristics, such as its high degree of dollarization and the important role played by the asset-accumulation strategy. Then, the conceptual framework includes three methodological elements. First, the traditional debt sustainability analysis (DSA), with an explicit treatment of debt composition (by currency, interest rate and maturity). Second, a stock-flow approach using the balance sheet of the consolidated public sector, where we analyze liabilities and assets dynamics.[1] Third, since international reserves accumulation is a self-assurance tool, we compute some "comfortable level" of reserves to face different kind of crises.

2.1 The DSA Framework

Starting from the budgetary restriction of the public sector, where the fiscal balance (FB_t), the interests that must be paid on the debt of the previous period $(i_t B_{t-1})$, and the net primary surplus (S_t), must be financed with an increase in debt (ΔB_t) or in the monetary base (ΔM_t), we can derive the traditional DSA framework based on Buiter (1985) and Blanchard (1990):

$$FB_t = i_t B_{t-1} - S_t = \Delta B_t + \Delta M_t, \tag{1}$$

where $\Delta B_t = B_t - B_{t-1}$ and $\Delta M_t = M_t - M_{t-1}$.
Then

$$B_t = (1 + i_t)B_{t-1} - S_t - \Delta M_t. \tag{2}$$

Deflated by nominal GDP and after some computation:

$$b_t = (r - g)b_{t-1} - s_t - \mu_t. \tag{3}$$

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[1]The consolidated public sector is a broad definition, which includes the central and local governments, the public corporations and the central bank.

In this framework the current level of (gross) debt (b_t) depends on the relationship between real interest rate (r) and real growth rate (g), the evolution of the primary surplus (s_t) and the collection of *seigniorage* (μ_t), for a given initial value of debt (b_{t-1}).[2]

The real interest rate is the nominal interest rate (i) deflated by the inflation rate (π), while *seigniorage* is the nominal change in the money stock in terms of GDP, which depends on real money demand.

Then, a government is solvent if its debt does not grow in an explosive way, meaning that the government fulfills its intertemporal budgetary constraint (IBC). This restriction is binding if the present value of the planned trajectory of primary surpluses from now to infinity is (higher than or) equal to the initial debt-to-GDP ratio for a given value of *seigniorage* financing, and is referred as the solvency condition.

Moreover, it is said that a government shows a sustainable fiscal policy if it fulfills the above solvency requirement without a need for a significant adjustment in its planned trajectory of future income and outlays, given the financial cost that faces in the market. Therefore, the concept of sustainability incorporates to the solvency definition the ones of liquidity. Then, a government is in an illiquid position, regardless of whether or not it fulfills the solvency requirement, if its reserve assets and its available financing are not enough to face its liability maturities.

Finally, fiscal vulnerability is defined as the risk of violation of the liquidity and/or the solvency condition after the realization of a negative shock to the economy. This concept is especially relevant for countries that, like Uruguay, face a high level of volatility of their main macroeconomic variables.

2.2 Summary Indicators

From this conceptual framework a set of summary indicators can be derived to analyze the sustainability of fiscal policy. As a first approximation, traditional DSA can be summarized in well-known indicators of public solvency, such as the primary gap and the medium-term tax gap. Then, one can derive an indicator of solvency from the fiscal reaction function methodology. Finally, a liquidity indicator arises from the "comfort level" of assets methodology.

i. *Solvency: The Primary Gap*

The Buiter-Blanchard approach to solvency seeks to maintain a constant debt-to-GDP ratio. Looking back to equation (2), we impose the condition $\Delta b_t = 0$ and we solve for the primary surplus. We obtain s_t^*, the condition the government must meet to keep the debt-to-GDP ratio constant:

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[2]All variables are presented as a share of GDP.

$$s_t = (r - g).b_{t-1} - \mu_t. \tag{4}$$

From the comparison between s_t^* and the effective primary balance s_t we can obtain the Primary Gap indicator *(k)*, which measures the required primary balance adjustment in order to stabilize the debt-to-GDP ratio in a specific level (the current level or some desired target).

$$k_t = s_t^* - s_t. \tag{5}$$

A primary gap indicator with positive sign shows the need for a fiscal adjustment in order to keep the debt-to-GDP ratio constant, while a negative sign means a comfortable fiscal position.

ii. *Solvency: The Medium-Term Tax Gap*

A more informative indicator can be found by breaking down primary surplus into revenues and expenditures. Typically, primary expenditures (PE) show a higher level of rigidity over the medium term than tax revenues. Hence, the tax burden (T/GDP) is the main variable left for discretionary fiscal policy in such horizon.

Starting from the definition of primary balance $S = T - PE$, with similar calculations as in the previous section we can derive the tax gap (TG), defined as the difference between T^*/GDP (tax rate necessary to keep constant debt-to-GDP ratio) and the effective tax rate T/GDP:

$$TG_t = \frac{T^*}{GDP_t} - \frac{T}{GDP_t} = t_t^* - t_t. \tag{6}$$

The tax gap is another indicator of public solvency; it evaluates not only the potential need for a fiscal consolidation, but also the magnitude and then the likelihood of such tax-based fiscal adjustment.

iii. *Solvency: The Fiscal Reaction Function*

The estimation of a fiscal reaction function aims at establishing how government reacts to its debt burden. The sustainability analysis benefits by specifying the response of primary balance-to-GDP ratio to changes in previous public debt-to-GDP ratio, controlling for other factor, as the business cycle, the real exchange rate or the terms of trade. If public debt-to-GDP increases, an improvement of the primary balance-to-GDP is needed in order to offset or reverse that increase.

Taking into account equation (2), dropping the collection of *seigniorage*, it is possible to derive:

$$\Delta b_t = \frac{(r-g)}{(1+g)} b_{t-1} - s_t. \tag{7}$$

This equation leads to the condition that the primary balance must comply with so that the debt-to-GDP ratio can remain unchanged:

$$s_t = \frac{(r-g)}{(1+g)} b_{t-1}. \tag{8}$$

If the prevailing level of debt is considered acceptable, (7) can be understood as a fiscal rule: it establishes the primary balance required to keep to debt-to-GDP target. In order to study the actual behaviour of government, a fiscal reaction function of a similar form can be estimated:

$$s_t^{act} = \alpha b_{t-1}^{act} + \epsilon_t, \tag{9}$$

where "act" stands for "actual series". The assessment of the conduct of fiscal policy consists of comparing α to $(r-g)/(1+g)$.

It is usual to include s_{t-1} as a means of allowing for inertia in government behaviour. It is also a common practice to consider the output gap y_t as a control variable. Nevertheless, in Uruguay another variable proved to be more relevant: MPAS, a variable that combines the quantity of retirement and old age benefits granted by the government and the evolution of wages. In this regard, it is important to bear in mind that social security spending represents a large amount of Uruguayan public expenditure and it is mostly exogenously determined. Since 1990 retirement and old-age benefits granted by government are indexed to the increase wages have experienced the year before. Thus, the gap between actual values of MPAS and their trend, the "MPAS gap" ($MPAS$), was added as an explanatory variable.

Finally, the basic fiscal reaction function for Uruguay was specified as:

$$s_t = \alpha_1 + \alpha_2 s_{t-1} + \alpha_3 b_{t-1} + \alpha_4 MPAS + \epsilon_t. \tag{10}$$

From (7) and (9), it is possible to conclude that fiscal policy will be sustainable if:[3]

$$\frac{\alpha_3}{1-\alpha_2} \gg \frac{r-g}{1+g}. \tag{11}$$

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[3]See Appendix (A) for further details and estimation results.

iv. *Liquidity: The "Comfortable Level" of Reserve Assets*

Indicators presented above implicitly assume that the country has a permanent access to capital markets, which is not always the case in an emerging market economy. Therefore, the analysis of solvency must be completed with indicators of potential liquidity problems.

Liquidity can be viewed as the difference of the maturity structure of public debt, its available liquid assets and its short-run financing possibilities in the framework of a "comfortable" level of assets. This indicator is based on the idea that the quantity of "optimal" reserve assets results from a balance between its benefits and its costs. The benefits are derived from its potential uses within a risk management framework, while the costs are financing and opportunity. Following this approach, Della Mea et al. (2011) try to determine a "precautionary" or "comfortable" level of reserve assets, that is the level that would allow the Monetary Authority to cover the simultaneous occurrence of risks from the financial system, the sovereign debt, and the money and foreign exchange market in an extreme situation of financial stress (with a 1% level of significance).

The methodology can be assimilated to a value-at-risk one in two stages: in the first stage it is determined the period in which the reserves can be required; then, these risks, originated in the three sources mentioned above, are quantified, given a certain significance level. Since the period, spanning the three decades between the 90s and 2010, includes the 2002 crisis, many of the thresholds founded are linked to this actual event.

First, the longest term in which the public sector loses access to capital markets with a probability set at 99% results in five months for the central bank (CB) and 13 months for the central government (CG).

Then, to establish the "comfortable" amount of reserves, the risks to be hedged with the CB liquidity are quantified in the usual way. On the money and foreign exchange markets, according to the empirical density function, the fall in the demand for money covering 99% of the cases reaches 15%, this maximum is associated with the 2002 crisis.

The link between the CG and the CB's assets comes through the use of its deposits at the CB and the financial assistance that may be granted by the CB (articles 46 and 48 of its Organic Act). To obtain the eventual amounts to be covered, we use the CG's debt amortization calendar and its primary deficit forecast.

Finally, the financial sector affects the CB's reserves through the use of its deposits and the financial assistance that can be granted by the CB (article 32 of its Organic Act). The deposits withdrawn from the banking system according to

the density function with a 99% probability are estimated on 80% for non-residents deposits and 36% for resident deposits, once again corresponding to the 2002 crisis values. Then, financial assistance is computed up to the legal ceiling, considering the estimated withdrawals net of reserve deposits, short-term financial sector's external assets and public sector securities held by the financial sector.

Adding these three sources of risk, the "comfortable" level of reserves is determined, which is the level that allows covering the risks faced by the Monetary Authority in an extreme case, derived from its operations and its legal mandate. If the level of reserves is greater than these risks, it is said that there is a "surplus" or "excess" in its reserves level relative to the comfortable level.

Recently, Amante et al. (2019) highlight the importance of maintaining liquid assets at levels that are sufficiently robust to meet shock scenarios to manage sovereign liquidity risk, especially in emerging market economies. The papers document that countries that have such a policy include Denmark, New Zealand, South Africa, Turkey and Uruguay.

2.3   The Augmented DSA: Debt Composition

This extension captures some important characteristics of Uruguayan public debt, such as the importance of public assets management, the historical relevance of the US dollar (USD) in its liabilities and the emergence of local currency linked units (to inflation or wages).

2.3.1   Adding Assets

Traditional DSA is usually carried out for gross debt of Central Government. However, since policy reaction usually involves a combination of debt and assets strategies, it is relevant to analyze the evolution of assets and liabilities in an integrated way. This is especially important in a country such as Uruguay, where after the 2008 global financial crisis an asset and liabilities management (ALM) strategy was developed as part of an integrated monetary-fiscal-financial framework. More recently, Yousefi (2019) has shown that markets discriminate governments' asset positions in addition to debt levels in determining the borrowing costs, since the asset position gives economics resilience. In addition, Malacrida et al. (2017) and Amante et al. (2019) highlight the importance of the assets and liabilities management that Uruguay has been carried out.

From Equation (1), incorporating the return on public assets, we seek to identify the effect of the main macroeconomic variables, such as real growth, inflation, depreciation and the evolution of interest rates.

$$FB_t = i_t B_{t-1} - S_t - i_t^a A_{t-1} = \Delta B_t + \Delta M_t - \Delta A_t, \qquad (12)$$

where $\Delta B_t = B_t - B_{t-1}$ is the increase in gross debt and $\Delta A_t = A_t - A_{t-1}$ is public assets (de)accumulation. Then,

$$B_t = (1 + i_t)B_{t-1} - (1 + i_t^a)A_{t-1} - S_t - \Delta M_t + A_t. \qquad (13)$$

In order to obtain ratios in terms of GDP, all items are divided by GDP. Then, we define net debt as $d_t = b_t - a_t$, where a_t is the ratio of public sector assets in terms of GDP. We come back to the previous framework working with net debt. After some computation we obtain:

$$d_t = b_t - a_t = \left(\frac{1 + i_t}{(1 + \pi_t)(1 + g_t)}\right)b_{t-1} - \left(\frac{1 + i_t^a}{(1 + \pi_t)(1 + g_t)}\right)a_{t-1} - s_t - \mu_t, \qquad (14)$$

where i_t is now the nominal interest rate on public liabilities and i_t^a is the nominal rate of return on public assets.

2.3.2 Adding Currencies

The previously presented DSA exclusively focuses on debt level, without taking into account its composition by currency or maturity. In this section we explicit debt composition, allowing for risk analysis coming from exchange rate, interest rate, rollover and access to capital markets.

In particular, until the 2002 crisis almost all the gross debt was denominated in US dollar. After that, a long-run de-dollarization policy begins, decreasing the US dollar share to half of the debt, which has reduced sovereign debt exposure to exchange rate movements. However, this share is still high. Following Rial & Vicente (2004) and Dominioni et al. (2012), we develop a breakdown of debt and deficit by currency to contemplate this feature.

Since 2002, when the CG issued its first security denominated in local, inflation-linked currency and the CB started a road to an inflation targeting regime, issuing nominal and inflation-linked securities for liquidity regulation, the Uruguayan (gross) public debt is denominated mainly in three currencies: nominal local currency in pesos (p), inflation-linked local currency (r) and foreign currencies (mainly the USD). Then, we can break down the debt-to-GDP ratio as follows:

$$b_t = b_t^p P_t + b_t^r + b_t^{usd} E_t, \qquad (15)$$

$$(1 + i_t)b_t = (1 + i_t^p)b_t^p P_t + (1 + i_t^r)b_t^r + (1 + i_t^{usd})b_t^{usd} E_t, \qquad (16)$$

where E_t is the nominal exchange rate and P_t is a local price index. Then, following the previous framework, we have:

$$d_t = (\frac{1 + i_t^r}{(1 + \pi_t)(1 + g_t)})b_{t-1}^r + (\frac{1 + i_t^p}{(1 + \pi_t)(1 + g_t)})P_t b_{t-1}^p$$
$$+ (\frac{1 + i_t^{usd}}{(1 + \pi_t)(1 + g_t)})E_t b_{t-1}^{usd} \tag{17}$$
$$- (\frac{1 + i_t^a}{(1 + \pi_t)(1 + g_t)})b_{t-1}^a - s_t - \Delta m_t.$$

Considering that $\pi_t = \frac{P_t}{P_{t-1}}$ and $e_t = \frac{E_t}{E_{t-1}}$, after some computation we obtain:

$$d_t = (\frac{1 + i_t^r}{(1 + \pi_t)(1 + g_t)})b_{t-1}^r$$
$$+ (\frac{1 + i_t^P}{1 + g_t})P_{t-1} b_{t-1}^p + (\frac{(1 + i_t^{usd})(1 + e_t)}{(1 + \pi_t)(1 + g_t)})E_{t-1} b_{t-1}^{usd} \tag{18}$$
$$- (\frac{1 + i_t^a}{(1 + \pi_t)(1 + g_t)})a_{t-1} - s_t - \Delta m_t.$$

In order to analyze the dynamics of the previous equation, we subtract d_{t-1} from each side. Thus,

$$\Delta d_t = (\frac{1 + i_t^r}{(1 + \pi_t)(1 + g_t)} - 1)b_{t-1}^r + (\frac{1 + i_t^p}{1 + g_t} - 1)P_{t-1} b_{t-1}^p$$
$$+ (\frac{(1 + i_t^{usd})(1 + e_t)}{(1 + \pi_t)(1 + g_t)} - 1)E_{t-1} b_{t-1}^{usd} \tag{19}$$
$$- (\frac{1 + i_t^a}{(1 + \pi_t)(1 + g_t)} - 1)a_{t-1} - s_t - \Delta m_t,$$

$$\Delta d_t = (\frac{i_t^r}{(1 + \pi_t)(1 + g_t)} - \frac{g_t}{(1 + g_t)} - \frac{\pi_t}{(1 + \pi_t)(1 + g_t)})b_{t-1}^r$$
$$+ (\frac{i_t^p}{1 + g_t} - \frac{g_t}{1 + g_t})P_{t-1} b_{t-1}^p + (\frac{i_t^{usd}(1 + e_t)}{(1 + \pi_t)(1 + g_t)}$$
$$+ \frac{e_t}{(1 + \pi_t)(1 + g_t)} - \frac{\pi_t}{(1 + \pi_t)(1 + g_t)} \tag{20}$$
$$- \frac{g_t}{(1 + g_t)})E_{t-1} b_{t-1}^{usd} - (\frac{1 + i_t^a}{(1 + \pi_t))(1 + g_t)} - 1)a_{t-1}$$
$$- s_t - \Delta m_t.$$

Finally, we obtain the following equation, which captures the whole picture:

$$\Delta d_t = \frac{1}{1+g_t}(\frac{i_t^r - \pi_t}{1+\pi_t})b_{t-1}^r + i_t^p P_{t-1} b_{t-1}^p$$
$$+ (\frac{i_t^{usd}(1+e_t) + (e_t - \pi_t)}{1+\pi_t})E_{t-1}b_{t-1}^{usd}$$
$$- (\frac{i_t^{a_{usd}}(1+e_t) + (e_t - \pi_t)}{1+\pi_t})E_{t-1}a_{t-1}^{a_{usd}} \quad\quad (21)$$
$$- g_t d_{t-1} - s_t - \mu_t.$$

In this equation the first three terms account for the average real gross debt rate by currency, while the fourth term represents the average real rate on assets.

As a result, this equation summarizes the main features of Uruguayan public debt: liabilities and assets structure, gross debt composition by currency, the exposure to international conditions (i), the risk arising from real depreciation (e-π), the role of inflation as an alternative to fiscal consolidation through the local currency real rate (i-π), and the *seigniorage* μ. Then, it is the basic framework to perform historical and prospective analysis of public finances in Uruguay.

2.4   The Stock-Flow Approach: The Public Sector Balance Sheet

Recent studies, such as Yousefi (2019), argue that while it is still essential the assessment gross public debt, fiscal policy debate could be enriched by looking at the entire public sector balance sheet, including the asset side. First, from a fiscal policy perspective, this instrument would allow policy makers to assess how public wealth could be better used to meet a country's long-term economic goals. Second, this approach could improve the analysis of long-term sustainability of macroeconomic policies by extending the DSA framework using measures of intertemporal net worth, which includes future revenues and expenditures flows and hence fully accounts for the whole public sector "social contract" such as prospective ageing-related liabilities. Finally, this public sector consolidated balance sheet framework allows for an ALM strategy that reduces vulnerabilities of different public agencies involved, such as Central Government, Central Bank and public corporations.[4]

Then, in this section we include the analysis of the balance sheet as an approximation of the public sector's financial net worth. To do so, we work with a broader institutional coverage: we include assets as well as liabilities, using high-quality data collection on the asset side, while we include higher-frequency (quarterly) data. This allows for an in-depth analysis of assets and liabilities, the relevance of currency denomination and the different financing sources at an institutional sector level, and the role played by different

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[4]The advantages of a comprehensive management of assets and liabilities are widely studied; see for instance Lu et al. (2007); Das et al. (2012); Koc (2014); Cangoz et al. (2018).

macroeconomic variables in the dynamic of the stocks of net worth.

The basic analytical framework comes from the government finance statistics manual (IMF 2001, 2014).[5] Under this framework, the change in the stocks of assets and liabilities is explained by two types of flows: transactions (T), which reflect the overall result (deficit) of each institution, and the so-called "other economic flows" (OEF), that account for the variation in stocks caused by changes in currencies and the market value of assets and liabilities (Figure 1).

Figure 1: Stocks and Flows Analysis
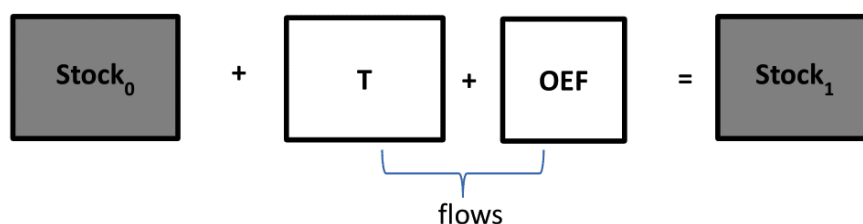
Notes: (T) Transactions / (OEF) Other Economic Flows. Sources: Own design based on basic analytical framework from GFSM2014.[6]

This methodology has some advantages over the traditional approach. First, it is based on a rigorous statistical reference framework from which stocks and flows can be constructed with an intrinsic logic; this is not obvious in each of the statistics for public debt and fiscal balance. Then, one can analyze in a unique framework net worth dynamics (solvency) and financing needs (liquidity). On the other hand, it allows for the analysis of interactions between different public agencies, typically the Central Government and the Central Bank, making explicit the link between fiscal and monetary policies. In particular, it makes it possible to analyze the expansion and contraction of the Central Bank balance sheet in episodes of (de)accumulation of assets caused by capital inflows (outflows) and the consequent defense of the currency, which implies a broader dimension of macro-prudential policy.

Starting from a given initial public sector financial net worth, there are *transactions* of each agency that determine their deficit or surplus. These fiscal balances, together with the amortization schedule, define the financing gap, which is closed by transactions of financial assets and liabilities. Additionally, macroeconomic variables affect stocks and flows of these assets and liabilities, given rise to the *other economic flows* (OEF). Both transactions and OEF determines the end of period public sector financial net worth. This exercise is done each for institutional agency of the consolidated public sector; then, by adding institutions we obtain the consolidated balance sheet dynamics. The logic of

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[5]The Government Finance Statistics Manual (International Monetary Fund (2014)) made some revisions on the 2001 version.

[6]See Departamento de Análisis Fiscal de la División Política Económica del BCU (2001).

the below figure allows for a historical analysis while can be used in a prospective way, by forecasting the different macro and fiscal variables involved; see Section 4.

Figure 2: Stocks and Flows Analysis
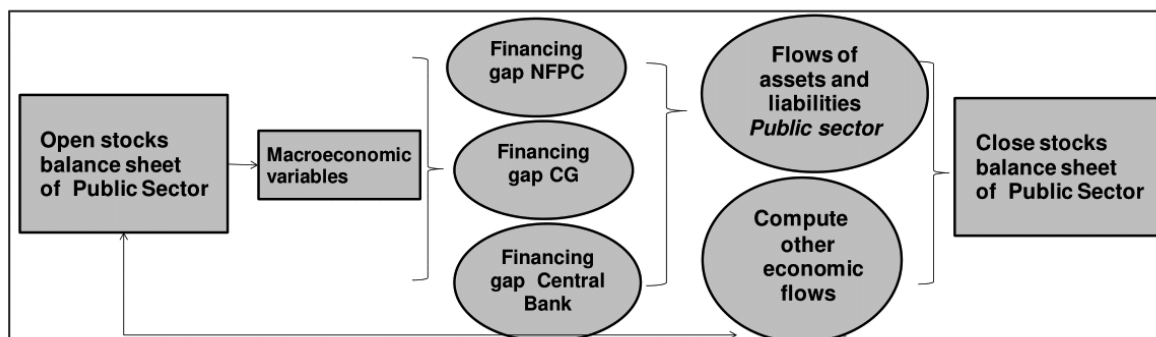
Notes: Own design, model structure based on basic analytical framework from GFSM2014.

This methodology requires a richer dataset, differentiating assets and liabilities, and breaking them down by instruments, currency of denomination, maturity and interest rate for each public sector agency: Central Government, public corporations and Central Bank. In addition, this exercise is performed using quarterly data. So, the construction of balance sheets is one of the main contributions of this paper to the sustainability analysis issue.

2.5   Public Finance Statistics

As mentioned above, the methodologies require different data breakdowns, with an incremental requirement in the order in which the approaches were presented.

Uruguay has a long standing tradition in the production of sound macroeconomic statistics. However, the Public Sector Statistics are still published according to the IMF's 1986 Manual, with some exceptions that take into account the methodology established the GFSM 2001-2014. What is more, in 2001 the methodology for the compilation of fiscal statistics was revised; since then, the public debt figures include a stocks and flows statistic consolidation, resulting in a more robust methodological framework[7].

As a result, the CB produces quarterly series consistent with the stock-flow approach since 1999. Yet, this framework does not include the full balance sheet, since it focuses only on debt instruments, and still is not publicly available. Modernizing public sector statistics provides a more powerful framework for analysis, exposing in the same methodology the link between flows (such as deficits and holding gains and losses) and stocks (debt and financial wealth).

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[7]See "A New Methodology for Public Debt and Deficit", Departamento de Análisis Fiscal de la División Política Económica del BCU (2001).

Currently, the CB produces the basic statistics required for the balance sheet approach, differentiating assets and liabilities, breaking down by instrument, currency of denomination, maturity and interest rate, for each public sector agency. The debt considered in this paper is the publicly statistical net debt plus the reserve requirements deposits in foreign currency of the banking sector at the CB. The institutional coverage, following the official statistics, is the consolidated public sector, which includes the central government, local governments, public corporations and the central bank (see Figure 3).

Figure 3: Institutional Coverage of the Public Sector
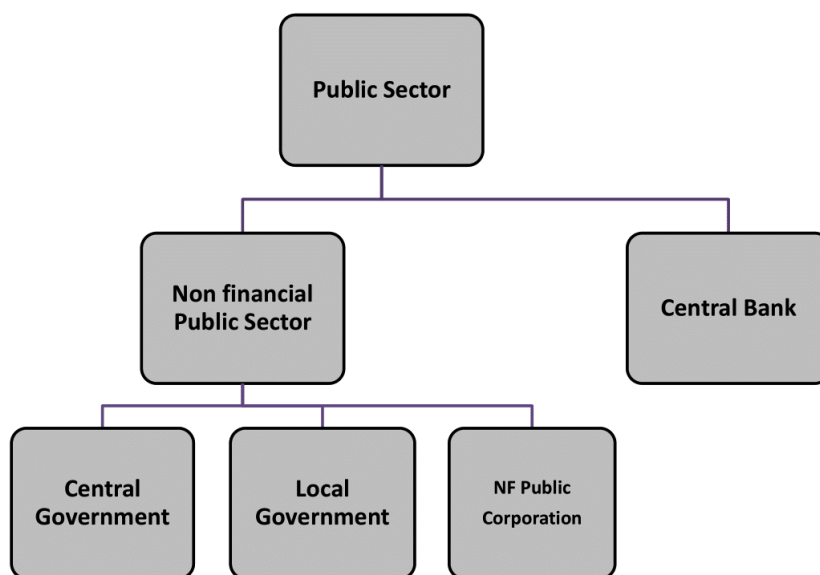
Note: Each box shows the institutional sector that make up the institutional coverage of the public sector.

For the historical analysis, the series are spliced with the previous methodology so that we can have time series at an annual basis starting in 1988. This splice generates some methodological changes that may account for some differences between the actual debt figures and the ones estimated by the DSA-SFA methodology, which is captured by the residual component "others stock-flow adjustment". In addition, this component also reflects net acquisitions of assets excluded from the definition of debt but included in the definition of wealth, such as financial derivatives and equity.

Moreover, this variable includes a series of factors that are magnified in times of crisis or sudden macroeconomic adjustment, such as accounting valuation difficulties (for example, the CB's assistance to the financial sector, or debt management operations), end-of-period versus average variations (notably the exchange rate) or differences between inflation (used in the debt dynamics as a proxy for the GDP deflator) and the actual change in the GDP deflator. As a matter of fact, these factors explained around 10 p.p.

of the increase in debt-to-GDP ratio in 2002.

3   Public Debt Dynamics over the Last 30 Years (1988 - 2019)

3.1   Main Features

Uruguay is a small open economy, continuously exposed to global and regional shocks as well, both real and financial. During this period the economy experienced a steady growth interrupted by the 2002 financial crisis which was a combination of currency, banking and public debt crises with harmful effects on output and employment. In particular, this event was the end of the last ERBS plan, which finished with the typical jump in the nominal exchange rate. Before and after this event there have been long periods of expansion; more recently, after the commodities super cycle, the economy grew at moderate rates. Moreover, a key feature of the economy has been its high degree of dollarization (in public and private debt and in bank deposits and loans), a relevant channel for shock transmission.

The public sector has a broad coverage on social security and health systems, resulting on a high tax burden and on deficit biased public finances: the median of the period shows a deficit of 2.5% of GDP. In this framework, public finances have been conducted in a reasonable way: the median primary balance represents a surplus of almost 1% of GDP.

Starting from a deficit of 6% of GDP in the late 80s, the 1990 fiscal consolidation reduced the imbalance to an average of 2% of GDP until 1998, a turning year for the next recession and financial crisis in 2002. After the crisis, fiscal policy reacts in a fiscal reaction function fashion, making an important fiscal consolidation at the time of the debt spike: primary balance reached a surplus of 4 GDP p.p. during the five years after the event, surplus which continued at a minor level for another four years until 2011. Later macroeconomic slowdown guided mainly by the international and regional environment, together with an expansive fiscal policy, led to an increase in the fiscal deficit, which averaged 4% of GDP in the last five years of the sample, a similar figure than the pre-crisis one (see Figure 4).

Figure 4: Real GDP growth, Real Depreciation, and Fiscal Balance
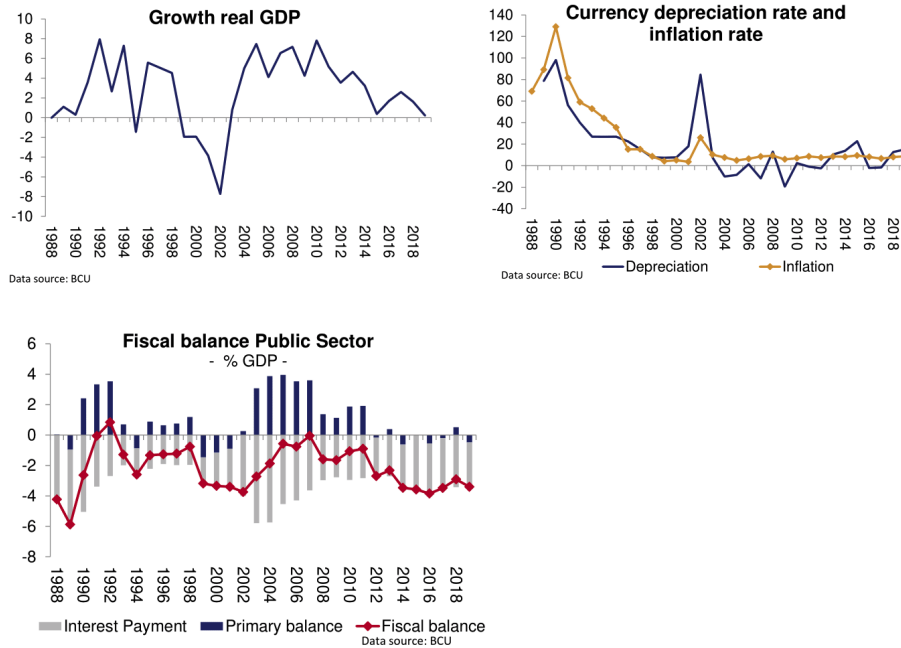
Notes: The graphs show the historical evolution of the variables. Variables included are growth real GDP rate, currency depreciation rate, inflation rate, interest payment as a percentage of GDP, primary balance as a percentage of GDP.

3.1.1 Main Fiscal Policy Measures

Starting from a deficit of 6% of GDP in the late 80s, several fiscal adjustments, and, in some years, a positive output gap made it possible to reduce the imbalance to an average of 2% of GDP until 1998, a turning year for the next recession and financial crisis in 2002.[8]

In 1990, the Administration that took office in March adopted corrective measures. The more effective were the ones intended to bolster up government income: increases in many tax rates – a temporary VAT hike was particularly noticeable – introduction of new taxes and a sharp rise in public utilities prices. Expenditure cuts in investment and on the wage bill were more than offset by expenditure increases elsewhere.

Another fiscal consolidation was deemed necessary in 1995-1996. Actions were taken to restrain the growth of expenditures: hiring in the public sector was curtailed, limits on discretionary spending on goods and services were imposed, a reduction in capital expenditures was implemented. Tax measures were also carried out: increases in rates and reduction of exemptions would apply to VAT, higher rates of the tax on wages and retirement benefits were introduced. Additionally, prices of public utilities rose sharply during the year. The increase of social security outlays and the reduction of social security

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[8]For a detailed analysis on this section, see Mitchell (1996), David & Leigh (2018), Forteza et al. (2018).

contribution rates in the manufacturing sector weakened the effect of the attempted fiscal consolidation.

Uruguayan "Pay as you go" (PAYG) social security system shortfalls contributed to the overall government deficit. Increasing benefit outlays brought about by generous laws and demographic factors could not be covered by payroll taxes. Additional funding was needed, such as a substantial share of VAR revenues. However, the dearth of the system was evident and the prospect of insolvency loomed large. The financing system was amended to create a new mixed system by the social security reform approved in 1995: the public PAYG system was partially substituted by individual accounts managed by private institutions.

In 2000, with the country in recession, expenditure cuts were aimed at boosting competitiveness. Reduction in capital spending prevailed.

In the context of a banking and balance of payment crisis and a severe economic recession, as part of an IMF supported program, measures were taken to ensure the sustainability of the public debt by seeking a permanent increase in the primary surplus. The fiscal consolidation took place in 2002 and 2003. An increase in the tax on wages and pensions, new excise taxes, a broadening of the VAT base, rise in the prices of public utilities, along with significant expenditure cuts were implemented.

In summary, fiscal policy reacted in a fiscal reaction function fashion, making an important fiscal consolidation at the time of the debt spike: primary balance reached a surplus of 4 GDP p.p. during the five years after the event, surplus which continued at a minor level for another four years until 2011. Later macroeconomic slowdown guided mainly by the international and regional environment, together with an expansive fiscal policy, led to an increase in the fiscal deficit, which averaged 4% of GDP in the last five years of the sample, a similar figure than the pre-crisis one.

During the last 30 years central government primary spending increased from 19 to 30 GDP percentage points (p.p.), driven mainly by retirement and old age benefits, social protection and the health care system. The social security network is a far-reaching one and comprises two thirds of public spending. As retirement and old-age benefits granted by the government are linked to wages, there is limited room for discretional adjustment. To cover these increasing outlays, the tax burden increased in a similar way during the period: from 22 to 29 GDP p.p. between 1988 and 2018 (see Figure 5).

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Figure 5: Income and Primary Spending in the Central Government
and the Social Security Bank, %GDP
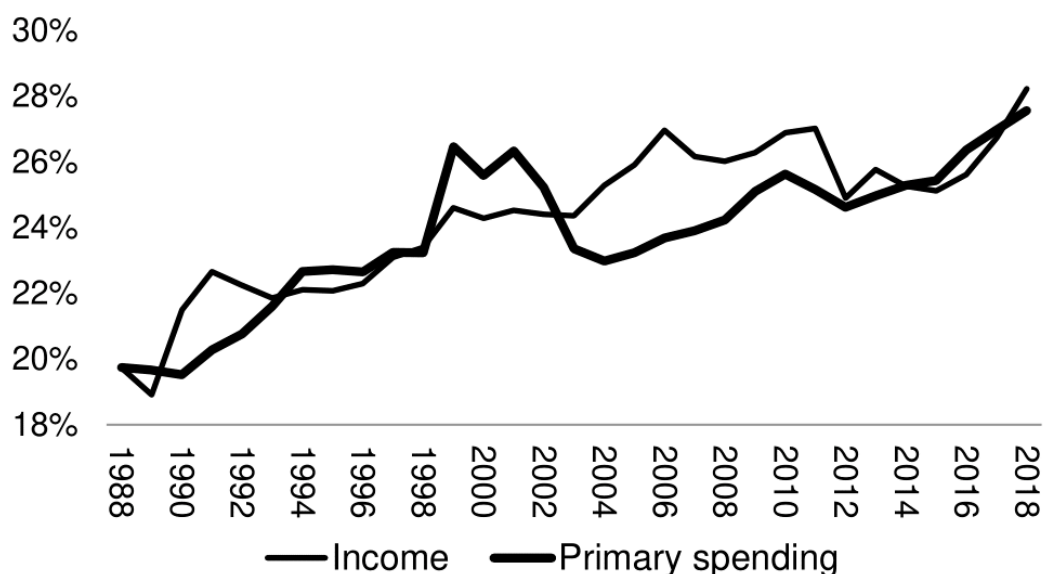
Note: The figure refers to data on income and primary spending as a share of GDP in the central government and the social security bank. Data Source: Ministry of economy.

Historically, consumption was the main tax base; after the 2007 tax reform, income taxes began to play a key role in public finances. This structural change makes public revenues less sensitive to the economic cycle. Since 2003 the strong increase in revenues, both in structural and cyclical terms based on the strong performance of the Uruguayan economy, generated few concerns about the expansion of public spending. The loss of economic dynamism in recent years has led to an increase in the deficit, changing this perspective.

3.1.2 Debt Dynamics and Composition

Over the last 30 years net public debt-to GDP-ratio fluctuated on the comfortable zone of 20%-40%, peaking 87% in 2002-2003 following the domestic financial crisis (see Figure 6). After this peak, public finances developed new tools for better risk management, such as a long-term policy of de-dollarization and an integrated framework of assets and liabilities management. As a result, Uruguay has nowadays a strong macro-financial position, reflected on low sovereign risk premium and the "Investment Grade" status from the three major rating agencies.

Figure 6: Public Debt to GDP
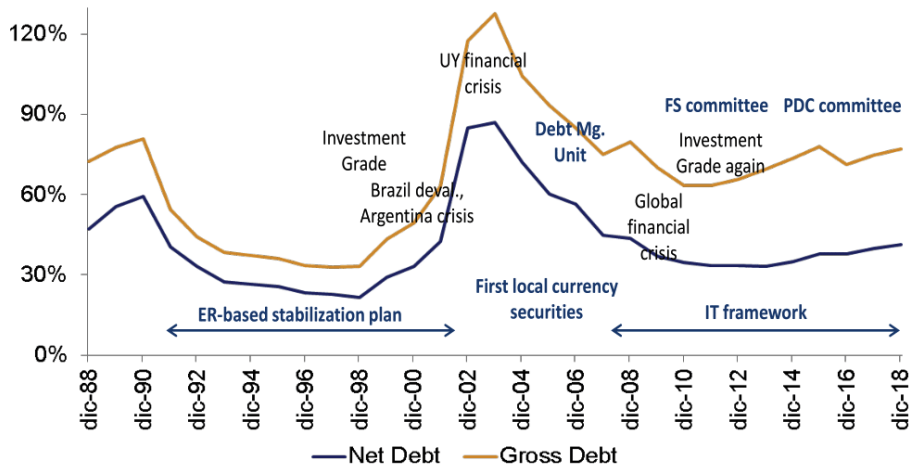
Notes: The graph shows the historical evolution of the variables and relevant events that influenced it. Variables included are net and gross debt percentage of GDP. Source: Own.

A key feature of the public debt composition is its historical high degree of dollarization: until 2003 more than 95% of the gross debt was denominated in foreign currency, mainly the US dollar (USD).

This fact, in combination with a monetary policy conducted through some variations of a fixed exchange rate regime, provoked a steady decline of debt-to-GDP ratios during the 90s, when an exchange rate-based stabilization plan (ERBSP) resulted in a real exchange rate (RER) appreciation and a GDP expansion. In this context, Uruguay enjoyed a continuous access to financial markets and its sovereign debt reached the "Investment Grade" status in 1998. Later deterioration of macroeconomic conditions after the Brazilian devaluation in 1999 and the Argentinian crisis in 2001 explained the sharp increase in this ratio, which reached the local maximum of the period after a four-year recession than ended in 2002 with the financial crisis which had a huge cost in terms of output and employment.

An important lesson of the crisis was that, in spite of actual low levels of debt-to-GDP ratio observed during the decade, exchange rate vulnerability was very high during the whole period, being a central challenge in the post crisis agenda.

After the resolution of the crisis, policy-makers developed new tools for a better risk management: the monetary framework moved from the traditional fixed exchange rate regime to a floating one, while the price stability setting changed to the more flexible inflation targeting (IT) regime. Moreover, the late 2002 issuance of the first inflation-linked local currency bond was the landmark of the de-dollarization long-lasting roadmap; furthermore, traditional view of a separate assets and liabilities management (ALM) was removed in favor of an integrated framework.

These settings, together with a better macroeconomic performance within a continu-

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ous annual GDP growth since 2003, resulted on a stronger macro-financial position during the following decade: after peaking 128% in 2003, Gross Public Debt-to-GDP ratio fall steadily to 64% in 2011, being 81% in 2019. At the same time, Foreign Assets grew from a minimum of 7% of GDP after the crisis to its end-of-period level of around 27% of GDP.

Likewise, there were important improvements in debt composition: local currency denominated debt evolved from 5% to around 50% of total debt, whereas its average life was extended: the residual maturity of more than 5 years, starting from 35%, peaked 60% of total debt (see Figure 7). This sovereign debt de-dollarization strategy, a long-lasting policy seeking to reduce exchange rate vulnerability, is also a macro-prudential tool, since it provides a benchmark for the private sector. As a result, during this period Uruguay also experienced a reduction in the dollarization of credits and deposits in the banking sector, meaning a stronger financial position of the whole economy.

Figure 7: Debt Structure by Currency and Maturity
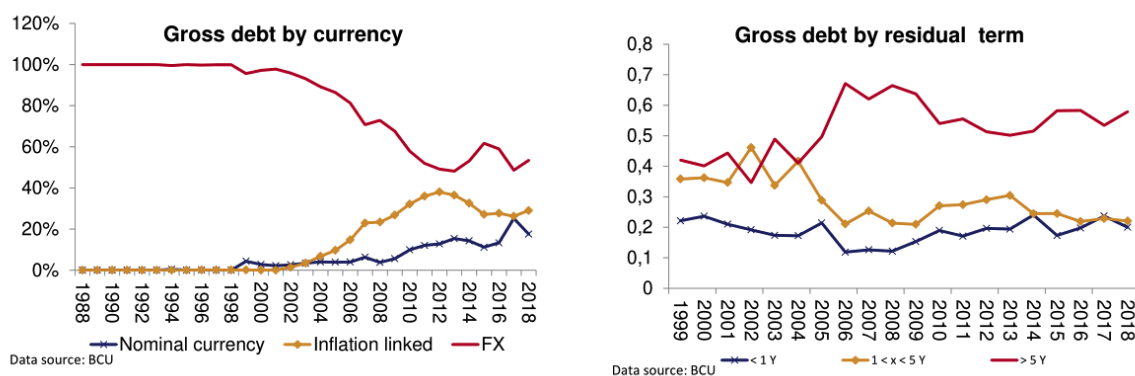
Notes: The graphs show the historical evolution of debt structure by currency and residual term. Variables included by currency are: percentage of gross debt in nominal currency, indexed to inflation and in foreign currency (FX). Variables included by term are: less than one year (<1Y), between one and 5 years (1<x5Y) and more than 5 years (<5Y).

Moreover, during the period there were institutional improvements in the coordination of policies and visions of different government agencies, reflected in the creation of different committees involving the Central Government, the Central Bank, the Banking Supervisor and the Debt Management Unit.[9] As a result, economic policy has nowadays a strong institutional support, a formal coordination technology and a clear setting for the conduct of macro-prudential policies.

Consequently, during 2012-2013 Uruguay's sovereign risk premium reached its historical minimum while sovereign debt regained the "Investment Grade" status from the three major rating agencies. These features remained until the end of the period analyzed.

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[9]Since 2008 there were created the following committees: Macroeconomic Coordination (MCC, 2008); Monetary Policy (MPC, 2008); Financial Stability (FSC, 2011) and Public Debt Coordination (CCDP, 2016).

To sum up, during the post-2002 crisis Uruguay has developed many strengths and capacities, such as: a long-last decline in debt-to-GDP ratios, a high level of Reserve Assets, a decrease path in debt dollarization, a clear debt maturity profile and an integrated assets and liabilities management approach within the balance sheet of the consolidated public sector. Nonetheless, the last years increase in fiscal deficit and debt ratios have put the issue of sustainability back at the agenda.

3.2 Trends and Drivers Through the Augmented DSA - SFA Framework

In this section we analyze the dynamics of the Uruguayan public debt in the last 30 years, using the sustainability indicators developed in Section 2 to explicitly address the risks related to the debt structure (by currency, maturity, interest rate), the role of fiscal policy, the linkages between different agencies of the consolidated public sector and the management of public liabilities and assets in the context of its balance sheet.

The evolution of (gross and net) public debt for the Uruguayan economy in the last 30 years was determined by the interaction of the macroeconomic environment and policy measures on stocks and flows. We can identify three periods for the analysis within the sample (see Figure 8): 1988-2001, a period of relative stability in the evolution of debt, before the largest financial crisis in Uruguayan history; 2002-2008, that covers the crisis and its exit, and 2009-2019, which shows the macro-financial framework after the 2008 global financial crisis. Aside from this, the following figure also shows that the methodology managed to mimic the actual evolution of public debt.

Figure 8: Net Debt to GDP Annual Change
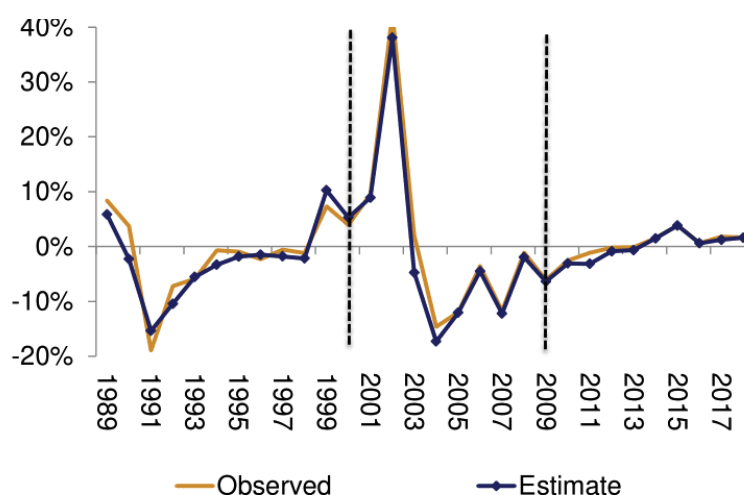
Notes: The graph shows the historical evolution of the annual variation of net debt to GDP, observed and estimated by our methodological framework. The dotted vertical lines separate the analyzed periods.

The macro and fiscal factors involved, according to the methodological framework, can be summarized in the evolution of few variables, such as: primary balance, real growth, currency depreciation, inflation, interest rate (which depends on a reference rate such as the Libor rate and risk premium summarized in the EMBI) and *seigniorage.*

The evolution of macro variables show that public debt generally increased during recessions and fell during expansions, while the greatest movements are determined by changes in relative prices (real depreciation) in spikes and rapid slowdowns episodes (see Figure 9). This was the case of the 2002 crisis, when real depreciation accounted for 31 of the 42 GDP p.p. of the net debt jump, and the fast debt reduction in the following years: in 2003-2007 net debt-to-GDP reduced by 44 p.p., driven mainly by the 36 p.p. of the accumulated real appreciation. A similar pattern could be found in 1991, the starting year of an ERBS plan that provoked a sharp real currency appreciation and a fast decline in net debt in terms of GDP. In these episodes almost all the debt was denominated in foreign currency, amplifying the effects of changes in relative prices. Apart from these specific episodes, the rest of the period showed a smooth evolution in the debt-to-GDP ratio.

Figure 9: Net Debt Dynamics and its Determinants
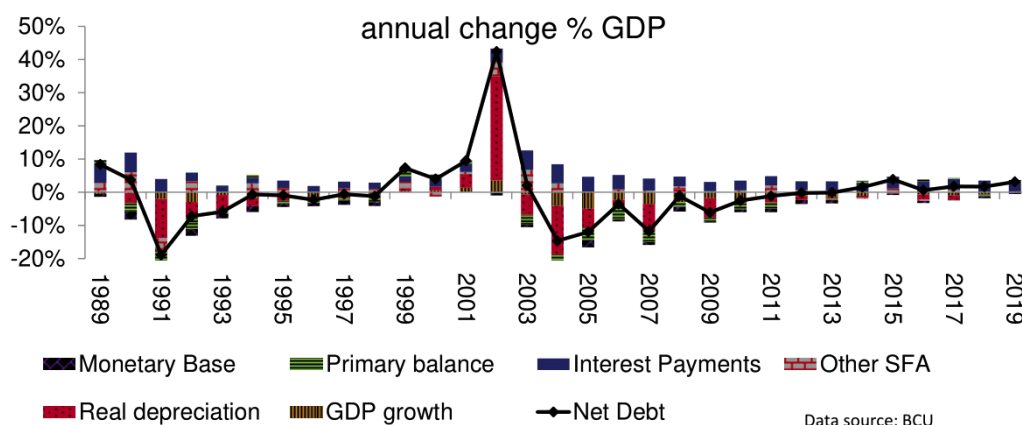
Notes: The graph shows the historical evolution of net debt and its determinants. Variables included are: Monetary Base, Primary Balance, Interest Payments, Real Depreciation, GDP Growth and other stock-flows analysis (other SFA).

Besides, there were some fiscal policy measures that also affected the evolution of public debt. From a debt management perspective, after the 2002 crisis, gross debt denominated in foreign currency decreased from 95% to 59% of gross debt as a result of a de-dollarization strategy, while its maturity was extended. Furthermore, the Government implemented a foreign assets accumulation strategy as a self-assurance device: Reserve Assets as a share of GDP grew from the minimum of 7% in 2002 to a maximum of 32% in 2014, being 27% at the end of the sample. These three policies resulted on an important reduction of currency, rollover and liquidity risks.

Finally, although there is no formal fiscal rule in Uruguayan public finances, one can estimate a fiscal reaction function (FRF) in the way it was developed in Section 2, following equation (8).[10]

$$s_t = \alpha_1 + \alpha_2 s_{t-1} + \alpha_3 b_{t-1} + \alpha_4 MPAS + \epsilon_t. \tag{22}$$

The econometric estimation was carried out by using three modeling techniques for the purpose of robustness and to be thorough in capturing interactions among the variables: TSLS, VAR and GMM. The average value for α_3 was around 0.007, with a range (0.0055-0.0074), this coefficient is statistically significant. This evidence suggests that Government does react to its debt-to-GDP ratio.

As to fiscal sustainability, one has to check if equation (10) holds ($\frac{\alpha_3}{1-\alpha_2} \gg \frac{r-g}{1+g}$). Since 1989 and until 1995 (international financial crisis), and between 2004 and 2013, with the exception of 2009 (another international financial crisis), Uruguayan public finances would have complied with the fiscal sustainability condition (see Figure 10). It stands out that $\frac{\alpha_3}{1-\alpha_2}$ was smaller than $\frac{r-g}{1+g}$ during the second half of the nineties until 2003: tough external conditions and domestic recession made the debt-to-GDP ratio rise. It is also noticeable that $\frac{r-g}{1+g}$ has been on the edge of the fiscal sustainability region since 2014.

Figure 10: Assessing Fiscal Sustainability (TSLS coefficients)
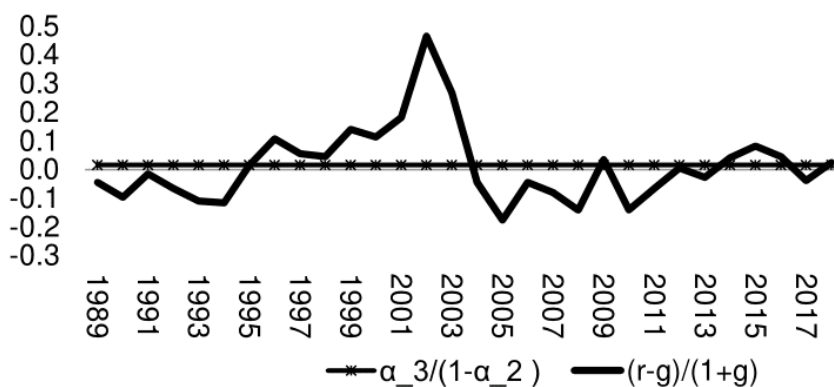
Notes: Own elaboration.

3.2.1   1988-2001: The Pre-crisis Years

During this period there was a reduction of debt-to-GDP ratios in a context of a favorable evolution of its macroeconomic determinants, such as growth and currency real appreciation, together with primary surplus, which was driven by endogenous and discretionary factors (see Figure 11). Later deterioration of macroeconomic conditions and real depreciation explained the increase in this ratio from 29 to 42 GDP p.p. in

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[10]For more details, see Appendix (A).

1999-2001 after a three-year recession. Then, in spite of the low levels of debt-to-GDP ratio observed at the beginning of the 90s, vulnerability to shocks in debt determinants was very high during the whole period.[11]

Figure 11: Net Debt Dynamics and its Determinants (1988-2001)
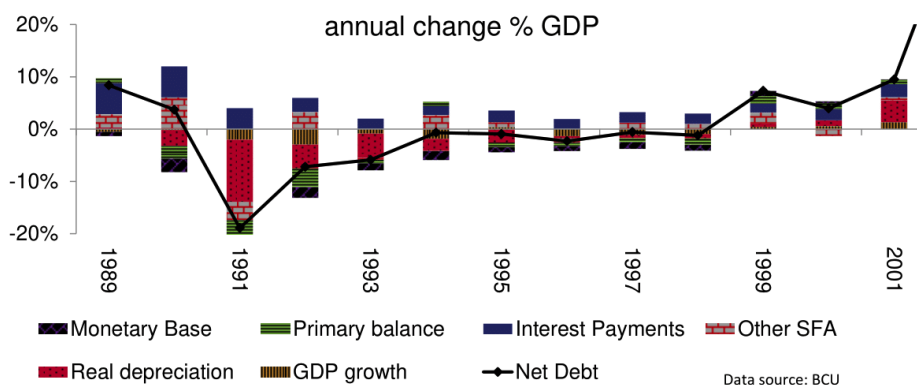
Notes: The graph shows the historical evolution of net debt and its determinants in the first time period analyzed. Variables included are: Monetary Base, Primary Balance, Interest Payments, Real Depreciation, GDP Growth and other stock-flows analysis (Other SFA).

At the beginning of the 90s we can highlight some major events that reduced sharply debt-to-GDP ratios: the debt renegotiation in 1991,[12] the return to economic growth within a framework of regional expansion, the exchange rate-based stabilization plan, which provoked an important real appreciation and the simultaneous fiscal adjustment, resulting in a primary fiscal surplus.

The important capital inflow to the region, allowed the public sector to have broad access to international capital markets. In this context, the country achieved in 1997 the "Investment Grade". The spread of gross public debt went from about 300 basis points (b.p.) to about 50 b.p. in the second half of the decade. In addition, taking into account the for that moment low levels for the reference Libor rate, which stabilized at about 5.5% at the end of the period, the financing cost for Uruguay had substantially improved.

As a result, all debt to GDP determinants has acted favorably, accounting for a yearly average reduction in the debt ratio of 2.2% of GDP in 1991-1998. The real appreciation was the most relevant factor, followed by the primary balance and *seigniorage*. Economic growth reduced the debt-to-GDP ratio by almost 1 point on average, while the interest payments showed an average expansionary effect of 2.5% of GDP.

Under these conditions, the public sector met the solvency requirement. During this period where debt-to-GDP ratio adjusted very slowly and was kept at relatively low levels, none of the traditional sustainability indicators showed warning signals (see Figure 12).

[11]For a deeper analysis on this and next section see Rial & Vicente (2004).

[12]In 1991, through the Brady plan agreement the Central Bank repurchased debt in the secondary market, reducing its gross stock by 5% of GDP and extending its maturity by issuing new collateralized bonds.

Nonetheless, the debt management strategy increased its vulnerability in terms of time structure (concentrated on short- and medium-terms) and exchange rate (almost all the gross debt was in USD dollars).

Then, in 1999-2001 there was a rapid deterioration of economic conditions. Real activity was negatively shocked by the Brazilian devaluation in January 1999 and later by the Argentinean recession, promoting a deterioration of the endogenous-determined fiscal balance: fiscal deficit reached 3.2% of GDP on average. In addition, relative prices adjusted by a moderate real depreciation and the average interest rate remained at relative low levels. As a result, all debt determinants contributed to its expansion, which increased by 15 points in net terms relative to 1998. This situation undermined private sector confidence, while solvency indicators showed some warning signals.

The debt strategy followed was to issue bonds in foreign currency and medium-term maturity in international capital markets beyond the needs of fiscal financing in order to accumulate foreign assets. As a result, debt structure deepened its previous concentration and therefore the debt vulnerability.

Figure 12: Solvency Indicators (1988-2001)
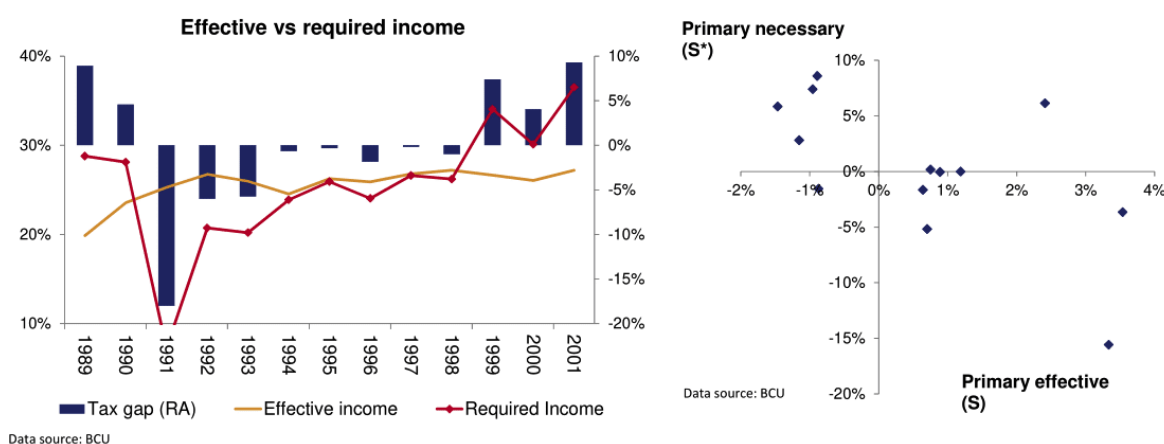
Notes: The graphs show the solvency indicators. The first one shows in lines the effective income and that required to stabilize the debt ratio and in bars the tax gap. The second on the ordinate axis represent the primary result necessary to leave the debt-to-GDP ratio constant and on the abscissa the effective primary result. Own elaboration with data from the BCU.

### 3.2.2 2002-2008, The Crisis and Its Exit

During 2002, economic activity dropped for the fourth consecutive year, this time by 11% in real terms. The nominal exchange rate devaluation that followed the 20th June announcement of a free floating regime caused a significant adjustment in relative prices: real devaluation reached a 40% annual average, explaining some 30 p.p. of GDP of the debt-to-GDP ratio this year. From a fiscal policy side, in spite of strong consolidation

measures both in public income and expenditures, fiscal position remained unchanged, showing a deficit of 4% of GDP. As a result, net public debt increased 45 p.p. of GDP; the country loses the "Investment Grade" and later the access to international credit markets.

By the end of 2002, the financing gap was closed by loans from multilateral agencies in USD, sales of Reserve Assets and, in a minor amount, new primary balance adjustments and higher *seigniorage*, collected through higher inflation (deficit monetization). At the same time, there were negotiations to change the debt value (write off, maturity extensions, etc.); finally, a successful debt renegotiation was carried out in May 2003, which was the definite turning point of the sovereign debt crisis.
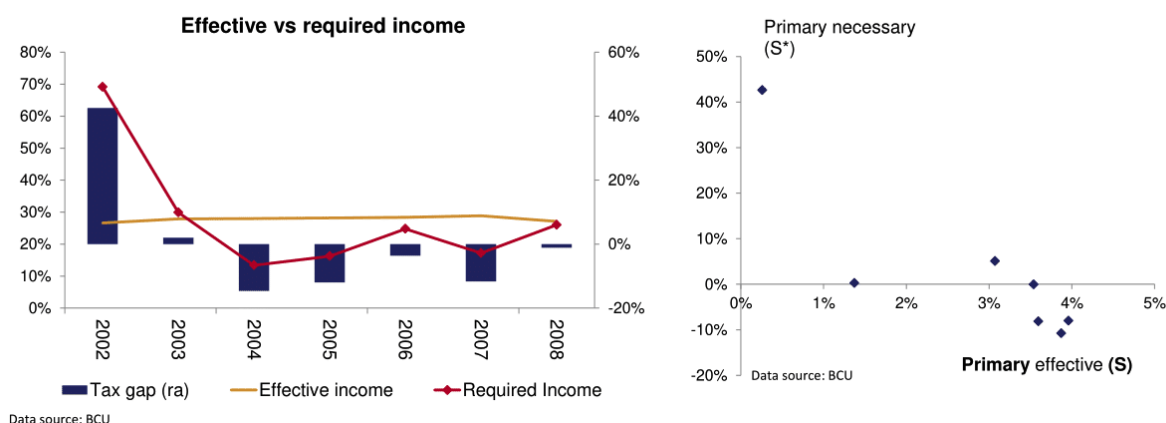
After this episode, the economy recovered confidence, starting a period of fast growth and rapid adjustment in relative prices to a lower real exchange rate, provoking that net public debt-to-GDP ratio fell every year from 2003 onwards. The main drivers of this trajectory were the real appreciation, in a context of reduction of the degree of dollarization of the debt, and economic growth (see Figure 13). Asides, fiscal balance showed a lasting primary surplus, as a consequence of both the endogenous increase in tax collection and fiscal consolidation measures (see Figure 14).

Figure 13: Net Debt Dynamics and its Determinants (2002-2008)
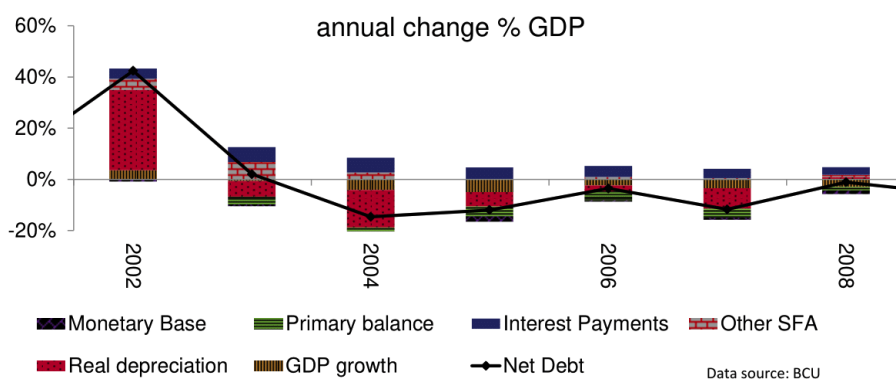
Notes: The graphs show the historical evolution of net debt and its determinants in the second time period analyzed. Variables included are: Monetary Base, Primary Balance, Interest Payments, Real Depreciation, GDP Growth and other stock-flows analysis (Other SFA).

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Figure 14: Solvency Indicators (2002-2008)

Effective vs required income

Primary necessary (S*)

Legend: ■ Tax gap (ra) — Effective income ◆ Required Income

Data source: BCU

Primary effective (S)

Data source: BCU

Notes: The graphs show the solvency indicators. The first one shows in lines the effective income and that required to stabilize the debt ratio and in bars the tax gap. The second on the ordinate axis represents the primary result necessary to leave the debt-to-GDP ratio constant and on the abscissa the effective primary result.

### 3.2.3 2009-2019: The Macro-Financial Framework after the 2008 Global Financial Crisis

After the subprime crisis Uruguay, as many emerging market economies, faced some major policy challenges from the international financial environment, after having a different phase of the business cycle, with positive growth, inflation and interest rates differentials in a context of strong macro fundamentals, which led to important capital inflows.[13] These inflows, together with the so-called commodities super-cycle, promoted fast growth and currency appreciation, both nominal and real, while leading to Central Bank's foreign reserves accumulation. At the same time, growth and fiscal reaction managed to keep primary surplus in the first years and the increasing real demand for money allowed for some *seigniorage* financing. Then, debt-to-GDP had a decreasing path driven by almost all its determinants (see Figure 15). Moreover, Uruguay achieved again the "Investment Grade" rate for its sovereign debt, which implied a smaller financing cost (see Figure 16). It is important to mention that the CB policy was to sterilize these Reserves accumulation with bills in local currency leading to CB's balance sheet expansion and pushing the CB balance from equilibrium to a deficit near 1% of GDP. This was the story until May 2013.

After Bernanke's talk of May 2013, the tapering process begun. The process imposed a strong challenge for a small open economy as Uruguay, starting with the traditional capital outflows, sudden currency depreciation and CB's sales of USD to manage the exchange rate evolution. The last five years of the sample experienced a growth slowdown,

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[13]For an extended analysis on topics on this period see Malacrida et al. (2017).

smaller currency real appreciation and primary deficit, leading to a smooth increasing path in net debt-to-GDP which seems to accelerate in the last year of the period.

Figure 15: Net Debt and its Determinants (2009-2019)
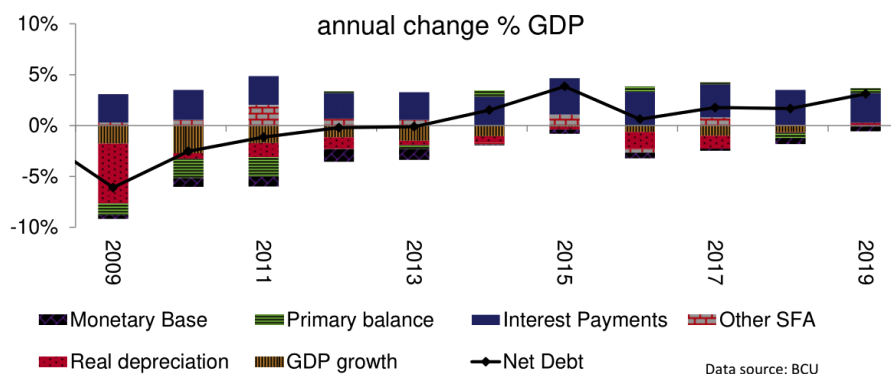
Notes: The graph shows the historical evolution of net debt and its determinants in the last time period analyzed. Variables included are: Monetary Base, Primary Balance, Interest Payments, Real Depreciation, GDP Growth and other stock-flows analysis (Other SFA).

Figure 16: Solvency Indicators (2009-2019)
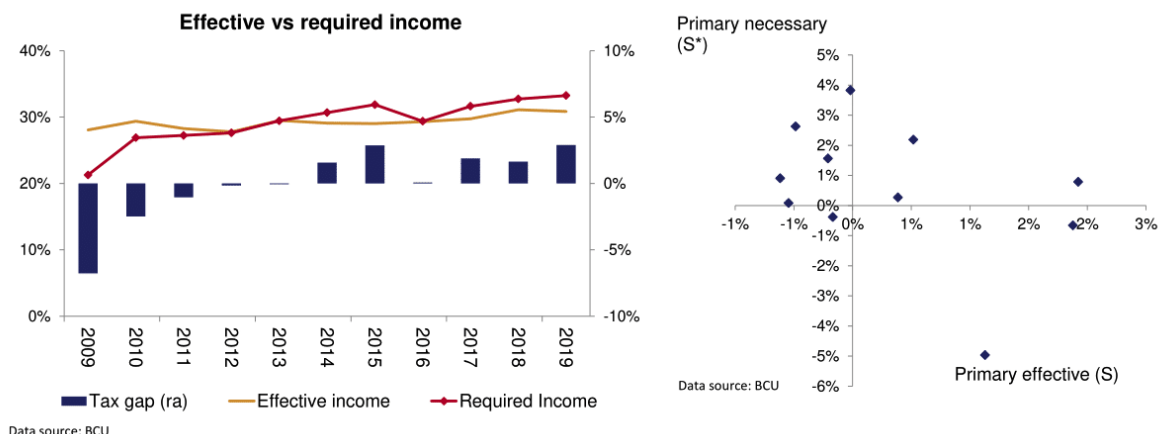
Notes: The graphs show the solvency indicators. The first one shows in lines the effective income and that required to stabilize the debt ratio and in bars the tax gap. The second on the ordinate axis represents the primary result necessary to leave the debt-to-GDP ratio constant and on the abscissa the effective primary result. Own elaboration with data from the Central Bank of Uruguay.

On the other hand, during this period there was an explicit strategy to ensure a sufficient amount of liquidity to face potential macro-financial turbulence. As we mentioned earlier, the central bank experienced a significant accumulation of foreign reserve assets (see Figure 17). At the same time, the CG carried out a precautionary pre-financing policy of 12 months of debt service that increased its assets in foreign currency and, as a liability management strategy, extended the maturity of its debt. The combination of these policies determined until mid-2013 an accumulation of assets greater than the

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accumulation of associated risks, increasing the gap with respect to the "comfort level" of Reserves.

Following Bernanke's talk, given that in a capital outflow context the probability of a financial episode is higher, the CG maintained its pre-financing policy, while the CB's asset management strategy switched to one focused on liquidity. Furthermore, during 2015 CG and CB implemented a couple of ALM operations: a long-term debt swap of CG for CB bills and an early amortization of CB's own bills. These operations determined a simultaneous reduction on both sides of CB's balance sheet: Reserve de-accumulation along with debt reduction, maintaining a positive gap with respect to its Reserve asset "comfort level" of at least USD 2 billion after these operations. During the second half of 2017 and 2018, the positive gap average USD 3.1 billion. Pre-financing was not deemed as important as before, and contingent loans were assigned a more important role in the event of turbulence.

Figure 17: Central Bank's Reserve Assets and Short-Run Risks to Cover
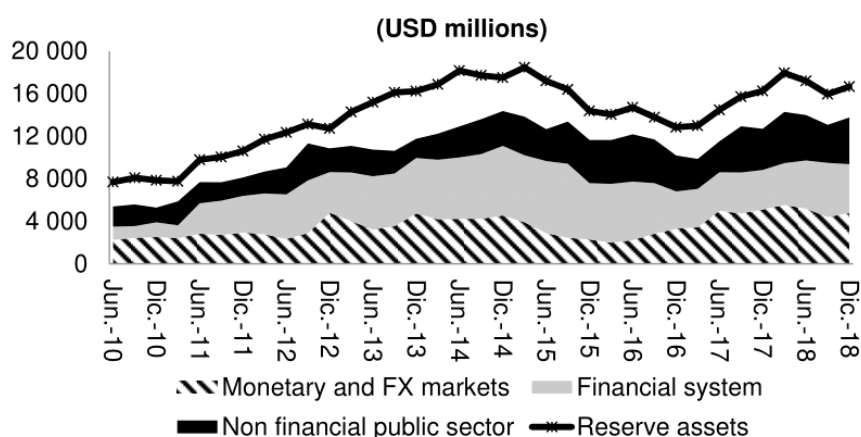
Notes: The reserve assets stock has been higher than the "precautionary" or "comfortable" level of reserve assets, that is the level that would allow the monetary authority to cover the simultaneous occurrence of risks from the financial system, the sovereign debt and the money and foreign exchange market in an extreme situation of financial stress, with a 99% confidence level. Own elaboration with data from the Central Bank of Uruguay.

The aforementioned ALM operations implemented by CG and CB generated a better Asset-Liability matching. For the CB, there was a simultaneous reduction of both US dollar-denominated assets and local currency liabilities, meaning a reduction of its balance sheet. The CG increased its liquid assets and the share of long term, local currency debt. The central bank started to offer these corporations a cross currency swap in which the bank sold forward US dollars against domestic currency using collateralized forward contracts. These contracts hedged partially the mismatch in the bank and the corporate balance sheet.

In the second place, since liabilities are heavily denominated in local currency while international liquid assets not, the strategy seek to optimize an inflation-linked denomi-

nated fund, by constructing a multi-currency global portfolio with high correlations with the return of the local domestic currency.

The combination of these monetary, quasi-fiscal, macroprudential and ALM measures as part of an integrated monetary-fiscal-financial framework resulted in a more comfortable scenario and helped manage a complicated scenario after Bernanke's May 2013 talk. The end of capital inflows and the desired change in the monetary composition of the portfolio was managed by some ALM operations, which also changed the actions and dynamics of the central bank deficit. At the same time, CB's foreign exchange interventions reduced exchange rate volatility while allowing the market to set the ER level and then reduce the pass-through to inflation. In addition, CG's preventive pre-financing and liquidity-focused CB asset management determined a strong public sector position in the event of a financial stress event.

These operations improved the balance sheet composition of different public sector units. Then, analysing the Central Bank balance sheet between 2013 and 2015, we can observe a reduction of both sides of the balance. The CB used its reserve assets as the main financing source and to perform a net amortization of its liabilities, mainly inflation-linked instruments (the transaction column in Table 1). At the same time, the real depreciation of the currency during the period resulted on equity gains, since the CB had a long position in foreign currency (reflected on the OEF column).

Table 1: Balance Sheet BCU
(*Millions of UY pesos*)

	2013	Transactions	OEF	2015
Assets	-400235	26530	-149283	-522988
Foreign Currency	-383507	26628	-154228	-511106
Domestic Currency	-16729	-98	4945	-11882
Liabilities	465297	14827	96737	576862
Foreign Currency	164623	82939	83971	331532
Domestic Currency	300674	-68112	12767	245329
- Pesos	189734	19649	2423	211806
- CPI Index	110940	-87761	10344	33523
Financial Wealth	65062	41357	-52546	53873
Foreign Currency	-218884	109567	-70257	-179574
Domestic Currency	283946	-68210	17712	233447

Notes: The table shows the analysis of the stock-flow methodological framework applied to the stocks in the BCU balance sheet.

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4 Debt Dynamics and Fiscal Sustainability over the Next 10 Years

In this section we apply the methodology presented in Section 2 to perform a prospective analysis to assess fiscal sustainability in the medium term, that is, for a 10-years-period based on annual data until 2030.

To do so, we obtain simulations of debt dynamics using both the augmented DSA and the SFA in a common framework, which allows determining solvency and liquidity conditions that must meet debt dynamics in order that fiscal policy follows a sustainable path.

For long-run horizons we must take into account demographic and actuarial data and its impact on the social security system for a thorough assessment of debt dynamics, which is beyond the scope of this paper.

4.1 Setting the Methodology for a Forward-Looking Analysis

The methodology follows three steps to produce simulations of public debt and deficit: i) forecasts of the macroeconomic and fiscal endogenous variables, ii) definition of scenarios for discretionary fiscal variables (taxes, expenditure and debt structure), iii) forecasts of stocks (public debt) and flows (deficit, financing gap, "other economic flows") conditional on the two previous steps, which includes the computation of the summary solvency and liquidity indicators.

First, forecasts of the main macroeconomic and fiscal variables are taken from a set of macro-econometric models: a general equilibrium macro econometric model (MMET), which interacts with other two macro models (MPM, DSGE) to give sensible figures. It is important to notice that all the variables that interact in this exercise are endogenously and jointly determined for a given set of few exogenous variables, respecting the internal logic of the model. In this step we determine the path for the forecast horizon (FH) for: GDP growth, inflation, currency depreciation (real and nominal), money demand and then *seigniorage*, and the endogenous part of the primary balance. These figures are obtained for an exogenous path of the global economy (growth, inflation, reference interest rate) and the monetary policy instrument.

The next figure illustrates the logic of the model. There are two main blocks, real and nominal, which interact to each other. In the real sector it is determined (together with other variables) GDP growth and the real exchange rate (RER). From the nominal sector come the determination of inflation and nominal exchange rate, while real interest rate is jointly determined by the two blocks. Real money demand and primary balance are derived as satellites blocks to the model. Finally, country sovereign risk is partially derived from the evolution of international financial conditions and fiscal variables, which

gives a recursive feature to the whole framework.

Figure 18: The Structure and Links of the Model
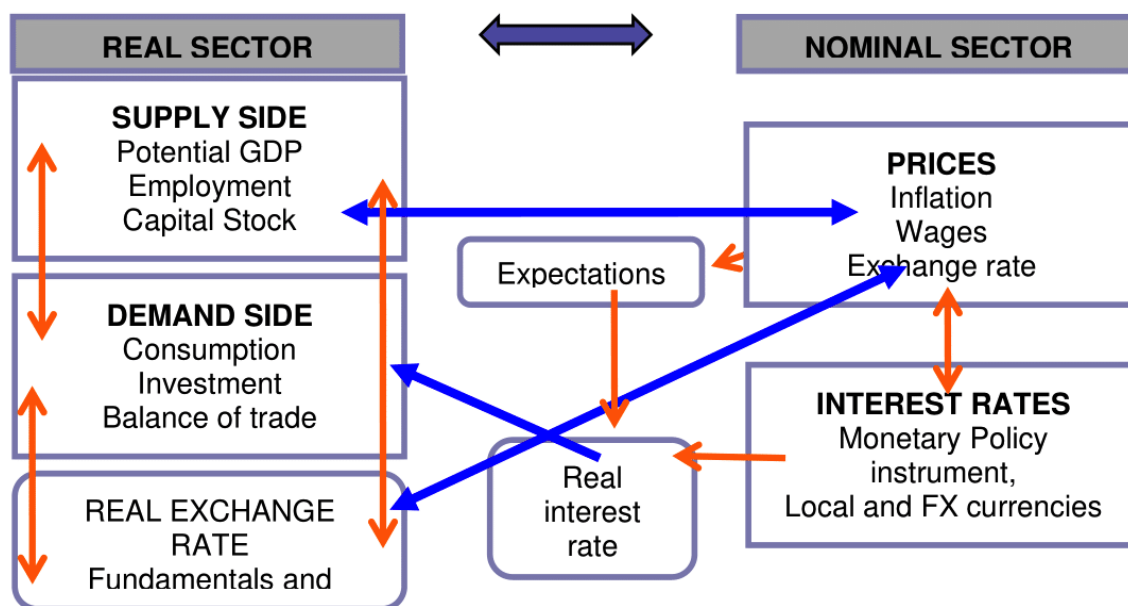
Note: Elaborated with data from the Central Bank of Uruguay.

Second, acting in the macroeconomic framework presented above, we set scenarios for discretionary fiscal variables: the exogenous part of the primary balance (taxes and expenditure) and the debt structure (currency, maturity and interest rate composition).

The exogenous primary balance evolution focuses on the public debt level. We define a **baseline scenario**, in which primary balance behaves as the average of the last 5 years of the historical analysis, and three alternative scenarios.

1. **Average policy scenario**. Is the one in which fiscal policy reacts to changes in public debt in the same fashion as the empirical fiscal reaction function estimated for the sample period (1988-2019).

2. **Fiscal adjustment scenario**. In this case, the discretionary part of the fiscal balance follows a path compatible with the forecasts that support the official fiscal budget for 2021-2025 and then keeps constant at the 2025 level.

3. **Debt-to-GDP stabilization scenario**. In this alternative we compute the primary balance needed to stabilize this ratio at the initial level.

Aside from the evolution of the level of debt, its composition makes explicit issues of vulnerability. We simulate two alternatives that focus on its most important parameters: currency and maturity. Then, we simulate a shock on relative prices (real depreciation) in a particular year, set in 2026-2027, so that to have a measure of the impact of the realization of a risk (currency or rollover) on debt dynamics.

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1. **De-dollarization scenario**. We suppose that the gross public debt increases the local currency share, from 40% at the initial year to 50% at the end of 2024.

2. **Extended maturity scenario**. We suppose that public debt increases its average maturity by 3 to 5 years.

Third, these inputs from the previous steps are included in the augmented DSA-SFA framework to obtain forecasts for public debt, deficit, financing gap and OEF, as well as the resulting summary solvency and liquidity indicators. This exercise is performed for each of the institutions covered in the consolidated public sector, which allows for the analysis of potential different dynamics and the interactions at a government agencies level.

4.2 Debt Dynamics over Different Policy Scenarios

The macroeconomic environment is set as follows. For the first two years forecasts are provided by the quarterly set of projections presented to the Monetary Policy Committee (MPC); then for 2 to 5 years horizon variables are guided by medium-term trends, while for 5 to 10 years horizon variables evolve at their steady state values (see Table 2).

Table 2: Main Variable Values

	Medium term	Steady state
Inflation	6.9	5
Depreciation	7.3	5
Real GDP growth	1.7	2.5
Change Monetary Base	8.6	7.6

Notes: Data from the Central Bank of Uruguay was used in the elaboration of this table.

In steady state GDP, inflation and RER gaps are closed. Therefore, real GDP growth at its potential trend of 2.5%, inflation meets the 5% central point of the target and the RER reaches a steady state level compatible with the evolution of its fundamentals. Moreover, RER dynamics together with domestic and foreign inflation paths determines the trend for the nominal ER. All these variables jointly determine the endogenous evolution of taxes and primary expenditure as well as *seigniorage*. For the evolution of macroeconomic variables, see Figure (19).

Foreign interest rate and risk premium trends, together with inflation, the monetary policy rule (MPR) and the UIP determine local interest rates, both in local and foreign currency. At the same time the foreign interest rate is the rate of return on public assets. Then, we obtain the average interest rate on liabilities and assets, which help to forecast the net interest bill of each agency of the public sector.

Figure 19: The Evolution of Macro Variables
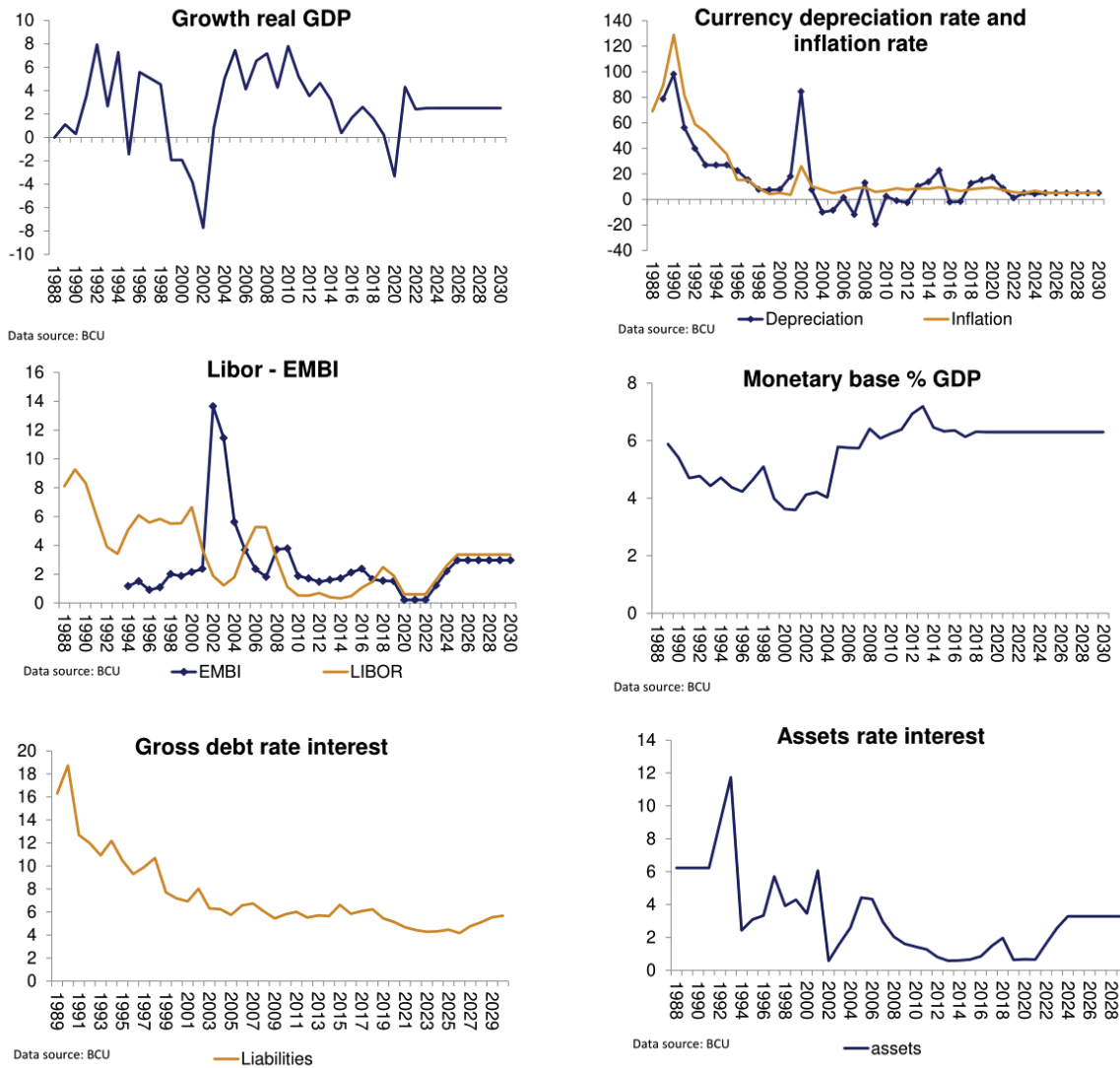
Notes: The graphs show the historical evolution of the relevant macro variables of net debt and its projections.

Then, the discretionary portion of the primary balance has different trends according to the simulations of fiscal policy described in the previous section. Finally, for an initial stock of the balance sheet, the simulated fiscal deficit (primary balance and interest bill) and the effect of the macroeconomic variables on the stocks of assets and liabilities (conditional on debt structure simulations) give the balance sheet stock at the end of the period.

The starting point is 2020, which is a rather peculiar year because it includes the effects of the COVID-19 pandemic on public finances. So that, debt and deficit are bigger than in previous years: net debt-to-GDP would reach 54 p.p. (8% more than in 2019) while fiscal deficit would be 2.3% of GDP (1.8% bigger than the 2019 figure).

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From 2021 onwards, primary balance path is dependent on the fiscal policy alternative simulations.

In the baseline scenario, which primary balance is set at its average level of the last 5 years (2015-2019), which is a primary deficit of 0.2% of GDP. Public debt, starting from a relative high level, follows an increasing path of almost 1% of GDP per year, ending at 62% of GDP (see Figure 20).

Figure 20: The Evolution of Public Sector Debt and Primary Balance, Baseline Scenario
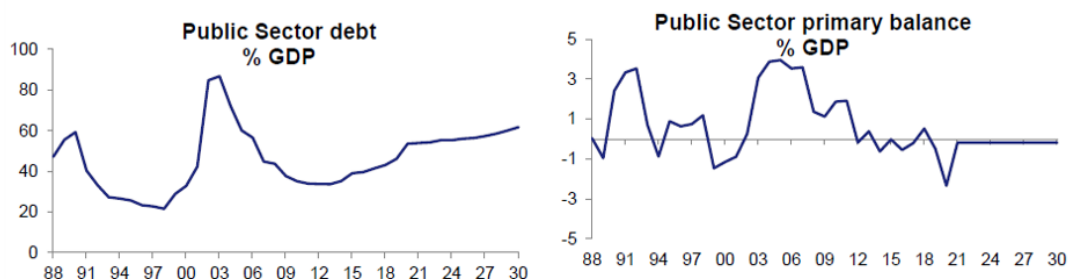

Notes: The graphs show the historical evolution and the projections of the net debt and the primary balance. Own elaboration with data from BCU.

This pattern implies an increasing medium-term tax gap and should be judged as an unsustainable path, so some consolidation should be implemented.

The tax increase required to stabilize net debt is on average 0.8 % GDP per year (see Figure 21). This represents an amount that should not be difficult to match based on the history of Uruguayan public finances.

Figure 21: Medium Term Tax Gap-Baseline
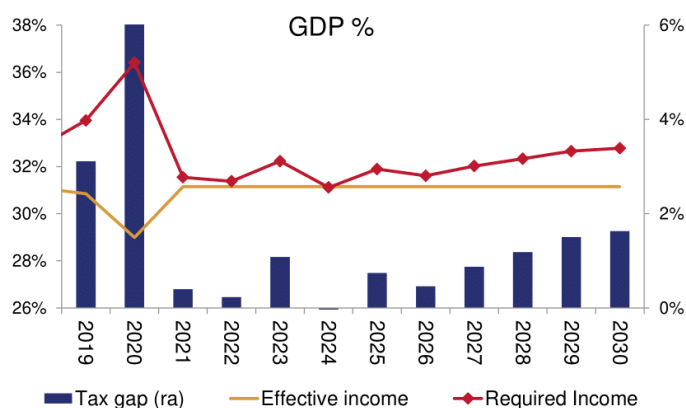
Notes: The graph shows the projected evolution for the tax gap, effective income and required income to stabilize the debt-to-GDP ratio. Own elaboration with data from the Central Bank of Uruguay.

Fiscal consolidation is performed according to the three alternative policy scenarios. Under the average policy scenario, primary balance reacts as the fiscal reaction function estimated for the sample period:

$$s_t = 0,53.s_{t-1} + 0,0074.b_{t-1} - 0,17.MPAS. \tag{23}$$

This equation shows a positive though weak relationship between the primary balance and the previous debt stock, both in terms of GDP, once we adjust for inertia and the business cycle. Following this pattern, from 2021 primary balance adjusts slowly until reaching a 0.6% of GDP surplus by 2024, last year of the current budget period; after then, we keep Figure (23).

Figure 22: Public Sector Debt and Primary Balance under Different Scenarios
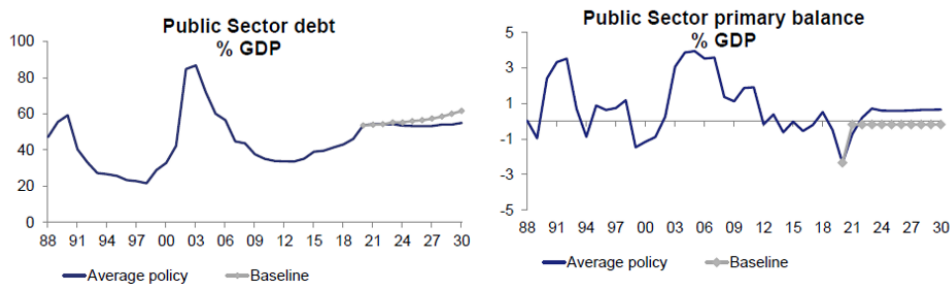
Notes: The graphs show the historical evolution and the projections of the net debt and the primary balance. Own elaboration with data from the Central Bank of Uruguay.

In this context, the net public debt-to-GDP ratio shows a smooth trend, staying at 54% at the end of the period, a similar level than 2006, when this ratio experienced a sharp fall following the macroeconomic adjustment of relative prices after the 2002 crisis. However, the macroeconomic context in this scenario is quite different: here relative prices have a quite neutral contribution to debt dynamics. Moreover, economic growth, primary balance and to a lesser extend money financing put a decreasing trend to the debt-to-GDP ratio. Then, in this comfortable scenario, the only variable that increases the debt ratio every year are the interest payments (see Figure 23).

Figure 23: Net Debt Dynamics and its Determinants with Average Policy
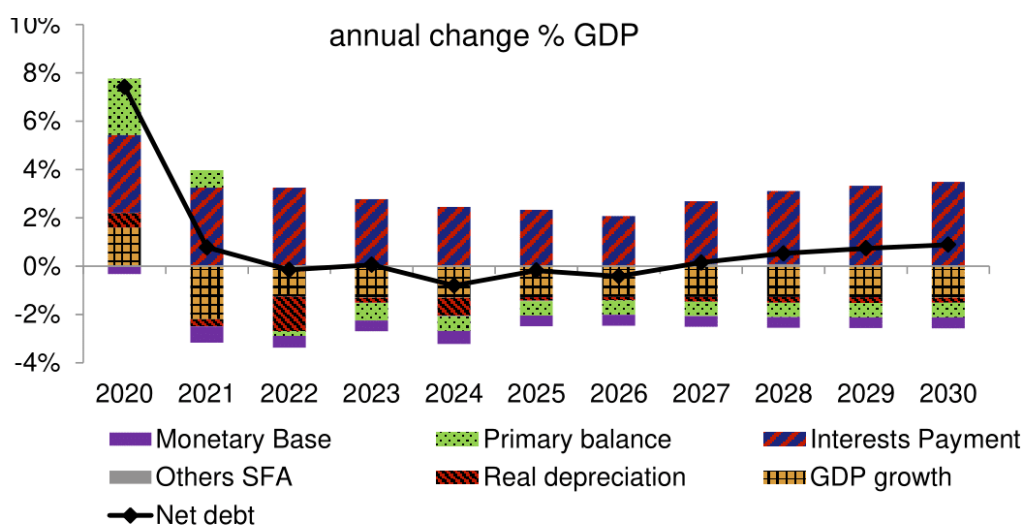
Notes: The graph shows the projected evolution of net debt and its determinants in the average policy scenario. Variables included are: Monetary Base, GDP Growth, Primary Balance, Interest Payments, Real Depreciation and Other Stock-Flows Analysis (Other SFA). Own elaboration with data from the Central Bank of Uruguay.

Let's now analyse the likelihood of these forecasts. On one hand, in a time series analysis reaching such a figure could be not so demanding, since the average surplus for the last 30 years is 1% of GDP (median 0.7% of GDP) and there were episodes of surplus of 3%-4% of GDP, though lasting for few years. On the other hand, we can compare these figures with the ones of the other scenarios: the fiscal adjustment scenario implied in the official fiscal budget for 2021-2025 and a debt-to-GDP stabilization scenario.

As we can observe in Figure (24), the fiscal consolidation figures implicit in the fiscal budget are similar to the "average policy" scenario. Again, the same result occurs when analyzing the traditional debt-to-GDP stabilizing exercise for the whole period, although the dynamics is different, asking for smaller surplus at the beginning and bigger ones at the end of the forecast horizon.
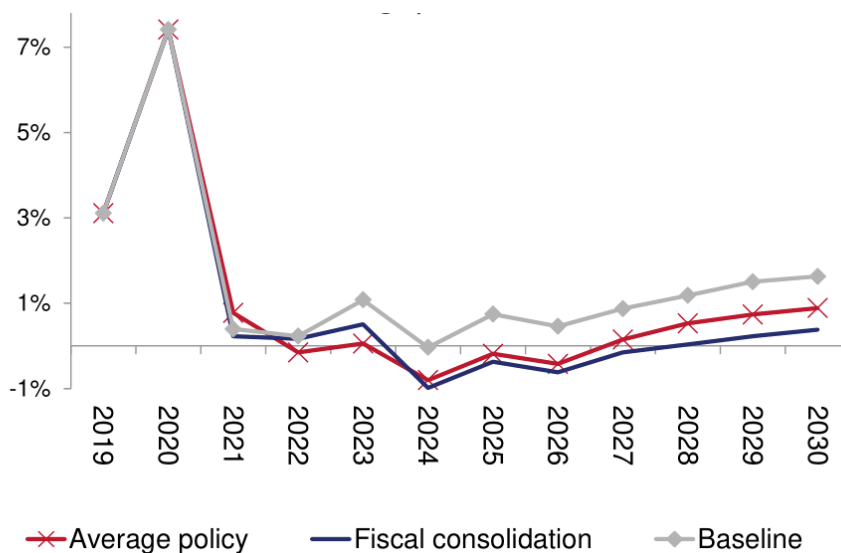
Figure 24: Public Sector Debt and Primary Balance
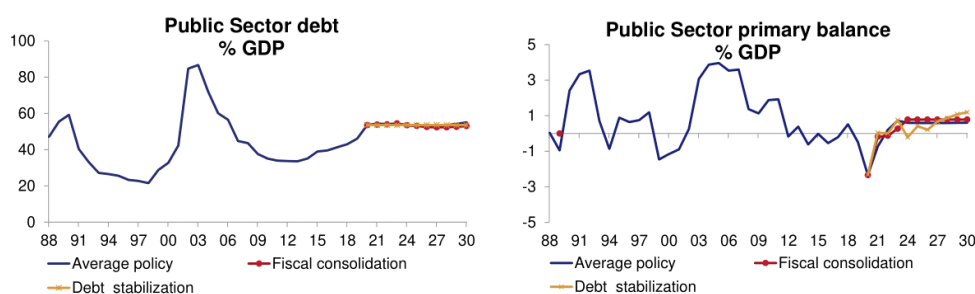
Notes: The graphs show the historical evolution and the projection of the net debt and the primary balance at different scenarios. Own elaboration with data from the Central Bank of Uruguay.

Since the macroeconomic forecasts are the same in any case, we can assign the small differences in public debt path to the primary balances generated in each scenario (see Figure 25).[14] Then, debt-to-GDP ratio would reach a constant path under sensible assumptions, assuring fiscal sustainability in a 10-year horizon.

Figure 25: Medium Term Tax Gap Under Different Scenarios

Notes: The graphs show the historical evolution and the projection of the net debt and the primary balance at different scenarios.With data from the Central Bank of Uruguay.

Finally, we move to debt composition to address the issue of vulnerability of the public debt. To do so, we define an **average policy scenario** in which we keep the debt structure by currency at the figure of 2019, which implied that 60% of gross debt is denominated in foreign currency for the whole FH. On the other hand, an alternative scenario was built that implied reducing the dollarization of the debt, so that the national currency reaches 50% of gross debt in the next five years, which is called **benchmark 50% scenario**.

Then, an external financial shock was simulated in 2026-2027 in the macroeconometric model, which increases real depreciation and reduces real GDP growth. Finally, we compute the effects on net debt-to-GDP under both scenarios.

As it is shown in Figure (26), the financial shock implies a jump in debt ratios under both scenarios. However, when local currency has a bigger share of gross debt, this jump is smaller while the convergence path after the shock is faster. We can conclude that deepening the de-dollarization strategy is a useful tool to reduce RER risk on public debt and, more generally, a good macro-prudential tool.

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[14]There are some second round effects since macro and fiscal variables are jointly determined.

Figure 26: Net Debt to GDP of SPG with Different Structures by Currency

% GDP

- gap between scenarios (ra)
- Benchamark local currency 50% / total
- Average policy with shock
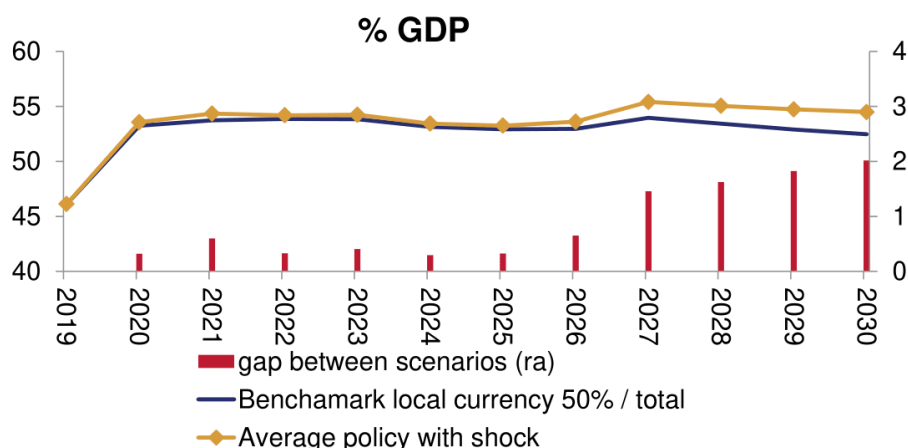
Note: Elaborated with data from the Central Bank of Uruguay.

5 Concluding Remarks

This paper presented an evaluation of fiscal sustainability in Uruguay beyond the traditional DSA methodology, building a framework for the dynamics of the balance sheet of the consolidated public sector (not just gross debt) and using a more comprehensive data set in institutional coverage (not just Central Government), debt structure (not only debt level matters) and frequency (quarterly data).

The methodology was first applied to an historical analysis in Uruguay, highlighting important events of debt dynamics, such as the 2002 domestic crisis or the 2008 global financial crisis. Moreover, we discussed the mains strengths and weaknesses of public finances over the last 30 years, how these strengths were developed in the shape of long run policies after the 2002 crisis and we identified the main drivers of public debt volatility, which are the interaction of fluctuations in relative prices (real depreciation) with the partial dollarization of public debt.

Then, we extended the framework to a prospective analysis, where fiscal variables are determined within a macroeconometric model which includes an empirical fiscal reaction function. In this context we performed simulations of different debt paths depending on fiscal and debt policy decisions in a medium-term outlook. We found that a feasible fiscal consolidation would be enough for the debt-to-GDP ratio find a declining path, while a sensible faster de-dollarization strategy would reduce the damage of a financial shock that provokes a sudden adjustment in relative prices.

In both cases the determinants that drive debt dynamics come from a fiscal-financing perspective (interest payments, primary deficit and *seigniorage*) as well as from the macroeconomic framework (inflation, currency depreciation, real GDP growth). The real depreciation (appreciation) is the main driver and source of vulnerability of the

Uruguayan public debt, though its potential damage has been reduced as a long run policy since the 2002 domestic crisis.

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Appendix

A   Estimating a Fiscal Reaction Function for Uruguay

In order to assess the response of primary balance to the evolution of debt, a fiscal reaction function was estimated.

Data for the central government are considered. The data set consists of annual variables over the period 1988 through 2018. The primary balance and the debt of the central government are expressed in terms of GDP. The first series is part of the statistics provided by the Ministry of Economy. The latter is compiled by the Central Bank. Data about wages come from surveys conducted by the National Institute of Statistics, and the Social Insurance Bank is the source of the data about the number of recipients of retirement and old age benefits.

As a point of departure, the estimation procedure takes into account that for the debt-to-GDP ratio to remain unchanged, primary balance must comply with:

$$s_t = (\frac{r-g}{1+g})b_{t-1}, \tag{24}$$

where: s_t: primary balance-to-GDP ratio and b_t: debt-to-GDP ratio.

Additionally, to allow for inertia in government behavior, the lag of primary balance should be included. Social security spending represents a large amount of public expenditure, and it is mostly exogenously determined as, since 1990, retirement and old-age benefits granted by government are indexed to the increase wages have experienced the year before. Hence, a variable (MPAS) that combines the quantity of benefits granted and the evolution of wages is likely to be a key determinant of primary balance. The "MPAS gap" ($MPAS$), that is the gap between actual values of MPAS and their trend, was added as an explanatory variable.

The output gap was included as another control variable, but it rendered statistically insignificant in all the modelling strategies followed.[15]

Univariate structural time series models that resort to Kalman filtering were used to estimate the gaps.

The basic fiscal reaction function was then specified as:

$$s_t = \alpha_1 + \alpha_2 s_{t-1} + \alpha_3 b_{t-1} + \alpha_4 MPAS + \epsilon_t. \tag{25}$$

Bearing in mind (1), it is possible to conclude that fiscal policy will be sustainable if:

$$\frac{\alpha_3}{1-\alpha_2} \gg \frac{r-g}{1+g}. \tag{26}$$

Before estimating (2), the issue of stationarity of the data was addressed. First of all,

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[15]Nevertheless, it turned out a valid instrument in the TSLS and GMM estimations.

unit root tests were performed. Due to the 2002 economic crisis, it was deemed likely that the primary balance and the debt series could exhibit a structural break. Hence, the tests computed included in their specifications the possibility of a break. The results in Table (A1) presented refer to the trend specifications that best suit data.

Table A1: Testing For Unit Roots

|	ADF test	$p-value$	Breakpoint	Order of Integration
s_t	-4.61	0.0994	Intercept 2002	$I(1)$
b_t	-9.11	<0.01	Intercept and Trend 2001	$I(0)$

According to these results, it is not clear if the primary balance is a stationary series whereas stationarity of the debt-GDP ratio series seems evident. Because of these results, a VAR model was estimated and not a VECM: cointegration would not hold.

Several modelling techniques were used for the purpose of robustness and to be thorough in capturing interactions among the variables.

First of all, a Two-Stage Least Squares (TSLS) model was estimated. Simultaneity was to be expected since the lagged debt-GDP ratio and the MPAS gap were included as right hand side variables. The lags of output gap and MPAS gap were taken as instruments.

Moreover, Vector Autoregression (VAR) model estimation was also carried out in order to capture multiple interactions among variables. For a graphical representation of the VAR and TSLS coefficients, see Figure (A1).

Figure A1: Net Debt to GDP of SPG with Different Structures by Currency
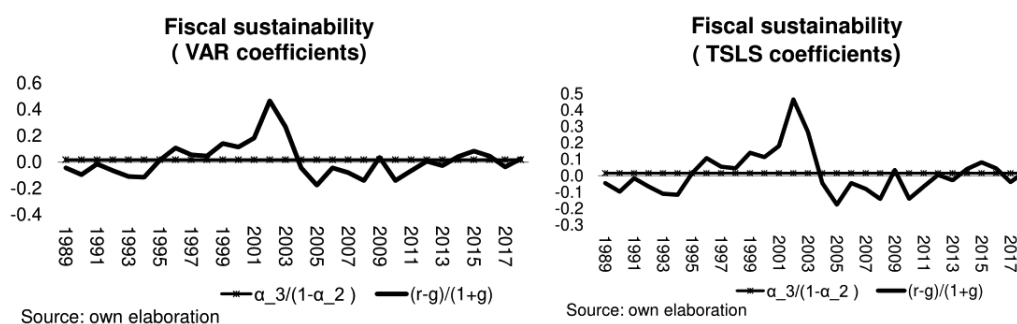
Finally, at this stage of the research, equation (2) was also estimated with Generalized Method of Moments (GMM). Again, output gap and MPAS gap worked as instruments. The results of the estimates using the various methods are presented in Table (**??**).

Table A2: Fiscal Reaction Function Estimation

	TSLS	VAR	GMM
$s_{t-1}(\alpha_2)$	0.5319	0.5672	0.6383
	[5.29]	[5.36]	[8.59]
$b_{t-1}(\alpha_3)$	0.0074	0.0072	0.0055
	[1.95]	[1.80]	[2.87]
MPASGAP	- 0.1728	-0.1361	-0.1667
	[-3.72]	[-3.15]	[-4.56]
Adj. R-sqr	0.72	0.69	0.71
$\frac{\alpha_2}{1-\alpha_3}$	0.0159	0.0165	0.0151

Notes: The sample consists of annual data from 1988-2018. Data from 2016 were not considered, since the capitalization of the public-owned oil company was deemed an outlier.

The evidence suggests that government does react to the level of its debt-to-GDP ratio (α_3 is statistically significant). The results also point to a high degree of inertia in government behavior.

As to fiscal sustainability, it stands out that $\frac{\alpha_2}{1-\alpha_3}$ was smaller than $\frac{r-g}{1+g}$ during the second half of the nineties till 2003: tough external conditions and domestic recession made the debt-to-GDP ratio rise. It is also noticeable that $\frac{r-g}{1+g}$ has been on the edge of the fiscal sustainability region since 2014. In fact, except for 2017, the primary balance required to render an unchanged debt-to-GDP ratio was higher than the actual one.