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**CENTRAL BANK BALANCE SHEET
EXPANSION IN A DOLLARIZED
ECONOMY: THE CASE OF ECUADOR**

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Central Bank Balance Sheet Expansion in a Dollarized Economy: The Case of Ecuador

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Abstract

A textbook argument in favor of adopting another country's legal tender is that it imposes strong constraints on money creation and therefore fiscal dominance. In Ecuador, an officially dollarized economy since January 2000, a series of accounting practices and subsequent changes in legislations approved over the period 2009-2014 allowed an expansion of the Central Bank of Ecuador's (CBE) balance sheet to finance the central government. At its peak, central bank financing of the government represented 10 percent of GDP. This resulted in large liabilities to the CBE that translated into low reserve coverage, putting the public and private financial systems and ultimately the dollarization regime at risk. In this paper, we first present the legal and accounting processes behind the expansion of the CBE's balance sheet and some stylized facts. In the second section, we establish a stress test-like methodology to show how the expansion of the CBE's balance sheet induced strong pressures on CBE's liquidity. Ultimately, such liquidity stress at the CBE translated into high cash inflows needs, i.e. external debt, for the central government.

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I. THE ACCOUNTING AND LEGAL MECHANISMS FOR CENTRAL BANK BALANCE SHEET UNDER OFFICIAL DOLLARIZATION AND BALANCE SHEET EXPANSION

Full dollarization is often presented as an extremely rigid monetary system that can help countries dealing with chronic external imbalances. One of the main arguments in support of full dollarization is the elimination of the risk of a sudden, sharp devaluation of the country's exchange rate. This may enable the country to reduce the risk premium attached to its international borrowing, foster a higher level of confidence among international investors, reduce fiscal costs, and encourage more investment and growth, according to an analysis of the pros and cons of full dollarization by Berg and Borensztein (2000). Full dollarization can also reduce the moral hazard that banks will be bailed out associated with partially dollarized banking systems because the lack of a lender of last resort encourages changes in the way supervisory and regulatory institutions and banks manage liquidity and solvency risks (Gale and Vives, 2002). In addition, because dollarization implies a complete abdication of the monetary authorities' control over domestic monetary policy, the capacity of the central bank to finance the public sector's deficit, or fiscal dominance, is in theory removed. Its inability to finance the public sector deficit is likely to affect positively, i.e. lower, the sovereign spread, as it curbs some fiscal sustainability issues, such as the expansion of domestic liabilities and inflation, typically observed in countries with monetary and exchange rate autonomy and high fiscal dominance (Daseking et al., 2004).

Despite these advantages, very few countries have chosen such an exchange rate regime. Only seven countries in the world use the U.S. dollar as legal tender: Ecuador, El Salvador, Marshall Islands, Micronesia, Palau, Panama, and Timor-Leste. Three other countries are anchored to the euro: Kosovo, Montenegro, and San Marino. In the IMF standard classification of exchange rate arrangements (text chart and Table 1), those countries are classified as “no separate legal tender.”²

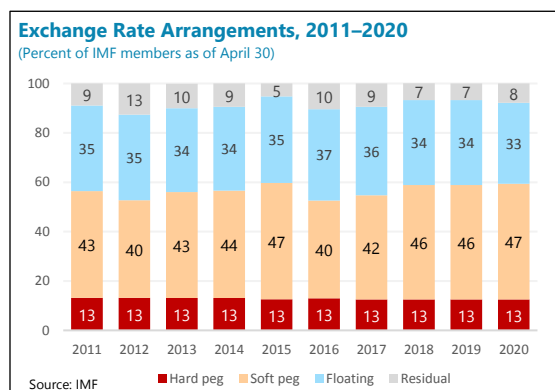


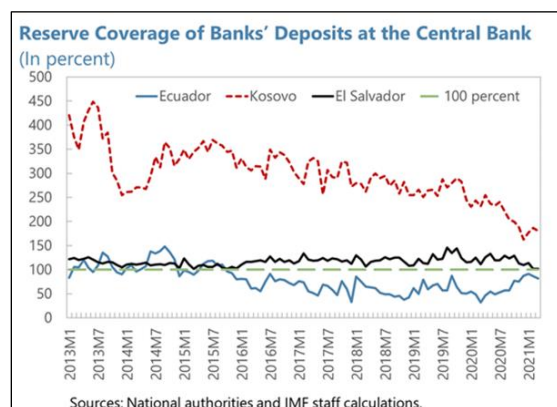
Table 1. IMF Classification of Exchange Rate Arrangements

Type	Categories
Hard pegs	Exchange arrangement with no separate legal tender Currency board arrangement
Soft pegs	Conventional pegged arrangement Pegged exchange rate within horizontal bands Stabilized arrangement Crawling peg Crawl-like arrangement
Floating regimes (market-determined rates)	Floating Free floating
Residual	Other managed arrangement

Source: IMF. Exchange Arrangements and Exchange Restrictions. 2020

² <https://www.imf.org/en/Publications/Annual-Report-on-Exchange-Arrangements-and-Exchange-Restrictions/Issues/2021/08/25/Annual-Report-on-Exchange-Arrangements-and-Exchange-Restrictions-2020-49738>

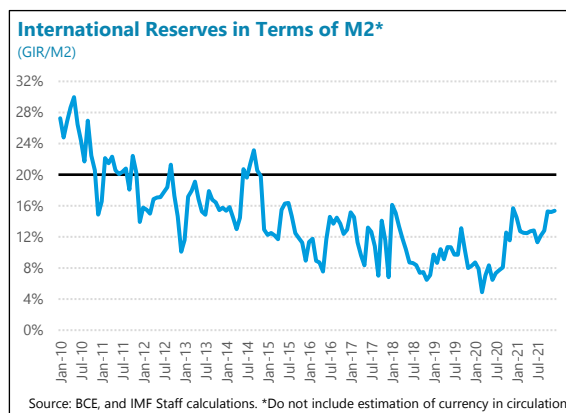
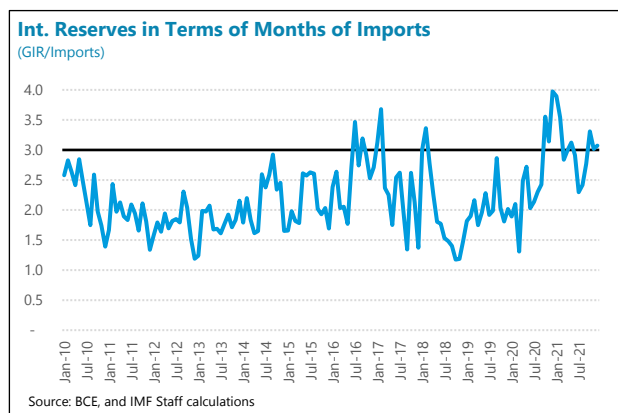
Because of the lack of a lender of last resort in officially dollarized and euroized countries, most central banks tend to hold high reserve coverage of banks' deposits for self-insurance purposes. When a country adopts another currency as legal tender, it gives up the capacity to issue its own currency and must therefore ensure that the central bank has enough liquidity to cover its obligations. For example, the central bank of El Salvador holds a steady 100 percent of reserve coverage and Kosovo holds a significant reserve coverage of, on average, 200 percent over the last decade. For Ecuador, the CBE reserve coverage has been around 100 percent until the mid-2010s, and then decreased significantly in the mid-2010s to close to 30 percent (text chart). Of course, comparison of different countries must account for the relative size of the government, financing sources, and the importance of banks' deposits in their central banks funding structure. In El Salvador banks are the main source of deposits, and the government is a net borrower, although on a limited scale. In contrast, the central bank of Kosovo receives net deposits from the government, which is by far the main net funding source. In Ecuador, the CBE is the only banking agent for the public sector; it manages the interbank payment system and clears payments between financial institutions and the rest of the world, so the deposit coverage should in principle be relatively large.³



In a fully dollarized economy, bank deposits are a crucial metric for surveillance beyond their relevance for the financial and monetary sectors, because they are the main counterpart of international reserves (IMF, 2015, and Box 1). Three measures are commonly accepted to determine the appropriate level of international reserves for surveillance and risk analysis purposes.⁴ The first indicator is the ratio of international reserves to the money base, M2. By convention, the floor for this ratio is set at 20 percent of M2. Below that level, international reserves are considered to be critically low. For Ecuador, the ratio has had a clear downward trend since 2010, reaching as low as 5 percent in March 2020. The second indicator is defined as the number of months of imports covered by the stock of international reserves. By convention, the indicator should be greater than 3 months. Below 3 months, international reserves are considered critically low. The third indicator, so-called the ‘Greenspan–Guidotti rule’, posits that international reserves should ensure of full coverage of short-term external debt. For Ecuador, this indicator has been below the 3-month benchmark most of the time over the 2010s and 2020s, reaching as low as 1 month in October and November 2018. Between 2015 and 2018 though, series of economic measures were taken to restrict imports as a solution to the scarce international reserves in relation to international outflows, hence the bump in the reserves-to-import ratios around that time (text charts).

³ For a detailed discussion on the appropriate level of reserves see: International Monetary Fund, 2019. "Ecuador: Selected Issues Paper," IMF Country Report 19/80. Pages 32-40, Reserve Adequacy.

⁴ International Monetary Fund. 2016. "Guidance note on the assessment of reserve adequacy and related considerations". Policy Papers, 16 (18).



Beyond simplistic rules, the optimal level of foreign reserves has been modelled in cases of *de jure* dollarization of banks deposits. In a series of seminal papers, Jeanne (2007) and Jeanne and Rancière (2011) presented models of the optimal level of international reserves seeking insurance against sudden stops in capital flows. Formula for the optimal level of reserves were derived and show that plausible calibrations can explain reserves of the order of magnitude observed in many emerging market countries. The optimal level of reserves depends on the probability and the size of the sudden stop, the consumer's risk aversion and the opportunity cost of holding the reserves. Gonçalves (2007) extended the Jeanne and Rancière (2006) model to explicitly incorporate the dollarization of bank deposits into the analysis of the optimal level of foreign reserves, making the analogy of sudden stop of capital flows and bank runs as a sudden stop in capital flows occurs in tandem with a run on dollar bank deposits. In this views, central bank are seen as holding foreign reserves for insurance purposes, and beyond, which is different from an officially dollarized economy, but the motives of economic agents when deciding to run banks should be similar.

Box 1. Forms of Money in Ecuador and their Acceptance as International Payments

Money can be represented in a triangle of four hierarchical forms depending on their transactional capacity with the rest of the world. From a domestic perspective, the ability to exchange with the rest of the world depends on how high it is in this hierarchy represented in Figure 1 and discussed below (see Asobanca, 2019):

Bank deposits are the liabilities that financial institutions hold for their clients, both natural and legal persons. Bank deposits are expressed in the unit of account legally established for Ecuador, the U.S. dollar, and are accepted for any public or private payment. Commonly, transactions with bank deposits are made using checks, debit cards, transfers through online banking, and a variety of applications for mobile phones that allow deposit transfers from one account to another within the country immediately.

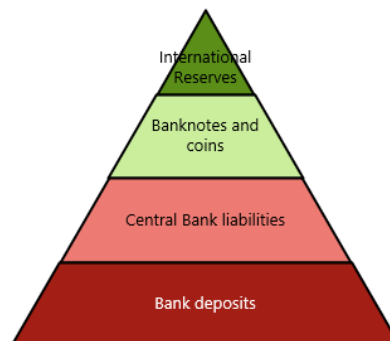
- **Central bank liabilities** are defined by the Organic Monetary and Financial Code, in its Article 36, number 14 as "... acting] as a fiscal, financial and depository agent of public resources...". This means that the CBE is the bank of all public entities and the bank of private financial institutions that by law must maintain bank reserves at the CBE, the so-called 'encaje' in Ecuador. When public sector salaries are paid, for example, the treasury account of the Ministry of Economy and Finance (MEF) at the CBE decreases, and the resources of the private financial entity, where the salary is deposited at the CBE are automatically increased by the same amount. This just moves funds within the CBE's liabilities, a transfer of resources from one client to another client on the CBE's balance sheet. The opposite movement will be recorded when, for example, the private sector pays taxes, the resources of financial institutions at the CBE will decrease, and the resources of the public sector will increase by the same amount. Compensation and payments between private financial entities and public entities are consolidated at the CBE using the National Payment System.

- **Banknotes and coins** are the most straightforward expression of money. The bills and coins used in Ecuador are issued by the Federal Reserve of the United States and are used daily for countless transactions of companies and households. The CBE has also minted physical coins of low denomination (1, 5, 10, 25 and 50 cents) for small transactional purposes., by law this issuance must be backed by liquid assets from the international reserve.

- **International Reserves** are defined in the Organic Monetary and Financial Code, Article 137, and "... comprise the total external assets that the CBE owns in financial instruments, denominated in foreign currencies issued by non-residents, which are considered liquid and low risk." These resources are mainly kept in correspondent banks abroad, in physical banknotes in the vaults of the CBE, and gold bullion. Bank reserves (reserve requirements a.k.a "encaje") should not be confused with international reserves; the former is a liability for the CBE and the latter are liquid assets that enable transactions with the rest of the world, and also serve to meet the demand for money (banknotes and coins) of Ecuadorian society.

The four forms of money (bank deposits, CBE liabilities, banknotes and coins, and international reserves) have a different hierarchy of acceptance at the international level. Only banknotes and coins and international reserves are accepted for international transactions. Bank deposits and liabilities of the CBE work smoothly and effectively for domestic transactions within Ecuador but are not accepted for transactions abroad. Private financial institutions also have their international assets shown on their balance sheet as available funds and investments abroad, which are part of their liquid assets. These resources also serve for external transactions, but the current liquidity regulations in Ecuador limit the amount of resources that private banks can hold abroad.

Figure 1. Money Forms



Dollarization in Ecuador and Central Bank Balance Sheet Expansion

Ecuador adopted the U.S. dollar as legal tender following a deep banking and exchange rate crises in January 2000. Toward the end of the 1990s, Ecuador registered large structural fiscal and balance of payments deficits, aggravated by weak oil prices that reached historical lows of around 15 dollars per barrel. In addition, El Niño phenomenon sharply reduced agricultural production, an important contributor to growth. Ecuadorians lost confidence in the national currency, the *Sucre*, after a decade of stiff exchange rate depreciation and rampant inflation. As a result, the financial system, which lacked adequate safeguards, became de facto dollarized. The decision to dollarize the economy came in the midst of serious social upheaval that led to the overthrow of President Jamil Mahuad, who made the decision to official dollarization on January 9, 2000.

The Central Bank of Ecuador (CBE) was conceived as a reserve bank when the dollarization system was put in place. Whether, in a fully and officially dollarized system, a central bank is necessary remains an open debate or whether an entity that enables the clearing of domestic payments and allows transactions with the rest of the world would be sufficient, e.g., as in Panama. A so-called “system of four balances” was established at the onset of dollarization, to ensure full coverage of the CBE’s obligations. It was based on the principles of risk management to grant confidence in the financial system and the CBE operations, ensuring that international reserves were exceeding bank reserves and public sector deposits (see Box 2). The CBE also banned granting credit to the public or private sector since March 2000.

Between 2009 and 2014, a series of legal and regulatory changes were adopted that ultimately aimed at allowing the CBE to finance the deficit, challenging standard economic thinking related to a full officially dollarized monetary system. In December 2009, the CBE Board adopted a resolution that allowed the CBE to acquire government bonds from public banks, and therefore increased its holding of public debt. The main objective of this process, called “domestic investment”, was that those resources be channeled to private companies through productive loans from public banks.⁵ This mechanism was reconfigured in 2012, and the transactions assigned to public banks were triangulated to the Ministry of Economy and Finance (MEF) to support the budget (see García, 2016). In September 2014, the government promulgated a new Monetary and Financial Code (COMYF)⁶ in which this mechanism was legalized and credit operations between the CBE and the MEF were undertaken directly. These decisions unnecessarily generated liquidity and credit risks in the CBE balance sheet and therefore threats to the public and private financial sector (the counterparts), putting at risk the dollarization system.

In the following section, we illustrate how the CBE balance sheet was expanded:

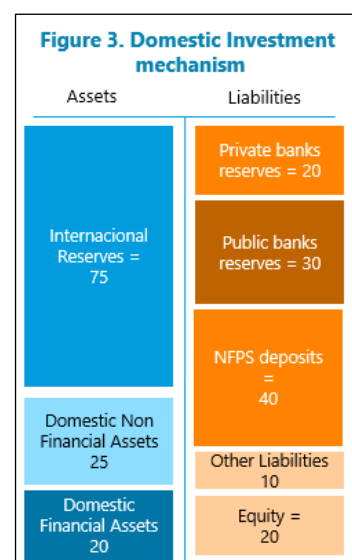
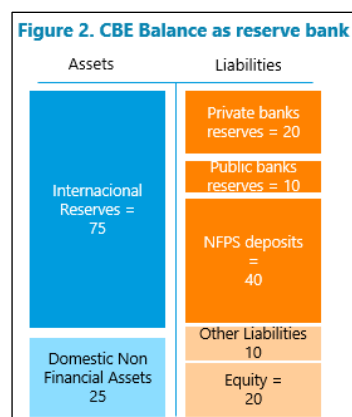
- **Figure 2** represents the initial state in which the central bank is a reserve bank, with a high ratio of liquidity to liabilities, just as for the CBE in early 2000s. Assets include international reserves and other domestic non-financial assets. The liabilities side is composed of resources of private and public financial institutions, as well as the deposits of all the entities of the non-

⁵ The Board of Directors of the Central Bank of Ecuador issued Regulation No. 200-2009 on September 24, 2009, creating the Domestic Investment Program with the objective of “... channeling surplus liquidity from the different sources of public savings to the national economy, through public financial institutions and reimbursable financial instruments...”

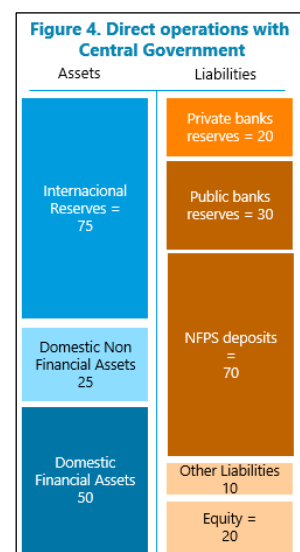
⁶ <https://www.bce.fin.ec/index.php/boletines-de-prensa-archivo/item/696-c%C3%B3digo-%C3%B3rganico-monetario-y-financiero-es-publicado-hoy-en-el-registro-oficial>

financial public sector (NFPS)⁷. To complete the balance sheet, there are other liabilities and equity. In this case, the reserve coverage ratio is $75/(20+10+40) = 107$ percent.

- The so-called “domestic investment” mechanism was an accounting process whereby the CBE acquired unmarketable and unfunded securities from the public banks. As a result, the CBE invested resources in public banks without having the necessary own resources, through electronic accounting records. The CBE balance sheet was expanded with the purchase of public bank securities that translated in an increase in central bank liabilities. This process is illustrated in **Figure 3**. Suppose that the CBE invests a notional 20 in public banks. On the asset side, illiquid **domestic financial assets** (the securities issued by public banks) increase, while on the liability side, **public bank reserves** at the CBE increase by the same amount. The CBE's balance sheet is artificially expanded. The international reserves are still 75, but liabilities are now 90 (20+30+40), therefore the **reserve coverage ratio is down to 83 percent, from 107 percent**. Problems can emerge when CBE clients, now with more resources, decide to make payments abroad or demand cash. Since liabilities are no longer covered in full by international reserves, a liquidity risk is created for the CBE and for the financial system. From the perspective of the balance sheet of the public banks that were credited by the CBE, there is also an expansion of their balance sheets. Assets increase, since they have more resources at the CBE and at the same time, they have new liabilities (bonds issued) which must be paid back to the CBE in the future.



- The procedure used to give credit to the MEF was similar to the one used with public banks. **Figure 4** illustrates the process. Let us assume that the MEF requests credit of 30. On the asset side, the **CBE has more domestic financial assets** (in form of an illiquid IOU from the MEF), and at the same time, creates resources in the treasury account of the MEF at CBE (NFPS deposits). International reserves remain at 75, while CBE liabilities are now 120 (20+30+70). **The coverage ratio now falls to 63 percent**. From the government's perspective, it now has more resources that can be used for spending and in turn has a debt with the CBE that must be repaid in the future.
- Ultimately, the impact on the CBE balance sheet and financial sector risks depends on how the resources are used by the public sector. Therefore, the additional resources that the public sector holds after the expansion of the CBE balance sheet could be used internally or



⁷ A single treasury account system in Ecuador has been in place since 1998. Therefore, public sector entities are not allowed to hold bank accounts in the private sector.

for foreign payments. For example, let us consider how 50 out of the 100 available for the public sector (**Figure 4: 70+30**) could be used: (i) imports of fuel and medicines for 15, **this operation reduces international reserves and NFPS deposits**; (ii) payments of central government suppliers for 25, this operation **decreases NFPS deposits and at the same time increases private bank deposits**, since all compensation of internal payments are made at the CBE, the state suppliers have current accounts in private banks. This operation does not decrease international reserves, it is only a change in the liabilities of the CBE. However, if those government suppliers import goods and make some payments abroad, international reserves can decrease by those amounts. For example, (iii) purchases of goods and services and the payment of salaries and wages of the public banks for 10, **this operation decreases public banks deposits, and at the same time increases private banks deposits**. This operation does not decrease international reserves, it is only a change in the liabilities of the CBE. However, if public servants then buy imported goods or make some payments abroad, those payments decrease international reserves. **Figure 5** presents the condition of the BCE's balance sheet after all these transactions have been completed.

Figure 5. Internal and External Transactions

Assets	Liabilities
Internacional Reserves = 60	Private banks reserves = 55
Domestic Non Financial Assets 25	Public banks reserves = 20
Domestic Financial Assets 50	NFPS deposits = 30
	Other Liabilities 10
	Equity = 20

- Public spending caused this artificial liquidity creation to flow into the private sector. When CBE liabilities have been created, bank deposits increase. However, it is important to remember that these two expressions of money cannot make payments abroad, but they do allow transactions within the country. Continuing with our illustration, the private sector needs to import raw materials and capital goods to produce goods and services. Let us assume the private sector imports 25, and households also import final consumption goods of 10. **In this example, international reserves drop to 25 (60-25-10), while public and private liabilities at the CBE are 70 (20+20+30). The coverage ratio falls to 35 percent (25/70)**, as illustrated in Figure 6.

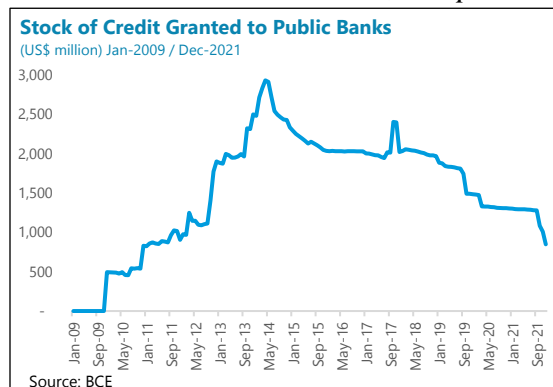
Figure 6. Impact on CBE's liquidity ratio

Assets	Liabilities
Internacional Reserves = 25	Private banks reserves = 20
Domestic Non Financial Assets 25	Public banks reserves = 20
Domestic Financial Assets 50	NFPS deposits = 30
	Other Liabilities 10
	Equity = 20

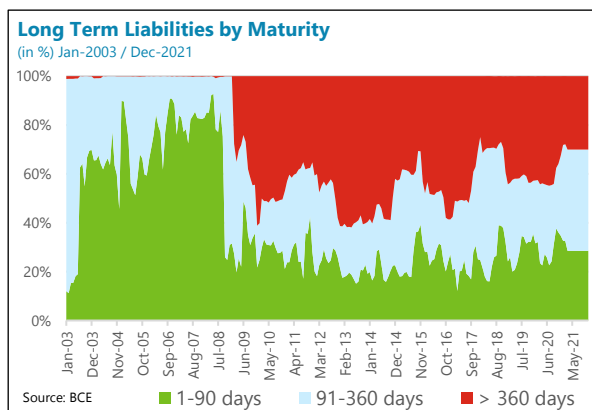
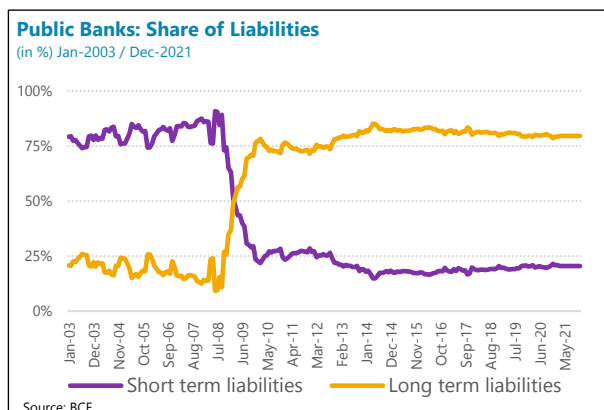
The mechanism of central bank balance sheet expansion in a dollarized system decreases the reserve coverage ratio, making the central bank illiquid. *De facto*, this mechanism reallocated international reserves to be used by the public and the private sector, in exchange for illiquid and unfunded government securities. In Ecuador, holding a low level of international reserves in relation to public and private liabilities put the CBE in a situation of high liquidity risk as illustrated above by the ratios of international reserves to M2 and related to months of imports. Ultimately, critically low international reserve coverage is associated with a higher probability of foreign default and a financial crisis. In the next section, we present more stylized facts of those mechanisms with historical data.

Stylized Facts

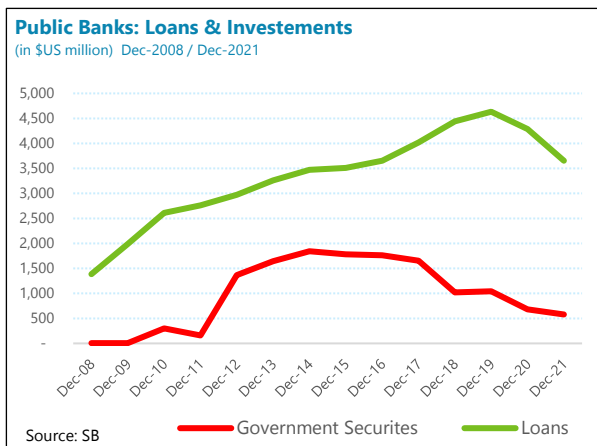
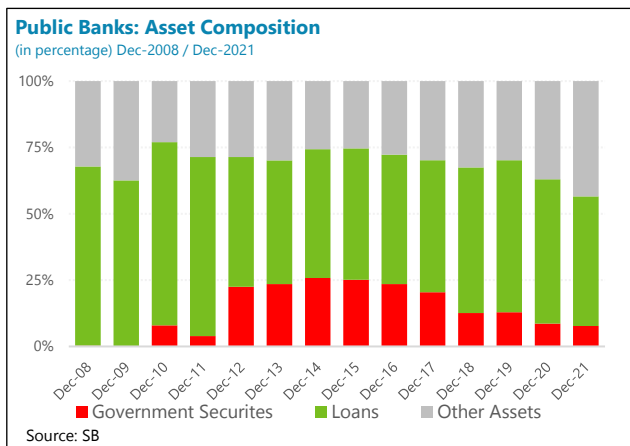
CBE credit to public banks peaked at about 3 percent of GDP in 2014. Initially, in December 2009, a credit of US\$520 million was granted by the CBE to *Banco del Estado, Corporación Financiera Nacional, Banco Nacional de Fomento, Banco Pacifico, Banco Ecuatoriano de la Vivienda, and Programa de Finanzas Populares* (see García, 2016). From this initial transaction, the stock of credit granted to public banks rose rapidly and peaked at US\$3 billion in April 2014 (text chart). Since then, the decrease was due to the repayment of the obligations. As of December 2021, the outstanding public banks' debt to the CBE is US\$850 million.



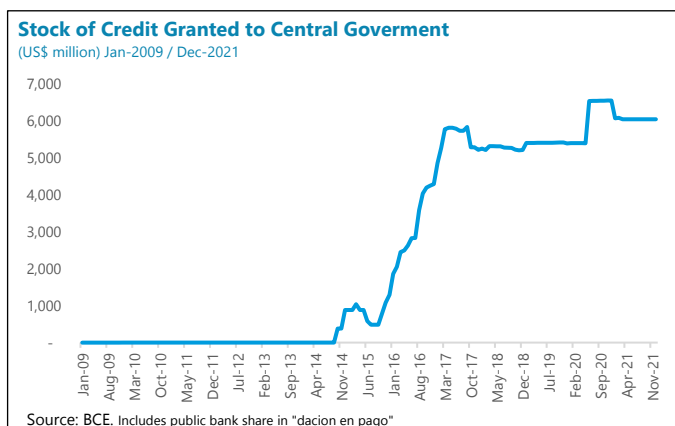
With these operations, public banks received long-term funding and modified their balance sheets. Before this type of operations with the CBE, three-quarters of public bank's liabilities were short term, but as of 2009 they started to issue long-term debt and their funding structure changed. Long-term liabilities increased to more than 75 percent (text chart). In addition, the long-term liabilities were less than 1 year, but with the operations with the CBE, they obtained funding for more than 360 days.



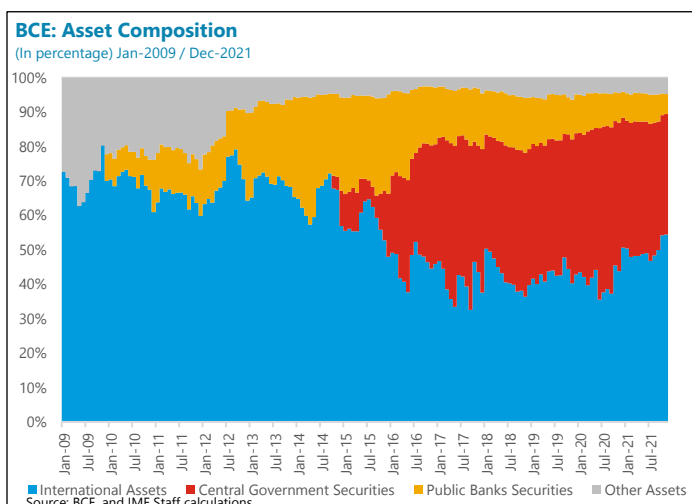
The additional resources obtained by public banks did not boost development credit significantly. The new long-term funding was mostly used to finance the central government by acquiring domestic public debt. Resources were triangulated to finance the central government's deficit. Those government securities came to represent 25 percent of the total assets of public banks, in December 2014 reached approximately US\$2 billion (text chart).



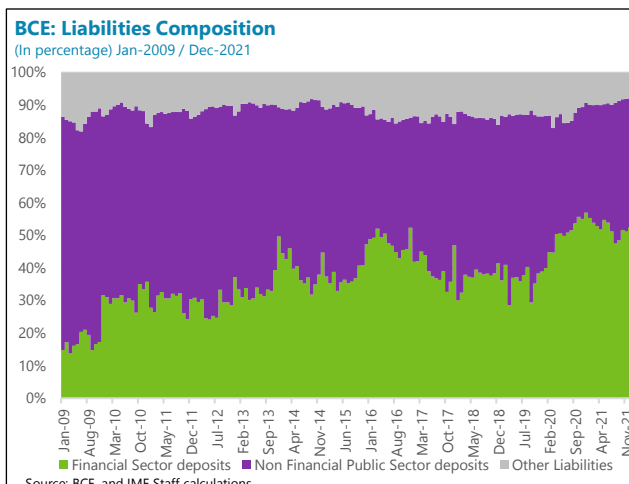
From September 2014 onwards, with the enactment of the Organic Monetary and Financial Code (COMYF), the CBE directly financed the central government deficit up to 7 percent of GDP. The COMYF, in its Article 36, Number 5, granted the CBE the function of acquiring securities issued by the MEF. This opened the possibility of financing the fiscal deficit. The first direct lending operations between the CBE and the Ministry of Economy and Finance started with a loan of US\$380 million in October 2014 (text chart). Given fiscal difficulties following the fall in commodities prices in late 2014, this mechanism grew significantly from October 2015 to May 2017 to reach close to US\$7 billion, or 7 percent of GDP. As end-2021, the Ministry of Economy and Finance owes the CBE approximately US\$6 billion, to be repaid by 2035.



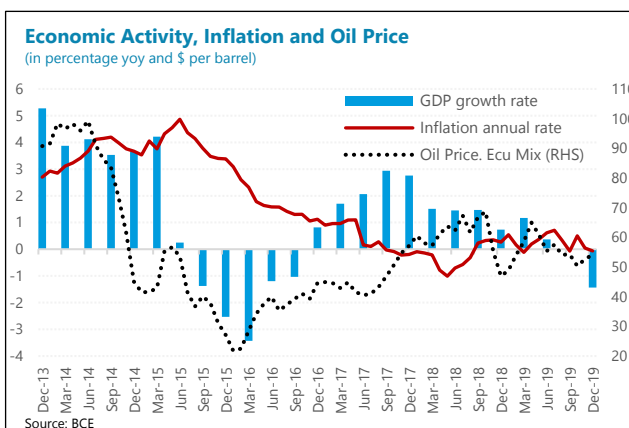
By acquiring public bank and central government securities, the CBE altered the composition of its assets as well. The CBE's balance sheet changed from a high proportion of liquid assets to a higher proportion of illiquid local financial assets (text chart). By the end of 2021, approximately half of the CBE's assets are international, and the other half are public bank securities, central government securities or other domestic assets.



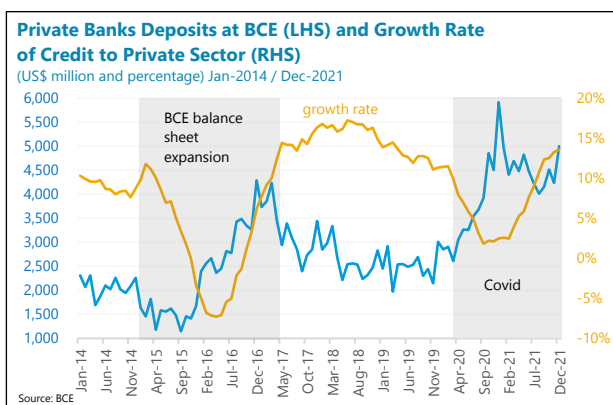
Balance sheet expansion also influenced the composition of the CBE's liabilities. The CBE balance sheet expansion was used for public spending, which triggered payments to the private sector. Nearly 50 percent of the CBE's liabilities correspond to deposits of public and private financial sector institutions, which at the beginning of 2009 were less than 20 percent (text chart).



The highest intensity of the expansion of the ECB's balance sheet was at a time when the Ecuadorian economy was experiencing a recession caused by the abrupt drop in oil prices in 2014. By 2015, the Ecuadorian economy had no mechanism to contain an economic crisis; there was very limited fiscal space as savings had been depleted and no access to international markets as a result of the 2008 default. The government's response was a monetary impulse by expanding the ECB's balance sheet. This monetary impulse along with the recovery in oil prices supported economic recovery in 2017 and 2018 (text-chart).



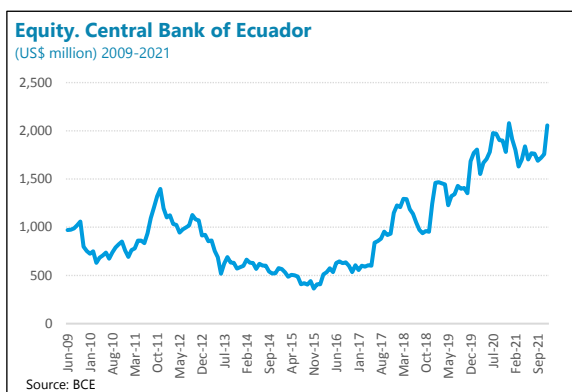
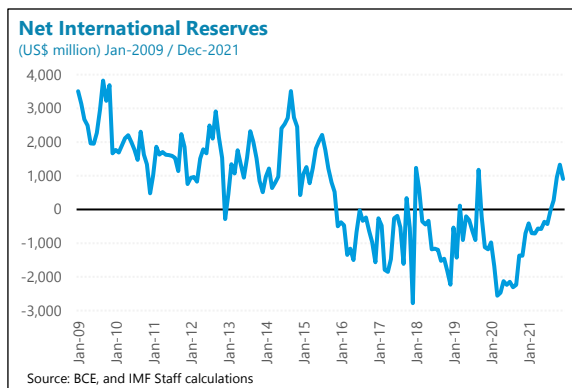
The consequences of the CBE's balance sheet expansion were directly reflected in the financial sector. After this endogenous money creation was channeled through public spending, private financial institutions had more liquid resources at the CBE, given that all public institutions must have bank accounts at the CBE. The Central Bank is the clearing agent of the public sector, and when payments are made to the private sector, the private bank reserves at the CBE automatically increase. These resources at the CBE had no remuneration and were an opportunity cost for financial institutions. The natural response of financial institutions was to increase the offer of credits. Following the stiff contraction in 2015, the growth rate of credit to the private sector rebounded from mid-2016 to reach growth rates of 12%-18% between mid-2017 and mid-2019 (text chart).



A complementary measure to establish the strength of Ecuador's Central Bank balance sheet is the net international reserve (NIR) position. The NIR is calculated as the liquid components of the gross international reserve minus the deposits at the CBE of other depository institutions and other financial institutions (excluding the bank of the Social Security, *BIESS*). Looking at historical data, we observe that the NIR had been positive until mid-2015, when the CBE balance

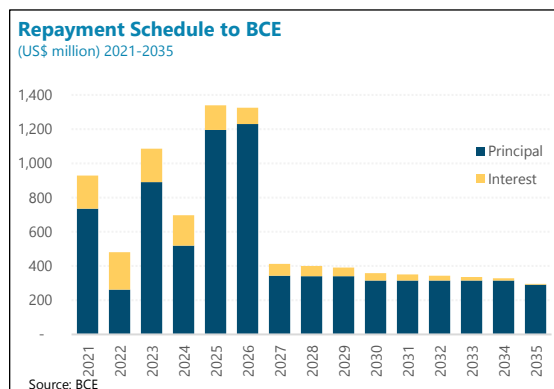
deteriorated significantly. It is not until mid-2020 that its recovery begins. At the end of 2021, NIR was close to one billion dollars.

Another concern has been the low levels of the Central Bank of Ecuador's equity until mid-2017. An adequate level of capital is another determinant of the health of the Central Bank's balance sheet. As mentioned by Stella (1997) a large negative net worth is likely to compromise central bank independence and interfere with its ability to attain policy objectives. If society values a central bank capable of effectively implementing monetary policy, recapitalization may become essential. And this case is magnified in a country without autonomy in monetary policy because it does not have its own legal tender, such as Ecuador. The equity, mainly composed of capital contributions and capital reserves, had a sharp decline over the mid-2010s to a low point of approximately US\$360 million in November 2015, coinciding with the monetary expansion as described above. The decision to put an end to the CBE's balance sheet expansion in 2018 set a recovery in the CBE's equity base (text chart).



To fortify the institutional foundations for dollarization, Ecuador reversed the 2014 amendments to the COMYF in 2021. This bill was approved by the National Assembly and published in the Official Gazette on May 3, 2021. One of the objectives of the amendments was to prohibit all future quasi-fiscal activities of the CBE as well as direct and indirect lending to the government or public sector (including loans, advances, guarantees or transactions that indirectly support lending operations of the public sector). Additionally, the law sought to strengthen the central bank's autonomy and governance arrangements and to strengthen the central bank's financial stability oversight function. Ultimately, the law aims to clean up the CBE's balance sheet of illiquid IOUs, and to gradually recapitalize the CBE. This will result in full coverage of liabilities with international reserves by 2035, with a return to the four-balance system (Box 2).

To meet the central bank's balance sheet coverage requirements, public banks and the MEF agreed on an annual payment schedule. For all payments that the public sector must make to the CBE, which includes the reversion of public bank shares, implemented on June 30, 2021, the CBE will receive US\$7,723 million for principal payments and US\$1,349 million for interest during 2021-2035. The years of most significant pressure on public finances will be 2025 and 2026 (text chart).



Box 2. CBE's Balance Rules

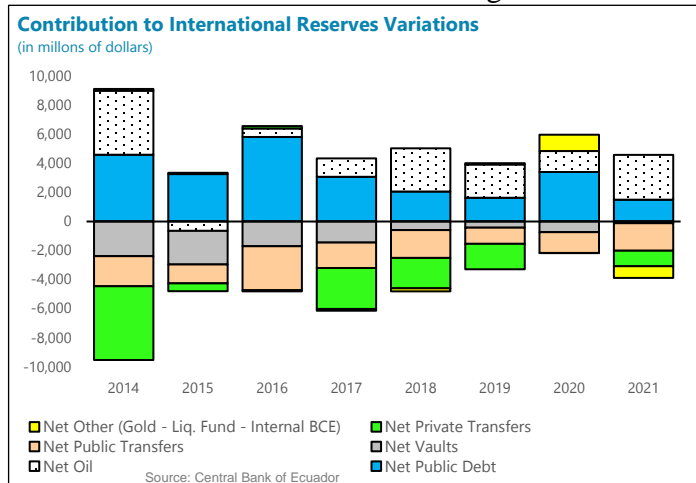
	Original Four Balance Rule	The New Four Balance Rule: COMYF 2021
Context	On March 13, 2000, "Ley para la Transformación Económica del Ecuador" (Law for the Economic Transformation of Ecuador) was published in the Official Gazette. Article 33 outlines the four-balance system backing dollarization by defining the initial fundamentals of dollarization and establishing the four balances that the CBE must follow.	On May 3, 2021, "Ley Orgánica Reformatoria al Código Orgánico Monetario y Financiero para la Defensa de la Dolarización" (Reformatory Organic Law to the Monetary and Financial Code for the Defense of Dollarization) was published in the Official Gazette. Article 33 defines and reinstated the four-balance system backing rule.
First Balance	Includes the fraction of the monetary base (M1) of low denomination coins (1-5-10-25-50 cents) minted by the CBE. To balance these liabilities, an identical amount of International Reserves must be recorded in the assets.	Liabilities of this balance include the national monetary species minted by the Central Bank of Ecuador that are in circulation, Central Bank Securities (TBC), any other direct obligation with the public and the deposits of other depository institutions, which include private banks, mutual banks, savings and credit cooperatives, and public banks with demand deposits. These liabilities must be covered one hundred percent with the assets of the International Reserves.
Second Balance	Consists of deposits of public and private financial institutions. To balance these liabilities, an identical amount of International Reserves must be recorded in the assets. The law requires that the first two systems must always be covered by International Reserves of at least 100%.	Liabilities of this balance include the deposits of other financial entities, including CFN, BIESS (Banco del Instituto Ecuatoriano de Seguridad Social), other public sector financial entities and financial intermediaries that do not take demand deposits from the public. These liabilities will be covered with the remaining reserve assets once the First Balance is covered and must be equivalent to one hundred percent of the liabilities in this balance.
Third Balance	Comprises the deposits of the non-financial public sector (NFPS); this system does not require complete matching by International Reserves.	The liabilities of this balance include deposits of the Non-Financial Public Sector (NFPS), deposits of authorized private legal entities in the Central Bank of Ecuador and transfers through the payments system pending settlement, as well as the CBE's own external indebtedness. These liabilities must be one hundred percent covered with the assets of International Reserves, once the second balance has been fully covered.
Fourth Balance	The fourth balance covers the remaining asset and liability accounts of the Central Bank of Ecuador, including the equity and income accounts. Once the Third System is covered, its remnant will be added to the assets covering the fourth balance.	The balance records the remaining asset and liability accounts of the Central Bank of Ecuador, including the equity and income accounts. Once the third balance is covered, its remnant will be added to the assets covering this balance.

II. STRESS TEST ANALYSIS

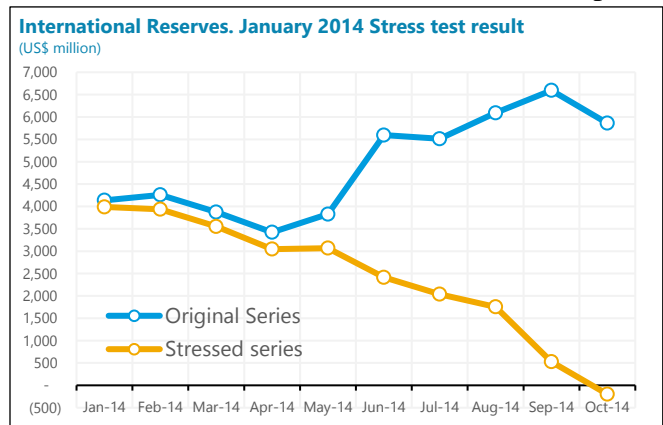
This section builds on insights from liquidity stress tests methodologies to determine the intertemporal pressure of international reserves from January 2014 to December 2021. The sample selection is determined by the availability of statistics on international reserve movements.

Methodology

Three main factors influence international reserves: (i) Public and private transactions with the rest of the world; (ii) demand for cash from financial entities; and (iii) other economic flows (e.g. change in the value of gold). For Ecuador, data on flows that determine the change in the stock of international reserves is available from January 2014 at the monthly frequency. The flows are in gross and net terms. For example, in the case of oil, a positive flow is an income from crude oil exports, and a negative flow corresponds to imports of oil derivatives. Between 2014 and 2021, oil and public debt have been the main driver of changes in international reserves (text chart). Debt contribution is expressed in net terms, i.e. public external debt disbursements minus interest and principal payments. The highest net external borrowing was registered in 2016, with a net amount received of US\$5.8 billion, of which the issuance of sovereign bonds for US\$2.75 billion and loans from the China Development Bank for US\$2.3 billion. In contrast, during the COVID-19 pandemic in 2020, borrowing came mainly from multilateral organizations (IMF, World Bank, IADB, and CAF) for a total of US\$7.2 billion.



Our stress test method gauges each month what the reserve coverage would have been without future external debt disbursements. We assume that no new financing is obtained, but external payments, both public and private, will continue. The objective is to determine the number of months that international reserves will cover (without the inflow of new resources from public external debt) cash demand and internationally acceptable transactions. In practice, one could even think about a Krugman (1979)-like view that currency attack/runs on banks would happen before international reserves actually run out, as investors/depositors anticipate that reserves will run out eventually, i.e. in a self-fulfilling way. In the end, we model both a liquidity and a financing stress test since the more international reserves can cover liabilities without the need for external debt, the more liquid is the central bank to cover its obligations, and the government becomes less dependent on external financing. This methodology can be illustrated as follows: In January 2014,



it is assumed that going forward no new external disbursements are received. In this circumstance, it would have taken seven months for the international reserves to reach US\$2 billion, eight months to reach US\$500 million, and reserves would have been exhausted after nine months. This exercise is replicated for each of the 96 months for which data is available, between January 2014 and December 2021 (text chart).

The mathematical specification of this exercise is represented as follows:

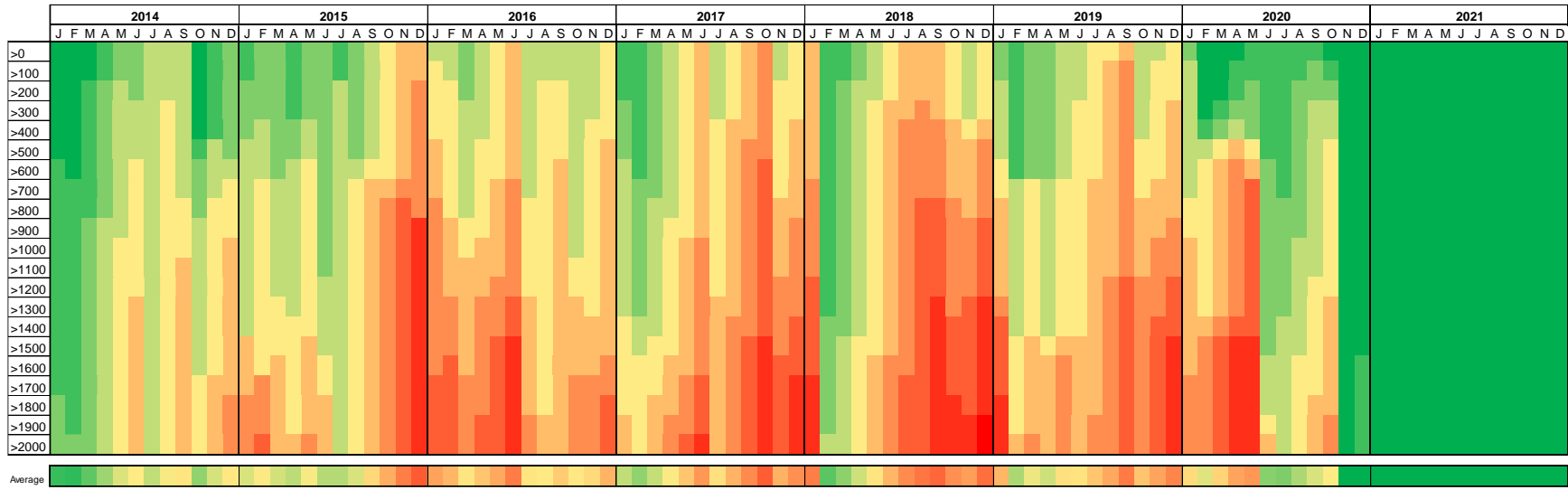
$$GIR_t = GIR_{t-1} + NetOil_t + NetVaults_t + NetPrivateTransfers_t + NetPublicTransfers_t + NetOthers_t + \gamma ExternalPublicDisbursements_t - PublicDebtService_t$$

where γ takes the value of 1 for original series, and 0 for the stress exercise.

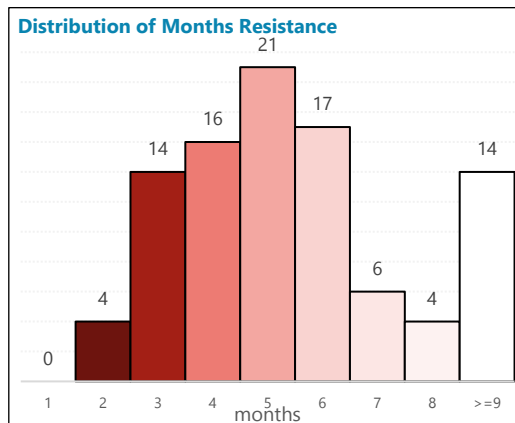
Results

Our results indicate high liquidity stress caused by severe international reserves shortages. Using a heat map (Figure 7), we represent the results for each of the months from January 2014 through December 2021, arranged in columns. In rows, we calculate thresholds where we applied the methodology to determine the liquidity pressures at each point in time, ranging from US\$2 billion to zero. The result is expressed in the number of months that international reserves will take to reach the defined threshold. The resulting values vary between 0 and 14 months. The range of colors reflects these results; the greenest color corresponds to a value equal or above 9 months, and the reddest values equal to 0 months.

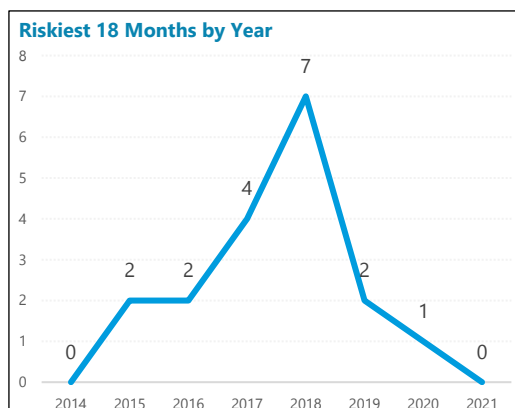
Figure 7. Results of the stress test: Heat map.



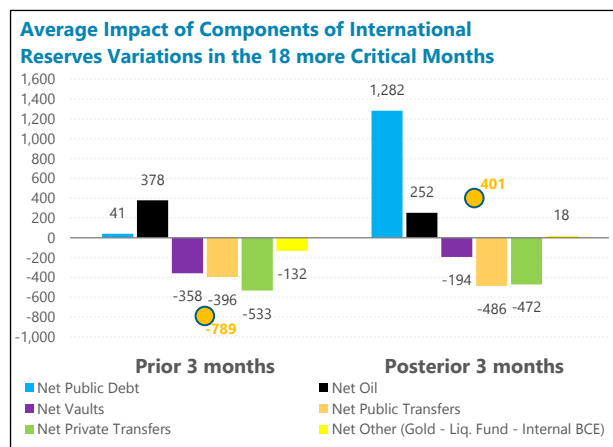
The analysis covers 96 months (2014-2021), which can be divided according to their reserve coverage capacity. The text-chart shows the distribution of these months according to the average amount of time international reserves can last without liquidity constraints. High-risk levels, below 2 months of coverage, are recorded in 4 of the 96 months of analysis. In 14 months, international reserves can only withstand three months without new financing. In other words, in roughly 20 percent $((14+4)/96)$ of instances between 2014 and 2021, the CBE was in a situation where its liquidity horizon was less than one quarter. Overall, there were very few months in which the CBE had sufficient international reserves prior 2021. It is clear from the heat map that the liquidity stresses on the balance sheet of the CBE receded starting end-2020, and remained in healthy territories all over 2021, coinciding with the external debt restructuring and exceptional financial support from international financial institutions.



These eighteen high-risk months are concentrated around 2018. When ranking those high-risks months by year, 2018 recorded 7 of the 18 episodes pointing to the highest levels of liquidity stress. This points to why the Government of Ecuador approached the IMF in late 2018 to enter a financing agreement, which was later approved in March 2019.



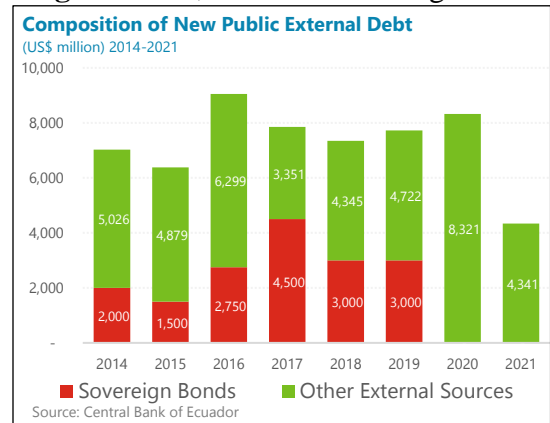
A way to corroborate our result is to analyze the change in the reserve component around the identified critical months. Analyzing these eighteen months of greatest liquidity stress, we observed that on average, in the three previous months, there was almost no net inflow of external debt. On the other hand, in the months following those critical months, significant foreign debt resources flowed in to sustain a minimum level of international reserves and need for cash.



Alternative scenario

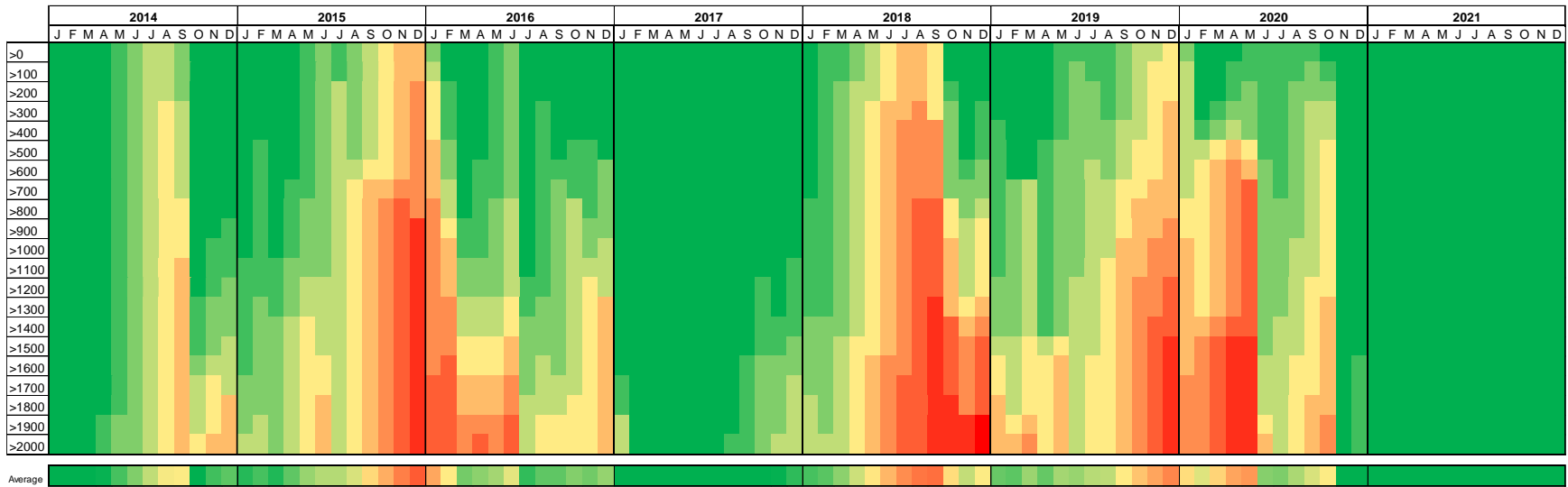
Our baseline stress test scenario assumes a complete removal of external debt disbursement flows. As an alternative scenario, we propose to remove all external financing sources, except sovereign bond disbursements since those were not the main source of financing.

From 2014 to 2021, disbursements received from sovereign bond issuance represented on average 29 percent of the total of external financing. In effect, external financing can take the form of bilateral debt, multilateral debt, direct bank loans, commercial oil loans, sovereign bond issuance, among others. Since Ecuador did not have a smooth access to sovereign bond markets following the 2008 default, the government relied mostly on bilateral debt, which is typically more expansive and less transparent than bond markets. In 2016, 2020, and 2021, a large share of the non-bond financing came from multilaterals, supporting the post 2016 earthquake reconstruction efforts and providing financing following the latent fiscal crisis in 2018 and the pandemic and debt restructuring in 2020.



In the scenario, liquidity pressures were challenging in late 2015 and early 2016, late 2018, and late 2019 to early 2020. Using a heat map (Figure 8), we represent the results for each of the months from January 2014 through December 2021, arranged in columns. In rows, we calculate thresholds where we applied the methodology to determine the liquidity pressures at each point in time, ranging from US\$2 billion to zero international reserves. The result is expressed in the number of months that international reserves will take to reach the defined threshold. The resulting values vary between 0 and 20 months. The range of colors reflects these results; the greenest color corresponds to a value equal or above 9 months, and the reddest values equal to 0 months. The results show that the most important liquidity pressure point coincide with the 2015 and 2018 fiscal crises, in line with our baseline scenario. Results also corroborate that the liquidity stresses on the balance sheet of the CBE receded starting end-2020, and remained in healthy territories all over 2021, coinciding with the external debt restructuring and exceptional financial support from international financial institutions.

Figure 8. Alternate Results of the Stress Test: Heat Map



III. CONCLUSION

In this paper, we document how in Ecuador, an officially dollarized economy, the expansion of the Central Bank of Ecuador's (CBE) balance sheet financed the public sector in the mid-2010s. Between 2009 and 2014, some accounting practices and subsequent changes in legislation were adopted that ultimately aimed to allow the CBE to finance the central government's deficit, challenging standard monetary economic thinking that fiscal dominance are disallowed in a full officially dollarized economy. At its peak, financing of the public sector represented up to 10 percent of GDP.

Using a stress test methodology, we illustrate how the expansion of the Central Bank of Ecuador's balance sheet weakened its capacity to complete foreign payments and also put significant stress on the cash position of the central government. Using data on international reserves components, we documented how an expansion of the balance sheet of a central bank in a dollarized economy generated a need for cash resources, given the increase in liabilities that could be demanded for foreign payments or cash needs. To solve the liquidity problems, the Ecuadorian government relied on obtaining external debt and cash through the issuance of sovereign bonds and large bilateral loans. If these resources had not been available, the CBE would have lost the capacity to meet the demand for cash or the payment of foreign transactions. If this scenario had materialized, Ecuador could have faced a heightened risk of financial crisis, putting the very foundations of dollarization at risk.

Following a deep fiscal crisis and the need to request financial support from the international community, the Organic Monetary and Financial Code was modified in 2021 to ensure the financial balances of the CBE are in line with international financial standards (IFRS). The unmarketable and unfunded securities (IOU's) received from the public banks and central government would likely have been significantly lower in value upon origination in fair-value terms, a key feature of IFRS. This reduction in value on origination would have either: (i) reduced the CBE's ability to invest as much in the public banks or central government; or (ii) the CBE would have had to record a loss on origination, which would have eroded the CBE's equity. The application of internationally recognized accounting standards would have made the risks more apparent, potentially reducing the motivation to undertake them in the first place.

More broadly, our study emphasizes the risks related to the expansion of central banks' balances and knock-on effects to other sectors of the economy, including on the fiscal and external balances in the context of an officially dollarized economy. In Ecuador, such policies put the financial sector at great risk, given that the central bank was stripped of its liquid assets. Ultimately, this also left the Ministry of Economy and Finance with large outstanding obligations to the CBE at a very complex juncture of fiscal crisis, exacerbated by the economic and fiscal impact of the COVID-19 pandemic.

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