The External Financial Constraint in Latin America and the Caribbean

A Stock-Flow Approach

Lorenzo Nalin, Leonardo* Rojas Rodríguez** and Esteban Pérez Caldentey***[1]

Abstract

The growth of developing economies is constrained by the performance of the external sector. Countries face an external constraint when their performance (current and expected) in external markets and the response of the financial markets to this (current and expected) performance delimit and restrict their scope for conducting domestic policies, including fiscal, exchange-rate and monetary policy. We argue that the main external constraint on growth is financial rather than determined by real factors as postulated by the literature on this subject.

On this basis we provide an explanation of the decline in trend GDP growth in Latin America and the Caribbean based on the interaction between financial flows, more flexible exchange rate regimes, and the external indebtedness of governments and the non-financial corporate sector. The interaction between these factors is mediated by five transmission mechanisms: (i) the sensitivity of bond prices to changes in interest rates; (ii) the positive and statistically significant correlation between nominal exchange rate variations and sovereign risk perceptions; (iii) the positive and statistically significant correlation between sovereign and corporate risk perceptions; (iv) the positive correlation between risk and debt; (v) the non-linear relationship between leverage and investment. These different components are pulled together in a macroeconomic consistent stock-flow model comprising four sectors: private, government, and external sectors, and a central bank. Our external financial restriction approach contrasts with the two broad type explanations have been put forward to explain the decline in growth in LAC. The first focuses external shocks/financial/balance of payments crises. The second type center on the real sector and attributes the decline in growth to the failure of domestic policies to create the conditions for broad-based structural change towards higher value-added production.

Key words: Debt, external financial cycle, financial flows, growth, Latin America and the Caribbean, stock-flow.

JEL Codes: B59, E32, E52, F21, F41, G15.

---

[1] * Universidad Nacional Autónoma de México - nalin.lorenzo@comunidad.unam.mx

**Universidad Nacional de Colombia. leorojasrod@unal.edu.co

*** Chief of the Financing for Development Unit. Division of Economic Development. Economic Commission for Latin America and the Caribbean. esteban.perez@cepal.org

Introduction

The growth of developing economies is constrained by the performance of the external sector. The notion of growth under external constraint places the organization of international economic relations at the heart of the analysis. The economic performance of developing countries (i.e, the countries of the periphery) is largely determined by the international financial architecture. The current financial and monetary system is anchored in the United States dollar as the reserve currency, and countries which do not issue the international reserve currency (such as the countries of the periphery, including those in Latin America and the Caribbean), need to acquire and have access to this currency that they cannot issue (for example through an international reserves accumulation policy) in order to be able to import (and develop) and conduct international financial transactions.

Consequently, the domestic policy of developing countries is in large part permanently delimited and restricted by external conditions. It is in this sense that the growth efforts of these economies are confronted with an external constraint. More specifically, countries face an external constraint when their performance (current and expected) in external markets and the response of the financial markets to this (current and expected) performance delimit and restrict their scope for conducting domestic policies, including fiscal, exchange-rate and monetary policy.[2]

Traditionally the external constraint is approached from the real sector side, that is by identifying the rate of growth of an economy that is compatible with current account equilibrium. This presupposes that the behavior of the financial accounts of the balance-of-payments is determined by the current account (or that the financial account 'finances' the current account).

The external constraint implies that an economy (especially on the periphery) is unlikely to be able to maintain a current account deficit for a long period, except in the case of countries that usually receive substantial amounts of foreign direct investment or official assistance flows (McCombie and Thirlwall, 1999). In the long run, countries have to keep their current account (CA) or basic balance (the current account (CA) plus long-term financial flows (FF)) in equilibrium. Maintaining a current account deficit or a 'basic balance 'deficit' will prove to be unsustainable as a country will either contract absorption or will end in a balance-of-payments/financial crisis. The rate of growth compatible with balance-of-payments equilibrium can be increased only through progressive structural change.

2 This definition is based on McCombie and Thirlwall (1999, p. 49), according to whom countries face an external constraint when their performance in foreign markets and the response of the financial markets to this performance restrict growth to a rate lower than external conditions require. This definition assumes that countries grow at a rate lower than the one compatible with full employment. Consequently, the organization of the global economic system, including its financial architecture, has a restrictive bias and prevents countries subject to external constraints from realizing their growth potential..

This view gives rise to two types of explanations to account for the persistent decline in GDP growth since the 1980s. The first traces this performance to the occurrence of external terms-trade and financial 'shocks', including sudden capital stops and balance-of-payments crises. The external real-financial shocks seemed to fit well with the series of economic crises that affected the region in the 1990s and 2000s, including the Debt Crisis (1981-1983), the Tequila Crisis (1995), the East Asian Crisis (1997-1998), the Russian-Cum Brazilian Crisis (1999), the Argentine Crisis (2002-2003) and the Global Financial Crisis (2008-2009). However, it can hardly explain the economic performance of the region in the period 2010-2019 where, with no significant external shocks, GDP growth tended towards stagnation as it declined from 6.2% to 0.1%. An alternative explanation focuses, almost exclusively on the real sector. It also focuses on long-term trends relegating the business cycle to a second plane. It traces the poor economic performance of the region mainly to the failure of domestic policies to create the conditions for broad-based structural change towards higher value-added production. Although it recognizes that external shocks (such as changes in terms-of-trade) are a part of the explanation, their effect is much aggravated by a narrow productive and exporting structure. From this viewpoint the binding nature of the external constraint to growth reflects a weak productive structure. This approach captures several stylized facts of the evolution of the real sector in Latin America and the Caribbean. Indeed, the impact of COVID-19 on Latin American and Caribbean economies is explained to a great extent by its flimsy production base.

Despite their importance financial factors are placed in the background, are rarely integrated and seldom interact with real sector variables. This interpretation obliviates the transformation and importance that finance has acquired since the 1990s and especially in the 2000s, and its impact on Latin American and Caribbean economies.

In line with both views we also believe that the external sector plays a crucial role in shaping the economic performance of the countries in the region. This is the starting point of our analysis. In line with the external shock approach, we focus the analysis on the business cycle and place the weight of our explanation on financial factors rather than real factors. While financial/balance of payments crises can part of the explanation of business cycle, these are by no means necessary to its workings. In this sense a business cycle need not conform to the typology of a boom-bust cycle.

We also sustain that causality runs from the former to the latter and that the binding external restriction is financial. In this sense the focus of the explanation lies in the determinants of the business cycle and its behavior determines the GDP growth trend. We regard the decline in labor productivity as the result of the working mechanisms of the business cycle driven by financial factors.

Following the 1980s debt crisis the region embarked on a process of trade and financial liberalization. In line with this policy stance, the countries in the region moved in the 1990s and early 2000s towards more flexible price and exchange rate regimes. This made their performance more dependent and susceptible to changes in foreign financial flows.

The latter is reflected in the 1990s the changes in the debt situation of governments. Overall, governments used the international bond market to finance part of their deficits, but this did not translate into an increase in sovereign debt over time.

By comparison in the 2000s, especially after the Global Financial Crisis, both government and the non-financial corporate sector made extensive use of the international bond market, and in addition their external debt has increased overtime. Accordingly, from our point of view, the interaction between financial flows, more flexible exchange rate, and the external indebtedness of governments and the non-financial corporate sector have become a central part of the explanation of the business of the region and of the evolution of its growth trend. The interaction between these factors is mediated by five transmission mechanisms: (i) the sensitivity of bond prices to changes in interest rates; (ii) the positive and statistically significant correlation between nominal exchange rate variations and sovereign risk perceptions; (iii) the positive and statistically significant correlation between sovereign and corporate risk perceptions; (iv) the positive correlation between risk and debt; (v) the non-linear relationship between leverage and investment.

The different components of our view of the business cycle and the transmission mechanisms are pulled together in a macroeconomic consistent stock-flow model. The model comprises four sectors: private, government, and external sectors and a central bank and five assets. The model is used to replicate the behavior and trajectory of GDP growth.

The paper is divided into six sections. The first section briefly describes the external shock/financial and balance-of-payments crisis and productive structure views. Section two and three present the building blocks and transmission mechanisms of the external financial restriction approach. Section three describes the stock-flow model and main innovative features. Sections four and five show the results of the workings of the model with a base scenario and an increase in the international rate of interest.

1. Latin America's growth pattern: the external shock and productive structure viewpoints

Since the early 1980's the trend rate of growth of GDP for Latin America and the Caribbean region shows a persistent decline. The available evidence for the period ranging from 1950 to 2019 shows that the growth rate of regional GDP went from an average of 5.6% for the period 1951-1980, to 2.5% for the period 1981-2009, to 1.9% for the period 2010-2019 (Figure 1).

The decline in GDP growth between 1951-1980 and 1981-2009 can be explained partly by the fact that the region transitioned from a state to a market led development model, especially from 1990 onwards, characterized by privatization, deregulation and liberalization of trade and finance making the economies of the region more vulnerable to external shocks and financial crises. The latter have included significant capital account liberalization, and reductions and impediments to cross-border financial transactions, increased participation of foreign banks in the local banking systems, and greater cross-border capital market activity and mobility.[3]

Figure 1
Latin America and the Caribbean: rate of growth of GDP (1951-2020)

Source: On the basis of World Bank (2021) and ECLAC (2021)

During the latter period Latin American and the Caribbean was affected by a series of recurrent financial crises. These include the 1980s debt crisis, the Tequila Crisis (1994-

[3] According to Galindo et al. (2010) argue that "…by 2007 Latin America as a whole was the most financially open region in the developing world." This view is exemplified through both jure and de facto measures. De jure measures include the evolution of the Chinn-Ito Index of capital account liberalization which has increased since the 1990s and that by 2006, Latin America became the most financially open region in the world. De facto measures include the sum of the stocks of (the absolute value of) external assets plus external liabilities as a percentage of GDP and the participation of Foreign Banks in Local Financial Systems. Bank concentration has been accompanied by a growing presence of foreign banks in the region. Foreign banks account for a large share of the assets of the commercial banking system. They own more than 50% of total bank assets in the cases El Salvador (100%), Uruguay (92%), Mexico (70%), Honduras (53%), Paraguay (51%), Peru (51%), and between 25% and 33% of total assets for Costa Rica (26%), Guatemala (30%) and Chile (33%).

1995), the East Asian Crisis (1997-1998), the Brazilian-Russian Crisis (1999), the Argentine Crisis (2001-2002), and the Global Financial Crisis (2008-2009).

However, the same argument cannot explain the decline in the economic growth rate between 2010 and 2019 (6.2% and 0.1% respectively), which is one of the sharpest on record since there were no economic shocks or crises of the magnitude registered during 1981-2009. In this sense, an adequate exposition of the causes of growth and, also business fluctuations, must supersede that based on booms and busts which characterizes a great deal of the literature on this topic.

An alternative explanation focusses on real factors and more precisely on the productive structure. It argues that during the openness and liberalization period Latin American economies failed to diversify and upgrade their productive and export structure and this had a lasting damage on the long-term rate of growth. Some of the manifestations of this view include the decline rate of growth of labor productivity (1.87 to -.015% between 1970-1979 and 2010-2019) which compares unfavorably to other developing regions and, also the widening gap between labor productivity in LAC relative to developed economies (the ratio of labor productivity of Latin America to that of the United States fell from, roughly, 30% in the 1980s to 20% in the 2000's).[4]

The absence of a progressive structural change is also reflected in the composition of exports. An analysis of the decomposition of exports by technological content shows that the export structure has remained anchored in natural resources, reflecting a process of primarization and the absence of progressive structural change. Available evidence for the period 1980-2012 shows that the share of raw materials and manufactures based on natural resources accounted for 76%, 63%, 44% and (approximately) 60% of the total in the early 1980s, 1990s, 2000s and late 2000s.

For the most part the productive structure approach also provides a partial explanation as it tends to obliviate the impact of financial crises which are relevant in explaining the behavior of regional GDP during the 1981-2009 period. At a more general level, it fails to, take, into account, that the degree to which the process of openness and liberalization of trade and finance that took place from the 1990s onwards necessarily implies that financial factors, beyond the occurrence and impact of financial crises, and the way these interact with the real economy, must be part of a broader and more complete explanation of the economic performance of the region.

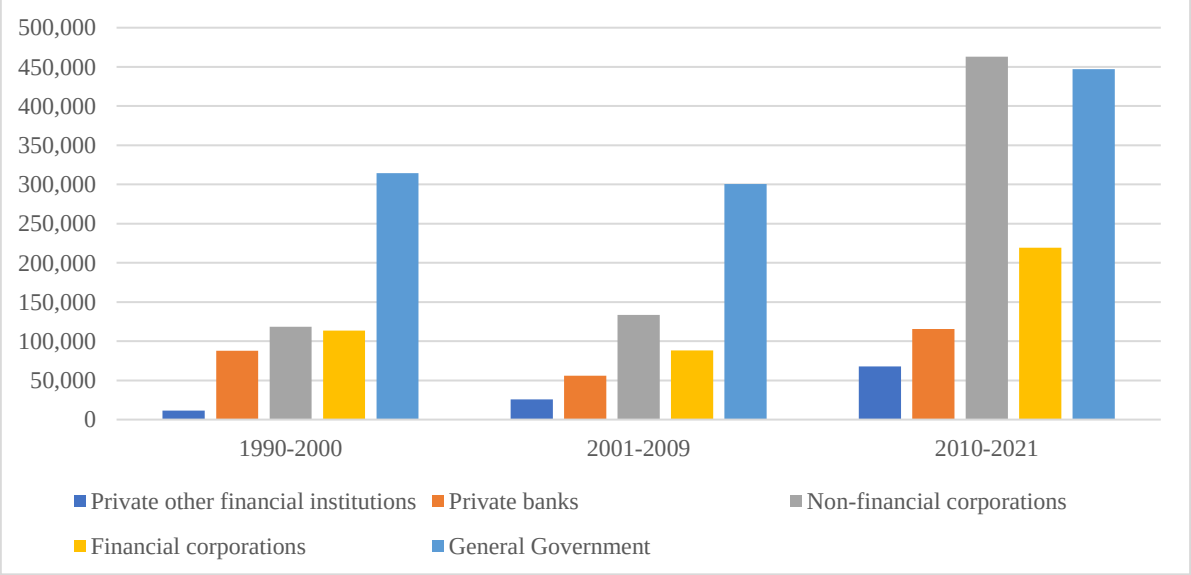
2. The external financial restriction: the main building blocks

[4] According to Paus (2019) the rate of growth of labor productivity in Latin America has lagged over the past thirty years behind that of all other developing regions.

As both the external shock/financial and productive structure explanations recognize Latin America and the Caribbean, as other developing economies, confront a balance-of-payments constraint that severely limits their ability to pursue expansionary aggregate demand policies. The external constraint refers to both a real sector and a financial constraint. As explained by McCombie and Thirlwall (1999, p. 49) "countries face an external constraint when their performance in overseas markets and the response of the financial markets to this performance constrains the growth of the economy to a rate which is below that which internal conditions would warrant''. With the exception, of the analysis of financial crises, the analyses have focussed on the real sector and, particularly on identifying the conditions that ensure a domestic rate of growth that is consistent with current account equilibrium.

However, the increasing domestically and external financial openness of Latin American and Caribbean economies jointly with their domestic policies implemented to accommodate greater financial openness, has made their performance highly dependent on the vagaries of foreign financial flows and especially short-term flows. This has also shaped the type of transmission mechanisms between the financial and the real sector. The combination of these factors can push an economy towards a low growth plateau without the occurrence of financial crises and before the current constraint becomes binding.

Figure 2
Latin America and the Caribbean: Gross debt security issues
US$ millions of dollars. 1990-2020



Source: BIS (2021)

The analysis of the financial account of the balance of payments for the period 1980-2020 shows that Latin America and the Caribbean relied significantly on short-term capital flows in the 1990s decade, and in the wake of the Global Financial Crisis (2008-2009). In the 1990's decade, short-term flows reached US$ 25.9 billion dollars growing to US$ 32.1 billion

for 2001-2009, and to US$ 107.4 billion for the period 2010-2020. A comparison between 2003-2009 and 2010-2019 indicates that the share of short-term inflows in total inflows rose from 37.3% to 52.1% of the total.

In both for the 1990's and the second decade of the 2000s, the behavior of short-term flows, were driven mainly by debt issues in the international capital markets and to a lesser extent by cross-border loans and deposits. However, by comparison, in the 1990's, international capital markets served to finance the debt of the general government whereas in the period 2010-2019, the use of the international bond market was not limited to the government. The non-financial corporate sector made extensive use of the bond market during this period (Figure 2 above).

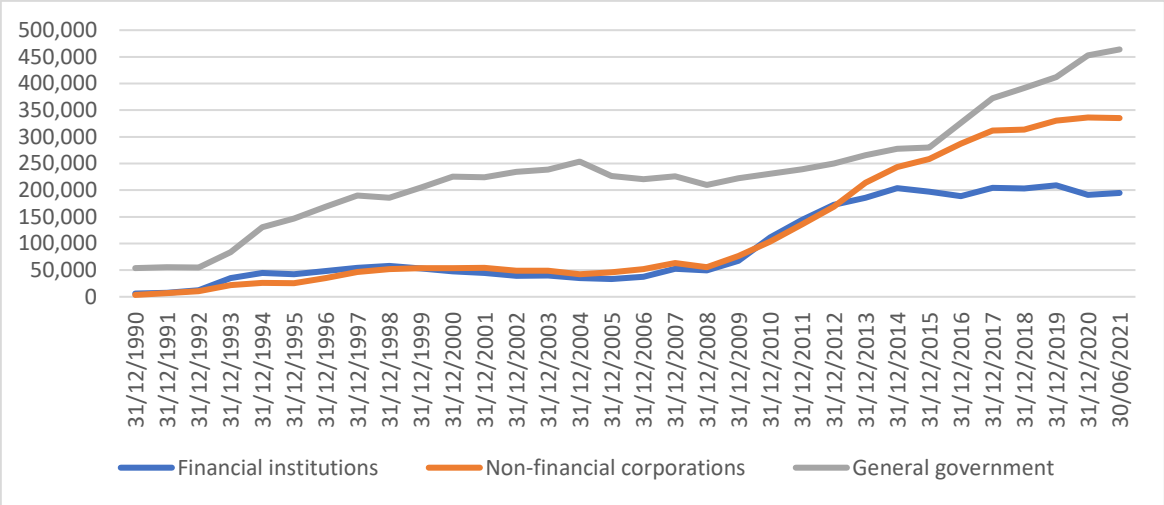
The composition of external debt by sector, based on an analysis of international debt issues, shows that the general government is the largest bond issuer. On average, it accounted for 65 percent of the total stock of debt securities between 1990 and the first quarter of 2021. However, the share of the government's stock of debt securities has declined over time (88.4 in 1990 and 50.8 percent of the total in the first quarter of 2021).

In contrast, nonfinancial corporations, the second most important debt issuer in the region, have increased their debt stock of debt securities both in volume (US$ 3.5 and 332.2 billion dollars between 1990 and 2021) and as a share of the total (5.7 and 36.3 percent of the total for the same years). Moreover, nonfinancial corporate debt has increased faster than any other sector since the Global Financial Crisis.

Also, by comparison with the 1990's decade, the period 2010-2019 is characterized by an accumulation of debt by the government and the non-financial corporate sector. On average, Latin America and the Caribbean is the most indebted region of the developing world with a general government debt reaching 77% of GDP and an external debt as a percentage of exports of goods and services equal to 226.7% in 2020. Latin America and the Caribbean also has the highest debt service in terms of its exports of goods and services (59%).

Figure 3

Latin America and the Caribbean. Debt securities, amounts outstanding, in billions of US$ dollars. 31/03/2000-31/03/2021 (Quarterly data)



Source: BIS (2021)

Increased external indebtedness has an endogenous vulnerability. As in the case of other developing economies, the non-financial corporate sector in Latin America tends to operate with a currency mismatch. Liabilities denominated in foreign currency exceeds the assets denominated in foreign currency. Moreover, available evidence shows that the currency mismatch has increased in the second half of the 2000 decade.[5]

Table 1
Selected emerging and developing economies (12 countries): net foreign-currency assets of the private corporate sector as a share of exports, 2007–2014
(Percentages)

	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Brazil	-43.3	-37.0	-45.6	-54.4	-60.2	-72.2	-64.1	-74.6
Chile	-20.6	-34.6	-51.8	-44.8	-43.8	-47.1	-48.5	-58.7
Hungary	-30.7	-40.1	-48.9	-34.4	-26.3	-26.3	-22.6	-16.9
Mexico	-10.3	-9.7	-15.1	-18.0	-18.9	-21.3	-27.4	-30.3
India	-15.3	-16.5	-18.4	-18.2	-16.1	-19.1	-19.5	-18.6
Indonesia	-12.6	-7.9	-4.9	-8.7	-14.5	-23.1	-31.3	-41.1
Malaysia	-8.0	-12.7	-14.5	-8.0	-7.9	-5.1	-10.8	-8.7
Philippines	-0.7	-2.9	-1.4	-11.5	-15.8	-23.5	-25.5	-16.3
Poland	-14.4	-27.6	-42.0	-38.5	-31.2	-30.6	-28.6	-22.7
Russia	-37.2	-16.0	-8.1	-5.5	-1.3	-2.1	-5.7	1.5
Thailand	8.7	1.6	-1.6	-4.9	-1.7	-6.7	-7.9	-4.0

[5] See Chui, Kuruc and Turner, 2018.

Turkey	-41.8	-37.7	-46.1	-64.4	-60.5	-67.9	-86.9	-91.4

Source: M. Chui, E. Kuruc and Ph. Turner, "A new dimension to currency mismatches in the emerging markets: non-financial companies", *BIS Working Paper*, No. 550, 2016.

Increased dependency on short-term flows and rising debt in the 2010-2019 take place in a context of narrower monetary and fiscal space than in the 1990s. Most of the countries of the region have signed investment agreements (jointly with trade agreements) which prevent them from imposing restrictions and controls on the financial and capital account of the balance of payments including on short-term flows.[6] In addition, the majority of countries have moved towards price flexibility which include more flexible exchange rate regimes. With the exception, of the Caribbean economies (Eastern Caribbean Currency Union, Bahamas, Barbados, Belize, Guyana, Trinidad and Tobago), countries with inflation targets (or monetary aggregate targets) and some degree of exchange-rate flexibility (either floating or crawling peg exchange-rate regimes) make up the bulk of the cases considered in table 2 (71% of all Latin American countries).

Table 2

[6] Some have been incorporated as members of the Organisation for Economic Co-operation and Development, such as Chile, Mexico, and Colombia.

Latin America and the Caribbean (27 countries): base interest rates by country and by exchange-rate and monetary regime, January, March and August 2020

Exchange-rate regime	Monetary regime		
	Exchange-rate anchor *(United States dollars)*	**Monetary aggregate target**	**Inflation targets**
Dollarization	Ecuador El Salvador		
Currency board	Eastern Caribbean Currency Union		
Conventional parity	Bahamas Barbados Belize		
Stabilization arrangement	Guyana Trinidad and Tobago	Bolivia (Plurinational State of)	Guatemala
Crawling peg regimes	Honduras Nicaragua		Costa Rica Dominican Republic
Floating			Brazil Chile Colombia Jamaica Mexico Paraguay Peru Uruguay

Source: Prepared by the authors, on the basis of International Monetary Fund (IMF), *Annual Report on Exchange Arrangements and Exchange Restrictions 2019*, Washington, D.C., 2020 and on the basis of official data.

Note: Figures in parentheses represent base interest rates for January, March and the last available month of 2020.

(...) indicates that data is not available.

The Eastern Caribbean Currency Union includes Antigua and Barbuda, Dominica, Grenada, Saint Kitts and Nevis, Saint Vincent and the Grenadines, and Saint Lucia.

Flexible exchange rate regimes are justified mainly on the basis that these provide an important shock absorber to external shocks preventing the transmission of their effects to the domestic economy. However, within a context of high debt and currency mismatches exchange rate flexibility can heighten financial vulnerability and fragility and encourage capital outflows.

A nominal exchange-rate depreciation, such as those that have occurred following the financial outflows from emerging economies resulting from the COVID-19 crisis, adds to debt service costs and increases the debt burden, thereby heightening credit risk. This effect can generate further pressure for financial outflows, by tightening financing conditions. In addition, if firms in a mismatch situation purchase foreign currency to meet their foreign exchange liabilities, the increased demand for foreign currency could cause a further

depreciation of the exchange rate. This could then fuel further capital outflows and, also increase the debt burden (ECLAC, 2016).

Two additional factors that narrow the policy space of Latin American and Caribbean countries. The first is the low value of the multiplier (m; $m \approx 1$)[7] determined by structural factors which is compounded by low public investment levels. This means that the effect of the multiplier on growth may be insufficient to act as an engine of growth. The second is that government spending is constrained by sovereign risk perceptions which are established a credit rating oligopoly which has procyclical bias with respect to developing countries. Credit downgrades occur when governments follow a countercyclical policy stance. Covid-19 is a perfect example.

In 2020, as the governments of the region pursued expansionary policies to counteract the effects of the pandemic, credit rating agencies downgraded a record number of sovereigns. Fitch, downgraded Argentina, Ecuador, and Suriname which defaulted on their debt. Besides these countries, Fitch also downgraded Bolivia, Chile, Colombia, Costa Rica, Guatemala, and Mexico. For its part, Standard and Poor downgraded, Argentina, Bahamas, Belize, Bolivia, Ecuador, Suriname and Trinidad and Tobago. Moreover, the analysis of the sovereign ratings by the three major credit rating agencies shows that more than half of the economies for which data are available are classified with the worst ratings (substantial risk and speculative grades). These include the majority, of smaller economies in the region and some of those that were in a weaker position prior to the pandemic

3. The transmission mechanisms

The combination of the above factors provides the setting for a business cycle narrative for Latin America and the Caribbean in the post Global Financial Crisis period. The main transmission mechanisms that give life to a business cycle are supported by empirical evidence and include:

(i) The high sensitivity of bond prices to international interest rates which has increased since the Global Financial Crisis

(ii) The high correlation between nominal exchange rate variations and the EMBI inverse correlation between the trend of sovereign risk as measured by the

[7] $(1)\ m = \frac{1}{s_p+\xi+\tau} s_p = (1-\alpha) + s_w\alpha$

where s_p= the average propensity to save; α = the share of wages in GDP; s_w= the propensity to save from earned income; ξ = the average propensity to import; and τ = the average tax burden. Capitalists are assumed to spend all of their income

Emerging Markets Bond Index (EMBI)[8] and nominal currency depreciation or appreciation. A depreciation (expected or effective) of the local currency is associated with a higher risk perception and can easily cause capital flight (BIS, 2019). Empirical data collected for Latin America display positive and statistically significant correlations between the rates of variation of the EMBI and those of the nominal exchange rate —for example, Argentina 0.21, Brazil 0.71, Chile 0.46, Colombia 0.64, Mexico 0.63 and Peru 0.39 (see Abeles, Pérez Caldentey and Abeles, 2020)

(iii) The high association between sovereign and non-financial corporate sector risk, captured by the positive and statistically significant correlation between EMBI and CEMBI

(iv) The positive correlation between EMBI, CEMBI and external debt service

(v) The non-linear relationship between cash flow and investment below a certain leverage (debt) threshold, cash flow (derived from the issuance of bonds in the international capital markets) and investment (and obviously debt) have a positive association. Beyond that threshold the relationship turns negative as firms may feel more financially constrained, leading them to increase their retained earnings and cash holdings to protect themselves against illiquidity and ultimately insolvency.[9] One hypothesis focuses on the dynamics between firm cash flow and investment. It argues that both variables have a non-linear relationship. Another hypothesis maintains that nonfinancial corporations become financial intermediaries by capturing international liquidity through bond issues and investing a growing amount in financial assets (Advjiev 2014; De Camino, Vera and Pérez Caldentey, 2021). The available evidence shows the region has been receiving increasing flows into financial assets from corporations outside the region. Those flows have been channeled through trade credit and cross-border

[8] The emerging market bond index is the key emerging economy risk indicator. It is calculated as the spread between the interest rate that countries pay on dollar-denominated bonds issued by those economies and United States Treasury bonds, which are considered risk-free. The index is based on the behaviour of external debt issued by each country. The less certainty there is that a country will meet its obligations, the higher its EMBI, and vice versa. The minimum rate that an investor would require to invest in a certain country would be equal to the rate on United States Treasury bonds (risk-free) plus the EMBI. See ECLAC (2016). The reasoning here assumes that changes in EMBI are endogenous to changes in the nominal exchange rate. See Borio (2019).

[9] An econometric estimation that relates investment in tangible assets to cash flow by degree of leverage for 270 firms in six Latin American countries (Argentina, Brazil, Chile, Colombia, Mexico and Peru) for the 2010–2016 period, shows that when leverage exceeds a 0.77 threshold, a 1% increase in cash flow-to-assets is associated with a reduction in investment of 0.25%–0.24%. In terms of the growth of tangible assets, the estimated equation shows that when leverage exceeds the 0.77 threshold a 1% increase in cash flow-to-assets is associated with a 0.75% reduction in the rate of growth of tangible assets. See Pérez Caldentey, Favreau-Negront and Méndez (2019).

> loans and deposits and, especially, intercompany loans.[10] This hypothesis implies the extensive use of the international bond market by the nonfinancial corporate sector has not been accompanied by an increase in investment and is associated with a strategy of financial accumulation.[11]

This analysis and description provide the main elements for a financial cycle narrative for Latin America and the Caribbean. The workings of the financial cycle, its origins and transmission and propagating mechanisms can be exemplified with the case of an expansionary monetary policy such as that currently followed by the United Federal Reserve Board and other major central banks. The expansionary monetary policy consists in the lowering the short-term policy rate to levels close or at zero (in nominal terms) and the increase in central bank's balance sheets, as a result, of the purchase of government securities.

In turn, the expansion of central banks' balance sheets results in a decline in the yield to maturity of government securities. The decline in the yield to maturity pushes investors to search for higher profitability (higher yields) and demand and invest in developing country sovereign and corporate bonds. On the supply side, governments and non-financial corporations are willing to take advantage of the favourable external financial conditions to issue debt. As a result, short-term financial gross inflows increase while at the same time the government and non-financial corporations witness an increase in their debt levels.

Also, the increase in gross short-term financial inflows can lead to an appreciation of the nominal exchange, which in turn leads to a decline in the risk of sovereign (EMBI) and non-financial corporates (CEMBI) pushing down future borrowing costs. In addition, the appreciation of the exchange rate improves balance sheet conditions by reducing government and firms' liabilities (external debt servicing costs (for those firms that work with domestic currencies) and, also the debt stock)). In the case of firms, currency mismatches are narrowed which means that the net-worth increases. Finally, the appreciation of the nominal exchange creates windfall profit opportunities for foreign investors that hold domestic bonds issued in local currency.

This set of factors can set the stage for a cumulative upward movement consisting of increasing short-term gross inflows, appreciating nominal exchange rates and higher debt levels. These are three stylized facts observed in the period 2010-2019.

The impact of these financial factors on the performance of the real sector will depend on profitability, actual relative to normal capacity utilization, and, also on leverage. As explained above up to a given leverage threshold increases in debt can increase investment. Beyond this threshold increases in debt do not translate in an increase in investment. Thus

[10] This explanation contrasts with the view that attributes to decline in investment to real factors, such as for example a lack of competitiveness due to an appreciated real exchange rate.
[11] See Advjiev (2014), Bastos et al. (2016) and Pérez Caldentey and Vernengo (2021)

increasing financial flows, exchange rate appreciation and rising debt coexist with declines in investment.

4. A brief description of the stock-flow model

In the present section we build an original growth model that describe the linkages between financial and real variables described with stylized facts. The model focuses on the financial and economic dynamics of a peripheral emerging market economy that have arisen with the implementation of global financial integration.

As shown in the transaction-flows matrix (TFM), reported below, the model incorporates four institutional sectors: i) the private sector, which includes households, non-financial corporations, and financial corporations; ii) the public sector, which includes central national government, non-financial public enterprises, and financial public enterprises; iii) the central bank; iv) and the Rest of the World (ROW), which, following Valdecantos (2016), represents foreign partners linked to the domestic economy through trade and international capital markets.

We define five financial assets: i) public debt issued in domestic and foreign currency, both purchased by the private sector and ROW; ii) private debt issued in domestic and foreign currency purchased by the public sector and the ROW; iii) debt issued by the ROW and purchased by both the public sector and the private sector as form of investment or reserve accumulation.

EMBI and CEMBI risk premiums are among the main novelties of the model. In our system, they affect several real and financial variables, such as private investment, exchange rate (level and agent's expectations), interest rate premiums, and ROW demand for local assets. We also explicitly consider the role of debt - and in particular mismatches in the private sector- in conditioning financial risk and real investment. In addition, we include a debt sustainability rule for the government in order to formalize the relationship between financial dynamics and fiscal policy.

Table 3 Transaction-Flows Matrix

		Production	**Private Sector**		**Govt Sector**		**Central bank**		**ROW**	**Σ**
			Current	Capital	Current	Capital	Current	Capital		
Consumption		$+C_d$	$-C_d$							0
Investment		$+I^k$		$-I^k$						0
Government Spending		$+G_d$			$-G_d$					0
Imports		$-IM$							$+IM$	0
Exports		$+X$							$-X$	0
[GDP]		$[-Y]$	$[+Y]$							$[Y]$
Interest	Govt Bonds (domestic currency)		$+int_p^g$		$-int^g$		$+int_{bc}^g$		$+int_{row}^g$	0
	Govt Bonds (FX currency)		$+int_p^{\$g}$		$-int^{\$g}$				$+int_{row}^{\$g}$	0
	Priv Debt		$-int^p$		$+int_g^p$				$+int_{row}^p$	0
	Priv Debt FX		$-int^{\$p}$						$+int_{row}^{\$p}$	0
	Bonds ROW		$+int_p^{row}$				$+int_{bc}^{row}$		$-int^{row}$	0
	Deposits				$+int_{mm_g}^{cb}$		$-int_{mm_g}^{cb}$			
Financial gains(dividends)					$+FB_g^{bc}$		$-FB^{bc}$			
[Gross National Income]			$[GNI_{PS}]$		$[GNI_{GS}]$					$[GNI]$
Taxes			$-T$		$+T$					0
Savings			$[S_{PS}]$		$[S_{GS}]$				$[S_{RoWS}]$	0
Capital			$+K$							$-K$
Inventories			$+IN$							$-IN$
Govt Bonds (domestic currency)				$-B_p^g$		$+B^g$		$-B_{bc}^g$	$-B_{row}^g$	0
Govt Bonds (FX currency)				$-B_p^{\$g}$		$+B^{\$g}$			$-B_{row}^{\$g}$	0
Priv Debt				$+D^p$		$-D_g^p$			$-D_{row}^p$	0
Priv Debt FX				$+D^{\$}$					$-D_{row}^{\$}$	0
Bonds ROW				$-B_p^{row}$				$-B_{bc}^{row}$	B^{row}	0
High power money				$+H^{bc}$				$-H^{bc}$		
Deposits						$-M^g$		M^g		0
Σ		0	0	0	0	0	0	0	0	0

a. Production, Income, and Wealth

Consumption, together with private investment, public spending and external trade determines the level of sales. Expected sales depend on the previous level of sales adjusted for the world GDP growth. The system does not operate at full employment, thus each period there exist a target of inventories the production sector accumulates. Expected sales and the misalignment of inventories from their target determine the level of production. Finally, by multiplying the level of sales for domestic prices we obtain nominal GDP.

(1) $c = \alpha_1 yd^e + \alpha_2 v_{-1}$

Sales

(2) $s = c + i + g + (x - m)$

Total Production

(3) $y = s^e + (in^T - in_{-1})$

Expected sales

(4) $s^e = ß \,.\, s_{-1} + (1 - ß) \,.\, \Delta Y_{row}$

Target inventories

(5) $in^T = \gamma . s^e$

Real inventories

(6) $in = y - s$

Nominal GDP

(7) $Y = s.p$

The private sector consumes according to its expected disposable income and real wealth. Income follows the High-Simmons' tradition that defines it as the sum of real (wages earned) and financial (interest received on assets held) flows, adjusted for the tax rate, θ. The part of income that is not consumed increases wealth.

Disposable Income

(8) $YD = \left(Y + int_p^g + int_p^{\$g} - int_g^p - int_{row}^{\$p} + int_p^{row} + CG_{-1} \right). (1 - \theta)$

Consumption

(9) $c = \alpha_1 yd^e + \alpha_2 v_{-1}$

Expected disposable income

(10) $yd^e = \beta_1 . yd_{-1}$

Wealth

(11) $\Delta V = YD - C$

Sales prices are obtained applying a profit margin over the historical unit cost, where the latter is a function of its lagged value and the nominal unitary cost, that is, the ratio of the wage bill over physical production. Employment level depends on the misalignment of current employment from a target level, where the latter is function of production and productivity. Wages and productivity grow according to ***gr,*** an exogenous parameter.

Sales Price

(12) $p_s = (1 + \pi) * UC$

Unitary Cost

(13) $UC = \frac{\left((WB) + M + int^{p} + int^{\$p}_{row}\right)}{y}$

Wage Bill

(14) $WB = W.N$

Employment Level

(15) $N = N_{-1} + \Omega_n.(N_{-1} - N^T)$

Employment Target

(16) $N^T = N^T_{-1} + \Omega_{n_1}\left(\frac{y_{-1}}{pr_{-1}}\right)$

Productivity

(17) $pr = pr_{-1}.(1 + gr)$

Wages

(18) $W = w_{-1}.(1 + gr)$

Capital Gains

(19) $CG = (B^{\$}_{p_{-1}} + B^{row}_{p_{-1}}).\Delta E$

b. Capital accumulation and Private Debt

The level of investment is determinate in the private sector. Each period, investment flows vary according to capital depreciation (a fixed proportion of the stock of capital) and the development of the investment confidence index, Δi_{ic}. Expectations are crucial for investment. Prospects on future returns, π^e, are function of two elements, namely, return on investment, ROI, and corporate risk premium, CEMBI – which will be shortly defined. Expectations, jointly with the rate of growth of the ROW, ΔY_{RoW}, are the determinants of the investment confidence index, i_{ic}. The parameter δ determines the impact of π^e on i_{ic}, its value depends on the firm's debt-to-capital ratio, D / K; above a certain threshold, δ slows (Perez Caldentey et al, 2019). Additionally, δ_1, which determines the effect of world growth on expectations, also has a nonlinear relationship with i_{ic}. When world GDP growth turns negative, the parameter increases to account for the effect of external real shock on the peripheral economy. Thought this modelling, investment flows are closely related to the development of the internal, financial, and external sector.

Capital Accumulation

(20) $\Delta k = i - d.k_{-1}$

Private Investment

(21) $i = (dp.k_{-1}).p_d + i_{-1}.(\frac{\Delta i_{ic}}{i_{ic_{-1}}})$

Confidence Index

(22) $i_c = \delta.\pi^e + \delta_1 \Delta Y_{RoW}$

Expected Profits

(23) $\pi^e = \varsigma_1.\frac{F_{-1}}{I_{-1}} + (1 - \varsigma_1).\Delta cembi_{-1}$

Total Profits

(24) $F = YD - UC.y - int^p - int_{RoW}^{pfx} + int_p^g + int_{Pfx}^g - cons + WB + depreciation_p$

Private profits, F, are calculated as the difference between real and financial revenues and costs. Whether positive, a proportion of them is retained to finance investment. Profits that are not retained are used in two ways, a fraction is allocated to the repayment of previously accumulated debt, while the remaining is distributed to the private sector that uses it to accumulate financial assets. If investment requirements are lower than the retained profits, then the excess of profits will be used to accumulate more financial assets. On the contrary, wheatear investment is higher than retained profits, the private sector issues debt, a fraction of which (δ_{cd}) is in foreign currency.[12]

Retained Profits

(25) $Fr = \theta_f.F$

Distributed Profits

(26) $Fd = FdT - Fdc$

Profits not retained

(27) $FdT = (1 - \theta_f).F$

Profits not retained used to repay debt

(28) $Fdc = \theta_{fdT} * FdT$

Excess profits

(29) $Frn = Fr - i \quad if\ Fr > i$

Private Budget Constraint

[12] According to stylized facts, 25% of total debt is issued in dollar, thus $\delta = 0.75$

(30) $\Delta D^t = I - Fr$

Private debt (local currency)

(31) $\Delta D^p = \delta_{cd}.D^t$

Private debt (foreign currency)

(32) $\Delta D^{\$p} = (1 - \delta_{cd}).D^t$

The private sector accumulates wealth through three financial assets, namely, domestic, and foreign-currency bonds issued by the government, and ROW bonds (issued in foreign currency). The demand for each asset depends on two components. One exogenous parameter, which implies that, despite market conditions, the private sector always demand a proportion of those assets. A second endogenous component that relies on arbitrage conditions among yields (Godin and Yilmaz, 2020).

Private sector's demand for domestic currency government bonds depends on the differential between domestic interest rate and expected rate of profits on physical investment. Demand for government bonds issued in foreign currency depends on the arbitrage between domestic and ROW interest rate. Finally, for the case of ROW securities, the private sector focuses on the differential between domestic interest rate on foreign currency liabilities and ROW interest rate.

Private Demand for Govt bonds

(33) $\Delta B^g_{p\_d} = \epsilon_1.F_d$

Private Demand Sensitivity for govt bonds

(34) $\epsilon_1 = \epsilon_{1_0} + \epsilon_{1_1}\left(\frac{1+i^g}{1+\pi^e}\right)^{\sigma_b}$

Private Demand for domestic bonds in USD

(35) $\Delta B^{\$g}_{p\_d} = \epsilon_2.F_d$

Private Demand sensitivity for domestic bonds in USD

(36) $\epsilon_2 = \epsilon_{2_0} + \epsilon_{2_1}\left(\frac{1+i^{g\$}}{1+i^{row}}\right)^{\sigma_{b\$}}$

Private demand for ROW bonds

(37) $\Delta B^{row}_{pd} = \epsilon_3.F_d$

Private Demand sensitivity for ROW bonds

(38) $\epsilon_3 = \epsilon_{3_0} + \epsilon_{3_1}\left(\frac{1+i^{row}}{1+i^{g\$}}\right)^{\sigma_{row}}$

c. Risk premiums and their relationship with investment

The modelling of country risk (EMBI) and corporate risk (CEMBI) is among the novelty of the present model. We follow IMF (2010) that identifies debt-to-gdp ratio, foreign-debt-to-reserve-ratio, and exchange rate variations as determinants of EMBI. In turn corporate risk is a function of country risk (EMBI), a premium, ϕ_0, and the currency mismatch, $\frac{D^{\$p}}{B_p^{row}}$, that is, the ratios of foreign liabilities to foreign assets accumulated in the private sector.

(39) $embi = \varepsilon_0 + \varepsilon_1.\left(\frac{B^g}{Y}\right) + \varepsilon_2.\left(\frac{B^{\$g}}{B_g^{row}}\right) + \varepsilon_3.\Delta E$

(40) $cembi = \phi_0 + \phi_1\left(\frac{D^{\$p}}{B_p^{row}}\right) + \phi_2.embi$

By substituting (39) and (40) into (22) and (23), and then plugging the result into (21), we are able to express investment as a function of real and financial variables, that is:

(41) $i = (dp.k_{-1}).p_d + i_{-1}.\{[\varsigma_1.\frac{F_{-1}}{I_{-1}} + (1-\varsigma_1).\Delta[\phi_0 + \phi_1\left(\frac{D^{\$p}}{B_p^{row}}\right) + \phi_2.[(\varepsilon_0 + \varepsilon_1.\left(\frac{B^g}{Y}\right) + \varepsilon_2.\left(\frac{B^{\$g}}{B_g^{row}}\right) + \varepsilon_3.\Delta E)] + \delta_1\Delta Y_{RoW}$

As a result, investment flows are determined by:

- Real Capital depreciation, $(dp.k_{-1}).p_d$
- Return on investment (ROI), $\frac{F_{-1}}{I_{-1}}$
- Private currency mismatch $\left(\frac{D^{\$p}}{B_p^{row}}\right)$
- The government overall level of public debt sustainability $\left(\frac{B^{\$g}}{B_g^{row}}, \frac{B^g}{Y}\right)$ due to its effect on risk premiums
- Currency fluctuations, $.\Delta E$
- RoW growth rate, ΔY_{RoW}

d. External sector

Trade sector is governed by the Thirlwall's Law, that is, the quantity demanded of exports and imports is conditioned to foreign and domestic GDP growth, as well as the performance of the exchange rate and relative prices. As usual, current and capital accounts track the movement of financial and real flows between RoW and the domestic economy.

Exports growth

(42) $\Delta x = \eta_0 . Y_{row}^{\eta_1}.\left(E\frac{p^*}{p}\right)^{\eta_2}$

Real Exports

(43) $X = x.p$

Imports growth

(44) $\Delta m = \eta_3 . \frac{Y^{\eta_4}}{\left(E\frac{p^*}{p}\right)^{\eta_5}}$

Real Imports

(45) $M = m.p$

Current Account

(46) $CAB = X - M - int^g_{B_{row}} - int^g_{BFX_{row}} - int^p_{d_{row}} - int^p_{dFX_{row}} + int^{row}_B$

Capital Account

(47) $KAB = \Delta B_{row} + \Delta B^{\$}_{row} + \Delta D_{row} + \Delta D^{\$}_{row} - \Delta B^{row}$

RoW demand for domestic government bonds depends on RoW GDP growth adjusted by the parameter ξ_1 which varies according to interest differentials and currency expectations. On the other hand, RoW demand for government bonds issued in foreign currency is conditioned only by interest rate differentials. The sum of public ($\Delta B^{g\$}_{row} + \Delta B^{g}_{row}$) and private bonds ($\Delta D^{\$p}_{row} + \Delta D^{p}_{row}$) bought by RoW equals to world financial flows (WFF).

RoW total supply of security to the domestic economy is the sum of RoW bonds demanded by the private and public sector. In this case, we assume RoW asset supply always matches demand and RoW interest rate is exogenous. Also, the world GDP growth is exogenous.

RoW Demand for Private Debt (local currency)

(48) $\Delta D^{p}_{row} = (1 - \lambda).D^p$

ROW demand for Private Debt (foreign currency)

(49) $\Delta D^{\$p}_{row} = \Delta D^{\$p}$

RoW demand for Govt Debt (local currency)

(50) $\Delta B^{g}_{row\_d} = \xi_1.(Y^{row})$

$\xi_1 = \xi_{1_0} + \xi_{1_1}.(i^{\$g} - i^{\$}) + \xi_{1_2}.\Delta E^e$)

RoW demand for Govt Debt (foreign currency)

(51) $\Delta B^{g\$}_{row\_d} = \xi_2.Y^{row}$

(52) $\xi_2 = \xi_{2_0} + \xi_{2_1}.(i^{\$g} - i^{\$})$

RoW supply of debt

(53) $\Delta B^{row} = \Delta B^{row}_p + \Delta B^{row}_g$

World Financial Flows (WFF)

(54) $WFF = \Delta B^{g\$}_{row} + \Delta B^{g}_{row} + \Delta D^{\$p}_{row} + \Delta D^{p}_{row}$

RoW GDP

(55) $Y^{row} = exogenous$

International interest rate

(56) $i^{row} = exogenous$

Notice that exchange rate variations may generate depreciation or appreciation that have to be considered for consistency purposes:

(57) $depreciation_p = \Delta E.\, B_p^{RoW}{}_{-1} + \Delta E.\, B_p^{\$g}{}_{-1} - \Delta E.\, D_{row-1}^{\$p}$

(58) $depreciation_g = \Delta E.\, B_g^{RoW}{}_{-1} - \Delta E.\, B_{-1}^{\$g}$

(59) $depreciation_{row} = -\Delta E.\, B_{-1}^{RoW} + \Delta E.\, B_{row-1}^{\$g} + \Delta E.\, D_{row-1}^{\$p}$

e. Public Sector

The public sector recollects taxes on income and uses a proportion of it (T_d) for the repayment of public debt. Real spending fluctuates each year according to the rate of growth, gr^g. The latter follows a debt sustainability rule that adjust according to the misalignment of debt to its target level (B_t^*) – i.e. there is space to increase public spending as long as debt remains below the target. The target is set according to two elements. First, the differential between the real target interest rate and output growth rate ($r - \Delta Y$). The real target interest rate, r, is a function of the nominal interest rate adjusted by the growth rate of domestic (∂_d) and foreign (∂_f) debt and a risk premium (φ^g, formalized in the following section). Second, the fiscal deficit as a proportion of GDP.

Taxes

(60) $T = \theta.Y$

(61) $T_d = \theta_{T_d}.T$

Govt spending

(62) $G = G_{-1} + gr^g$

Debt sustainability rule

(63) $gr_g = \varphi_0 + \varphi_1(B_t^* - B_t)$

Debt Target

(64) $B_t^* = (r - \Delta Y)\, d + \frac{(G-T)}{Y}$

Real interest target rate

(65) $r = (i_g(\partial_d + (1 + \varphi^g\ )\partial_f))$

The total amount of debt issued depends on the public sector budget restriction ($PSBR$), i.e.,

the difference between inflows and outflow in the public balance alleviated by the central bank's profits obtained for holding reserves, FB^{bc}. A fraction, ζ, of debt is issued in foreign currency The supply of debt equals the minimum among sectorial demands ($-\Delta B^{g}_{p\_d}$, $\Delta B^{g}_{row\_d}$ for domestic bonds and $\Delta B^{g\$}_{p\_d}$, $\Delta B^{g\$}_{row\_d}$ for foreign debt) and total public financial needs, ΔB.

Public sector budget restriction

(66) $$PSBR = G - T - int^{g}_{B} - int^{g}_{Bfx} + int^{p}_{d_g} + int^{row}_{Bg} + -FB^{bc}$$

Govt Debt Supply (local currency)

(67) $$\Delta B = \zeta . PSBR$$

Govt Debt Supply (foreign currency currency)

(68) $$\Delta B^{\$} = (1 - \zeta). PSBR$$

Govt Debt Supply to Private Sector (Local Currency)

(69) $$\Delta B^{g}_{p} = min\ [\Delta B^{g}_{pd}, \Delta B]$$

Govt Debt Supply to ROW (Local Currency)

(70) $$\Delta B^{g}_{row} = \min\ [\Delta B - \Delta B^{g}_{pd}, \Delta B^{g}_{rowd}]$$

Govt Debt Supply to Private Sector (Foreign Currency)

(71) $$\Delta B^{g\$}_{p} = min\ [\Delta B^{g\$}_{pd}, \Delta B - \Delta B^{g}_{row}]$$

Govt Debt Supply to ROW (foreign currency)

(72) $$\Delta B^{g\$}_{row} = \min\ [\Delta B^{\$}, \Delta B^{g\$}_{rowd}]$$

f. Interest Rates, and Exchange Rate

Following Godin and Yilmaz (2020) demand and supply of bonds may differ; thus, the model adjusts via interest rates. The domestic interest rate, i^{g}, depends on international rate, i^{row}, a spread φ^{g}, and government risk (EMBI), but it also varies according to the excess demand for debt – calculated as the sum of private, central bank, and ROW demand over the total debt auctioned. The nominal interest rate on foreign-denominated debt is obtained by adding to the international interest rate a risk premium, where the latter is a function of EMBI. Private sector nominal rates on domestic and foreign debt work in a similar fashion.

Govt Nominal Rate (domestic currency)

(73) $$i^{g} = i^{row} + \tau_1 . \left(\frac{\Delta B - \Delta B^{g}_{p\_d} - \Delta B^{g}_{row\_d} - \Delta B^{g}_{cb\_d}}{\Delta B} \right) + (1 - \tau_1). \Delta embi + \varphi^{g}$$

Govt Nominal Rate (foreign currency)

(74) $i^{\$g} = i^{row} + \varphi^{\$g}$, $where\ \varphi^{\$g} = \varphi_0^{\$g} + \varphi_1^{\$g} \Delta embi_g$

Private Nominal Rate (domestic currency)

(75) $i^p = i^g + \varphi^p$, $where\ \varphi^p = \varphi_0^p + \varphi_1^p . \Delta cembi_p$

Private Nominal Rate (foreign currency)

(76) $i^{\$p} = i^{\$g} + \varphi^{\$p}$, $where\ \varphi^{\$p} = \varphi_0^{\$p} + \varphi_1^{\$p} . \Delta cembi_p$

To model the exchange rate we follow Lavoie and Daigle (2011), that is, the exchange rate follows a AR(1) process with expectations. The parameter ψ (included between 0 and 1) determine de degree of rationality in expectation, the closer to 1, the higher the degree of rationality. In turn, expectations depend on the composition of the forex market. There exist two types of agents, namely, fundamentalists and chartists. Fundamentalists consider the existence of a fundamental level of the exchange rate, E^T, influenced by traditional macroeconomic factors – we proxy E^T with the 3-years moving average of E, implicitly assuming that over a horizon of three years shocks in E are absorbed and E converges to its long run trajectory. EMBI also influence fundamentalist expectations, which represent an extension to Lavoie and Daigle (2011). On the other hand, chartists are trend-follower, speculative agents, who rely on technical analysis. They also follow EMBI as it incorporates valuable information on public debt and reserves level. Expectations are given by the market structure: the higher the share of chartist traders, the more volatile are expectations and, in turn, the nominal exchange rate.

Nominal Exchange Rate

(77) $E = E_{-1} + \psi . \Delta E^e$

Nominal exchange rate expectations(fundamentalist)

(78) $\Delta E_f^e = \psi_{f1}(E_{-1} - E_{-1}^T) + \psi_{f_2} . \Delta EMBI_{-1}$

Nominal exchange rate expectations(chartist)

(79) $\Delta E_c^e = \psi_{c1} \Delta E_{-1} + \psi_{c_1} . \Delta EMBI_{-1}$

Total Expectations

(80) $\Delta E^e = \omega_f . \Delta E_f^e + \omega_c . \Delta E_c^e$

Exchange Rate Target

(81) $E^T = 5\ year\ Moving\ Average$

g. Central Bank

Central Bank demands domestic bonds according to a target, which depends on the development of the credit and exchange rate market. Indeed, the ideal quantity of bond the central wants to hold depends on the interest rate differential between the current rate, $\boldsymbol{i_{-1}^g}$, and the central bank's target rate, $\boldsymbol{i_{-1}^{cb}}$, and the volatility observed in the exchange rate, $\boldsymbol{e^{risk}}$. The latter is calculated as a rolling standard deviation. Whereas it is above 3 standard deviations, the coefficient $\boldsymbol{\vartheta_{e^{risk}}}$ will take a value of 1 and the demand for bonds will adjust

accordingly. This mechanism works equally, but with opposite sign, in case of both appreciation and depreciation. Additionally, the central bank follows the Taylor's Rule as deviations in inflation and output growth from their target level determine the desired interest rate.

Central bank target of domestic govt bond

(82) $$B_{cb}^{g*} = B * (\vartheta_{bc}(i_{-1}^{g} - i_{-1}^{cb}) + \vartheta_{e^{risk}}. e^{risk})$$

Taylor's Rule

(83) $$i^{cb} = \pi_t + i_t^{cb*} + \vartheta_1(\pi_t - \pi_t^*) + \vartheta_2 (\Delta y_t - \Delta y_t^*),$$
$$where \quad \Delta y_t^* = 5yr\ MA, \qquad i_t^{cb*} = i^{row} + \varphi^{cb}$$

CB currency volatility indicator

(84) $$e^{risk} = \begin{Bmatrix} if\ s.d.\ of\ E \geq 3, & 1 \\ if\ s.d.\ of\ E < 3, & 0 \\ if\ s.d.\ of\ E \geq -3, & -1 \end{Bmatrix}$$

The quantity of domestic governmental bonds assigned to the Central Bank (ΔB_{cb}^{g}) is the maximum, between its demand and the residual not allocated to private and external sector. The supply of international reserves to the central bank from the RoW is illimited.

Public sector supply of bond to CB

(85) $$\Delta B_{cb}^{g} = max[\Delta B - \Delta B_{row}^{g} - \Delta B_{p}^{g},\ B_{cb}^{g*}]$$

RoW supply of debt to CB

(86) $$\Delta B_{cb}^{row} = -CAB + WFF + B_{P}^{row}.E - depreciation_{RoW}$$

h. <u>Stock</u>

The variation in flows of each period translates into the accumulation of stocks:

(87) $$B = B_p^g + B_{row}^g + B_p^{\$g} + B_{row}^{\$g}$$

(88) $$B_p^g = B_{p\ -1}^{g} + \Delta B_p^g - T_{d_3}$$

(89) $$B_{row}^g = B_{row_{-1}}^{g} + \Delta B_{row}^g - T_{d_4}$$

(90) $$B_p^{\$g} = \left(B_{p\ -1}^{\$g} + \Delta B_p^{\$g} - \frac{T_{d_1}}{E}\right).E$$

(91) $$B_{row}^{\$g} = \left(B_{row_{-1}}^{\$g} + \Delta B_{row}^{\$g} + \frac{T_{d_2}}{E}\right).E$$

(92) $$D^T = D_{-1}^{T} + \Delta D^T$$

(93) $$D_g^p = D_{g\ -1}^{p} + \Delta D_g^p$$

(94) $D_{row}^{p} = D_{row_{-1}}^{p} + \Delta D_{row}^{p}$

(95) $D_{row}^{\$p} = (D_{row_{-1}}^{\$p} + \Delta D_{row}^{\$p}).E$

(96) $V = V_{-1} + \Delta V$

(97) $k = k_{-1} - d + \Delta k$

The identity between the capital and current account represents the closure of the model:

Model's closure

(98) $CAB = KAB$

5. Simulation and Baseline Scenario

To obtain the baseline scenario, we simulate the system of equations introducing observed data for the two exogenous variables in the external sector, namely, the international interest rate– here proxied with the U.S. 1-year nominal rate available from the BIS statistics - and world GDP growth rate – reported in the IMF's International Financial Statistics that provides forecasts until the year 2025. We simulate the system for the period 1990-2025 and report outcomes in the annex.

Parameters for production, taxes, income, consumption, and saving have been assigned according to the existing literature on SFC (Zezza, 2006). Trade parameters follow the work on the balance of payment constraint from Abeles and Cherkasky (2020). Preference for foreign debt over national debt were selected according to stylized facts for the region (i.e. 25% of private debt are generally issued in foreign currency). The nonlinearity in investment function follows Perez Caldentey et al (2019) – i.e. a debt-to-capital ratio higher then 0.7 reduces the value of δ The complete list of parameters is reported in the annex of the work.

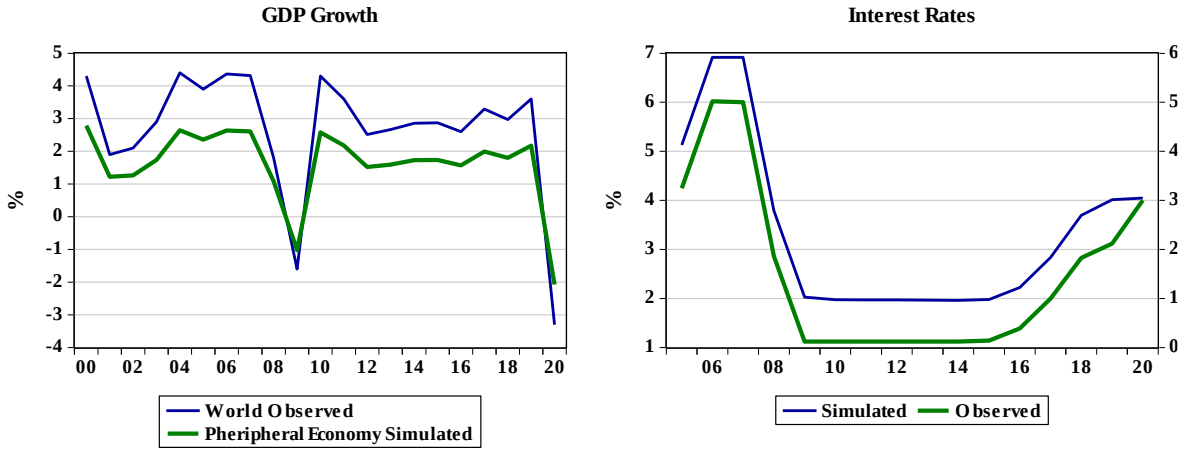
Some clarification is needed before proceeding with the analysis. The model is a theoretical model based on stylized facts for Latin America and estimated with only two observed series. Thus, simulations are not to be considered forecasts. In this sense, the baseline and scenario analysis are concerned with the trend of the variables under the baseline scenario and their swings when shocks are introduced, rather than the magnitude of the changes in variables.

Figure 4 reports the comparison between the observed world GDP growth and the baseline obtained for the fictional Latin American economy. The estimated series presents a satisfactory level of accuracy in replicating output trends as it captures the increase in world GDP experienced over the decade of 2000s and the slump during the Great Financial Crisis (GFC) in 2007-2008. The simulation also captures the lower dynamism in the aftermath of the GFC, over the period 2012-2019, when the growth of world economy averaged of roughly 3%. Over this period, the Latin American simulated GDP suggests a 2% rate growth, a result that in line with the average growth observed for the region.

A satisfactory accuracy in replicate trends is also observed for interest rates. The estimated series properly replicates the sequence of interest rate cuts started in the aftermath of the GFC, as well as the hawkish monetary policy started in 2014 with the so-called *taper tantrum*. Finally, when comparing the long run trajectory (5-year moving average) of the gross fixed capital formation as percentage of GDP, we observe that – although with significantly differences for the values of the ratio - the simulated series captures the downward trajectory started in 2013 - of the observed data for Latin America.

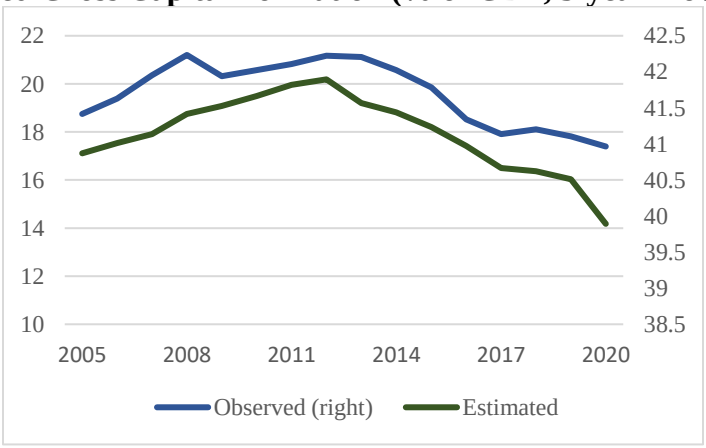
The accuracy in predicting shift in GDP, interest rates, and investment-to-GDP ratio validates the theoretical assumptions proposed by the model. Based on this evidence, we analyze the mechanisms and transmission channels that govern the baseline scenario. We report the simulated series for the baseline scenario in the annex of the work. Notice that initial stocks and flows are based on fictional values. Thus, to provide a clearer understanding on their evolution, we transformed most of the series so that the year 2005 equals to 100.

Figure 4. Simulated vs Observed: GDP growth and Interest Rate



Source: own elaboration, IMF International Financial Statistics (2021), BIS Interest Rate Statistics (2021)

Figure 5 Fixed Gross Capital Formation (% of GDP, 5-year moving average)



Source: own elaboration, World Bank Indicators (WBI)

World financial flows growth throughout the 35 fictional years simulated as they increase by roughly 50%. Yet, they move in a cyclical manner as shows by the rate of variation. Prolonged phases of inflows are followed by sudden stops, as it was the case for the 2008 GFC, the 2013 taper tantrum, and the 2020 Covid crisis. In line with stylized facts, the baseline scenario shows an increase in cross-border flows towards the peripheral economy after 2010, when interest rates decreased, and arbitrage opportunities raised. During the period 2012-2020 they peak, before falling by 7%.

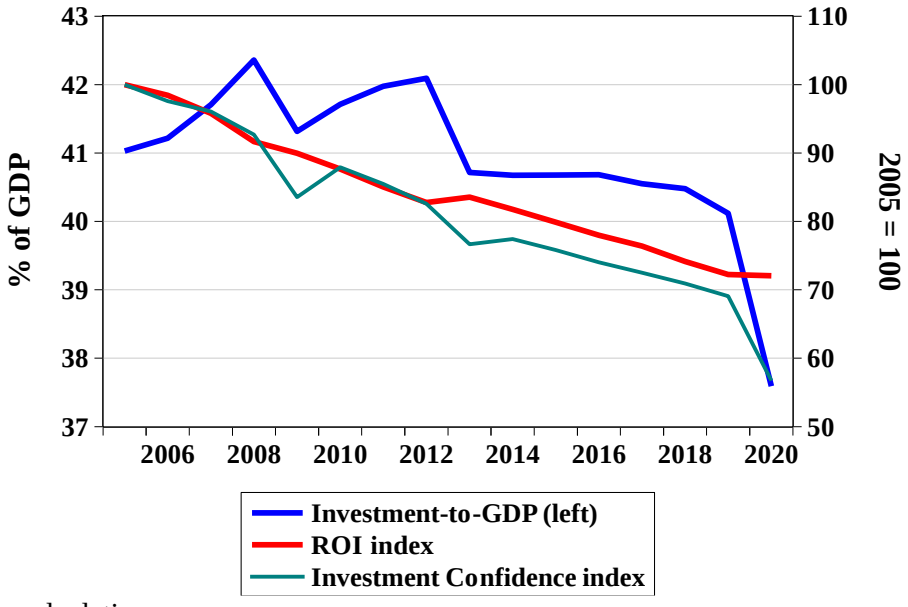
The currency volatility index – calculated as the rolling standard deviation of the nominal exchange rate (NER) - properly captures the volatility spike in 2008 and 2020. Currency volatility is primarily caused by the presence of chartist traders and their continuous swings in expectations.

Looking at the level of NER, simulations show that over the long run its trajectory tends to depreciate. Recall that NER follows closely the behavior of EMBI, which is, in turn, conditioned by the level of public debt, both in domestic and foreign currency. Public sector debt-to-GDP ratio raises throughout the period simulated. As government debt grows, so does EMBI, and in turn CEMBI. Similarly to exercises on Granger causality reported in the Annex, simulations confirm that currency depreciation and EMBI move together.

The co-movement between EMBI and NER also affects CEMBI as it reports an increasing trajectory that suggests the raise in corporate risk. Notice that, in addition to EMBI and NER, CEMBI is also pressured by the private sector ratio between foreign assets and foreign liabilities – i.e. the mismatch indicator - that tends to rise due to the growing issuance of private foreign debt.

Higher private foreign debt and currency depreciation *cum corporate risk premium* ultimately raise private interest payments, causing several adjustments in the private sector. For instance, expected profits report a downward trajectory due to the deterioration of both components of the index, namely, return on investment (ROI) and corporate risk (CEMBI). On the one hand, ROI is falling due to the erosion in profits caused by higher interest paid on debt. On the other hand, the increase in corporate risk, CEMBI, provokes a further deterioration in profit expectations.

Figure 6. Investment components
Investment-to-GDP, ROI, and Expectations



Source: own calculation

Recall also that investment is a nonlinear function of private debt. The growing level of external corporate debt causes the mismatch indicator to increase above the threshold of 0.7, which triggers the decrease of the parameter δ and depresses investment. All in all, the investment to GDP ratio shows a downward trajectory since 2012, and falls even more dramatically in 2020, as the second nonlinear parameter in investment confidence index, δ_1,

adjusts downward due to the fall in world GDP. In this sense, the baseline scenario shows that the combination of real and financial determinants may provoke a long-term deceleration in capital accumulation.

Likewise, the deterioration of profits expectations alters the allocation of savings in the private sector through the arbitrage condition. As financial investment (bonds) pays higher yields than real investment (expected profits), the private sector prefers the former to the latter. This is observed in the increase in the endogenous parameter Epsilon1, which determines the arbitrage condition between financial and real investment.

The private sector's net worth – i.e., capital and financial assets minus total debt – reports a decreasing rate of accumulation. Indeed, when focusing on the first difference of this variable, we observe a decreasing trend over the long period. In 2020, the accumulation of new wealth, while still positive, is 50% lower than 2005, signaling a poorer ability of the private sector to generate new wealth.

6. Scenario Analysis: External Monetary Policy Shock

In this section we simulate a cycle of interest rate hikes by the FED, an event that is likely to occur in the foreseeable future. We assume, that international interest rate, i^{row},, will increase from 2.3 to 3% over the period 2020-2023, and then stabilizes to 3.30% after 2024. The hawkish monetary policy implies a series of adjustments in the financial and real sector of the peripheral economy. We focus on the scenario analysis for the period 2019-2024 and compare how the system behaves with respect to the baseline scenario.

Financial flows would deviate their trajectory facing the hawkish policy scenario. By increasing the yield on ROW security, world financial flows are attracted toward ROW and the peripheral economy suffers from outflows. Figure 7 reports net financial flows under the two scenarios. In both scenarios there is a drop in 2020 due to the fall in world economic activity. However, in the baseline scenario, in 2021 net financial flows would start a quick recovery toward the pre-pandemic crisis growth rates, while under the monetary policy shock scenario, two consequences would manifest. First of all, the total amount of outflows at the end of 2021 would be higher. Though under the baseline scenario net financial flows would stabilize around the fictional value of -9, with the introduction of the monetary shock they would drop to almost -15. In addition, there exists a concern about the recovery to pre-crisis level. In the baseline scenario, the series moves rapidly towards its pre-crisis level, and by 2023 it recovers roughly 40% of outflows caused by the 2020 crisis. On the other hand, in the monetary shock scenario, outflows would not recover quickly, but rather stabilize around the level of -13, implying a much lower level of foreign capital in the peripheral economy.

The lower dynamism in foreign cross-border flows simulated with the introduction of a monetary shock resembles the experience of Latin America after 2014, when the region, after having enjoyed a larger period of inflows, suffer a sudden shock in capitals caused by the joint effect of commodity prices fall and *taper tantrum*, which led to a period of lower-than-average inflows over the following years.

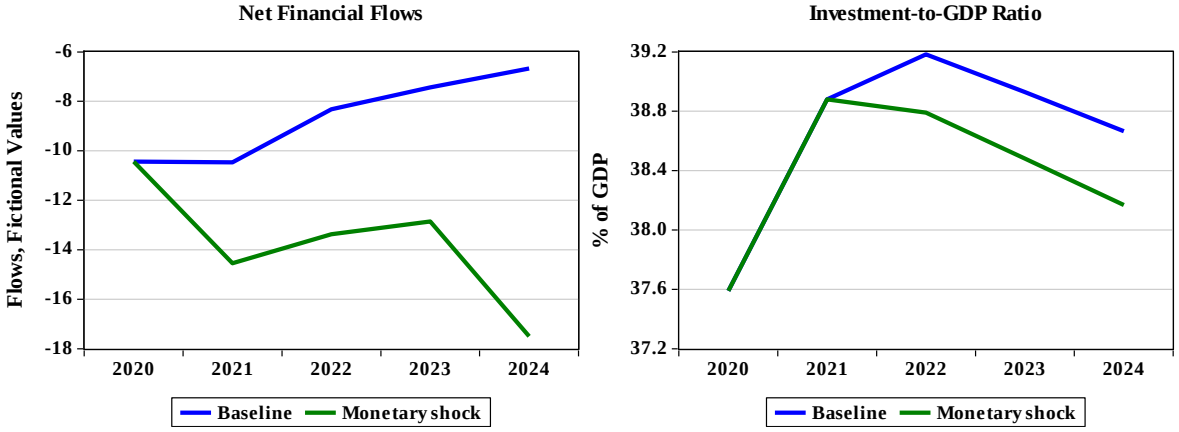
Due to the higher volume of outflows in the monetary shock scenario, the nominal exchange rate level would depreciate. Rather than stabilizing over the period 2021-2022, it would continue its upward trajectory, and the gap between the series in the two scenarios amplify over time. That is, with a cycle of interest rate increases in the U.S., Latin American currency would struggle to recover to the pre-Covid levels.

Looking at recent history, this outcome would not be unusual for the region. For instance, after the taper tantrum shock no Latin American currency successfully recovered to pre-shock level. Nowadays, the region has experienced a similar situation. Indeed, after one year and half from the March 2020 Covid shock and with the first announcements of tapering from the FED, no currency has yet recovered to pre-pandemic levels.

As the nominal exchange rate level increases, private sector's foreign liabilities would revaluate along with their service. In turn, the country risk premium (EMBI) would rise as well. In the baseline scenario, after the shock experienced in 2020, the EMBI stabilizes in a new, higher steady state. But with the monetary policy shock, EMBI failed to stabilize and continues a higher trajectory. Higher international interest rate and domestic risk premium

generate and upward pressure on domestic interest rates, which eventually would raise from 4 to 6% with the monetary policy shock, worsening the government deficit and decreasing public spending.

Figure 7. Net Financial Flows and Investment to GDP Ratio



Source: own calculation

Likewise, the currency mismatch indicators would increase faster under the assumption of a monetary policy shift by the FED due to the revaluation of debt caused by currency depreciation. Consequently, also corporate risk (CEMBI) would increase, causing interest rates on private debt to raise. In turn, interest payment would become more expensive and squeeze both retained and distributed profits.

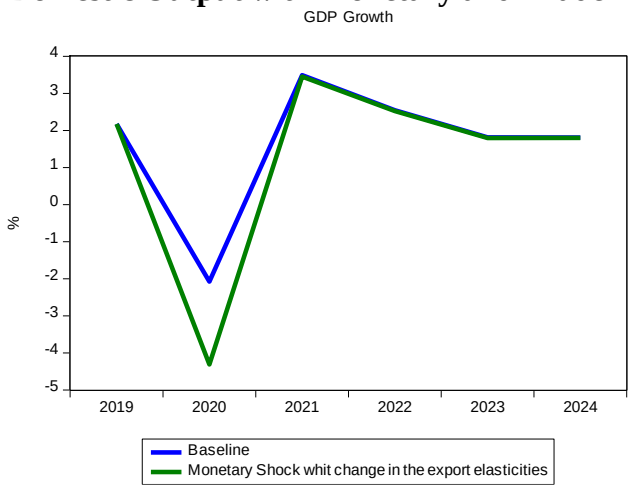
Lower distributed would decelerate the accumulation of financial assets in the private sector, whilst lower retained profits would cause the private sector to issue more debt. As a result, the mismatch could grow over time due to the lower acquisition of foreign assets and higher issuance of foreign debt. If the process last over time, there might be a vicious cycle among corporate risk, profits, and debt.

Notice that the lower accumulation of financial assets would not shift the private sector towards higher investment in real activity. A paradox of the model consists in the increase of the parameter $\boldsymbol{\delta_1}$, which defines the preference between real investment and domestic bond. After the monetary policy shock hits the system, the parameter would be higher. Indeed, higher yields on sovereign domestic bonds attract the fewer available distributed profits at the expanse of real investment.

All in all, private investment would drop as result of the adjustments in financial, credit, and currency markets. With the introduction of the monetary shock, the investment-to-GDP ratio, already on a falling trajectory before the pandemic crisis, would decreases after 2020 by two fictional GDP points. The outcome occurs for three reasons. As previously mentioned, higher interest payments would squeeze profits. Lower profits in the current period would generate lower expectations for future profits and deteriorate investment confidence. Finally, the increase in the mismatch indicator would keep the level of debt-to-capital ratio above the 0.7 threshold, thus maintaining the investment parameter, $\boldsymbol{\delta}$, in its lower bound.

Analyzing the effects of the monetary policy shock on the remaining GDP components, we observe that consumption and public spending both decrease in terms of GDP. However, results suggest the counterintuitive outcome that the growth rate in Latin American would follow the same path as in the baseline scenario as net exports would counteracts the negative effect of the Fed's policy change on GDP. Given that the world GDP growth, as well as exports and imports elasticity to income, are taken as exogenous, the change in monetary policy would not modify the behavior of the foreign sector, which would counterbalance the negative impacts caused by a shift in monetary policy.

Figure 8 Gross Domestic Output with Monetary and Trade Parameter Shock



This outcome, however, is based on the unrealistic assumption that throughout time the trade propensity parameters remained unchanged. However, given the low and decreasing levels of investment that Latin American has recorded over the past decade, this might be a false assumption. If we postulate a change in international trade propensities – i.e. the elasticity of exports has increased due to the low diversification of the basket of goods exported – then GDP would not be as resilient as our monetary shock simulation suggests. To test this hypothesis, we simulate an additional scenario, depicted in figure 9, where, apart from the monetary shock, a change is imposed to the income elasticity of exports. Under this circumstances, the joint effect monetary and trade shocks negatively affect the rate of growth of the Latin American economy, which would deviate from the outcome of the baseline scenario as net exports would suffer a deterioration rather than an improvement.

ANNEX

A1. Granger Causality Test

Emerging Market Bond Index (EMBI) vs Nominal Exchange rate (NER)
(%, annual change)

	Brazil	Chile	Colombia	Mexico	Peru
Model	VAR (2)	VAR (2)	VAR (2)	VAR (2)	VAR (1)
Dummy Correct Specification	Yes	Yes	Yes	Yes	Yes
Jarque-Bera	2.80 (0.59)	4.60 (0.32)	3.02 (0.55)	7.02 (0.13)	5.07 (0.27)
LM Test (8)	1.94 (0.74)	2.74 (0.60)	5.12 (0.28)	1.56 (0.81)	3.49 (0.48)
White Test (C.T.)	63.57 (0.07)	104.95 (0.32)	94.28 (0.82)	113.18 (0.50)	70.23 (0.11)
NER Granger causes EMBI	1.10 (0.58)	28.40 (0.00)	7.95 (0.02)	12.61 (0.00)	21.78 (0.00)
EMBI Granger causes NER	34.41 (0.00)	3.94 (0.14)	20.80 (0.00)	9.66 (0.00)	0.43 (0.51)

Note: P-values in parenthesis; LM Test= residuals autocorrelation test; White Test (C.T.)= Residuals Heteroskedasticity Test; Jarque Bera= residuals normality test

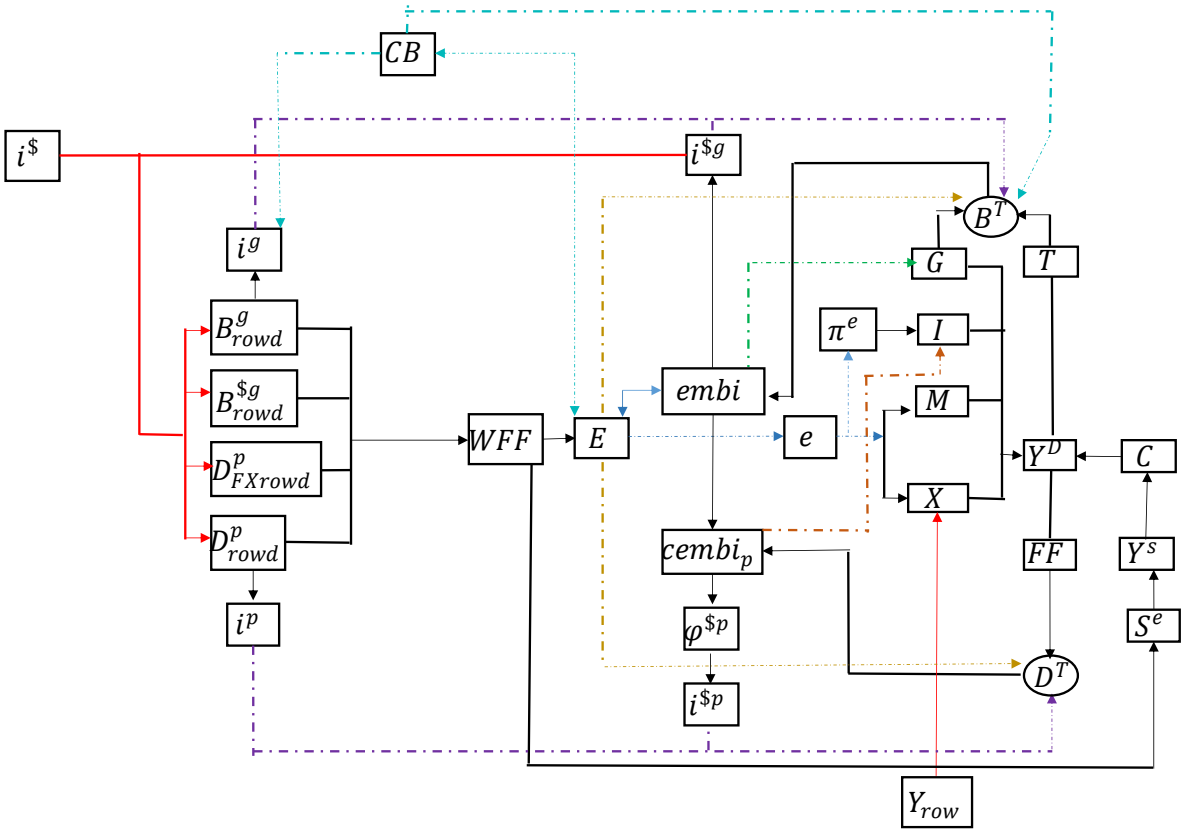
Corporate Emerging Market Bond Index (CEMBI) vs Nominal Exchange rate (NER)
(%, annual change)

	Brazil	**Chile**	**Colombia**	**Mexico**	**Peru**
Model	VAR (2)	VAR (5)	VAR (2)	VAR (2)	VAR (1)
Dummy Correct Specification	Yes	Yes	Yes	Yes	Yes
Jarque-Bera	3.79 (0.43)	2.22 (0.70)	3.66 (0.45)	1.45 (0.83)	
LM Test (8)	0.68 (0.95)	2.30 (0.68)	4.66 (0.32)	0.96 (0.91)	
White Test (C.T.)	96.80 (0.22)	247.08 (0.18)	82.98 (0.83)	84.65 (0.06)	
H0 : CEMBI Granger causes EMBI	1.80 (0.40)	11.46 (0.04)	0.62 (0.73)	2.62 (0.27)	
H0 : EMBI Granger causes CEMBI	13.46 (0.00)	88.00 (0.00)	50.02 (0.00)	12.59 (0.00)	

Note: P-values in parenthesis; LM Test= residuals autocorrelation test; White Test (C.T.)= Residuals Heteroskedasticity Test; Jarque Bera= residuals normality test

A2. Stock-Flow Consistent Model

Flows Diagram



Endogenous variable

Variables	Definition	Variables	Definition
y	Production	B^{row}	Stock of issued RoW'S bond.
s^{e}	Expected sales	B^{row}_{pd}	Private demand for ROW bonds
in^{T}	Target inventories	G	Nominal Govt Spending
in	Real Inventories	T	Income taxes
s	Real sales	$PSBR$	Govt sector Budget Constraint
IN	Nominal inventories	B	Stock issued Govt bond (domestic currency)
UC	Unit cost	$B^{\$}$	Stock issued Govt bond (foreign currency)
c	Real consumption	B^{g}_{p}	Govt Debt Supply Local Currency to Private Sector

i	Real Investment	B_{row}^{g}	Govt Debt Supply Local Currency to ROW
g	Real government expenditure	$B_{p}^{g\$}$	Govt Debt Supply Foreign Currency to Private Sector
x	Real export	$B_{row}^{g\$}$	Govt Debt Supply Foreign Currency to RoW Sector
m	Real import	B_{g}^{row}	Supply RoW's Bond to Government Sector
Y	Nominal GDP	D_{g}^{p}	Govt Demand for Private Debt
p	Price	X	Nominal Export
YD	Disposable income	M	Nominal Import
int_{p}^{g}	Interest paid by government to private sector	CAB	Capital Account
$int_{p}^{\$g}$	Interest paid by government for the Bond in foreign currency to private sector	$int_{B_{row}}^{g}$	Interest paid by government to rest of the world (domestic currency)
int_{g}^{p}	Interest paid by private sector for the debt in domestic currency	$int_{BFX_{row}}^{g}$	Interest paid by government for the Bond in foreign currency to rest of the world sector
$int_{g}^{\$p}$	Interest paid by private sector for the debt in domestic currency to government	$int_{d_{row}}^{p}$	Interest paid by private sector for the debt in domestic currency to RoW
int_{p}^{row}	Interest paid by RoW sector for the Foreign Bonds to Government	$int_{dFX_{row}}^{p}$	Interest paid by private sector for the debt in foreign currency to RoW
yd	Real disposable income	int^{row}	Interest paid by RoW sector for Foreign Bonds
yd^{e}	Expected income	int_{g}^{row}	Interest paid by RoW sector for the Foreign Bonds to Government
v	Wealth	int_{p}^{row}	Interest paid by RoW sector for the Foreign Bonds to Private sector
WB	Wage Share	KAB	Capital Account
W	Nominal Wage	B_{row}	Total stock Govt bond on hands of the RoW (Domestic Currency)
N	Employment level	$B_{row}^{\$}$	Total stock Govt bond on hands of the RoW (Foreign Currency)

k	Real Stock of capital	$D_{row}^{\$p}$	ROW demand for Private Debt (Foreign currency)
d	Depreciation	B^{row}	
F	Profits	$D_{row}^{\$p}$	ROW demand for Private Debt (local currency)
CG	Capital Gains	B_{rowd}^{g}	ROW demand for Govt Debt (local currency)
I	Nominal Investment	WFF	World Fund Flows
D^t	Total Corporate Debt	$B_{rowd}^{g\$}$	ROW demand for Govt Debt (Foreign currency)
B_P^g	Stock of Govtbond on hand of private sector (domestic currency)	Y^{row}	Global GDP
$B_p^{\$g}$	Stock of Govtbond on hand of private sector (foreign currency)	τ_1	Sensitivity of the Bond's interest rate to excess of demand
B_p^{row}	Stock of RoW's bond on hand of private sector (foreign currency)	φ^g	Premium on global risk-free interest rate
E	Nominal Exchange Rate	φ^p	Private risk premium
D^t	Total Debt	$CEMBI$	Corporate Emerging Markets Bond Index
D_{FX}^p	Private debt issued (foreign currency)	$EMBI$	Emerging Markets Bond Index
B_{pd}^g	Private Demand for Government bonds	E^e	Variation expected of nominal Exchange rate
B^g	Total GovtBond (domestic currency)	E^T	Nominal Exchange rate target
i^g	Bond's interest rate	F	Retained Profits
$B_{pd}^{\$g}$	Private Demand for domestic bonds in USD	F	Distributed Profits
$B_p^{\$g}$	Govt Debt Supply Foreign Currency to Private Sector		
$i^{\$g}$	Interest rate of the Bonds in foreign currency		

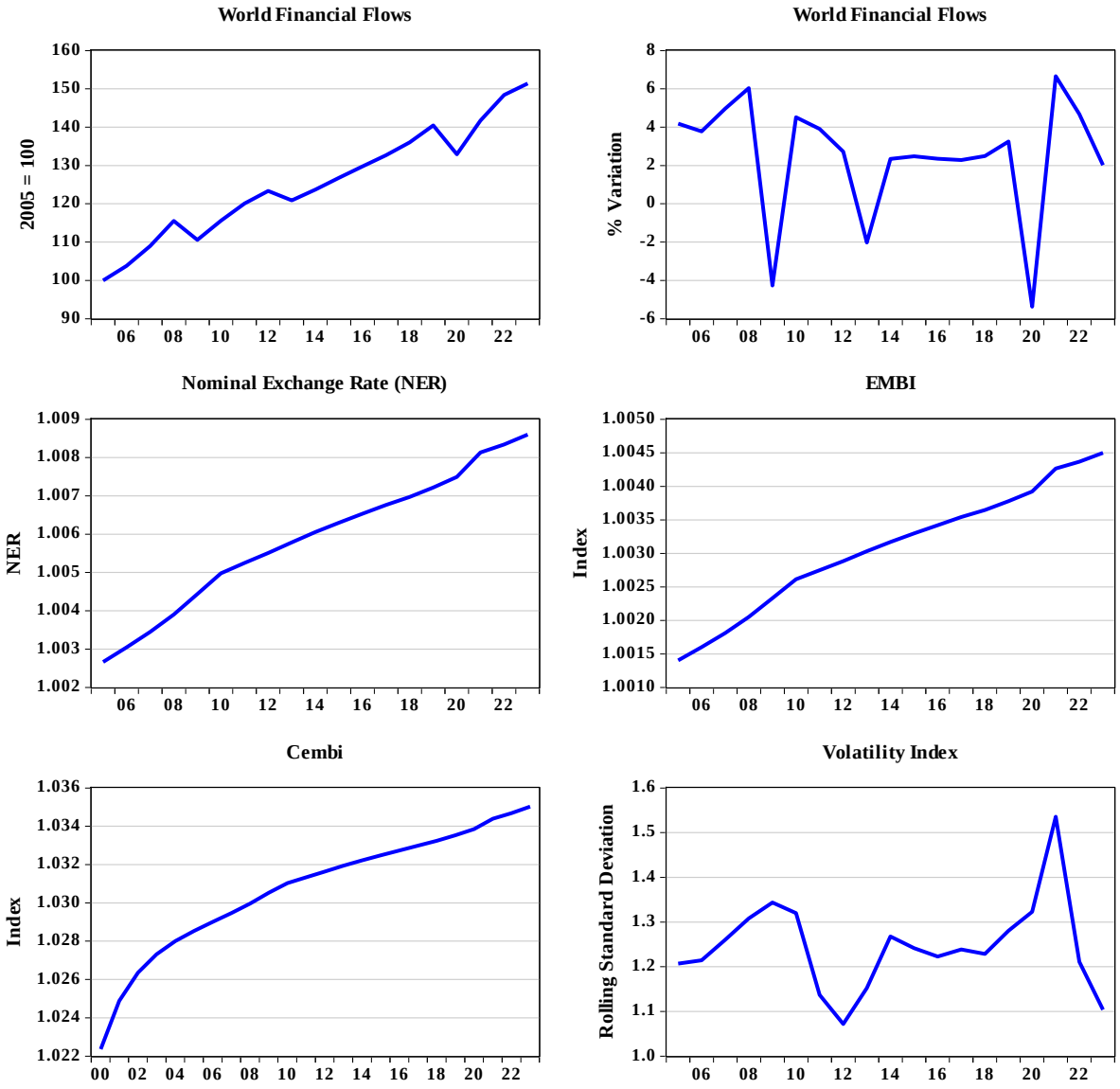
Exogenous Variables

Variable	Value	Definition	Variable	Value	Definition
ß	0.8	Expected sales Sensitivity to previous sales	gr^g	0	Govt spending growth rate
γ	0,1	Target inventories sensitivity to expected sales.	ζ	0.75	Share of PSBR Supplied in Local Currency
θ	0,3	Tax rate	λ	0.6	Share of the Government Demand for Corporate debt
α_1	0,6	MPC out of income	η_0	0.1	Technique coefficient of the exports in RoW GDP.
α_2	0,01	MPC out of wealth	η_1	1.1	Income elasticity of exports to RoW GDP
β_1	0.8	Expected income Sensitivity to disponible income	η_2	0.08	Export Elasticity to exchange rate / price
β_2	0.2	Expected income Sensitivity to world financial flows	η_3	0.15	Imports elasticity to domestic GDP.
gr	0	Productivity variation rate	η_4	1.15	Income elasticity of import to domestic GDP
π	0.3	Mark-up	η_5	0.09	Import Elasticity to exchange rate / price
W	1	Nominal Wage	σ_{wff}	0.5	Currency Hierarchy sensitivity
ς_1	0.2	Expected profit rate Sensitivity to exports	ξ_{10}	0.05	ROW autonomous demand for Govt Debt
ς_2	0.2	Expected profit rate Sensitivity to imports	ξ_{11}	0.05	ROW sensitivity demand for Govt Debt to interest rate differential

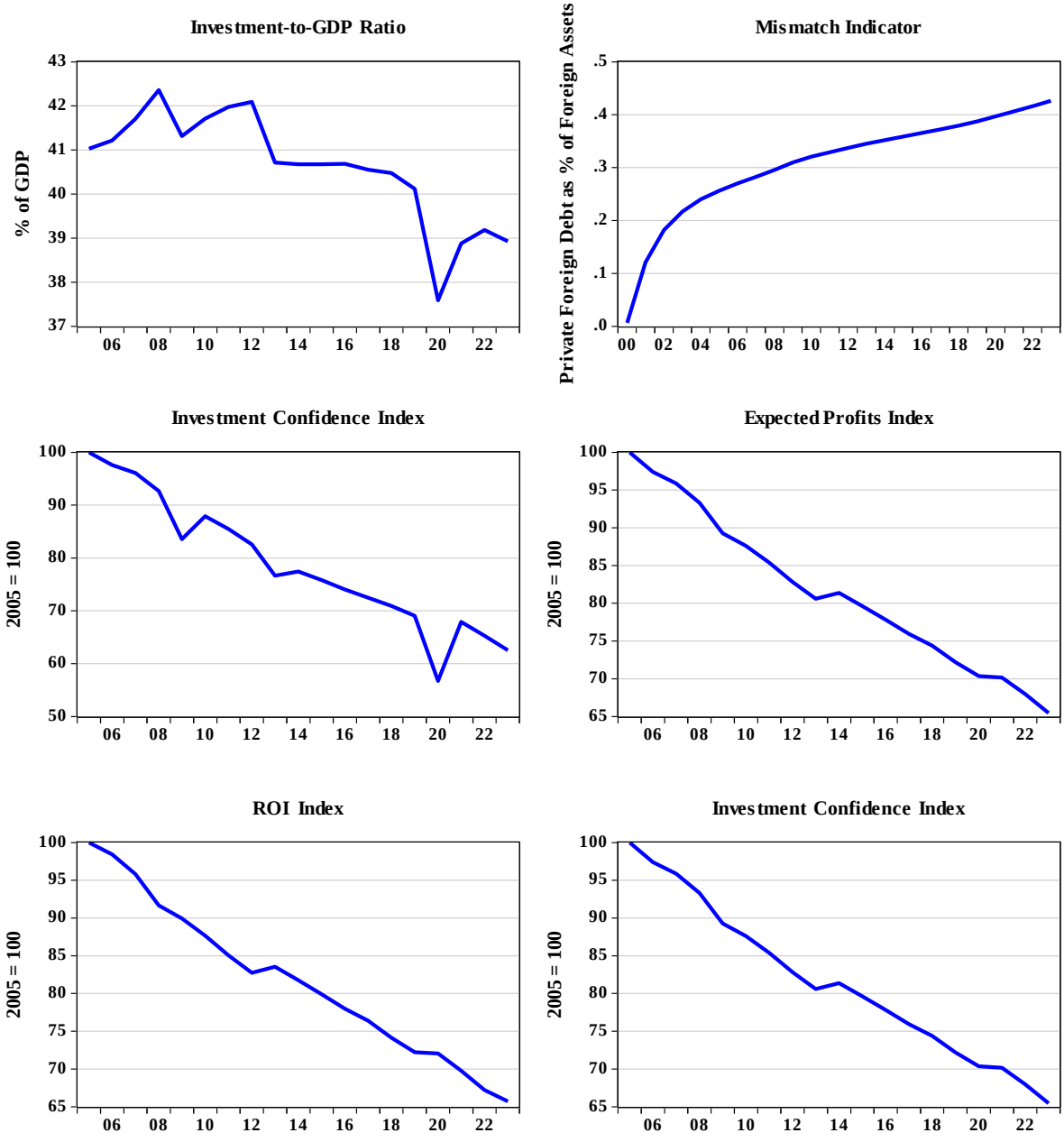
ς_3	0.1	Expected profit rate Sensitivity to CEMBI	ξ_{12}	0.2	ROW sensitivity demand for Govt Debt to Exchange rate Expectations
d	0,15	Capital Stock Depreciation rate	ξ_{20}	0.1	ROW autonomous demand for Govt Debt USD
δ	0.75	Share of corporate debt issued in domestic currency	ξ_{21}	0.05	ROW demand elasticity for Govt Debt (foreign currency)
ϵ_{1_0}	0.55	Autonomous Private Demand for govt bonds	gr^{row}	0.03	RoW GDP growth rate
ϵ_{1_1}	0.2	Private Demand Sensitivity to Arbitrage for govt bonds	$\varphi_0^{\$g}$	0,02	Autonomous component Govt Risk Premium
σ_b	0.7	Elasticity demand of Private sector for govt bond	$\varphi_1^{\$g}$	0.5	Govt Risk premium sensitivity to changes in EMBI
ϵ_{2_0}	0.15	Autonomous Private Demand for govt bonds in USD	$\varphi_0^{\$p}$	0,01	Autonomous component Private risk premium USD
ϵ_{2_1}	0.2	Private Demand Sensitivity to Arbitrage for govt bonds in USD	$\varphi_1^{\$p}$	0.75	Private Risk premium USD sensitivity to changes in CEMBI
$\sigma_{b\$}$	0.7	Elasticity demand of Private sector for govt bond USD	φ_0^{p}	0,02	Autonomous component Private risk premium
ϵ_{3_0}	0.2	Autonomous Private Demand sensitivity for ROW bonds	φ_1^{p}	0,75	Private Risk premium sensitivity to changes in CEMBI
ϵ_{3_1}	0.2	Private Demand Sensitivity to Arbitrage for ROW bonds	ε_0	1	Autonomous parameter of *embi*
σ_{row}	0.8	Elasticity demand of Private sector for ROW bond	ε_1	0.02	EMBI Sensitivity to Debt-to-GDP ratio

			ε_2	0.01	EMBI Sensitivity to FX Debt-to-foreign reserve ratio
p^*	1	International price	ε_3	0.05	EMBI Sensitivity to nominal exchange rate
σ_{row}		Elasticity of private sector RoW bond demand relative to interest rate (foreign currency)	ϕ_0	1	Autonomous parameter of *cembi*
i^{row}	0,02	Foreign Interest rate	ϕ_1	0.08	Sensitivity of *cembi* to the currency mismatch
θ_{T_d}	0.07	Share of the Taxes addressed to pay the public debt	ϕ_2	0.1	Sensitivity of c*embi* to the *embi*
θ_{d_1}		Share of the Taxes addressed to pay the public debt in foreign currency on hand of the private sector	ψ	0.5	Exchange Rate Expectation Rationality
θ_{d_2}		Share of the Taxes addressed to pay the public debt in foreign currency on hand of the RoW sector	ψ_{f1}	0.05	Fundamentalist sensitivity to misalignment from target E
θ_{d_3}		Share of the Taxes addressed to pay the public debt in domestic currency on hand of the private sector	ψ_{f2}	0.02	Fundamentalist sensitivity to EMBI
θ_{d_4}		Share of the Taxes addressed to pay the public debt in domestic currency on hand of the RoW sector	ψ_{c1}	0.06	Chartists sensitivity to trend
δ		Sensibility of the confidence index to expected benefit	ψ_{c2}	0.03	Chartists sensitivity to EMBI
δ_1		Sensibility of the confidence index to growth rate of the RoW			

A3. Baseline Scenario Simulations
World Financial Flows, Nominal Exchange Rate and Risk (Figure 9)

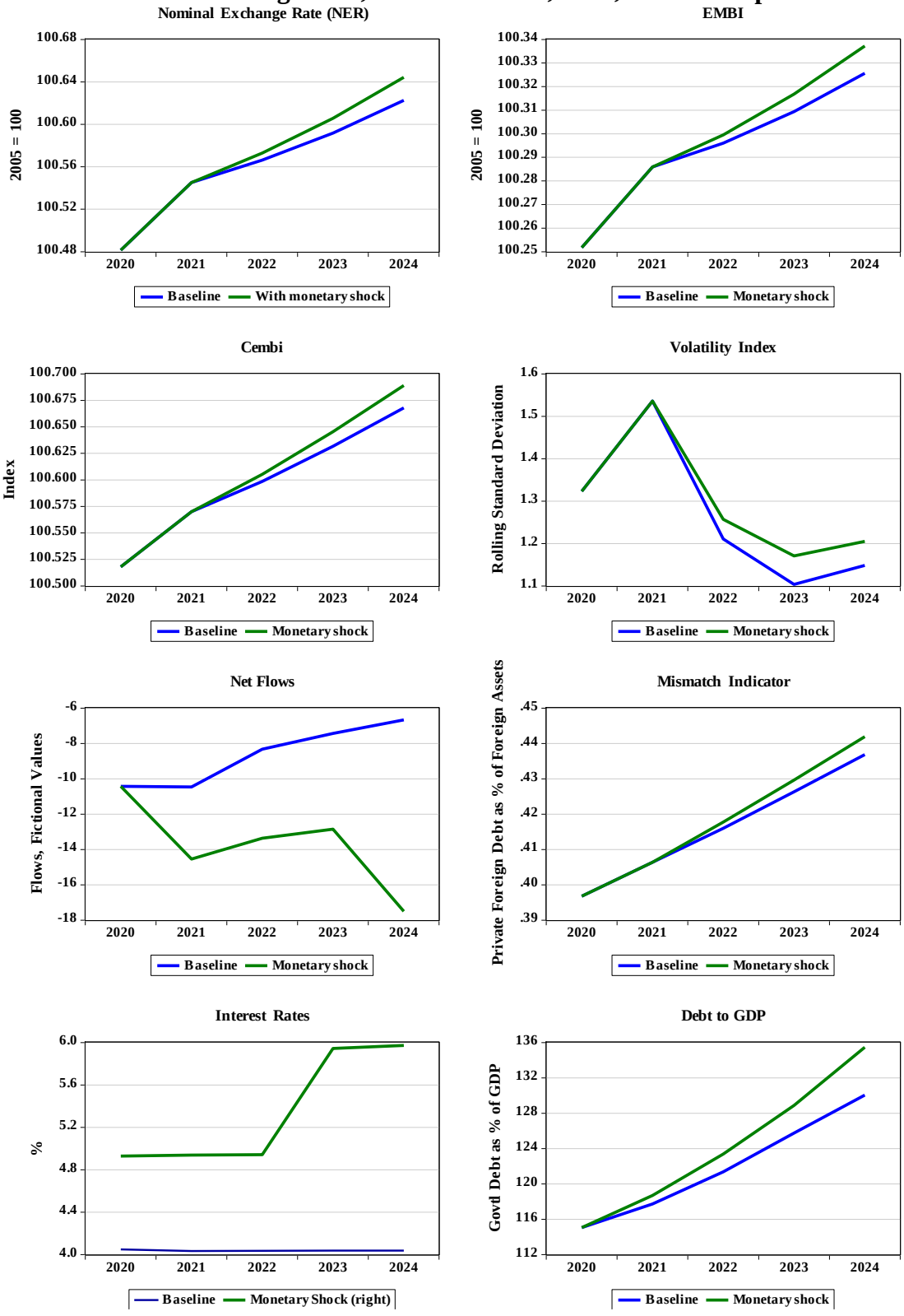


Baseline Scenario: Investment, Mismatch, and Confidence (Figure 10)



A4. Scenario Analysis: Monetary Shock. Figure 11

Nominal Exchange Rate, Risk Premiums, Debt, and Net Capital Flows



References

Abeles, M., & Cherkasky, M. (2020). Revisiting Balance-Of-Payments Constrained Growth 70 Years After Ecalc's Manifesto: The Case Of South America. *Revista De Economia Contemporânea*, *24*.

Abeles M, Pérez Caldentey, E. and Porcile J. (2021). Los Efectos de la Pandemia en América Latina y el Caribe. Revista de la CEPAL. Número especial.

Aguilar, A. and C. Cantú (2020), "Monetary policy response in emerging market economies: why was it different this time?", BIS Bulletin, No. 32, November, Basel, Bank for International Settlements (BIS).

BIS (Bank for International Settlements) (2020a), BIS Quarterly Review, Basel, September [online] https://www.bis.org/publ/qtrpdf/r_qt2009.htm.

_____ (2020b), "Global liquidity indicators", 26 October [online] https://www.bis.org/statistics/gli.htm.

_____ (2020c), "Debt securities statistics", 14 September [online] https://www.bis.org/statistics/secstats.htm.

Board of Governors of the Federal Reserve System (2020), "Federal Reserve Board announces the extensions of its temporary U.S. dollar liquidity swap lines and the temporary repurchase agreement facility for foreign and international monetary authorities (FIMA repo facility) through March 31, 2021", 29 July [online] https://www.federalreserve.gov/newsevents/pressreleases/monetary20200729b.htm.

Borio, C. (2019), "Monetary policy frameworks in EMEs: inflation targeting, the exchange rate and financial stability", BIS Annual Economic Report 2019, Geneva, Bank for International Settlements (BIS) [online] https://www.bis.org/publ/arpdf/ar2019e2.pdf.

Chui, M., E. Kuruc and Ph. Turner (2018), "Leverage and currency mismatches: Non-financial companies in the emerging markets", Special Issue: Global Trade Policy 2018, vol. 41, No.12 The World Economy [online] http://wileyonlinelibrary.com/journal/T

_____(2016), "A new dimension to currency mismatches in the emerging markets: non-financial companies", BIS Working Paper, No.550.

De Camino, C., E. Pérez Caldentey, and C. Vera (2021), 'Non-financial corporations as financial intermediaries and their macroeconomic implications: an empirical analysis for Latin America,' Mimeo.

Federal Reserve Bank of St. Louis (2020), Federal Reserve Economic Data (FRED) [online] https://fred.stlouisfed.org/.

Godin, A., Yilmaz, S. D. (2020). Modelling Small Open Developing Economies in a Financialized World: A Stock-Flow Consistent Prototype Growth Model (No. 5eb7e0e8-560f-4ce6-91a5-52e5bc819887).

_____ (2020b), “How COVID-19 is affecting bank ratings: October 2020 update”, 22 October [online] https://www.spglobal.com/ratings/en/research/articles/201022-how-covid-19-is-affecting-bank-ratings-october-2020-update-11706057.

McCombie, J. S. L. y Thirlwall, A. P., __(1994), *Economic Growth and the Balance-of-Payments Constraint*, New York, St. Martin’s Press.

McCombie, J. S. L. y Thirlwall, A. P., 1999. Economic growth and the balance of payments constraint, Macmillan.(1999): Growth in an international context: a post Keynesian view, in J. Deprez and J.T. Harvey (eds.), Foundations of International Economics. Post Keynesian Perspectives, New York, Routledge

Paus, E. (2019), ‘Latin America’s dismal productivity growth: firm-level innovation and government policies,’ Presentation at LASA, Boston, 24–26 May.

Pérez Caldentey, E., Nicole Favreau Negront, and Luis Méndez Lobos (2019), ‘Corporate debt in Latin America and its macroeconomic implications,’ *Journal of Post Keynesian Economics*, 42(3), 335–362.

United States Department of the Treasury (2020), “Major foreign holders of Treasury securities” [online] https://ticdata.treasury.gov/Publish/mfh.txt.

Thirlwall, A. P., 1979. “The Balance of Payments Constraint as an Explanation of International Growth Rate Differences” Banca Nazionale del Lavoro Quarterly Review, vol. 32(128), p. 45-53.

_____ 2003. The Nature of Economic Growth. Edward Elgar: North Hampton.

Vernengo, M. & Esteban Pérez Caldentey (2020) Modern Money Theory (MMT) in the Tropics: Functional Finance in Developing Countries, Challenge, 63:6, 332-348, DOI: 10.1080/05775132.2020.1747729

Valdecantos, S. (2016). Estructura productiva y vulnerabilidad externa: un modelo estructuralista stock-flujo consistente.

Zezza, G. (2006) EViews macros for building models in Wynne Godley and Marc Lavoie Monetary Economics: An Integrated Approach to Credit, Money, Income, Production and Wealth (https://gennaro.zezza.it/software/eviews/gl2006.php)