

# Commodity speculation and exchange rate swings in Latin America: A Stock Flow Consistent (SFC) analysis

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## Introduction

The scope of this present work is to build a two-country Stock Flow Consistent model (SFC) to investigate the role of speculative agents during a commodity-boom period in a small open economy. The analysis is inspired by the cases of Mexico and Chile during the period 2001-2016

Latin American countries (LACs) have a long history of speculative attacks, balance of payments crises, and currency devaluations. Recently, once again, the story repeated itself, even though it took some different connotations.

At the beginning of the 2000s, the region experienced rising commodity prices and, as has often happened in the past, foreign investors shifted part of their portfolio composition towards LACs securities in search of short-term capital gains.

Unlike past episodes, financialisation – which, as Epstein (2005) defines, is the increasing role of financial motives, financial markets, and financial actors in the economy - has allowed international investors to have a wider range of financial instruments in which to invest. Apart from the traditional government bonds, in the current financialised context new asset categories have appeared such as derivatives, exchange traded funds (ETFs) and structured notes.

In addition, the ultra-expansionary policies adopted by the major central banks in the aftermath of the 2008 financial crisis led investors in advanced economies to seek higher returns in emerging countries. As a result, flows to Latin countries increased even more.

However, starting from 2012, the international macroeconomic and financial context changed. The end of the commodities boom together with the start of a *hawkish* monetary policy in the United States modified the risk sentiment of international investors, shifting portfolio flows towards advanced economies again.

From 2003 to 2010, Chile received on average roughly 7.5 USD billions of dollars in portfolio inflows per year, and the currency appreciated by 26% at the end of the period. However, from 2011 to 2016 the country experienced an average monthly outflow of almost 2 USD billions, while the currency lost 40% of its nominal value.

On the other hand, Mexico underwent a massive increase in foreign holdings of short-term securities. In 2012 money market inflows peaked at almost 11 billion dollars, five times greater than the average of the last two decades. However, inflows declined to 2 billions during the period 2013-2016, and this translated into 44% depreciation.

In order to replicate this macro-financial episode, this work will adopt an SFC framework. International real-financial connections are one of the main issues tackled by this methodology, as Godley explored in his famous article “Seven Unsustainable Processes” (1999).

The element of novelty of our contribution will consist in depicting a speculative financial sector, which issues commodity - based assets (CBAs) to be sold to rentier households in the developed country. As in Godley and Lavoie (2003; 2006a), Bonizzi (2015) and Valdecantos (2011;2015) we will assume that the advanced currency is used as international reserves by the local Central Bank. Comparative static exercises with different scenarios will be performed.

Finally, we will argue that for periphery economies to achieve both convergence with the Center and a sustainable growth path, an active control of speculative capital inflows will be necessary, in order to stabilise the exchange rate to promote development of the periphery. To show this, we will simulate a tax on foreign asset similar to the one imposed by Chile in the first half of the ‘90s.

### **Stylized Facts**

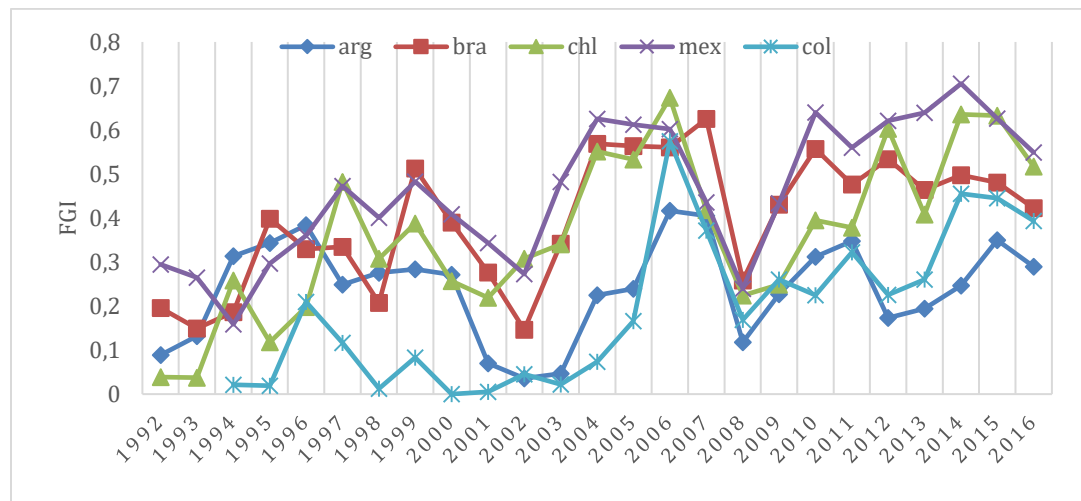
For long time economists have studied the determinants of the long-run trajectory, as well as the short-run swings, of the exchange rate. Two main views emerged: what we called the “macro-fundamental view” and the “financial view”. In this section we present some stylized facts to argue that in the current financialized macroeconomic environment, financial markets and portfolios strategies have emerged in Chile and Mexico and we should take them into consideration when studying the long run trajectory of the exchange rate.

By “macro-fundamental view” we refer to the mainstream view that believes that on the long run the exchange rate is mainly influenced by macroeconomic factors - such as term of trades and current account imbalances – while financial shocks are just transitional elements. On the other hand, the post-Keynesian tradition (Harvey, 2007), argues that financial determinants do matter and points out that capital flows, are the main determinants for the value of a currency. According to this view, expectations play an important role in moving capitals through the allocation of portfolios assets.

Looking at the evolution of financial variables during the last decades, we find a more financialized world in the current context. An important feature of financialization is the integration between the domestic and global financial system. This implies the interconnection between global financial markets. There are two consequences for a developing country like Chile or Mexico. On the one hand, there is a greater inflow and outflow of foreign capital into the domestic financial system, favored by the elimination of entry/exit barriers in the capital account. These flows influence the domestic currency demand and therefore its value. On the other hand, there is a greater sensitivity of domestic financial markets to international financial conditions. Geopolitical and financial events can play an important role in defining the value of the currency, even more than the macroeconomic situation of the domestic country.

Mexico and Chile are the two most integrated Latin countries in global financial markets. The evolution of 1992-2017 of the Financial Integration Index calculated by the World Bank is reported in graph 1.

**Graph 1 – Financial Globalization Index (FGI)**



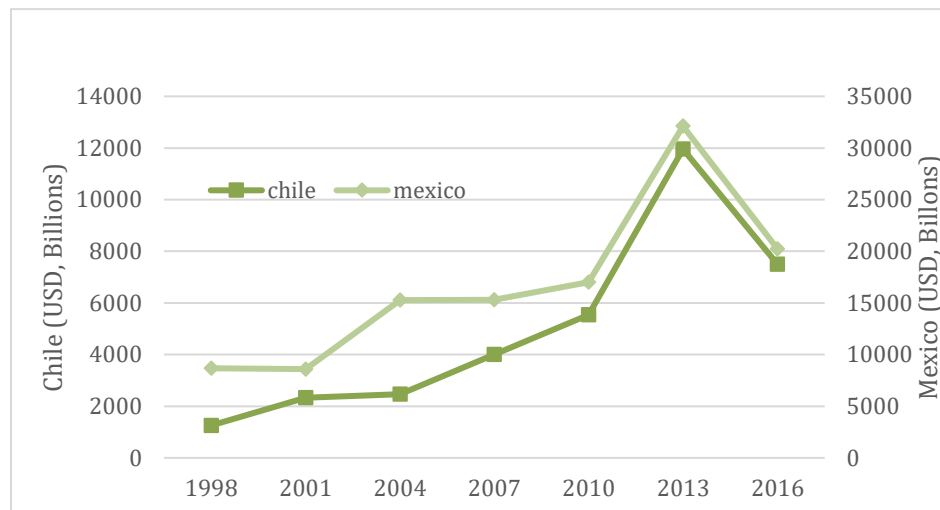
Source: Cordella, T. and A. Ospino Rojas (2017), “Financial Globalization and Market Volatility: An Empirical Appraisal,” World Bank Policy Research Working Paper 809

The strong integration with international financial markets is an element that must be considered to study the long-term real exchange rate trajectory. According to Cordella and Rojas (2017) - the authors who created the IGF index - financial integration entails an amplification of volatility during periods of high uncertainty in developing countries.

Global financial integration has played a fundamental role in currency fluctuations especially since 2000 when the region experienced rising commodity prices. As often happened in the past, foreign investors shifted part of their portfolio composition towards LACs securities in search of short-term capital gains, determining the real exchange rate trajectory. Unlike past episodes, financialization has allowed international investors to have a wider range of financial instruments in which to invest. Apart from the traditional government bonds, in the current financialised context new asset categories have appeared such as derivatives, exchange traded funds (ETFs) and structured notes.

In graph 2 we report the Forex market daily average turnover, which represents total volume of transaction in FX derivatives market. We appreciate a similar path for both Mexico and Chile. From 2001 to 2008, the volume of FX trades for both currencies increased. Starting in 2009, thanks to adoption of extraordinary expansive monetary policies, both series show an exponential growth. After 2013, however, there is again a major shift in the international macroeconomic context as the FED started adopting a hawkish monetary policy. As a result, capital flows moved from developing countries to developed ones, causing the currency to depreciate.

**Graph 2 – Currency Derivatives Turnover**



Source: Bank of International Settlement (BIS)

Starting from 2012, the international macroeconomic and financial context changed. The end of the commodities booms together with the start of a *hawkish* monetary policy in the United States modified the risk sentiment of international investors, shifting portfolio flows towards advanced economies again. From 2003 to 2010, Chile received on average roughly 7.5 USD billions of dollars in portfolio inflows per year, and the currency appreciated by 26% at the end of the period. However, from 2011 to 2016 the country experienced an average outflow of almost 2 USD billions, while the currency lost 40% of its nominal value. On the other hand, Mexico underwent a massive increase in foreign holdings of short-term securities. In 2012 money market inflows peaked at almost 11 billion dollars, five times greater than the average of the last two decades. However, inflows declined to 2 billion during the period 2013-2016, and this translated into a 44% depreciation.

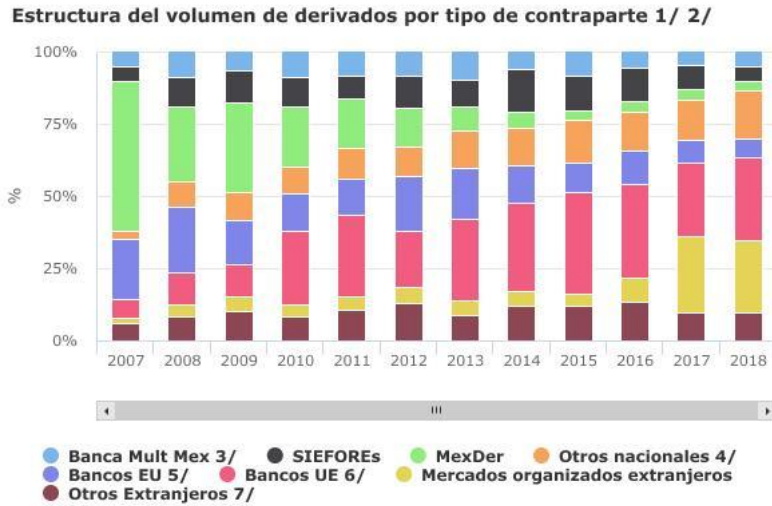
Another important characteristic of financialization is the increasing presence of foreign investors in domestic financial markets. Nowadays, the external sector is the main actor in the FX derivatives markets in developing countries. This might result to be a problem, as foreign investors are generally speculators with a short time investment horizon. We report the composition of the domestic derivatives markets in Chile and Mexico in Graph 4a and 4b.

Graph 1.5a reports the structure of the volume of derivatives in Mexico by type of counterparty for the period 2007-2018q2 (older data are not available). The graph shows the change in the last decade in the type of investor behind these instruments. In 2007, the sum of national investors - composed of Mexican Multiple Banking, SIEFORES, MEXDER and other national investors - represented about 65 percent of the total instruments. Conversely, in the last ten years the volume of derivatives traded outside of Mexico - composed of the sum of derivatives in U.S. Banks, European Banks, and others - has increased from 30 to more than 60 percent of the total derivatives in circulation. The volume of negotiations in the Mexican institutional market suffers a sharp drop. In 2007, MEXDER was the main market for Mexican derivatives, with a volume

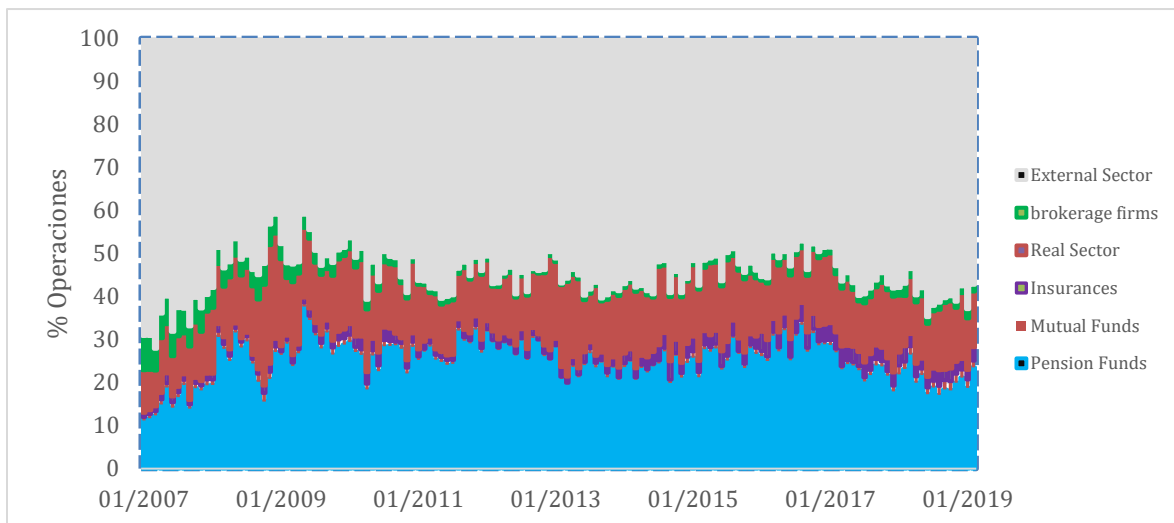
around 40 percent of the total negotiations. Ten years later, it turns out to have a marginal role, indicating the internalization of foreign exchange negotiations.

Data for derivatives in Chile are structured slightly differently than Mexico, still they indicate a strong present of foreign investors. The external sector represents the main player in the market with almost 70 percent of all transactions, followed by pensions funds (23 percent) and the real sector (12 percent).

**Graph 3a – Composition of derivates market in Mexico**



**Graph 3b – Chile derivatives por type of counterparts**



## Literature Review

This section will be devoted to the review of Stock-Flow Consistent (SFC) models addressing open economy issues, and in particular those aiming at establishing a direct link between capital flows and the determination of the exchange rate. We will focus, in particular, on these three following classes of works: (1) first generation of SFC models; (2) multi-country models; (3) models referring (implicitly and explicitly) to Latin America contexts.

Among the first class of works, we shall mention those that belong to the first generation of the SFC literature, mainly developed in analytical terms and making use of few behavioral equations or accounting identities, which nonetheless provided some useful insights as well as the theoretical backbone of the second generations of works – which in our categorization will fall under the classes n. 2) and 3). Although most of the SFC models in recent years are solved using simulations due to their complexity, some scholars still rely on mathematical and comparative static exercises to draw a number of straightforward conclusions – a feature that sometimes get lost especially in large-scale models. A useful example of this is Godley and Cripps' (1983) quasi steady state in an open economy, which directly stems from the national accounting identity (plus the trade balance), and from the sectorial decomposition of the economy carried out by Kalecki (1971). It simply boils down to the following equation:

$$(1) \quad Y = \frac{G+X}{\theta+\mu}$$

The latter says that, once the stock of private assets and debts are held constant, the level of income will equal the sum of government ( $G$ ) and external demand ( $X$ ) over the sum of government income share ( $\theta$ ) and the country's propensity of import ( $\mu$ ). Godley and Cripps (1983) define this as a “quasi” steady state because, differently from a “full” one, government debt could continuously rise (fall) while external transactions go in deficit (surplus) territory. They argue that this process could not last forever, as either the fiscal stance ( $G/\theta$ ) or the trade performance ratio ( $X/\mu$ ) will continuously change to offset each other. In practice, this imply for the authors (ibidem, pp. 283) that:

*“In the long run fiscal policy can only be used to sustain growth of real income and output in an open economy, provided that foreign trade performance so permits.”*

This important take-away establishes an interesting connection between the works of the Cambridge Economic Working Group and Harrodian<sup>1</sup> models of trade, as for instance the one put forward by Dixon and Thirlawll (1975), since their Balance of Payment Constraint Growth Rate can be essentially seen as a dynamic version of the trade performance ratio (Lavoie, 2014).

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<sup>1</sup> Harrod also argued that open economy models that disregarded financial accounts were flawed, as capital movements heavily did heavily affected trade account through the determination of the nominal exchange rate. For more on this see Shaik (2017, chap. 11).

Pérez Caldentey (2009) was one of the first to address the issue of balance of payment constraint growth in a SFC model for Caribbean countries, by reinterpreting Godley and Cripps (1983) relationship between the public budget and the trade balance in a dynamic framework. The central point of his argument is that fiscal rules that overlook the behavior of the external sector could not be effective in bring back the public expenditure under control.

In other words, the evolution latter – and hence the evolution of the local economy - is endogenous with respect external conditions. This result is obtained, as said, if the private sector balance is zero; but there is another assumption implicit in equation (1), that is the nominal exchange rate is held as a constant. In Godley and Cripps (1983), it is the equivalent to say that that the stock of assets does not change, since for this to happen the possibility of assets and bonds revaluations should be ruled out. In fact, in an economy where households accumulates savings denominated in foreign currency, capital gains (losses) could also take place as a result of appreciations (depreciations) of the latter.

The framework for the international economy outlined by the two authors, being extremely simple, lacked of some features that would be further developed in their later works. Among them, a full description of the macroeconomic interaction between two economic regions/countries, something that in fact is required by their same claim that every model should be consistent (Godley, 1996; 1999; Godley and Lavoie, 2003; 2006a).

The latter, who was in fact embedded in the model used by the Cambridge Economic Policy Group (Fetherston, 1976; 1977), that Godley himself helped to develop, depicted the impact of oil and gas extraction from North Sea on UK. As a matter of fact, North Sea was treated as an “economy” with no resident so that all the output is due as property income to UK and foreigners in the form of UK taxes and profits (Cripps and Tarling, 1975). Nevertheless, being a “dependent” area, exchange rate complications were left out of the picture. In turn, the CEPG specifically conceived the latter as the main policy instrument together with the fiscal budget for the economy to achieve any employment and output target (Cripps and Godley, 1976), so that in the end its determination would not have been a problem to care about, provided the design and the aim of the model itself – i.e. to give prospects for the management of UK conjecture.

However, the effort to model an endogenous exchange rate formation mechanism was undertaken by Godley when he started his collaboration with the Levy institute in the early ‘90s. One of his first articulated attempt to provide a theoretical framework to analyze some issue of the international monetary system was carried out in a seminal paper of 1996, were he build up a system composed of two economies that together comprise the whole universe (Godley, 1996), since: (i) the exports of one country were the import of the other, and vice versa; (ii) foreign asset transactions by one had exact counterpart in the supply/demand of the other; (iii) interest payment on those assets were accounted as local (foreign) receipts. Besides the model being a

fully interdependent one, it could be split in four different sub-parts – the one of our interest determining the nominal exchange rate as a result of foreign asset demand/supply interactions - subject to an analytical solution. To be more specific, the demand for stocks (both local and foreign) follows a portfolio approach similar to Brainard and Tobin (1969) and Tobin and De Macedo (1980); government liabilities, in turns, are supplied upon request of both local and foreign households. As clean floating was assumed, this would mean that each government matches passively the asset allocation preference of world citizens. For space reasons, we report here only the expression which gives the equilibrium value of the exchange rate,

$$(2) \quad (DG\$ - V\$)xr^2 + (1 - \alpha)Vxr - (1 - \beta)V\$ = 0$$

with  $DG$  indicating the stock of government debt,  $V$  household wealth,  $xr$  the nominal exchange (unit of local currency per unit of foreign currency),  $\alpha$  and  $\beta$  standing for the share of domestically issued bills in the total wealth of locals and foreigners, respectively, and the  $\$$  illustrating foreign variables. Holding interest rates constant, as well as  $DG$ ,  $DG\$$  and  $V\$$ , it is possible to analyze some equilibrium properties. Besides the expression being non-linear, it is possible to see that the function is increasing in  $\alpha$  and decreasing in  $\beta$  – postulating a direct (inverse) relationship between  $xr$  and the interest rate locally (abroad). According to the author (1996, p.9), the model postulate that

*“(...) there will always some rate of exchange which will make Sterling (i.e., local) residents buy whatever is the effective supply of Dollar securities to them while simultaneously matching Dollar residents’ demand for Sterling bills to the effective supply of these”.*

The term “effective” is of particular importance in this context. For instance, if it happens to be a change in the preference of UK residents in favor of Dollar’s securities while everything else remain constant, their portfolio composition will shift accordingly. As instead US wealth and allocation will not change, as well as US asset supply, to balance the new situation it will be the case for  $xr$  to rise, hence revaluating the existing claims of UK households – in this sense, the latter acts as a pure “price” effect. In the full model, this mechanism take into account endogenous wealth and government debt stocks, which is influenced by trade between the two countries and income determination within each country.

But the nominal exchange rate determination process described above allow Godley to reject the conclusion of Dornbrush’ (1976) overshoot model, which stressed that any shock will be absorbed by the interplay of the demand and supply of assets, bringing back  $xr$  to an equilibrium path governed by uncovered interest parity (UIP) considerations. As a matter of fact, the nominal exchange rate (here as to be intended as the spot exchange rate), will not be governed by the interest rate differentials, but by the necessity to cover the imbalances in both each government budgets or to equilibrate household preferences with their income flows.



For instance, Taylor (2004; 2009), who employs as a starting point the framework set forth by Godley, takes an alternative road by closing his model assuming UIP to hold. However, the empirical studies does not confirm the existence of such relationship (see Lavoie, chap.7); rather, evidence has been found that instead covered interest parity (CIP) does hold true. As Lavoie (2014, chap.7) suggests, the forward exchange rate is not an expectational variable, but it is a simple mathematical rule applied by financial operators to hedge against risks. Hence, it turns out that it does not affect the change of stocks or the reserve account. This is in accordance with the *Cambist view* on forward exchange markets, which holds that interest rate are set exogenously by Central Banks, while forex dealers decide how much the spread between the spot and forward rate will be based on the interest rate differentials.

A multi-country approach in a sense, is embedded in the open economy framework developed by Godley (1996). As we mentioned, full consistency of the models requires modeling a second economy that can be able to reproduce the real and financial interactions among the institutional sectors. Godley and Lavoie (2003; 2004; 2006a; 2006b) progressively built upon the original Godley's contribution - as well as his policy works written during his collaboration at the Levy - to provide a more realistic representation of how two regions co-evolve. For instance, in Godley and Lavoie (2003) some important modifications were introduced, such as a disaggregated government sector (composed of a treasury department and a central bank), a better specification of the asset demand function, and the analysis of different exchange rate regimes closures.

The introduction of the monetary authorities made it possible to describe with more accuracy their foreign reserve operations, and to depict an important asymmetry in the latter, that is the fact that the treasury bills (the only type of asset together with money and gold) of one country is accepted as part of the reserve portfolio of the foreign central bank – but not the other way around. This allows depicting the mechanism of the compensation principle, a central piece of the Post-Keynesian open economy framework (Lavoie, 2014). In short, it postulate that there can never be an excess supply of money, as when foreign currency flows in banks get rid of it by reducing their outstanding debt at the Central Bank (Godley and Lavoie, 2003) – hence, from the standpoint of its balance sheet any movement in the foreign reserve account will be compensated by one of opposite sign in banks' reserve accounts. The model as such does not comprise banks, but the principle can operate through each CB budget (i.e. the horizontal constraint in its line of the flow of funds matrix).

The new asset demand function contained an additional element for the rate of return on securities issued abroad. In fact, it was also made dependent upon the expected change in the exchange rate – as the Tobinesque principle describes the ex-ante wealth allocation, thereby making necessary the introduction of expectations. This made possible to introduce the discussion on how the latter are formulated. For instance, three alternative methods were put

forward in Godley and Lavoie (2003; 2006a): (i) an uncovered interest parity relationship, which was dismissed for the reasons above mentioned; (ii) a constant expected exchange rate, which may correspond to some exogenous “fundamental” value and (iii) an exchange rate that endogenously adjust towards the latter.

Lavoie and Daigle (2011) argued that this fundamental does not derive from any underlying macroeconomic factor, but in fact respond to a simple “convention” established among market participant that this will be the long-run anchor towards which the short run rate will sooner or later converge. In turn, some agents might behave and react in line with (or bet against to) the market mood, hence paying attention at the last value taken by the exchange rate only. These two types of individuals are called, respectively, “Fundamentalists” (“Conventionalists”) and “Chartists” as defined by the contributions of Harvey (2007) for the former and Schulmeister (2009) for the latter. Their different microeconomic behavior has been modeled in Lavoie and Daigle (2011), which sought to capture the impact of their action on exchange rate movements and trade accounts. The authors found that when the share of the Conventionalists exceeds (falls short of) that of the Chartists, the system does (does not) return to the original steady state values, although the convergence takes more time with respect a scenario in which expectations are totally absent. This framework has been exploited and extended by other authors, such as Ramos and Prates (2017) and Ramos and others (Forthcoming), who have implemented the latter in an Agent-Based Stock Flow model.

Finally, they use of different closure for the exchange rate, namely, the fixed (implying flexible reserve accounts) and the flexible one (implying fixed reserve accounts). Since countries can incur in a lower bound to foreign reserves, the former can be illustrated either with an endogenous interest rate – i.e. increasing (decreasing) it when flows out (in) – or with endogenous government expenditure – i.e. making it dependent on the willingness of the private sector to hold an additional amount of treasury bills. While in the first case instability occurs, in the second case the current account get balanced, however at the expense of both the GDP of the surplus and the deficit country (Godley and Lavoie, 2004; 2005; 2006a). The standard two-country augmented model, known also as the “Chapter 12”, has been extended qualitatively, with the behavioral development proposed by Lavoie and Daigle (2011) and Ramos and others (forthcoming) and with the analyses of Bonizzi (2015) and Bortz (2014) on pension funds and foreign debt, respectively (see below); and quantitatively, with multi-country frameworks developed by Lequain (2003) Godley and Lavoie (2006b), Zhao (2006), Lavoie and Zhao (2010), Mazier and Aliti (2012) and Valdecantos and Zezza (2015).

The first two are simply an extension of the Chapter 12, with the novelty that two countries share the same currency. The third and the fourth contribution introduce for the first time a three-country model comprising US, the Eurozone and China to study the effect of reserve diversification of the latter, while the fifth one discusses the effects of different exchange rate

parities among these countries. The last two works additionally inserted a Rest-of-the-World area (supposed to be commodity-based provider) to give a realistic illustration of the global economy.

Lastly, we shall mention a different tool, which however share the same root of the works that we have seen so far, namely the Global Policy Model, elaborated by Cripps and Izurieta (2014) at UNCTAD for scenario analyses for the world economy. Indeed, the model itself comprehend 25 regions and it is estimated econometrically, following rigid accounting principles in the legacy of the New Cambridge works, as acknowledged by Lavoie (2014). To the best of our knowledge, this is the only open economy SFC model empirically calibrated.

Among the third set of contributions, several different works deserve our attention. Valdecantos (2011; 2014) for instance stands among the others for its attempt to include an input-output matrix inside a standard SFC open economy model designed for Argentina, in order to take into account of the heterogeneity of the productive structure – so generating 4 productive sectors (primary non-agricultural and agricultural, manufacture and services) in addition to the usual ones. By simulating a negative shock in the price of each commodities, the model gives as a result a depreciation of the exchange rate, at the detriment of the sector depending on this price – due to imported inflation - and at the benefit of the others – due to the lower costs of inputs. Besides, the simulation of an increase in the foreign interest rate affects all the sectors, through the reversion of foreign capital.

Also having in mind the case of Argentina, Bortz (2014) presents a two-economy model with US, allowing the domestic sector to issue debt in foreign currency and investigating the effects of portfolio allocation decisions of the agents on trade and financial flows. The author argues that the latter are the main determinants of the exchange rate, together with the expectations of traders on its movements and the financial position of each sectors. Trade and current account are mainly caused by exchange rate shifts, and not the other way around – a similar argument applies also in the author’s rejection of the “twin deficit” view, as current account imbalances might have been originated by factors others than fiscal indiscipline.

Portfolio flows are also at the center of the work of Bonizzi (2015), which while not having in mind any specific country it is well suited to depict an important stylized fact for LA, namely the behavior of foreign institutional investors. He shows that those intermediaries could play either a stabilizing or a destabilizing role for the exchange rate of the emerging economy: when capital inflows take place, they act first procyclically by demanding EM assets and thereafter countercyclically by selling it once satisfied their funding needs; conversely, when interest rate is risen in the advanced country, investors accelerates the corresponding sell-off of assets of the developing economy. International liquidity cycles are specifically addressed in Pedrosa and Biancarelli (2015), where it is shown that a developing economy, when exposed to financial openness lose control of its macroeconomy. Mounting capital inflows, in particular, trigger a

redistribution of the ownership structure towards foreigners, while fragility increase even in absence of exchange rate movements as the public debt shift upwards and both the current and reserve account end up being lower - as well as GDP levels.

### **A brief description of the model**

The following section will be devoted to the preliminary description of our model, focusing on the structure – in terms of the balance sheet and transaction flow matrixes – and on some particular equation that depart from (build on) the previous contributions. Figures 1 and 2 depict the balance sheet and the transaction flow of our world economy, respectively. The matrix of stock resemble closely the one put forward by Godley and Lavoie (2003, 2006a), with some notable exceptions: the first one is the explicit presence of an aggregate financial sector in the two economies, as in Bortz (2014), Lavoie and Zhao (2010) and Valdecantos and Zezza (2015).

The second novelty is the presence of two additional asset, respectively time deposits and a new class of securities whose value depends upon the export price of country # and the spread between the returns on government bills. We branded the latter as “Commodity-Based Asset” (CBA), and we assumed that it is only issued by the Financial sector of US. Thirdly, we assumed that both the US and # financial sectors carry out an non-homogeneous and non-comprehensive amount of functions; for instance, while they both provide deposits to their resident households and hold treasury bills issued by the local government, the US financial sector additionally buys foreign bills and issue CBA securities to be sold at the US savers. This liability is effectively a derivative contract, pretty much like to an ETF or a structured note, which are built to follow (or to replicate) some fundamentals of the emerging markets – most notably, commodity prices and returns on foreign T-bills. Thus, our US Financial sector takes on an originate and distribute behavior, using in this case an asset as an implicit collateral for CBA contracts.

Finally, for the sake of simplicity some of the traditional characteristics of the banking system are left out of the picture in both countries, as neither loans are made nor advances from the CBs are granted. In further works we will task ourselves with the proposal of reducing these heterogeneity.

	US			#		
	Households	Production	Financial sector	Government	Central bank	$\Sigma$
	\$			#		
Deposits	+Dh	-D	xr\$	+Dh	-D	0
Treasury bills#	+Bh\$	+Bb#	xr\$	+Bb#	-B#	+Bcb#
Treasury bills\$	+Bh\$	+Bb\$	xr\$	+Bh#\$	+Bcb#\$	0
CBAs	+pCBAh	-pCBAh	xr\$	+Hh	+Hb	-H
High-powered money	+Hh	+Hb	xr\$	+Hh	+Hb	-H
Balance	-V	0	-NW <sub>g</sub>	-V	0	-NW <sub>g</sub> -NW <sub>cb</sub>
$\Sigma$	0	0	0	0	0	0
	\$			#		
	Households	Production	Financial sector	Government	Central bank	$\Sigma$
Consumption	-C	+C	xr\$	+C		0
Government expenditures	+G	+G	xr\$	+G	-G	0
Trade	-IM	+X	xr\$	+X		0
Taxes	-T	-T	xr\$	-IM	+T	0
GDP	+Y <sub>g</sub>	-Y <sub>g</sub>	xr\$	+Y <sub>#</sub>		0
Financial sector profits	+Fb	+Fb	xr\$	+Fb	-Fb	0
Central bank profits	+Fb	+Fb	xr\$	+Fb	-Fcb	0
Interest on Deposits	+r <sub>d,t-1</sub> D <sub>t-1</sub>	-r <sub>d,t-1</sub> D <sub>t-1</sub>	xr\$	+r <sub>d,t-1</sub> D <sub>t-1</sub>	-r <sub>d,t-1</sub> D <sub>t-1</sub>	0
Treasury bills#	+r <sub>ts,t-1</sub> B <sub>ts,t-1</sub>	+r <sub>ts,t-1</sub> B <sub>ts,t-1</sub>	xr\$	+r <sub>ts,t-1</sub> B <sub>ts,t-1</sub>	-r <sub>ts,t-1</sub> B <sub>ts,t-1</sub>	+r <sub>ts,t-1</sub> B <sub>ts,t-1</sub>
Treasury bills\$	+r <sub>ts,t-1</sub> B <sub>ts,t-1</sub>	+r <sub>ts,t-1</sub> B <sub>ts,t-1</sub>	xr\$	+r <sub>ts,t-1</sub> B <sub>ts,t-1</sub>	+r <sub>ts,t-1</sub> B <sub>ts,t-1</sub>	0
CBAs	+r <sub>cb,t-1</sub> CBA <sub>t-1</sub>	-r <sub>cb,t-1</sub> CBA <sub>t-1</sub>	xr\$	+r <sub>ts,t-1</sub> B <sub>ts,t-1</sub>	+r <sub>ts,t-1</sub> B <sub>ts,t-1</sub>	0
Change in the stocks of	+ΔD <sub>h</sub>	-ΔD <sub>h</sub>	xr\$	+ΔD <sub>h</sub>	-ΔD	0
Treasury bills#	+ΔBh\$	+ΔBb#	xr\$	+ΔBh#	+ΔBb#	+ΔBcb#
Treasury bills\$	+ΔBh\$	+ΔBb\$	xr\$	+ΔBh#\$	+ΔBb#\$	+ΔBcb#\$
CBAs	+ΔpCBAh	-ΔpCBAh	xr\$	+ΔH <sub>h</sub>	+ΔH <sub>h</sub>	-ΔH
High-powered money	+ΔH <sub>h</sub>	+ΔH <sub>h</sub>	xr\$	+ΔH <sub>h</sub>	+ΔH <sub>h</sub>	-ΔH
$\Sigma$	0	0	0	0	0	0

On the flow side, as in Chapter 12 of Godley and Lavoie (2006a), households' income comes only from financial sources (deposits and local bills for both US and # citizens, plus foreign bills for the latter and CBAs for the former). Moreover, all profits of the Financial Sector are redistributed to household in each country – just like CB' profits are redistributed to Government. Thus, in both economies households are “rentiers”, although only in the case of # country they directly choose how to allocate their wealth among the different classes of assets. In turn, in US it is the Financial Sector that carries out the portfolio choices, and then sell to household its main financial product, the CBA.

These differences are justified on the ground that while in developed countries financial intermediaries are engaged with a wider set of financial activities – such as derivatives trading, for instance – in the developing ones such transaction are relatively less important, although they have been growing steadily in the last decade (Abeles and others, 2018). Thus, it is safe to assume that # rentiers build up their own portfolio, which comprises also US bills, while relying on their local financial sector for more traditional activities.

Finally, the # Central Bank holds a fixed amount of reserves (US bills), letting the exchange rate to adjust freely. However, as the # currency is not considered to have the same liquidity preference as the dollar, only the latter is used as the international reserve currency.

### **Preliminary conclusions**

Based on the model described above, we will simulate different scenario; the first experiment will be to generate capital inflows from the US to the # country, increasing the autonomous demand for # T-bills sold to foreigners, as shown by Ramos and Prates (2017). A second experiment will consist in endogenizing the interest rate, when the reserve account hit a lower bound. Finally, we will describe the impact of a tax on financial flows, such as the one applied by Chile in the early '90 (Ffernch-Davis, 2018). Due to the review of the literature we believe that, especially for what concern our last experiment, our paper contains element of novelty that have not yet been explored by the existing works.

Moreover, due to the characteristic of a SFC framework, that we have also explored, we conclude that this instrument 1) can provide an useful representation of the exchange rate determination in a context of deeply interrelated actors which share balance-sheet commitment among each other; 2) allows to reject the mainstream “macro-fundamental” view on the exchange rate by using a macro-financial framework that show how financial variables indeed

do play a big role in influencing the latter and 3) gives an snapshot on the asymmetries that middle income countries such as Chile and Mexico faces in the financial markets, and how they influence both their steady states and the convergence (divergence) towards them.

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