



IMF Working Paper

What is Driving Financial De-dollarization in Latin America?

Mercedes García-Escribano and Sebastián Sosa

IMF Working Paper

Western Hemisphere Department

What is Driving Financial De-dollarization in Latin America?

Prepared by Mercedes García-Escribano and Sebastián Sosa¹

Authorized for distribution by David Vegara

January 2011

This Working Paper should not be reported as representing the views of the IMF.

The views expressed in this Working Paper are those of the author(s) and do not necessarily represent those of the IMF or IMF policy. Working Papers describe research in progress by the author(s) and are published to elicit comments and to further debate.

Abstract

In the last decade, a group of Latin American countries (Bolivia, Paraguay, Peru, and Uruguay) experienced a gradual, yet sustained decline in financial dollarization. This paper documents the stylized facts and uses a standard VAR approach to examine the drivers of both deposit and credit de-dollarization. It finds that the exchange rate appreciation has been a key factor explaining deposit de-dollarization. The introduction of prudential measures to create incentives to internalize the risks of dollarization (including an active management of reserve requirement differentials), the development of a capital market in local currency, and de-dollarization of deposits have all contributed to a decline in credit dollarization. Continuing efforts on these fronts, while maintaining macroeconomic stability and strong fundamentals, would help deepening de-dollarization.

JEL Classification Numbers: E50; G20; G21; G28

Keywords: de-dollarization; banking system.

Author's E-Mail Address: mgarciaescribano@imf.org; ssosa@imf.org

¹ Mercedes García-Escribano and Sebastián Sosa are economists at the Western Hemisphere Department, International Monetary Fund. The authors would like to thank Miguel Savastano, Rodrigo Valdés, Martín Kaufman, Robert Rennhack, Gilbert Terrier, David Vegara, Gastón Gelos, and participants at the Central Bank of Peru and WHD-IMF seminars for their feedback and extensive discussions.

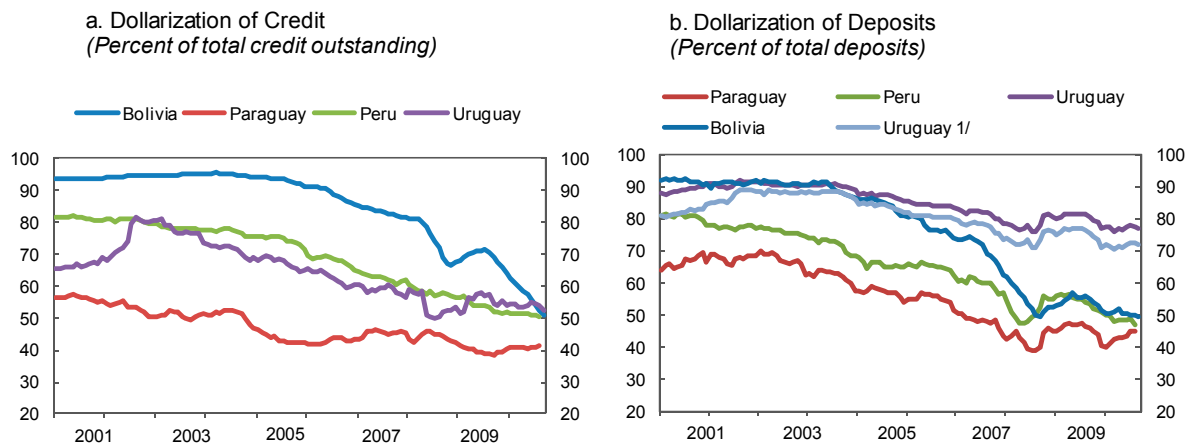
Contents	Page
I. Introduction	3
II. De-dollarization Trend—Stylized Facts.....	5
III. Explaining De-dollarization: Empirical Approach	8
A. Methodology	8
B. Macro variables—the role of exchange rate trend and volatility	9
C. The introduction of prudential measures.....	11
D. Capital market development in local currency	12
IV. Empirical Results.....	13
V. Concluding Remarks.....	21
Tables	
1. De-dollarization 200110	6
2. Peru: Decomposition of De-dollarization Into a Within and Between Components.....	7
3. Definition of Variables in the VAR	8
4. Size of the Shock	17
5. Variance Decomposition of Changes in Credit Dollarization	19
6. Variance Decomposition of Changes in Deposit Dollarization.....	19
7. What Drives De-dollarization?	20
Figures	
1. Evolution of Dollarization in Selected Countries of Latin America.....	3
2. Evolution of Financial Dollarization	5
3. Evolution of Deposit Dollarization by Maturity	7
4. Evolution of Credit Dollarization by Type of Credit.....	7
5. Evolution of Inflation.....	9
6. Changes in the Exchange Rate and Dollarization Ratios, 2003–2010.....	10
7. Evolution of the Nominal Exchange Rate and Dollarization.....	10
8. Exchange Rate Volatility and Changes in Dollarization	11
9. Development of Debt Market in Domestic Currency and Dollarization	13
10. Response of Dollarization to a Shock to Differential Reserve Requirement Ratios ...	14
11. Response of Dollarization to the Introduction of Prudential Measures.....	15
12. Response of Dollarization to the Issuance of Local Currency Long-term Bonds	15
13. Response of Dollarization to an Exchange Rate Shock.....	16
14. Response of Dollarization to an Exchange Rate Volatility Shock	17
15. Response of Credit Dollarization to a Shock to Deposit Dollarization	18
References.....	22

I. INTRODUCTION

Financial dollarization—process in which a large share of residents’ assets and liabilities are denominated in U.S. dollars—has been a distinguishing feature of the banking sector of many countries in Latin America, making it one of the most dollarized regions in the world. Financial dollarization is typically a consequence of past episodes of severe economic crisis and high inflation, which made the U.S. dollar the preferred currency to minimize risks for both savers as well as lenders. When economic stability was restored and inflation declined, dollarization ratios of deposits and loans have usually remained high. Hence, financial dollarization continues to be a source of concern for policy makers since it contributes to the vulnerability of the banking system to exchange rate fluctuations.

During the past decade, some Latin American countries with very high dollarization ratios in the early 2000s have experienced a gradual and sustained decline in financial dollarization. Prominent examples of successful market-friendly de-dollarization processes include Bolivia, Paraguay, Peru and Uruguay (Figure 1).

Figure 1. Evolution of Dollarization in Selected Countries of Latin America



Source: IMF Staff calculations.

1/ Excludes foreign currency deposits for nonresidents.

What explains de-dollarization? What could countries do to overcome dollarization hysteresis? A great deal of work exists on the causes of financial dollarization, yet the empirical literature on the causes of de-dollarization is scant. While it is widely accepted that financial dollarization is at least in part an optimal response to periods of particular uncertainty—typically associated with high inflation—that undermined confidence in the local currency, the persistence of high dollarization ratios after periods in which inflation fell substantially is still a puzzle. One explanation, introduced by Ize and Levy-Yeyati (2003), argues that price instability per se is not enough to explain financial dollarization. They develop a model of optimal portfolio choice of risk-averse borrowers and lenders where the equilibrium level of deposit dollarization depends on the relative price and real exchange rate

volatility.² Another strand of the literature highlights the role of currency-blind regulatory frameworks—for example, Broda and Levy-Yeyati (2003) argue that an explicit deposit insurance that applies uniformly across all deposits exacerbates deposit dollarization.

Reinhart, Rogoff, and Savastano (2003), Galindo and Leiderman (2005), and Erasmus et al. (2009) review the international experience on de-dollarization. These papers highlight that dollarization persists after periods of substantial decline in inflation and after macroeconomic stability has been restored. Cases of forced de-dollarization—for example, Bolivia and Peru in the 1980s—have entailed high macroeconomic costs and dollarization quickly returned.³ On the contrary, successful cases have been market-based and combined macroeconomic stability with other policies (such as capital market development in local currency).⁴ Kokenyne et al. (2010), using data on deposit and credit dollarization for a sample of 32 emerging markets between 2001 and 2009, find that higher exchange rate volatility coupled with stable inflation fosters de-dollarization. García-Escribano (2010) analyzes de-dollarization across categories of loans and deposits in Peru and finds that de-dollarization has been driven by macroeconomic stability, the introduction of prudential policies (such as an active management of reserve requirements) to better reflect currency risk, and the development of the capital market in local currency (for example, through the issuance of long-term treasuries in Soles) that facilitated bank funding and pricing of long-term loans in domestic currency.

The main purpose of this paper is to explore the short-term drivers of financial de-dollarization in Bolivia, Paraguay, Peru and Uruguay. A standard unrestricted VAR is used to examine the role of three sets of factors—macroeconomic variables, prudential regulations, and the development of the capital market in domestic currency—as drivers of de-dollarization of both credit and deposits in these countries.

The main results are as follows:

- Drivers of deposit de-dollarization are different from those of credit de-dollarization.
- The appreciation trends experienced during the last decade have been key for deposit de-dollarization in these countries.

² Specifically, their minimum variance portfolio (MVP) model implies that if real exchange depreciation is less volatile than inflation, then consumers would prefer to hold dollar deposit as it is less risky. The authors test the model using cross-section data on deposit dollarization for 23 countries. De Nicolo et al. (2005) and Rennack and Nozaki (2006) provide evidence supporting the MVP hypothesis.

³ In 1980s Bolivia and Peru forced the conversion of foreign currency deposits to local currency, resulting in capital flight and financial disintermediation. When the restriction on foreign currency deposits was lifted, re-dollarization was rapid.

⁴ Reinhart, Rogoff, and Savastano (2003) identify only four successful cases (Israel, Mexico, Pakistan and Poland), among a group of 86 countries, of significant and persistent deposit de-dollarization. Galindo and Leiderman (2005) identify the cases of Chile, Israel and Poland as successful.

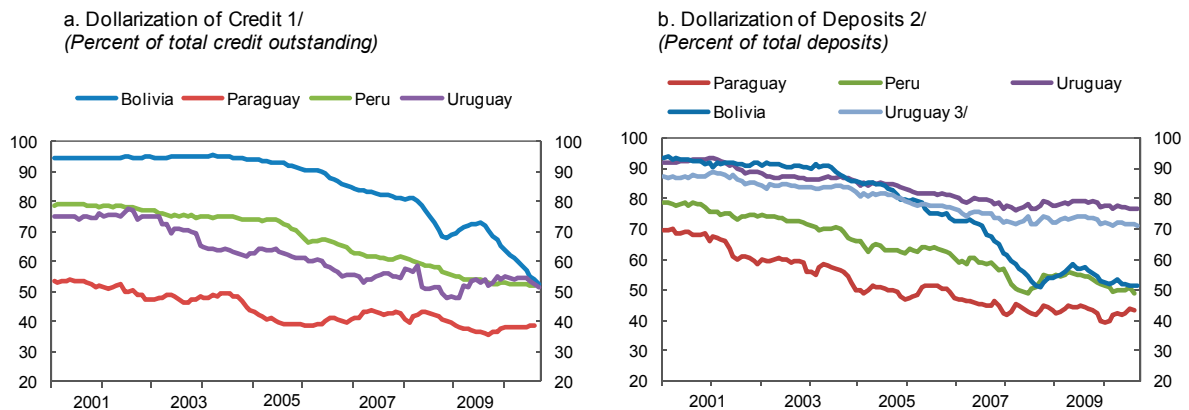
- An active management of reserve requirement differentials has contributed to credit de-dollarization.
- The introduction of other prudential measures to create incentives to internalize the risks of dollarization (such as higher provision requirements for foreign currency loans, and tighter limits on the banks' net open position) has also fostered credit de-dollarization.
- The extension of the domestic currency yield curve has facilitated credit de-dollarization.
- De-dollarization of deposits has also contributed to credit de-dollarization.

The paper proceeds as follows. Next section presents the stylized facts, documenting the gradual yet steady decline in credit and deposit dollarization ratios in Bolivia, Paraguay, Peru, and Uruguay. Section III describes the empirical approach and the evolution of the main variables in the model. Section IV contains the results. Finally, section V concludes.

II. DE-DOLLARIZATION TREND—STYLIZED FACTS

De-dollarization has gradually declined in Bolivia, Paraguay, Peru and Uruguay following the successful implementation of macroeconomic stabilization policies. Figure 2 shows the evolution of dollarization, with deposits and credits in foreign currency evaluated at a constant exchange rate to exclude changes in dollarization due to valuation effects. Deposit dollarization in Bolivia and Peru sharply increased following Lehman Brothers, but quickly reversed thereafter.

Figure 2. Evolution of Financial Dollarization



Source: IMF staff calculations.

1/ Foreign currency credit evaluated at constant exchange rate.

2/ Foreign currency deposits evaluated at constant exchange rate.

3/ Excludes foreign currency deposits for nonresidents.

Deposit dollarization declined (on average) by 27 percentage points between 2001:Q1 and 2010:Q3 (Table 1). But there are cross-country differences: while deposit dollarization fell by 42 percentage points in Bolivia, it only declined by 10½ percentage points in Uruguay. The average decline in credit dollarization has been similar, amounting to 26 percent, with falls ranging from 41 percentage points in Bolivia to 15 percentage points in Paraguay. The decline in deposit dollarization matched the one in credit dollarization in Bolivia and Peru,

while the reduction in the share of foreign currency deposits was larger in Paraguay and smaller in Uruguay.

Table 1. De-dollarization 2001–10 1/
(In percent)

		Dollarization		De-dollarization
		2001:Q1	2010:Q3	2001-2010
Peru	deposits	78.5	49.7	-28.7
	credit	78.9	52.1	-26.8
Paraguay	deposits	69.7	43.5	-26.1
	credit	53.3	38.6	-14.7
Uruguay	deposits 2/	87.0	76.6	-10.4
	credit	75.1	52.5	-22.6
Bolivia	deposits	93.2	51.4	-41.8
	credit	94.4	53.8	-40.7
Average	deposits	82.1	55.3	-26.8
	credit	75.4	49.2	-26.2

1/ Foreign currency deposits and credit evaluated at constant exchange rate.

2/ Excludes foreign currency deposits for nonresidents.

Dollarization is higher for less liquid deposits. Despite the differences in dollarization across deposits of different maturities, dollarization declined for all types of deposits (Figure 3). In other words, the decline in deposit dollarization reflects a dollarization decline within deposit maturities and not just compositional changes between deposits of different maturity structure. Similarly, dollarization differs across types of credit and it is higher for loans with longer maturities (i.e., mortgages and commercial credit). All credit sectors exhibited a decline in dollarization during the past decade (Figure 4).⁵ Hence, de-dollarization of credit has been driven mainly by de-dollarization changes within each type of credit and not only compositional changes of credit between sectors. Table 2 decomposes, following García-Escribano (2010), the changes in credit and deposit dollarization for Peru into a “within” and “between” component.⁶

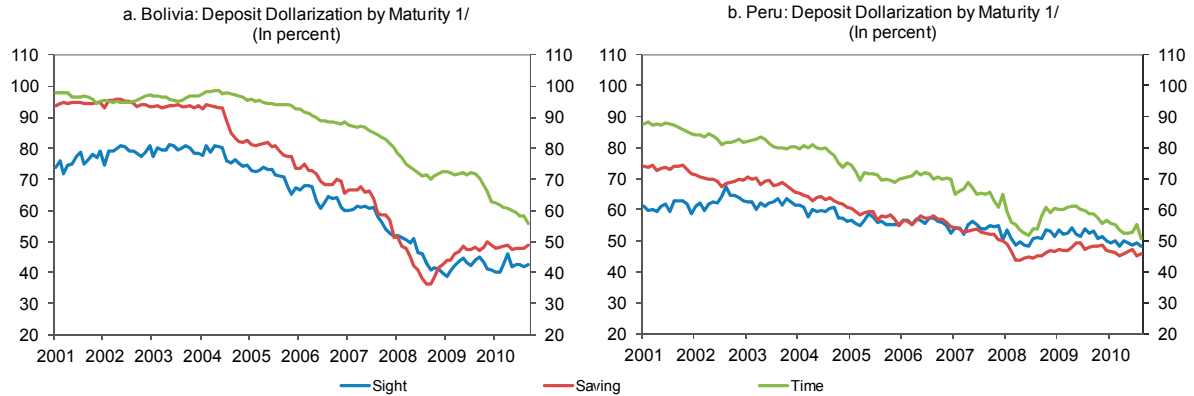
⁵ Figure 3 and Figure 4 illustrate the evolution of dollarization for each category of deposits and credit in Bolivia and Peru, where data with this breakdown is available.

⁶ Changes in credit dollarization through time can be decomposed as

$$d_t - d_\tau = \sum_{i=1}^I d_{it} \frac{c_{it}}{c_t} - \sum_{i=1}^I d_{i\tau} \frac{c_{i\tau}}{c_\tau} = \sum_{i=1}^I (d_{it} - d_{i\tau}) \frac{c_{it}}{c_t} + \sum_{i=1}^I d_{i\tau} \left(\frac{c_{it}}{c_t} - \frac{c_{i\tau}}{c_\tau} \right)$$

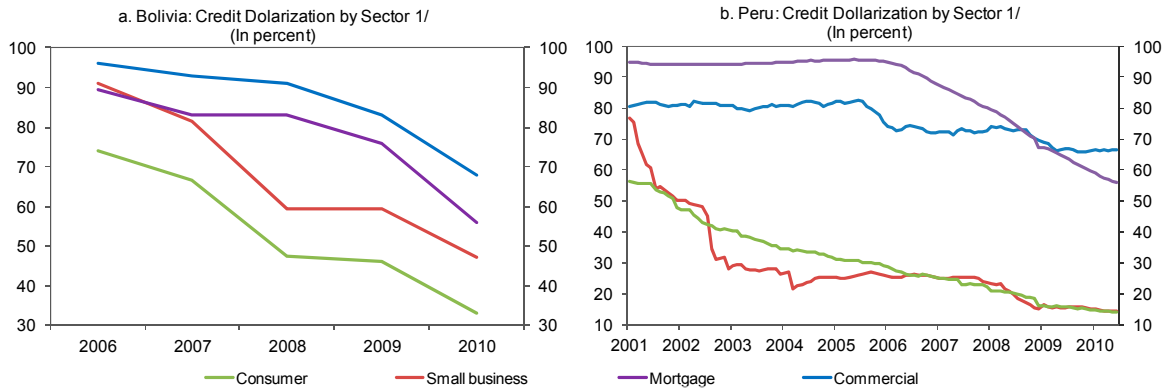
where d_{it} is dollarization of credit in sector i in year t , and c_{it} is the total credit extended to sector i in year t . The first term captures the time-series changes in dollarization within sectors. The second term captures the effect of changes in credit composition. A similar decomposition can be done for deposits.

Figure 3. Evolution of Deposit Dollarization by Maturity



Source: IMF staff calculations.
1/ Foreign currency deposits evaluated at constant exchange rate.

Figure 4. Evolution of Credit Dollarization by Type of Credit



Source: IMF staff calculations.
1/ Foreign currency credit evaluated at constant exchange rate.

Table 2. Peru: Decomposition of De-dollarization Into a Within and Between Components

a. Credit 1/							
Sectors	Dollarization		Share in total credit (in percent)		2001-2010		
	2001	2010	2001	2010	between effect	within effect	total effect
commercial	80.8	66.4	79.0	63.1	-10.5	-11.4	-21.9
small business	50.3	14.4	2.6	6.0	0.5	-0.9	-0.4
consumer	47.8	14.0	9.0	17.0	1.1	-3.0	-1.9
mortgage	94.1	55.8	9.4	13.9	2.5	-3.6	-1.1
total	78.3	52.9	100	100	-6.4	-18.9	-25.4

b. Deposits 1/							
Maturities	Dollarization		Share in total deposits (in percent)		2001-2010		
	2001	2010	2001	2010	between effect	within effect	total effect
sight	58.7	48.4	19.1	30.1	5.3	-2.0	3.4
saving	71.7	45.7	32.1	26.8	-2.4	-8.3	-10.8
time	84.6	50.8	48.9	43.1	-2.9	-16.5	-19.4
total	75.5	48.7	100	100	0.0	-26.8	-26.8

Sources: BCRP, SBS; and IMF staff calculations.

1/ Credit and deposits in foreign currency are evaluated at a constant nominal exchange rate.

2/ Data for credit extends till June 2010. Data for deposits extends till August 2010.

III. EXPLAINING DE-DOLLARIZATION: EMPIRICAL APPROACH

This section describes the methodology and the three groups of factors—specifically, macroeconomic conditions, prudential policy measures, and the development of a capital market in domestic currency—that could have affected banks’ and agents’ preferences for borrowing and lending in domestic and foreign currency.

A. Methodology

The empirical approach used to examine the drivers of short term variations in both deposit and credit dollarization is a standard country specific unrestricted VAR model. In addition to changes in credit and deposit dollarization, the model also includes three sets of variables:

1. macroeconomic variables,
2. the introduction of prudential measures to create incentives for agents to internalize the risks of financial dollarization, and
3. the development of a capital market in domestic currency.

The variables included in each of these groups are defined in Table 3. The selection of these variables is mainly driven by the existing literature.

Table 3. Definition of Variables in the VAR

<i>Macro-variables</i>	
$inflation_t$	Sum over t and $t-1$ of the monthly percentage change of the CPI
e_t	Sum over t and $t-1$ of the monthly percentage change of the nominal exchange rate
s_t	Standard deviation of daily percentage change of the nominal exchange rate over 90-days
$\Delta embi_t$	First-difference of the EMBI spread, divided by 100
<i>Prudential measures</i>	
ΔRR_t	Difference over t and $t-2$ of the spread between the required RR rate on foreign currency deposits to the rate on domestic currency deposits (in percent)
d_t	Dummy equal to 1 (for three months) after the introduction of prudential measures (other than changes in reserve requirements); zero otherwise
<i>Development of domestic capital market</i>	
d_t^{10-30}	Dummy equal to 1 if medium-to-long term bonds (between 10 to 30 years, depending of the country) were issued in that month; zero otherwise.
<i>Financial dollarization</i>	
ΔDL_t	Change over t and $t-1$ of the deposit dollarization ratio
ΔCL_t	Change over t and $t-1$ of the credit dollarization ratio

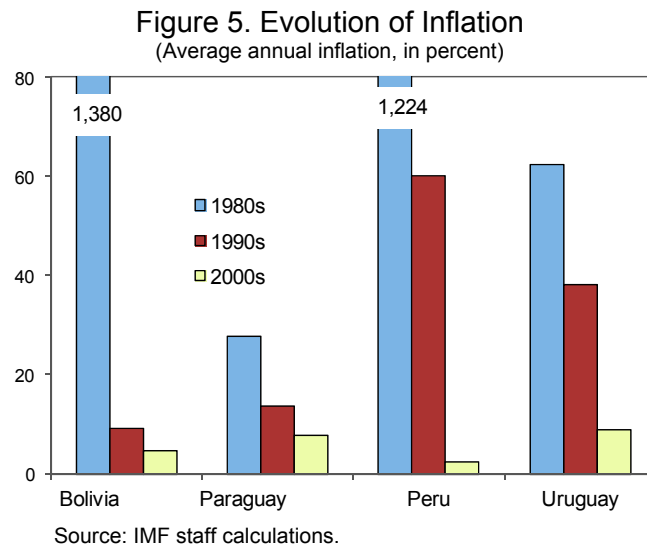
Note: Deposit and credit dollarization are computed at constant exchange rate. In Peru, where data is available, dollarization ratios are computed using December 2008 weights to avoid changes in dollarization reflect composition changes between types of credit and of deposits.

The identification strategy used is a standard Choleski decomposition, and the selected ordering is the following: (i) the introduction of prudential measures in the financial sector; (ii) the extension of the yield curve for public bonds in local currency; (iii) the macro-variables; (iv) the change in deposit dollarization; and (v) the change in credit dollarization. The main results, however, are robust to different orderings of the variables in the model.

The model is estimated with three lags (and six lags in an alternative specification, to check robustness), using monthly data from January 2001 through September 2010 (starting in 2003 and 2004 for Bolivia and Uruguay respectively, to exclude the financial crises in these countries from the sample).

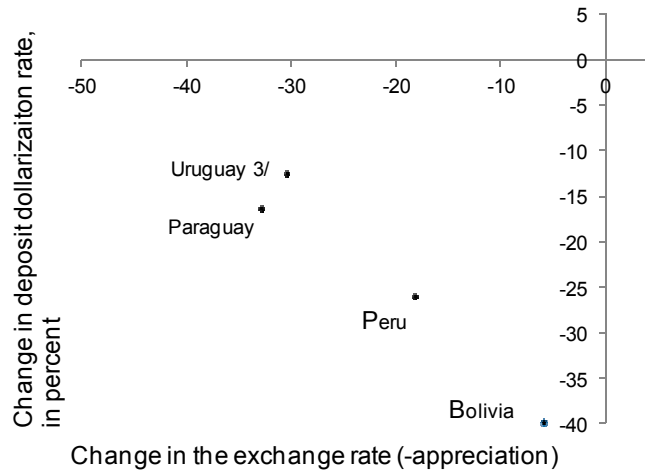
B. Macro variables—the role of exchange rate trend and volatility

De-dollarization has followed the successful implementation of macroeconomic stabilization policies, which have resulted in low inflation, anchored inflation expectations, gradual appreciation of the currencies, and generally stronger fundamentals. Figure 5 shows that in contrast to the previous decades that were characterized by very high inflation, these four countries have successfully contained inflation during the period of analysis.



The decline in dollarization during the past decade in these four countries has been accompanied by an exchange rate appreciation trend (Figures 6 and 7). The empirical analysis in the next section examines whether this appreciation trend has been an important factor explaining de-dollarization, by testing if months with bigger appreciation moves have led to a faster decline of deposit dollarization.

Figure 6. Changes in the Exchange Rate and Dollarization Ratios, 2003–2010 1/ 2/



Source: IMF staff calculations.

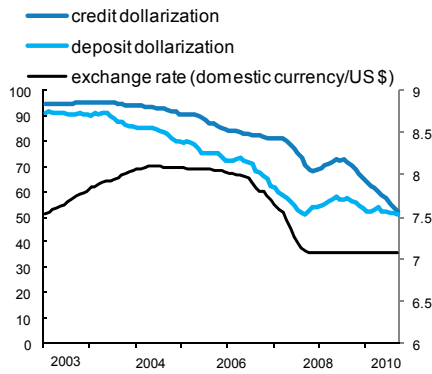
1/ Nominal exchange rate (domestic currency/US\$). Data extends till August 2010. Data for Uruguay starts in January 2004.

2/ Foreign currency deposits evaluated at constant exchange rate.

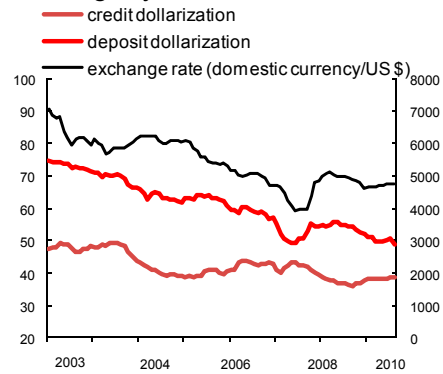
3/ Excludes foreign currency deposits for nonresidents.

Figure 7. Evolution of the Nominal Exchange Rate and Dollarization

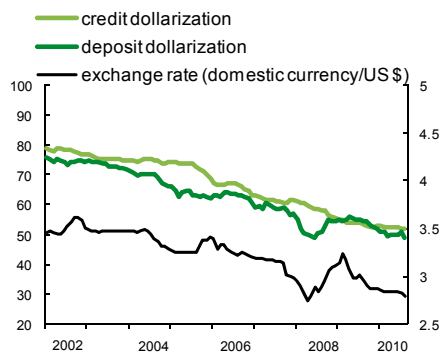
a. Bolivia 1/



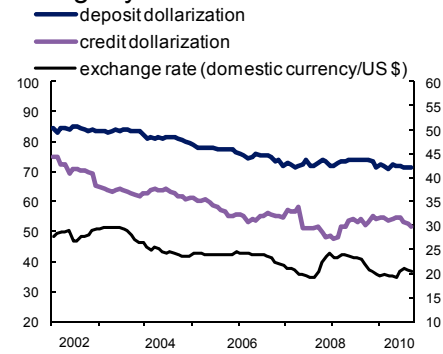
b. Paraguay 1/



c. Peru 1/



d. Uruguay 1/

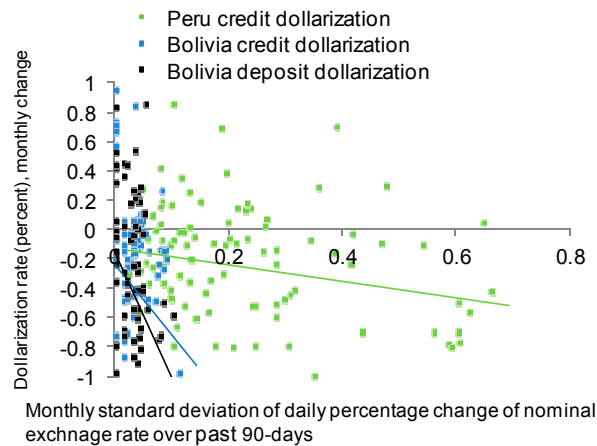


Source: IMF staff calculations.

1/ Foreign currency credit and deposit evaluated at constant exchange rate.

As dollarization rates declined (and hence, vulnerabilities associated to financial dollarization were contained) and preconditions of macro-stability were in place, monetary authorities seem to have had a greater tolerance for exchange rate volatility in some of these countries. A strand of the literature looks at the opposite direction of causality, suggesting that financial dollarization is influenced by exchange rate volatility. However, the evidence on this relationship is mixed. Kokenyne et al. (2010) show that “two-way” exchange rate volatility fosters de-dollarization by rendering foreign exchange risk more apparent. Barajas and Morales (2003) provide evidence that greater exchange rate volatility reduces credit dollarization in a sample of Latin American countries. García-Escribano (2010) and Luca and Petrova (2007) find similar results for Peru and a sample of transition economies respectively. In contrast, Berkmen and Cavallo (2010), Rennhack and Nozaki (2006), and Neanidis and Savva (2009) do not find evidence that a more flexible exchange rate regime, by itself, promotes de-dollarization. Arteta (2005) finds that more flexibility is actually associated with higher dollarization, especially in the case of deposits. Figure 8 shows that higher exchange rate volatility associated with an appreciation trend has been accompanied by a fall in dollarization in the case of credit in Bolivia and Peru, and deposits in Bolivia.

Figure 8. Exchange Rate Volatility and Changes in Dollarization



Source: IMF staff calculations.

1/ Foreign currency credit and deposits evaluated at constant exchange rate.

C. The introduction of prudential measures

During the past decade, Bolivia, Paraguay, Peru and Uruguay introduced different prudential measures to lower banks' incentives to borrow and lend in foreign currency, as well as to diminish agents' preferences for using foreign currency as a means of payments.

Bolivia and Peru have raised provisions for foreign currency loans.⁷ Bolivia, Paraguay, Peru and Uruguay have tightened capital requirements against open foreign exchange positions.⁸ Uruguay required differentiated capital risk weights on foreign currency loans since mid-2006. Bolivia introduced a financial transaction tax on foreign currency debits and credits, while exempted transactions in Bolivianos (mid-2006).

Moreover, these four countries have implemented an active management of their reserve requirements.⁹ In particular, increases in the spread between the required reserve requirement ratios on foreign currency deposits and domestic currency deposits seem to have fostered de-dollarization of deposits and credits. Further to the changes in reserve requirements ratios, the remuneration rates have been modified.¹⁰

In addition to the financial prudential measures listed above, the regulatory framework of these countries includes other measures—such as asymmetric liquidity requirements for foreign and domestic currency liabilities in Peru—with an impact on banking dollarization, but as these were not modified or introduced during the period of analysis, they are not contemplated in the empirical analysis.

D. Capital market development in local currency

Credit de-dollarization seems to have been facilitated by the development of the capital market in local currency, in particular through the issuance of long-term public bonds in domestic currency. With the exception of Paraguay, these countries have been actively developing their public debt market in domestic currency in recent years (Figure 9). Bolivia, Peru and Uruguay have issued public bonds in domestic currency with maturities exceeding 10 years resulting in a considerable extension of the domestic yield curve, which in turn has

⁷ Since early-2009, Bolivian banks are required to constitute an additional provision of up to 1.5 percent for foreign currency denominated loans classified as “A” (best quality). Since mid-2006, Peruvian banks have to carry out a routine evaluation of currency risks, or alternatively, set up an additional reserve ranging from 0.25 to 1 percent for credit in foreign currency that had not been evaluated.

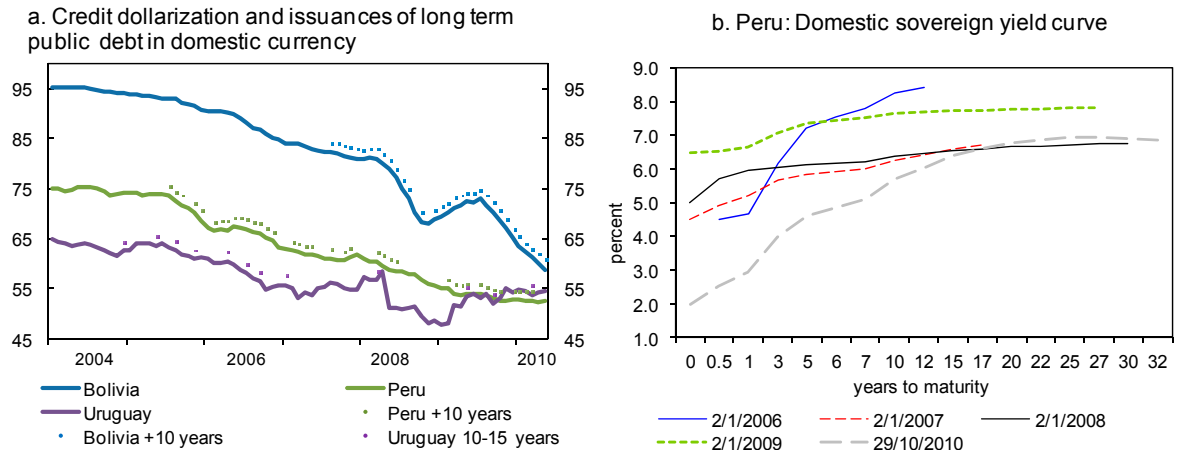
⁸ Bolivia reduced the limit for a bank’s long open position to 60 percent, from 70 percent, in late 2009. Paraguay introduced a net open position limit of 50 percent of capital in mid-2007, and reduced the limit on the long position to 30 percent in late-2008. Peru changed the limit to banks’ long (short) open position to 75 (15) percent of capital in early-2010, from a previous limit of 100 (10) percent of capital. Uruguay set a net open position limit of 150 percent of minimum required regulatory capital in late-2003.

⁹ In December 2008, Bolivia raised the marginal cash reserve requirement for deposits in foreign currency above the level observed in September to 30 percent (the measure was effective in January 2009). In June 2009, Bolivia established that the marginal reserve requirement in domestic currency could be reduced by an amount equivalent to the increase in domestic currency credit relative to the stock of June 30, 2009—up to the equivalent of 100 percent of the cash reserve requirement (2 percent) and 40 percent of the reserve requirement in securities (10 percent). Hence, the reserve requirements associated to deposits in Bolivianos and UFV could decline by half in practice (from 12 percent of deposits to 6 percent).

¹⁰ Changes in remuneration rates are not considered in the empirical analysis below, but further work could usefully focus on this variable.

facilitated bank funding and pricing of long-term loans in domestic currency. The longest maturity of fixed-rate government paper in domestic currency in Peru is 32 years, while it was 5 years in 2003.¹¹ The curve also extends now up to 30 years in Bolivia and 15 years in Uruguay.

Figure 9. Development of Debt Market in Domestic Currency and Dollarization



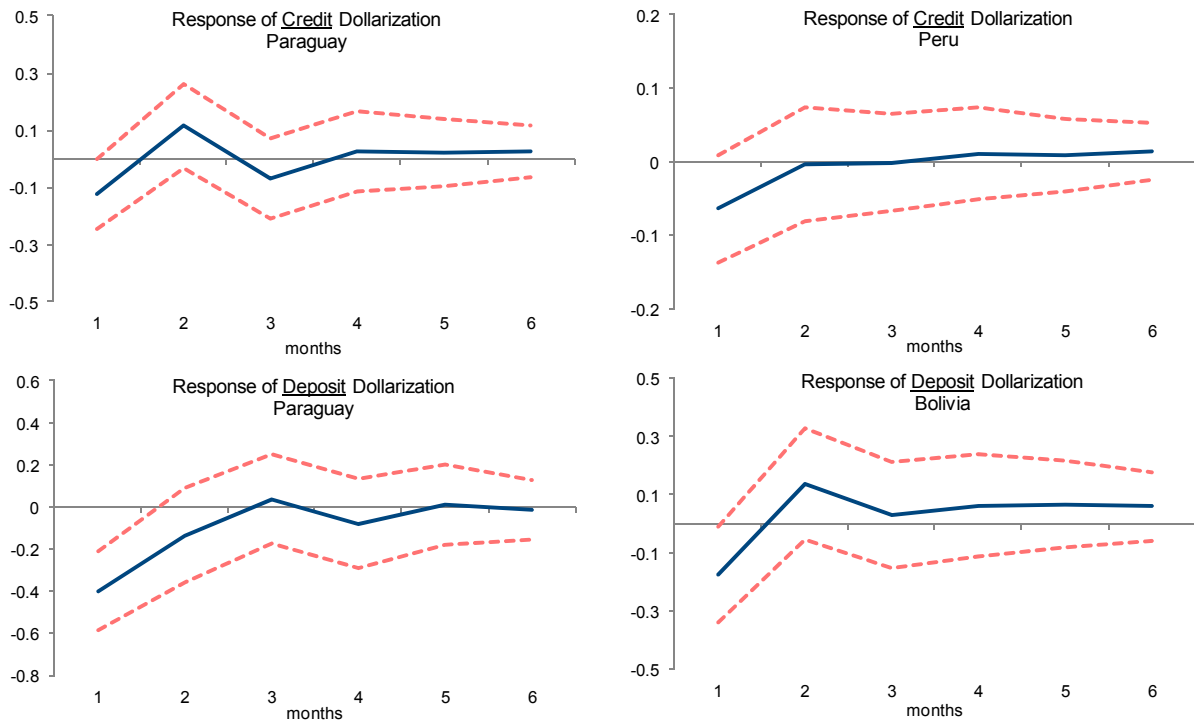
IV. EMPIRICAL RESULTS

The main objectives of the paper are achieved through two standard tools of VAR analysis: impulse response functions and variance decomposition. Impulse responses constitute a practical way to identify the dynamic responses of changes in deposit and credit dollarization to shocks to the rest of the variables in the model, taking into account not only the direct effects of disturbances, but also the indirect effects through reactions of other variables in the model. In this section, we present impulse responses showing the effects at each month, and not the cumulative—and typically larger—effects over time. Variance decomposition provides a quantification of the relative importance of each of the shocks as sources of variations in dollarization levels.

An active management of reserve requirement differentials—in particular by increasing the spread between reserve requirement ratios on foreign and local currency deposits—seems to have contributed to de-dollarization (Figure 10). In fact, an increase in the ratio of foreign-to-local currency reserve requirement rates has helped fostering credit de-dollarization in Paraguay and Peru, and deposit de-dollarization in Bolivia and Paraguay. The impact is quite rapid, with effects being significant only one month after the shock.

¹¹ The inflation adjusted, “VAC”, curve extends up to 39-year tenors, but has limited liquidity, as they only represent 10 percent of the domestic public bonds in Peru. The rest of the domestic public bonds are the fixed-coupon “Tasa Fija” bonds.

Figure 10. Response of Dollarization to a Shock to Differential Reserve Requirement Ratios 1/

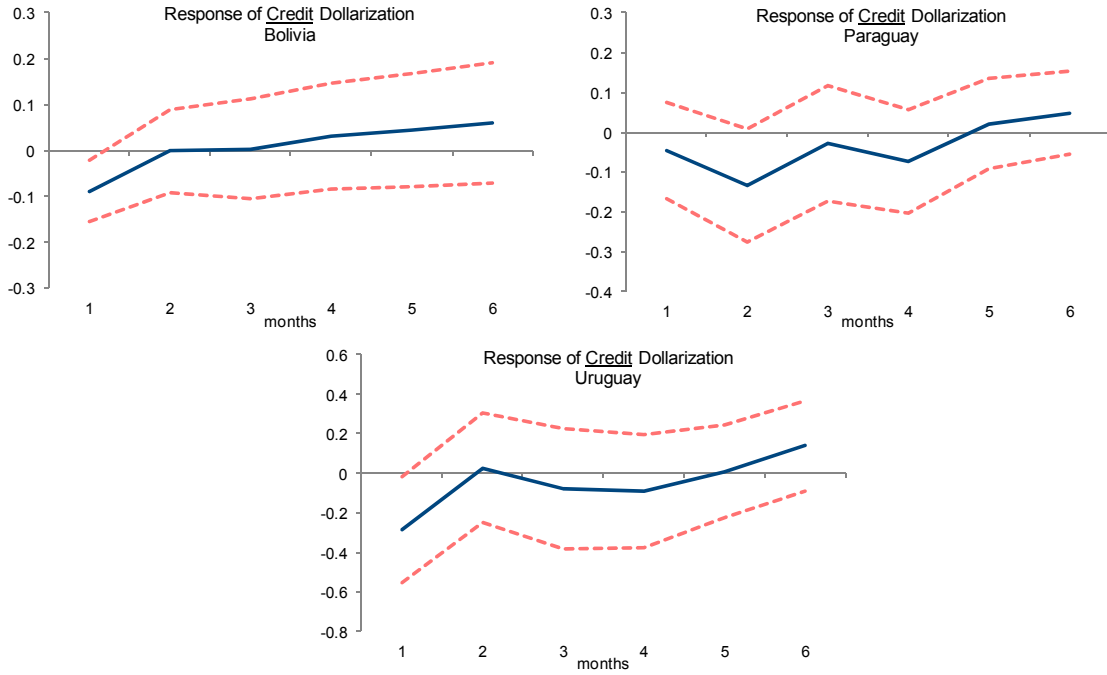


Source: Authors' calculations.
1/ One standard deviation shock + - 2 s.e.

The introduction of other prudential measures creating incentives to internalize the risks of financial dollarization has also tended to help credit de-dollarization in Bolivia, Paraguay, and Uruguay by discouraging lending in foreign currency to unhedged borrowers (Figure 11). These measures include raising provision requirements for foreign-currency denominated loans, introducing differentiated capital risk weights on foreign currency loans, and tightening capital requirements against open foreign exchange positions. These measures typically affect changes in credit dollarization on impact, with effects lasting for up to two months. The impact on deposit dollarization, in contrast, is not statistically significant.

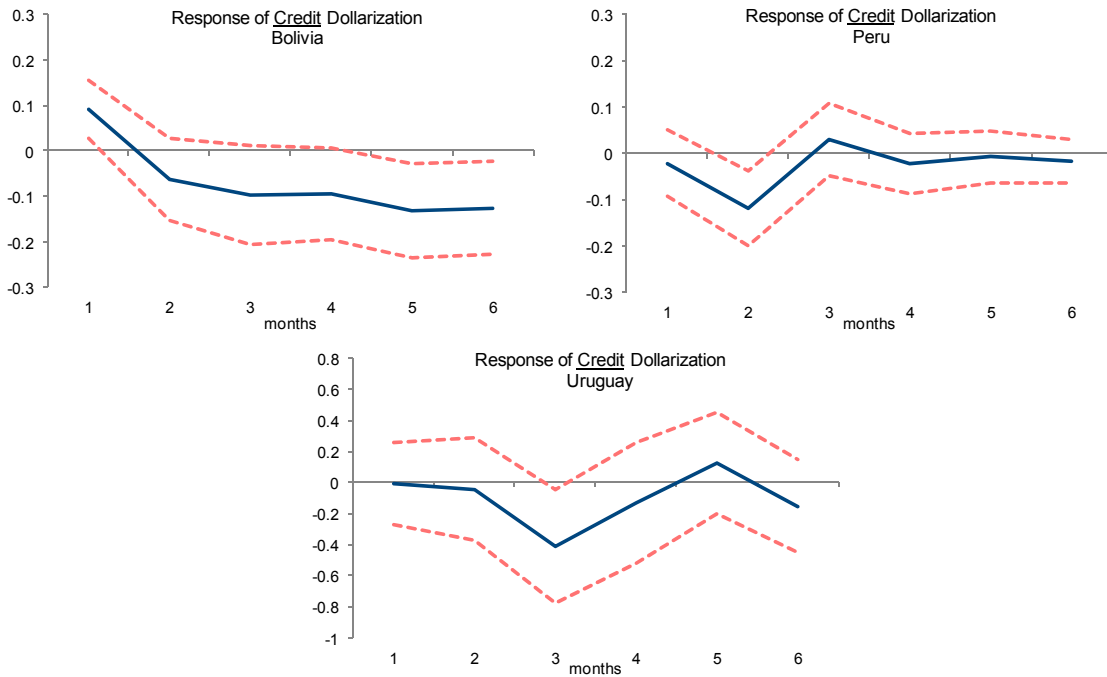
The extension of the yield curve of local currency public bonds has also contributed to credit de-dollarization in these countries (Figure 12). Bolivia, Peru and Uruguay have recently issued public bonds in domestic currency with maturities exceeding 10 years, while Paraguay has not started to issue long-term public debt in local currency yet. The existence of a benchmark for long-term domestic currency debt has facilitated the pricing of private instruments in local currency at longer maturities. The effects of issuance of domestic currency long-term public bonds on deposit de-dollarization, however, are not significant.

Figure 11. Response of Dollarization to the Introduction of Prudential Measures 1/



Source: Authors' calculations.
1/ One standard deviation shock + - 2 s.e.

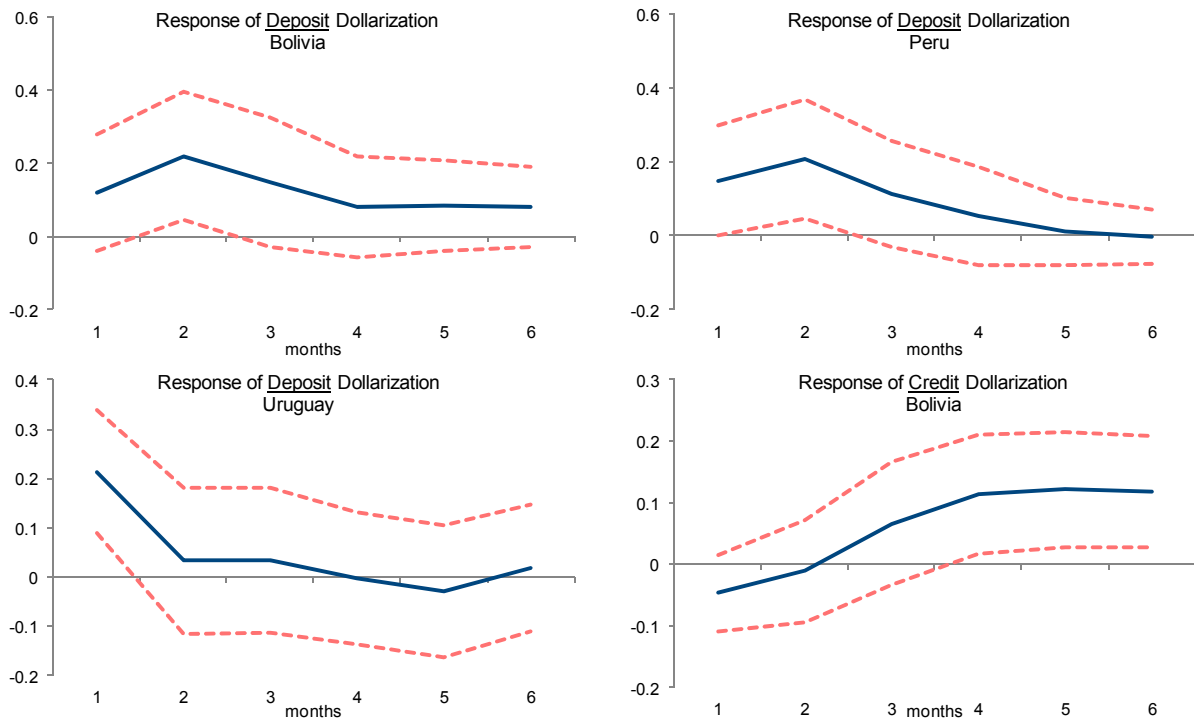
Figure 12. Response of Dollarization to the issuance of Local Currency Long-term Bonds 1/



Source: Authors' calculations.
1/ One standard deviation shock + - 2 s.e.

The exchange rate appreciation trend observed in the past decade has been an important factor to explain deposit de-dollarization in Bolivia, Peru, and Uruguay (Figure 13). The impact of an exchange rate shock is typically rapid and significant. Expectations of further appreciation and higher returns of local currency deposits have created incentives to shift to local currency deposits. In Paraguay, however, the effects on deposit dollarization do not appear to be significant. In Bolivia, the exchange rate appreciation has also played a role in credit de-dollarization, but we do not find any such effects in Paraguay, Peru, and Uruguay.

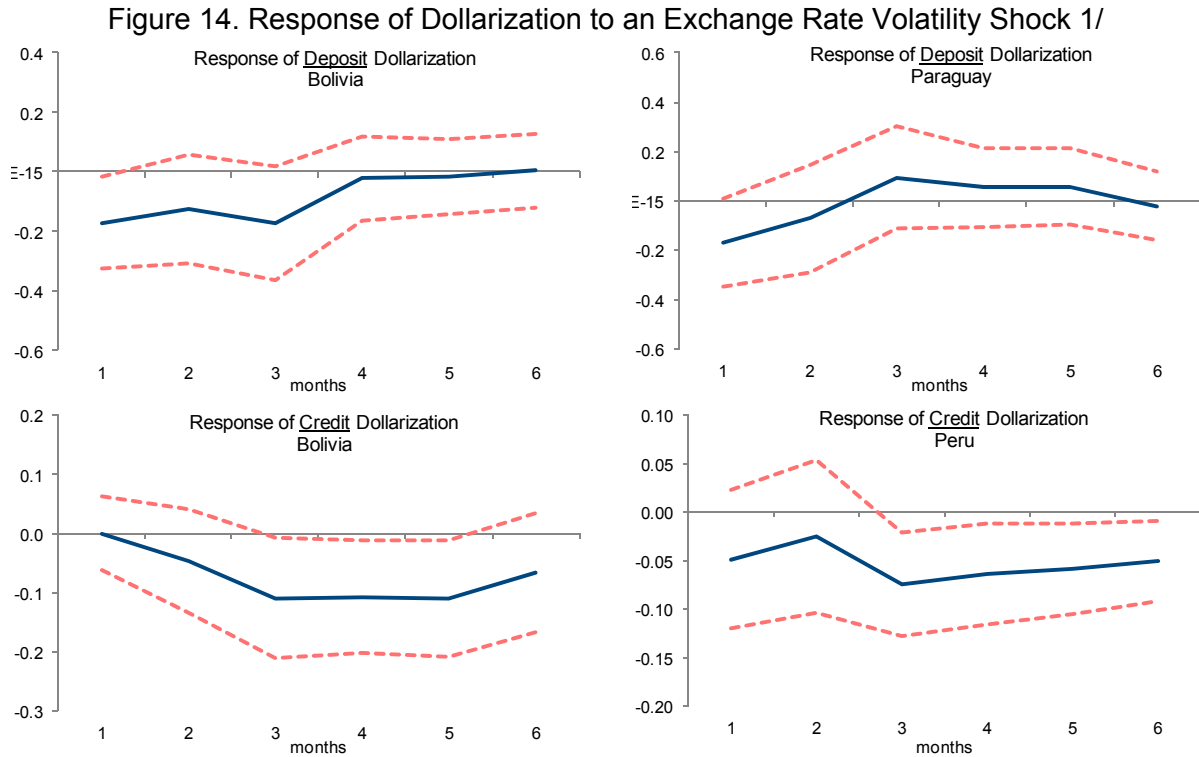
Figure 13. Response of Dollarization to an Exchange Rate Shock 1/



Source: Authors' calculations.
1/ One standard deviation shock \pm 2 s.e.

The evidence on the effects of exchange rate volatility on financial dollarization is mixed, somewhat inconclusive and requires some interpretation. Shocks to exchange rate volatility have contributed to de-dollarization of credit in Peru (Figure 14), a result consistent with the findings of García-Escribano (2010) using a different specification of the model. Exchange rate volatility shocks seem to have helped deposit de-dollarization in Paraguay, although the results are not strongly significant. In Uruguay, exchange rate volatility does not appear to have contributed to de-dollarization. Interestingly, shocks to exchange rate volatility have had a positive impact on both deposit and credit de-dollarization in Bolivia. This is interesting and a bit surprising at first, given that the size of these shocks in Bolivia is much smaller than in the other three countries (Table 4). In fact, Bolivia's exchange rate regime is a crawling peg to the U.S. dollar, with smooth exchange rate movements. During this period, the Boliviano has appreciated slowly but steadily under the crawling peg since 2005, and has remained de-facto pegged since October 2008. Thus, in the case of Bolivia higher exchange

rate volatility has not implied a “two-way” volatility, but larger changes in the same direction—appreciation in most of the period of analysis. Thus, a plausible interpretation is that exchange rate volatility shocks actually reflected larger appreciation changes, fueling the perception of deposits in Bolivianos as a “one-way bet”, and providing stronger incentives to switch into them.¹²



Source: Authors' calculations.
1/ One standard deviation shock \pm 2 s.e.

Table 4. Size of the Shock 1/

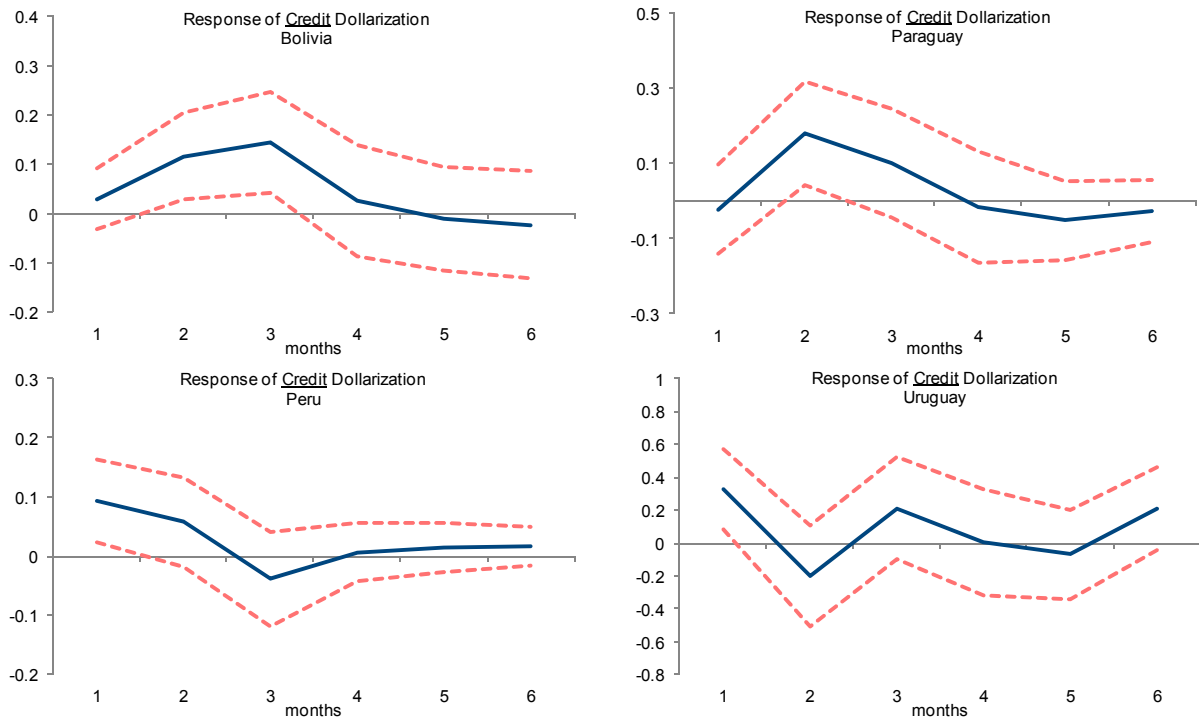
	ER changes	ER volatility
Bolivia	0.21	0.01
Paraguay	2.56	0.14
Peru	1.31	0.08
Uruguay	2.06	0.16

Source: Authors' calculations.
1/ One standard deviation shock.

¹² There is an alternative interpretation of the results. The trend towards appreciation could signal in some of these countries a regime shift towards more exchange rate flexibility. This may imply that the ex-ante expected volatility could be higher than the ex-post observed volatility, since agents would now expect that the central bank allows sharp exchange rate movements in either direction if necessary. Under this interpretation, changes in the exchange rate (in light of the appreciation trend) would be to some extent capturing greater flexibility, fostering de-dollarization by introducing a two-way exchange rate risk.

The methodological approach used in this paper, allows also examining the existence of any relationship between changes in deposit and credit dollarization, and the direction of causality. Our findings show that causation goes from changes in deposit to changes in credit dollarization. In fact, changes in deposit dollarization have a strong impact on credit dollarization in the same direction in all these countries (Figure 15). These are expected results, and mainly reflect the banks' behavior of maintaining a matched foreign currency position. Thus, the declining trend in deposit dollarization has also played a role in fostering de-dollarization of credit during this period.

Figure 15. Response of Credit Dollarization to a Shock to Deposit Dollarization 1/



Source: Authors' calculations.
1/ One standard deviation shock \pm 2 s.e.

In order to assess the sensitivity of our results, we conduct a number of robustness tests. First, we extend the number of lags included in the model to 6 months. Second, we estimate the model using alternative Choleski orderings of the variables. Third, we modify the definition of deposit (and credit) dollarization, by using the ratio of foreign currency deposits (credit) to total deposits (credit) at current exchange rates instead of measuring at constant exchange rates as in the baseline specification. Finally, in the case of Uruguay, we estimate the VAR using dollarization ratios for deposits of only residents, in contrast to the baseline estimation, where we include total deposits.¹³ The results of all these exercises do not differ significantly from those obtained in our baseline specification.

¹³ While non-resident deposits account for about 20 percent of deposits in Uruguay's banking system, they represented more than 40 percent in 2001—before the 2002 banking crisis.

Tables 5 and 6 show the relative importance of shocks to different variables included in the model to explain variations in deposit and credit dollarization. These tables illustrate the role played by each of the variables with an impact on dollarization, based on the impulse response functions shown above. On average, changes in prudential regulation (including changes in reserve requirement ratios) explain about 7 percent of credit dollarization variations.¹⁴ The contribution of shocks to the development of a local currency public bonds market is about 11 percent on average. Changes in deposit dollarization, in turn, account for about 8 percent of credit dollarization fluctuations. In the case of deposits, exchange rate movements explain around 8 percent of dollarization variations. The percentages explained by these variables seem to be somewhat low. This may be related to the short number of lags (3 months) used in the baseline model. In fact, in the alternative specification with 6 lags, the fraction explained by these variables is substantially larger.

Table 5. Variance Decomposition of Changes in Credit Dollarization

Contribution of shocks to prudential measure variables					
Horizon (months)	Bolivia	Paraguay	Peru	Uruguay	Average
(in percent)					
1	7.9	4.0	3.7	5.8	5.3
3	4.9	9.4	3.1	4.9	5.6
6	8.4	10.6	3.1	6.8	7.2
Contribution of shocks to local currency bond market development					
Horizon (months)	Bolivia	Peru	Uruguay	Average	
1	7.7	0.3	0.0	2.7	
3	8.8	8.1	8.3	8.4	
6	15.8	7.8	9.2	10.9	
Contribution of shocks to deposit dollarization					
Horizon (months)	Bolivia	Paraguay	Peru	Uruguay	Average
(in percent)					
1	0.8	0.1	5.8	7.5	3.6
3	14.3	7.4	7.0	9.4	9.5
6	9.1	7.6	6.7	9.9	8.3

Source: Authors' calculations.

Table 6. Variance Decomposition of Changes in Deposit Dollarization
Contribution of shocks to exchange rate changes

Horizon (months)	Bolivia	Paraguay	Peru	Uruguay	Average
(In percent)					
1	2.3	0.2	3.2	13.0	4.7
3	10.2	1.2	9.4	10.6	7.8
6	10.9	1.5	9.2	8.9	7.6

Source: Authors' calculations.

¹⁴ For a horizon of six months.

In sum, what have been the main short-term drivers of financial de-dollarization in Bolivia, Peru, Paraguay, and Uruguay? Table 7 summarizes our findings.

- First, forces driving deposit de-dollarization are different from those driving credit de-dollarization.
- In the case of credit, an active management of reserve requirements and the introduction of other prudential measures to internalize the risks associated with financial dollarization have both played a role in fostering de-dollarization.
- The development of a capital market in local currency by extending the yield curve of public bonds has also contributed to credit de-dollarization.
- De-dollarization of deposits has also contributed to credit de-dollarization given the banks' matching behavior of foreign currency positions.
- In the case of deposits, the main factor behind de-dollarization has been the appreciation trend observed in all these countries in recent years.
- Changes in other macroeconomic variables such as inflation rates and EMBI spreads do not appear to have any short-term impact on financial de-dollarization. This does not mean that macroeconomic stability is not important. On the contrary, macroeconomic stability and strong fundamentals are pre-conditions for de-dollarization. Once stability is achieved and macro-fundamentals are relatively strong, changes in macroeconomic variables may not have a marginal effect on de-dollarization.

Table 7. What Drives De-dollarization?
Impulse Response Functions: Summary of Results

	D(RR)	Prudential	Issuance	D(ER)	Vol(ER)	D(infl)	D(EMBI)	D(DL)
<u>Deposit Dollarization</u>								
Bolivia	√	n.s.	n.s.	√	√	n.s.		n.s.
Paraguay	√	n.s.		n.s.	√	n.s.		n.s.
Peru	n.s.	n.s.	n.s.	√	n.s.	n.s.	n.s.	n.s.
Uruguay	n.s.	n.s.	n.s.	√	n.s.	n.s.	n.s.	n.s.
<u>Credit Dollarization</u>								
Bolivia	n.s.	√	√	√	√	n.s.		√
Para	√	√		n.s.	n.s.	n.s.		√
Peru	√	n.s.	√	n.s.	√	n.s.	n.s.	√
Uruguay	n.s.	√	√	n.s.	n.s.	n.s.	n.s.	√

V. CONCLUDING REMARKS

While the steady decline in financial dollarization observed in Bolivia, Paraguay, Peru and Uruguay in recent years has been remarkable, dollarization levels remain high. This suggests that one decade of efforts may not be enough to fight a phenomenon so entrenched in these economies, and countries should continue striving to lower dollarization levels in the financial sector.

What are the main policy implications, not only for these countries to continue on the route to de-dollarization but also for other countries with still high levels of financial dollarization? Our findings highlight the importance of:

- First, maintaining strong fundamentals and macroeconomic stability (for instance, keeping a low and stable inflation).
- Second, ensuring that the prudential regulation framework of the financial sector (including an active management of reserve requirements) provides incentives for an appropriate internalization of currency risks by agents.
- Finally, further developing local currency capital markets. Capital markets in domestic currency in these countries are still narrow, and their continued development would help enhancing de-dollarization. This implies deepening not only local currency markets for public but also for private bonds.

References

- Armas, A., N. Batini, and V. Tuesta, 2007, “Peru’s Experience with Partial Dollarization and Inflation targeting,” IMF Country Report 07/53.
- Armas, A., A. Ize, and E. Levy, eds., 2006, “Financial Dollarization—The Policy Agenda,” IMF: Palgrave Macmillan, New York.
- Arteta, C., “Exchange Rate Regimes and Financial Dollarization: Does Flexibility Reduce Bank Currency Mismatches?,” Berkeley Electronic Journals in Macroeconomics, Topics in Macroeconomics 5 (2005): Article 10.
- Banco Central Reserva de Peru, 2005, “Fenómeno de la Dolarización,” in Reporte de Inflación, May, pp. 42–46.
- Barajas, A., Morales, R.A., 2003, “Dollarization of Liabilities: Beyond the Usual Suspects,” IMF Working Paper 03/11.
- Berkmen, P., and E. Cavallo, 2010, “Exchange Rate Policy and Liability Dollarization: What do the Data Reveal about Causality?,” Review of International Economics, 18(5), pp. 781-795.
- Broda, C. and E. Levy-Yeyati, 2003, “Endogeneous Deposit Dollarization,” Staff Report 160 (New York: Federal Reserve Bank of New York).
- Castillo, P., and D. Winkelried, 2006, “Dollarization Persistence and Individual Heterogeneity,” Manuscript.
- Cayazzo, J. et al., 2006, “Toward and Effective Supervision of Partially Dollarized Banking Systems,” IMF Working Paper 06/32.
- De Nicolo, P. Honokan, and A. Ize, 2005, “Dollarization of Bank deposits: Causes and Consequences,” Journal of Banking and Finance 29, pp. 1697–1727.
- Erasmus, L., J. Leichter, and J. Menkulasi, 2009, “Dedollarization in Liberia—Lessons from Cross-country Experience,” IMF Working Paper 09/37.
- Fernandez-Arias, E., 2005, “Financial Dollarization and Dedollarization,” Inter-American Development Bank, Economic and Social Study Series (Washington DC: Inter-American Development Bank).
- García-Escribano, M., 2010, “Peru: Drivers of De-dollarization,” Central Reserve Bank of Peru, Working Paper Series No. 2010–11.
- García-Escribano, M., 2010, “Peru: Drivers of De-dollarization,” IMF Working Paper 10/169.

- Galindo, A. and L. Leiderman, 2005, “Living with Dollarization and the Route to Dedollarization,” IDB Working Paper No. 526 (Washington DC: Inter-American Development Bank).
- Ize, A. and E. Levy-Yeyati, 2005, “Financial De-dollarization: Is it for Real?,” IMF Working Paper 05/187.
- Ize, A. and E. Levy-Yeyati, 2003, “Financial Dollarization,” *Journal of International Economics* 59, pp. 323–347.
- J.P. Morgan Securities Inc., October 2009, “Local Markets Guide”.
- Kokenyne, A., J. Ley, and R. Veyrune, 2010, “Dedollarization,” IMF Working Paper 10/188.
- Luca, A., Petrova, I., 2008, “What Drives Credit Dollarization in Transition Economies?” *Journal of Banking and Finance* 32 (5), 858–869.
- Morón, E., and Castro, J. F., 2003, “De-dollarizing the Peruvian Economy: A Portfolio Approach,” Centro de Investigación de la Universidad del Pacifico, Documento de Discusión 03/01.
- Neanidis, K., and C. S. Savva, 2009, “Financial Dollarization: Short-Run Determinants in Transition Economies,” *Journal of Banking and Finance* 33, 1860–1873.
- Quispe, Z., 2000, “Política Monetaria en una Economía con Dolarización Parcial: el Caso de Perú,” Banco Central Reserva de Perú, Estudios Económicos No. 6.
- Rennhack, R. and M. Nozaki, 2006, “Financial Dollarization in Latin America,” in Armas, A., A. Ize, and E. Levy, eds, 2006. “Financial Dollarization—The Policy Agenda” IMF: Palgrave Macmillan, New York.
- Reinhart, C., R. Rogoff, and M. Savastano, 2003, “Addicted to Dollars,” NBER Working Paper 10015 (Cambridge, MA: National Bureau of Economic Research, Inc.).