De-dollarization of Credit in Peru: The Role of Conditional Reserve Requirements

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This chapter documents and evaluates the use of conditional reserve requirements in Peru to reduce credit dollarization. The empirical analysis uses the counterfactual test proposed by Pesaran and Smith (2012) and shows that both the high reserve requirements, used countercyclically since 2010, and the de-dollarization program put in place by the Central Reserve Bank of Peru (BCRP) since 2013 had statistically significant effects on reducing dollar lending by banks in Peru. The chapter also discusses the impact on banks' balance sheets of the complementary tools created as part of the de-dollarization program to inject domestic currency liquidity.

Peru is a successful market-driven case of de-dollarization, which reflects both macroeconomic stability and prudential policies. Since the adoption of inflation targeting in 2002, inflation has averaged 2.7 percent and core inflation reached 2.1 percent, one of the lowest levels in Latin America for the period 2001–15. During the same period, loan dollarization declined steadily from levels close to 80 percent to less than 30 percent.

During 2011 and 2012, the low levels of international interest rates and the appreciation of the domestic currency in Peru that followed the U.S. Federal Reserve's quantitative-easing policies generated a rebound in the expansion of dollar credits, slowing the decline in credit dollarization. In this context, in 2013, the BCRP initiated a more ambitious program of credit de-dollarization that combined a set of contingent reserve requirements[1] and a new set of instruments

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[1]Within the de-dollarization program, additional reserve requirements are activated when bank dollar lending exceeds certain levels set by the BCRP. Separate levels for two categories of banks' dollar lending were set. First, in February 2013, the BCRP set the limits for mortgage and automobile credits, and then in September 2013, it established the limits for total credit in dollar loans, excluding loans for trade. The limits were set as a fraction of the stock of dollar loans at the beginning of the program, and they are adjusted as banks comply with reducing credit dollarization.

219

aimed at providing the liquidity in domestic currency and the currency hedge that the conversion of dollar loans into sol loans required.

Following the implementation of these measures, credit dollarization decreased from 38 percent to 28 percent in 2015, and the stock of dollar loans declined by 15 percent on average for the banking system. However, a proper evaluation of the empirical impact of the de-dollarization program requires distinguishing its effects from those associated with changes in the determinants of credit dollarization, such as changes in exchange rate risk. In order to accomplish this task, we use the counterfactual test developed by Pesaran and Smith (2012), a methodology that allows us to generate an unbiased estimator of the impact of policy changes in order to statistically assess the impact on credit dollarization of the de-dollarization program and the use of countercyclical reserve requirements since 2010. We also discuss the impact on bank balance sheets of the complementary tools created as part of the de-dollarization program to inject domestic currency liquidity.

Our empirical results show that the de-dollarization program had a statistically significant effect on the degree of dollarization of bank credit in 2015. In particular, two-thirds of the reduction of credit dollarization in 2015 was explained by the de-dollarization program and one-third by other factors, such as exchange rate volatility. Moreover, the results show that the countercyclical use of reserve requirements since 2010 had a significant effect on dollar loan growth rates, but the impact on de-dollarization was not statistically significant. As both domestic and foreign currency reserve requirements have been raised in tandem since 2010, both credit in domestic and in foreign currency slowed simultaneously, making the impact on credit dollarization less clear. Also, the increase in capital requirements for dollar loans had a negative impact on mortgage and automobile loans, although its impact was not statistically significant according to the test of Pesaran and Smith (2012).

This chapter is related to a growing literature that studies the impact of regulatory tools on credit conditions and systemic risks. Garcia-Escribano (2010) used vector autoregressive models to assess the impact of prudential tools such as reserve requirements and higher capital requirements on the de-dollarization of credit for a selected set of Latin American countries. Armas, Castillo, and Vega (2014) tested the impact of reserve requirements on credit conditions for Peru using the Pesaran and Smith (2012) methodology. Vargas and Cardozo (2012) performed a similar evaluation for Colombia.

Another branch of the literature related to this chapter has linked monetary policy with systemic risks. For advanced economies, Borio and Zhu (2008) have highlighted the relevance of the risk-taking channel. This channel is further strengthened by regulatory standards that increase risk-weighted capital in response to a fall in default risks created by the appreciation of collateral values.[2]

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[2]Ioannidou, Ongena, and Peydró (2009), Jiménez and others (2009), and Maddaloni and Peydró (2011) find empirical evidence supporting this channel using loan-level data. However, using more aggregate data, Merrouche and Nier (2010) and Dell'Ariccia and others (2012) find less conclusive empirical evidence in favor of this channel.

In addition, monetary policy affects borrowers' balance sheets by altering their income flows and loan repayment capacity. Thus, an increase in the policy rate may exacerbate default risks for borrowers by inducing higher leverage and lower income flows. The fall in asset prices in response to higher interest rates further reinforces the impact of monetary policy on default risks.[3]

The next section of this chapter explains the use of reserve requirements by the BCRP and capital requirements by the Superintendence of Banks, Insurance Companies and Pension Funds (SBS) to reduce credit dollarization in Peru. The chapter then discusses the rationale and main features of the de-dollarization program and quantifies the effectiveness of reserve requirements in foreign currency in reducing financial dollarization by employing a counterfactual test following Pesaran and Smith (2012). The final section presents some concluding remarks.

DE-DOLLARIZATION AND PRUDENTIAL POLICIES

De-dollarization is a fundamental strategy of prudential policies aimed at preserving financial stability in Peru. Since financial stability is not explicitly assigned to any particular institution, each regulatory body uses its own instruments to achieve this objective. The SBS is in charge of supervising and regulating financial institutions to guarantee their individual solvency conditions. Its toolbox includes capital requirements, provisioning, and limits to banks' operations. For its part, the BCRP has as its main objective to maintain price stability, although it has a mandate to regulate the credit and payment systems. The BCRP is also the lender of last resort, which makes financial stability an integral part of the monetary policy design.

Unlike that of other inflation targeters, the inflation-targeting regime implemented in Peru factored in the impact of financial dollarization on the transmission mechanism of monetary policy and on financial stability. The adoption of a target of 2 percent with a tolerance range of 1 to 3 percent for headline inflation aims to generate strong incentives for local agents to de-dollarize their assets and liabilities. This, along with the active use of additional monetary tools, is part of the BCRP's efforts to limit financial risks created by financial dollarization.[4] Reserve requirements and a precautionary accumulation of international reserves are employed to limit liquidity and solvency risks associated with exchange rate

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[3]Consistent with this channel, Allen and Gale (2000), Goodhart, Tsomocos, and Vardoulakis (2009), and Illing (2007) find an increase in the probability of a financial crisis after monetary policy tightening. On the other hand, Sengupta (2010) shows that an increase in the interest rate in the United States after 2004 increased the debt service burden on adjustable rate mortgages, which increased the defaults of Alt-A mortgages loans in 2006.

[4]Although Peru has attained inflation rates below 5 percent since 1997, dollarization ratios remained above 50 percent until 2010. See Winkelried and Castillo (2010) and Rappoport (2009) for explanations of the persistence of financial dollarization.

fluctuations, and foreign exchange market intervention is used to limit exchange rate volatility.

Besides delivering low and stable inflation, the current monetary policy framework has also contributed to providing an effective response to the global financial crisis by limiting its spillover effects on the domestic financial system. The Asian and Russian crises had a severe impact on the Peruvian banking system, with bank credit collapsing in Peru and several banks falling into bankruptcy in 1999 and 2000. In contrast, during the global financial crisis, domestic banks continued to provide credit to the private sector at an even faster pace than in 2008, and no banks went bankrupt in Peru.

Liquidity and credit risks induced by exchange rate fluctuations are among the most relevant risks facing the Peruvian economy. Liquidity risks are associated with the central bank's inability to print dollars, which significantly reduces its ability to act as lender of last resort. Credit risk is associated with the existence of currency mismatches that increase the default probability of agents borrowing in dollars. The cash flows of those agents do not increase with the value of the dollar. A common feature of these two additional sources of financial vulnerability is that both create negative externalities that justify policy intervention. They can also trigger potential nonlinear dynamics with undesirable consequences for financial stability, which justifies the use of precautionary policy measures.

The existence of a currency mismatch on the balance sheet of domestic agents generates an externality to the financial system because agents either do not properly internalize the foreign-currency-induced risk or engage in moral hazard behavior. Even nontradable firms that set prices in foreign currency do not realize that the nature of the mismatch is real. In other words, a negative shock to the economy that depreciates the real exchange rate increases the real debt of nontradable firms by reducing the net present value of cash in dollars.

The complementary instruments used by the BCRP generate incentives to reduce credit dollarization and, thus, reduce the exposure of banks' assets to the credit risk associated with currency mismatches, as well as the spillovers and externalities for financial stability that dollarization generates. These instruments aim to (1) help banks to internalize dollarization risks; (2) prevent the impact of shocks from spreading across the economy; and (3) enhance the financial system's capacity to absorb shocks.

These objectives are achieved by (1) increasing the level of international liquidity in the financial system; (2) raising the cost of intermediation in dollars to curb excessive credit growth; and (3) reducing exchange rate volatility to prevent negative balance sheet effects.[5] Table 9.1 summarizes the main financial risks that each prudential instrument is tailored to mitigate, as well as the instruments

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[5]See Rossini, Quispe, and Rodriguez (2011) for a detailed discussion about the BCRP foreign exchange intervention strategy.

TABLE 9.1

Use of Macroprudential Policy Instruments			
Instrument/Objective	**Liquidity Risk**	**Excessive Credit Growth**	**Mismatch**
Reserve requirements on foreign currency deposit	Higher than reserve requirements on domestic deposits given that central bank cannot act as lender of last resort	Reserve requirements on foreign currency deposits are hiked during episodes of capital inflows	Additional reserve requirements conditional on the evolution of credit in foreign currency to curb mismatches on private agents' balance sheets
Reserve requirements on domestic currency deposits		Reserve requirements on domestic currency deposits are hiked during episodes of capital inflows	
Reserve requirements on short-term liabilities	Excessive reliance on short-term liabilities generates liquidity risk for banks		Reserve requirements on short-term liabilities provide banks with incentives to fund their activities with more stable funding (match maturity)
Capital requirements		Cyclical capital requirements	High capital requirements on foreign currency loans
Provision requirements		Cyclical provisions	

used by the SBS, such as capital requirements and higher provisioning, which have been designed to reduce credit risk and limit currency mismatches.

Although a formal macroprudential committee is not in place in Peru, the SBS, BCRP, and Ministry of Economy and Finance (MEF) have held periodic meetings since 2008 to analyze potential sources of systemic risk and coordinate policies to mitigate them. Several of the macroprudential policies implemented by each entity since 2008 have been closely coordinated within this committee.[6] However, a key difference between the instruments used by the SBS and the BCRP is the scope of the systemic risks they aim to mitigate. The BCRP's instruments target mainly liquidity risks, both in domestic and foreign currency and excessive credit growth, whereas SBS instruments focus mainly on strengthening the financial system's capacity to absorb potential losses.

In addition, reserve requirements are used to limit the spillover effects of capital flows on domestic monetary conditions, particularly after the quantitative expansionary policies put in place by the U.S. Federal Reserve. The use of the aforementioned monetary instruments by the BCRP is discussed below.

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[6]For a detailed description and analysis of the macroprudential policies implemented in Peru, see Choy and Chang (2014).

Reserve Requirements

Reserve requirements in dollars are calibrated to increase the cost of lending and curb credit growth, or to increase the cost of using short-term external funding to expand domestic credit. In addition, since 2008 the BCRP has used reserve requirements in a more cyclical fashion by raising their average and marginal levels during periods of capital flow surges and reducing them during capital reversal episodes.[7] By increasing reserve requirements in foreign currency during periods of intense capital inflows, the BCRP reduces banks' incentives to lend in dollars. At the same time, it creates a foreign currency buffer to reduce banks' vulnerability to capital flow reversals.

The 2007–09 global financial crisis put the inflation target cum financial risk control to the test. Inflation was running above target during the first half of 2008. High inflation called for higher domestic policy interest rates and a widening spread vis-à-vis foreign interest rates. In turn, higher interest rate spreads against the U.S. federal funds rate induced more carry trades and short-term capital inflows in the run-up to the crisis. Elevated bank liquidity levels originated by capital inflows hindered the conduct of monetary policy and intensified appreciation pressures. In this context, in addition to raising the reference rate (from 4.5 percent in July 2007 to 6.5 percent in August 2008) in response to inflationary pressures, the BCRP increased reserve requirements on domestic and foreign currency deposits to ensure an orderly expansion of liquidity and credit. The BCRP also accumulated a significant amount of international reserves, mainly through foreign exchange intervention sterilized with fiscal savings.[8]

In September 2008, the BCRP responded immediately to the turbulence caused by the collapse of Lehman Brothers by injecting liquidity up to 9.3 percent of GDP through a wide range of instruments. These included the reduction of reserve requirements to end-2007 levels, foreign exchange sales of US$6.8 billion during September 2008–February 2009, and the provision of liquidity through repo operations and currency swaps.

These measures cushioned the domestic financial system from the impact of the crisis and facilitated a swift and sustained recovery of credit and growth starting in the second half of 2009. Even during the most acute period of the crisis (October 2008–March 2009), access to credit was preserved, and nonperforming bank loans remained low.

The global financial crisis provided policymakers worldwide with an important lesson: monetary policy can—and must—take financial stability concerns into account to a greater extent. During the crisis, central banks in advanced economies made innovative policy moves, including explicit guidance to steer

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[7]See Perez-Forero and Vega (2014) for estimations of the quantitative effects of reserve requirements in Peru.

[8]See Rossini, Quispe, and Rodriguez (2012) for a detailed discussion on the interactions between monetary and fiscal policy in Peru.

Figure 9.1. Peru: Reserve Requirement in Domestic and Foreign Currency
*(Percentage of total deposits)*
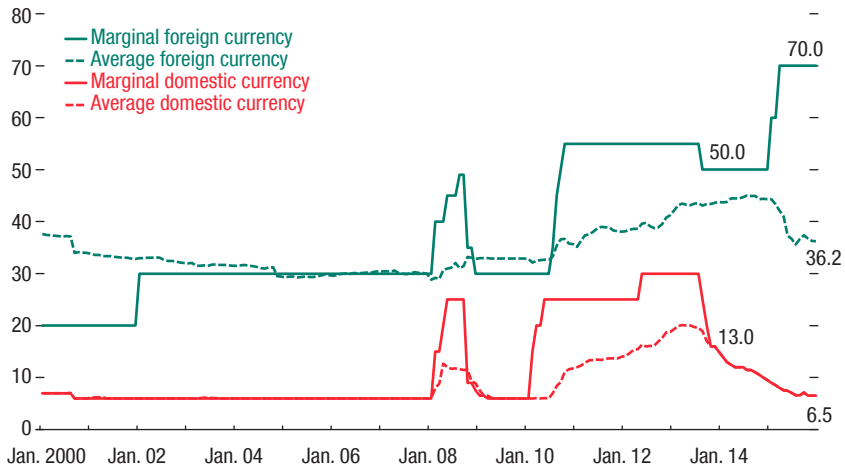
Source: Central Reserve Bank of Peru.

expectations for future interest rates, and quantitative easing. These policies spilled over into emerging market economies, which had to face unprecedented capital inflows. Under these circumstances, monetary policy in Peru had to maneuver to sail against the wind and apply a sort of quantitative tightening (Armas, Castillo, and Vega 2014). This implied raising reserve requirements, as described in Figure 9.1.

The surges in capital flows that followed the implementation of quantitative easing by the U.S. Federal Reserve had a significant impact on monetary and credit conditions in Peru. This required a more active use of complementary policy instruments such as reserve requirements. As shown in Figure 9.1, the BCRP increased not only the marginal reserve requirement rate several times, but also the average rate, which has a stronger impact on banks' intermediation costs in foreign currency, thereby limiting credit expansion in foreign currency and contributing to reducing credit dollarization.

Measures Adopted by the SBS

The SBS has also used its policy instruments to induce banks to internalize the risks associated with financial dollarization. In November 2012, the SBS increased capital requirements for dollar lending by raising the risk weight for dollar credit from 102.5 to 108 percent. Also, since 2013, the SBS has established larger capital requirements for mortgage loans in dollars when the loan-to-value (LTV) ratio is above 80 percent.

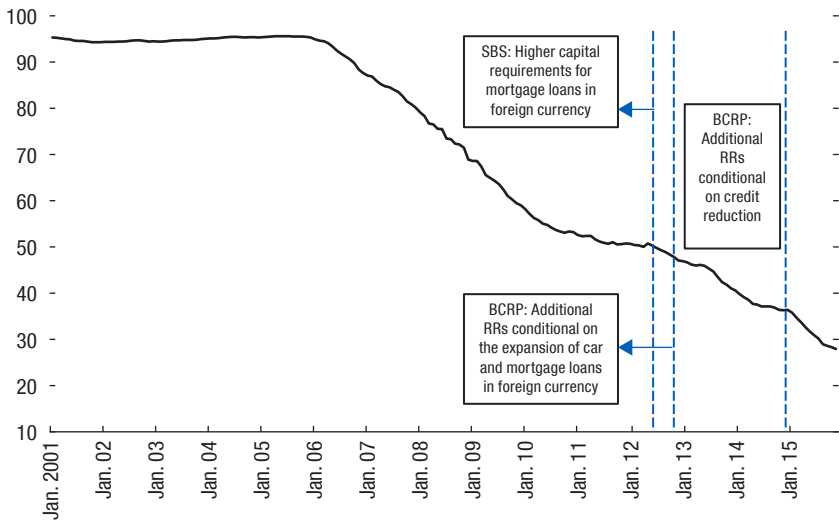**Figure 9.2. Evolution of Credit Dollarization in Peru**
(Percent)
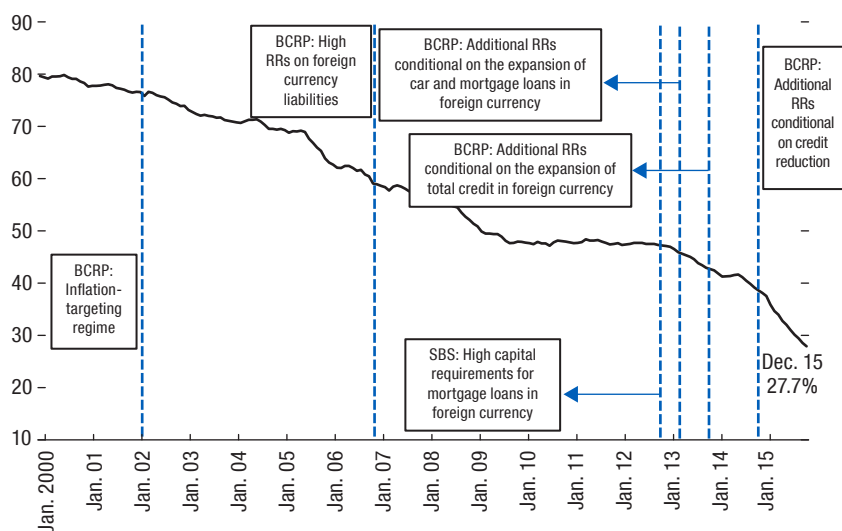
Source: Central Reserve Bank of Peru.
Note: BCRP = Central Reserve Bank of Peru; RR = reserve requirement; SBS = Superintendence of Banks, Insurance Companies and Pension Funds.

Higher capital requirements for loans that have greater credit risk associated with the fluctuations of the exchange rate induce banks to increase lending rates for these types of credits, reducing demand for them. Figure 9.2 illustrates the evolution of credit dollarization and highlights the implementation of the three most important prudential policies adopted in Peru to foster the de-dollarization of credit. These are the countercyclical adjustment of the reserve requirement in dollars by the BCRP, the increase in capital requirements set by the SBS, and the BCRP's de-dollarization program.

As the figure illustrates, credit dollarization started to decline persistently after the adoption of the inflation-targeting regime in 2002. A slowdown in the decreasing trend in de-dollarization is observed from 2010 to 2012, associated with the increase in the demand for dollar loans in response to very low international interest rates and expected appreciation of the local currency. During this period, the BCRP increased the average and marginal reserve requirements several times to reverse the impact of external financial conditions on credit dollarization. The most significant change in the de-dollarization trend is observed in 2015, after the BCRP adjusted its de-dollarization program. As can be seen in Figure 9.2, the downward trend in credit dollarization started accelerating in 2013 and did so with more intensity during 2015. This period coincides with the application of the BCRP's de-dollarization program and also with the increase in expected depreciation of the exchange rate, which increases the expected cost of borrowing in dollars.

Figure 9.3. Dollarization Ratio of Mortgages and Automobile Loans
(Percent)

Source: Central Reserve Bank of Peru.
Note: BCRP = Central Reserve Bank of Peru; RR = reserve requirement; SBS = Superintendence of Banks, Insurance Companies and Pension Funds.

For the case of dollar-denominated mortgages and automobile loans (Figure 9.3), the clearest change in the de-dollarization trend occurs around the date the SBS increased capital requirements for dollar lending. This trend was reinforced in 2013 with the adoption of the de-dollarization program by the BCRP that year.

Later in the chapter we will test the impact of these three prudential policies using the Pesaran and Smith (2012) counterfactual test.

THE DE-DOLLARIZATION PROGRAM, 2013−16

In 2013, the BCRP implemented additional reserve requirements to induce a more rapid reduction in credit dollarization. Financial institutions with dollar-denominated-loan growth rates above certain thresholds established by the BCRP were subject to these requirements. Reducing financial vulnerabilities in a timely manner is crucial to maintain financial stability and effectively implement monetary policy, particularly under the current external conditions of high volatility in financial markets. In dollarized economies, the need to limit the risks attached to the considerable influence of foreign currency liquidity shocks and unexpected large exchange rate movements on liquidity conditions and credit spreads is crucial for the stability of the financial system.

This section discusses the rationality of these measures and the details of their application and presents some evidence that the de-dollarization program has been effective in achieving its main objective of reducing currency mismatches associated with financial dollarization.

Main Features of the Program

As a permanent feature, the BCRP has set higher reserve requirements for deposits in foreign currency compared to those in domestic currency. This difference increases the cost of financial intermediation in foreign currency, thereby reducing the incentives for financial dollarization.

In March 2013, the de-dollarization program started with the establishment of additional reserve requirements on foreign currency liabilities tied to the evolution of mortgage and vehicle loans denominated in foreign currency. The stock of these loans as of February 2013 was set as a reference point, and growth rates of 10 and 20 percent above it made the offending financial institution subject to the additional requirements. These were set at 0.75 percentage point for banks exceeding the first threshold, and 1.5 percentage points for those exceeding the second threshold.

In October 2013, a similar additional reserve requirement was established linked to a broader definition of credit, including all loans to the private sector denominated in foreign currency except those extended for international trade purposes. In this case, additional reserve requirements increased by 1.5 percentage points when total outstanding credit in foreign currency (excluding credit for trade operations) exceeded the reference stock—which was set to its September 2013 level—by 5 percent; by 3 percentage points when this definition of foreign total credit exceeded the reference balance by 10 percent; and by 5 percentage points when it exceeded the reference balance by 15 percent.

In December 2014, the BCRP modified the previous framework of additional reserve requirements defined in terms of threshold levels for the expansion of dollar-denominated loans. The new setup required reductions in dollar-denominated loans. Under the new rules governing the additional reserve requirements in foreign currency, banks were given until June 2015 to reduce their stock of total credit in foreign currency (excluding foreign trade operations as well as operations with terms longer than four years and amounts over US$10 million) to at least 95 percent of their September 2013 levels. Otherwise, banks faced additional requirements on their total liabilities in foreign currency proportional to the gap between their current stock and the desired balance. This measure became more demanding in December 2015, when banks had to reduce their balances of dollar-denominated loans to at least 90 percent of the September 2013 balance.

A similar set of rules applied for car and mortgage loans denominated in foreign currency. In this case, by June 2015 banks had to reduce their stock for this type of credit to at least 90 percent of the balance as of February 2013. For December 2015, the requirement was for banks to reduce their stock of dollar-denominated car and mortgage loans to 85 percent of the balance as of February 2013. With these measures, the BCRP aimed to reduce potential risks

Figure 9.4. Bank Credit in Foreign Currency Excluding Trade Loans
(Billions of U.S. dollars; September 2013 = 100 percent)
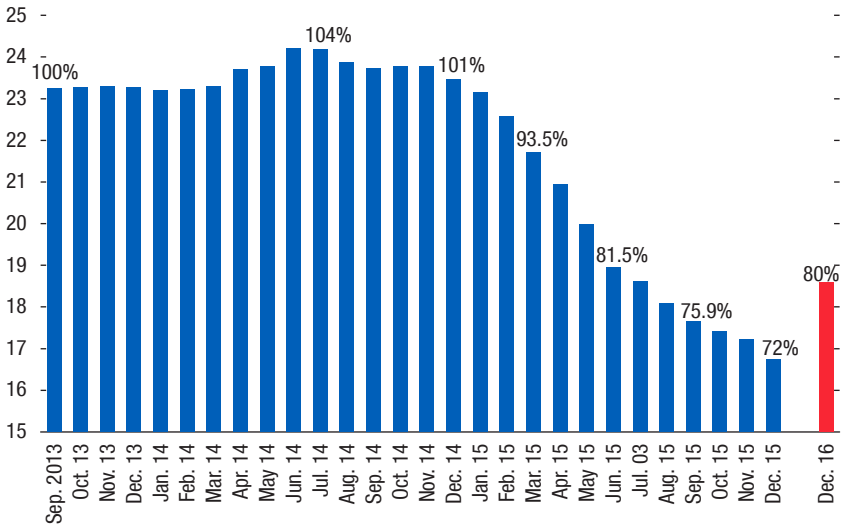
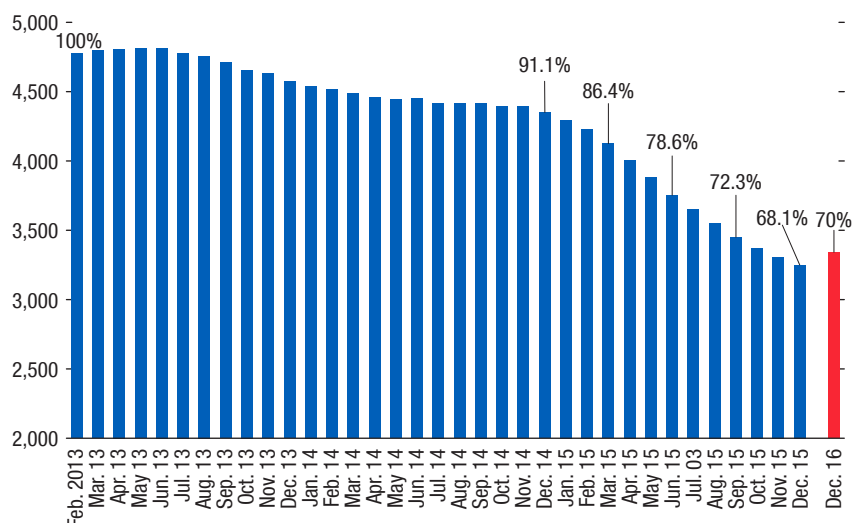Source: Central Reserve Bank of Peru.

in the financial system by providing incentives for banks to reduce their balances of credit in foreign currency, without discouraging foreign trade operations and focusing on credit sectors that are more vulnerable due to their high dollarization level.[9]

As of July 2015, the reduction in total credit in foreign currency (excluding credit for trade operations) was significant, with levels below the threshold established by the BCRP for December 2015. By December 2015, total credit in foreign currency had fallen even more, going beyond the objectives of the program. At the level of individual banks, all achieved the reductions in total foreign currency credit set by the BCRP (Figure 9.4).

The reduction in the degree of dollarization of mortgage and car loans in foreign currency was even larger (Figure 9.5). Thus, as of July 2015, aggregate mortgage and vehicle credit was equivalent to 76.4 percent of the February 2013 balance—lower than the level required by the BCRP for December 2015. By December 2015, this figure had fallen even further to 68.1 percent.

Consequently, aggregate dollarization levels for bank lending dropped from 44 to 32 percent from December 2014 to December 2015 (Table 9.2). The reduction of dollarization was widespread across different credit market segments.

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[9]In February 2013, dollarization of mortgage and car loans was 47.7 and 79.6 percent, respectively.

Figure 9.5. Banks' Car and Mortgage Loans in Foreign Currency
(Millions of U.S. dollars; February 2013 = 100 percent)

Source: Central Reserve Bank of Peru.

Given the program's success, and in order to consolidate the gains already obtained, in December 2015 further objectives were set for 2016. Total credit denominated in foreign currency, excluding foreign trade loans, was required to decrease at least to a level equivalent to 80 percent of the September 2013 stock, while mortgage and car loans denominated in foreign currency had to be brought down to 70 percent of the stock observed in February 2013.

TABLE 9.2

Ratio of Dollarization of Credit to the Private Sector			
(Percent)			
	Dec. 2010	**Dec. 2014**	**Dec. 2015**
Credit to firms	**55.9**	**48.5**	**38.7**
Corporation and large firms	69.4	59.9	46.4
Medium firms	67.4	59.3	47.5
Small firms	19.3	11.5	8.5
Household credit	**26.5**	**20.0**	**15.9**
Consumer loans	10.8	9.5	7.8
Car loans	64.0	68.9	44.9
Credit cards	7.2	6.6	6.4
Rest	8.4	5.9	5.8
Mortgage loans	52.2	33.9	26.8
Total	**46.1**	**38.3**	**30.5**
Dollarization at constant exchange rate	*47.6*	*38.3*	*27.7*
Dollarization of private banks' credit	*50.4*	*43.7*	*32.8*

Complementary Instruments to Inject Liquidity in Sols to Support the De-dollarization of Credit

Turning to banks' balance sheets, the de-dollarization program had two important effects:

1. Banks that had their balance sheets matched by currency before the program ended up with a short position in dollars after substituting (converting) dollar-denominated loans already on their balance sheet for sol-denominated loans. This meant that banks needed a means to regain their neutral position with respect to the dollar.

2. Strong incentives to denominate all new loans in domestic currency meant that banks needed long-term funding sources in sols in order to avoid a currency mismatch on their balance sheets. These were particularly scarce given that private agents expected strong depreciation of the sol and thus preferred to save in dollars.

The first effect would imply more demand for dollar instruments. Banks would hedge their position purchasing dollars either in the spot or forward market, generating pressure on the exchange rate. Given the prudential objective of low foreign exchange volatility, the de-dollarization program would require a hedge instrument provided by the BCRP.
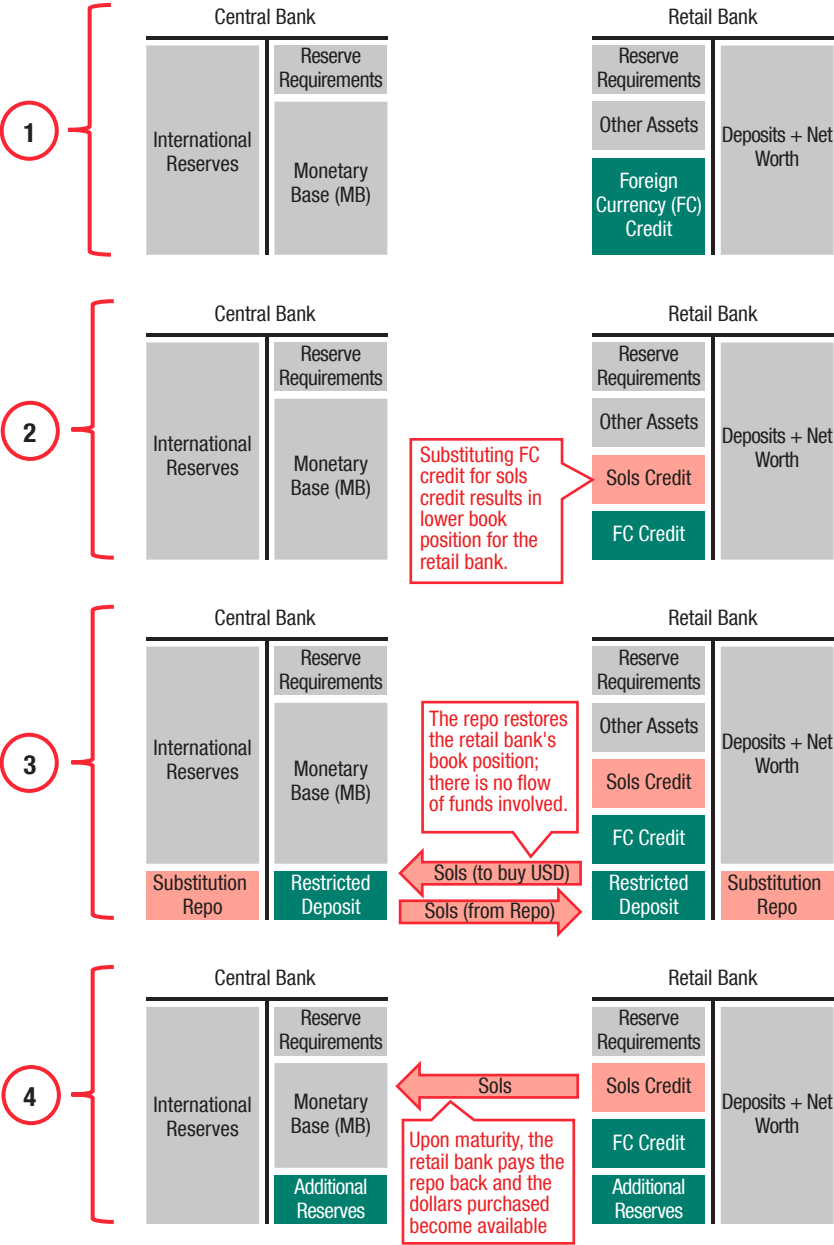
Repos for Credit Substitution

Repos for credit substitution support the conversion of loans in foreign currency into loans in domestic currency. In this operation, banks purchase dollars from the BCRP and simultaneously perform a currency repo using these same dollars as collateral: they constitute a restricted deposit at the BCRP. As a result, banks' customers obtain loans in sols, while the banks maintain the same amount of assets in dollars. The repo for credit substitution provides banks with a dollar-denominated asset (the restricted deposit in U.S. dollars that serves as collateral for the repo) and a sol-denominated liability (the repo itself). These cancel the effect of credit substitution—which increases assets in sols and decreases dollar assets—on banks' dollar exposure.

Figure 9.6 shows the effects of the repo for credit substitution on the balance sheet of the BCRP and a private bank. Steps 1 and 2 show the situation before and after the credit substitution takes place.

In our example, we assume substitution takes place in the same bank: a client calls the bank and asks for his or her dollar-denominated loan to be replaced by a sol-denominated loan. From the private bank's point of view, this is an accounting matter that results in a lower dollar book position with no funds exchanged. However, we could consider the possibility of a client taking a loan in sols at bank A and then using the funds to pay for his or her dollar-denominated loan in bank B. In this case, it would seem both banks suffer no change in their book position: bank A gives sols to the client and obtains an asset in sols, whereas bank B receives dollars and loses an asset denominated in dollars. This is not the case, because the

Figure 9.6. Repo for Credit Substitution

1

Central Bank

| International Reserves | Reserve Requirements |
| | Monetary Base (MB) |

Retail Bank

Reserve Requirements	Deposits + Net Worth
Other Assets	
Foreign Currency (FC) Credit	

2

Central Bank

| International Reserves | Reserve Requirements |
| | Monetary Base (MB) |

Retail Bank

Reserve Requirements	Deposits + Net Worth
Other Assets	
Sols Credit	
FC Credit	

Substituting FC credit for sols credit results in lower book position for the retail bank.

3

Central Bank

International Reserves	Reserve Requirements
	Monetary Base (MB)
Substitution Repo	Restricted Deposit

Retail Bank

Reserve Requirements	Deposits + Net Worth
Other Assets	
Sols Credit	
FC Credit	
Restricted Deposit	Substitution Repo

The repo restores the retail bank's book position; there is no flow of funds involved.

Sols (to buy USD)
Sols (from Repo)

4

Central Bank

International Reserves	Reserve Requirements
	Monetary Base (MB)
	Additional Reserves

Retail Bank

Reserve Requirements	Deposits + Net Worth
Sols Credit	
FC Credit	
Additional Reserves	

Sols

Upon maturity, the retail bank pays the repo back and the dollars purchased become available

Source: Central Reserve Bank of Peru.

client must have purchased the dollars given to bank B from some other bank (which could be A, B, or a third party). The bank that sold the dollars in exchange for sols has lost book position.

Thus, the bank that loses book position needs to get it back. In step 3 of Figure 9.6, the bank buys dollars from the BCRP and uses them as collateral to borrow sols from the central bank. The dollars that the bank purchased become a restricted deposit at the BCRP. In this way, the retail bank regains its original foreign exchange position, but the foreign exchange position of the BCRP falls. The BCRP's international reserves are not affected, however.

Notice that the fall in the BCRP's foreign exchange position mirrors the increased foreign exchange position of the bank's client, who now has less outstanding loans in foreign currency. Thus, the operation allows the private sector to protect itself from depreciation at the expense of the BCRP's position.

When the substitution repo matures, the retail bank must pay the BCRP back (step 4 in Figure 9.6). This contracts the monetary base and makes the dollars the retail bank purchased available. In the figure, these dollars are shown as "Additional Reserves" at the BCRP, but the retail bank could choose to withdraw them.

In the external environment characterized by the strengthening of the dollar, the growth of domestic currency deposits diminished, thereby increasing banks' need for alternative sources of long-term liquidity in domestic currency. In this context, the BCRP implemented a new facility to inject liquidity in sols. This new facility reduces banks' required foreign currency reserves at the BCRP in order to use the liberated funds as collateral.

Repos for Credit Expansion

Repos for credit expansion were designed to support credit growth in domestic currency. Through this instrument, banks can use part of their reserve requirements in foreign currency (up to an amount equivalent to 10 percent of their total liabilities subject to these requirements, extended to 20 percent in December 2015) to make currency repos with the BCRP, obtaining long-term funding in domestic currency.

Figure 9.7 illustrates the workings behind the repos for credit expansion. Consider the case of a financial institution that uses a fraction of its dollar-denominated reserve requirements to obtain a repo for credit expansion (step 2 of Figure 9.7). When a private bank obtains one of these repos from the central bank, its foreign currency reserve requirement is reduced, and the dollars liberated are used to constitute a restricted deposit at the BCRP, serving as collateral for the repo. In exchange, it receives the equivalent amount in domestic currency, which constitutes an expansion of the monetary base for the central bank. The private bank uses the funds to expand credit in domestic currency. Note that the private bank's foreign exchange position does not change, and for the central bank the level of international reserves and the foreign exchange position are not affected either.

These new types of repo operations have been instrumental in facilitating a smooth reduction in credit dollarization, particularly during 2015, when

Figure 9.7. Repo for Credit Expansion
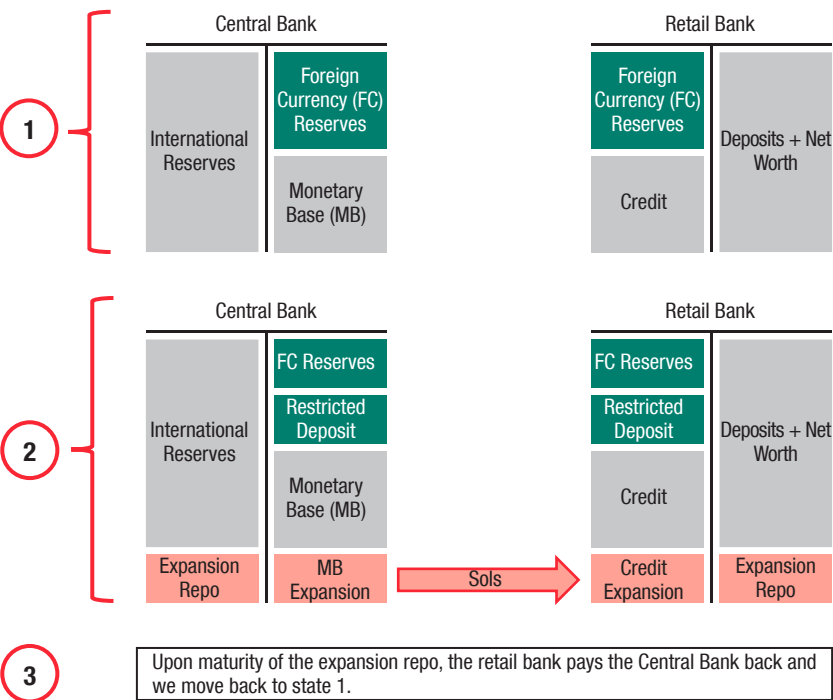
Source: Central Reserve Bank of Peru.

banks faced a shortage of domestic currency funding as depositors increased their preference for saving in dollar-denominated deposits. In addition, banks faced an excess of liquidity in foreign currency, generated both by the substitution of dollar-denominated loans for sol-denominated loans and by the increase in dollar deposits. The repos for credit substitution and for credit expansion contributed to swapping the excess of banks' funding in foreign currency into more funding in domestic currency, which allowed them to rapidly expand credit in domestic currency without creating pressures on domestic interest rates. Figure 9.8 illustrates the dynamics of these instruments. Bank credit expansion in 2015 was mostly financed by repo operations with the BCRP.

Looking forward, unwinding the instruments deployed by the BCRP in 2015 will require deposit dollarization to decrease as well, corresponding with credit dollarization. This will only be the case when depreciation expectations cease. However, this might not be enough. It is quite plausible that given the right conditions—for instance, an appreciation of the sol—credit dollarization could

Figure 9.8 Funding Sources of Bank Credit Expansion in Domestic Currency
(Millions of sols; annual flows)
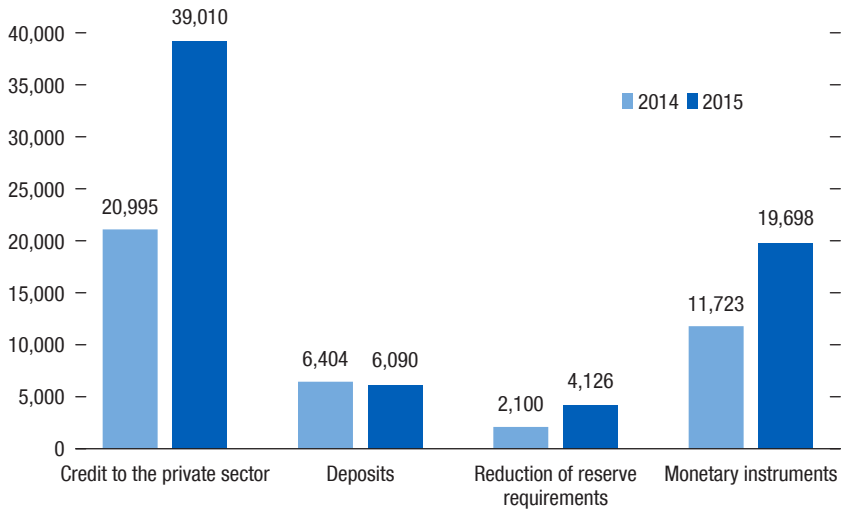
Source: Central Reserve Bank of Peru.

increase again if the measures implemented by the BCRP in the last three years are phased out. A similar situation occurs with deposit dollarization: when the circumstances are adequate it will fall, but keeping it at low levels will probably require the central bank to implement backstops in the same spirit as the ones described here. Low inflation will provide incentives for private agents to de-dollarize deposits, but when the winds change again—particularly with regard to the exchange rate—policy will have to be in place to make sure dollarization does not rear its head again.

IMPACT OF RESERVE REQUIREMENTS ON CREDIT GROWTH RATE AND FINANCIAL DOLLARIZATION

This section empirically evaluates the effectiveness of reserve requirements in reducing financial dollarization by performing a counterfactual exercise following the methodology proposed by Pesaran and Smith (2012). We test the relevance of the cyclical use of marginal and average reserve requirements in foreign currency, and of the recent de-dollarization program launched in December 2014, for mitigating the growth of dollar-denominated loans and reducing the dollarization ratio.

The key assumption for our counterfactual policy exercise is that the policy instrument changes are due to an ad hoc change in the use of the instruments

and not the result of a structural change. Following Pesaran and Smith (2012), the counterfactual values can be obtained as a conditional forecast generated by a reduced-form equation (static version) that assumes the policy was not in place:

$$y_t = \pi_1 x_t + \pi_2' w_t + v_{y,t}, \tag{9.1}$$

where y_t is the target or outcome variable, which is affected by a policy variable x_t and one or more control variables z_t. The methodology also allows us to consider a set of variables w_t affecting y_t or z_t, but invariant to changes in x_t and z_t. For small and open economies such as Peru, w_t includes commodity prices and U.S. interest rates, among other variables.

Under these assumptions, the counterfactual path y_t is defined as the difference of the impact of policy instruments considering the observed values and their counterfactual analogs. Let us define the set of expected values for the policy instruments and their counterfactual values as:

$$\Psi^1_{t+H} = \Psi_{t+H}(x^1) = \left\{ x^1_{T+1}, x^1_{T+2}, \ldots, x^1_{T+H} \right\},$$

$$\Psi^0_{t+H} = \Psi_{t+H}(x^0) = \left\{ x^0_{T+1}, x^0_{T+2}, \ldots, x^0_{T+H} \right\}.$$

However, the policy-reduced form presented in equation (9.1) is clearly misspecified for estimating the structural parameters of the model. Pesaran and Smith (2012) show that under the assumption that w_t, the parameters of the policy-reduced form (π_1, π_2'), and the errors $v_{y,t}$ are all invariant to policy interventions, the policy effect can be consistently estimated by:

$$d_{T+h} = \pi_1 \left(x^1_{T+h} - x^0_{T+h} \right). \tag{9.2}$$

It is clear that this result does not require the invariance of the structural parameters, but only that the parameters of the reduced form of the policy are invariant to policy intervention. In our policy evaluation, we use as the outcome variable the bank's dollarization of credit and the annual growth rate of dollar-denominated credit. As policy variables, we use both the average and marginal reserve requirement rates. In order to measure the effect of the de-dollarization program, we use a dummy variable that takes the value of 1 from January to December 2015 and 0 otherwise. Let us recall that under this program, banks were given six months to cut their dollar-denominated loans at least by 5 percent. Otherwise, they faced an additional reserve requirement starting in June 2015 that was proportional to the deviation of the balance of dollar-denominated loans and the level required by the BCRP.

As control variables that are time invariant to policy instruments, we use external variables such as the terms of trade, the federal funds rate, the 10-year U.S. Treasury yield, the U.S. unemployment rate, and an index of a basket of exchange rates for the main regional partners. For the dollarization ratio we consider regressions for both the change in the dollarization ratio and the level of this ratio. For the regressions that use variables in levels, we use the fully modified ordinary least square estimator to account for the effect of residual correlations on the t-statistics

of the key policy variables. We also add lags for the endogenous variables to obtain well-behaved residuals for the case of the first-difference regressions.

We study the effects of the dollarization program both on the dollarization of total credit (excluding credit for trade operations) and on the dollarization of mortgage and car loans, which are the two types of credit targeted by the BCRP's de-dollarization program.

An additional dummy variable is included in the regression to account for the effect of the higher capital requirement established by the SBS for banks' foreign exchange exposure since November 2012. Table 9.3 presents the results of these reduced-form regressions. Monthly information is used for the period that spans from January 2004 to December 2015.

The estimators for both the impact of the average reserve requirement and the dummy variable capturing the effect of the de-dollarization program have the expected negative sign and are statistically significant in the regressions for the growth of dollar loans. In the case of the dollarization ratios, the de-dollarization program has a negative and significant effect on this indicator. The average reserve requirement also has a negative effect on the change in dollarization of total credit, but not in the case of the change in the dollarization of mortgage and car loans and deposits. The SBS's higher capital requirement also has a negative and significant effect on both the change and level of the dollarization of mortgage and automobile loans, but not for the aggregate level of dollarization or for deposits.

An interesting result in the regression for the level of dollarization is the negative and significant effect of the time trend variable, which we associate with the impact of the inflation-targeting regime and price stability on dollarization decisions. As Table 9.3 shows, the estimated impact is about –0.2 in the two cases of dollarization being analyzed, implying an average reduction in dollarization ratios of about 2.4 percentage points per year.

Next, we use the previous reduced forms to perform the counterfactual exercise and evaluate their statistical significance. The simple question we seek to answer in this case is what would have happened to the growth of dollar-denominated loans and the dollarization ratios if the BCRP had not increased, since 2010, both the average and marginal reserve requirement rates in foreign currency and if the de-dollarization program had not been established. In order to perform this test we measure the policy effectiveness as follows:[10]

$$\bar{d}_H = \hat{\pi}_1 \left[\frac{1}{H} \sum_{h=1}^{H} \left(x_{T+h} - x_{T+h}^0 \right) \right], \tag{9.3}$$

where the expression in brackets is a measure of the average size of the policy change. Following Pesaran and Smith (2012), the policy effectiveness test is then calculated as follows:

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[10]In our model, the specification to be used includes two lags of dependent variables: $(1 - a_1 L)$ $(1 - a_2 L) y_t = \pi_1 x_t + \pi_2' \boldsymbol{w}_t + \boldsymbol{v}_{y,t}$. This last expression will drive the next measure of the test: $\bar{d}_H = \hat{\pi}_1 \frac{1}{H}$ $\sum_{j=1}^{H} \sum_{m=0}^{j-1} \left(\sum_{i=0}^{m} a_1^i a_2^{m-i} \left(x_{T+j-m} - x_{T+j-m}^0 \right) \right).$

TABLE 9.3

Reduced-Form Models							

	OLS Estimation	Long-Term Relationships (Fully modified estim.)[1]	Dollarization Coefficient			Dollarization Coefficient: Long-Term Relationship (Fully modified estim.)[1]	
					Mortgage-Auto Credit	Total Credit	Mortgage-Auto Credit
	Dependent (growth rate of credit at):		Total Credit				
Explanatory:	12 months M1	12 months M2	In difference M3	In difference M4	In difference M5	M6	M7
Constant	0.30 (0.85)	69.84* (0.00)				99.46* (0.00)	121.10* (0.00)
Banking Reserves Requirements Rate[2] (foreign currency)	**−0.24*** **(0.00)**	**−2.53*** **(0.00)**	**−0.18**** **(0.03)**				
Banking Reserves Requirements Rate[3] (domestic currency)			**0.18**** **(0.01)**				
Banking Reserves Requirements Rate[3] (foreign currency – domestic currency)				*−0.14*** *(0.02)*		*−0.17*** *(0.09)*	*−0.86** *(0.00)*
SBS Program (started in November 2012) Higher Capital Requirement for FX Exposure					−0.28* (0.00)		−1.71** (0.03)
De-dollarization Program (announced 2015)	**−2.85**** **(0.02)**	**−34.86*** **(0.01)**	**−1.12*** **(0.00)**	**−0.83*** **(0.00)**		**−10.72*** **(0.00)**	**−1.28** **(0.15)**
Banking Marginal Reserves Requirements Rate[3] (domestic currency)							
Marginal Reserve Requirements Rate (foreign currency)	0.03 (0.44)	0.76* (0.00)					
Exogenous Controls:							
Terms of Trade[4]	0.09* (0.00)	0.19** (0.05)	0.01 (0.45)		0.01 (0.38)		−0.21* (0.00)
U.S. Unemployment[5]				−1.80* (0.00)	−0.51** (0.01)	−1.80* (0.00)	

(continued)

TABLE 9.3 *(continued)*

Reduced-Form Models

	OLS Estimation	Long-Term Relationships (Fully modified estim.)[1]	Dollarization Coefficient	Dollarization Coefficient	Dollarization Coefficient	Dollarization Coefficient: Long-Term Relationship (Fully modified estim.)[1]	Dollarization Coefficient: Long-Term Relationship (Fully modified estim.)[1]
		Dependent (growth rate of credit at):		Total Credit	Mortgage-Auto Credit	Total Credit	Mortgage-Auto Credit
FED Interest Rate		−0.09* (0.00)		−0.10* (0.00)		−0.93* (0.00)	1.69* (0.00)
Treasury Bill–10 Years (yield)	−5.35* (0.00)			0.11*** (0.06)	−0.09* (0.00)	−2.37* (0.00)	
Exchange Rate Basket (Main Regional Partners)[6]				−2.39*** (0.06)			
Trend Component Inflation-Targeting Regimen Proxy						−0.24* (0.00)	−0.25* (0.00)
Lags: Dollarization Coefficient Mortgage/Auto Credit in Differences: (lag2)					0.37* (0.00)		
12 Months (lag1)	1.19* (0.00)						
12 Months (lag1)	−0.30* (0.00)						
R-Squared	0.98	0.69	0.20	0.30	0.41	0.96	0.99
Durbin-Watson Stat	2.08		1.13	1.23	1.85		
Akaike info criterion	4.09		1.21	1.10	0.75		

Source: Authors' calculations.

Note: T-statistics probability in parentheses; * Significant at 1%, ** Significant at 5%, *** Significant at 10%. FED = U.S. Federal Reserve; FX = foreign exchange; OLS = ordinary least squares; SBS = Superintendence of Banks, Insurance Companies and Pension Funds.

[1] Phillips and Hansen (1990) methodology. In M6 SBS Program is modeled as deterministic. For M2, M6, and M7 de-dollarization program is modeled as deterministic, as well.

[2][3][4]M3 and M5 defined in difference. In 4 for M1, sixth lag is also put in, as well.

[5] M5 expressed in difference.

[6] M4 expressed in difference.

$$\varrho_H = \frac{\bar{d}_H}{\hat{\sigma}_{v_y}} \sim^a N(0,1), \tag{9.4}$$

where $\hat{\sigma}_{v_y}$ is the standard error of the policy reduced-form regression. We perform the counterfactual evaluation considering two periods to differentiate the impact of the increase in the average and marginal reserve requirements in foreign currency from those of the recent de-dollarization program. For the average and marginal reserve requirements in foreign currency, we restrict the sample until December 2014, whereas for the de-dollarization program we use the sample from January to December 2015. We also test the effect of the SBS's increase in capital requirements for foreign exchange exposure, and present the results in Table 9.4.

As Table 9.4 shows, the persistent increase in the average reserve requirement rate in foreign currency since July 2010 had a statistically significant effect on the annual growth rate of dollar-denominated loans. The counterfactual exercise considers 53 periods, from July 2010 to December 2014, and the counterfactual value used for the average and marginal rates is 33 percent, its corresponding value for July 2010. The average effect, depending on the model used, is a difference between 6 to 18 percentage points in the counterfactual path for the growth rate of dollar-denominated credit. In all the cases, the effect of higher reserve requirements is statistically significant.[11]

In the case of the de-dollarization program, we consider the period from January to December 2015 for the policy evaluation exercise. The policy effects on dollar-denominated credit growth are negative and statistically significant, as well as the effect on the dollarization ratio of total credit.[12] The impact of reserve requirements on the dollarization of mortgage and car loans is not significant, even though it has the expected sign. In the case of the SBS's higher capital requirements for foreign exchange exposure, we find that they have the expected sign, but the policy impact is not statistically significant.

In addition, to illustrate the effects of reserve requirements and the de-dollarization program on the dollarization ratios, Figure 9.9 shows both the observed path of credit dollarization and the counterfactual path for three models, M3, M4, and M6. The counterfactual estimated level of credit dollarization for December 2015 is on average 39 percent vis-à-vis the observed level of 32 percent. This difference of close to 7 percentage points in credit dollarization is explained by the impact of the de-dollarization program, which represents about two-thirds of the total reduction in the banks' credit dollarization ratio (12 percentage points, from 44 to 32 percent).

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[11]See Perez-Forero and Vega (2015) for empirical evidence on the impact of reserve requirements on credit using a different methodology.

[12]Also, Garcia-Escribano (2010) finds that higher dollar reserve requirements have contributed, together with inflation targeting and the prudential regulatory measures taken by the SBS, to reduce credit dollarization.

TABLE 9.4

Policy Effectiveness Statistics				
	Mean Effect	**Policy-Effectiveness Statistics**	**_p_-Value**	**Expected Sign**
Outcome: Growth Rate of Credit at:	**Banking Reserves Requirements Rate (Foreign Currency)[1]**			
12 Months (M1)	−14.29	−8.03	**0.00**	yes
12 Months (M2)	−18.78	−2.75	**0.01**	yes
	De-dollarization Program (Announced 2015)[2]			
12 Months (M1)	−11.22	−6.30	**0.00**	yes
12 Months (M2)	−27.60	−4.05	**0.00**	yes
Outcome: Dollarization Ratio of:	**Banking Reserves Requirements Rate (Foreign Currency)[1]**			
Total Credit (M3)	−0.04	−0.09	0.93	yes
Total Credit (M4)	−0.03	−0.07	0.94	yes
Total Credit (M6)	−1.26	−0.59	0.56	yes
	De-dollarization Program (Announced 2015)[2]			
Total Credit (M3)	−0.89	−2.11	**0.04**	yes
Total Credit (M4)	−0.66	−1.65	**0.10**	yes
Total Credit (M6)	−11.61	−5.40	**0.00**	yes
Mortgage-Auto Loans (M5)	0.00	0.00	1.00	yes
Mortgage-Auto Loans (M7)	−1.39	−1.31	0.19	yes
	SBS Program (Started in November 2012)[3]			
Mortgage-Auto Loans (M5)	−0.43	−1.34	0.18	yes
Mortgage-Auto Loans (M7)	−1.71	−1.62	0.11	yes

Source: Authors' calculations, following Pesaran and Smith (2012).
Note: SBS = Superintendence of Banks, Insurance Companies and Pension Funds.
[1]Sample period: July 2010–December 2015.
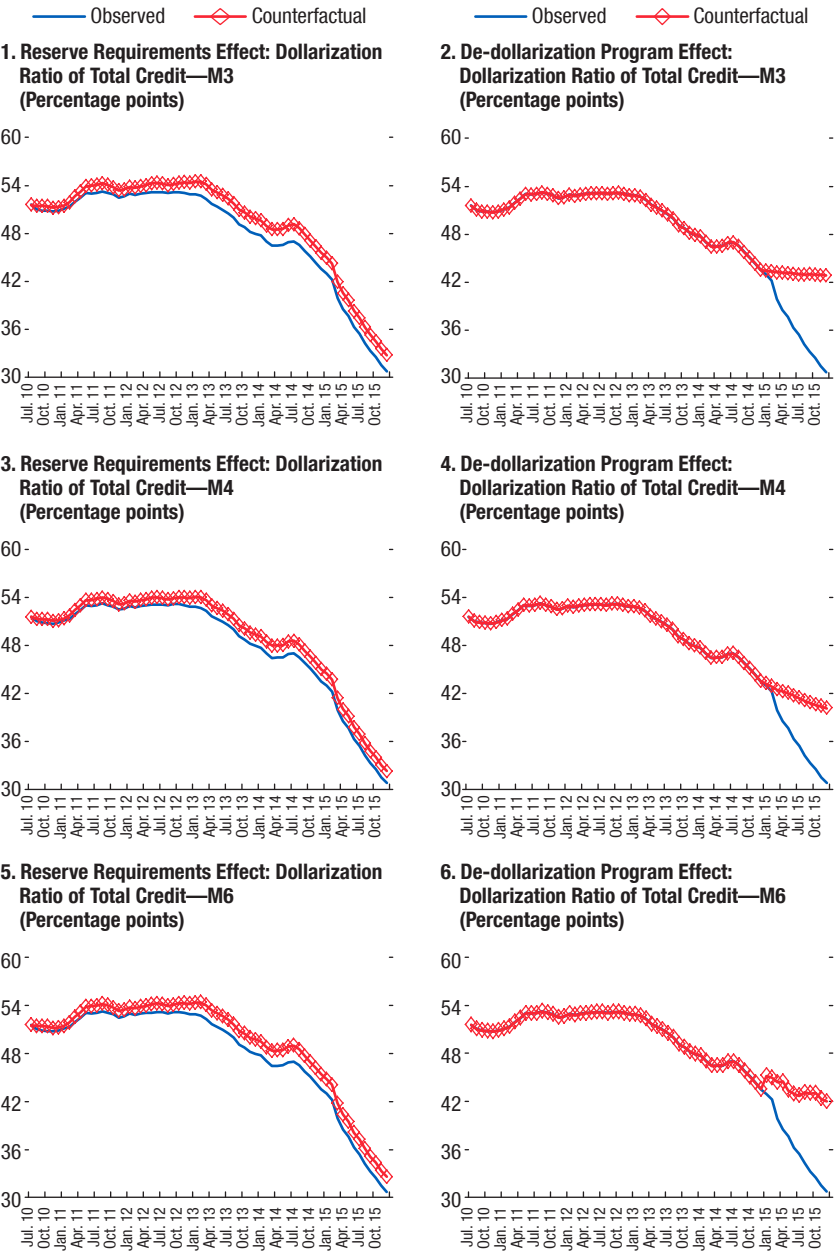[2]Sample period: January 2015–December 2015.
[3]Sample period: November 2012–December 2015.

CONCLUSIONS

The experience of the Peruvian economy highlights the interaction between monetary and macroprudential policy. Particular characteristics specific to Latin American economies, such as currency mismatches and excessive leverage with foreign lenders, cause concerns for financial stability, as they may have an impact on the transmission mechanism of monetary policy through several channels.

In economies affected by financial dollarization, a large depreciation of the exchange rate can lead to higher default rates among firms with currency mismatches and affect borrowers' balance sheets by altering their income flows and loan repayment capacity. Thus, a large increase in the exchange rate may increase default risks of borrowers by inducing higher leverage and lower income flows. Therefore, additional prudential instruments that can limit the negative effect of the risk-taking channel, both ex ante and ex post, are central to effectively conduct monetary policy.

Figure 9.9. Counterfactual Effects of Reserve Requirements and the De-dollarization Program

———— Observed   —◇— Counterfactual   ———— Observed   —◇— Counterfactual

1. Reserve Requirements Effect: Dollarization Ratio of Total Credit—M3 (Percentage points)

2. De-dollarization Program Effect: Dollarization Ratio of Total Credit—M3 (Percentage points)

3. Reserve Requirements Effect: Dollarization Ratio of Total Credit—M4 (Percentage points)

4. De-dollarization Program Effect: Dollarization Ratio of Total Credit—M4 (Percentage points)

5. Reserve Requirements Effect: Dollarization Ratio of Total Credit—M6 (Percentage points)

6. De-dollarization Program Effect: Dollarization Ratio of Total Credit—M6 (Percentage points)

Source: Central Reserve Bank of Peru.

The BCRP and its peers in Latin America have used higher reserve requirements on foreign currency liabilities, liquidity management tools, and international reserve accumulation as tools to limit systemic risks, both ex ante and ex post. These tools have gained importance over the last decade, particularly given the current international context characterized by high uncertainty associated with the normalization of the U.S. Federal Reserve's monetary policy and volatility in the terms of trade of Latin American economies, particularly commodity exporters.

Peru's case illustrates that implementing these tools while preserving monetary stability is not only possible, but necessary. Furthermore, this chapter has provided empirical evidence that bolder measures to directly reduce vulnerabilities such as credit dollarization through the use of additional reserve requirements can significantly enhance financial stability, thereby creating space to allow traditional monetary policy to fulfill its role.
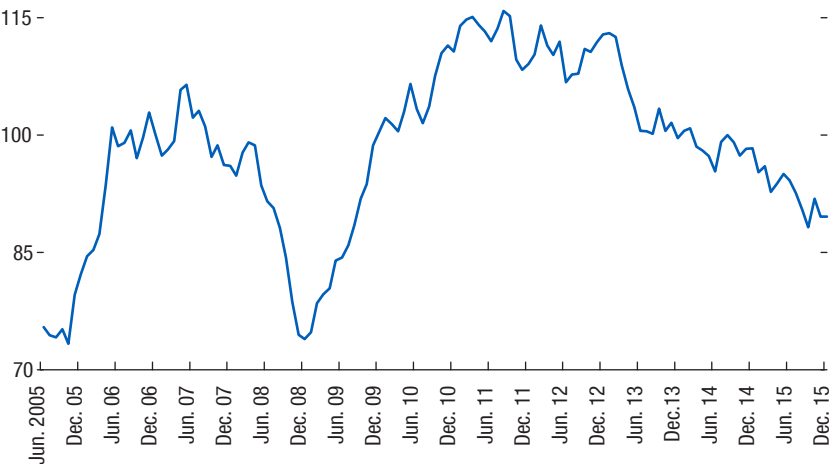
APPENDIX 9.1. ADDITIONAL FIGURES
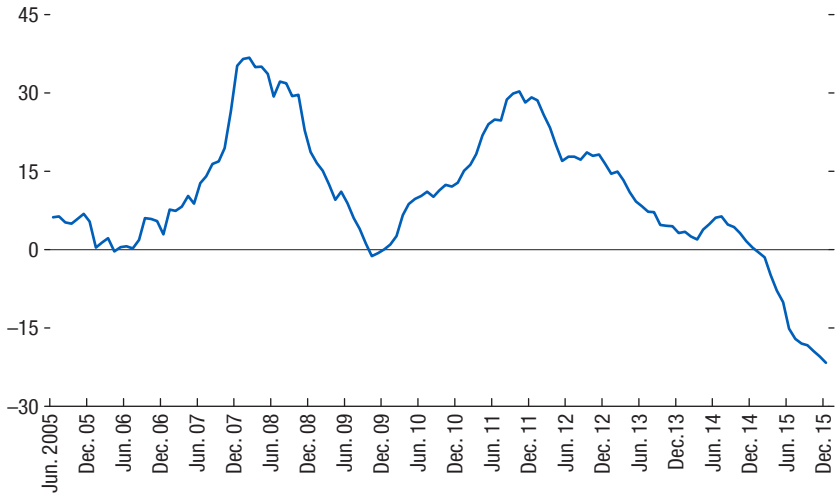
Appendix Figure 9.1.1. Bank Reserve Requirement Rates
(Percent)
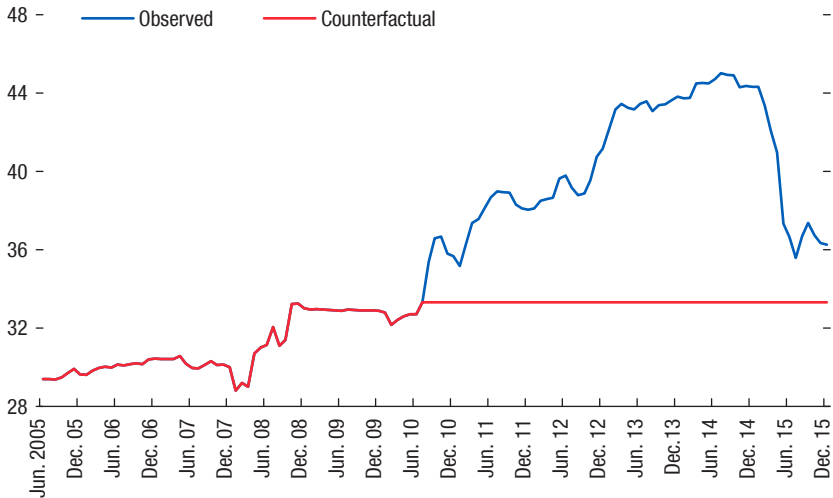
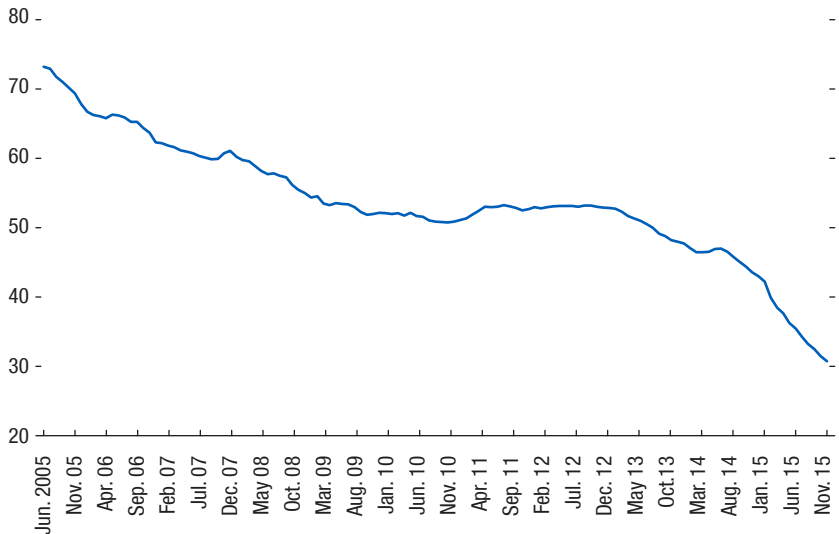**Appendix Figure 9.1.2. Bank Marginal Reserve Requirements**
(Percent)
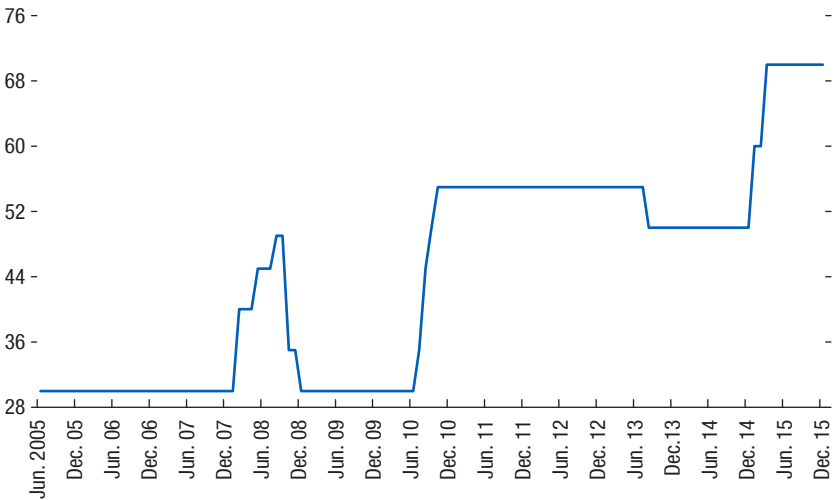
Appendix Figure 9.1.3. Terms of Trade
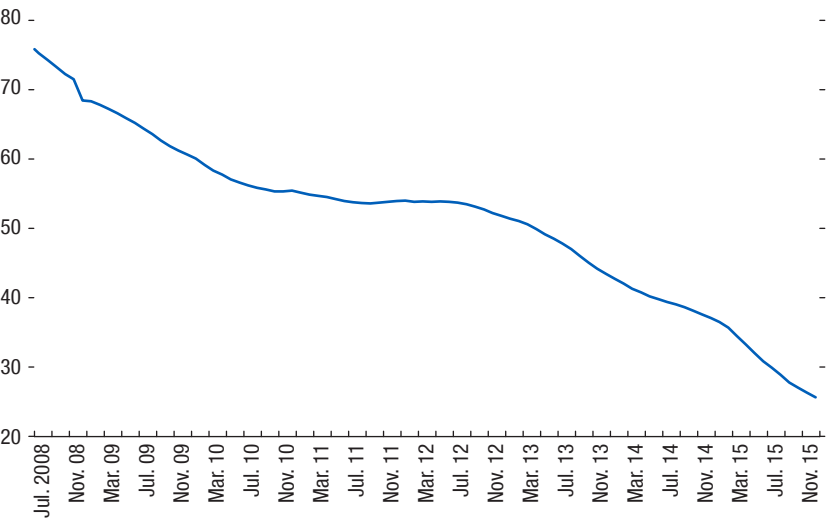*(Percent)*

Appendix Figure 9.1.4. Annual Growth Rate of Credit: Foreign Currency
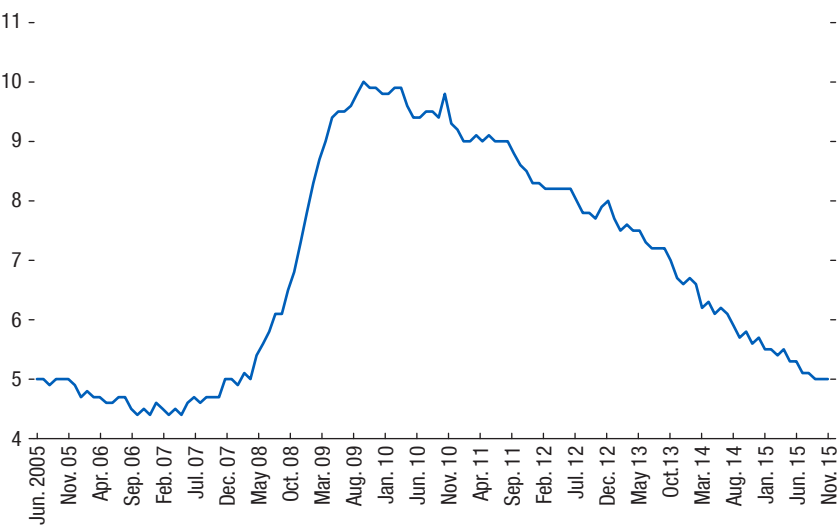*(Percent)*

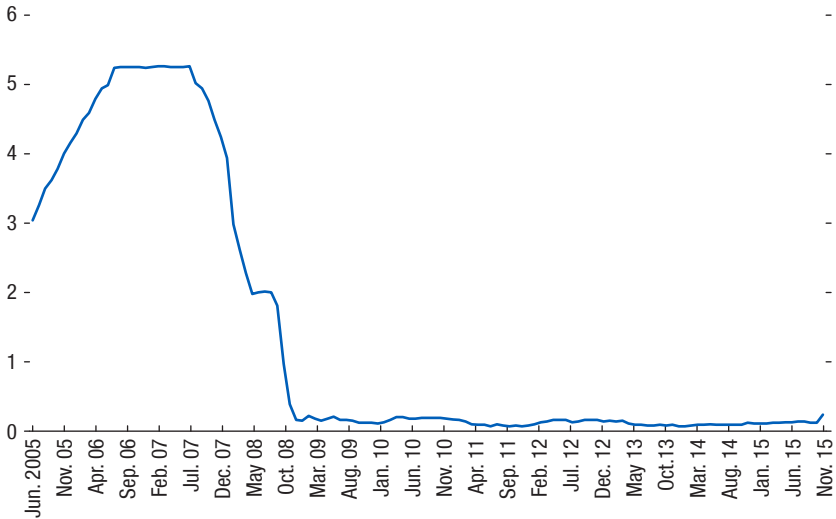**Appendix Figure 9.1.5. Dollarization Ratio: Total Credit**
(Percent)

Appendix Figure 9.1.6. Dollarization Ratio: Mortgage and Auto Loans
(Percent)

Appendix Figure 9.1.7. U.S. Unemployment Rate
(Percent)

Appendix Figure 9.1.8. U.S. Federal Reserve Interest Rate
(Percent)

Appendix Figure 9.1.9. 10-Year Treasury Bills Yield
(Percent)

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