



BANCO CENTRAL DE RESERVA DEL PERÚ

De-dollarization of credit in Peru: the role of unconventional monetary policy tools

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DE-DOLLARIZATION OF CREDIT IN PERU: THE ROLE OF UNCONVENTIONAL MONETARY POLICY TOOLS¹

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Abstract

In this paper we document and empirically evaluate the use of unconventional monetary policy tools in Peru to reduce credit dollarization. Our empirical analysis uses the counter-factual test proposed by Pesaran and Smith (2012) and shows that both high reserve requirements, used counter cyclically 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 credit dollarization in Peru. The paper also discusses the impact on bank's balance sheet of the complementary tools created as part of the de-dollarization program to inject domestic currency liquidity.

JEL Classification: E52, E58, E61, G38

Key words: Unconventional policy tools, reserve requirements, Monetary Policy, Dollarization, and Peru.

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I. Introduction

In this paper, we document and empirically evaluate the use of unconventional monetary policy tools in Peru to reduce credit dollarization. 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 been on average 2.7 percent and core inflation reached 2.1 percent, one of the lowest in Latin America for the period 2001-2015. During the same period, financial dollarization has declined steadily from levels close to 80 percent to less than 30 percent.

Different from other inflation targeters, the IT 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% with a tolerance range of 1%-3%² for headline inflation aims at generating strong incentives for local agents to de-dollarize their assets and liabilities and the active use by the central bank of additional monetary tools has the objective of limiting financial risks created by financial dollarization. Reserve requirements and a precautionary accumulation of international reserves are employed to limit liquidity and solvency risks associated with exchange rate fluctuations, whereas FX 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. In contrast to the Asian and Russian crises, which had a severe impact on the banking system, with banking credit collapsing and several small banks falling into bankruptcy in 1999 and 2000. 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.

The accumulation of international reserves and the precautionary increase in reserve requirements, both in domestic and foreign currency, prior to the global financial crisis,

² Although Peru has achieved inflation rates below 5 percent since 1997, dollarization ratios have remain above 50 percent until 2010. See Castillo and Winkelried (2010) and Rappoport (2009) for explanations of the high degree of persistent in financial dollarization.

allowed the BCRP to inject liquidity to the financial system in a timely manner. The availability of liquidity and the BCRP's readiness to provide it swiftly reduced the pressure on domestic interest rates. In total, since October 2008 to March 2009, the BCRP injected liquidity by an equivalent of 9.3 percent of GDP by using a variety of instruments, mainly reductions in reserve requirement in domestic and foreign currency, repos with terms up to one year, swaps, and direct FX sales. The resilience shown by the Peruvian financial system during episodes of financial stress has also contributed to boost confidence in the local financial system and to reduce financial dollarization.

During 2011 and 2012, the low levels of the international interest rates and the appreciation of the domestic currency in Peru that followed the FED quantitative easing policies, generated a rebound in the expansion of dollar credits, making more slowly the fall 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, and a new set of instruments aiming at providing the liquidity in domestic currency and the currency hedge that the conversion of dollar loans into soles loans required.

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

In December 2014, the BCRP modified the original limits to new levels that implied reductions up to 10 percent for total dollar loans and 15 percent for mortgages and automobile loans in dollars from their corresponding levels observed in 2013. Banks had to comply with these reductions of dollar lending by the end of December 2015. Recently, the BCRP has announced an additional reduction up to 20 percent for total loans and to 30 percent for mortgage and automobiles for December 2016.

Although, credit dollarization decreased in 2015 from 38 to 28 percent, and the stock of dollar loans declined by 15 percent on average for the banking system, a proper evaluation of the empirical impact of the de-dollarization program requires to distinguish 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 counter-factual test developed by Pesaran and Smith (2012), a methodology that allows us to generate an unbiased estimator of the impact of policy changes, to statistically assess the impact on credit dollarization of the de-dollarization program and counter-cyclical use of reserve requirements since 2010. We also discuss the impact on bank's balance sheet of the complementary tools created as part of the de-dollarization program to inject domestic currency liquidity.

Reducing financial vulnerabilities in a timely manner is crucial for maintaining financial stability and for an effective implementation of monetary policy, particularly under the current external conditions of high volatility in the 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.

In the case of Peru, liquidity and credit risks induced by exchange rate fluctuations are among the most relevant ones. 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. On the other hand, credit risk is associated with the existence of currency mismatches that increase the default probability of agents borrowing in dollars, but whose cash flows 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 non-tradable 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 non-tradable firms (by reducing the net present value of cash in dollars).

The de-dollarization program implemented by BCRP, by generating incentives to diminish credit dollarization, reduces banks assets exposure to exchange rate credit risk associated to currencies mismatches, and the spillovers and externalities for financial stability that dollarization generates.

Our empirical results show that the de-dollarization program had statistically significant effect on the de-dollarization of banking credit in 2015. According to the counterfactual test of Pesaran and Smith (2012), 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. Also, the results show that the counter-cyclical use of reserve requirements since 2010 had a significant effect on dollar loans growth rates. However, as both domestic and foreign currency reserve requirement were raised in tandem since 2010, their impact on de-dollarization was not statistically significant. In addition we find that the increase in capital requirements for dollar loans that the Superintendence of Banks, Insurance Companies and Pensions Funds established in 2012 had a negative impact on mortgage and automobile loans growth; although, its impact was not statistically significant according the test of Pesaran and Smith (2012).

This paper is related to an increasing literature that studies the impact of non-conventional policy tools on credit conditions and on systemic risks. Garcia-Escribano (2009) using vector autoregressive models assess the impact of prudential tools such as reserve requirement and higher capital requirements on de-dollarization of credit for a selected set of Latin America countries. Armas et. Al (2014) using the Pesaran and Smith (2012) methodology test the impact of reserve requirements on credit conditions for Peru. Vargas et.al (2012) performs, using a different methodology, a similar evaluation for the case of Colombia. Another branch of the literature related with this paper is the one that links monetary policy with systemic risks.

For developed economies, Borio and Zhou (2008) and Valencia (2011) have recently highlighted the relevance of the risk-taking channel as a potential source of systemic risk. In the case of developed economies, where asset markets are deeper and more developed than in EMEs, a prolonged period of low interest rates can boost capital and collateral values, which in turn can encourage agents to expand their balance sheets and increase their leverage, and induce financial intermediaries to reduce their efforts in screening borrowers. This channel may 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.³ Tighter monetary policy, by reducing intermediation margins, also induces financial intermediaries to invest in riskier assets to maintain their expected returns on equity, thereby shifting value from depositors and creditors to bank shareholders.

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 risks⁴. Similar channels operate for dollarize economies through the link between the exchange rate and the liquidity and credit risks of the financial system, as we previously discussed.

The remaining of the paper is organized as follows: section II explains the use of reserve requirements by the Central and Capital requirements by the Superintendence of Banks, Insurance companies and Pension Funds to reduce credit dollarization; section III discusses the rationale and main features of the de-dollarization program, section IV quantifies the effectiveness of prudential policies aiming at reducing credit dollarization by employing a counter-factual test following Pesaran and Smith (2012). The final section presents some concluding remarks.

II. De-dollarization and Prudential Policies

De-dollarization is a fundamental strategy of prudential policies aiming at preserving financial stability in Peru. Financial stability is not explicitly assigned to any particular institution, each regulatory body uses its own instruments with this objective. On one hand, the Superintendence of Banks, Insurance companies and Pension Funds (SBS) is in charge of supervising and regulating financial institutions to guarantee their

³ Jimenez and others (2009), Iannidou and others (2009) and Maddaloni and Peydro (2011) find empirical evidence supporting this channel using loan level data. However, using more aggregate data Merrouche and Nier (2010), Dell'Ariccia and others (2012) find less conclusive empirical evidence in favor of this channel.

⁴ Consistent with this channel Allen and Gale (2000), Illing (2007), Goodhart and others (2009) find an increase in the probability of financial crisis after a 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.

individual solvency conditions. Its toolbox includes capital requirements, provisioning, and limits to bank's operations. On the other hand, the BCRP's main objective is 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. It uses unconventional monetary policy instruments, reserve requirements, precautionary accumulation of international reserves and FX intervention to limit the risks from financial dollarization.

As we highlighted previously, financial dollarization generates systemic risk on at least two crucial dimensions: first, it reduces the BCRP's capacity to act as a lender of last resort, as financial dollarization increases the likelihood of a liquidity shortage in the financial system. Second, since banks lend in foreign currency to non-tradable firms, financial dollarization also creates currency mismatches, which magnify foreign-currency-induced credit risk.

The unconventional instruments used by the BCRP aim at: i) helping banks to internalize dollarization risks; ii) preventing the impact of shocks from spreading across the economy; and iii) enhancing the financial system's capacity to absorb shocks.

These objectives are achieved by: i) increasing the level of international liquidity in the financial system; ii) raising the cost of intermediation in dollars to curb excessive credit growth; and iii) reducing exchange rate volatility to prevent negative balance sheet effects. Figure 1 summarizes the main financial risks that each unconventional instrument is tailored to mitigate, as well as the instruments used by the SBS, such as capital requirements and higher provisioning, which have been designed to reduce credit risk and limit currency mismatches.

Figure 1. Use of unconventional monetary policy instruments.

Instrument / Objective	Liquidity risk	Excessive credit growth	Mismatch
RRs on foreign currency deposits	Higher than RRs on domestic deposits given that CB cannot act as lender of last resort	RRs on foreign currency deposits are hiked during episodes of capital inflows	Additional RRs conditional on the evolution of credit in foreign currency to curb mismatches on private agents' balance sheets
RRs on domestic currency deposits		RRs on domestic currency deposits are hiked during episodes of capital inflows	
RRs on short term liabilities	Excessive reliance on short term liabilities generates liquidity risk for banks		RRs on short term liabilities provide banks with incentives to fund their activities with more stable funding (match maturity)
Capital requirements		Cyclical capital requirements	Higher capital requirements on foreign currency loans
Provision requirements		Cyclical provisions	

Note: CB stands for Central bank and RR for reserve requirements.

Although a formal macro-prudential committee is not in place in Peru, since 2008 the SBS, the BCRP, and the Ministry of Economy and Finance (MEF) hold periodical meetings to analyze potential sources of systemic risk and coordinate policies to mitigate them. Several of the macro-prudential policies implemented by each authority since 2008 were closely coordinated within this committee.⁵ However, a key difference between the instruments used by the SBS and the BCRP is the scope of the systemic risks they aim at mitigating. 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, unconventional monetary policy tools are used to limit the spillover effects of capital flows on domestic monetary conditions, particularly after the quantitative

⁵ For a detailed description and analysis of the macro-prudential policies implemented in Peru, see Choy and Chang (2014).

expansionary policies put in place by the FED. The use of the aforementioned unconventional monetary instruments by the BCRP is discussed below.

a) Reserve Requirements

Reserve requirements in dollars are calibrated to increase to 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 cutting them during capital reversal episodes. 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 reversals.

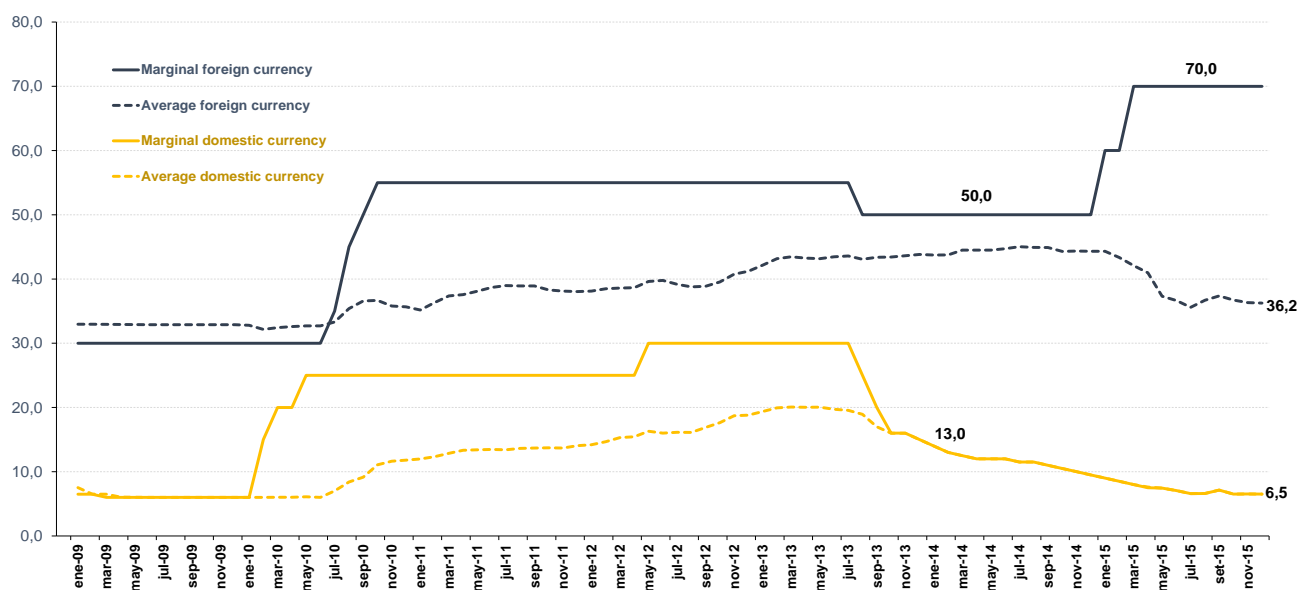
The 2007–09 global financial crisis put the inflation target cum financial risk control to the test. Inflation was running above target during the first half of 2008. High inflation called for higher domestic policy interest rates and a widening spread vis-à-vis foreign interest rates. In turn, higher interest rate spreads against the U.S. federal funds rate induced more carry trades and short-run capital inflows in the run-up to the crisis. The important 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.

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, including the reduction of reserve requirements to end-2007 levels, the use of foreign exchange sales by \$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 from the second half of 2009. During the worst episode of the crisis (October 2008–March 2009), access to credit was preserved and nonperforming bank loans remained low.

The 2007–09 global financial crisis provided policymakers worldwide with an important lesson: monetary policy needs to, and can, take financial stability concerns into account to a greater extent. During the crisis, central banks in developed economies made innovative policy moves, including explicit guidance to steer expectations for future interest rates, and quantitative easing. These policies spilled over into EMEs, 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 2.

Figure 2: Peru: Reserve Requirement in Domestic and Foreign Currency
(Percentage of total deposits)



Source: Central Reserve Bank of Peru.

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, which required a more active use of complementary policy instruments such as

reserve requirements. As shown in Figure 2, 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 reduce credit dollarization.

b) Measures adopted by the SBS

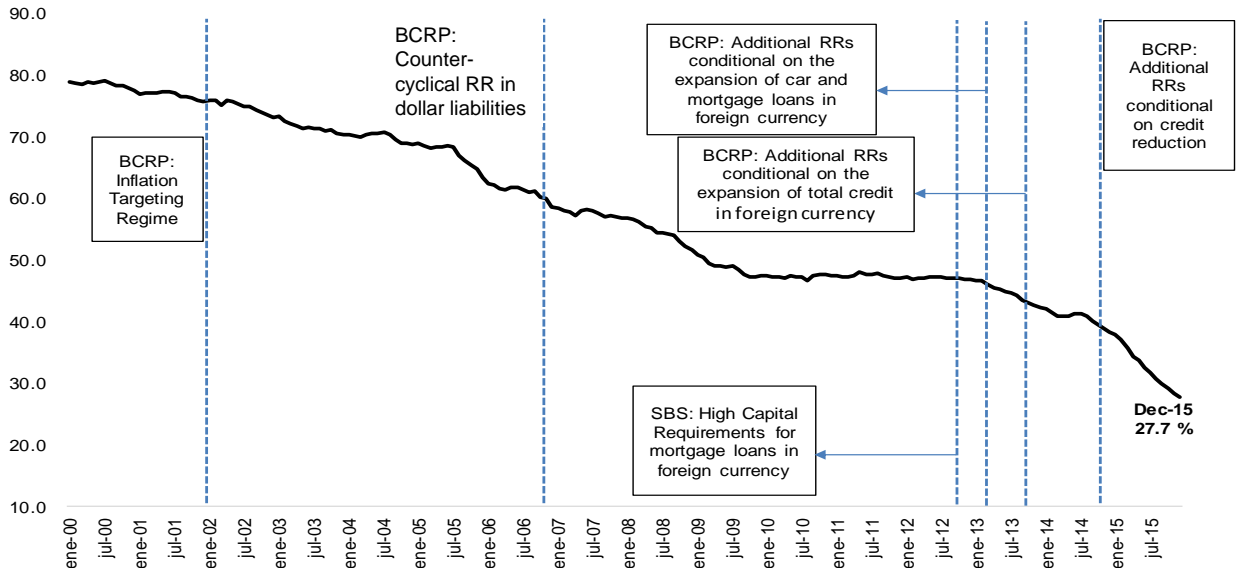
The SBS has also used its policy instruments to induce banks to internalize the risks associated to financial dollarization. In November 2012, the SBS increased capital requirements for dollar lending by raising the risk-weight for dollar credit from 102.5% to 108%. Also since 2013, the SBS has established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

Higher capital requirements for credits that have larger credit risk associated to the fluctuations of the exchange rate, induce banks to increase lending rates for these type of credits, reducing its demand.

Figure 3, illustrates the evolution of credit dollarization and the dates of the three most important prudential policies adopted in Peru to foster the de-dollarization of credit, which includes, the counter-cyclical adjustment of reserve requirement in dollars by the BCRP, the increase in capital requirements set by the SBS in 2012 and the de-dollarization Program of the BCRP.

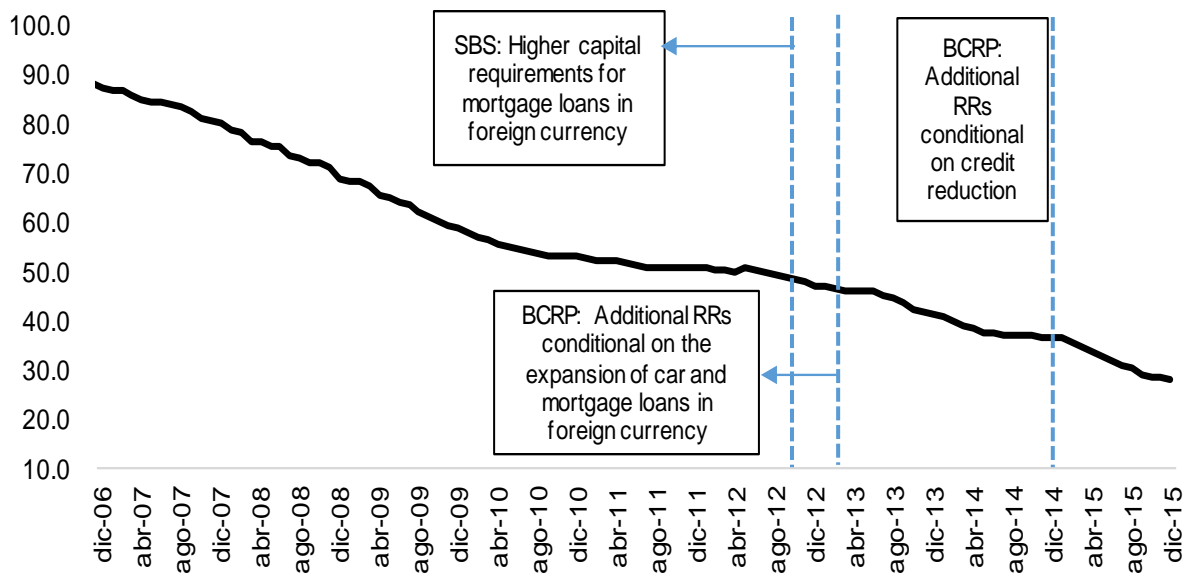
As this figure illustrates, credit dollarization started to decline persistently after the adoption of the IT regime in 2002. Then, from 2010 to 2012, associated very low international interest rates and expected appreciation of the local currency, a slowdown in its decreasing trend is observed. During this period, the BCRP increased several times the average and the marginal reserve requirement to revert the impact of external financial conditions on credit dollarization. However, the most significant change in the de-dollarization trend is observed in 2015, after the BCRP adjusted its de-dollarization program. As it can be seen in Figure 3, the downwardly trend in credit dollarization accelerates since 2013 and with more intensity during 2015. This period coincides with the application of the de-dollarization program of the BCRP and also with the increase in expected depreciation of exchange rate, which increases the expected cost of borrowing in dollars.

Figure 3: Evolution of credit dollarization in Peru



For the case of dollar denominated mortgages and automobiles loans, the clearest change in the de-dollarization trend occurs around the date the SBS increased capital requirements for dollar lending. This trend is reinforced in 2013 with the adoption of the de-dollarization program by the BCRP in 2013.

Figure 4: Dollarization ratio of Mortgages and Automobile loans



In the next section we discuss in detail the implementation of the de-dollarization program and in section IV we test empirically the impact of these three prudential policies using the Pesaran and Smith (2012) counter-factual test.

III. The de-dollarization program 2013-2016

In 2013, the Central Bank implemented additional reserve requirements with the objective of inducing a faster reduction in credit dollarization. Financial institutions with dollar-denominated loans growth rates above certain thresholds established by the BCRP were subject to these requirements. In this section we discuss the rationality of these measures, the details of their application, and empirical evidence that the de-dollarization program has been effective in achieving its main objective; i.e., reducing currency mismatches associated with financial dollarization.

a. 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 to 0.75 percentage points for banks exceeding the first threshold, and 1.5 percentage points for those exceeding the second threshold.

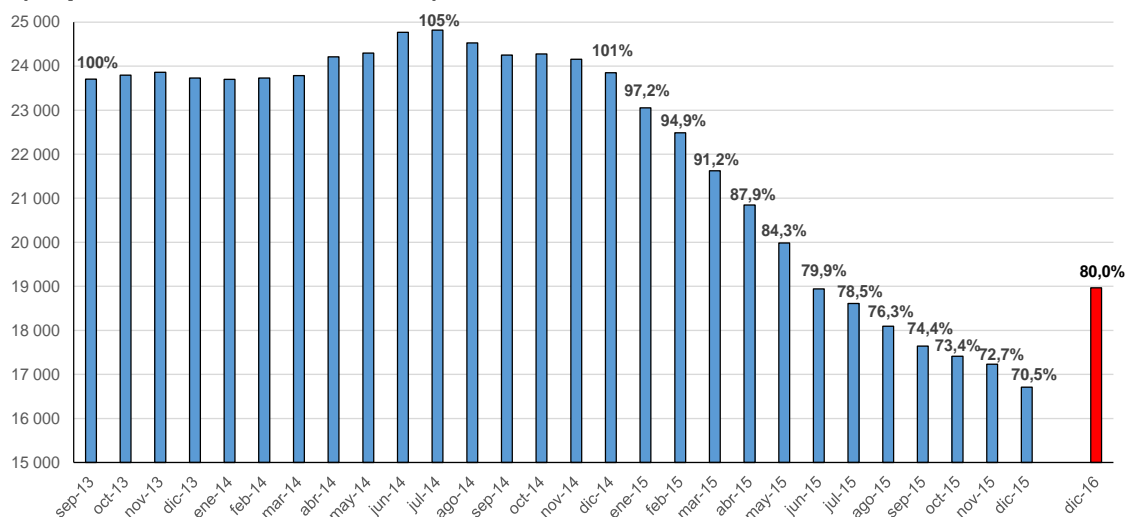
In October 2013, a similar additional reserve requirement was established linked to a broader definition of credit, including all loans to the private sector denominated in foreign currency except those given for international trade purposes. In this case, additional reserve requirements increased by 1.5 percentage points when total outstanding credit in foreign currency excluding credit for trade operations exceeded 1.05 times the reference stock (which was set to September 2013), 3.0 percentage points when this definition of foreign total credit exceeded 1.10 times the reference balance, and 5.0 percentage points when it exceeded 1.15 times the reference balance.

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 to a new set-up that required reductions in dollar denominated loans. Under the new rules governing the additional reserve requirements in foreign currency, banks had to reduce, by June 2015, the stock of total credit in foreign currency (excluding foreign trade operations as well as operations with terms longer than 4 years and amounts over US\$10 million) to at least 95 percent of the comparable balance as of September 2013. 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 for December 2015, since 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 mortgages loans to 85 percent of the balance as of February 2013.

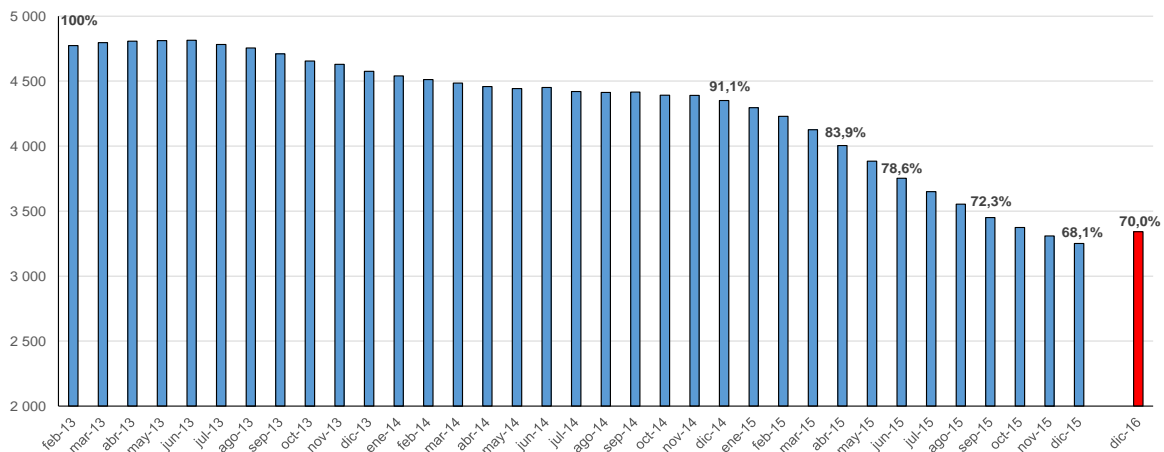
With these measures, the BCRP aimed to reduce potential risks in the financial system by providing incentives for banks to reduce their balances of credit in foreign currency, without discouraging foreign trade operations and focusing on credit sectors that are more vulnerable due to their high dollarization level (in February 2013, dollarization of mortgage and car loans was 47.7 and 79.6 percent, respectively).

Figure 5: Banking Credit in Foreign currency excluding trade Loans (Sep 2013=100, US\$ millions)



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. In December 2015, total credit in foreign currency fell even more, going beyond the objectives of the program. At the level of individual banks, all of them achieved the reductions in total foreign currency credit set by the BCRP (See figure 5).

Figure 6: Car and Mortgage Bank's Loans in Foreign Currency Feb 2013=100, US\$ millions



The reduction in the stock of mortgage and car loans in foreign currency was even larger. 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 for bank's credit dropped from 43 to 30 percent from December 2014 to December 2015. The reduction of dollarization was widespread across different credit market segments, as table 1 illustrates.

Table 1

Banks Credit dollarization			
	In Percentajes of total Credit		
	Dec 13	Dec 14	Dec 14
Firms	59,9	55,3	39,2
Large firms	67,1	59,6	42,8
Medium Size firms	63,8	59,3	44,1
Small firms	18,7	17,5	8,1
Households	26,2	22,5	15,4
Consumer Loans	11,8	10,4	6,8
Mortgages	40,8	34,7	24,7
TOTAL	48,2	43,8	30,8

Given the program's success, and in order to consolidate the gains already obtained, in December 2015 further objectives for 2016 were set. Total credit denominated in foreign currency excluding foreign trade loans is 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 must fall to 70 percent of the stock observed in February 2013.

b. Complementary instruments to inject liquidity in soles to support the de-dollarization of credit.

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

- i. 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 in their balance sheet for sol-denominated loans. This meant that banks needed a means to regain their neutral position with respect to the dollar.

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

The BCRP realized that 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 FX volatility, the BCRP considered this scenario undesirable. Thus, it was decided that 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 dollars as collateral: a restricted deposit at the BCRP. As a result, banks' customers obtain loans in soles, 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 USD 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 soles and decreases dollar assets) on banks' dollar exposure.

Figure 7: Repo for Credit Substitution

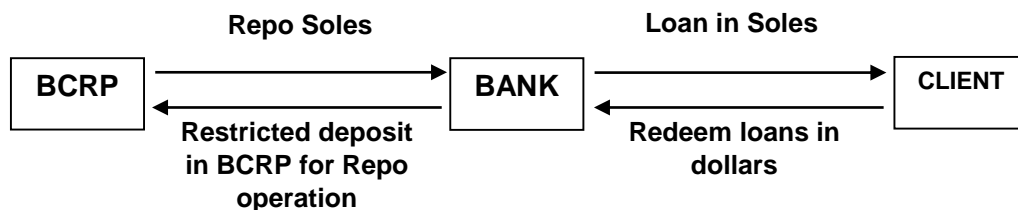


Table 2 shows the effects of the repo for credit substitution on the balance sheet of a private bank. Let's assume the bank wants to substitute US\$ 100 million of credit denominated in foreign currency for S/ 300 million of domestic currency loans (the exchange rate for this example is S/ 3 per dollar). First, the bank buys dollars from the BCRP and uses them as collateral to borrow soles from the central bank. The dollars

that the bank purchased become a restricted deposit at the Central Bank. The FX position of the private bank remains unchanged, but the FX position of the BCRP falls. The BCRP's international reserves are not affected, however.

Notice that the fall in the BCRP's FX position mirrors the increased FX 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.

Table 2: Repo for Credit Substitution Scheme

Banks		
Credit in DC (Mill. S./)	+300	Currency REPO (Mill. S./) +300
Credit in FC (Mill. US\$)	-100	
Restricted Deposit in BCRP (Mill. US\$)	+100	
Accounting Exchange Position (Mill. US\$)	0	
Central Bank		
Currency REPO (Mill. S./)	+300	Restricted Deposit in BCRP (Mill. US\$) +100
Exchange Position (Mill. US\$)	-100	
Sale of foreign currency (Mill. US\$)	+100	

Furthermore, given 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 soles. 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 which was extended to 20 percent in December 2015) to make currency repos with the BCRP, obtaining long-term funding in domestic currency.

Figure 8: Repo for Credit Expansion

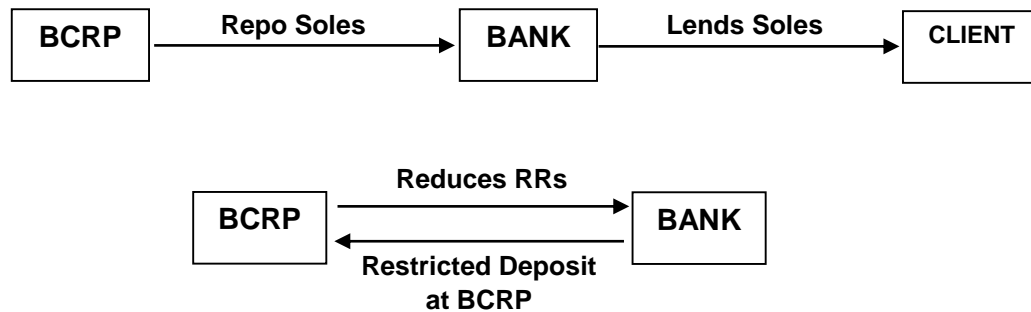


Table 3 illustrates the workings behind the repos for credit expansion. Let's consider the case of a financial institution that uses US\$ 100 million of its dollar denominated reserve requirements for a repo for credit expansion. Also, let's assume that the exchange rate of soles per dollar is S/ 3. With the repo, the bank puts US\$ 100 million as a restricted deposit at the Central Bank, which works as the collateral of the repo, and in exchange it receives S/ 300 million. Note that for the private bank its FX position does not change and for the Central Bank the level of international reserves and FX position are not affected either.

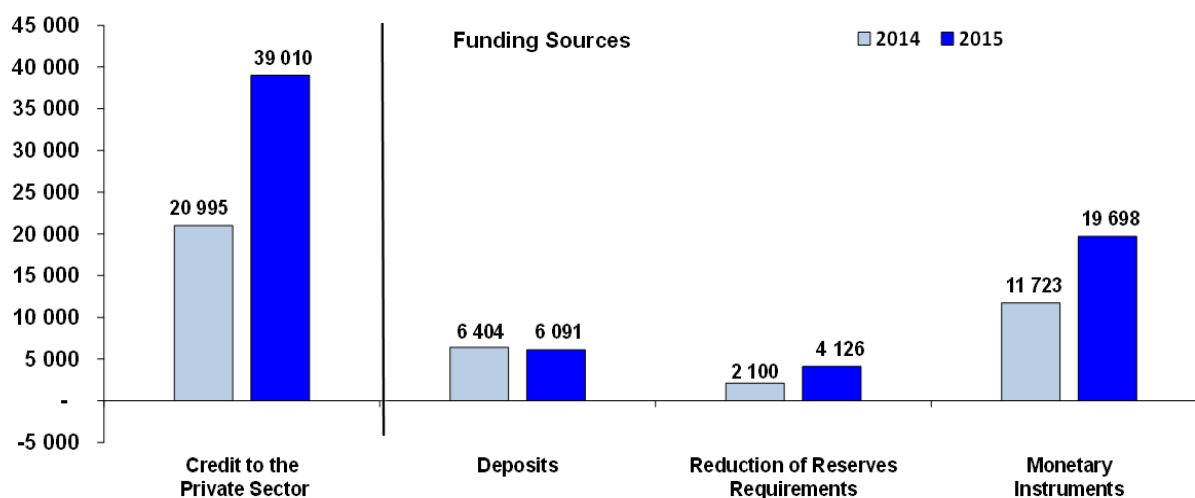
Table 3: Scheme of Repos for Credit Expansion

Banks		
Reserve Requirements in FC (Mill. US\$)	-100	Currency REPO (Mill. S/.) +300
Restricted Deposit in BCRP (Mill. US\$)	+100	
Current Account in DC (Mill. S/.)	+300	
Accounting Exchange Position (Mill. US\$)	0	
Central Bank		
Currency REPO (Mill. S/.)	+300	Reserve Requirement in FC (Mill. US\$) -100
Exchange Position (Mill. US\$)	0	Restricted Deposit in BCRP (Mill. US\$) +100
		Current Account in DC (Mill. S/.) +300

These new types of repo operations have been instrumental in facilitating a smooth reduction in credit dollarization, particularly during 2015, when 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 soles-denominated loans and by the increase in dollar deposits.

The repos for credit substitution and for credit expansion contributed to swap 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. The next figure illustrates the dynamics of these instruments. Bank credit expansion in 2015 was mostly financed by repo operations with the BCRP.

Figure 8: Funding sources of bank credit expansion in domestic currency (Annual flows in millions of Soles)



The de-dollarization program achieved the goal of reducing credit dollarization. However, as the graph illustrates, deposit dollarization did not follow. The reason is that agents' expectations of strong depreciation of the sol associated to the normalization of the Federal Reserve's monetary policy led to a strong shift in deposits from soles to dollars. Depreciation favors de-dollarization of credit but has the opposite effect on deposits. Thus, the Central Bank had to provide long-term funding

instruments in domestic currency to the financial system in order to maintain control over monetary conditions in domestic currency. Most of these instruments relied on the banks' dollar liquidity as collateral through currency swaps.

Looking forward, unwinding the instruments deployed by the Central Bank 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 (appreciation of the sol, for example), credit dollarization could increase again if the measures implemented by the Central Bank in the last 3 years are phased off. 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 maintain backstops as for instance, the high reserve requirements for dollar-deposits. Low inflation and a stable exchange rate will provide incentives for private agents to de-dollarize deposits but when the winds change again, particularly with regards to the exchange rate, policy will have to be in place to make sure dollarization does not rear its head again.

IV. Impact of reserve requirements on credit growth rate and on financial dollarization

In this section, we evaluate empirically 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.

First we require to identify periods before and after these instruments were introduced. We use July 2010-December 2015 as the period when the instruments were in place. During those years the BCRP continuously increased both the marginal and the average reserve requirement rates to limit credit growth in dollars. For the de-dollarization program, we use January-December 2015 as the evaluation period. 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):

$$y_t = \pi_1 x_t + \pi_2' \mathbf{w}_t + v_{yt} \quad \dots (1)$$

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

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 ones as:

$$\Psi_{t+H}^1 = \Psi_{t+H}(x^1) = \{x_{T+1}^1, x_{T+2}^1, \dots, x_{T+H}^1\}$$

$$\Psi_{t+H}^0 = \Psi_{t+H}(x^0) = \{x_{T+1}^0, x_{T+2}^0, \dots, x_{T+H}^0\}$$

However, the policy reduced form presented in equation (1) is clearly misspecified for estimating the structural parameters of the model. Pesaran and Smith (2012) show that under the assumption that \mathbf{w}_t , the parameters of the policy reduced form (π_1, π_2), and the errors v_{yt} , are invariant to policy interventions, the policy effect can be consistently estimated by:

$$d_{T+h} = \pi_1 (x_{T+h}^1 - x_{T+h}^0) \quad \dots (2)$$

It is clear that this result does not require the invariance of the structural parameters, but only that the parameters of the policy reduced form are invariant to policy intervention. In our policy evaluation, we use as the outcome variable the dollarization of credit and the annual growth rate of dollar-denominated credit. As policy variables, both the average and marginal reserve requirement rates. In order to measure the effect of the de-dollarization program, we use a dummy variable (with values 0 or 1) from January to December 2015. Let us recall that in this program, banks had six

months to cut their dollar-denominated dollar 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: terms of trade, the federal funds rate, the 10-year U.S. Treasury yield, and the U.S. unemployment rate, and an index of a basket's exchange rate 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 level regressions, we use the fully modified OLS regressions 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 in the dollarization of total credit, excluding credit for trade operations, and in the dollarization of mortgage and car loans, the two concepts of credit under 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' FX exposure since November 2012. The results of these reduced-form regressions are presented in table 4.

Table 4: Reduce form models

	OLS ESTIMATION	LONG RUN RELATIONSHIP (FULLY MODIFIED ESTIM.) ^{1/}	DOLLARIZATION COEFFICIENT			DOLLARIZATION COEFFICIENT: LONG RUN RELATIONSHIP (FULLY MODIFIED ESTIM.) ^{1/}	
	Dependent (growth rate of credit at):		TOTAL CREDIT		MORTGAGE-AUTO CREDIT	TOTAL CREDIT	MORTGAGE-AUTO CREDIT
	12 months M1	12 months M2	In difference M3	In difference M4	In difference M5	M6	M7
Explanatory:							
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)	
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 Basquet (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		

Estimates. T-statistics probability in brackets

* Significant at 1%

** Significant at 5%

*** Significant at 10%

^{1/} Phillips and Hansen Methodology (1990). In M6 SBS Program is modelled as deterministic. For M2, M6 and M7 De-dollarization program is modelled as deterministic, as well.

^{2/ 3/ 4/} For M3 and M5 are defined in difference. In ^{4/} also is put in 6th lag for M1, as well.

^{5/} For M5 it is expressed in difference.

^{6/} For M4 it is expressed in difference.

Note: The estimation period corresponds from January 2004 to December 2015. All variables are obtained from the web page of the Central Bank of Peru.

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 a significant effect on this indicator. The average reserve requirement has also a negative effect on the change on 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 mortgages and automobiles loans, but not for the aggregate level of dollarization.

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 IT regime and price stability on dollarization decisions. As Table 4 shows, in all the two cases of dollarization analyzed, the estimated impact is around -0.2, implying an average reduction in dollarization ratios of around 2.4 percentage points per year.

Next, we use the previous reduced forms to perform the counterfactual exercise and evaluate their statistical significance. We measure what would have happened to the growth of dollar-denominated loans and the dollarization ratios if the BCRP had not increased 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:⁶

$$\hat{d}_H = \hat{\pi}_1 \left[\frac{1}{H} \sum_{h=1}^H (x_{T+h} - x_{T+h}^O) \right] \dots (3)$$

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:

⁶ In our model, the specification to be used is: $(1 - a_1L)(1 - a_2L)y_t = \pi_1x_t + \pi_2w_t + v_{yt}$ (i.e. an equation with 2 lags of dependent variable). This last expression will derive the next measure of the test:

$$\hat{d}_H = \hat{\pi}_1 \frac{1}{H} \sum_{j=1}^H \sum_{m=0}^{j-1} (\sum_{i=0}^m a_1^i a_2^{m-i} (x_{T+j-m} - x_{T+j-m}^O)) .$$

$$\rho_H = \frac{\hat{a}_H}{\hat{\sigma}_{v_y}} \sim^a N(0,1) \dots (4)$$

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 increase in capital requirements for FX exposure. The results are presented in Table 5.

Table 5: 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).

^{1/} Sample Period: July 2010 - December 2015

^{2/} Sample Period: January 2015 - December 2015

^{3/} Sample Period: November 2012 - December 2015

As Table 5 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 counter-factual exercise considers 53 periods, from July 2010 to December 2014 and the counter-factual values used for the

average and marginal rates is 33 percent, its corresponding values 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 significant⁷.

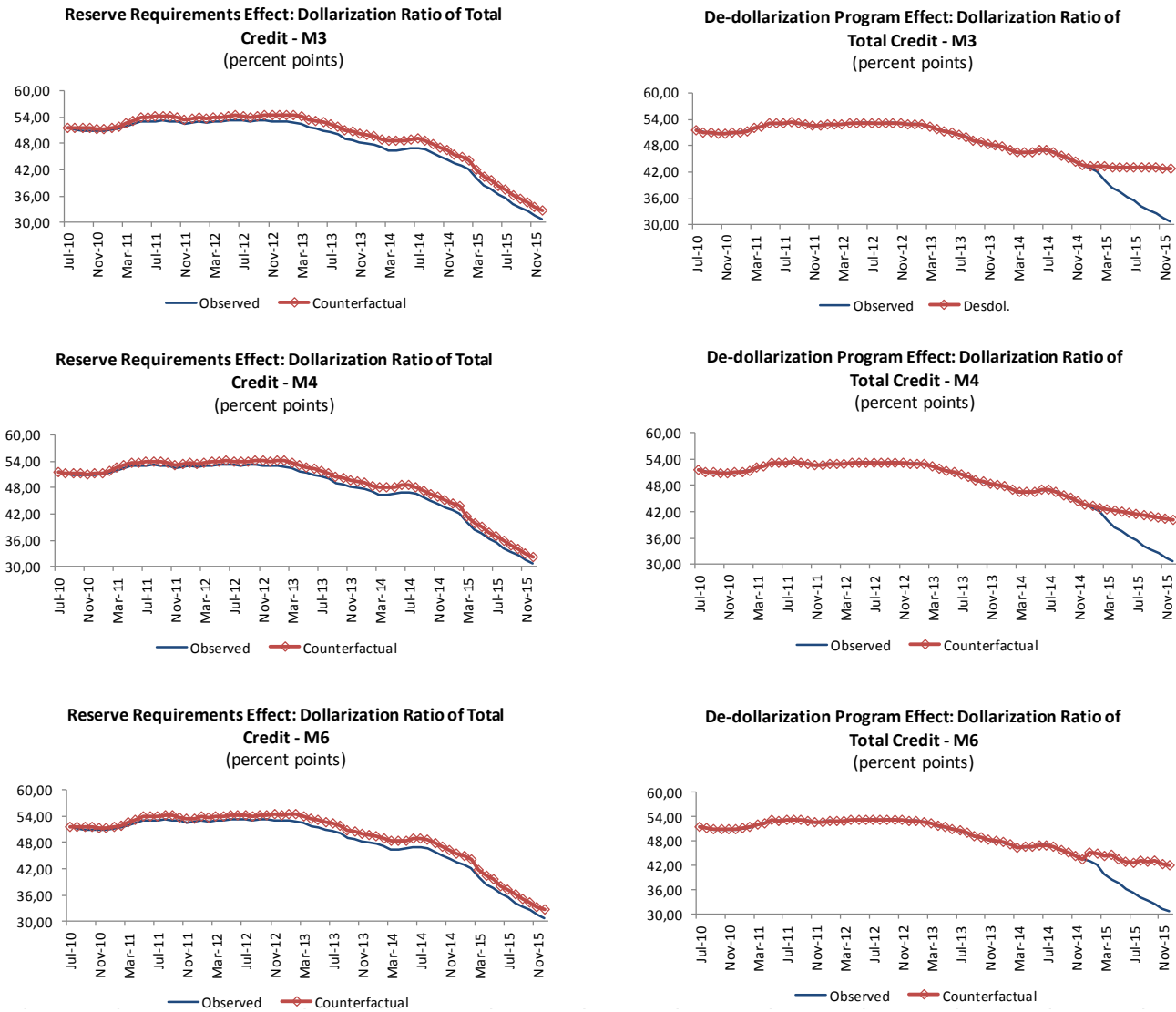
In the case of the de-dollarization program, we consider the period from January to December 2015 for the policy evaluation exercise. The policy effects on dollar-denominated credit growth are negative and statistically significant, as well as the effect on the dollarization ratio of total credit⁸. The 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 higher capital requirements for FX exposure, we find that it has the expected sign, but its 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 shows both the observed path of credit dollarization and the counterfactual path for three models, M3, M4 and M6. The counter-factual estimated level of credit dollarization for December 2015 is (in average) 39 percent vis-à-vis the observed level of 31 percent. That difference (close to 8 percentage points of lower credit dollarization) is explained by the impact of the de-dollarization program, which is approximately 60 percent of the observed fall in bank's credit dollarization for this period, from 43 to 30 percent.

⁷ See Perez-Forero and Marco Vega (2015) for empirical evidence on the effectiveness of reserve requirements to affect credit using a different methodology.

⁸ Also Garcia-Escribano (2010) finds that higher dollar reserve requirements have contributed, together with the IT and the prudential regulatory measures taken by the SBS, to reduce credit dollarization.

Figure 9: Counter-factual effects of Reserve Requirements and the de-dollarization Program



Conclusions

The experience of the Peruvian economy highlights the interaction between monetary and macro-prudential 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, unconventional monetary policies that can limit the negative effect of the risk-taking channel, both ex ante and ex post, are central to an effective conduct of monetary policy.

The BCRP and its peers in Latin America have used higher reserve requirements on foreign currency liabilities, liquidity management tools, international reserve accumulation, and FX-intervention in spot and forward markets 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 Fed's monetary policy and volatility in the terms of trade for LA economies, particularly commodities.

Peru's case illustrates that implementing these tools while preserving monetary stability is not only possible, but necessary. Furthermore, we provide preliminary empirical evidence that bolder measures, aimed at reducing vulnerabilities such as credit dollarization directly through the use of additional reserve requirements can significantly enhance financial stability, thereby creating space for allowing traditional monetary policy to fulfil its role.

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Appendix I

Figure 12: Banking Reserves Requirements Rates

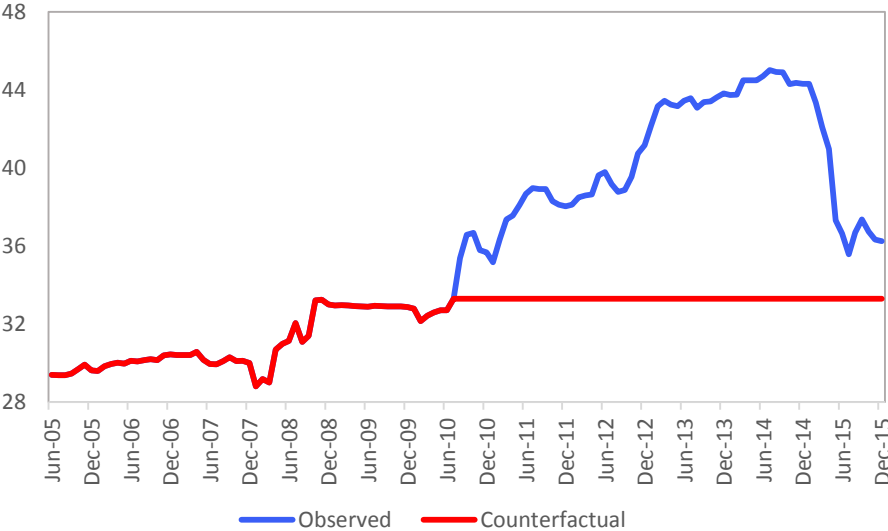


Figure 13: Banking Marginal Reserves Requirements

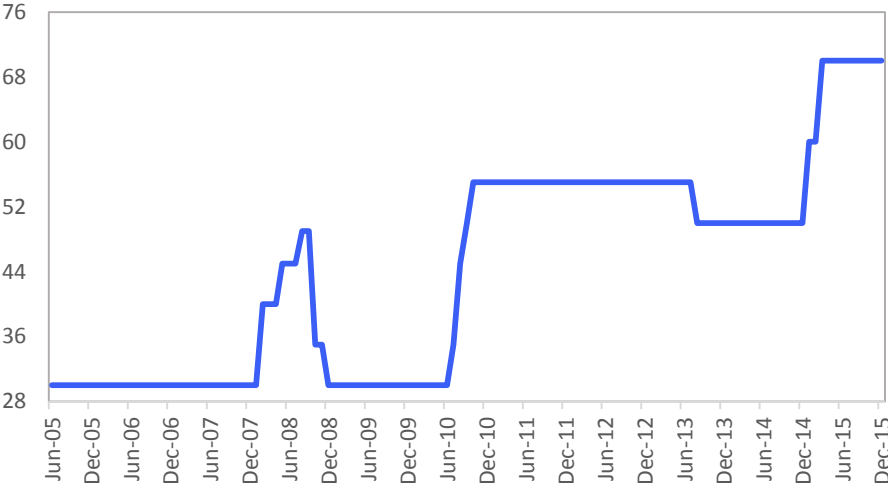


Figure 14: Terms of Trade

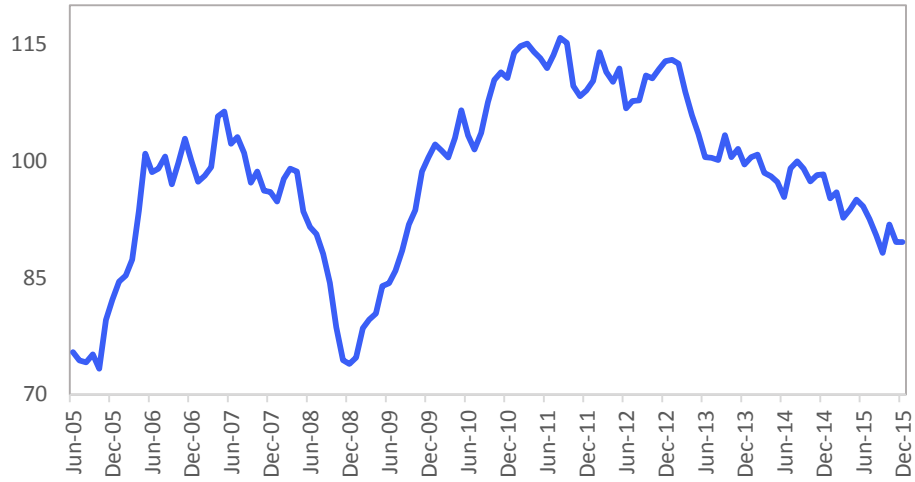


Figure 15: Annual Growth Rate of Credit (foreign currency)

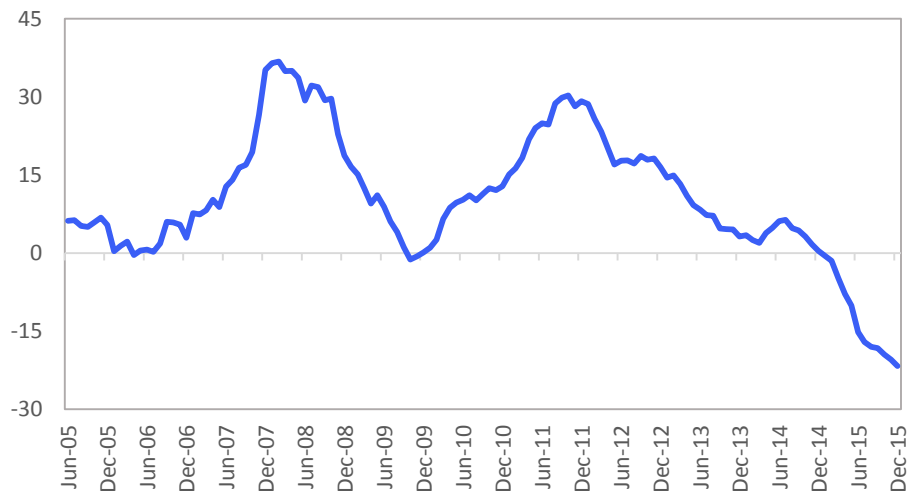


Figure 15: Dollarization Ratio - Total Credit

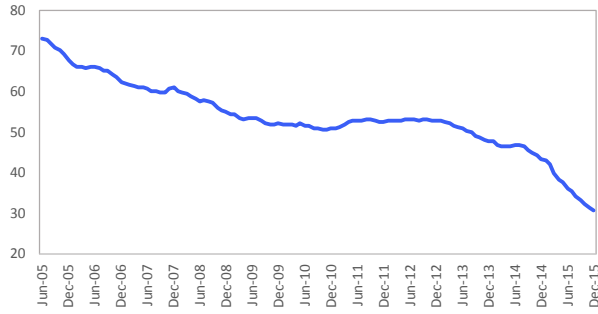


Figure 17: Unemployment Rate

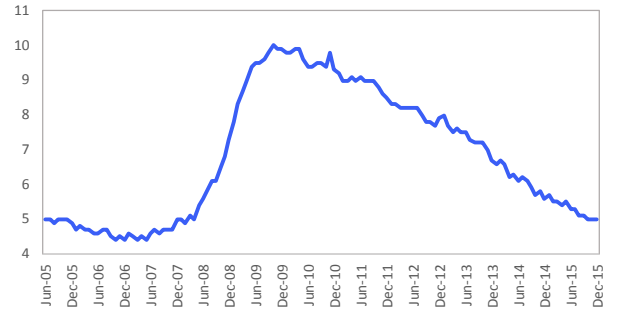


Figure 16: Dollarization Ratio - Mortgage/Auto Loans

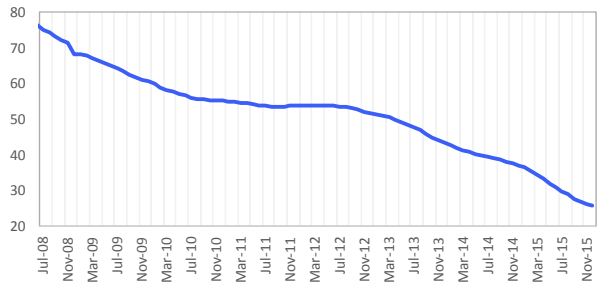


Figure 18: FED Interest Rate

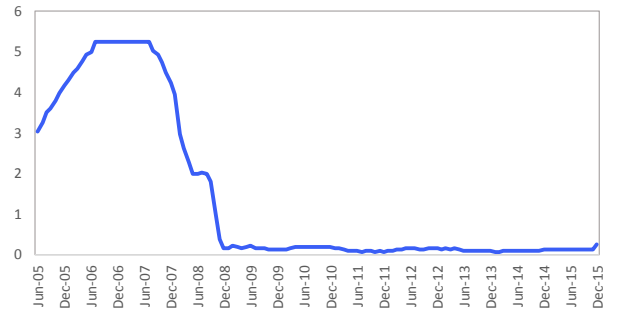


Figure 19: Treasury Bills - 10 years (yield)

