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SCHOOL OF ECONOMICS AND BUSINESS

MASTER'S THESIS

**DOLLARIZATION OF MORTGAGE AND CONSUMPTION LOANS
IN THE PERUVIAN BANKING SYSTEM AND ITS IMPACT ON
THE CAPITAL STRUCTURES OF BANKS BEFORE AND AFTER
THE 2008 FINANCIAL CRISIS**

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ALEXANDRA MELISSA ZUBIAGA NAVARRO

AUTHORSHIP STATEMENT

The undersigned Alexandra Melissa Zubiaga Navarro, a student at the University of Ljubljana, School of Economics and Business (hereinafter: SEB LU), author of this written final work of studies with the title Dollarization of mortgage and consumption loans in the Peruvian banking system and its impact on the capital structures of banks before and after the 2008 financial crisis, prepared under supervision of prof. dr. Marko Košak.

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INTRODUCTION

The purpose of this thesis study is to analyze the factors that contribute to the dollarization of the Peruvian credit market and the impact of the new macroprudential measures, implemented by the Peruvian regulators, on the capital structure of banks, liquidity and solvency ratios and foreign exchange gap exposure.

Regulatory institutions implemented a series of new macroprudential policies and reforms in order to face possible risks related to credits granted in American dollars and, at the same time, to try to decrease the dollarization of the banking system in general. Some of the new adopted macroprudential measures in Peru will be discussed later on in this paper, but the emphasis will be made on higher mandatory bank reserve requirements and larger capital reserve requirements to cover the risks related to mortgage and consumer loans, respectively. Likewise, it is important to evaluate if these measures are effectively contributing to a steady reduction of the amount of dollarization in Peru. As of 2016, approximately 32% of credits granted by banks are in dollars. The total amount of credits of the banking sector at the end of this year was 234,803 millions of soles (this amount represents 46.82% of the Peruvian Gross Domestic Product (hereinafter: GDP) in 2016), which means that approximately 75,000 millions of soles are credits originally granted in the American currency (this is approximately 23,000 millions of dollars and 14.95% as a representation of GDP).

The problem that will be analyzed arises from the fact that in 2008 one of the most deleterious financial crises befell the United States having a massive impact worldwide. The effects of the crisis spread out over Latin American countries, one of them being Peru. The study of this topic is significant, given that the Peruvian banking system and the economy in general are highly dollarized. The process of dollarization started in the nineties, having its origins in the eighties, as will be discussed later. After the crisis, the Peruvian financial system received a massive inflow of American dollars (hereinafter: dollars - US\$ or USD) given that investors were looking forward to obtaining higher returns in emerging markets. Many years ago this would have been seen as an extremely risky decision. However, during the years before the crisis, emerging economies, such as Peru, put in practice different measures in order to get a sounder economic environment. Ceballos, Didier, Hevia and Schmukler (2013, p. 3) claim that “The global crisis thus found many emerging countries with more fiscal space, better balance sheets, and the required credibility to conduct expansionary fiscal and monetary policies”. This is why investors decided to expand their portfolios, aiming to earn the high returns they were not able to get in the safe but depressed developed economies. Peru was one of the chosen economies in Latin American for expanding portfolios because, as Lizarzaburu Bolaños and del Brío (2016) claim, the Peruvian economy had been growing at a fast pace, having an average growth of 6% and an average inflation of 2.6% between the years 2002 and 2014. Most of these investments are classified as foreign portfolio investments, such as in Peruvian government bonds; and as

foreign direct investment, such as in companies of the mining, communications and financial sectors.

This massive inflow of American dollars (hereinafter: dollars or \$) had a great impact on the exchange rate, which is expressed as Peruvian *Nuevos Soles* (hereinafter: sol or soles – S/) per one dollar. The impact was an appreciation of the sol. By the end of September 2008 (shortly after the bankruptcy of Lehman Brothers), the exchange rate had achieved a level of 2.976 soles per dollar, which meant an appreciation (compound growth rate) of almost 18,33% of the sol if compared to the level the exchange rate had achieved six years before the crisis, which was 3.644 soles per dollar. This was the highest level the dollar achieved between the years 2001 and 2016, taking into account the closing level of the exchange rate for each month (Superintendence of Banking and Insurance, 2011).

This appreciation of the national currency was favorable to people whose income was in soles and their debts were in dollars (González Izquierdo, 2015). This encouraged people to take their credits in foreign currency, which can be appreciated in the amounts of personal consumer and mortgage loans granted in dollars. Taking as a representative sample the balance sheet of the largest Peruvian bank *Banco de Crédito del Perú* (hereinafter: BCP), whose market share is approximately 33%, the amount of these credits, net of provisions, is larger in dollars. By the year 2009, one year after the crisis, the average composition of the portfolio of personal consumer and mortgage loans of BCP was 39% in soles and 61% in dollars (Central Reserve Bank of Peru, 2018). The thesis will analyze this more deeply afterwards, but, so far, these numbers give an insight of what was happening at that moment related to the dollarization of credits.

The main problem with this is that the economic agents failed to see that this massive inflow of dollars was not going to be sustainable over time, given that many foreign investors were planning to invest in Peru only for the short-term and with a speculative goal. This sort of investment capital is known as “migrating capital” because investors put their money in the capital markets of a certain country for a short period of time when there are good conditions and, as soon as they get capital gains, they withdraw their money. As soon as the Federal Reserve Bank of the United States (hereinafter: FED) would start increasing interest rates and reducing its quantitative easing policies (hereinafter: QE), foreign investors would adjust their portfolios, taking back their financial assets to the American market and slowly leaving the emerging economies. This is something that nowadays worries the Peruvian authorities, even more than before, especially when a large amount of capital is considered to be “migrating capital”, as explained before. Furthermore, given that the exchange rate regime in Peru is a floating regime, the price of the dollar will increase, meaning a nominal and real depreciation of the sol against the dollar (González Izquierdo, 2015). As a result, the paying capacity of people whose debts are in this foreign currency would be undermined.

This undermined paying capacity means a higher risk to the balance sheet of the banks, regarding the credits granted to natural persons. If they would not be able to repay their debts in due time, banks will face risks related to losses for credits that could not be recovered and higher provisions. At the same time, this could be seen by other economic agents as the beginning of a possible systemic risk, causing the ability of banks to get deposits from the public to be jeopardized, putting at stake the health of the financial system as a whole.

In order to fulfill the purpose of this thesis, the thesis will answer the following research questions:

- Which are the most important measures taken by the Peruvian authorities in order to reduce the coefficient of dollarization in the banking system, for both credits and deposits? Could it be concluded that they have been effective, given that the reduction of dollarization is the goal of authorities?
- What is the correlation between overdue credits in American dollars and the variation of the foreign exchange rate (soles versus dollars)? Can it be concluded that the depreciation of the sol against the dollar could be a possible cause of the deterioration of the portfolio of credits in dollars (increase of overdue credits)?
- What is the impact of changes of mandatory reserve requirements in American dollars on the overdue consumer and mortgage loans of banks?
- Have the new measures taken by the authorities to reduce dollarization had an impact on the capital structure of these banks related to the capital requirements and on their solvency ratios?

To answer these questions, the thesis will use a quantitative approach that includes different variables among the four largest financial institutions of Peru across the years 2001 and 2016. The quantitative approach consists of analysis of correlations among variables, in order to be able to get answers related to the questions stated above.

Some of the variables that will be included are: capital requirements, debt-to equity ratio, coefficient of dollarization, amount of reserve requirements, composition per currency of the portfolio of personal and mortgage loans, etc.

Furthermore, the qualitative approach also includes a comparison amongst these variables across the years and amongst the banks of the sample. The comparison will be done using graphics and a descriptive method, by means of an analysis of the data obtained about the variables for each of the four banks of the sample. The quantitative approach includes an analysis of correlations of the variables mentioned previously.

This thesis has two main parts. The first one is about the theoretical and historical framework, which is divided into five subsections. The first subsection is about the history of dollarization of the Peruvian financial market and a description of the credit market in Peru. The second subsection describes the existing literature on dollarization, focusing on

the dollarization in Latin American countries and Peru. The third subsection gives an insight on the theory about foreign exchange positions and capital requirements. The fourth subsection describes the relation between the implementation of the Quantitative Easing program by the FED and the Peruvian financial system by means of an analysis of the balance of payments and sovereign debt of Peru. The fifth subsection describes the macroprudential measures implemented by Peruvian authorities in order to face the vulnerabilities that arise from a dollarized financial system and their alignment with the Basel regulations. The second main section consists of the data and empirical analysis of the banks chosen as the most representative ones of the Peruvian banking sector. This section is subdivided in nine subsections. Subsection one describes the banks chosen for the sample. Subsection two and three analyze the banks' portfolios of credits and funding. The fourth one explains why dollarization is still a persistent issue in the Peruvian financial system. The fifth, sixth, seventh, eighth, and ninth subsections analyze mandatory reserve requirements, liquidity, capital adequacy ratios, solvency ratios, foreign exchange position and correlations among variables, respectively. Last, the thesis concludes about the effectiveness of the measures implemented by the authorities in order to reduce dollarization and the vulnerabilities of a dollarized economy.

1 THEORETICAL AND HISTORICAL FRAMEWORK

1.1 Description of the Peruvian Banking Sector

First of all, it is significant to describe briefly what the Peruvian financial system consists of. It is divided into two sectors: the banking and the non-banking sector. The latter consists of financial companies, municipal and rural savings and credit banks (even though the translation of this sort of financial entities includes the word "banks", under the classification used in Peru they are not taken into account as banks in a formal sense). These financial entities are mostly oriented to granting credits at a micro financial level. As of March 2016, they hold a 10.5% of the credit market share. On the other hand, the banking sector holds 89.50% of the credit market share, as shown in Table 1.

Table 1 also mentions EDPYMES. It is worth to state that EDPYMES are Peruvian financial entities whose objective is to provide credits to natural and legal persons whose activities involve the development of new small and micro businesses. EDPYMES stands for "*Entidad de Desarrollo para la Pequeña y Microempresa*" in Spanish, which means, in English "Small and Micro Businesses Development Entity".

Likewise, the category named as "Other financial institutions" refers to institutions that take deposits from the public and grant credits, but the main difference is that they pay and charge a higher interest rate on those deposits and credits, respectively. This is because, first of all, they are not as solid as banks and the rest of the institutions included in the non-banking category. Moreover, they usually grant credits to riskier individuals, whose credit records

are not sufficiently good in order for banks or saving banks to give them loans. This is why these institutions charge a higher interest rate for those credits because they are assuming a higher risk.

Table 1. Market share in the Peruvian financial industry

As of March 2016	Assets (in millions of soles)	Assets (share in %)	Credits (share in %)	Deposits (share in %)
Total	392,680	100.00	100.00	100.00
1. Banking	359,560	91.60	89.50	91.50
2. Non banking	33,121	8.40	10.50	8.50
2.1 Municipal saving banks	18,921	4.80	5.90	6.10
2.2 Rural saving banks	641	0.20	0.20	0.20
2.3 EDPYMES	2,151	0.50	0.70	-
2.4 Other financial institutions	11,407	2.90	3.70	2.10

Source: *Central Reserve Bank of Peru – statistical series (2018)*.

The banks this thesis will work with are the following: BCP, BBVA Continental, Scotiabank and Interbank, given that these are the banks which have the largest market share with respect to credits granted in the Peruvian market.

The thesis includes only these banks in the sample not only because of the large market share they hold, but also because, in case of an event of default of any of these specific banks, there is a probability of occurrence of systemic risk in the Peruvian economy due to large bank runs. If this shall happen, the Peruvian economy would go into a long and harsh recession, due to the highly important role these specific banks have in the economy.

In case one of these big banks goes bankrupt, the fragility of the whole banking system will be at stake, due to the expectations of economic agents. In this case, there will be a contagion effect, due to the fact that economic agents will also expect smaller banks to fail. Besides, these four banks have the highest sensitivity to negative shocks in the market (especially shocks related to negative profitability), leading to higher levels of capital losses.

In addition, BBVA and Scotiabank are exposed to the risks faced by the main agencies, in Spain and Canada, respectively, which consist of the risks originated by the crisis in the mortgage loans market in these two countries.

Regarding the market shares of the banks, these are depicted in Figure 1. These percentages have been calculated with the data about the portfolios of loans of each bank as of December 2015 and December 2016 and they represent an average of all the amounts (as stocks) between those dates. Furthermore, the category “Others” include the following banks:

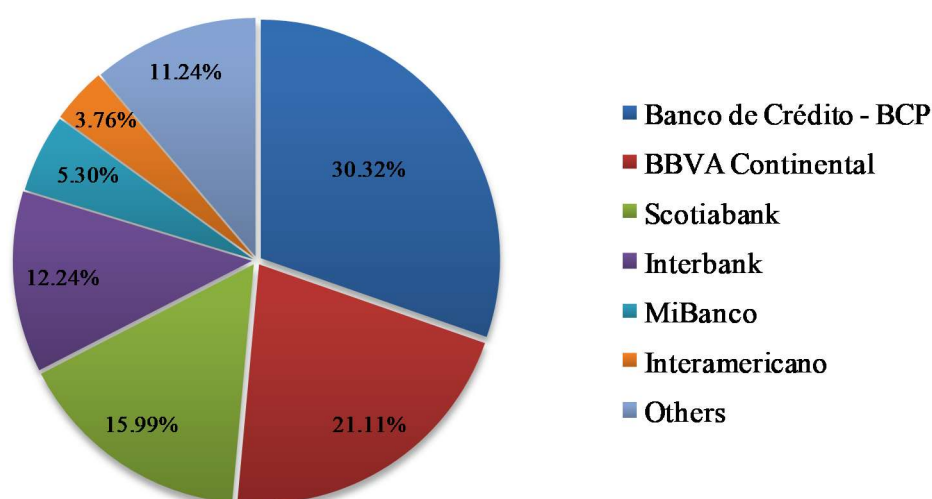
Financiero, Falabella, GNB, Ripley, Citibank, Comercio, Santander and Azteca. Table 2 offers a brief classification of the Peruvian Banking sector as of 2013, including all the banks at that time.

Table 2. Classification of the Peruvian Banking sector

Categories	Names of the banks
The four largest banks	BCP, Continental, Scotiabank, Interbank
Medum – sized Banks	Comercio, Financiero, Banbif, Citibank, HSBC, Santander, Deutsche Bank
Consumer and small – sized producers oriented banks	Mi Banco, Falabella, Ripley, Azteca
Consumer oriented banks	Falabella, Ripley, Azteca, Cencosud

Source: Equilibrium Clasificadora de Riesgo S.A., *El sistema financiero Peruano: revisión y perspectivas* (2013, p.4).

Figure 1. Market Share of Peruvian Banks according to portfolio of credits



Source: Central Reserve Bank of Peru – statistical series (2018).

1.2 History and causes of dollarization of the Peruvian financial market

In this section we review the history of dollarization of the Peruvian economy and its influence on both the real and financial sectors as a way to analyze what was the cause that led economic agents to prefer dollars over soles for almost all their transactions. This is related to the fact that during the eighties, Peru went through a harmful economic turmoil that resulted in a period of hyperinflation, reaching levels of 2,000,000% by the end of 1990 (Alonso, 2014). Under these circumstances, all economic agents lost their trust in the

Peruvian currency, which was, between 1985 and 1991, the *Inti*. After 1991, it was replaced by the Peruvian Nuevo Sol. During this period, households and companies looked for a safer currency in which they could have their savings, assets in general and to use it as a means of payment. As a consequence, by the end of the nineties, approximately 80% of deposits and credits were denominated American dollars (García-Escribano, 2010).

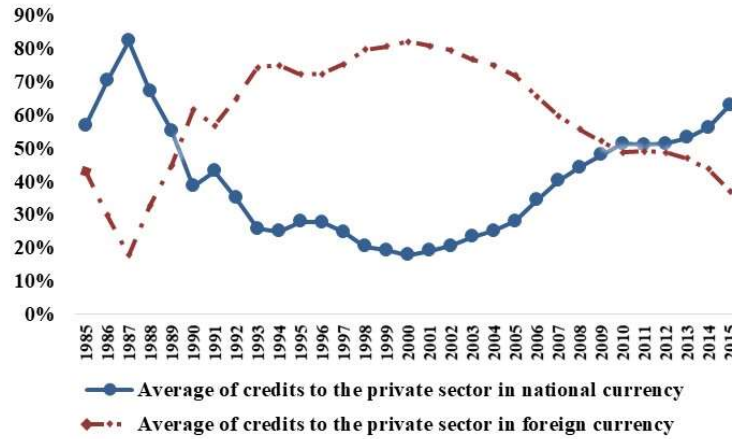
One of the causes of this hyperinflation process was the implementation of a policy by the Government in place from 1985 to 1990, which referred to the expansion of the monetary base, so that the Peruvian Government could continue being financed by the Central Bank. This started when the Government decided to stop repaying the outstanding external debt and, as a consequence, Peru was not able to get further financing from abroad anymore. So, as Quispe Misaico (2000) mentions, the Peruvian Central Bank had to provide subsidized credits to the Government and the State Development Banks in order to finance the different activities of the public sector. Additionally, amongst other causes, he mentions the fact that the Central Bank applied a fixed multiple exchange rate system in order to control exports and imports, which consequentially led to the expansion of the monetary base.

In the year 1990, upon the beginning of a new Government, the economic policies changed in Peru and, following the amendments of a new Constitution, the Peruvian Central Bank became totally autonomous and independent from the Government. Upon this change, its only objective was monetary stability and control of inflation. Quispe Misaico (2000) points out that the Central Bank is no longer authorized and is totally prohibited from financing the public sector, granting credits to any particular sector of the economy or any specific region and fixing the exchange rates for any currency. Furthermore, transparency became one of the most important pillars of the bank, due to the fact that the Central Bank is now obliged to publish reports about its operations, new macroeconomic policies and statistics. Despite the implementation of these changes, economic agents lost their confidence in the domestic currency and preferred the American currency as a means of value storage and of exchange.

Figure 2 shows the average amount of credits given to the private sector per year and per currency as a percentage of the total amount. This figure considers the banking system, which is composed by the Peruvian Central Bank and all other banks, excluding financial companies, municipal and rural savings and credit banks, mutual funds, insurance companies and pension funds (Frequently asked questions, 2019). By the end of 1990, credits in dollars represented 62% of the total amount, in comparison to 45% in 1989. This trend continued until 2000, year in which this percentage achieved its highest value, 82%. After this year, the percentage of credits granted in dollars started to fall little by little and in 2010 the trend started to reverse. This is line with the implementation of the inflation targeting regime, which was introduced in the year 2000 in order to start reducing the dollarization of the Peruvian economy (García-Escribano, 2010). In relation to dollarization, Figure 3 and Figure 4 partially show the dynamics of dollarization by means of using the exchange rate soles per dollars. The more dollarized the economy is, it means that the dollar appreciates against the

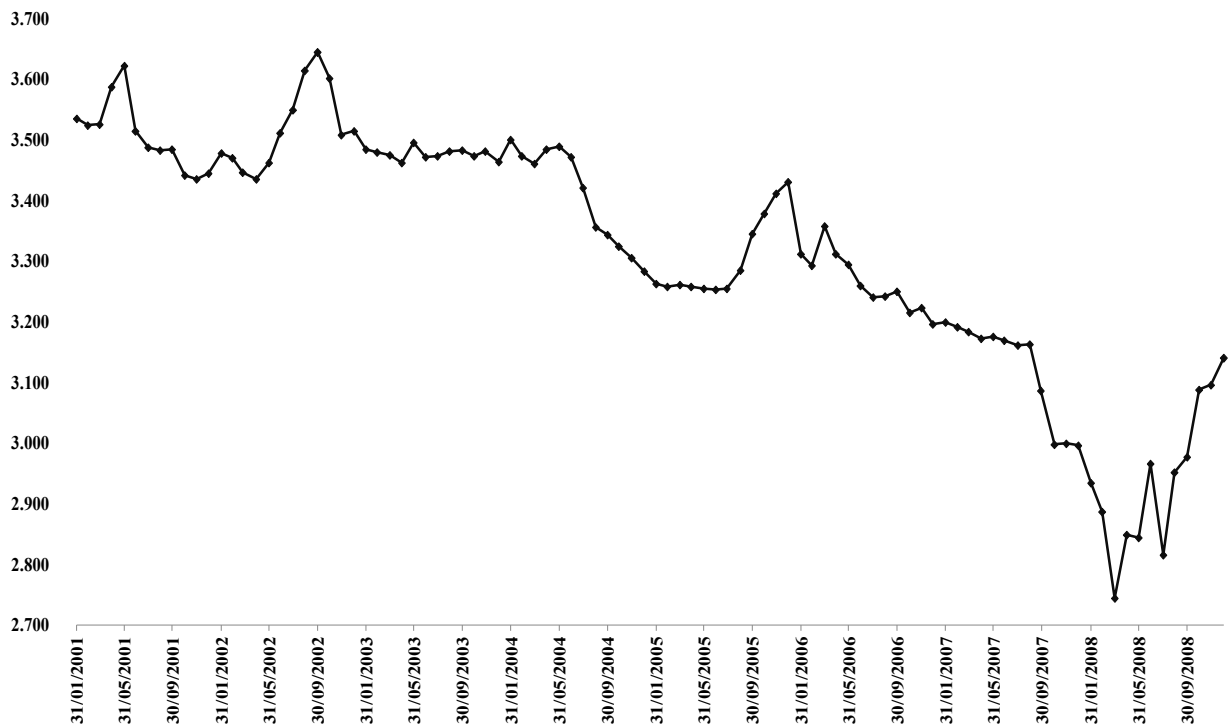
Peruvian sol, because economic agents value the American currency more over the Peruvian currency. Likewise, a depreciation of the dollar against the sol shows that economic agents value the Peruvian sol more, causing the price of the dollar against the sol to decrease.

Figure 2. Credits given to the private sector in national (solid line) and foreign currency (dashed line) by the banking system (as a percentage of the total amount-stock of credits)



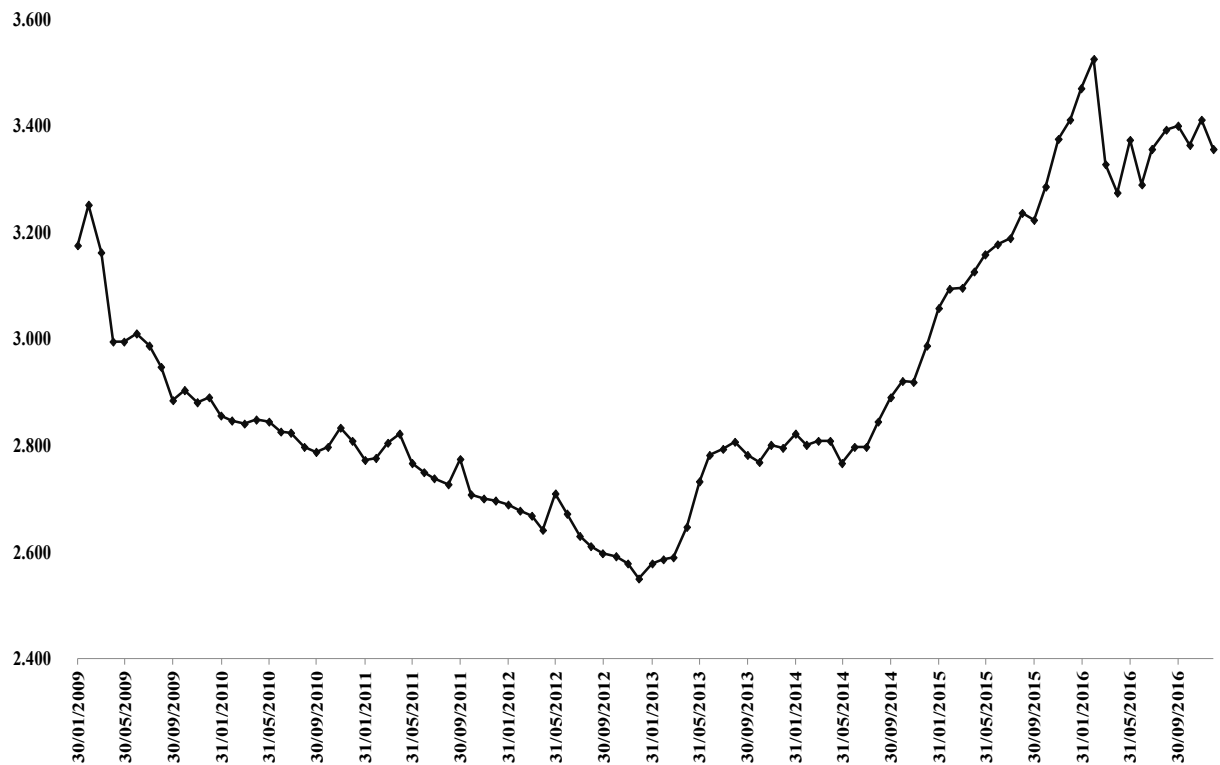
Source: Central Reserve Bank of Peru – statistical series (2018).

Figure 3. Exchange rate soles per dollar 2001– 2008 (on a monthly basis)



Source: Central Reserve Bank of Peru – statistical series (2018).

Figure 4. Exchange rate soles per dollar 2009–2016 (on a monthly basis)



Source: *Central Reserve Bank of Peru – statistical series* (2018).

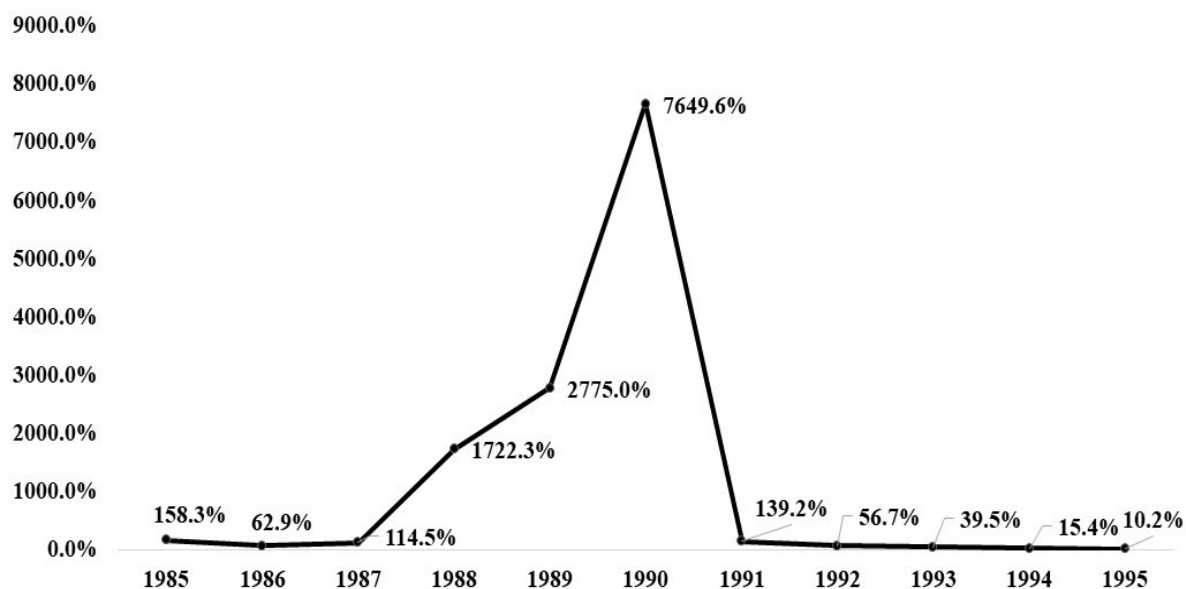
Moreover, it is not a coincidence that, after implementing the inflation target in the year 2002, economic agents started to trust in the Peruvian currency once again. The inflation target of the Peruvian central bank was 2.5% when it was first introduced and then it was reduced to 2% (Vega, 2008).

This new inflation target has been published since the year 200 in the Annual Monetary Program report of the Peruvian Central Bank. Besides the inflation target, this report also includes the main monetary objectives and the forecast of macroeconomic variables.

This is why, as of the year 2009 approximately (Figure 2), economic agents in Peru realized that the Central Bank was fulfilling its objectives and this translated into a larger usage of the domestic currency (Peruvian Nuevo Sol).

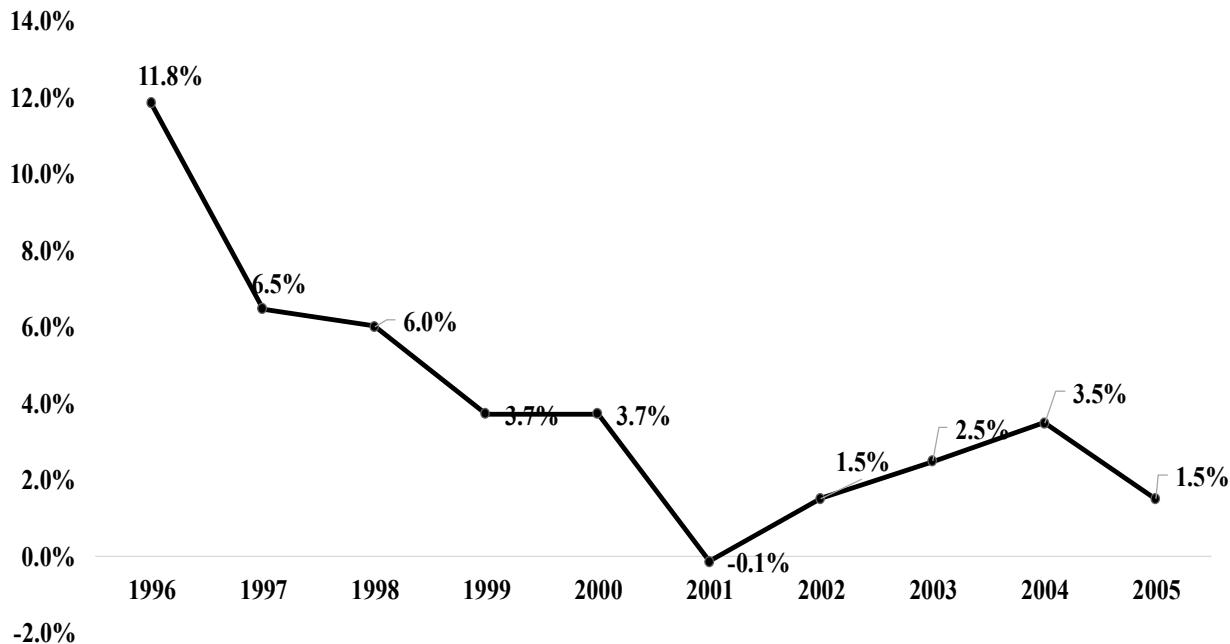
Figure 5, Figure 6 and Figure 7 show the Consumer Price Index (hereinafter: CPI) for the Peruvian economy between 1985 and 2015. If the trends of these figures and Figure 2 are compared, we can see that after the year with the highest inflation - 7,649.6% in the year 1990 -, the percentage of credits in dollars started to increase. And, in the year 2000, after the introduction of the inflation target, this percentage of dollarization started to fall.

Figure 5. Consumer Price Index 1985–1995 (End of year index in percent variation,)



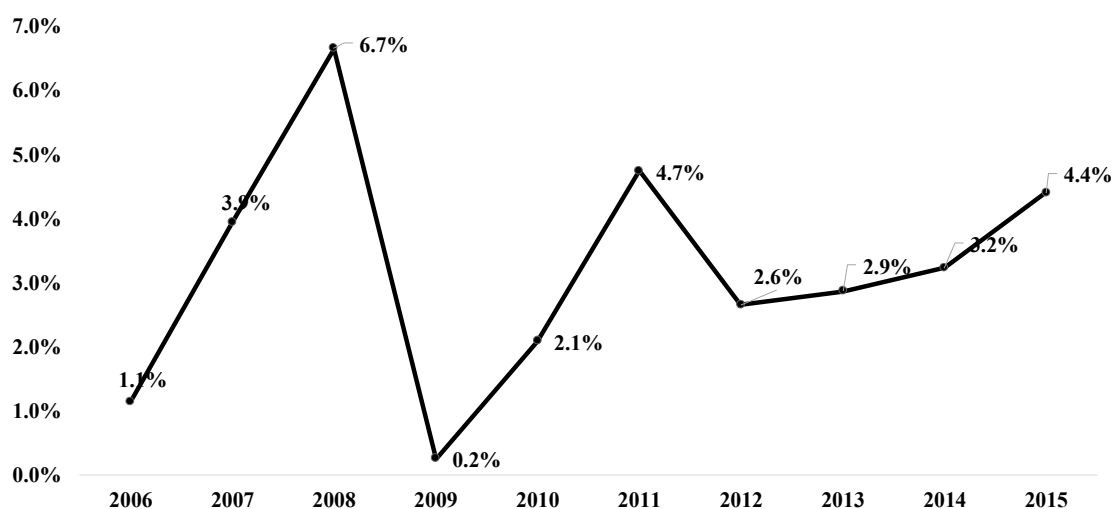
Source: Central Reserve Bank of Peru – statistical series (2018).

Figure 6. Consumer Price Index 1996–2005 (End of year index in percent variation)



Source: Central Reserve Bank of Peru – statistical series (2018).

Figure 7. Consumer Price Index 2006–2015 (End of year index in percent variation)



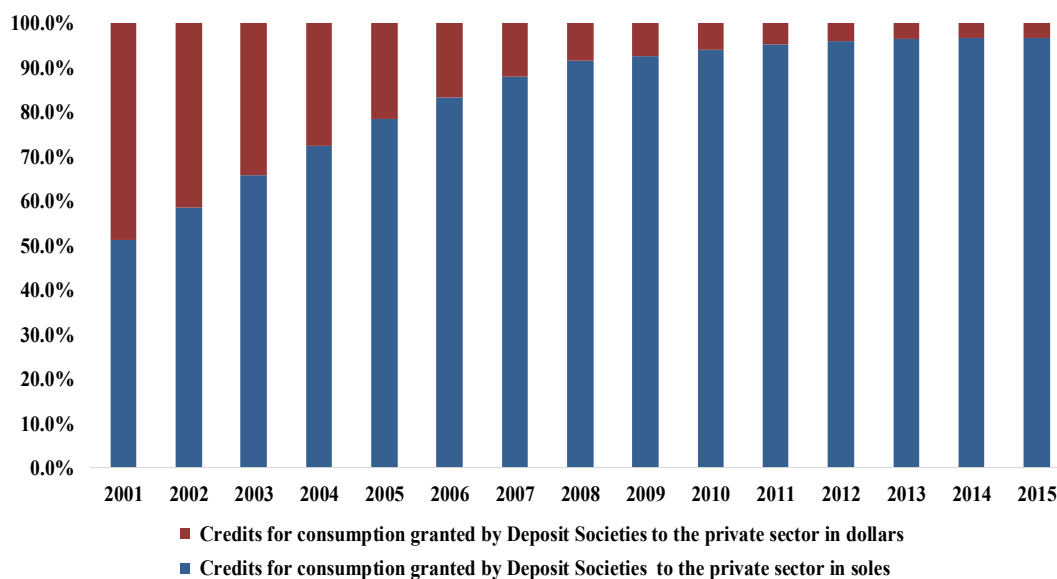
Source: Central Reserve Bank of Peru – statistical series (2018).

In relation to consumer credits and mortgages granted by Deposit Societies, Figure 8 and Figure 9 show the evolution of these categories. First of all, the classification of Deposit Societies or Deposit Corporations refers to all financial institutions that are authorized to get deposits from the public. This category includes banks, financial companies, municipal and rural savings and credit banks; in other words, this definition includes the banking and non-banking system (Frequently asked questions, 2019). Even though this thesis focuses on the four largest banks, it is important to show the dollarization of all the financial system as a whole; this is why the non-banking institutions are included in this point. Whereas consumer credits have had a lower coefficient of dollarization, credits for mortgages have shown a different behavior, especially during the first seven years (2000 – 2007). As defined by the Central Reserve Bank of Peru, the **coefficient of dollarization** measures what percentage of a financial asset is denominated in foreign currency. In this case, it measures the percentage of credits granted in foreign currency. Appendix D shows a formula for the calculation. The different behavior of mortgage loans is related to the fact that prices in the real estate sector used to be expressed in dollars as a means to reveal the preference for this foreign currency as a store of value. Also, banks used to push the offer of mortgage loans in dollars.

Furthermore, during 2014, the real estate sector started to show a weaker growth due to several factors, being one of them the depreciation of the exchange rate soles per dollar. In order to reverse this trend, the Peruvian Central Bank and the *Superintendencia de Banca y Seguros* (Superintendence of Banking and Insurance, hereinafter: SBS) implemented several reforms to reduce the dollarization of credits for mortgages and to boost the credits in soles (Scotiabank, 2015). These actions are crucial because take into account the fact that consumer credits and mortgages constitute an important part of the whole loan portfolio of the Peruvian financial system and to avoid possible losses of the paying capacity of borrowers. As Figure 10 shows, as for August 2017, consumer credits and mortgages

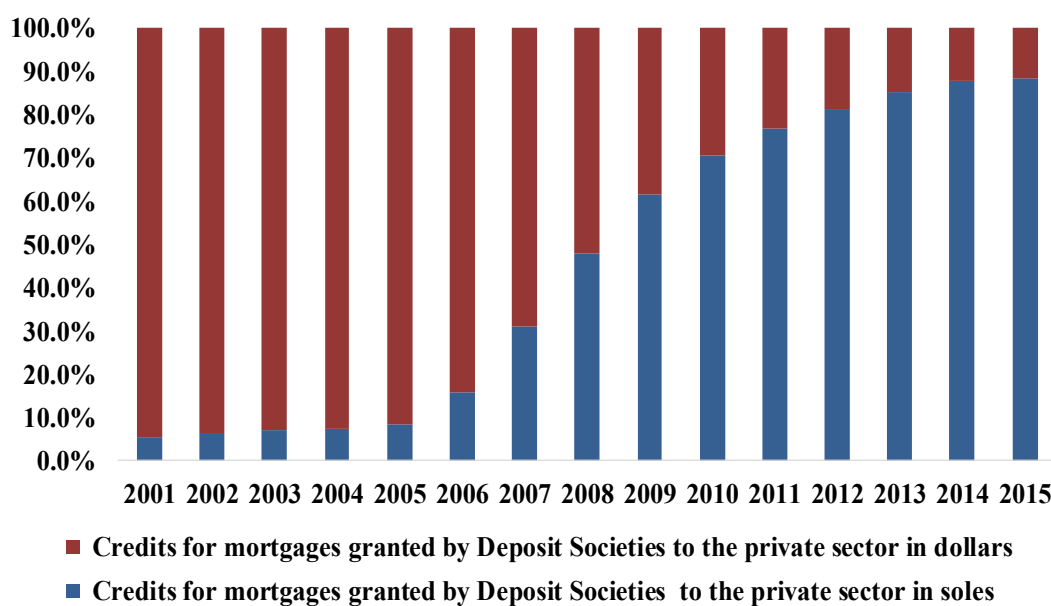
represented 18.07% and 16.84% of the total loan portfolio in the financial system, respectively.

Figure 8. Consumer credits granted by Deposit Societies to the private sector as a percentage per currency of the total amount of the balances



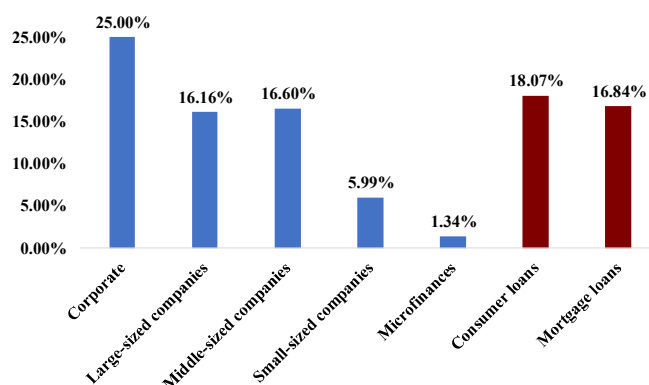
Source: *Central Reserve Bank of Peru – statistical series (2018).*

Figure 9. Credits for mortgages granted by Deposit Societies to the private sector as a percentage per currency of the total amount of the balances



Source: *Central Reserve Bank of Peru – statistical series (2018).*

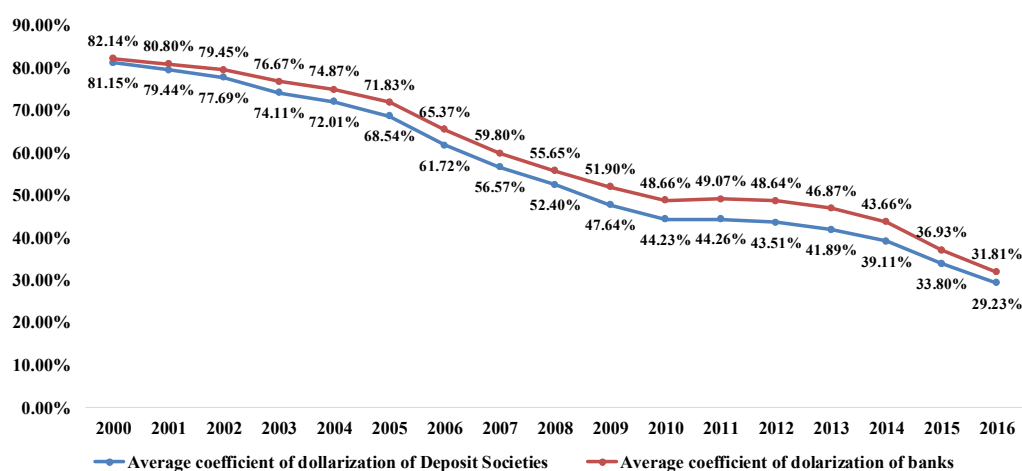
Figure 10. Composition of the total loan portfolio of the Peruvian financial system in August 2017 by type of credit



Source: Asociación de Bancos del Perú (ASBANC) (2017).

Last, Figure 11 shows a comparison between the coefficient of dollarization of credits granted by Deposit Societies and banks. It indicates that they followed the same trend during the years 1992 and 2015. However, banks had a higher coefficient of dollarization due to the fact that they are the ones that offer consumer credits and mortgages, which are habitually granted in dollars. As defined previously, Deposit Societies also include municipal and rural savings and credit banks, whose main objective is to grant credits oriented to small businesses of cities and rural areas. Credits oriented to microfinances are mostly given in soles. It is also affirmed by Avelino Sánchez, Torres Ramírez, and Tipe Torvisco (2016), that banks have a 75% of participation in the consumer credit market and this trend is still increasing. Whereas the market share of other financial companies in this area is decreasing in relative terms.

Figure 11. Coefficient of dollarization of credits granted by all banks and by Deposit Societies (average per year)



Source: Central Reserve Bank of Peru – statistical series (2018).

1.3 Exchange rate regime in Peru

The exchange rate regime used in Peru is the floating one, which was adopted in the beginning of the nineties, due to the high levels of hyperinflation and macroeconomic instability that Peru was going through. The adoption of this regime was part of the macroeconomic stabilization plan, whose objective was monetary stability and inflation management, due to the fact that a floating exchange regime allows the possibility to apply independent monetary policies. As explained before, one of the changes made in the year 1990 was to grant the Peruvian Central Bank total independence from the Government.

A floating exchange regime is defined as the exchange regime in which the exchange rate is determined by the market forces of offer and demand, which means that, under a scenario of lack of American dollars, the price of this currency would go up; meaning that more soles have to be given per one dollar. On the contrary, if the amount of dollars in the economy is abundant, its price tends to go down (less soles per dollar).

Nevertheless, in order to prevent abrupt changes of the exchange rate, the Peruvian Central Bank intervenes by buying or selling dollars in the market. The BCRP does this with the use of foreign exchange swaps, repurchase agreements and other market operations. The same approach is used in other Latin-American countries such as Mexico and Colombia. The objective of this is to allow changes in the exchange rate to be gradual and not abrupt in order not to disrupt the market. This is why it can be said that the exchange rate regime applied in Peru is a managed – floating exchange rate regime.

1.4 Review of the literature on dollarization

There is a vast literature on dollarization oriented to the analysis of its risks and challenges and what they mean to the Peruvian economy and its financial system. First of all, this literature can be organized into two types: the first one is the theoretical literature; the second one consists of the reports written by the Peruvian Central bank.

Some of the most representative papers written about dollarization seek to make a comparison among different Latin American countries and how their de-dollarization processes differ from each other. Other papers focus on the dollarization of the Peruvian financial system. Also their objective is to focus on the main risks which arise from dollarized balance sheets, from both, assets and liabilities sides and to describe the most important measures taken by each country's regulator in order to reduce the levels of dollarization.

Additionally, the most important findings of these papers are related to the risks inherent to a dollarized system, such as the credit risk which derives from the depreciation of the national currency. The papers conclude that such depreciation translates into higher probabilities of default of credits, as borrowers are not able to cover the gap between their

income and expenses when they are not in the same currency, being their expenses, represented by the repayment of credits, in foreign currency.

Furthermore, the papers conclude that Peru has gone through a successful de-dollarization process, triggered especially by better macroeconomic conditions; the implementation of higher capital requirements by regulators in order to internalize the levels of currency risk. These papers also mention the importance of the utilization of reserve requirements, not only as a tool to control economic growth, but also to control the levels of dollarization in the economy.

The research studies conclude that the implementation of the de-dollarization process by the Peruvian regulators translated into lower rates of dollarization of credits and deposits in general; and that this was also a contribution of the implementation of an accurate monetary policy that reduces the vulnerabilities of a dollarized economy. The most important monetary policy implemented in Peru is the inflation target in 2002, which contributed to borrowers regaining their trust in the Peruvian sol.

Furthermore, on the one hand, the Financial Stability reports published by the Peruvian Central bank include analysis and conclusions about the impact of dollarization on the economy as a whole and how this dollarization is influenced by the events happening in the economy of the United States. These reports also provide statistics about the advances on dollarization, as, for example, how the amount of credits and deposits in dollars increased or decreased from one period to another. They associate these increases and decreases not only to local macroeconomic factors, but also to international ones, such as the influence of the movements of the FED interest rate, the international prices of commodities, etc.

On the other hand, the Peruvian Central Bank has also published papers in which it concludes that credits are, in general, growing at a solid pace and that the growth of credits in dollars, especially the ones related to mortgages, are also steady, due to the higher capital requirements to credits in dollars imposed by regulators. Besides, these papers conclude that the fact of being aligned to the Basel regulations is allowing banks in Peru to strengthen their levels of solvency. Therefore, the Peruvian banking system is becoming more robust.

1.5 Relationship between credit risk and exchange currency risk in the banking industry

With the creation of new financial products and the technologies involved in their development, new risks are arising in the financial industry. However, the main risks can be classified under the following categories: operational, reputational, liquidity, credit, market, currency and interest rate. This thesis will focus on the analysis of the relationship between credit and currency risk.

Cabello, Lupú and Minaya (2017) believed that, a banking system with high levels of dollarization is really exposed to sudden rises of the exchange rate, due to currency mismatches between the income of borrowers and their expenses. This means that if the exchange rate of soles per dollar increases (depreciation of the sol), economic agents that have debts in dollars might not be able to repay their obligations, as the value of their debt is increasing relative to their income, which stays the same. Therefore, the credit risk related to these loans rises, affecting the balance sheets of financial institutions due to the gap between national and foreign currency.

Banks try to reduce their currency mismatches by granting loans in dollars to clients whose cash inflows are in soles. Therefore, the exchange rate risk is shifted to the clients. However, by doing this, banks are increasing their exposure to credit risk in case of a sudden depreciation of the national currency, Peruvian Nuevo Sol (Cayazzo, Pascual, Gutiérrez and Heysen, 2005).

Banks tend to underestimate this greater exposure to credit risk and do not have enough capital in order to cover the possible losses in case of non-payment. This situation worsens due to the fact that Peruvian financial markets are not so well developed yet and hedging instruments against credit risk are still incipient. This is why over the last five years regulatory institutions are implementing measures in order to oblige banks to have higher capital ratios, especially for operations in dollars. This awareness to vulnerabilities related to dollarization has been increasing over time, especially a few years after the crisis, when banks and regulators started foreseeing the consequences of a sudden outflow of the American dollars that started coming into the Peruvian economy after the 2008 financial crisis.

For the Peruvian case, regulators have increased reserve requirements for dollars and required banks to assign a higher risk to those individuals whose paying capacity is sensitive to changes in the exchange rate. Regulators have also suggested that, in order to reduce exchange rate risk, the best approach to take is the one known as asymmetric limits in the foreign exchange rate position (Cayazzo, Pascual, Gutiérrez and Heysen (2005).

The definition of foreign exchange rate position is the difference between assets and liabilities held in dollars. This position can be net long or net short. A net long position means that total assets in dollars are larger than the liabilities in this same currency. Whereas a net short position means that liabilities are larger. In a highly dollarized economy such as the Peruvian one, banks prefer to have a net long position, which means that, in case of a depreciation of the sol against the dollar, the value of the assets will continue being greater than the value of liabilities. This is related to the asymmetric limits. Banks look forward to protecting themselves against an appreciation (less soles per one dollar) of the exchange rate when they have a net long position; they protect themselves against depreciation (more soles per one dollar) when having a net short position. In other words, it is better for banks

to have a net short position when they are anticipating an appreciation of the exchange rate (less soles per dollar); and to have a net long position when they are anticipating a depreciation of the sol against the dollar.

It is commonly assumed that a closed position is the best option if the objective is to reduce exchange rate risk and protect the bank's capital - a neutral position means that the amount of assets and liabilities is the same. However, as mentioned by Cayazzo, Pascual, Gutiérrez and Heysen (2005), this neutral position does not prevent a deterioration of the Capital Adequacy Ratio (hereinafter: CAR) of the bank. By definition, the CAR of a bank measures the amount of capital that can absorb losses triggered by different events. Equation 1 shows how CAR is measured and that it must be 8% or larger. Whereas Tier 1 Capital is the amount of capital that can absorb losses without the bank stopping its operations, Tier 2 Capital is the amount that can absorb losses with the bank being liquidated.

$$CAR = \frac{\text{Tier 1 Capital} + \text{Tier 2 Capital}}{\text{Risk Weighted Assets}} \geq 8\% \quad (1)$$

There have been some changes between the implementation of Basel II and Basel III. The topic about the Basel Committee regulations and its implementation in Peru will be developed in further detail later on this thesis. However, at this point it is important to mention the changes related to the CAR, as shown in Table 3. Whereas Basel is still recommending that the CAR is at least 8%, the Peruvian Superintendence recommends it is at least 10%. Moreover, Tier 2 Capital for Peruvian banks must not be larger than 5%. In a nutshell, these rules show compliance with the rules proposed by Basel, but with certain changes according to the Peruvian context.

Table 3. Regulatory capital requirements for the Peruvian Banking Industry as a percentage of the risk – weighted assets (RWA)

Categories of Capital	Basel II	Basel III
Tier 1 Capital (A)	4.0	6.0
Tier 2 Capital (B)	4.0	2.0
Capital conservation Buffer	0.0	2.5
Capital requirement: A + B + C	8.0	10.5
Contracyclic capital requirement	Does not apply	2.5
Too Big To Fail requirement	Does not apply	1 – 3.5
Share Capital on Tier 1	2.0	4.5
Share capital on total requirement	2.0	4.5 + 2.5 = 7

Source: Central Reserve Bank of Peru (2014, p. 62).

The General Law of the Financial and Insurance System – *Ley General del Sistema Financiero y del Sistema de Seguros y Orgánica de la Superintendencia de Banca y Seguros* (Superintendence of Banking and Insurance, 2011, p. 104) states the following: “The effective capital of the companies must be equal to or greater than 10% of the total risk-

weighted assets and contingencies corresponding to the sum of: the effective capital requirement for market risk multiplied by 10, the effective equity requirement for operational risk multiplied by 10, and the assets and contingencies weighted for credit risk”.

This ratio is called “The Global Capital Ratio” in Peru and, as of 2013, it has been stable and larger than the minimum asked by the Superintendence. This is depicted on Table 4.

Table 4. Average CAR of Peruvian Banks between 2013 and 2016

Period	Average CAR
Dec. 2013	14.9
Dec. 2014	15.2
Dec. 2015	15.1
Mar. 2016	15.0

Source: *Central Reserve Bank of Peru – statistical series* (2018).

It is crucial to consider the impact of an abrupt variation of the exchange rate on the CAR and not only on the bank’s capital itself, as the CAR has been implemented by the Basel Committee as a means to strengthen financial stability. Once again, as concluded by Cayazzo Pascual, Gutiérrez and Heysen (2005), banks should hold a foreign exchange rate position (a net long or net short positions expressed in terms of total capital) that is equivalent to the coefficient of dollarization of their assets, so that their CAR remains at the same level in case of an appreciation or depreciation of the exchange rate (soles per dollar).

When banks grant credits in dollars, the assets denominated in this currency start increasing on the balance sheet, achieving a net long position or, as it is also known, a structural positive position. Even though the risk related to this kind of position can be overcome by taking the right measures to keep the CAR stable, credit risk emerges, as those customers whose loans are in dollars are now facing problems to repay their credits. All combined, this may be known as the exchange rate-credit risk.

According to microeconomic theory, a depreciation of the exchange rate (more soles per dollar) means a negative income effect for households whose mortgage and consumer loans are in dollars (Escobar Patiño, 2003). As they do not have the means to hedge against exchange rate risk, the amount of the credit in dollars they owe to the bank will be larger in real terms when compared to their income in soles. Given that the sol is worth less after a depreciation, they might not be able to return the money to the banks. If this happens on a large scale, the banks’ balance sheets could suffer a significant deterioration, and, as concluded by Reinhart and Rogoff (2009), many bankruptcies could mean the beginning of a crisis.

Despite the fact that banks are aware of this, they expect the Central Bank to intervene in the market by selling dollars in order to prevent the national currency from depreciating (Calvo

and Reinhart, 2002). That is, the Central Bank increases the amount of dollars that are circulating in the economy. This is why the macroprudential measures related to higher capital requirements and provisions of credits in dollars are extremely crucial for dollarized economies.

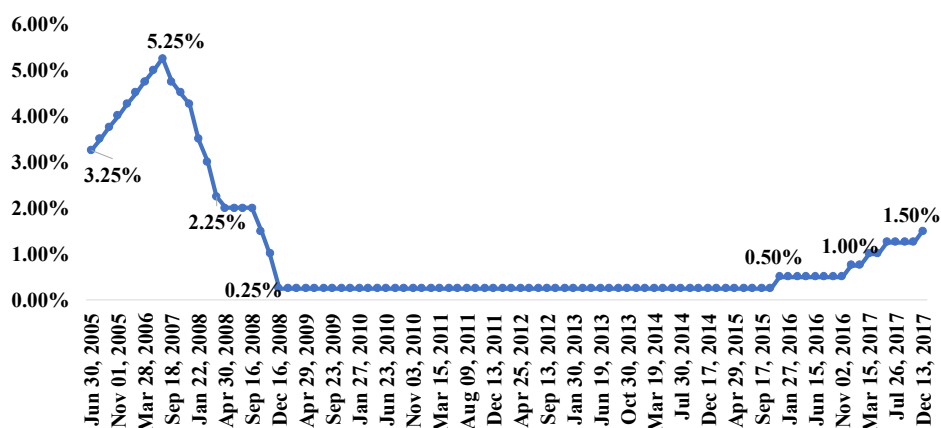
1.6 Federal Reserve Bank actions and their impact on the Peruvian financial system

As it was mentioned beforehand, the massive inflow of dollars into the Peruvian economy began after the start of the crisis and it increased in the aftermath due to the policies that were enacted by the FED. In order to measure the increase of the amount of dollars (through deposits, credits and foreign investments) in the Peruvian financial system, this thesis will use the statistical series about the liquidity in dollars of the financial system published by the Central Bank of Reserve of Peru.

The average of this variable in the year 2000 was 9,370.89 millions of dollars. In 2009, after the crisis, the average was 18,717.78 millions of dollars and, as of 2016, the liquidity consists of 31,869.46 millions of dollars. This variable can give an insight about the inflow of dollars into the Peruvian economy.

Another variable that might be helpful to show the quantity of dollars in the economy is the amount of Net International Reserved of the Peruvian Central Bank. In the year 2000, the amount was 8,180 millions of dollars. In 2009 and 2016 the amounts were 33,135 and 61,686 millions of dollars, respectively (Central Reserve Bank of Peru, 2018). Regarding the policies implemented by the FED, they include the decrease of the reference interest rate (federal funds rate), lowering it to a level of 0.25%, and the Quantitative Easing program (hereinafter: QE), as an unconventional action regarding monetary policy. Figure 12 shows the evolution of the FED reference interest rate. In December 2008, it reached its lowest level, which was maintained until December 2015, when it was increased to 0.50%.

Figure 12. Federal Reserve reference interest rate 2006 - 2017



Source: *Investing* (2019).

By means of the QE, the FED intended to repurchase financial assets from the market, such as commercial paper, securitized consumer loans, and mortgage securities (Simpson, 2014) in order to provide it with liquidity (increase of the money supply). Its main objective is to stimulate and boost economic growth by means of cheaper lending to all economic agents (public and private).

In the medium term or long term, this measure will be reflected on the level of inflation and unemployment rate. These two indexes are being monitored constantly by the FED as indicators of economic growth and improvements of the employment level. The FED decided to increase the reference interest rate to a level of 0.5% by December 2015, given that these two indexes showed certain improvements, indicating that the American economy had started to recover. It was also expected that, during 2017, the FED would also probably start reversing its QE program, by letting assets mature off its balance sheet to an amount equivalent to 4.5 trillion dollars (Bishop, 2017).

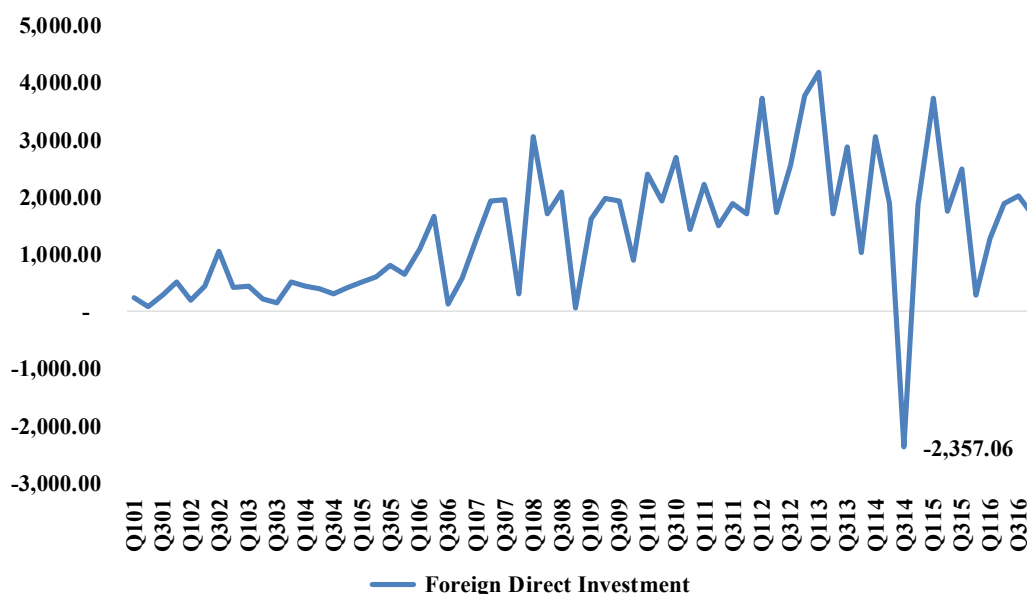
All these actions affect dollarized economies. To the Peruvian case, the actions taken by the FED during the first years after the crisis meant a great inflow of dollars, as foreign investors were looking forward to getting higher gains in markets that offered them higher interest rates. Peru was one of the Latin American countries that benefited from this the most, given that its solid macroeconomic fundamentals and conditions created a suitable environment for investors.

Figure 13 and Figure 14 show two components of the financial account of the balance of payments of Peru. The first component is foreign direct investment (hereinafter: FDI), which is an investment that has a long-term goal, such as being part of the ownership of a company. This component includes reinvestments of profits, capital contributions and privatizations; and, in general, it shows a growing tendency. However, in the fourth quarter of 2008 there was a general outflow of foreign capitals due to the unstable financial environment at a global level after the bankruptcy of the Lehman Brothers bank. FDI decreased by 97% between the third and fourth quarters of 2008. Moreover, FDI experienced a great decrease in the third quarter of 2014. The main cause of this was the slowdown of investments in the mining sector due to the fall in the prices of metals. Given that much of the FDI is concentrated in the mining, 22% as of 2017 (Proinversión, 2017), this caused a large drawback to the FDI of Peru in general.

The second component is foreign portfolio investment, which is related to short-term investments or the ones known as “migrating capital”. Also this component decreased after the beginning of the crisis. In the fourth quarter of 2008, the amount was 132 millions of dollars. Whereas in the beginning of 2009 it was negative – 15 millions of dollars-. As mentioned by Leon and Quispe (2010), after the crisis began, developing economies went through a generalized outflow of foreign capitals, such as the reduction of investments in sovereign bonds, certificates of deposits of the Peruvian Central bank and of private capital.

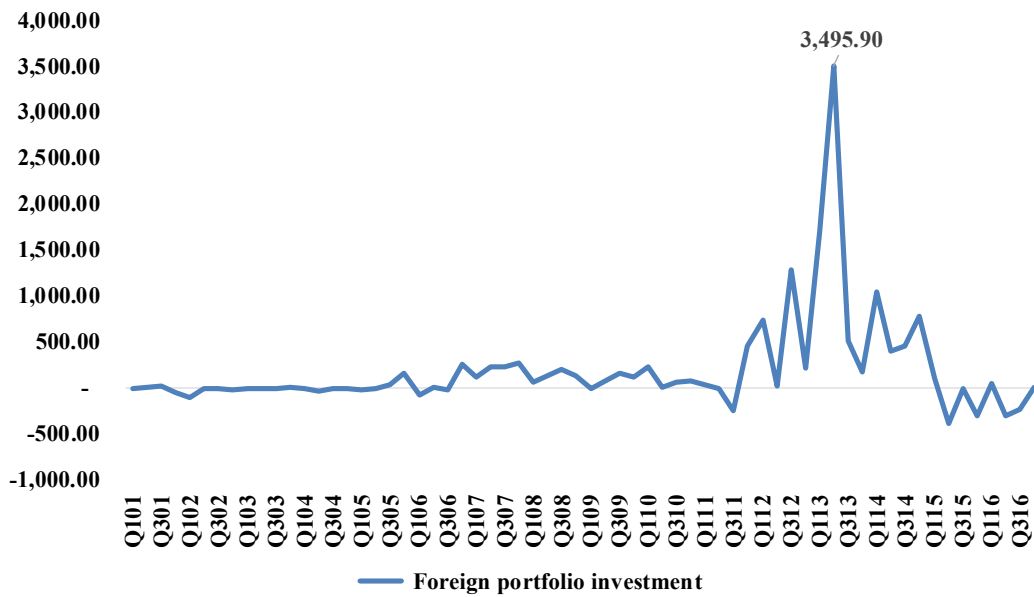
After this period, the foreign portfolio investments started to increase due to two factors. The first one is the strength of the Peruvian financial market; and the second one is the international context of low yields, which encouraged investment in emerging countries, such as Peru (Diario El Peruano, 2012). Nevertheless, the foreign portfolio investments started to decrease in the second quarter of 2015, as shown in Figure 14. The reason for this were the upward expectations of foreign investors on the interest rate of the FED (Central Reserve Bank of Peru, 2016a). During this time, it was expected that the FED would increase its reference interest rate, effectively doing it by the end of 2015. In the fourth quarter of 2015, foreign portfolio investments were minus 302 millions of dollars. As mentioned previously, this is one of the main topics that concerns the authorities. One of the sources of this type of investments is the forwards market, which is used by local and foreign investors in order to hedge or speculate about the behavior of the Peruvian sol. The Peruvian Central Bank believes that the continuous depreciation of the sol originates from the speculative positions foreigners take against the sol in the forwards market (Müller, 2014). Also, as said by Hilbck Rios (2009), many foreign investors use the “Carry trade” strategy to seize the differential in interest rates between soles and dollars and obtaining profits by using soles-denominated instruments, causing, in the beginning, an appreciation of the sol.

Figure 13. Foreign Direct Investment (in millions of dollars - quarterly)



Source: Central Reserve Bank of Peru – statistical series (2018).

Figure 14. Foreign Portfolio Investments (in millions of dollars - quarterly)



Source: Central Reserve Bank of Peru – statistical series (2018).

The inflow of dollars in the economy caused an appreciation of the exchange rate soles per dollar, which encouraged people to take credits in the foreign currency, especially consumer credits and mortgages. As explained before, this dollarization started to be seen as a critical issue after the FED began to give signs to the markets of possible reversals of the monetary policies taken in order to boost the American economy. In December 2015, after the FED increased its reference rate for the first time since 2008, Peruvian markets showed certain volatility regarding the soles per dollar exchange rate. According to Coloma (2015), economist and analyst Mario Guerrero thinks that these reversals by the FED will not have a significant impact on the new credits that banks will grant, as they will be in soles, due to the new policies implemented by the Peruvian Central bank in order to reduce dollarization. This idea is reinforced by economist Díaz Ortega (2015), who claims that the dollar will keep up its ascending trend and this will have an impact on the paying capacity of people who already have credits in dollars. He also suggests that, in the long term, this will have an impact not only on the financing cost of credits in dollars, but also on the cost of credits in soles, among other factors.

At this point, it is important to analyze the impact of the progressive depreciation of the sol against the dollar on the loan portfolios of banks and on their provisions for loans. At the same time, it is also crucial to take into account the changes in monetary policies enacted by the Peruvian Central Bank and examine how they correlate with the evolution of the dollarization of credits.

The progressive depreciation of the sol is related, as mentioned before, to the FED policies. If the FED decides to increase its reference interest rate, many foreign investors will follow

the action known as “Flight to Quality”, meaning that they will take back their assets to safer investments offered by advanced economies.

As stated by Carranza (2017), if the FED increases its reference interest rate at a quicker pace than it was expected, the price of the dollar at a global level will boost. In the case of a rate hike, investors will prefer to invest their capital in securities in dollars. This would trigger an increase of the demand for the dollar and, consequently, its price would increase.

In order to measure the possible impact of the FED policy, related to the reference interest rate, on the Peruvian financial system, it is useful to mention the sovereign debt of Peru, given that part of the dollars that entered into the Peruvian economy did so through foreign investments in Peruvian sovereign bonds. Figure 15 depicts the evolution of the sovereign debt and Figure 16 shows the amount of Peruvian sovereign bonds held by non-residents.

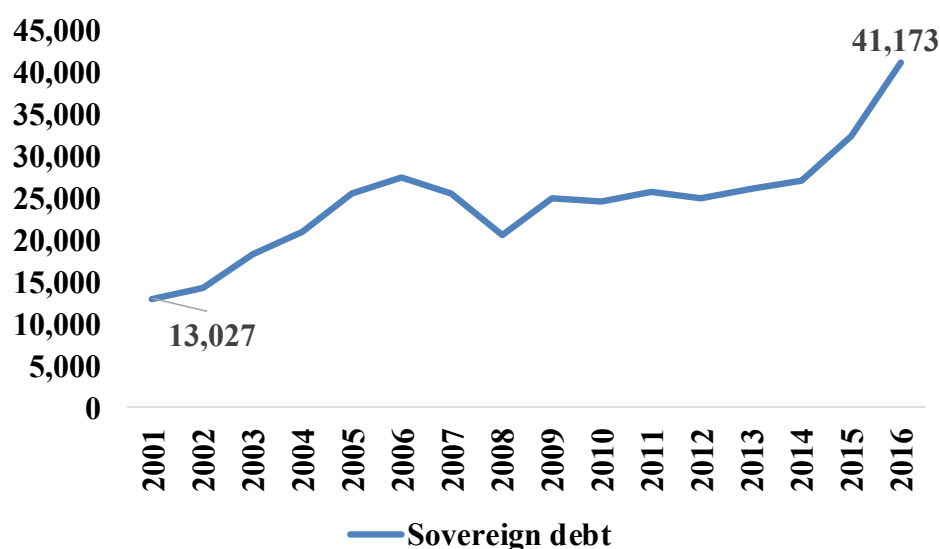
As depicted, there is a considerable amount of sovereign debt owned by foreign investors, but they are gradually decreasing their holdings. This is something that worries the Peruvian authorities, as this means that investors are deciding to withdraw their dollars from the Peruvian economy, making the dollar a scarcer and more expensive currency against the Peruvian sol, causing the depreciation of the latter.

This is supported by Montes (2015), who claims the holding of bonds by non-residents is a significant topic, given that the spot market for the sol versus dollar exchange rate reflects the sales and purchases of bonds by non-residents. As a means to avoid abrupt depreciations, the Peruvian Central Bank intervenes in the market, from time to time, by selling dollars in the market.

In addition, if the FED increases its interest rates, other economies, including Peru, will increase their interest rates as well, resulting in more expensive credits and, at the same time, in less attractive investment projects.

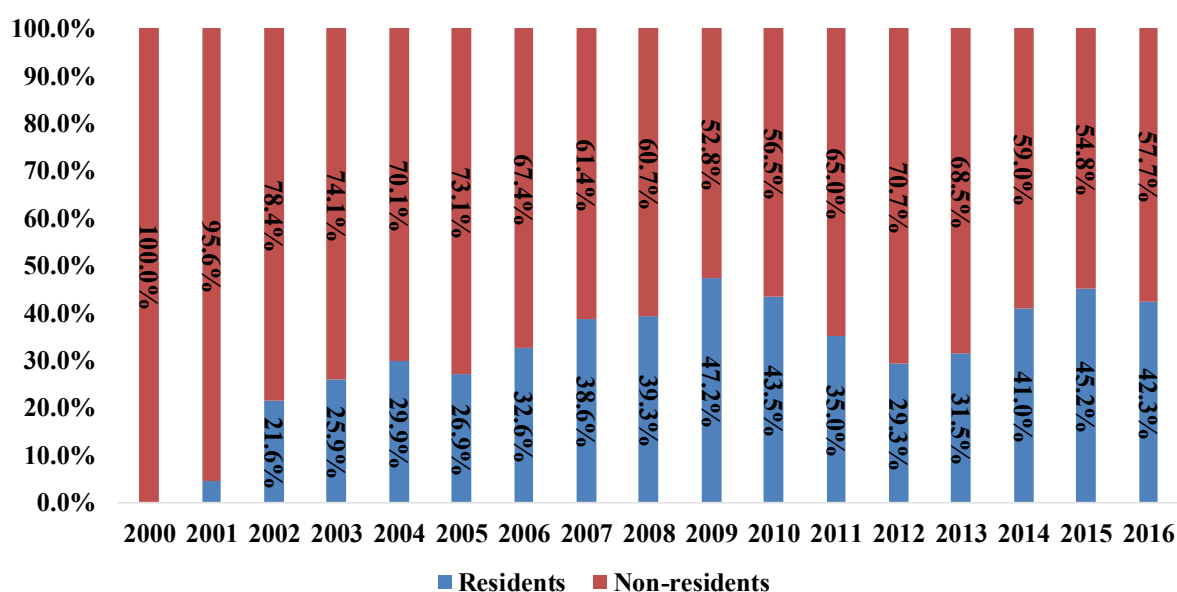
Given that the Peruvian economy is currently going through a slowdown process, more expensive credits will cause an increase in the country risk premium as well. Therefore, investments, which are crucial for the Peruvian economy, will decrease (Escudero, 2017).

Figure 15. Evolution of the Peruvian sovereign debt (in millions of soles)



Source: Central Reserve Bank of Peru – statistical series (2018).

Figure 16. Holdings of Peruvian sovereign bonds



Source: Central Reserve Bank of Peru – statistical series (2018).

1.7 Implementation of macroprudential measures and the rules of the Basel Committee

In this section, we will consider the macroprudential measures adopted by the Peruvian authorities in order to have a better insight about the main changes that occurred in the banking system and how these relate to the reduction of the dollarization level, especially

after the beginning of the global financial crisis of the year 2008. This global crisis exposed the weaknesses of banks on an individual level and how these weaknesses could translate into a systemic banking crisis that would lead to a further recession. Bearing this in mind, Peruvian authorities realized the importance of continuing with the reduction of dollarization levels in the economy in order to lessen further impacts of a global crisis on the local banking and financial system. By means of adopting macroprudential measures, authorities were looking forward to decreasing dollarization levels, especially through credits granted and deposits taken by banks in American dollars.

The continuous appreciation of the Peruvian sol versus the dollar, and the entry of foreign capital, especially the short term capital, began to be a subject of great concern and interest for the authorities that regulate the financial market in Peru. That is why they decided to improve and expand the macroprudential regulation measures in order to increase the robustness and manage the vulnerabilities of a dollarized financial system. The authorities aligned its macroprudential measures to the ones proposed by the Basel Committee. The Basel regulatory and supervisory framework for the banking sector looks forward to enhancing the stability of the banking system as a whole in order to prevent possible crisis and to make sure that banks hold sufficient capital according to the level of risk they are willing to take. Due to its credibility amongst many industrialized countries, the SBS in Peru decided to adopt and begin to apply this framework in April 2003. The SBS created the Special Committee for Basel II (*Comité Especial Basilea II – CEB*) as a means to adequate each pillar of the new capital adequacy of the Basel framework to the Peruvian context. Some of the tasks performed by this committee were related to the studies and measurements about the application of the Basel criteria to the Peruvian banks and about operational risk. Also, this committee was in charge of spreading the credibility of this framework as a means to promote an enhancement for the management of risks by using more sophisticated techniques and, as a consequence, improve the worldwide perception especially that of international credit rating agencies and international financial institutions, towards the Peruvian country risk (Canta, 2003; Valakivi, 2005).

The Peruvian regulatory institutions, based on the Basel guidelines, implemented some macroprudential measures in order to enhance the strength and reduce the vulnerabilities of the Peruvian financial system. Some of these measures are: procyclical provisions, higher bank reserve requirements and larger capital reserve requirements to cover the risks related to mortgage and consumer loans (Chang and Choy, 2014). The first two measures are crucial to control the growth of credit and macroeconomic activity in general which is linked to that growth. In other words, by means of reserve requirements, central banks can control the amount of credit that is granted by banks to the market (firms and households); and thus controlling inflation so that it does not go beyond a specific target triggered by the growth of different monetary aggregates (Gray, 2011). In the Peruvian case, the inflation target is between 1% and 3%.

The third measure, which is related to mortgage and consumer loans, emphasizes the higher degree of risk associated to these types of loans because they are mostly granted to households and in dollars. As mentioned before, this risk increases when the exchange rate soles per dollar depreciates, meaning that a higher amount of soles must be given per one dollar.

Following these criteria, banks' main objective was to change the methodologies used for assessing risk, and, instead, use other more complex procedures that would result in a further precise and efficient measurement of their risk exposure. As claimed by Valakivi (2005), the methodologies used for calculating capital requirements in emerging markets have been designed based on the methodologies used in advanced economies. This design takes into account other criteria such as the risk assessment of emerging economies done by credit rating agencies, sovereign debt, etc.

After the financial crisis, the Basel Committee decided to change the regulatory framework in such a way that capital requirements would be higher and have a better quality, so that, in case of a crisis, banks would be able to absorb greater losses. This current framework is known as Basel III and the SBS in Peru has also implemented it. The main changes related to capital requirements in Peru are the following (Instituto Peruano de Economía, n.d.):

- Increase of the banks' minimum common equity from 2% to 4.5% of all the assets.
- Creation of the capital conservation buffer equal to 2.5%, which is aimed to be built during periods of good and healthy economic conditions, so that banks can have sufficient capital in order to face possible crisis during economic downturns (situations of financial stress).
- Implementation of countercyclical buffers between 0% and 2.5% of the common equity. This capital is aimed to be built during periods over which there is excessive growth in the credit sector, so that during economic downturns banks have sufficient capital to face possible losses. This countercyclical buffer is part of the macroprudential measures contemplated now by Basel III and its objective is to strengthen the whole financial system and to prevent it from going through a systemic crisis (Contreras and Quispe, 2011). This prevention contemplates the economic cycles, which means that, as soon as the economic growth starts to sluggish, banks will tend to reduce the amount of credits they grant to the public, given that the indicators of the financial health of companies and households is worsening during a period of economic downturn. As a consequence, this would depress the economy even more. So, this countercyclical buffer seeks to reduce credit crunches that would worsen the state of the economy.

Going into further details about the countercyclical provisions for building up capital buffers, as Contreras (2011) mentions, these capital buffers go beyond the expected minimum levels of capital so that they can be used in times of a downturn and financial stress in the markets. This new capital requirement aims to reduce the procyclical behavior of the financial system,

which is reinforced by banks, especially during times of credit expansion. These are the times when good conditions are present in the economy in general and banks grant more credits to companies and households. Therefore, with this regulation Basel III seeks to encourage banks to build up higher levels of preventive capital during times of economic growth in order to face risks related to the economic cycles.

For Peruvian banks, in 2010, SBS established that the same rules that banks apply in order to activate and deactivate the procyclical component of provisions for credits are going to be used for calculating the countercyclical capital buffers. These rules are explained in the guidebook called “Regulation for the evaluation and classification of the debtor and the requirement of provisions” (*Reglamento para la evaluación y clasificación del deudor y la exigencia de provisiones*) by the SBS.

In a nutshell, the SBS (2008), according to its Resolution N° 11356-2008, has established that the minimum rates of the procyclical components for each type of credit are the following:

Table 5. Procyclical components per type of credit

Type of credit	Procyclical component (in %)
Corporate credits	0.40
Large – sized companies	0.45
Medium – sized companies	0.30
Small – sized companies	0.50
Microenterprises credits	0.50
Revolving consumer credits	1.50
Non – revolving consumer credits	1.00
Mortgage credits	0.40

Source: Superintendence of Banking and Insurance (2008, p. 32).

Table 5 shows the rates that will be applied to credits that are classified as “Normal” when the rule for procyclical provisions will be active. By saying that credits are “normal”, the SBS means that none of these credits are facing risk of default. Moreover, the rule for procyclical provisions is activated according to the calculation of the average of the annualized percentage variation of the GDP over the last 30 months or over the last 12 months, depending on the given scenario. The same criteria apply to the deactivation of this rule.

As for other measures, Basel III has implemented a series of ratios regarding liquidity such as the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR) with the aim that banks maintain high quality and sufficiently liquid assets for the short and long term, respectively. The purpose of explaining the LCR and NSFR is to give a brief insight

about how the Peruvian banking system is adopting the Basel measures in order to increase its robustness and resilience.

$$\text{LCR} = \frac{\text{Stock of High Quality Liquid Assets}}{\text{Total Net Cash Outflows over the next 30 calendar days}} \geq 100\% \quad (2)$$

Source: Superintendencia of Banking and Insurance (2017, p.21).

Equation 2 shows that the LCR must consider high quality liquid assets so that, under a stress scenario of liquidity contingencies, banks will be able to cover possible cash flow mismatches over a period of 30 days.

It should be mentioned that in December 2012, the SBS approved a new regulation regarding the Management of Liquidity Risk, taking into consideration the calculation of the LCR. First of all, the LCR must be applied to assets and liabilities in both currencies (Peruvian soles and American dollars). Second, the SBS decided to apply some changes to the methodology for the calculation of the LCR proposed by the Basel Committee.

These changes include some modifications of the formula, the periodicity to validate compliance with the minimum requirements, the weighting factors of all the components included in the formula and a progressive adequacy of the minimum level of the LCR. In Peru, from January to December 2014, the minimum level was 80%; from January to December 2015, 90%; and from January 2016 on, 100% (Central Reserve Bank of Peru, 2014a; SBS, 2012a).

Additionally, going into further details about the topic of the NSFR, its main objective is to reduce short-term and more volatile sources of funding, so that banks do not rely heavily on the short-term wholesale funding. In the case of Peru, the SBS is still researching all the possible impacts of the application of the NSFR. Its implementation is expected to be between 2019 and 2020 (SBS, 2012b).

Coming back to the topic related to the CAR, which was developed in the section called “Relationship between credit risk and exchange currency risk in the banking industry”, Basel III includes in Capital Tier 1: common shares, legal reserves, retained profits with capitalization and hybrid instruments- such as preferred shares and convertible subordinated debt-; given that these are the components whose highest quality enables them to absorb a great amount of losses.

Basel III emphasizes the quality of capital and not only the quantity, because in times of an economic downturn, the easiest thing for banks to do is to shrink their balance sheets by reducing their assets. In other words, banks would reinforce the already depressed state of the economy by contracting the credit even further, as they would not lend money to economic agents anymore. This reduction of new lending would increase the cost of credit, making it more difficult for firms and economic agents in general to find cheap sources of

credit. This would lead to a reduction of investment, employment and, in general, a decline of economic growth (Hanson, Kashyap and Stein, 2011).

Taking all this into account, Basel III disposes that banks must build up good quality capital to prevent them from shrinking their balance sheets and also to avoid acquiring further debt in order to restructure their balance sheets – given that debt is cheaper than capital –. Basel III encourages a recapitalization process, especially with common equity, due to the fact that it has a higher quality than preferred equity (Hanson, Kashyap and Stein (2011).

As Table 3 describes, at least 4.5% of Tier 1 Capital has to be share capital, which is, in other words, common equity and retained profits in the Peruvian case. Basel II required that just 2% of Tier Capital 1 was common equity and retained profits.

2 DATA AND EMPIRICAL ANALYSIS

The empirical analysis will consist of a study of the balance sheets of the most representative banks in Peru. The tools used in the empirical analysis will be graphics in order to compare ratios and different variables of these banks, such as solvency ratios, foreign exchange position, portfolios of credits and deposits, etc. Other tools will be analysis of correlations amongst variables.

The analysis will take into account the balance sheets of the banks selected and it will be performed for the period between 2001 and 2016. The general structure of the data will be the following: the observations will be split up into two clusters: pre-crisis, from 2001 to 2007 and post-crisis, from 2008 to 2016.

The information will be managed on a yearly basis, with the purpose of showing the way in which banks were managed before and after the global financial crisis. Moreover, the thesis will use the information of Peruvian GDP on a yearly basis in order to ease the comparison of different variables among years.

The thesis will evaluate financial variables such as the total amount of credits granted for the categories of consumer loans and mortgages, capital and liabilities. Likewise, the following solvency ratios will be included: debt-to-assets, debt-to-capital and debt-to-equity. By doing this, the thesis seeks to evaluate how these ratios and the capital structure of banks have changed between the pre and post crisis times.

Moreover, the thesis will include the data regarding the amount of mandatory reserve requirements required by the Central Bank and how it correlates with the evolution of the credits (consumer and mortgages) granted in dollars and the coefficient of dollarization of the Peruvian financial system. Furthermore, the study is going to evaluate the foreign exchange gap positions and whether they are net long or net short for each defined period.

Last, in the case of Scotiabank, the data that will be used for the years 2001, 2002, 2003 and 2004 is the one corresponding to Sudamericano bank (*Banco Sudamericano*), given that Scotiabank had not started operations as itself in Peru before 2005. Before this year, Scotiabank had a 35% stake in the shareholding of Sudamericano. This is why the data of the latter will be used with the sole purpose of the analysis of the time series.

2.1 Descriptive statistics of the sample

Three variables are taken into account in order to describe the data, as summarized in Table 6. The three variables are: the amount of credits granted by banks in soles, the amount of deposits and the amount of capital. These are the chosen variables in order to give a general insight about the size of the banks of the sample based on their main activities: granting credits, taking deposits and based on their capital.

The data is evaluated on a year-end basis, considering the stock of each variable as of December and is expressed in thousands of soles. There are 64 observations in total, which are obtained by multiplying the data of the four banks by sixteen years of data. For the categories of credits and deposits, this amount has been divided by the Peruvian GDP of the year 2007 (base year) to get the ratios Credits and Deposits over GDP.

Table 6. Descriptive statistics of the sample expressed in thousands of soles

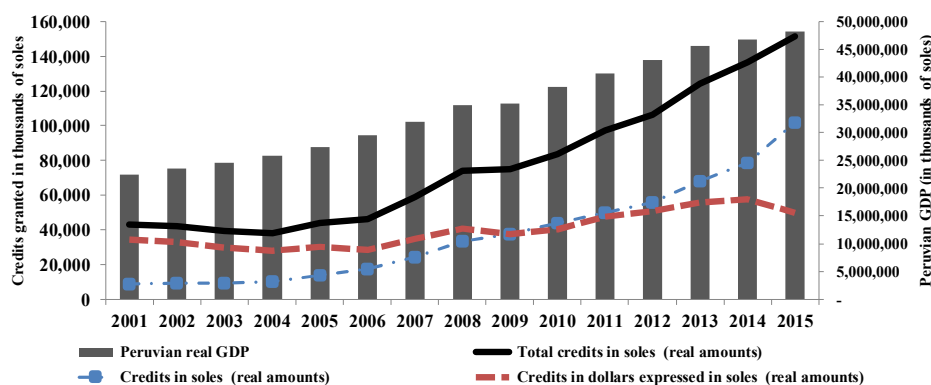
	Amount of credits granted in soles	Amount of deposits in soles	Amount of capital in soles	Credits / GDP	Deposits / GDP
Mean	21,100,000	21,500,000	3,278,298	6.60%	6.73%
Standard Deviation	18,200,000	16,700,000	2,831,522	5.69%	5.22%
Minimum	1,590,987	1,154,558	159,701	0.50%	0.36%
Maximum	78,000,000	71,000,000	13,600,000	24.40%	22.21%
Observations	N = 64	N = 64	N = 64	N = 64	N = 64

Source: *Central Reserve Bank of Peru – statistical series* (2018).

2.2 Analysis of banks' portfolio of credits according to their balance sheets

This part of the analysis will focus on the portfolio of credits and the components of capital of each bank chosen for this thesis. Regarding the portfolio of credits, the trend for these banks coincides with the trend for the whole industry of credits granted to the private sector (in real terms), as Figure 17 depicts. Nevertheless, we should notice that the inflexion point in this case is in 2010, which is the same date of the inflexion point for Interbank, opposite to the cases of BCP, Continental and Scotiabank, in which the change in this trend started some years later.

Figure 17. Credits granted by all banks of the system to the private sector in comparison to real GDP from 2001 to 2015

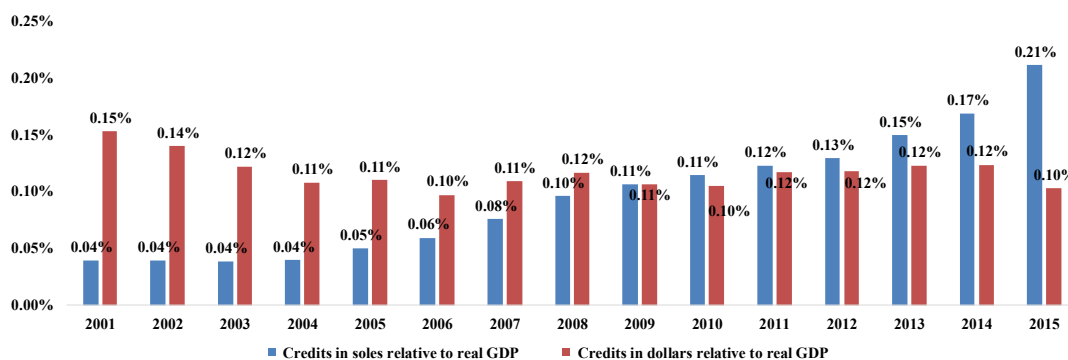


Source: Central Reserve Bank of Peru – statistical series (2018).

This means that the rest of the banks in the industry, along with Interbank, had a sooner de-dollarization process. In addition, when comparing the data about credits granted to the private sector to the Peruvian GDP in real terms, Figure 18 shows how the composition of credits has changed since 2010. As of 2015, credits in soles consists of approximately 0.32% of real GDP.

Figures in Appendix B show a similar trend for all the banks, with a difference in the date of the inflexion point where the portfolio of credits in domestic currency becomes larger than the portfolio of credits granted in American dollars. In the case of BCP, this trend started to change in February 2014; for Continental, in July 2013; for Scotiabank and Interbank the trend changed in January 2015 and January 2010, respectively. In the case of Interbank specifically, the trend started to reverse exactly in September 2009 if the analysis is made on a monthly basis. However, when taking annual averages, the change in the trend is as mentioned previously.

Figure 18. Credits granted by all banks of the system to the private sector as a percentage of real GDP



Source: Central Reserve Bank of Peru – statistical series (2018).

The reason why the three biggest banks in Peru started the de-dollarization process some years later is that a big percentage of their portfolio of credits consisted of mortgage loans, which continued being granted in dollars; and credits destined to finance external and foreign trade of companies. Many companies preferred to work with the biggest banks in order to finance these activities. This is shown in Table 7, which depicts the two types of credits for each bank as a percentage of GDP.

Table 7. Mortgage loans and credits for foreign trade as a percentage of Peruvian GDP as of 2016 (in thousands of soles)

Banks of the sample	Mortgage Loans	Credits for foreign trade activities
BCP	2.36%	0.68%
Continental	2.13%	1.12%
Scotiabank	1.13%	0.73%
Interbank	0.95%	0.29%

Source: *Central Reserve Bank of Peru – statistical series* (2018).

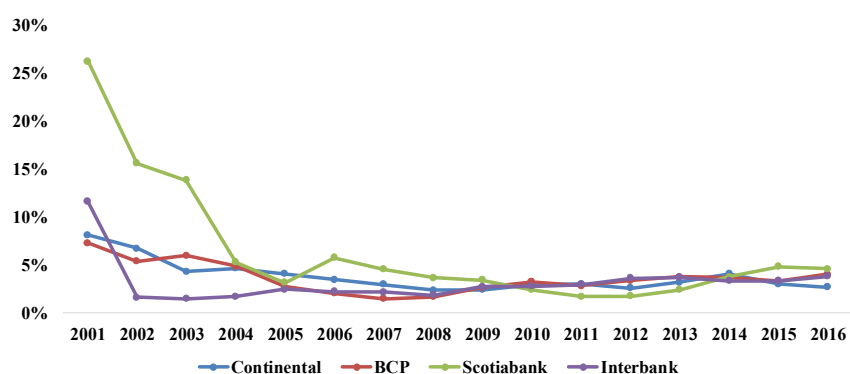
The previous analysis includes the category of credits granted to foreign trade activities with the sole purpose of explaining why the trend for the biggest banks regarding the de-dollarization process has shown a different behavior in comparison to the whole industry. Mentioning this is relevant, given that the focus of this study is on mortgage and consumer loans.

Regarding this focus, Figure 19 shows the behavior of the portfolio of overdue consumer loans (as a ratio of overdue over outstanding loans) and that Scotiabank had the largest amount of overdue credits between 2005 and 2009. This is an interesting observation, due to the fact that the portfolio of consumer credits of Scotiabank was the smallest in comparison to the portfolios of the rest of the banks of the sample. However, the reason why this trend occurred is the restructuring process Scotiabank went through during those years. As mentioned previously, Scotiabank started operations in Peru in 2005, when it merged with Sudamericano Bank. According to the 2005 Annual Report of Scotiabank, the Credit Division was in charge of the challenge to merge the credit methodologies for the assessment of risk of these three banks. The previous trend of Scotiabank was reversed during the years 2010 and 2014. During these years, the amount of its portfolio was similar to that of Continental Bank. However, the management of Scotiabank for the collection of its account receivables was more efficient, given that during these years, it had an average of 2.28% of overdue credits, compared to an average of 2.98% of Continental.

Last, BCP, Scotiabank and Interbank are showing signs that the quality of their loan portfolios is decreasing, given that the amount of overdue credits is going up (measured as the ratio of overdue loans over outstanding loans). This is a sign of possible default on these

credits, which could be linked to the depreciation of the sol against the American dollar (the thesis will go into further detail about this point). The default ratio of BCP increased from 2.43% in 2015 to 2.71% in 2016 (El Comercio, 2017). As for Scotiabank, Apoyo y Asociados (2016) suggest that the bank should not leave aside the reinforcement and enhancement of its policies for early collection of the credits granted for the categories of consumer loans and mortgages. Likewise, the risk rating agency Equilibrium Clasificadora de Riesgo S.A (2016) affirms that Interbank faces an immense challenge regarding the deterioration of its credit portfolio, especially for the categories of consumer and mortgage loans, which represent almost 50% of the total portfolio of credits for this bank. This challenge becomes tougher given the current situation of slower growth rate of the economy.

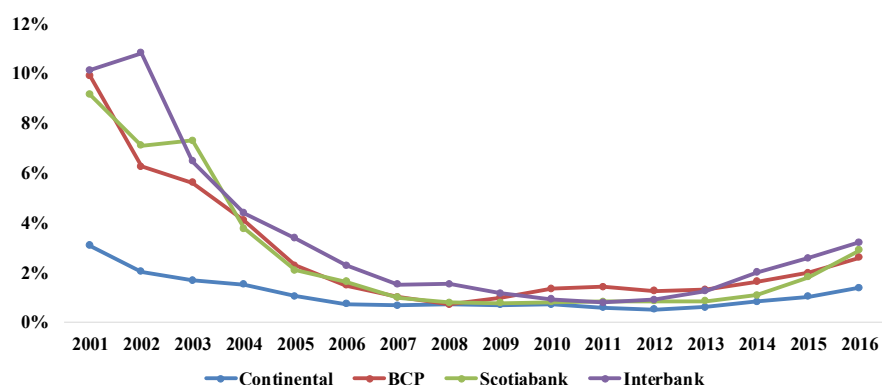
Figure 19. Ratio of overdue over outstanding consumer loans from 2001 to 2016



Source: Superintendencia of Banking and Insurance – statistical series (2018).

On the subject of mortgage loans, Figure 20 depicts the evolution of overdue mortgage loans. The two banks leading the Peruvian market of mortgage loans are BCP and Continental, having, respectively, 32.11% and 28.86%, market share in the category of outstanding loans in 2016 (Superintendencia of Banking and Insurance, 2011).

Figure 20. Ratio of overdue over outstanding mortgage loans from 2001 to 2016



Source: Superintendencia of Banking and Insurance – statistical series (2018).

Figure 20 depicts the fact that Interbank has had the worst performance with respect to the amount of defaulted credits. Moreover, the default ratio of BCP has increased, caused mainly by the deterioration of its portfolio of loans on a general level, as discussed by diverse analysts.

Going into further detail, with regard to the pre- and post-crisis comparison, Table 8 and Table 9 show the average percentage growth of the portfolios of overdue loans for the categories of consumer and mortgage loans, respectively. The purpose of these two tables is to show and compare the percentage of overdue loans in these two periods: pre and post-global financial crisis. For both categories, the growth was smaller, and even negative, during the years before the financial crisis (2002 and 2007). In the post crisis period (2008 and 2016) the growth of overdue credits was larger. This could be related to two factors: first, the slowdown in the economic growth of the Peruvian economy - as shown in Figure 21 -; and, second, the fact that more economic agents, in this case individuals and households, began to take more loans in American currency and, despite the appreciation of the Peruvian sol with respect to the dollar, then had difficulties for the repayment of the loans due to continuous fluctuations of the exchange rate. Scotiabank has 189.74% due to the merge with other banks.

Table 8. Average percentage growth of overdue consumer loans

Banks of the sample	2002 – 2007	2008 – 2016
Continental	8.16%	11.54%
BCP	-3.78%	36.11%
Scotiabank	189.74%	21.58%
Interbank	17.89%	28.58%

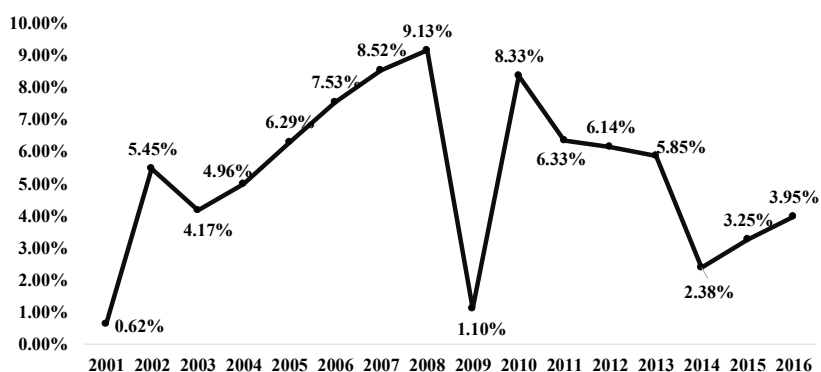
Source: *Superintendencia of Banking and Insurance – statistical series* (2018).

Table 9. Average percentage growth of overdue mortgage loans

Banks of the sample	2002 – 2007	2008 – 2016
Continental	-2.88%	29.77%
BCP	-9.81%	31.47%
Scotiabank	0.64%	40.72%
Interbank	-5.92%	40.64%

Source: *Superintendencia of Banking and Insurance – statistical series* (2018).

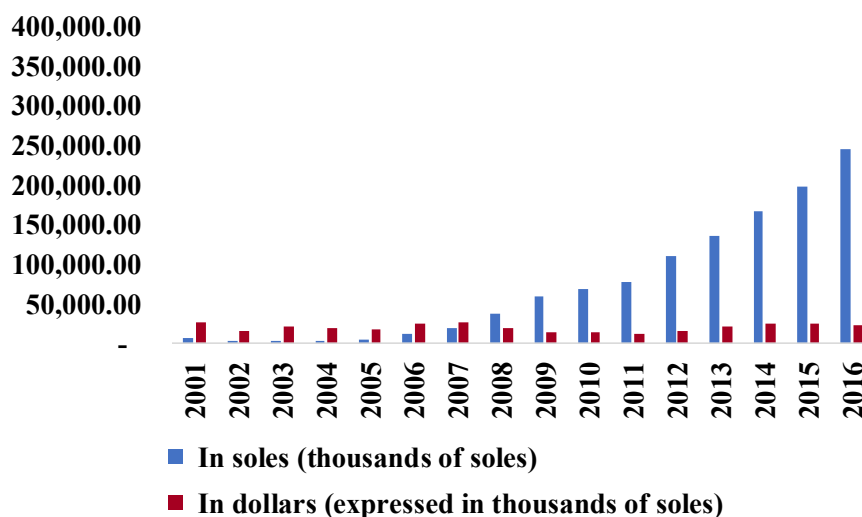
Figure 21. Peruvian Real GDP growth rates from 2001 to 2016 (base year = 2007)



Source: Central Bank of Reserve of Peru – statistical series (2018).

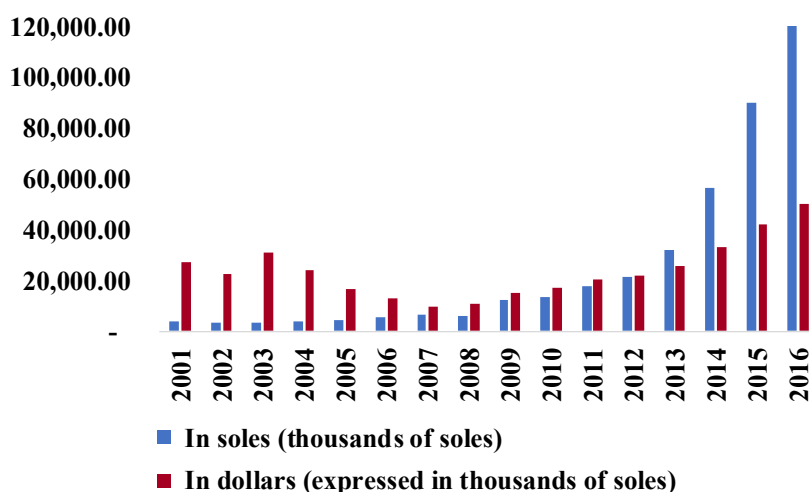
Last, Figure 22 and Figure 23, depict the portfolio of overdue consumer and mortgage loans, respectively, between 2001 and 2016. Mortgage loans have shown a larger deterioration in both currencies, given that the amount of overdue loans is larger for this category than for the category of consumer loans. However, it is interesting to observe that, for both categories and for the four banks of the sample, the deterioration of the portfolio in soles has been larger than in dollars. The main reason for this deterioration, especially over the last six years of analysis, has been the low growth of the Peruvian economy. This slowdown of the economy has worsened the paying capacity of households, causing default of payments.

Figure 22. Portfolio of overdue consumer loans by currency in thousands of soles (as an average of the four banks of the sample)



Source: Superintendencia of Banking and Insurance – statistical series (2018).

Figure 23. Portfolio of overdue mortgage loans by currency in thousands of soles (as an average of the four banks of the sample)



Source: Superintendencia of Banking and Insurance – statistical series (2018).

Regarding specifically the overdue mortgage credits in dollars, the main reason of the deterioration of this portfolio is the appreciation of the exchange rate (soles per dollar), due to the increase of the interest rates by the FED in the United States and the uncertainties related to the growth of the Chinese economy (ASBANC, 2016, p. 2). As the dollar started to appreciate and given the high dollarization of mortgage loans, the paying capacity of households was eroded. This shows the high exposure to credit risk of households whose credits are in foreign currency. As it can be observed in previously shown Figure 3 and Figure 4, the exchange rate soles per dollar has had continuous appreciations since the end of 2012, which means that the sol has depreciated against the American currency. Therefore, the paying capacity of borrowers was undermined.

Furthermore, this reversal in the trend of overdue credits in soles and dollars started to happen in 2008, which has been defined, as for the purpose of this thesis, the start of the post-crisis period (inflexion point). As explained before, the dollarization coefficient (percentage of a financial asset denominated in foreign currency) of loans was extremely high until the year 2000, reaching a value of 82% (Figure 2). This trend started to have a noticeable reversal by 2010, thanks to the policies implemented by the Peruvian Central Bank in order to reduce the dollarization. These policies were the following:

- Setting an inflation target.
- Accumulation of international reserves, dollars, in its vault.
- Increase reserve requirements in dollars

The first policy enacted by the Central Bank was the accomplishment of the inflation target, in the year 2002, which helped Peru achieve a stable level of inflation and, as a consequence,

economic agents started to trust the local currency again and, therefore, take credits in soles. The Central Bank of Peru adopted an inflation target equal to 2%, with an accepted deviation level between 1% and 3%, in order to start the dedollarization of the financial system (Castillo, Vega, Serrano, Burga and Serrano, 2016).

Regarding the accumulation of international reserves, the Central Bank gathered enough American dollars in its vault prior to the financial crisis in 2008. This allowed it to inject liquidity in dollars into the economy when foreign investors were leaving the country and taking their dollars back with them. From October 2008 until March 2009, the BCRP injected liquidity equal to 9.3 percent of GDP (Castillo, Vega, Serrano, Burga and Serrano, 2016), by means of direct sales of dollars to commercial banks, repos and swaps.

Additionally, in 2013 the Central Bank established additional reserve requirements in dollars, in order to reduce the expansion of mortgage loans in this currency and encourage their substitution by loans in soles. It was the first time the Central Bank set an additional amount of reserve requirements in dollars. In October 2013, the BCRP also applied these additional reserves to the evolution of total credits in dollars.

Also, when the massive inflow of dollars started to enter into the Peruvian economy, the Central Bank decided to increase the rate of reserve requirements. The main goal of this was to prevent the expansion of credits granted by banks, so that the economy would not overheat (Moloche and Toma, 2014).

Last, another regulator, the Superintendence of Banking and Insurance, established in 2009 the policy to increase the provisions for debtors whose loans were in American dollars, due to their higher exposure to foreign exchange risk. The aim of this policy was also de-dollarization.

2.3 Funding structure of banks

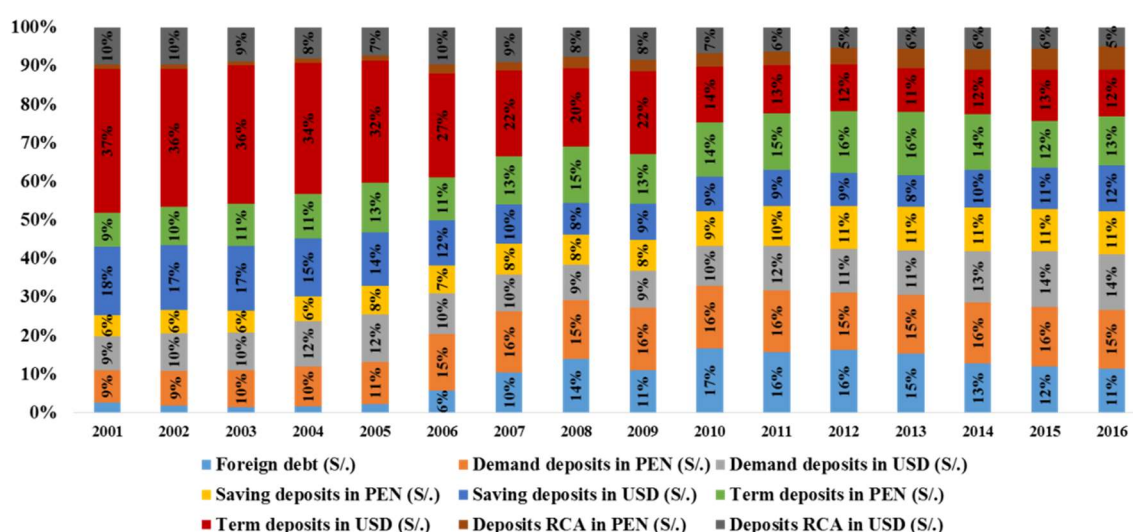
An important point that needs to be taken into account is the funding side of banks.

Figure 24 shows the funding structure of banks, as an average of the banks of the sample, based on their balance sheets. It is worth noticing that BCP, Continental and Interbank have had a similar structure, having term deposits in dollars as an important funding source. These three banks show a decreasing trend for this source, in order to receive more term deposits in soles. Additionally, they show a similar composition of saving deposits and demand deposits in dollars. This goes according to what is shown in the industry as a whole. Scotiabank, is the only bank with a different structure, whose weight is more concentrated in demand deposits in soles, foreign debt and RCA deposits, both in dollars and soles. RCA deposits refer to retirement compensation arrangement deposits.

Term deposits are the safest source of funding for banks, as they are supposed to remain in the bank for a determined period of time. Like this, banks may calculate more easily their funding mismatches per period of time.

Besides, the strategy of most of the banks of the Peruvian market is to diversify their sources of funding in order to achieve the most cost efficient combination and the most balanced portfolio according to their marketing plans and risk appetite. However, Peruvian banks prefer local deposits as their core source of funding, because this sort of deposits offers a stronger level of liquidity (Izquierdo and De Orbegoso, 2017).

Figure 24. Composition of the funding of banks (as an average of the banks in the sample, in percentages)

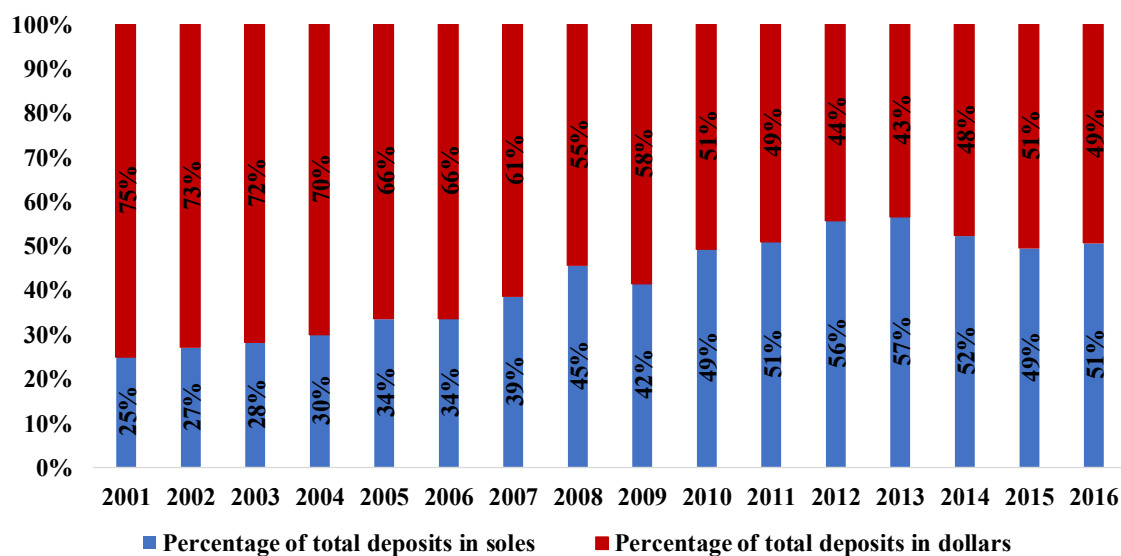


Source: *Superintendencia of Banking and Insurance – statistical series* (2018).

Additionally, the percentage of dollarization of deposits is still high, being 49% in 2016, as shown in Figure 25. The efforts made by the Peruvian authorities to reduce dollarization, such as the increase of mandatory reserve requirements of deposits in dollars, have achieved a reduction of the dollarization coefficient of deposits of banks. However, there is still plenty to do in order to accomplish a larger decrease. Izquierdo (2017) mentions that the macroprudential measures implemented by the competent authorities in order to reduce the dollarization of the asset side of the balance sheets of banks have had a faster effect than the policies implemented to reduce the dollarization of the liabilities side.

Besides, deposits in soles fulfill a transactional purpose, whereas deposits in dollars seek to store value for the depositor. This is related to the still permanent lack of trust in the Peruvian currency.

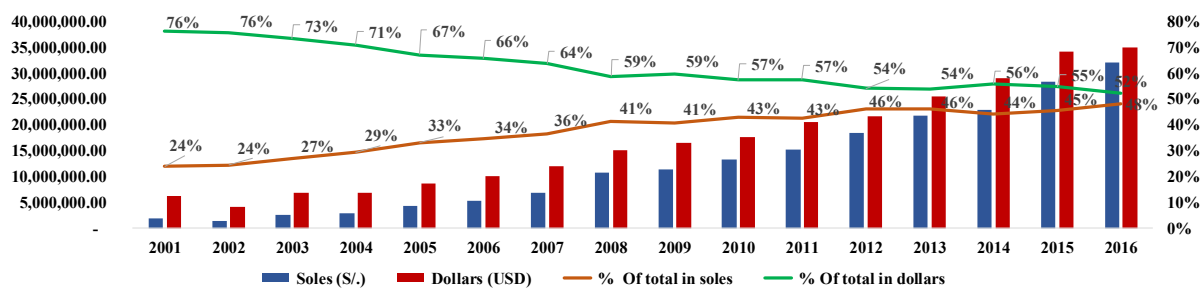
Figure 25. Percentage of deposits in soles and dollars in the banking system



Source: Central Bank of Reserve of Peru – statistical series (2018).

In addition, Figure 26 shows a comparison of the liabilities of all the banks of the sample as an average and in real terms. As of 2016, the total share of liabilities in dollars has been larger than that of liabilities in soles. However, the composition of liabilities per currency is almost the same, being 48% in soles and 52% in dollars. This is a big change if compare to the year 2001, in which liabilities in soles represented only 24% of the total.

Figure 26. Soles versus dollars denominated liabilities in thousands of soles (as an average of the four banks, in real terms)

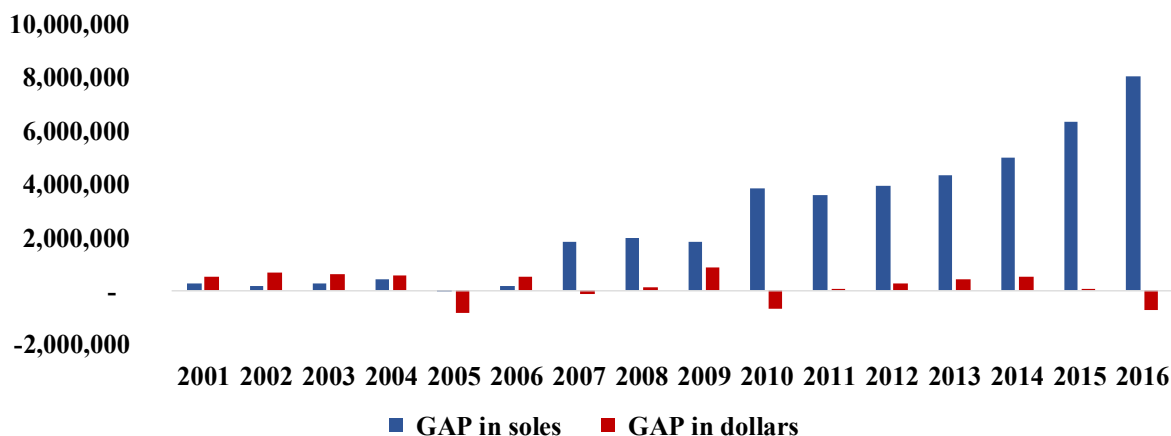


Source: Superintendence of Banking and Insurance – statistical series (2018).

Furthermore, Figure 27 shows the gap between assets and liabilities in both currencies – again as an average of the four banks of the sample and the calculation has taken into account the difference between assets and liabilities (excluding equity)-. This is shown in real terms. In 2005, 2010 and 2016 the gap was negative for dollar denominated liabilities. The main cause of this was the increase of debts and financial obligations with foreign institutions, given that, according to the banks’ balance sheets, these loans are in American dollars. This

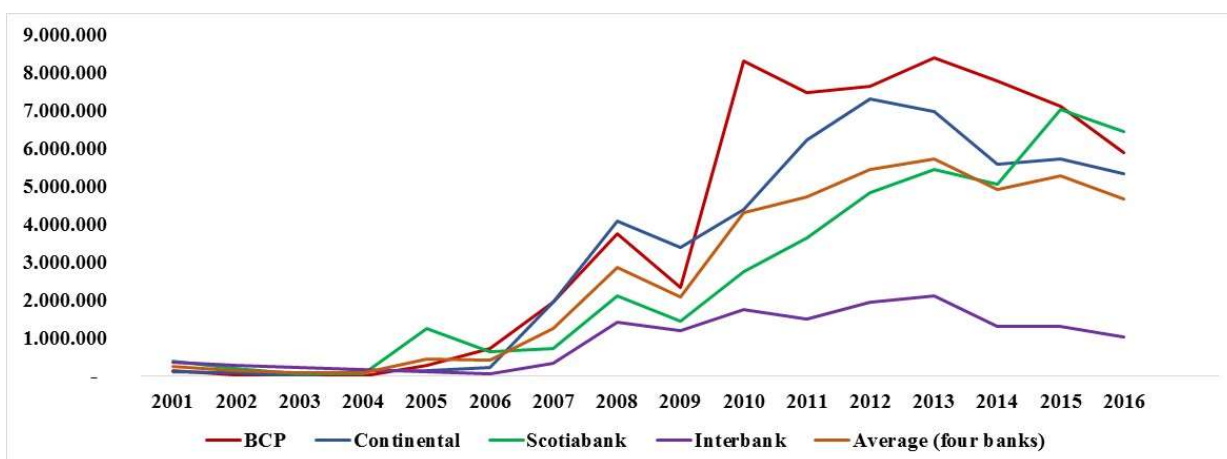
is one of the ways in which the American currency enters into the Peruvian economy. Figure 28 depicts this situation. In 2005 and 2016, Scotiabank increased its loans with foreign institutions. In 2010 it was BCP which received a larger inflow of dollars through these loans. These are the years in which the gap in dollars is negative, as mentioned previously.

Figure 27. Gap between assets and liabilities in thousands of soles (in real terms)



Source: *Superintendencia of Banking and Insurance – statistical series (2018).*

Figure 28. Debts and financial obligations with foreign institutions and international organizations in dollars (expressed in thousands of soles)



Source: *Central Reserve Bank of Peru – statistical series (2018).*

2.4 Reasons of the persistence of dollarization of credits in the Peruvian banking system

After analyzing both credits (asset side) and deposits (liability side) of the banks in the sample, the question remains why dollarization is still so high, despite the different measures taken by the authorities, both to reduce the dollarization of loans and deposits. This is a

crucial question because dollarization makes the financial system more vulnerable, and it is still too high according to international standards (Contreras, Quispe and Regalado, 2017).

As explained by Contreras, Quispe and Regalado (2017), the fact that the coefficient of dollarization has decreased is a reflex of the increasing trust of economic agents in the Peruvian sol. However, the de-dollarization process has not been steady during certain periods. In the case of loans, the de-dollarization process decreased during 2010; whereas de-dollarization of deposits showed a decrease during 2009. This behavior is related to the uncertainties caused by the global financial crisis and due to the Central Bank's policy to reduce the reserve requirement in dollars, which means that banks could increase the amount of credits granted in this currency and, at the same time, take more deposits from the public, since they were not obliged to fulfill such high levels of reserve requirements in dollars as before. This will be explained in further detail in the next section.

Contreras, Quispe and Regalado (2017) found there is a positive relation between the dollarization of deposits and the depreciation of the Peruvian sol against the dollar; and a negative relation between the dollarization of credits and the depreciation of the national currency. The first relation means that, when more soles have to be given per dollar, economic agents prefer to have their assets as deposits in the American currency. This happens because in the Peruvian economy there is still a permanent idea that the dollar will store the value of assets. On the other hand, the negative relation between credits and the depreciation of the sol means that, when more soles have to be given per dollar, people prefer to get credits in soles (the dollarization of credits decreases). Moreover, if less soles have to be given, economic agents prefer to get credits in dollars; therefore, this increases the dollarization of credits. This negative relation is caused by the credits risk associated with the dollarization of credits and the volatility of the exchange rate.

Last, other important reasons of the persistence of dollarization are transaction costs, contracts and market practices which are strongly attached to the American currency (Rossini, Vega, Quispe and Perez, 2016).

2.5 Mandatory reserve requirements as a means for the reduction of the dollarization level

At this point we will analyze the use of mandatory reserve requirements as a tool to decrease the dollarization in the financial system. The purpose of this is to understand the dynamics between the rate of mandatory reserve requirements in soles and dollars and the reduction or expansion of loans in both currencies, emphasizing mortgage and consumer loans in dollars and how these have been replaced, little by little, by credits in soles, given that one of the main goals of the Peruvian financial authorities is the reduction of the dollarization levels. As mentioned by Moloche and Toma (2014), as soon as the inflow of American dollars started to go into the Peruvian economy, the Central Bank decided to use its policy related to reserve requirements in order to prevent the economy from overheating; that is, to reduce

the expansion of credit. The Central Bank decided to do so instead of increasing the reference interest rate. Given that, by doing so, the Central Bank would increase the risk of attracting a larger inflow of capitals (this would be attractive to foreign investors due to the lower interest rates offered in advanced economies due to the crisis). Moreover, as stated by Leon and Quispe (2010), reserve requirements per currency fulfill a macro-prudential function in a financially dollarized economy, as is the case of Peru, which is why they are extremely important as a tool of economic policy.

Due to the still relatively high coefficient of dollarization, the Peruvian Central Bank enhances its reserve requirement policy for foreign currency with an extra obligation, which is known as marginal reserve requirement. This additional requirement helps preserve the international reserves of American dollars owned by the Central Bank, which can be used in period of financial stress (Leon and Quispe, 2010). In a nutshell, the legal or mandatory reserve requirement is calculated by applying the mandatory rate of reserve requirements to the average daily amount of the total liabilities (deposits and foreign debt) subject to be part of the reserve of a base period. The marginal reserve requirement consists of reserves in addition to the legal minimum established by the Central Bank. For the purpose of the analysis of this point, the thesis will take into account and focus on mandatory reserve requirements only.

Leon and Quispe (2010) also recognized two periods in their study related to the usage of reserve requirements as a tool of monetary policy. The first one is the pre-Lehman Brothers period, which is established from September 2007 to September 2008; and the second one is the post-Lehman, from September 2008 (after Lehman Brothers' bankruptcy) until 2010. During the pre-Lehman period, the Peruvian economy received a major inflow of American dollars through different forms: investments in certificates of the Central Bank, Peruvian Sovereign debt and through private capital. It was during this time that the Central Bank decided to increase the level of reserve requirements because, as mentioned before, it was seeking to prevent the economy from overheating. This is depicted in Figure 29. In April 2008, the mandatory reserve requirement for soles was 12.73% (compared to previous levels of 6%); and for dollars, it was 30.69%.

During the second period, post-Lehman, the main characteristic of the financial situation was a generalized outflow of foreign capitals from developing economies, such as Peru. This was due to the growing uncertainties on a global level regarding the measures that advanced economies were going to take for the future. In Peru, this caused restrictions of liquidity. However, they could be overcome because, during the pre-Lehman period, banks had stored plenty of liquid assets in dollars in the Central Bank, given that the latter had increased the mandatory reserve requirements. These actions helped avoid a possible credit crunch. Moreover, the Central Bank started to reduce the levels of reserve requirements to prevent stagnation in the economy. By January 2010, the mandatory reserve achieved again a level of 6% in soles (Figure 29). As for dollars, the levels of mandatory reserve requirements

remained almost unchanged, achieving a slightly higher level than in April 2008. By January 2010, the level of mandatory reserve requirements for dollars was 32.79%, which might be surprising due to the fact that the Central Bank was seeking to prevent a credit crunch. However, its policy of reducing credits in dollars prevailed and this is why it increased the rate of reserve requirements in dollars.

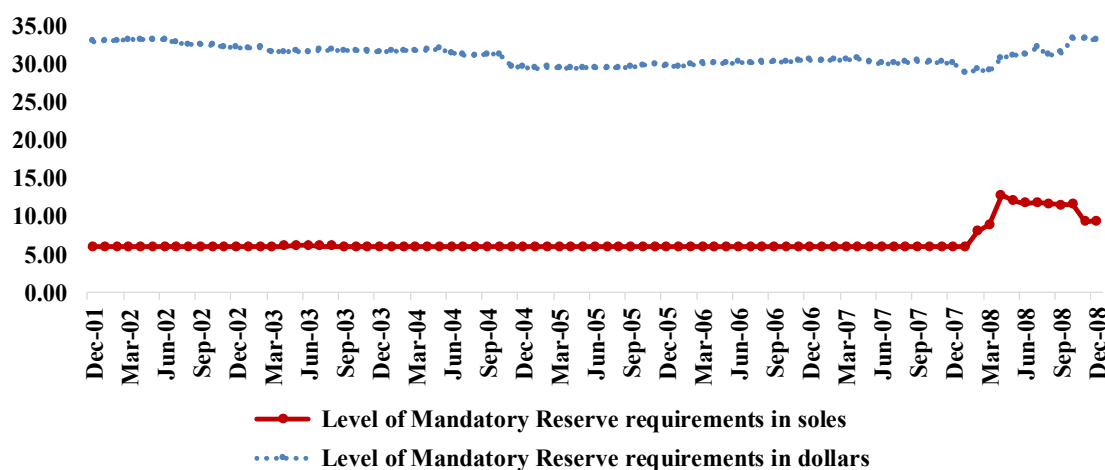
After this year and after the uncertainties had been dissipated to some extent, the solid macroeconomic fundamentals of the Peruvian economy made it, once again, receiver of new inflows of American dollars from foreign investors, especially long-term private capitals oriented to investment and debt of the financial and non-financial sectors. Investors basically were seeking the higher returns on capital that were offered by the Peruvian markets González Izquierdo (2012). After 2010, according to Figure 29, the Peruvian Central increased once again the levels of mandatory reserve requirements for both currencies in order to prevent, as previously said, an overheating of the economy. After December 2013 (Figure 29), the financial markets and monetary authorities worldwide were already expecting the FED to start increasing its reference rate. This is why the inflow of American dollars started to decrease little by little and this was one of the reasons why the Peruvian Central Bank began to reduce the rate of reserve requirements. Also, it implemented this policy in order to stimulate the credit market. In soles, the Central Bank reduced it from 18.93% to 17% in September 2013. In dollars, it stayed on a level around 43%. This measure was taken as a means to continue reducing the dollarization of credits (Central Reserve Bank of Peru, 2017).

In 2014 (Figure 29), the Central Bank announced further reductions of the mandatory reserve requirements in soles. Starting from January 2015, this reserve would go from 9.5% to 9%. (Central Reserve Bank of Peru, 2014b). In the case of dollars, the mandatory reserve requirement would go from 44.32% to 43.35%.

The last publication of the Central Bank regarding the modifications of the reserve requirements was done in December 2016. It announced that since January 2017, the mandatory reserve requirement in soles would decrease from 6.5% to 6%. In dollars, however, the rate would have a slight increase, from 34.26% to 35.16%. The Central Bank decided to do so in order to maintain a credit environment with flexible conditions, due to a deceleration in credit demand and higher international interest rates. Furthermore, between the years 2010 and 2013 there were high capital inflows due to an international context of low interest rates. Therefore, the BCR decided to increase the rate of reserve requirements. The situation reverted between 2013 and 2015, when the BCR reduced the rate of reserve requirements, given that the FED started reversing its monetary stimulus (Central Reserve Bank of Peru, 2016b). Additionally, the Central Bank requires that banks maintain high amounts of liquid assets in American dollars, because this will enable banks to face possible scenarios of illiquidity in this currency. Therefore, the financial system will be protected.

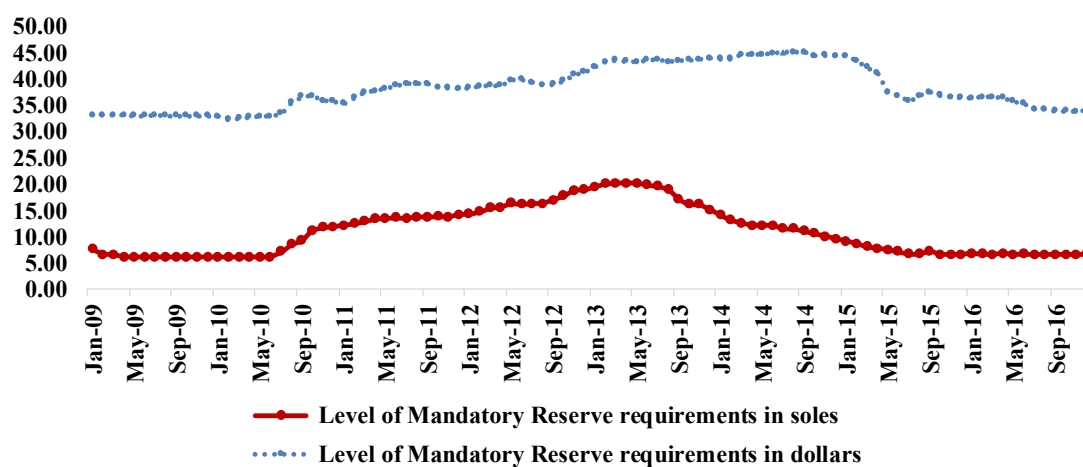
Even though the Central Bank is still looking forward to reducing the dollarization of credits, it had decided to reduce the rate of reserve requirements in dollars in order to prevent the cost of credit in this currency from increasing at an unexpected and extremely high pace, given the recent increases of the reference interest rate of the FED. Economic agents in Peru will continue demanding credits in American dollars, not only for mortgage or consumer loans, but also for activities linked to foreign trade. This is why, by means of a reduction of the reserve requirements in this currency, the Central Bank seeks to expand the liquidity and to inject approximately 59 millions of dollars into the economy, so that the cost of credit in dollars does not increase tremendously.

Figure 29. Mandatory reserve requirement for banks from 2001 to 2008 (expressed as a rate in percentage)



Source: Central Reserve Bank of Peru – statistical series (2018).

Figure 30. Mandatory reserve requirement for banks from 2008 to 20016 (expressed as a rate in percentage)



Source: Central Reserve Bank of Peru – statistical series (2018).

2.6 Analysis of capital requirements for credits, capital adequacy ratio and solvency ratios

As specified in section 1.3, the CAR (Capital Adequacy Ratio) within the Peruvian banking sector is known as global capital ratio. The behavior of these variables of each of these banks of the sample is similar to the behavior of the whole banking sector, as shown in Figure 31. The risk related to assets and contingent credits is measured using two different methodologies: the first one is called “the standard” method; and the second one is related to internal methods developed by each institution (IRB), under the supervision of the SBS.

According to Superintendencia de Banca y Seguros (2009) and its resolution 14354-2009, the standard methodology states that all the exposures in the banking book have to be classified according to certain categories such as sovereign, public sector entities, multilateral development banks, financial system companies, corporate credits, mortgage loans, revolving and non-revolving consumer loans, etc. In order to get the risk weighted assets and credits, each level of exposure for each category has to be multiplied by a risk weighting factor. The level of exposure in the case of mortgage loans and consumer credits is the value of the total exposure minus specific and generic provisions. This methodology considers that provisions for credit exchange risk are already included in the specific provisions. However, if the exposure is in foreign currency, it has to be multiplied by $(1+Hrcc)$. **Hrcc** is an adjustment factor that takes into account the increase in exposure due to credit exchange risk. This is applied to credits granted in American dollars. The level of this factor has been equal to 4%, 6% and 8% in 2013, 2014 and 2015, respectively. The factor has increased because, as observed in, Figure 25 the percentage of credits in dollars in the banking system was 48% in 2014 and 51% in 2015. This is why the Hrcc factor increased, as the credit risk exposure linked to the exchange rate risk also increased, given the larger amount of credits in dollars.

When the amount of risk weighted assets and credits has been obtained, it has to be multiplied by an adjustment factor, which used to be 0.96 between July 2010 and June 2011; 0.98 between July 2011 and June 2012; and 1 from July 2012 until today.

In order to calculate the amount of effective capital needed to cover the exposures related to consumer and mortgage loans, banks have to use the internal ratings-based advanced method. They have to calculate the probability of default (PD), the loss given default (LGD) and the exposure at default (EAD). With these variables banks calculate the minimum level they need in order to cover their exposures related to credit risk.

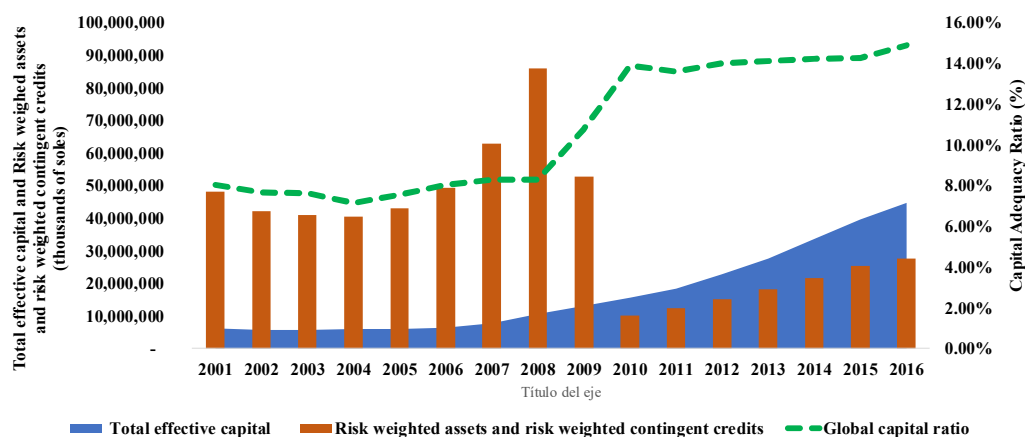
The level of risk weighted assets and credits had a similar pattern for the four banks; and all of them had their highest level in the year 2008. This is due to the expansion of credits during this year, especially the ones destined for consumer and mortgage loans. This goes in line with what has been explained in the previous section about the mandatory reserve requirements during the pre-Lehman period and the actions taken by the Peruvian Central

Bank of Reserve in order to prevent the economy from overheating, given that credits were expanding. After this year, credits started to decrease and from 2011 the expansion of credit began once again at a steady pace, as the Central Bank started to reduce the levels of reserve requirements to prevent stagnation in the economy.

As for the global capital ratio – or CAR (as said previously, the CAR – Capital Adequacy Ratio – within the Peruvian banking sector is known as global capital ratio) –, all banks have shown a good performance, in compliance with the Peruvian and international requirements. However, before 2009, all banks had at least one period when they did not meet the minimum levels of capital, neither according to the Peruvian requirements, nor the international ones, which were 9.1% and 8% (Basel I), respectively. Since July 2009 the Peruvian requirements have changed. At this time, the minimum capital ratio was 9.5%; as from July 2010 it was 9.8%; and since July 2011 it has remained at 10%.

Furthermore, since July 2009 the calculation of total effective capital includes the exposure to operational risk, besides the exposure to credit and market risk, as required by Basel II. This is why, as the graphs show, the amount of total effective capital has been much larger for all banks. At the same time, this increase is justified by the expansion of credits on a general level, especially because of the amount of overdue credits. Even though most of credits are in soles, the exposure in American dollars has to be multiplied, as explained before, by the factor $(1+Hrcc)$, which has increased from 4% in 2013 to 8% in 2015. This will cause an increase in the required amount of effective capital used to cover these exposures. Another reason of this increase is that, since 2011, banks have to build additional capital according to the economic cycle. This is related to the countercyclical capital requirement (storing capital during the “good” times in order to face the “bad” times). Last, over the last five years, banks have been able to provide more capital in cash and increase the levels of capitalization by reinvesting a greater percentage of their profits.

Figure 31. Risk weighted assets and credits, effective capital and global capital ratio (as an average of the whole banking sector)



Source: Superintendencia of Banking and Insurance – statistical series (2018).

Regarding the solvency ratio of banks, it is defined as total liabilities divided by equity (capital plus reserves). This ratio measures the level of financial leverage of banks. The Peruvian authorities define equity as the sum of capital (equity) and reserves (undistributed profits) for the purpose of the calculation of this ratio. The ratio is interpreted as the number of times liabilities are larger than equity (capital plus reserves). Even though the word “solvency” may refer to the regulatory approach used by Basel for supervising the Insurance industry, this thesis study uses this word to refer to the ratio that measures a bank’s capacity to fulfil and repay its long-term obligations.

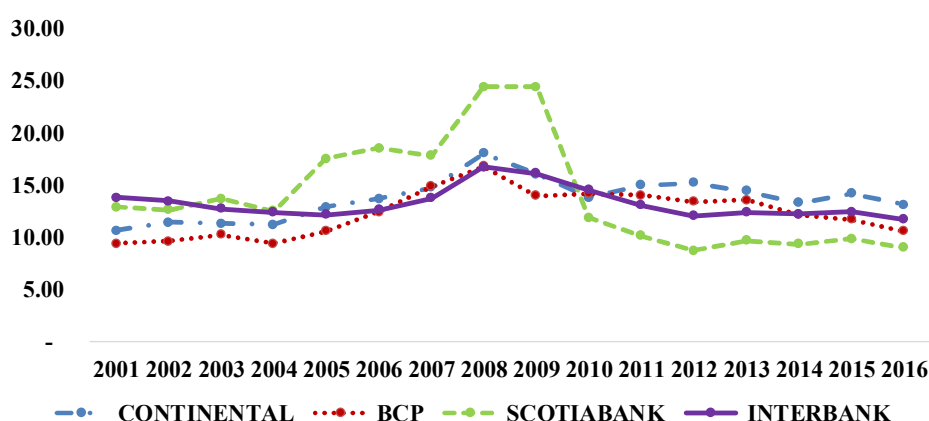
$$\text{Solvency ratio} = \frac{\text{Total Liabilities}}{\text{Capital+Reser}} \quad (3)$$

Figure 32 depicts the evolution of the solvency ratio between 2001 and 2016. It is important to mention that the optimal situation is when this ratio is as low as possible, which is an indicative of a stronger level of solvency. This means that, the lower the ratio, the lower the amount of debt that has been used in order to finance the operations of the bank. Taking this into account, it can be concluded that the worst year for these banks, especially for Scotiabank, was 2008. Scotiabank’s solvency ratio achieved a level equal to 24.37% in this year. Continental, BCP and Interbank achieved 17.98%, 16.76% and 16.71%, respectively.

The main reason of this deterioration of the solvency ratio was an increase of the liabilities for all banks. In general, BCP, Continental and Interbank have an increase in the amount of demand and term deposits. Continental showed an increase of its debt with foreign institutions and international organisms. The case of Scotiabank is a bit more peculiar, as the growth of its liabilities was caused by an increase in all of the three categories mentioned previously. In one year (2008 versus 2007) its level of term deposits in soles increased by 81%; and the amount of demand deposits in dollars increased by 28%. Moreover, the amount of debt with foreign institutions and international organisms augmented by 200% during the same period of time. Despite the tremendous increment of its liabilities in 2008, Scotiabank managed to fulfill the minimum required levels for the global capital ratio (CAR). Scotiabank’s ratio was 9.1% and the local requirement is 9.1%. This was due to the support of its main shareholder, The Bank of Nova Scotia, which provided additional capital to Scotiabank.

Since 2010, all of the banks in the sample show stronger and steadier levels of solvency ratios. This is because banks are providing additional capital and reinvesting the part of the profits and accumulated profits of past periods; therefore, the levels of capitalization are increasing, enhancing the robustness and solvency of these banks.

Figure 32. Solvency ratio (as a percentage)



Source: *Superintendencia of Banking and Insurance – statistical series (2018).*

2.7 Analysis of liquidity and the LCR

According to the Peruvian regulation, banks have to calculate liquidity ratios in soles (NC = national currency) and in dollars (FC = foreign currency). Equation 4 and Equation 5 show the methodology for the calculation and the minimum levels expected by the regulators.

$$LR_{NC} = \frac{\text{Liquid Assets (NC)}}{\text{Short-term liabilities (NC)}} \geq 8\% \quad (4)$$

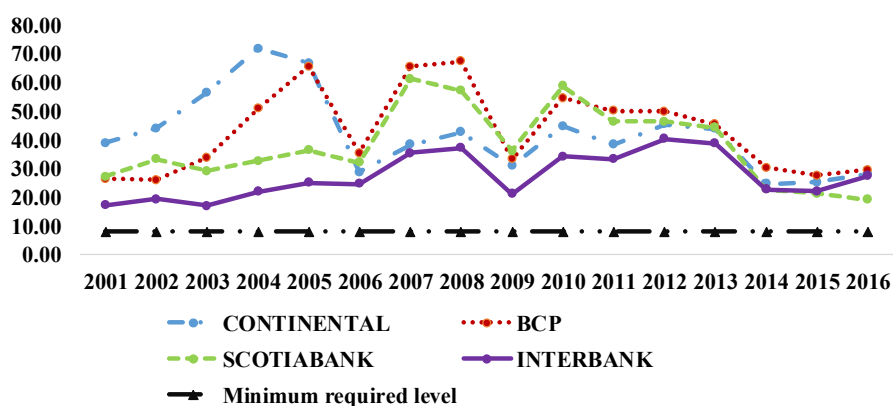
Source: *Superintendencia of Banking and Insurance – statistical series, 2018.*

$$LR_{FC} = \frac{\text{Liquid Assets (FC)}}{\text{Short-term liabilities (FC)}} \geq 20\% \quad (5)$$

Source: *Superintendencia of Banking and Insurance – statistical series, 2018.*

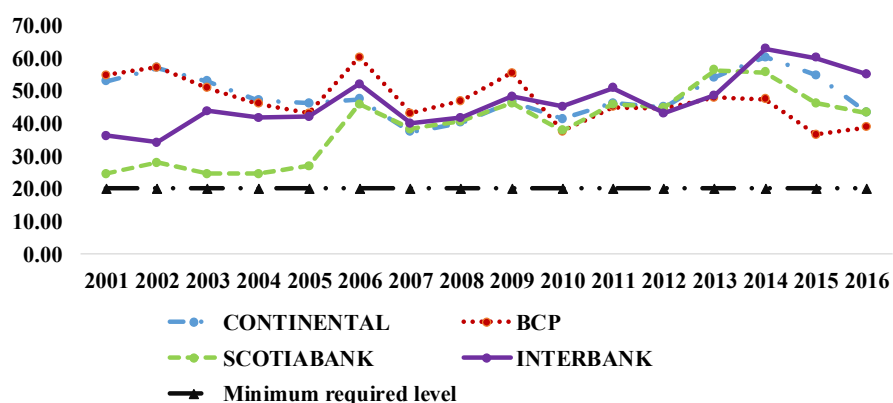
Figure 33 and Figure 34 show that the liquidity ratios for both currencies and all of the banks of the sample have always been over the minimum levels required by the Superintendencia. (The data about liquidity ratios is shown as reported by each bank and published by the Superintendencia). This means that all the banks would be able to continue granting credits to the market and face a situation of liquidity crisis, signaling the strength of the banking system. On the one hand, the main reason of these high liquidity ratios is, in the case of soles, the large amount of investments in debt instruments issued by the Government and the Central Bank; in the case of dollars, the liquid assets are mainly mandatory reserve requirements in the Central Bank. On the other hand, another significant reason for these ratios is the fact that banks carefully measure the concentration of their deposits for each time bucket and whether these funds are coming from the retail or wholesale sector. The latter represents a higher risk regarding liquidity, given that the deposits that come from this sector are exposed to greater credit and interest rate risk.

Figure 33. Liquidity ratio in soles (as a percentage)



Source: Superintendencia de Banking and Insurance – statistical series (2018).

Figure 34. Liquidity ratio in dollars (as a percentage)



Source: Superintendencia de Banking and Insurance – statistical series (2018).

Regarding the LCR, it was not approved until 2012, when the SBS published and approved a new regulation concerning the Management of Liquidity Risk. The calendar for adequacy was as described in Table 10.

Table 10. Timeline of implementation of the LCR in Peru

Period	Minimum LCR (in %)
January 2014 – December de 2014	80
January 2015 – December de 2015	90
Since January 2016	100

Source: Superintendencia de Banking and Insurance – statistical series (2018).

As of today, banks are not obliged to make public the information about the LCR and this is why there is still not so much data about this. However, Table 11 depicts the LCR for BCP,

Continental and Interbank. During these years, the banks have had ratios larger than the minimums required per period. Moreover, according to Class Rating, Scotiabank has also had ratios that surpassed the minimum levels, achieving, in 2017, a LCR equal to 108.48% in soles and 107.24% in dollars.

Table 11. Liquidity Coverage Ratio

Banks	December 2014		December 2015		December 2016	
	LCR in soles (in %)	LCR in dollars (in %)	LCR in soles (in %)	LCR in dollars (in %)	LCR in soles (in %)	LCR in dollars (in %)
Continental	123.15	194.52	150.60	150.60	180.00	126.50
BCP	121.68	203.96	134.11	170.97	180.00	147.00
Interbank	151.15	149.93	135.12	218.23	130.21	196.96

Source: *Equilibrium* (2017).

2.8 Analysis of the foreign exchange position exposure

This part of the thesis will analyze two variables. The first is the accounting foreign exchange position of banks and the second one is the ratio of the global exchange position divided by the amount of effective equity.

The accounting foreign exchange position is calculated by subtracting the total amount of liabilities in dollars from the total amount of assets in dollars. From this it can be concluded if banks hold a net long or net short position. Previously shown Figure 4 shows that the sol appreciated against the dollar during 2007 and 2008, falling to levels equal to 2.996 and 2.843 soles per dollar at the end of December 2007 and May 2008; respectively. The context of this, as mentioned previously in section 2.5, was the pre-Lehman Brothers period.

During the pre-Lehman period, foreign investors brought capital to Peru in the form of investments in certificates of the Central Bank, Peruvian Sovereign debt and through private capital. As a consequence, the sol appreciated against the dollar, due to the larger amount of the latter currency.

The reason why banks decided to have a net short position during 2007 and 2008 is the massive inflow of American dollars into the Peruvian economy. This would lead to the appreciation of the sol. However, this trend would reverse after September 2008, right after the bankruptcy of the Lehman Brothers bank in the United States. The bankruptcy caused uncertainties on a general level all around the world and investors decided to withdraw their investments, especially from emerging economies, such as the Peruvian one.

Regarding 2016, the Peruvian sol has been continuously depreciating and there has also been a continuous slowdown of the Peruvian economy. Under this scenario, one would expect that banks would hold strictly a net long position. However, BCP and Scotiabank decided to hold a net short position, as depicted in Figure 35 and Figure 37.

In the case of Continental, as shown in Figure 36, the decisions about its foreign exchange position were mixed. Most of the year 2016 it held net short positions and only during August, November and December it held net long positions. Interbank, according to Figure 38, is the bank which held a net long position for most of the year. In such highly dollarized economies, banks will prefer to hold a net long position because, in the long-term, national currencies tend to depreciate against the dollar.

Nevertheless, the reason for holding a net short position when one would expect banks to hold a net long position is related to the fact that despite all the measures taken in order to reduce the dollarization of deposits and credits, many economic agents still to maintain assets in American dollars. Therefore, banks uphold liabilities in foreign currency. As explained by Canta, Collazos and Shiva (2007), finding a perfect match of assets and liabilities in American dollars is highly complicated and difficult for agents in an economy with elevated levels of dollarization. Therefore, this is where the concept of “structural position” comes in. This structural position is not determined by the foreign currency trading activities.

The levels of foreign exchange position in Peru have been established as a percentage of equity. Since 2012, the maximum levels are 50% for a long position (net long) and 10% for a short position (net short). Additionally, the Peruvian regulation requires that banks increase their capital by 9.1%, calculated on the absolute value of the largest foreign exchange position. This means that 9.1% of a net long or net short foreign exchange position that exceeds the regulatory levels has to be backed up by more capital. With this requirement, regulators seek to prevent banks from taking speculative foreign exchange positions that are beyond certain threshold given a particular equity level (Canta, Collazos and Shiva, 2007).

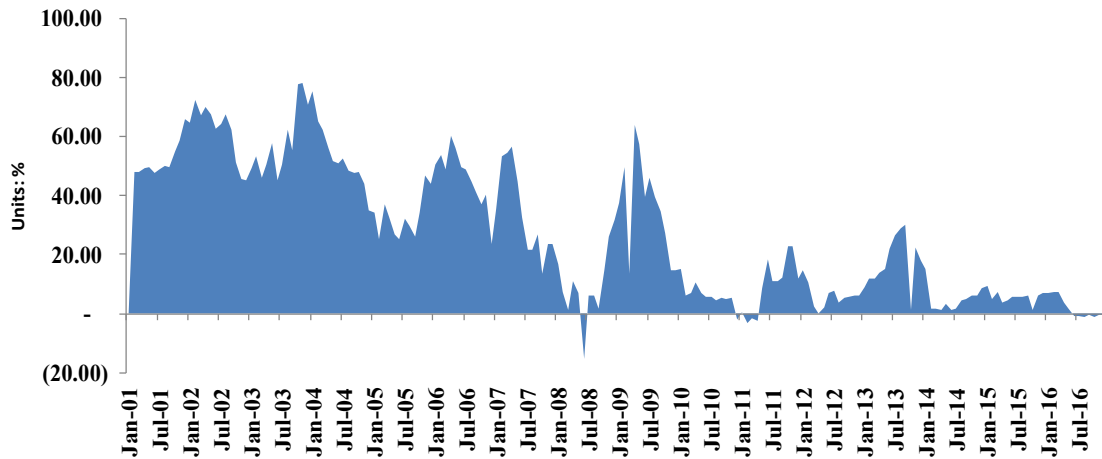
All of the banks have a net short position during 2007 and 2008. The same happens from July 2009 to January 2011. During this period, BCP was an exception, given that the net short position started one year later, in July 2010.

It was mentioned previously in the thesis that a net short position refers to the amount of liabilities in dollars being larger than the amount of assets in dollars. When banks have a net short position, it means that they are protecting themselves against a depreciation of the exchange rate.

In other words, if the exchange rate depreciates, more soles are needed in order to buy one dollar; and the value of the liabilities will be even larger than the value of the assets under this scenario. In this case, more soles will have to be given in order to pay the liabilities. In

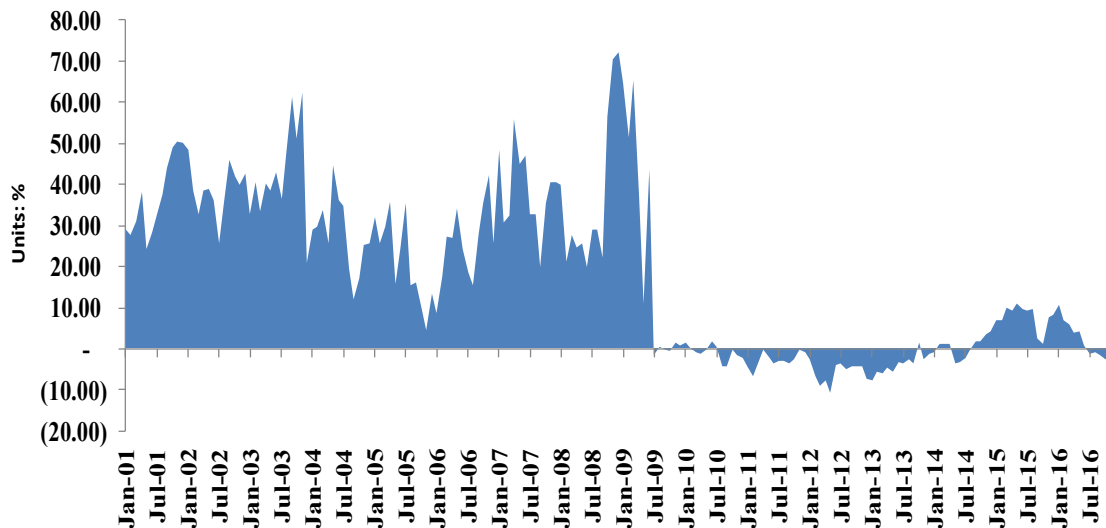
a nutshell, banks will tend to have a net long position when foreseeing a depreciation of the exchange rate; and they will hold a net short position under a scenario of appreciation of the exchange rate.

Figure 35. Accounting Foreign Exchange Position of BCP (as the ratio between the global position and equity)



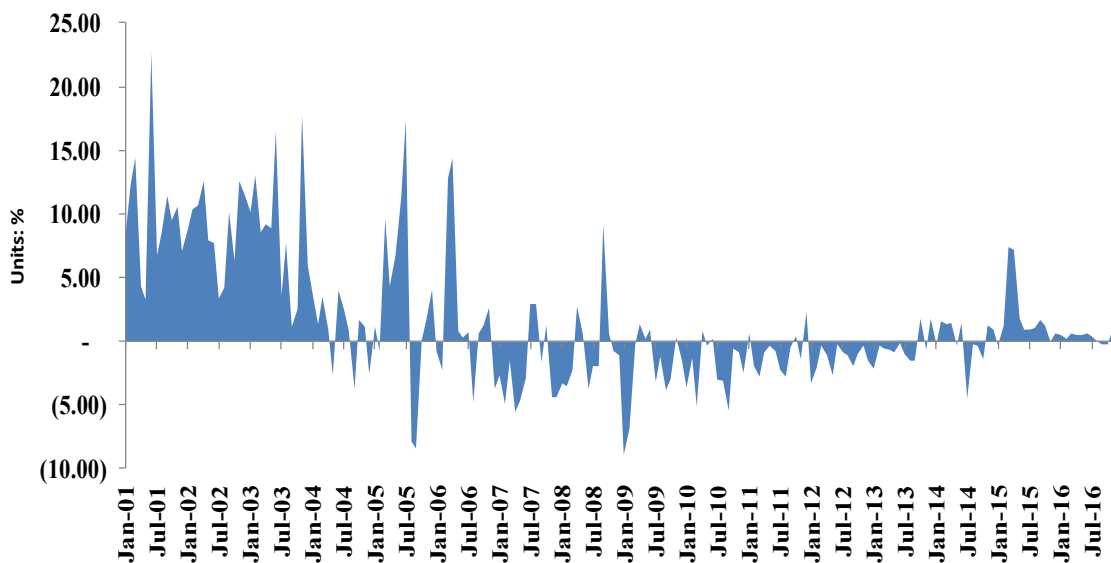
Source: Superintendence of Banking and Insurance – statistical series (2018).

Figure 36. Accounting Foreign Exchange Position of Continental (as the ratio between the global position and equity)



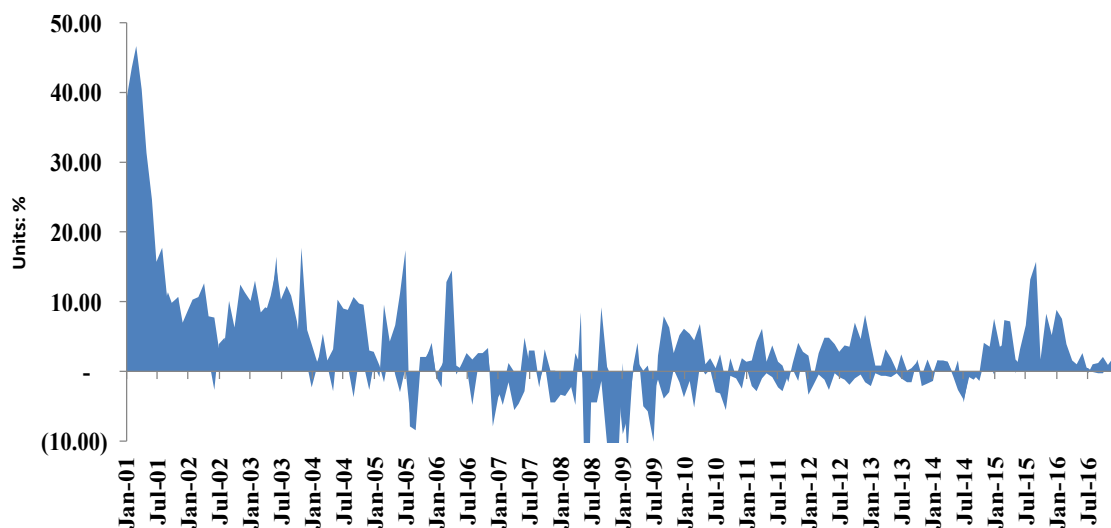
Source: Superintendence of Banking and Insurance – statistical series (2018).

Figure 37. Accounting Foreign Exchange Position of Scotiabank (as the ratio between the global position and equity)



Source: Superintendence of Banking and Insurance – statistical series (2018).

Figure 38. Accounting Foreign Exchange Position of Interbank (as the ratio between the global position and equity)



Source: Superintendence of Banking and Insurance – statistical series (2018).

The second ratio to be analyzed is the ratio of the global exchange position divided by the amount of effective equity. The global exchange position considers the accounting position and the position in financial derivatives, as the latter are used to hedge the exchange rate

risk. The position in financial derivatives is simply added (or subtracted) to the accounting foreign exchange position. This ratio is interpreted as the percentage of effective equity exposed to foreign exchange risk, meaning that the lower the ratio, the lower the amount of exposed effective equity.

The regulations regarding the limits of foreign exchange global position were approved by the SBS in the year 2003. The limits were 100% of effective equity for a net long position and 5% for a net short position. These limits changed throughout the time until, in 2012, the SBS established new ones, being equal to 50% and 10%, for a net long and net short position, respectively. The main goal of this change was to prevent banks from speculating against the national currency by using foreign exchange derivatives. When having a net long position limit equal to 50%, banks may speculate against the Peruvian sol and by doing this, they would risk 50% of their effective equity. The same logic applies for a net short position limit equal to 10%. This limit indicates that banks may put at risk 10% of their effective equity when speculating in favor of the Peruvian sol (Jiménez Sotelo, 2005).

In order to achieve this, the regulator diminished the maximum levels of position in derivatives of banks and their foreign exchange negotiation limits. Since 2015, the absolute value of the net position in forward contracts and other derivatives cannot be larger than 20% of effective equity; or larger than 300 million soles for a net short position. For a net long position the limits are 40% and 600 million soles. The aim of this new regulation is to reduce the volatility and speculation levels in the foreign exchange Peruvian market (SBS busca promover adecuado manejo de activos y pasivos en empresas del sistema financiero, 2015; SBS redujo el límite de operaciones de derivados de bancos ante caída del dólar, 2012).

Banks have always fulfilled the regulation, as their ratio of global foreign exchange position over effective equity has always been within the established limits, with just one exception in June 2008, when BCP and interbank reached levels equal to 15.53% and 28.70% for their net short position, respectively (Superintendencia of Banking and Insurance, 2011).

2.9 Analysis of correlations among different variables

The following analysis contains matrices of correlations in order to examine the interdependence among a range of variables used previously on this thesis. These variables are: overdue consumer and mortgage loans in dollars, variation of foreign exchange rate, dollarization coefficient of overdue loans, solvency ratios, required capital and mandatory reserve requirements in dollars. It is important to mention that, even though two variables are correlated, this does not mean there is a relation of causality per se. This analysis will just give an insight regarding the change of variables at the same time; and the direction and magnitude of this change.

Table 12 and Table 13 show the correlations between overdue consumer and mortgage credits in dollars. The purpose of this is to gain an intuitive idea if the reason of overdue consumer and mortgage loans is related only to macroeconomic effects, such as a depreciation of the sol against the dollar; or if is also related to each bank's management of recollection of debt and policies of risk assessment of their clients. In order to calculate these correlations, the percent variation of overdue credits was taken into account. Correlations are positive for all relations between banks, except for the relation between Interbank and Scotiabank. This happens in both categories of credit. Positive correlations indicate that, if the percentage of overdue loans increases (decreases) for bank A, it will also increase (decrease) for bank B. These tables also show that correlations for mortgage credits are larger than the ones for consumer credits. Furthermore, positive correlations could be a sign of the economic cycle, indicating that, if, for example, the economy is going through a slowdown, a large number of debtors will default on their credits. The negative correlation between Interbank and Scotiabank could be explained by the different approaches these banks have in order to assess the risk of their clients when granting credits. This means that a bank may have a better approach in order to assess this risk; therefore it is easier to identify if a client is very risky and decide not to grant her a credit. As a result, the portfolio of credits of this bank will be healthier.

Table 12. Correlations between overdue consumer credits in dollars (2001 – 2016)

	Continental	BCP	Scotiabank	Interbank
Continental	1.00000			
BCP	0.04889	1.00000		
Scotiabank	0.04180	0.05260	1.00000	
Interbank	0.15302	0.14615	-0.00243	1.00000

Table 13. Correlations between overdue mortgage credits in dollars (2001 – 2016)

	Continental	BCP	Scotiabank	Interbank
Continental	1.00000			
BCP	0.19143	1.00000		
Scotiabank	0.14680	0.20513	1.00000	
Interbank	0.21154	0.11724	-0.11022	1.00000

The correlations between the percent variation of the foreign exchange rate and the growth (percent change) of overdue consumer and mortgage credits in dollars are analyzed in Table 14. The first column shows the correlation between the dollarization coefficient of overdue consumer credits of the four banks in the sample and the percent variation of the exchange rate. The second column shows these correlations but for overdue mortgage credits. The percent variation of the exchange rate (FX) is calculated as follows:

$$\% \text{ variation of } FX = \frac{FX_T - FX_{T-1}}{FX_{T-1}} \quad (6)$$

In this case, a positive correlation is expected, meaning that, if the exchange rate depreciates (more soles needed per dollar), more people will default on their credits in dollars. Therefore, the larger the growth of overdue credits in foreign currency. All correlations are positive, except for Interbank in the case of overdue consumer loans. Regarding the positive correlations, the ones with the largest magnitudes are of BCP and Continental in the category of overdue mortgage loans. Moreover, positive correlations are present among banks, meaning that, if overdue credits increase in bank A, they will also increase in bank B. This is a sign of the state of the economy and a systemic factor. However, a negative correlation is still present between Interbank and Scotiabank, as in the previous tables (Table 12 and Table 13). In addition, the negative correlation between the variation of the exchange rate and the amount of overdue consumer credits of Interbank could indicate, once again, a different approach used by this bank in order to assess the risk of its clients regarding their exposure to foreign exchange risk.

Table 14. Correlations between the dollarization coefficient of overdue consumer credits and overdue mortgage credits and the variation of the foreign exchange rate (2001 – 2016)

Banks	% Variation of exchange rate (Overdue consumer credits)	% Variation of exchange rate (Overdue mortgage credits)
Continental	0.05603	0.31848
BCP	0.01237	0.28310
Scotiabank	0.03422	0.07671
Interbank	-0.07511	0.04051

Table 15 shows the correlation between the dollarization coefficient of overdue consumer and mortgage credits in American dollars and the solvency ratios of banks. To calculate this, the percent variation of overdue loans was used. Correlations are negative in the case of Continental, BCP and Interbank; which means that, if the dollarization coefficient increases (decreases), the level of financial leverage decreases (increases), meaning a higher (lower) level of solvency. On a general level, the coefficient of dollarization in the economy has decreased. However, the specific dollarization coefficient for mortgage and consumer loans has not. Given this scenario, banks have to add more capital in order to cover their exposure to foreign credit risk. Moreover, the exposure in foreign currency of credits has to be multiplied by the 1+Hrcc factor, as explained in a previous section. This translates into higher levels of capital, which decrease the levels of financial leverage. Since 2015, this factor is 8%. Additionally, the minimum capital ratios have also increased, reaching 10% and, since 2009 the levels of capital have increased on a general level because of the new

requirements of Basel II and III. Therefore, the denominator of Equation 3 increases. As a result, the level of financial leverage is smaller. The economic background related to solvency ratios is that the larger the amount of liabilities, the lower the solvency of a bank is. A bank is considered to be more solvent if its funding structure does not depend heavily on debt. So, if the amount of overdue consumer and mortgage credits increases, banks will have to increase their capital in order to cover the possible losses related to overdue credits that will not be repaid. This will cause a change in the funding structure of the banks, leading to an increase in capital and, assuming that the level of debt will not increase, then the solvency ratio rises and is therefore enhanced. On the other hand, according to Aguilar, Camargo and Morales (2006), the level of solvency of a bank and the amount of overdue credits are related due to the fact that banks that have weaker solvency ratios may try to improve their short-term performance by increasing the amount of credits without adequate assessment controls of the paying capacity of individuals. Therefore, banks may obtain higher short-term returns, but by jeopardizing their solvency ratios. However, as formerly stated, due to the policies of reinvestment of capital plus the policy of capital requirements which demands that banks enhance their capital coverage related to credit risk in American dollars, the banks of the sample have been able to hold good and steady solvency ratios. Also, as mentioned by BCRP, the stronger the solvency levels of banks, the easier it is to face a decline in the quality of credits.

The only positive correlation is Scotiabank's, meaning that if the dollarization coefficient increases the level of financial leverage increases too. Therefore, it means a lower level of solvency. As mentioned before, the growth of liabilities of this bank was caused, especially, by an increase in the amount of debt with foreign institutions and banks. Scotiabank's solvency ratio was 9.1% while the requirement was 9.1% also.

Table 15. Correlations between the dollarization coefficient of overdue consumer and mortgage credits and solvency ratios (2001 – 2016)

	Continental	BCP	Scotiabank	Interbank
Continental	1.00000	-0.56616	-0.59389	-0.54393
BCP	-0.49219	1.00000	-0.54949	-0.51696
Scotiabank	0.30336	0.26809	1.00000	0.20338
Interbank	-0.00976	-0.01813	-0.05759	1.00000

Table 16 depicts the correlations between the coefficient of dollarization of overdue loans (consumer and mortgage) and the required amount of capital used in order to cover the credit risk exposure (Credit RWA). As expected, correlations are positive; meaning that, if the coefficient increases, the required amount of capital increases too. The correlations are quite similar among all the banks, except for Scotiabank, which has a lower correlation. Likewise, the amount of capital increases for credits in soles as well. The economic background for this is similar to the one explained in the previous analysis for Table 15, due to the fact that

banks, according to Peruvian banking regulation, are obliged to increase their capital levels. One of the exposures that needs to be covered is the exposure related to credit risk for credits granted in American dollars.

Table 16. Correlations between the dollarization coefficient of overdue consumer and mortgage credits and the RWA to cover credit risk exposures (2001 – 2016)

	Continental	BCP	Scotiabank	Interbank
Continental	1.00000	0.73663	0.50697	0.73728
BCP	0.76015	1.00000	0.49536	0.72424
Scotiabank	0.74425	0.69885	1.00000	0.71183
Interbank	0.76414	0.72322	0.49550	1.00000

Last, this thesis analyses the correlations with mandatory reserve requirements in American dollars. According to BCRP, the increase of the amount of overdue credits in dollars accelerates with the rate depreciation of the exchange rate (more soles per dollar).

Table 17 shows this analysis. The first column shows the correlation between mandatory reserve requirements in American dollars and the dollarization coefficient of consumer and mortgage loans only. The second column shows these correlations, but includes the total amount of credits regardless of the category (it includes, besides mortgage and consumer loans, other credits such as commercial loans, credits granted to SMEs, etc). On the first column, all correlations are positive, meaning that, if the level of mandatory reserve requirements in American dollars increases, the dollarization coefficient of this category of credits increases as well. The reason for this is that, despite the higher level of reserve requirements in American dollars, the amount of overdue mortgage credits in dollars has grown over the last years. The expected result would be that correlations are negative, meaning that the higher the reserves in dollars banks must hold, the lower the dollarization coefficient of overdue mortgage and consumer loans, given that banks are obliged to restrict the amount of dollars they inject into the market by granting loans. This result is shown on the second column, which includes all categories of credits. However, the positive correlation between the mandatory reserve requirements in American dollars and the coefficient of dollarization of mortgages and consumer loans could be explained by the fact that mortgage loans have longer maturities and this is having an impact on the results. This is why it can be expected that loans with longer maturities, such as mortgages, have a higher level of dollarization than loans with shorter maturities (García-Escribano, 2010). Besides, even though regulators have been introducing policies in order to reduce dollarization on a general level, credits granted for mortgages in dollars are still high. Also, the BCRP announced that the program to reduce credit dollarization program, will be implemented gradually in the case of mortgage loans. It established annual reductions of 10% per year.

Moreover, as explained before and according to the second column of Table 14 (correlation between the dollarization coefficient of overdue mortgage credits and the variation of the foreign exchange rate), the main reason for this is the depreciation of the exchange rate soles per dollar. According to BCRP, the increase of the amount of overdue credits in dollars accelerates with the rate depreciation of the exchange rate (more soles per dollar).

Table 17. Correlations with mandatory reserve requirements in dollars (2001 – 2016)

Banks	Mandatory reserve requirements in USD and dollarization coefficient of consumer and mortgage loans	Mandatory reserve requirements in USD and dollarization coefficient of total credits
Dollarization of Continental	0.71713	-0.61154
Dollarization of BCP	0.73524	-0.63094
Dollarization of Scotiabank	0.42275	-0.59849
Dollarization of Interbank	0.66393	-0.62934

CONCLUSIONS

The Peruvian banking sector has gone through a series of transformations, especially since the year 2000. The main goals have been the achievement of stabilization and the decrement of dollarization levels, so that the sector is not highly exposed to international shocks caused by changes in the exchange rate soles per dollar.

On a general level, the amount of credits granted by banks has increased. However, it was not until 2009, that the credits in dollars started to show a decrement. In this year, both credits in soles and dollars represented 0.13% of the Peruvian GDP. This is related to what has been mentioned in the previous paragraph regarding stricter regulations for credits in dollars.

In reference to the amount of overdue consumer and mortgage loans, the four banks of the sample have had a deterioration of their portfolios. In the case of Continental bank and its portfolio of overdue consumer and mortgage loans, the amount is close to 400 millions soles (approximately 122 millions of dollars). Even though the other banks of the sample have lower amounts of overdue consumer and mortgage loans, the trend is the same for them and for the rest of the banks of the Peruvian financial system. As many analysts have concluded, this is due to the fact of the depreciation of the soles per dollar exchange rate, making the dollar a more expensive currency against the sol. Given this and that the income of households is in soles, therefore, it is more expensive for them to repay their debts in the foreign currency.

Regarding the funding structure of banks, it can be concluded that it shows a similar composition as of funding in dollars and soles. In 2016, the composition of liabilities was 48% in soles and 52% in dollars. A large contribution of liabilities in dollars comes from foreign debt. As for deposits, they showed a similar composition as the total amount of liabilities: 49% of deposits in dollars and 51% of deposits in soles. This reduction has been triggered also by the new and stricter regulations, especially the ones related to mandatory reserve requirements, which are much higher in the foreign currency. This means that banks face more constraints for granting credits in dollars. However, they still grant plenty of credits in dollars to companies, especially for foreign commerce operations. In order to finance a big part of these loans, they use foreign debt. As it has been mentioned, the amount of foreign debt of the banks in the system has increased

As for the amount of global capital ratio, all banks have met the requirements imposed by the regulator. This shows that banks are well capitalized and that they do not rely solely on debt. This is a good sign about the strength and resilience of the Peruvian banking sector. Furthermore, the amount of risk weighted assets and risk weighted contingent credits has increased, due to the fact that the regulators imposed another factor in the calculation of risk weighted assets, which is related to the exposure to credit risk that arises from the exchange rate risk. This is obviously for credits in American dollars.

Regarding liquidity and solvency ratios, it is concluded that banks fulfill the requirements, which is a sign that, in times of a crisis, banks would be able to continue operating without the need of being bailed out. As for solvency ratios, banks show steady and good levels that meet the requirements, given that they are increasing the levels of capitalization, especially from the reinvestment of profits of past periods.

Moreover, according to the correlations performed in the previous section, it can be concluded that there is a correlation between the amount of defaulted consumer and mortgage loans and the depreciation of the exchange rate (depreciation of the Peruvian Nuevo Sol against the dollar). This means that, if the dollar is more expensive, more people will face difficulties when repaying the credits. However, correlations amongst the banks are not so large, which means that the approach in used by banks when assessing the risk of clients to whom they grant credits and their policies for recollection of loans can be affecting the correlations and are an important variable when determining why banks have credits on default. Regarding the correlation between the dollarization coefficient and solvency ratios, it shows a negative sign for most of the banks. This is the expected sign, given that if the coefficient of dollarization increases, the level of financial leverage decreases (a higher level of solvency given that the amount of debt in the capital structure has decreased). This goes according to one of the requirements imposed by regulators regarding the amount of capital banks must have in order to cover their exposure to credit risk originated from a depreciation of the exchange rate. Besides, this finding matches the behavior of the solvency ratios of banks, which have been above the minimum levels. The reason for this is the good

management of risks, which result in a correct capitalization and measurement and assessment of risky assets, such as risky loans. Also, the new regulations implemented by authorities have supported the growing robustness and strength of the banking system, which are reflected in the capital adequacy ratios. This finding is related to the analysis of the correlation between the dollarization coefficient and the capital required to cover credit risk exposures. Given that the amount of defaulted credits in dollars has increased, banks have had to inject more capital. Therefore, the correlations shown between these two variables are positive and pretty high and that the dollarization levels have definitely changed before and after the international financial crisis, which has had an impact in the capital structure of banks. Regulators have increased capital requirements, obliging the banks to be less dependent on debt and increase their sources of capital; and, at the same time, they have increased capital requirements for loans in dollars as a way to continue reducing the levels of dollarization.

Additionally, since 2003 the Peruvian regulators have been working under the guidelines of the requirements of the Basel Committee and, after the international financial crisis, they implemented new and more strict regulations according to the new rules of Basel III. These implementations have been applied taking into account the specific characteristics of the Peruvian market and taking into account the fact that the Peruvian financial sector is not so developed as the financial sectors of advanced economies.

Since 2009 regulations became stricter regarding capital and liquidity ratios and the levels of dollarization. Regulators (the Central Bank of Reserve and the Superintendence of Banking and Insurance) implemented new rules, because banks should increase their levels of capitalization, so that they are not dependent on debt. Therefore, this would increase their solvency levels, also by decreasing the levels of financial leverage.

However, the Superintendence of Banking and Insurance, along with the Peruvian Central Bank, still have great work to do in order to reduce the dollarization coefficient to a larger extent. The main objective of this is to diminish the vulnerability of the financial system and banks' balance sheets to abrupt changes in the exchange rate PEN/USD. Otherwise, the Peruvian financial system will continue being susceptible to massive inflows of short-term foreign capital. These massive inflows usually take place during times in which the economic conditions of emerging markets are better than those of developed economies.

A possible explanation to why some economic agents prefer to have deposits in foreign currency is the lack of confidence in national currency due to past experiences of hyperinflation and, consequently, its loss of value. The dollarization process in Peru began as a consequence of the hyperinflation levels that began in the end of the 80's, reaching 7000 percent by the end of the 90's decade. This hyperinflation was accompanied by a constant depreciation of the soles per dollar exchange rate (Choy and Ayllón, 2007). All this caused a loss of confidence of economic agents in the national currency. Additionally, if economic

agents persist on making deposits in dollars, banks need to lend these dollars to the market in order to make a profit as a differential on the interest rate they pay depositors for their money. This cycle will continue pushing the dollarization. It is here that the competent authorities should continue increasing the reserve requirements for deposits made in dollars, so that the multiplier effect of dollarization will be reduced. In other words, if reserve requirements increase, banks will be obliged to lend less in this currency. Furthermore, it is more expensive for banks to maintain these reserves.

Last, the Peruvian Central Bank should continue operating the way it has been doing until now in order to keep restoring the confidence of economic agents in their national currency. The monetary policy measures related to maintenance of the inflation target have contributed to this goal since the 90's.

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APPENDIXES

Appendix A: Summary in Slovenian language (Povzetek v slovenskem jeziku)

Ime magistrskega dela je «Dolarizacija hipotekarnih in potrošniških posojil v perujskem bančnem sistemu ter njen vpliv na strukturo kapitala bank pred in po finančni krizi leta 2008».

Malo pred mednarodno finančno krizo iz leta 2008, se je količina ameriških dolarjih (od zdaj naprej: dolarji), začela poviševati in ta trend se je nadaljeval tudi po krizi. To se je zgodilo zaradi monetarne politike Banke Zveznih Rezerv Združenih Držav Amerike (od takrat naprej FED, za svoj akronim v angleščini). FED se je odločil za znižanje referenčne obrestne mere, tako da bi lahko po krizi ponovno aktivirali ameriško gospodarstvo in spodbudili njeno rast. Po znižanju obrestnih mer, so vlagatelji iskali privlačnejše naložbe, ki so jim ponujali višje donose. Zato so se odločili začeti vlagati v nastajajoča gospodarstva, kot je Peru. To je povzročilo velik priliv dolarjev v perujski finančni sistem.

Ta večja količina dolarjev je povzročila znižanje deviznega tečaja sol za dolar, kar pomeni, da je se je vrednost perujske valute povišala, saj je potrebno dati manj količine sol-ov za en dolar. Istočasno je to povzročilo, da so se gospodarski subjekti, kot so gospodinjstva, odločili, da dobijo kredite v ameriških dolarjih. Gospodinjstva vplivajo na kredite, saj so namenjene osebni potrošnji in hipotekarnim posojilom.

Slabost tega je, da perujski regulatorni organi perujskega finančnega trga niso predvideli posledic v prihodnosti dolarskih portfeljskih posojil. Pomembna posledica je, da bi se zaradi nenadne apreciacije ameriškega dolarja lahko poškodovala plačilna sposobnost gospodarskih subjektov. To bi povzročilo neplačilo plačil kreditov in morebitno bančno sistemsko tveganje.

Zaradi tega so se regulatorji perujskega trga odločili uskladiti z novimi predpisi Basla III in jih prilagoditi perujski realnosti. Nekateri od teh ukrepov so bili:

- Povečanje kapitalskih zahtev in likvidnosti
- Povečanje obveznih rezerv za depozite v ameriški valuti
- Proklificne kapitalске določbe

Po eni strani, lahko centralna banka z obveznimi rezervami nadzoruje znesek kredita, ki ga komercialne banke odobrijo trgu. Po drugi strani pa večje kapitalске zahteve poudarjajo višjo stopnjo tveganja, povezano s potrošniškimi in hipotekarnimi posojili v dolarjih. Kot je že bilo omenjeno, se to tveganje poveča, ko se tečaj sol za dolar poviša, kar pomeni, da je potrebno dati večjo količino sol-ov za en dolar.

Na podlagi teh meril je bil glavni cilj banke sprememba metodologij, ki se uporabljajo pri ocenjevanju tveganja, in namesto tega uporabiti druge bolj zapletene postopke, ki bi omogočili natančnejše in učinkovitejše merjenje izpostavljenosti tveganjem.

Poleg tega, glavne spremembe v zvezi s kapitalskimi zahtevami v Peruju so naslednje:

- Povečanje minimalnega skupnega kapitala banke z 2% na 4,5% vseh sredstev
- Izvajanje varovala za ohranjanje kapitala v višini 2,5%, katerega namen je graditi v dobrih in zdravih gospodarskih razmerah
- Izvajanje proticikličnih sredstev med 0% in 2,5% skupnega kapitala. Namen tega kapitala je graditi v obdobjih, ko je v kreditnem sektorju pretirana rast, tako da imajo banke med gospodarskimi recesijami dovolj kapitala za morebitne izgube.

Glede obvezne rezerve, obstajata dve glavni obdobji, ki so jih znanstveniki priznali glede uporaba obveznih rezerv kot orodja monetarne politike. Prva je od septembra 2007 do septembra 2008. V tem obdobju je perujsko gospodarstvo dobilo velik priliv ameriških dolarjev. V tem času se je centralna banka odločila, da bo povečala stopnjo obveznih rezerv, ker si je prizadevala preprečiti pregrevanje gospodarstva.

Drugo obdobje je od septembra 2008 (po stečaju banke Lehman Brothers) do leta 2010. Glavna značilnost finančnega položaja je bil splošni odtok tujih prestolnic iz gospodarstev v razvoju, kot je Peru. To je bilo posledica naraščajočih negotovosti na svetovni ravni glede ukrepov, ki naj bi jih napredovala gospodarstva za prihodnost. V Peruju je to povzročilo omejitve likvidnosti. Vendar bi jih bilo mogoče premagati, ker so banke v prvem obdobju hranile veliko likvidnih sredstev v dolarjih v centralni banki, saj so slednje povečale obvezne rezerve. Ti ukrepi so pripomogli k preprečevanju morebitnega kreditnega krča. Poleg tega je centralna banka začela zmanjševati stopnje obveznih rezerv, da bi preprečila stagnacijo v gospodarstvu. Do januarja 2010 je obvezna rezerva ponovno dosegla stopnjo 6%. Kar se tiče dolarjev, je bil učinek zmanjšanja še posebej opazen v obvezni rezervi, ki se je gibala od 49% do 30%. V prvem obdobju se je ta mejna zahteva gibala od 30% do 49%.

Poleg tega analiza likvidnosti in solventnosti bank v vzorcu nakazuje, da so banke uspele ustrezati novim predpisom glede obveznih rezerv za obe valuti in novim predpisom, ki se nanašajo na naraščajoče kapitalske zahteve, zlasti tiste, povezane s kreditnim tveganjem. Analiza teh razmerij kaže dobro vodenje bilance stanja in zato kaže na dobre rezultate in moč teh bank.

Nato se pričakuje, da bodo korelacije med odstotnima spremembama deviznega tečaja in rastjo zapadlih potrošniških in hipotekarnih kreditov v dolarjih pozitivne. To pomeni, da če se devizni tečaj poviša, bo več ljudi prenehalo plačevati svoje kredite v dolarjih. Zato je večja rast zapadlih kreditov v tuji valuti. Vse korelacije so pozitivne, razen pri eni od bank v vzorcu. Poleg tega obstajajo pozitivne korelacije med bankami, kar pomeni, da se bodo pri zapadlih kreditih v banki A povečale tudi v banki B. To je znak stanja gospodarstva in sistemskega dejavnika.

Kar zadeva korelacijo med koeficientom dolarizacije za zapadle kredite za potrošnike in hipoteke v ameriških dolarjih in količniki solventnosti bank, so to negativne v primeru

Continental, BCP in Interbank; kar pomeni, da se, če se dolaritveni koeficient poveča (zmanjša), raven finančnega vzvoda zmanjša (poveča), kar pomeni višjo (nižjo) stopnjo solventnosti. Na splošno se je koeficient dolarizacije v gospodarstvu zmanjšal. Vendar pa se posebni dolarjevski koeficient hipotekarnih in potrošniških posojil ni. Glede na ta scenarij morajo banke dodati več kapitala, da bi pokrile svojo izpostavljenost tujim kreditnim tveganjem. To pomeni, da so višje ravni kapitala, kar zmanjšuje stopnje finančnega vzvoda. Od leta 2015 ta faktor znaša 8%. Poleg tega se je povečal tudi minimalni kapitalski delež, ki je dosegel 10%, od leta 2009 pa so se stopnje kapitala povečale na splošno zaradi novih zahtev Basel II in III.

Edina pozitivna korelacija je Scotiabank, kar pomeni, da če se poveča koeficient dolarizacije, se poveča tudi stopnja finančnega vzvoda. To pomeni nižjo stopnjo solventnosti. Možna teorija je povzročila porast obveznosti te banke predvsem s povečanjem dolga pri tujih institucijah in mednarodnih organizmih (200% med letoma 2007 in 2008). Stopnja solventnosti družbe Scotiabank je bila 9,1%, medtem ko je bila zahteva 9,1%.

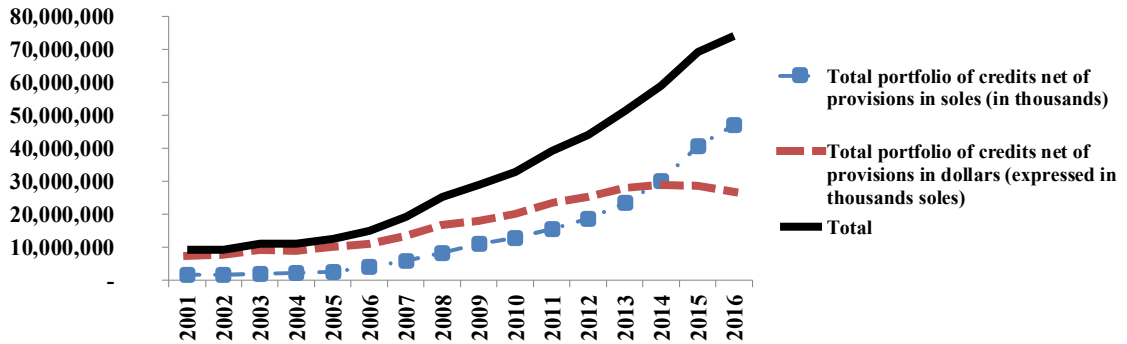
Kar zadeva korelacije med koeficientom dolarizacije zamudnih posojil (potrošnikov in hipotek) in zahtevanega zneska kapitala, ki se uporablja za kritje izpostavljenosti kreditnemu tveganju (Credit RWA), so korelacije pozitivne, kot je bilo pričakovano. To pomeni, da če se koeficient poveča, se tudi potrebni znesek kapitala poveča. Korelacije so precej podobne med vsemi bankami, razen pri Scotiabank, ki ima nižjo korelacijo.

Nazadnje, ta raziskava analizira korelacije med zahtevami obvezne rezerve in stopnjo dolarizacije kreditov. V ta namen uporablja dolarjevski koeficient le zapadlih potrošniških in hipotekarnih kreditov. Vse korelacije so pozitivne, kar pomeni, da če se raven obveznih rezerv poveča, se poveča tudi dolarjevski koeficient te kategorije posojil. Razlog za to je, da je kljub višji ravni obveznih rezerv v ameriških dolarjih v zadnjih letih narasel znesek zapadlih hipotekarnih kreditov v dolarjih.

Kar zadeva korelacijo med zahtevami obvezne rezerve v dolarjih in dolarizacijskim koeficientom skupnih kreditov. Te korelacije so negativne, saj bi se pričakovali v scenariju, v katerem bi centralna banka povečala obvezne rezerve v dolarjih. Zato se pričakuje, da se bo dolarizacija kreditov na splošni ravni zmanjšala. To se dogaja v perujskem gospodarstvu v zadnjih letih.

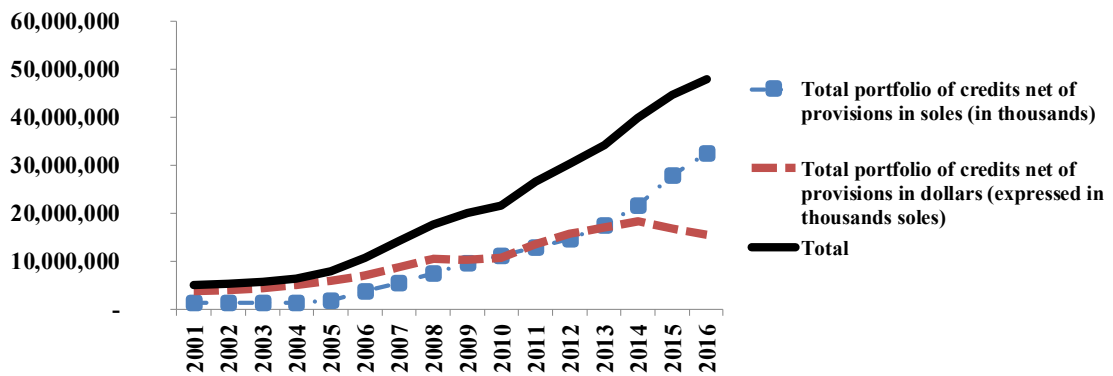
Appendix B: Portfolio of credits net of provisions of the banks of the sample from 2001 to 2016

Figure 1. BCP



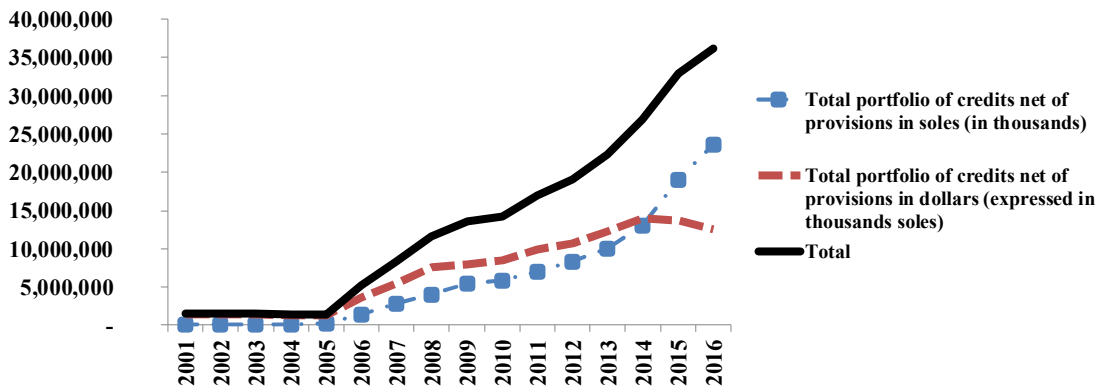
Source: *Superintendencia of Banking and Insurance – statistical series (2018).*

Figure 2. Continental



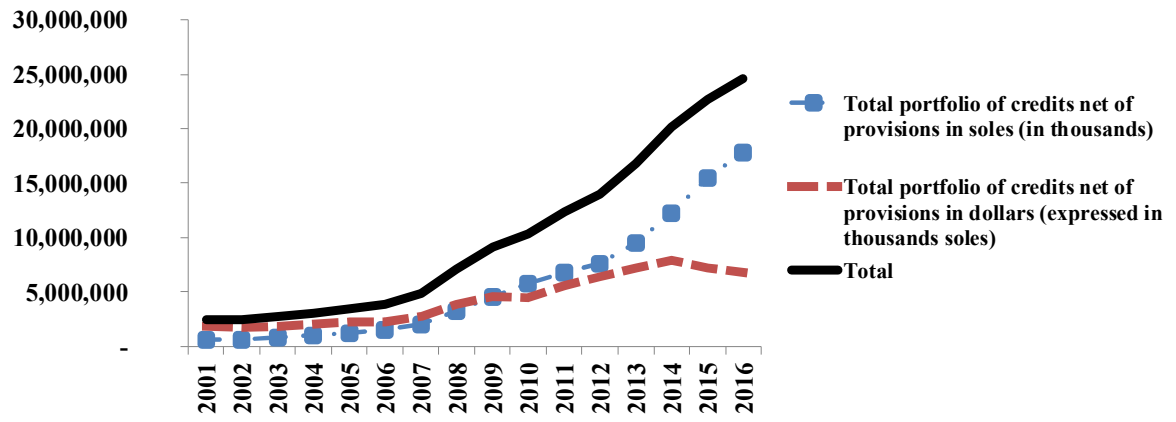
Source: *Superintendencia of Banking and Insurance – statistical series (2018).*

Figure 3. Scotiabank



Source: *Superintendencia of Banking and Insurance – statistical series (2018).*

Figure 4. Interbank



Source: *Superintendencia of Banking and Insurance – statistical series (2018).*

Appendix C: List of abbreviations

ASBANC	Asociación de Bancos del Perú (Association of Peruvian Banks)
BBVA	Continental Bank
BCP	Banco de Crédito del Perú
BCRP	Central Reserve Bank of Peru
CAR	Capital Adequacy Ratio
CPI	Consumer Price Index
FED	Federal Reserve Bank of the United States
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
Hrcc	adjustment factor that takes into account the increase in exposure due to credit exchange risk
LCR	Liquidity Coverage Ratio
NSFR	Net Stable Funding Ratio
PEN	Peruvian Nuevo sol (S/.)
QE	Quantitative Easing
SBS	Superintendence of Banking and Insurance
USD	American dollars (USD)

Appendix D: Coefficient of dollarization of credits

$$\text{Coefficient} = \frac{\text{Amount of credits in USD (expressed in soles according to the current exchange rate)}}{\text{Total amount of credits}}$$

Source: *Central Reserve Bank of Peru – statistical series (2018)*.

Appendix E: Summary in Spanish language (Resumen en idioma español)

El nombre de la tesis de maestría es »Dolarización de créditos hipotecarios y de consumo en el sistema bancario peruano y su impacto en la estructura de capital de los bancos antes y después de la crisis financiera del 2008«.

Poco antes de la crisis financiera internacional de 2008, el volumen de dólares estadounidenses (en adelante, dólares) comenzó a aumentar y esta tendencia continuó después de la crisis. Esto se debió a la política monetaria del Banco de la Reserva Federal de los Estados Unidos (en adelante, la FED, por sus siglas en inglés). La Fed ha decidido reducir su tasa de interés de referencia para que pueda reactivar la economía estadounidense después de la crisis y estimular su crecimiento. Después de reducir las tasas de interés, los inversores buscaban inversiones más atractivas que les ofrecieran mayores retornos. Entonces decidieron comenzar a invertir en economías emergentes como Perú. Esto dio lugar a una gran afluencia de dólares en el sistema financiero peruano.

Esta mayor cantidad de dólares resultó en una disminución en la tasa de cambio de sol por dólar, lo que significa que el valor de la moneda peruana ha aumentado, ya que es necesario dar menos cantidad de sol por dólar. Al mismo tiempo, esto ha llevado a los operadores económicos, como los hogares, a optar por recibir préstamos en dólares estadounidenses. Los hogares tienen un impacto en el crédito, ya que son para consumo personal y préstamos hipotecarios.

La desventaja es que las autoridades reguladoras del mercado financiero peruano no previeron las consecuencias a futuro de los préstamos otorgados en dólares. Una consecuencia importante es que la apreciación repentina del dólar estadounidense podría dañar la solvencia de los operadores económicos. Esto resultaría en incumplimiento de pagos de crédito y posible riesgo sistémico bancario.

Como resultado, los reguladores del mercado peruano han decidido alinearse con las nuevas regulaciones de Basilea III y adaptarlas a la realidad peruana. Algunas de estas medidas fueron:

- Aumento de los requerimientos de capital y liquidez
- Aumento del encaje (reservas) para depósitos en moneda estadounidense
- Provisiones de capital procíclicas

Por un lado, con los requisitos de encaje, un banco central puede controlar la cantidad de crédito que los bancos comerciales otorgan al mercado. Por otro lado, los mayores requerimientos de capital destacan el mayor nivel de riesgo asociado con los préstamos de consumo e hipotecarios en dólares. Como se mencionó anteriormente, este riesgo aumenta a medida que aumenta el tipo de cambio, lo que significa que debe dar más soles por un dólar.

Sobre la base de estos criterios, el objetivo principal de los bancos era cambiar las metodologías existentes utilizadas en la evaluación de riesgos y, en cambio, utilizar otros procedimientos más complejos que permitirían una medición más precisa y eficiente de la exposición al riesgo.

Además, los principales cambios con respecto a los requerimientos de capital en Perú son los siguientes:

- Aumento del capital total mínimo del Banco del 2% al 4.5% del activo total
- Implementación del buffer de conservación de capital del 2,5%
- Implementación de activos contracíclicos entre 0% y 2.5% del capital total. El propósito de este capital es acumularse en períodos donde hay un crecimiento excesivo en el sector crediticio, de modo que los bancos tengan suficiente capital durante la recesión económica para absorber cualquier pérdida.

Con respecto al requisito de encaje, hay dos períodos principales que los analistas han reconocido con respecto al uso de reservas mínimas como herramienta de política monetaria. El primero es de septiembre de 2007 a septiembre de 2008. Durante este período, la economía peruana recibió una gran entrada de dólares estadounidenses. Mientras tanto, el banco central decidió aumentar sus requisitos mínimos de encaje al tratar de evitar el sobrecalentamiento de la economía.

El segundo período es desde septiembre de 2008 (después de la quiebra de Lehman Brothers) hasta 2010. La característica principal de la situación financiera fue la salida general de capitales extranjeros de economías emergentes como Perú. Esto se debió a la creciente incertidumbre a nivel mundial sobre el crecimiento de otras economías a futuro. En Perú, esto ha llevado a restricciones de liquidez. Sin embargo, pudieron superarse porque los bancos mantuvieron una gran cantidad de dólares líquidos en el banco central durante el primer período, ya que este último aumentó sus reservas mínimas de encaje. Estas medidas ayudaron a prevenir cualquier contracción crediticia. Además, el Banco Central ha comenzado a reducir sus requisitos de encaje para evitar el estancamiento de la economía. Para enero de 2010, el requisito de encaje había alcanzado nuevamente el nivel del 6%. En cuanto a los dólares, el efecto de la reducción fue particularmente notable en el requisito de encaje, que varió del 49% al 30%. En el primer período, este requisito de límite varió del 30% al 49%.

Además, la liquidez y solvencia de los bancos de la muestra indica que éstos han podido cumplir con los nuevos requisitos de reserva mínima para ambas monedas y las nuevas regulaciones que abordan los requisitos de capital en aumento, especialmente aquellos relacionados con el riesgo de crédito. Un análisis de estas correlaciones muestra una buena gestión del balance y, por lo tanto, indica un buen rendimiento y fortaleza de estos bancos.

Entonces, se espera que las correlaciones entre los cambios porcentuales en el tipo de cambio y el crecimiento de los préstamos hipotecarios y de consumo vencidos en dólares sean positivos. Esto significa que si el tipo de cambio aumenta, más personas dejarán de pagar sus préstamos en dólares. Por lo tanto, el crecimiento de los préstamos vencidos en moneda extranjera es mayor. Todas las correlaciones son positivas, excepto uno de los bancos de la muestra. Además, existen correlaciones positivas entre los bancos, lo que significa que también aumentarán en el Banco A en préstamos vencidos, lo cual es una señal del estado de la economía y del factor sistémico.

Con respecto a la correlación entre el índice de dolarización de hipotecas y préstamos de consumo en dólares estadounidenses y los índices de solvencia de los bancos, éstos son negativos en el caso de Continental, BCP e Interbank; lo que significa que cuando el coeficiente del dólar aumenta (disminuye), el nivel de apalancamiento disminuye (aumenta), lo que significa una relación de solvencia más alta (más baja). En general, el coeficiente de dolarización en la economía ha disminuido. Sin embargo, no existe un coeficiente específico en dólares para préstamos hipotecarios y de consumo. En este escenario, los bancos necesitan agregar más capital para cubrir su exposición a los riesgos crediticios extranjeros. Esto significa que hay niveles más altos de capital, lo que reduce el apalancamiento. A partir de 2015, este factor es del 8%. Además, la participación mínima aumentó al 10%, y desde 2009 los niveles de capital han aumentado en general debido a los nuevos requisitos de Basilea II y III.

En cuanto a las correlaciones entre el índice de dolarización de los préstamos morosos y la cantidad de capital requerida utilizada para cubrir la exposición al riesgo de crédito (Credit RWA), las correlaciones son positivas como se esperaba. Esto significa que si el coeficiente aumenta, también lo hace la cantidad de capital requerida. Las correlaciones son bastante similares entre todos los bancos, excepto Scotiabank, que tiene una correlación más baja.

Finalmente, esta investigación analiza las correlaciones entre los requisitos de encaje y el grado de dolarización del crédito. Para este fin, utiliza el coeficiente en dólares de sólo préstamos hipotecarios y de consumo vencidos. Todas las correlaciones son positivas, lo que significa que si aumenta el nivel de reservas mínimas, también aumenta el coeficiente en dólares de esta categoría de préstamos. La razón de esto es que a pesar del mayor nivel de reservas mínimas en dólares estadounidenses, la cantidad de préstamos hipotecarios pendientes en dólares ha aumentado en los últimos años.