

# **AN EMPIRICAL ANALYSIS OF MACROPRUDENTIAL POLICIES IN PERU: The Case of Dynamic Provisioning and Conditional Reserve Requirements**



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# Motivation

- The recent financial crisis (2007-09) showed the need to place a macro-prudential point of view in the financial regulation, in order to preserve financial stability.
- In the last years, Peru, as many other economies, has been active in the use of macro-prudential tools carried out under the coordination between Central Bank, Supervisory Authority of Banks and the Ministry of Economy.
- The purpose of the macro-prudential tools implemented in Peru had been limiting the potential adverse effects of an excessive growth of credit over the economy.

# Main macro-prudential tools implemented in Peru

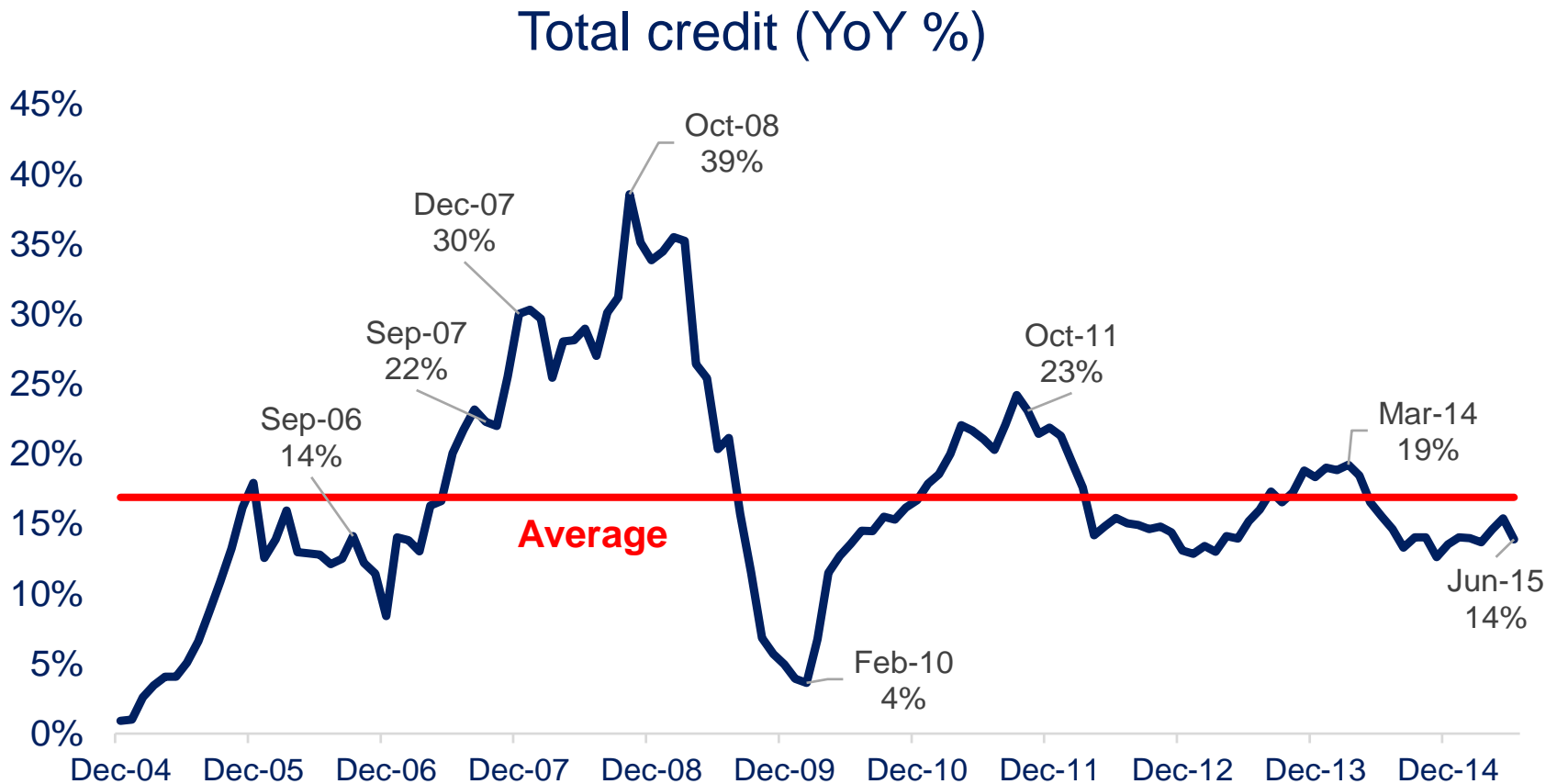
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- Pro-cyclical provisions (SBS, Nov-2008)
- Additional capital requirements for household debt according to the type of credit and the currency granted. (SBS, Nov-2012)
- Additional capital requirements for financial institutions that give loans to agents that are exposed to exchange risk (SBS, Nov-2012)
- Tighter liquidity requirements (SBS, Dec-2012)
- Higher reserve requirements for banks' liabilities in foreign currency (BCRP)
- Additional reserve requirements conditional on the evolution of loans in foreign currency (Central Bank, Feb-2013)

# Pro-cyclical Provisions Nov-2008

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Macroprudential goal: Limit the excessive credit growth



# Pro-cyclical Provisions: How does it work? Rule for activation

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## Activation Rule:

Average GDP (YoY %) of last 30 months passes from less than 5% to 5% or more.

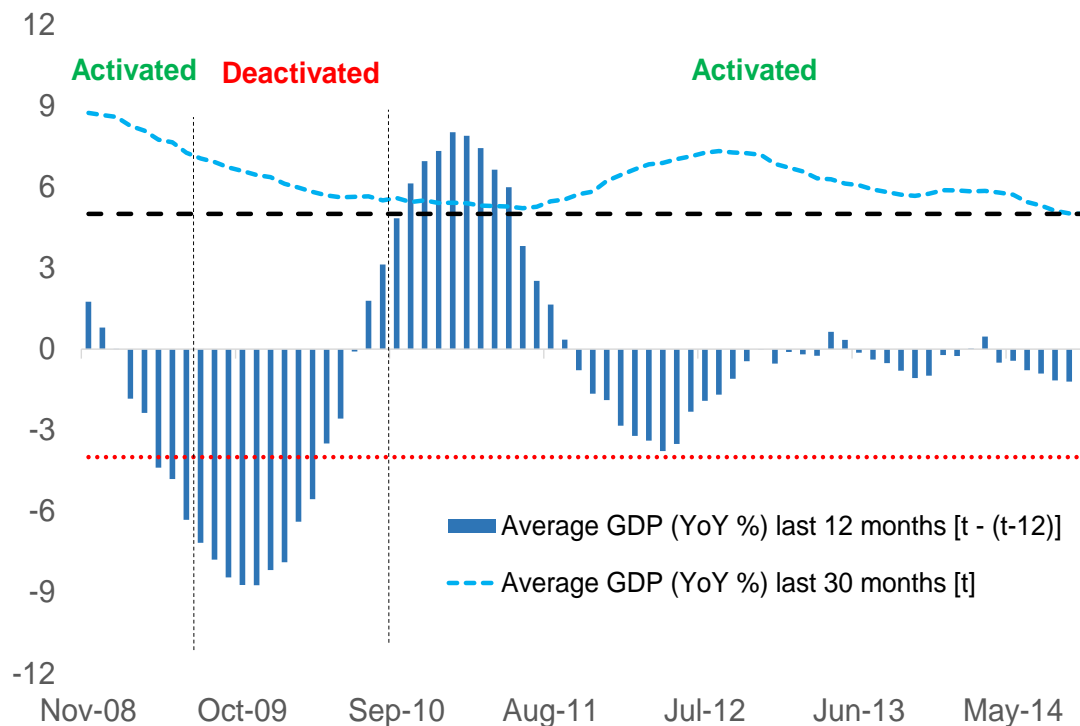
Average GDP (YoY %) of last 30 months is over 5% and the average GDP (YoY%) of the last 12 months is higher by 2% to this same indicator a year earlier.

Average GDP (YoY %) of last 30 months is over 5%, and 18 months had passed since the rule was deactivated.

## Deactivation Rule:

Average GDP (YoY %) of last 30 months passes from equal or above 5% to less than this 5%.

Average GDP (YoY %) of the last 12 months is lower by 4% to this same indicator a year earlier.



# Additional Reserve Requirements conditional to FX loans

## Conditional Reserve Requirements in Foreign Currency

Previous Measure: From March 2013 to May 2015

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	Targets of Credit Growth*			Additional RR		
	I	II	III	I	II	III
Total Credit excluding foreign trade loans (Sep.13=100)	5,0%	10,0%	15,0%	1,50%	3,0%	5,0%
Mortgage and Car Loans (Feb.13=100)	10,0%	20,0%		0,75%	1,50%	

### Since June 2015

	Required Stock*	Additional RR
Total Credit <sup>1/</sup> (Set.13=100)	0,95 times (reduction of 5%)	$0,3 \times \left( \frac{C_t}{C_{s13}} - 0,95 \right) \times TLiab$
Mortgage and Car Loans (Feb.13=100)	0,90 times (reduction of 10%)	$0,15 \times \left( \frac{CHV_t}{CHV_{f13}} - 0,90 \right) \times TLiab$

### Since December 2015

	Required Stock*	Additional RR
Total Credit <sup>1/</sup> (Set.13=100)	0,90 times (reduction of 10%)	$0,3 \times \left( \frac{C_t}{C_{s13}} - 0,90 \right) \times TLiab$
Mortgage and Car Loans (Feb.13=100)	0,85 times (reduction of 15%)	$0,15 \times \left( \frac{CHV_t}{CHV_{f13}} - 0,85 \right) \times TLiab$

\*These targets do not apply if total credit stock in foreign currency is lesser than bank net worth, and if mortgages and car loans are lesser than a fifth of bank net worth.

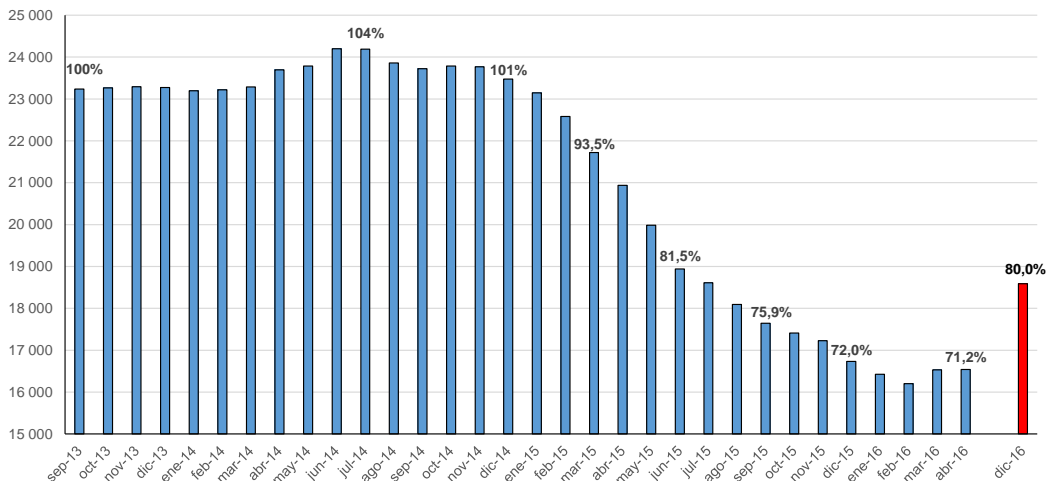
1/ Excludes foreign trade loans, and credits whose maturity exceeds 3 years and volume is higher than USD 10 millions.

TLiab: Total Liabilities in foreign currency (includes Deposits, debt and bons).

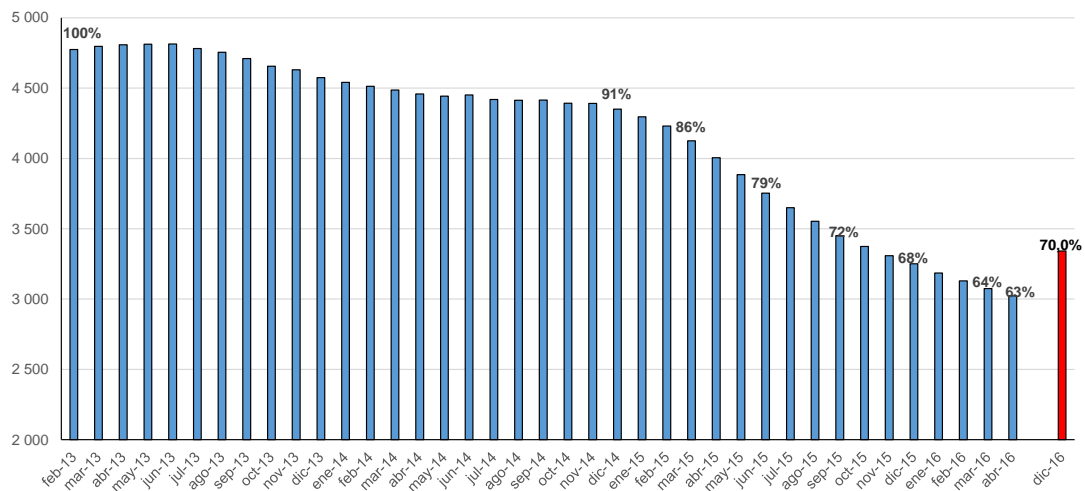
# Additional Reserve Requirements conditional to FX loans

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**BANKING CREDIT IN FOREIGN CURRENCY EXCLUDING FOREIGN TRADE LOANS**  
(Sep. 2013=100, Millions of USD)



**CAR AND MORTGAGE BANK'S LOANS IN FOREIGN CURRENCY**  
(Feb. 2013=100, Millions of USD)





# Literature Review

Summary of some Empirical Work with respect to Macroprudential Policies

Authors	Country / Region	Data Set	Macroprudential Variables	Dependent Variable	Main Results
Claessens, Ghosh and Mihet (2014)	Emerging and Advanced Economies	Panel Data 48 countries 2800 banks	LTV DTI RRs	Risky Asset Growth	LTV, DTI and RRs have a negative and relevant effect on risky asset growth. Measures to build-up liquidity buffers exhibit less relevant effects.
Cerutti, Claessens and Laeven (2015)	Emerging and Advanced Economies	119 countries 2000-2013	LTV DTI RRs	Real Credit Growth	Emerging countries use more actively macro-prudential instruments. The effects of borrower-based measures are higher than other macro-prudential instruments.
Drehman and Gambacorta (2012)	Europe	772 European banks 1998-2009	Counter-cyclical capital buffer	Credit Growth	Controlling for macroeconomic factors and bank characteristics, additional capital buffers have helped to reduce credit growth during booms.
Bruno and Shim (2014)	Asia-Pacific	12 countries 2004-2013	LTV DTI Capital Flow management	Capital Inflows (Banking and Bond)	Authors found that banking and bond market flow management policies have a negative impact on banking inflows and bond inflows as well. Authors suggest that macroprudential measures have a stronger effect if they reinforce the stance of monetary policy.
Jimenez, Ortega, Peydro and Saurina (2012)	Spain	Credit Register database	Counter-cyclical provisions	Credit Supply	The results suggest that dynamic provisions help to smooth credit supply cycles, and in bad times they have positive effects on firm credit availability.
Chan-Lau (2012)	Chile	14 Chilean banks 2004-2010	Dynamic Provisioning	Bank Solvency Credit Procyclicality	The main conclusion was that the dynamic provisioning scheme builds-up more capital buffers in order to cover loan losses than the current Chilean scheme. She shows that credit and output lead the evolution of credit provisioning, therefore credit provisioning could not have any effect on credit evolution.
Dasatti and Peydró (2015)	Uruguay	Credit Register database	Liquidity and Reserve Requirements	Bank Risk-Taking Behavior	They found that increases in reserve and liquidity requirements for distinct funding sources (deposits, short-term funding and others) reduce loan supply to the non-financial sector. This effect is asymmetric, larger banks are more capable to mitigate the effects of the lending channel.
Tovar, Garcia-Escribano and Vera (2012)	Latin America	5 countries Jan. 2003 - Apr. 2011	Reserve Requirements	Credit Growth	Their results suggest that the effects of RRs are limited, especially they mentioned that the effects on credit growth are "modest and short-lived", which implied that RRs need to be recalibrated with certain regularity in order to preserve their effects on credit dynamics.

# Data: Debtor's Credit Register (RCC)

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- **Source:** Superintendency of Banking, Insurance and Private Pension Funds Administrators (SBS)

## For Commercial Loans:

- **Sample period:** 2004 Q2 – 2014 Q4 (43 quarters)
- **Type of debtors:** Firms that has a minimum outstanding loan of one million soles (around 300 thousand dollars) at least in one quarter of the sample.
- **Financial Institutions:** All banks, excluding those oriented to the consumption segment and those that began operations from 2008.

## For Mortgages:

- **Sample period:** 2004 Q2 – 2015 Q3 (46 quarters)
- **Type of debtors:** Households.
- **Financial Institutions:** All banks.

# Macprudential Variables

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**For Dynamic Provisioning:**

$$MP = \begin{cases} +1, & \text{if dynamic provisionig is "activated"} \\ -1, & \text{if dynamic provisioning is "deactivated"} \\ 0, & \text{otherwise} \end{cases}$$

**For Conditional Reserve Requirements:**

$$MP = \begin{cases} 1, & \text{when conditional RRs started} \\ 0, & \text{otherwise} \end{cases}$$

# Growth of Commercial Loans - Equations 1-2:

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$$\begin{aligned} &\Delta \text{Log Credit}_{bft} \\ &= \delta_f + \sum_{j=0}^3 \beta_j \Delta \text{Macro controls}_{t-j} + \sum_{j=0}^3 \beta_j \text{Bank characteristics}_{t-j} + \text{quarter}_t + \lambda \text{MacroTool}_{t-1} + \varepsilon_{bft} \end{aligned}$$

$$\begin{aligned} &\Delta \text{Log Credit}_{bft} \\ &= \delta_f + \sum_{j=0}^3 \beta_j \Delta \text{Macro controls}_{t-j} + \sum_{j=0}^3 \beta_j \text{Bank characteristics}_{t-j} + \text{quarter}_t + \sum_{j=0}^3 \theta_j \text{MacroTool}_{t-j} + \varepsilon_{bft} \end{aligned}$$

# Growth of Commercial Loans - Equations 3-4:

13

$$\begin{aligned} &\Delta \text{Log Credit}_{bft} \\ &= \delta_f + \sum_{j=0}^3 \beta_j \Delta \text{Macro controls}_{t-j} + \sum_{j=0}^3 \beta_j \text{Bank characteristics}_{t-j} + \text{quarter}_t + \alpha_1 \text{Tightening}_{t-1} \\ &+ \alpha_2 \text{Easing}_{t-1} + \varepsilon_{bft} \end{aligned}$$

$$\begin{aligned} &\Delta \text{Log Credit}_{bft} \\ &= \delta_f + \sum_{j=0}^3 \beta_j \Delta \text{Macro controls}_{t-j} + \sum_{j=0}^3 \beta_j \text{Bank characteristics}_{t-j} + \text{quarter}_t + \sum_{j=0}^3 \theta_{1,j} \text{Tightening}_{t-j} \\ &+ \sum_{j=0}^3 \theta_{2,j} \text{Easing}_{t-j} + \varepsilon_{bft} \end{aligned}$$

# Growth of Commercial Loans - Equations 5-6:

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$$\begin{aligned} &\Delta \text{Log Credit}_{bft} \\ &= \delta_f + \sum_{j=0}^3 \beta_j \Delta \text{Macro controls}_{t-j} + \sum_{j=0}^3 \beta_j \text{Bank characteristics}_{t-j} + \text{quarter}_t + \lambda \text{MacroTool}_{t-1} \\ &+ \sum_{j=0}^2 \gamma_j \text{MacroTool}_{t-j} \times \text{Bank characteristics}_{t-j} + \varepsilon_{bft} \end{aligned}$$

$$\begin{aligned} &\Delta \text{Log Credit}_{bft} \\ &= \delta_f + \sum_{j=0}^3 \beta_j \Delta \text{Macro controls}_{t-j} + \sum_{j=0}^3 \beta_j \text{Bank characteristics}_{t-j} + \text{quarter}_t + \sum_{j=0}^3 \theta_j \text{MacroTool}_{t-j} \\ &+ \sum_{j=0}^2 \gamma_j \text{MacroTool}_{t-j} \times \text{Bank characteristics}_{t-j} + \varepsilon_{bft} \end{aligned}$$

# Growth of Commercial Loans - Equations 7-8:

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$$\begin{aligned} & \Delta \text{Log Credit}_{bft} \\ &= \delta_f + \sum_{j=0}^3 \beta_j \Delta \text{Macro controls}_{t-j} + \sum_{j=0}^3 \beta_j \text{Bank characteristics}_{t-j} + \text{quarter}_t + \lambda \text{MacroTool}_{t-1} \\ &+ \sum_{i=0}^2 \sum_{j=0}^2 \gamma_{i,j} \text{MacroTool}_{t-i} \times \text{MonetaryPolicy}_{t-j} + \varepsilon_{bft} \end{aligned}$$

$$\begin{aligned} & \Delta \text{Log Credit}_{bft} \\ &= \delta_f + \sum_{j=0}^3 \beta_j \Delta \text{Macro controls}_{t-j} + \sum_{j=0}^3 \beta_j \text{Bank characteristics}_{t-j} + \text{quarter}_t + \sum_{j=0}^3 \theta_j \text{MacroTool}_{t-j} \\ &+ \sum_{i=0}^2 \sum_{j=0}^2 \gamma_{i,j} \text{MacroTool}_{t-i} \times \text{MonetaryPolicy}_{t-j} + \varepsilon_{bft} \end{aligned}$$

# $\Delta$ Mortgage Dollarization Rate - Equations 1-3:

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$$\begin{aligned} &\Delta MortgageDollarization_{bt} \\ &= \delta_f + \sum_{j=0}^3 \beta_j \Delta Macro\ controls_{t-j} + \sum_{j=0}^3 \beta_j Bank\ characteristics_{t-j} + \lambda_0 DeDollar\_Program_t + \varepsilon_{bt} \end{aligned}$$

$$\begin{aligned} &\Delta MortgageDollarization_{bt} \\ &= \delta_b + \sum_{j=0}^3 \beta_j \Delta Macro\ controls_{t-j} + \sum_{j=0}^3 \beta_j Bank\ characteristics_{t-j} + \lambda_1 DeDollar\_Program_{t-1} + \varepsilon_{bt} \end{aligned}$$

$$\begin{aligned} &\Delta MortgageDollarization_{bt} \\ &= \delta_b + \sum_{j=0}^3 \beta_j \Delta Macro\ controls_{t-j} + \sum_{j=0}^3 \beta_j Bank\ characteristics_{t-j} + \sum_{j=0}^3 \lambda_j DeDollar\_Program_{t-j} + \varepsilon_{bt} \end{aligned}$$



# $\Delta$ Mortgage Non-Performing Loans Rate - Equations 1-3:

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$$\begin{aligned} &\Delta MortgageNPLrate_{bht} \\ &= \delta_f + \sum_{j=0}^3 \beta_j \Delta Macro\ controls_{t-j} + \sum_{j=0}^3 \beta_j Bank\ characteristics_{t-j} + \lambda_0 DeDollar\_Program_t + \varepsilon_{bt} \end{aligned}$$

$$\begin{aligned} &\Delta MortgageNPLrate_{bht} \\ &= \delta_b + \sum_{j=0}^3 \beta_j \Delta Macro\ controls_{t-j} + \sum_{j=0}^3 \beta_j Bank\ characteristics_{t-j} + \lambda_1 DeDollar\_Program_{t-1} + \varepsilon_{bt} \end{aligned}$$

$$\begin{aligned} &\Delta MortgageNPLrate_{bht} \\ &= \delta_{bh} + \sum_{j=0}^3 \beta_j \Delta Macro\ controls_{t-j} + \sum_{j=0}^3 \beta_j Bank\ characteristics_{t-j} + \sum_{j=0}^3 \lambda_j DeDollar\_Program_{t-j} + \varepsilon_{bht} \end{aligned}$$

# Conclusions

- Depreciation has a negative and significant effect on the growth of commercial loans. While, its effects on the change of mortgage dollarization and the NPL rate are mixed and are not intuitive.
- Monetary Policy shows a positive effect on the change of mortgage dollarization, while its effects on credit growth of commercial loans are not conclusive. The impact on the change of the NPL rate is also not significant.
- Dynamic provisioning impacts negatively on the credit growth of commercial loans. When the dynamic provision is active the credit growth decrease around 1,4 percent points. Its effect seems to be asymmetrically, in tightening periods the impact is around 5,2 percent points, while in easing periods, the credit growth increases in 0,5 percent points.
- Conditional Reserve Requirements (subject to FX loans evolution) has a strong and negative impact on the change of mortgage dollarization rate. However, the effect is not significant on the change of the NPL rate.

# Future Research

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- The counter-intuitive impact of monetary policy on credit growth seems to be an identification issue. Thus, if the change of interbank rate is replaced for the orthogonal shocks (from a SVAR exercise) could replicate the theoretical effect.
- Explore the effects of Macroprudential policies on bank risk behavior and costs of loans:

$$\Delta Interest\ rate_{bft} = \delta_f + \beta \Delta Macro\ tool_{t-1} + controls_{bft} + \varepsilon_{bft}$$

$$\Delta Bank\ risk_{bt} = \delta_b + \beta^* \Delta Macro\ tool_{t-1} + controls_{bt} + quarter_t + \varepsilon_{bt}$$

- Include all the macroprudential measures in the analysis.

# Additional macro-prudential tools

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## Evaluate the MP-tools oriented to the **household debt**:

- Additional capital requirements for household debt according to the type of credit and the currency granted. (SBS, Nov-2012)
- Additional reserve requirements conditional on their evolution of car loans in foreign currency (BCRP)

## Others:

- Tighter liquidity requirements (SBS, Dec-2012)

# Higher capital requirements (CR) for household debt (Nov-12) Gradual implementation (Jan-13 to Dec-15)

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**Macroprudential goal:** Control the excessive credit growth in this segment and also discourage loans in foreign currency.

## Consumption loans:

*if:*

- ↑ *Term to maturity*
  - Granted in foreign currency
  - Loan is revolving
- } ↑ CR

## Mortgages loans:

*if:*

- ↑ *Term to maturity*
  - ↑ *Loan to value (LTV)*
  - Granted in foreign currency
- } ↑ CR

