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Macroprudential policy, mortgage lending and economic activity in Mexico

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Abstract

The global financial crisis revealed the insufficiency of the microprudential approach in containing systemic risks associated with the procyclicality of credit and the build-in of bubbles in financial markets. Since then, different macroprudential regulation tools have been implemented, strengthening regulatory bodies and improving the monitoring of the financial system. In this regard, there is evidence of the macroprudential policy effectiveness in reducing the procyclicality of credit in developed countries. However, the literature on macroprudential policy in Mexico is scarce. This note presents preliminary results contributing to the literature by analyzing the relationship between macroprudential policy, economic activity, and credit in three segments of the Mexican mortgage market. We analyze the period 2009-2020 through the implementation of least squares with breakpoints in the total balances of mortgage credit. Our results show a decrease in the procyclicality of mortgage credit in the construction and new housing segments. In contrast, the used housing credit is decoupled from the economic cycle.

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1. Introduction

In the last 40 years, several countries have experienced financial crises, which have called into question the ability of regulatory bodies to maintain the stability of the international financial system. In the emergence of technological developments, financial innovations, and the globalization of markets, the prudential regulatory framework must be more effective in providing financial stability.

In this new global scenario, special attention has been paid to the risks associated with the entire financial system. Systemic risk concerns the possibility of a collapse in the financial system so that it evidences the interdependence between the parts of the system (Kaufman and Scott 2003). It is possible to visualize systemic risk in three non-exclusive ways: contagion, macro shocks, and adjustment risk in the face of existing imbalances. In this regard, one of the primary sources of systemic risk is associated with the procyclicality of credit cycles (European Central Bank 2009) and the built-up of bubbles in local markets such as mortgages, as highlighted by the global financial crisis (Demyanyk and Van Hemert 2011).

In this context, the economic and financial authorities have included financial stability from a macroeconomic perspective as part of their economic policy objectives, where macroprudential regulation examines all the institutions of the financial system and their interdependence under two objectives: guaranteeing financial stability and preventing the loss of well-being in society (Jácome 2013).

Since the global financial crisis, macroprudential policy has been gaining importance among financial authorities, regulatory bodies, and international institutions in order to reduce the risks faced by the financial system, particularly by containing cycles in the credit market (Fendoğlu 2017). However, given the nature of macroprudential measures and their high implementation costs, adopting these measures has been gradual.

Mexico has progressively incorporated several macroprudential regulation instruments, created regulatory bodies, and assessed systemic risks by constantly monitoring financial institutions and implementing stress tests. Regarding the Mexican economy, Cantú et al. (2019) show that banks with stronger balance sheets and stable sources of financing offer a more significant number of loans than banks with higher risk indicators. For his part, Zarazúa Juárez (2020) finds that countercyclical bank requirements and countercyclical value-loan ratios prevent the formation of credit bubbles and facilitate loans. However, Sánchez Hernández et al. (2022) find that macroprudential policies have increased mortgage credit growth and housing prices. Despite the existence of literature regarding the study of macroprudential policies, research on the impact of mortgage credit cycles in Mexico is scarce.

This note presents preliminary results on the analysis and evaluation of the relationship between mortgage credit and economic activity in Mexico in the period 2009-2020, this is, during the introduction of different macroprudential tools. Specifically, we examine whether the procyclicality of mortgage credit in Mexico has decreased in three segments of mortgage credit (construction, new housing, and used housing) and if this change is associated with the modification of the countercyclical capital requirements of 2016. The study's central hypothesis suggests that macroprudential policy has effectively reduced the procyclicality of credit through a decrease in the relationship and significance between economic activity and total mortgage loan balances in Mexico. The relationship is assessed using breakpoint regressions (Bai 1997; Bai and Perron 1998), whose advantage lies in the possibility of identifying the dates of the change in the procyclicality of mortgage credit.

2. Financial stability and macroprudential regulation

In response to the Latin American debt crisis of the eighties, the Basel Committee promoted the first comprehensive prudential policy framework known as Basel I. In 2004, improvements in the regulation of capital requirements were integrated into Basel I, becoming Basel II (Bank for International Settlements 2001; Heid 2007). The Basel I and Basel II regulatory frameworks were designed under a microprudential dimension, where financial stability derives from individual institutions (Boissay and Cappiello 2014).

However, financial stability requires policies whose dimension allows analyzing the structure of the financial system as a whole and its relationship with the real economy (Montagna, Torri, and Covi 2020). In this regard, the Basel Committee concluded that the credit bubble that caused the global financial crisis resulted from excess liquidity and a high level of leverage, leading to incorrect credit risk assessments and excessive credit growth. Thus, to ensure international financial stability and avoid the materialization of systemic risks, Basel III was developed in 2010 with a macroprudential regulatory framework (Bank for International Settlements, International Monetary Fund, and Financial Stability Board 2011).

In this line, Mexican regulation has evolved towards a macroprudential approach. As a result of the 1994 crisis, the financial authorities determined the first prudential measures whose focus was establishing an inflation target and mitigating exchange risk (Ramos-Francia and Torres-García 2005). Subsequently, in 1997, the implementation of dollar auction mechanisms were observed, as well as the development of a regulation related to the ratios of short-term liquid assets-liabilities (Guzman-Calafell 2013). These measures have been strengthened to fortify macroprudential regulation in the country.

In July 2010, the Financial System Stability Council was created, operating as the main prudential regulatory body, whose primary mandate is to avoid substantial disruptions in the financial system's functioning and minimize their impact if they occur. The Council is comprised of the Ministry of Finance (SHCP), the National Banking and Securities Commission (CNBV), the National Insurance and Surety Commission (CNSF), the National Commission for the Pension System (CONSAR), the Institute for the Protection of Bank Savings (IPAB), and Banco de México (Banxico).

The Annual Report on the Stability of the Mexican Financial System, published annually by the Council, and the Financial Stability Report, published semiannually by Banxico, describe the measures implemented to preserve the healthy development of the financial system. Additionally, these reports present stress tests and contingency plans.

After the global financial crisis, macroprudential regulation in Mexico has placed a particular interest in reducing the procyclicality of credit. Among the main macroprudential regulation measures implemented by the Council, the 2016 modification of the countercyclical capital requirement was aimed at protecting banks in periods of excessive credit growth (Bank for International Settlements 2022).

The countercyclical capital policy has been part of the international regulation of Basel III since 2019, where it was established that the total assets risk-weighted must be modified between 0% and 2.5% during the credit cycle in order to guarantee the flow of credit in the economy (Bank for International Settlements and Financial Stability Institute 2019). In some countries, the countercyclical capital requirement measure has proven to be a highly efficient macroprudential instrument in reducing credit bubbles associated with economic crises (Basel Committee on Banking Supervision 2009).

3. Data and methodology

The period of study is from August 2009 to February 2020. The period is restricted because of data unavailability before August 2009 and to prevent the effects of the COVID-19 pandemic from biasing the results. The analysis focuses on three segments of the mortgage market: construction loans, new housing loans, and used housing loans. For each segment, the total balances granted by Mexican banks are analyzed.

The baseline model aims to explain the movements in the growth rate of the total balances of each mortgage loan segment using as regressors the economic activity measured through the General Index of Economic Activity (IGAE) and the CETES-28 interest rate. The IGAE is included as a regressor to analyze the change in the procyclicality of credit, given that this variable indicates the dynamism of economic activity in Mexico. Therefore, it is used as a regressor with breaks. On the other hand, the CETES-28 interest rate is one of the primary reference rates of the Mexican economy. Therefore, CETES-28 is a control variable not affected by the countercyclical capital policy, so it is included as a regressor without a break.

The mortgage credit balances were retrieved from the National Banking and Securities Commission (CNBV), IGAE from the Banco de Informacion Económica-Instituto Nacional de Estadística y Geografía (BIE-INEGI) and the CETES-28 interest rate from the Banco de México (Banxico). Table 1A in the Appendix shows descriptive statistics of the variables.

The empirical analysis focuses on evaluating the change in the procyclicality of mortgage credit and the role of macroprudential policy. After the 2007 financial crisis, and especially with the Basel III reforms, Mexico has implemented different macroprudential policy measures to reduce the procyclicality of credit. Within these measures, in 2016 was introduced the countercyclical capital requirement. However, this policy has been accompanied by a series of macroprudential regulation measures. For this reason, the methodological strategy aims to identify the change in the credit-growth relationship and, if so, the dates on which the relationship was modified. Therefore, breakpoint regression analysis is implemented (Bai 1997; Bai and Perron 1998; Hansen 2001; Perron 2006), which makes it possible to identify the possible existence of a change in the relationship and the date when it occurred.

The econometric model consists of a multiple linear regression with T periods, m possible breakpoints and $m + 1$ regimes. The regressors are divided into two groups, the matrix X includes the variables where the parameters do not change between the regimes, while Z includes the variables that have coefficients that are of a specific regime. Thus, Equation (1) presents the base model:

$$y_t = X'_t \beta + Z'_t \delta_j + \epsilon_t \quad (1)$$

Where y_t represents the mortgage loan growth rate for each of the three segments of the mortgage loan market; X_t corresponds to the regressors without break(s), in this case, the constant and the CETES-28 interest rate, the latter used as a control variable. Z_t includes the regressors with break(s), in this case, the growth rate of the IGAE. Finally, ϵ_t is an error term.

We use two approximations for the break. In a first approximation, the date of the breakpoint is assumed to be unknown, for which a sequential determination strategy is implemented (Bai 1997) based on the Bai-Perron L+1 vs L test and the Bai test of recursively determined partitions. The second approximation assumes the breakpoint in January 2016, when the countercyclical capital policy was modified. Table 1 summarizes the empirical strategy.

Once the breaks have been identified, each regime's IGAE parameters are estimated. If the macroprudential regulation measures were successful, the procyclicality of credit for total balances

would have been reduced during the period analyzed. The procyclicality of credit would have decreased if 1) the coefficient that measures the effect of the IGAE on credit balances remains positive, but its size decreases; 2) the coefficient loses statistical significance; or 3) the coefficient becomes negative. That is, after implementing the macroprudential policy, the IGAE parameter decreases its magnitude, changes from positive to negative and/or loses statistical significance.

Table 1. Empirical strategy

Dependent variable:	Credit growth in construction, new housing and used housing
Regressors with break:	IGAE rate of growth
Regressors without break:	Constant; CETES-28
Segments of mortgage credit	
Construction	This segment involves the financing of construction projects to build new homes, commercial properties, and other facilities
New housing	This segment involves the buying and selling of newly built homes
Used housing	This segment involves the buying and selling of pre-owned homes
Approach for estimating breaks	
Bai-Perron L+1 vs L test (unknown breaks):	Gradually increase the number of breaks until no more breaks are detected
Bai test of recursively determined partitions (unknown breaks):	The test recursively divides the data into segments and tests for breaks within each segment
Breakpoint in January 2016 (known break):	Test the break when the countercyclical capital policy was modified
Period of analysis	
Period:	August 2009-February 2020
Observations:	127

4. Results

Tables 2 to 4 show the results of the breakpoint regression analysis for total credit balance growth rates in three mortgage market segments (construction, new housing, and used housing). Three strategies are implemented to identify breaks: the Bai-Perron L+1 vs L test (Table 2), the Bai test of recursively determined partitions (Table 3), and the break in January 2016 (Table 4), the latter considers the modification date of the countercyclical capital requirement.

Table 2 shows the results using the Bai-Perron L+1 test to identify break dates. For the construction (Model 1) and new housing (Model 2) segments, the results show breaks in March 2013 and July 2011, respectively, where there is a transition from a regime with a significant and positive parameter of the IGAE, to a parameter without statistical significance.

Table 2. Total balances of mortgage credit in Mexico

Dependent: Mortgage loans growth rate Methodology: Least squares with breaks (HAC standard errors) ***Break type:***	***Bai-Perron tests of L+1 vs. L sequentially determined breaks***		
Mortgage credit segment:	Construction	New housing	Used housing
	Model 1	Model 2	Model 3
	Regressors with break		
IGAE Period 1	0.0396***	0.086***	0.0599
Period 1	2009M08-2013M02	2009M08-2011M06	2009M08-2020M02
IGAE Period 2	0.0003	0.006	
Period 2	2013M03-2020M02	2011M07-2020M02	
IGAE Period 3			
Period 3			
	Regressors without break		
Constant	0.0229***	0.015*	-0.0012
CETES-28	-0.0015	-0.0014	0.0024
Observations	127	127	127
R-squared	0.27	0.15	0.01
F-stat (p-value)	14.62 (0.000)	7.26 (0.000)	0.60 (0.549)

(*), [**] y {***} significance at (10%), [5%] y {1%}

Moreover, Table 3 shows the results using the Bai test of recursively determined breaks; two breaks were identified in the construction segment (December 2012 and June 2016, model 4) and one break in the new housing segment (July 2011, model 5). In both cases, there is a decrease in the magnitude of the parameters and a loss of statistical significance in the most recent periods. In line with the central hypothesis, these findings suggest that the procyclicality of credit in construction and new housing has been reduced.

Table 3. Total balances of mortgage credit in Mexico

Dependent: Mortgage loans growth rate Methodology: Least squares with breaks (HAC standard errors) ***Break type:***	***Bai tests of breaks in all recursively determined partitions***		
Mortgage credit segment:	Construction	New housing	Used housing
	Model 4	Model 5	Model 6
Regressors with break			
IGAE Period 1	0.0250**	0.086***	0.0599
Period 1	2009M08-2012M11	2009M08-2011M06	2009M08-2020M02
IGAE Period 2	-0.0502**	0.006	
Period 2	2012M12-2016M05	2011M07-2020M02	
IGAE Period 3	0.011946		
Period 3	2016M06-2020M02		
	Regressors without break		
Constant	0.0384***	0.015*	-0.0012
CETES-28	-0.0037***	-0.0014	0.0024
Observations	127	127	127
R-squared	0.33	0.15	0.01
F-stat (p-value)	15.09 (0.000)	7.26 (0.000)	0.60 (0.549)

(*), [**] y {***} significance at (10%), [5%] y {1%}

Finally, Table 4 shows the estimate under the assumption of a break in January 2016. In this case, the construction (model 7) and new housing (model 8) segments present a decrease in the size of the parameters with a reduction in statistical significance in the construction segment and a loss of

statistical significance in the case of new housing. In short, both segments (construction and new housing) have seen a decrease in the procyclicality of the mortgage credit cycle.

These results are in line with previous evidence on the effectiveness of macroprudential policy in smoothing credit cycles (Jiménez et al., 2017), and preventing the formation of bubbles (Basel Committee on Banking Supervision 2009; Zarazúa Juárez 2020). However, the sensitivity of loans to the economic cycle depends on the type of macroprudential policy instruments and the duration of their use (Olszak and Kowalska, 2022).

Table 4. Total balances of mortgage credit in Mexico

Dependent: Mortgage loans growth rate			
Methodology: Least squares with breaks (HAC standard errors)			
Break type:	***Break in 2016M01***		
Mortgage credit segment:	Construction	New housing	Used housing
	Model 7	Model 8	Model 9
	Regressors with break		
IGAE Period 1	0.0343***	0.0808***	0.0883
Period 1	2009M08-2015M12	2009M08-2015M12	2009M08-2015M12
IGAE Period 2	0.0167*	0.0172	0.0139
Period 2	2016M01-2020M02	2016M01-2020M02	2016M01-2020M02
IGAE Period 3			
Period 3			
	Regressors without break		
Constant	0.0161*	-0.0063	-0.012
CETES-28	-0.0004	0.0017	0.004
Observations	127	127	127
R-squared	0.17	0.11	0.02
F-stat (p-value)	8.18 (0.000)	4.88 (0.003)	0.66 (0.575)

(*), [**] y {***} significance at (10%), [5%] y {1%}

Regarding the used housing segment, the results are different. No breaks in the relationship were identified using the Bai-Perron L+1 vs L (model 3) and Bai tests of recursively determined partitions (model 6). In this case, the IGAE parameter is not statistically significant. On the other hand, assuming a break in January 2016 (model 9), the IGAE parameters in both regimes are not statistically significant. In other words, none of the estimates shows evidence of a relationship between mortgage credit and economic activity in the used housing segment.

What can explain the difference in the performance of the used housing segment? Our central hypothesis is related to participants' behavior in the different segments of the mortgage credit market. In the construction and new housing segments, large construction companies play a fundamental role in the market and demand credit following economic growth expectations, maintaining a procyclical behavior. In the used housing segment (secondary market), the leading players are families whose behavior responds more to the life cycle in which they find themselves than to market expectations.

5. Final remarks

In response to the global financial crisis of 2007, financial regulation changed from an approach focused on the behavior of financial institutions at the individual level to an approach where the relevance lies in the behavior of the entire financial system, the aggregate risks, and the interdependence among financial entities. Among the aggregate risks that affect financial stability, the procyclicality of credit and the formation of bubbles in the real estate market have been of

particular concern, given their relationship with the gestation of the global financial crisis and other preceding financial crises in emerging markets.

This note presents preliminary results on assessing the relationship between mortgage credit balances and economic activity in Mexico. The note analyzes the presence of breaks in this relationship by implementing least squares with breakpoints (Bai 1997; Bai and Perron 1998) in the total credit balances in three segments of the mortgage market: construction, new housing, and used housing.

The findings of this research provide evidence of a decrease in credit procyclicality. However, the relationship between mortgage market credit and economic activity depends on the market segment. On the one hand, the results show that the construction and new housing segments have experienced a decrease in credit procyclicality. On the other hand, the evidence reveals different behavior in the used housing segment, where economic activity is not statistically significant.

The results have two implications for economic policy. First, it is essential to continue with the development of a macroprudential regulatory framework to ensure financial stability. Second, the effectiveness of macroprudential instruments within the mortgage sector may vary by segment, which must be considered during the regulation process.

The results obtained have some limitations. First, the study period is restricted by data availability and the Covid-19 pandemic. Second, although the change in macroprudential legislation is identified with the countercyclical capital supplement in 2016 (which potentially modified the credit-economic activity relationship), this change has been accompanied by different macroprudential policy measures, including the introduction of regulations associated with Basel III. Finally, the results suggest the need for a detailed analysis of the used housing mortgage market, whose determinants are different from the construction and new housing segments.

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Appendix

Table 1A. Descriptive Statistics

	Mean	Median	Maximum	Minimum	Std. Dev.	Obs.
Construction	0.02	0.02	0.10	-0.07	0.02	127
New housing	0.02	0.01	0.23	-0.23	0.04	127
Used housing	0.02	0.01	0.90	-0.14	0.10	127
CETES-28	4.91	4.30	8.25	2.67	1.73	127
IGAE	0.20	0.22	0.71	-0.40	0.18	127

Note: Own estimations