



BANCO DE MÉXICO

## Financial System Report

November 2016



*BOARD OF GOVERNORS*

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**NOTICE**

*Unless otherwise specified, this document has been drafted using information as of November 30, 2016. Figures are preliminary and may be revised.*

## **USE OF INITIALS AND ACRONYMS**

*In this report, initials and acronyms that correspond to names in English appear in italics, whereas those that correspond to names in Spanish appear in regular Roman characters. The meanings of all acronyms and initials are presented at the end of the document.*

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## 1. Introduction

The objective of the yearly *Financial System Report* is to present the analysis of the economic environment and financial system factors that may pose risks that, from Banco de México's viewpoint, represent threats to the domestic financial system. In that sense, financial stability is conceived as a situation in which the financial system has the ability to perform –without substantial disruptions or disturbances– its fund intermediation and risk management functions, solving in an orderly manner all imbalances that may arise, were adverse events to materialize.

From this perspective, more than thoroughly describing economic and financial system events, the *Report* focuses on the status of risks faced by our system, and their potential impact on domestic financial institutions, were they to materialize. Our purpose is therefore to identify potential vulnerability sources in a timely manner, in order to undertake preemptive measures.

Just like other emerging economies, the Mexican economy currently faces a particularly adverse scenario. In the foreign domain, the volatility and uncertainty triggered by the US electoral process are worth mentioning, together with the protectionist discourse in the US and other advanced economies, and the US monetary policy normalization process. Furthermore, it is possible that the world economy sees a long period of low growth, and even stagnation. On the other hand, in the domestic scene, certain risks need to be considered, resulting from the reduction of oil prices and its impact on public finances and external accounts.

In this vein, the major risks faced by the Mexican economy and financial system –owing to the above-mentioned factors– are: a sharp rise in interest rates, higher exchange rate depreciation and a substantial economic slowdown.

The potential materialization of said risks is particularly relevant given the significant share of foreign investors in Mexican public debt holdings and the financing of Mexican companies, which benefitted from the abundant liquidity prevailing in international financial markets, and thus placed debt in highly favorable conditions.

The domestic financial system is well capitalized and has reasonable liquidity levels. Further, authorities have taken decisive fiscal and monetary policy measures to strengthen domestic macroeconomic fundamentals; in addition, the International Monetary Fund approved an increase in the Flexible Credit Line for Mexico and its renewal for two more years. Nevertheless, from a prudential perspective, it is essential to analyze the potential risks to which our financial system is exposed, and that is the purpose of this report.

This report has three sections. In section 2, we analyze the major economic factors that could pose risks to financial stability, as well as the measures undertaken to strengthen the domestic macroeconomic framework. In the next section, we present the analysis of the expected potential impact if the risks were to materialize, together with the results of stress tests for domestic financial institutions. More specifically, in this section, we assess the credit, market, liquidity and contagion risks that were detected for various financial intermediaries. Also, we assess certain vulnerabilities that non-financial companies could present and their potential impact on domestic financial institutions. Last, section 4 presents conclusions derived from the previous analyses.

## 2. Main Risks and Vulnerabilities

The Mexican economy and its financial system currently face a complicated economic environment, characterized by a significant depreciation of the exchange rate (triggered by a number of events) and increases in all-term interest rates. Some of the causes for these effects are higher international financial volatility related to the US monetary policy normalization, and, recently, uncertainty brought about by the presidential election in the US.<sup>1</sup> In addition, the fall in oil revenues (triggered by a reduction in both oil prices and oil production) has had an impact on external accounts and public finances. In parallel, the global economic weakening could eventually deteriorate into a long phase of low economic growth, and ultimately, stagnation.

To sum up, the main risks for the stability of the domestic financial system are:

- i) the further weakening of domestic economic activity
- ii) sharp rises in domestic interest rates, and
- iii) a higher depreciation of the Mexican peso *vis-à-vis* the US dollar.

The materialization of these risks could affect domestic financial institutions by way of various channels. Lower economic activity could negatively impact financial institutions, companies and households via a fall in their income. Likewise, credit institutions would also face higher delinquency rates. Moreover, interest rate surges could affect financial institutions via losses, thereby deteriorating their balances.

Additionally, given the higher costs of credit and refinancing that financial institutions' debtors may encounter, delinquency may, in its turn, grow too. Last, a higher exchange rate depreciation would have a direct, albeit moderate, effect on financial institutions, as current regulation restrains currency mismatches. Yet, credit institutions debtors bearing foreign-denominated liabilities or importing inputs may eventually struggle to comply with their credit obligations.

In view of the environment described, strengthening the macroeconomic framework has become crucial, and that is the reason why authorities have been taking actions in that direction; namely, fiscal and monetary policy measures that are already contributing to the macroeconomic adjustment required.

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<sup>1</sup> During his election campaign, the President-elect of the United States of America disclosed a series of commercial and immigration proposals that, if implemented, would significantly impact the bilateral relation between Mexico and the US, and thus, our economy.

As for fiscal consolidation measures, the economic package that the Ministry of Finance and Public Credit submitted to the Congress is noteworthy. Said document puts forth both the attainment of a primary surplus and the stabilization of the Public Debt-to-GDP ratio for 2017. Banco de México, in its turn, has committed to a series of monetary policy adjustments aiming at anchoring inflation expectations and maintaining price stability. Thanks to these steps, the monetary policy is contributing to the strength of macroeconomic fundamentals and the stability of the domestic financial system.

### **2.1. Risks Related to the Global Economic Slowdown**

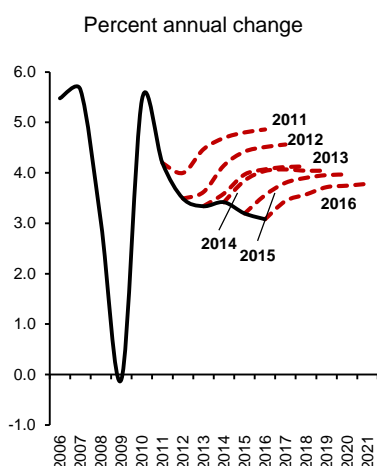
Broadly speaking, global economic activity continues to be weak, and, in a context of global trade stagnation over the last two years (graph 1b), global economic growth forecasts, drawn up by either international organizations or independent analysts, have been revised downwards (graph 1a). As far as advanced economies are concerned, growth has been lower than expected and economic recovery is still frail. As for emerging economies, although they continue to be the main engine for global economic growth, their growth has been moderate in recent years (graph 1c).

A number of factors may contribute to low global economic growth during a long period: i) high costs related to the legacy of the global financial crisis; ii) structural factors such as demographics and a long period of low growth in productivity; iii) an insufficient demand related to an increased propensity to save and a lower propensity to invest at a global scale; and iv) a lower level of global economic integration.

Touching upon the legacy of the global financial crisis, in some advanced economies, the high levels of public and private indebtedness have become a burden to growth. Ever since the beginning of the crisis, corporations and households have undertaken a deleveraging process that limited their expenditure possibilities. This, together with fewer compelling investment opportunities, may have contributed to investment still not returning to levels observed before the crisis.

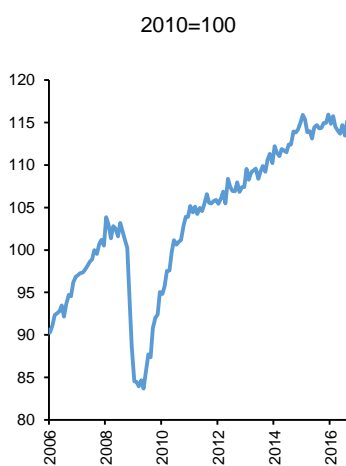
**Graph 1  
World Economy**

a) Forecasts for Global GDP<sup>1/</sup>



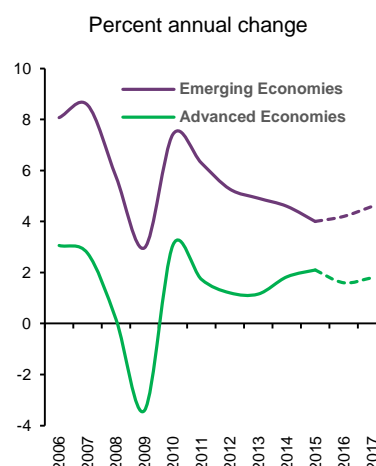
Figures as of October 2016  
Source: IMF, *World Economic Outlook*

b) Global Commodity Trade<sup>2/</sup>



Figures as of August 2016  
Source: CPB World Trade Monitor

c) Emerging and Advanced Economies' GDP<sup>3/</sup>



Figures as of October 2016  
Source: IMF, *World Economic Outlook*

1/ The black solid line refers to figures observed and revised as of October 2016. Red dotted lines refer to forecasts for the last edition of the World Economic Outlook for the corresponding year.

2/ Volumes, seasonally adjusted series

3/ Dotted lines refer to forecasts

On one hand, in response to the financial crisis, advanced economies authorities resorted to expansionary fiscal policies. Nevertheless, such policies gave way to a marked increase in the Public Debt-to-GDP ratio. In consequence, in those economies, the margin to use fiscal policy to boost productive activity has narrowed.

On the other hand, structural factors have played a part in toning down growth in advanced economies. On one side, the growth rate of the working age population has diminished, leading to lower productive capacity. On the other side, productivity has been growing at a slower pace compared to previous decades –one of the reasons for this may be a lower pace of technological innovation. Nevertheless, the factors described before were already in place before the onset of the global financial crisis. In addition to the supply factors already mentioned, it has also been argued that the low global economic growth may be due to insufficient demand, resulting from an increased propensity to save and a lower propensity to invest at a global scale (box 1).

Also, increased protectionist stances in advanced economies heighten the risk of a regression in the global trade integration process, that may, in its turn, deteriorate world economic growth perspectives.

In a context of economic weakness and moderate productivity growth, very low inflation rates have been reported, especially in the major advanced economies. Central banks of those economies are thus expected to maintain accommodating monetary policies over a

long period. However, for the US, the monetary normalization process is already underway and may accelerate further than expected before the US presidential elections. Therefore, a broader monetary divergence between the Euro zone, Japan and the United Kingdom is expected. This divergence may cause volatility bouts in exchange markets and further appreciation of the US dollar.

A long period of low economic growth would foreseeably lead to a lesser expansion of the Mexican economy, as a result of a fall in foreign demand. On one hand, heightened global economic weakness and the US dollar appreciation would negatively impact US exports and industrial production. Bearing in mind that Mexico is a major supplier of the US industry, this would translate into lower exports for our country. On the other hand, a global economic slowdown would generate a fall in Mexican exports to the rest of the world.

Additionally, lower than expected global economic growth may trigger higher risk aversion among investors. This trend may in turn generate a sudden decrease in the demand for risky assets –among which there are those pertaining to emerging economies, such as Mexico– and more astringent financial conditions, which would also intensify the negative impact on economic activity. Apart from the global economic slowdown, other factors, such as a further plunge in domestic oil production and a decline in oil prices, could also have an impact on the performance of our economy.

## Box 1

**Secular Stagnation and Financial Stability**

Eight years after the onset of the financial crisis, global economic recovery has been weak and fragile. It is in this context that the possibility of global “secular stagnation” has been suggested. We chose to briefly discuss this topic, given its relevance among academic circles and economic policy makers. We particularly explore the concept of secular stagnation, underlining that it has different definitions. And then, on the basis of the definition that refers to a permanent shortcoming in the aggregate demand as a cause for low growth, we comment on the implications that such a situation may have on financial stability.

**Definition of secular stagnation**

The concept of secular stagnation is not new. It was first introduced by the American economist Alvin Hansen in the thirties of last century to refer to the slow US recovery in the wake of the Great Depression.<sup>1</sup> Given the economic weakness in the aftermath of the international financial crisis of 2007-2008, Larry Summers rekindled the concept in 2013. Specifically, this economist put forth that the weakness observed related to a situation of secular stagnation in the advanced economies, particularly in the US.<sup>2</sup>

From that moment on, there has been extensive discussion and analysis among scholars and policy makers around it. Although the secular stagnation concept has been widely reconfirmed, it has not always been understood the same way, and thus, it has diverse meanings depending on who is using it.<sup>3</sup>

In general, three different stands on the concept of secular stagnation can be distinguished in literature.<sup>4</sup> First, the thesis put forth by Larry Summers that suggests that, owing to insufficient demand, economic stagnation relates to a persistent deviation of growth *vis-à-vis* its potential level.<sup>5</sup> This phenomenon results from the fact that even before the international financial crisis, there was a higher propensity to save and a lower propensity to invest at a global scale. This situation led to a fall in the equilibrium real interest rate or natural rate. This rate corresponds to the real interest rate consistent with the economy producing at its potential level, which is the maximum product level in concordance with price stability.<sup>6</sup> According to economic literature, diverse factors have had an effect on savings and investment propensities at a global scale, which has given way to a downward trend in equilibrium real interest rates.<sup>7</sup>

Second, the thesis that puts forth that economic stagnation has been caused by supply factors.<sup>8</sup> In particular, this thesis argues that the potential growth rate of the economy has been negatively impacted by two elements: on one hand, lower growth in production inputs resulting from structural factors such as demographics, among others; on the other hand, lower growth in the efficiency with which said inputs are combined in production processes, as reflected in the lower pace of productivity growth.<sup>9</sup>

Last, the thesis that states that the crisis may have caused a permanent decrease in the level of economic activity, whereas the potential growth rate of the economy remained constant. According to this vision, a crisis can permanently depreciate human capital.<sup>10</sup> For instance, the persistence of high levels of unemployment, known as hysteresis, increases the risk of eroding unemployed workers’ capacities.

With the purpose of delimiting the discussion over this topic and analyzing the effects of secular stagnation on financial stability, we took the definition proposed by Eichengreen in 2015 as reference, which coincides with the thesis put forth by Summers:

A downward trend in real interest rates, as a reflection of excess planned savings *vis-à-vis* planned investment, resulting in a constantly negative product gap and slow economic growth.<sup>11</sup>

**Implications on Financial Stability**

Summers has argued that, since the end of the last century, advanced economies have not been able to grow and keep at the same time sustainable financial conditions.<sup>12</sup> Particularly, he indicates that, during the years prior to the global financial crisis—that is, between 2003 and 2007—, the US economy did report satisfactory, although not spectacular, growth. Nevertheless, this growth coincided with the unsustainable rise in real estate prices, rapid credit growth and a significant increase in private sector leveraging. Summers argues that the US economy could only grow in a context where significant imbalances were accumulating. Also, he explains that a similar situation occurred in other advanced economies of the Eurozone.

According to Summers, given the downtrend in the equilibrium real interest rate or natural rate—that may have even reached negative values—, using conventional monetary policy<sup>13</sup>, it is very difficult for an economy to simultaneously reach full employment, satisfactory economic growth and financial stability. This is so because the monetary policy rate is limited by the zero lower bound of the short-term interest rate.<sup>14</sup>

It is worth underscoring that this rate may be reduced to the minimum possible, and still, that result would not be enough to make economic activity return to its potential level. In like manner, highly accommodating monetary policies and the corresponding environment of very low interest rates could jeopardize financial stability.

One concern is that said policies may drive investors to intensely search for yields.<sup>15</sup> Before very low interest rates, market participants may opt to invest in riskier assets, which may in turn lead to unsustainable rises in their price. A context of low interest rates is more conducive to a deviation of asset prices from their fundamental values.<sup>16</sup> On the other hand, higher asset prices, and consequently, a change in the value of collateral, may bring about a perception of lower risks in the economy, which could drive investors to take greater risks.<sup>17</sup>

Low interest rates also tend to encourage less responsible loan granting, as the debt service amount is negligible and easy to meet. Also, they make Ponzi schemes more attractive, particularly for lower interest rates. Last, very low interest rates, to the extent that they may contribute to a reduction in banks’ interest net margin, could have an impact on banks’ profitability.

It should be noted that there is empirical evidence, mainly for advanced economies, that lower interest rates do tend to incite greater risk taking. Particularly, Maddaloni and Peydro have found that in the US and Eurozone countries, decreases in short-term interest rates are associated with a relaxation of bank loan granting to companies and corporations. This phenomenon is magnified by

securitization activities, weak bank oversight and long periods of low monetary policy rates.<sup>18</sup> Furthermore, these authors found that low long-term interest rates are not conducive to the loosening of loan granting criteria. On their part, Altunbas, Gambacorta and Marques-Ibanez researched the effect of accommodating monetary policies on the risks that banks take, using data from US and EU institutions. They found evidence that long periods of very low interest rates are associated with higher risk taking by banking institutions.<sup>19</sup>

## Conclusions

According to the secular stagnation thesis, a higher propensity to save and a lower propensity to invest have led to both a fall in the equilibrium real interest rate, possibly below zero, and an insufficient demand. In that context, accommodating monetary policies and their corresponding very low interest rates have not sufficed to drive the economy back to its potential production level. What's more, very low interest rates may be leading to extreme risk taking and financial imbalances that may put financial stability at risk.

- <sup>1</sup> Alvin Hansen, "Economic Progress and Declining Population Growth", *The American Economic Review* 29, no. 1 (1939): 1-15.
- <sup>2</sup> Lawrence Summers, "Secular Stagnation", Speech at the IMF Fourteenth Jacques Polak Annual Research Conference, Washington, D.C., November 7-8, 2013.
- <sup>3</sup> Barry Eichengreen, "Secular Stagnation: A Review of the Issues", *CEPR's policy portal*, August 15, 2014, <http://voxeu.org/article/secular-stagnation-review-issues>.
- <sup>4</sup> For a summary of diverse secular stagnation concepts, see Richard Baldwin and Teulings Coen, "Secular Stagnation: Facts, Causes and Cures", *London: Centre for Economic Policy Research-CEPR* (2014).
- <sup>5</sup> Lawrence Summers, "Demand Side Secular Stagnation", *American Economic Review: Papers and Proceedings* 105, no. 5 (2015): 60-65; Lawrence Summers, "U.S. Economic Prospects: Secular Stagnation, Hysteresis and the Zero Lower Bound", *Business Economics* 49, no. 2 (2014): 65-73; Lawrence Summers, "Reflections on the New Secular Stagnation Hypothesis", *VoxEconomics* (October 2014).
- <sup>6</sup> Thomas Laubach y John C. Williams, "Measuring the Natural Rate of Interest," *Review of Economics and Statistics* 85, no. 4 (2003): 1063-1070.
- <sup>7</sup> For a summary of the role of diverse factors in the evolution of global investment and savings, see Rachel Lukasz and Thomas D. Smith, "Secular Drivers of the Global Real Interest Rate". Bank of England. Staff Working Paper N° 571 (2015).
- <sup>8</sup> Robert Gordon, "Secular Stagnation: a Supply-side View." *American Economic Review: Papers and Proceedings* 105, no. 5 (2015): 54-59.
- <sup>9</sup> From a long-term perspective, Gordon argues that productivity growth from 1970 to date has been lower than that observed between 1870 and 1970. He goes on to state that technological advances in the last decades, that belong to the digital era, have had a lower impact on the productive capacity of the economies than higher-impact inventions such as the internal combustion engine and electricity, among others, back in the day. See Robert Gordon, "Off its Pinnacle", *Finance and Development* 53, N° 2 (June 2016): 33-37. Moreover, the author asserts that current technological growth is negatively affected by a series of factors such as demographics, education levels and quality, inequality and public debt levels. See Robert Gordon. "Is US Economic Growth Over? Faltering Innovation Confronts the Six Headwinds". NBER Working Paper no. 18315.
- <sup>10</sup> Edward Glaeser, "Secular Joblessness", *CEPR's policy portal* (August 2014).
- <sup>11</sup> Barry Eichengreen, "Secular Stagnation: the Long View", NBER WP 200836 (2015).
- <sup>12</sup> Lawrence Summers, "Economic Prospects: Secular Stagnation, Hysteresis and the Zero Lower Bound"; *CEPR's policy portal*, October 30, 2014.
- <sup>13</sup> Lawrence Summers, "Economic Prospects: Secular Stagnation, Hysteresis and the Zero Lower Bound"; *Business Economics* 49 N°. 2 (2014): 65-73.
- <sup>14</sup> Recently, diverse monetary authorities, such as the central banks of Denmark, Japan, Sweden, Switzerland and the ECB have resorted to policy or deposit negative rates. Given the cost of cash storage, commercial banks, and economic agents across the board, may be willing to hold assets paying a negative interest rate. Therefore, in practice, the lower bound for nominal interest rates may be slightly lower than zero. See Nouriel Roubini, "The Negative Way to Growth?" Project Syndicate (2015); Todd Keister, "Why is there a "Zero Lower Bound" on Interest Rates?", *Liberty Street Economics*, Federal Reserve Bank of New York (2011).
- <sup>15</sup> Raghuram Rajan, "Has Financial Development Made the World Riskier?" NBER Working Paper N° 11728 (2005).
- <sup>16</sup> Jean Tirole, "Asset Bubbles and Overlapping Generations". *Econometrica* 53 N° 6 (1985): 1499-1528.
- <sup>17</sup> Claudio Borio y Zhu Haibin, "Capital regulation, Risk Taking and Monetary Policy: a Missing Link in the Transmission Mechanism". BIS Working Paper N° 268 (2008).
- <sup>18</sup> Angela Maddaloni and Jose-Luis Peydro, "Bank Risk-taking, Securitization, Supervision, and Low Interest Rates: Evidence from the Euro-area and the U.S. Lending Standards". *Review of Financial Studies* 24, N° 6 (2011): 2121-65.
- <sup>19</sup> Yener Altunbas, Leonardo Gambacorta and Davide Marques-Ibanez, "Do Bank Characteristics Influence the Effect of Monetary Policy on Bank Risk?" *Economics Letters* 117, N° 1 (2012): 220-22.



As for the impact that higher protectionism in the US may have on our economy, there are some considerations to take into account. Even though, during the US presidential campaign, a discourse in favor of implementing protectionist measures prevailed, it remains to be seen the extent to which the political campaign rhetoric will translate into concrete actions. Mexico is a major supplier of the US, and large economic sectors in said country benefit from trade with Mexico.<sup>2</sup> Moreover, both countries are signatories of the World Trade Organization (WTO). Hence, in the extreme event of the US renouncing the North American Free Trade Agreement (NAFTA), trade between Mexico and the United States would be subject to WTO provisions, one of which is the most-favoured-nation principle. This principle sets boundaries to restrictions that the US may eventually impose on Mexico.<sup>3</sup> Nonetheless, the prevailing uncertainty over the economic program that President-elect will indeed execute, and the measures he anticipated during his election campaign that he will indeed implement, may have an impact on prospects for the Mexican economy.

Last, the further weakening of Mexican economic activity may represent a risk for the stability of the financial system. In such a scenario, the shrinking of financial sector activities, and hence, financial institutions' revenues are to be expected. Further, debtors would find it far more difficult to meet their obligations; in consequence, default rates could rise.

## **2.2. Risks Derived from the Evolution of US Interest Rates**

In reaction to the global financial crisis, central banks in the major advanced economies implemented highly accommodative monetary policies. These actions increased liquidity in international financial markets and led to a situation of very low interest rates. In its turn, this situation motivated a yield search process among investors, which contributed to significant capital inflows towards emerging economies. In some cases, those inflows generated substantial distortions, such as disproportionate compressions in risk premia, rapid credit expansions and increases in asset prices.

For the case of the US, considering the performance of the economy, the labor market and inflation, the Fed started the monetary normalization process in December 2015 with an increase of 25 basis points in the target range for the federal funds rate. However, as a result of the presidential election, all-term interest rates showed an uptrend (graph 2a), and the Fed is now expected to rise its reference rate at a faster pace (graph 2b). One of the reasons for this is that the new government may implement a fiscal stimulus program. Also, market instruments and specialized surveys suggest that the next rate increase may occur in December 2016 (graph 2c).

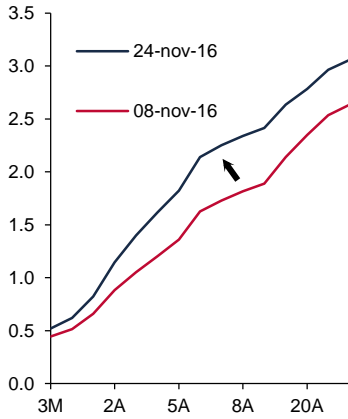
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<sup>2</sup> In 2015, Mexico was the second-best destination of US exports and the third place of origin for US imports.

<sup>3</sup> Although the US president has powers to renounce NAFTA, in order to abandon the WTO, approval in Congress is required. This implies a highly complex legal process, unlikely to be undertaken, given the potential negative impact that such an action would have on large sectors of the US economy.

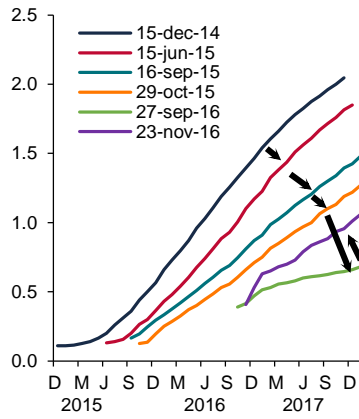
**Graph 2**  
**Monetary Policy Normalization in the US**

a) Yield Curve of US Treasury Bills and Bonds  
Percentage



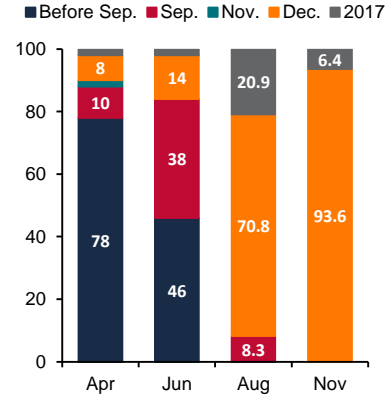
Figures as of November 24, 2016  
Source: Bloomberg

b) Federal Fund Futures Curve  
Percentage



Figures as of November 24, 2016  
Source: Bloomberg

c) Survey about the Rise in the Fed Target Range<sup>1/</sup>  
Percentage of participants



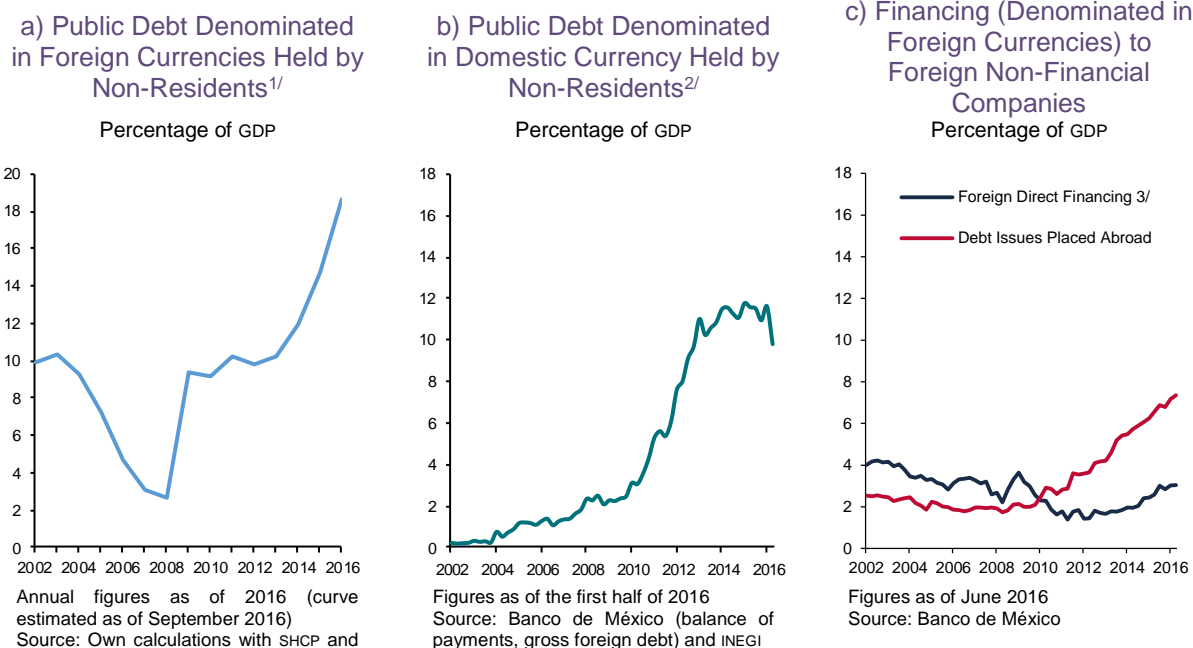
Figures as of November 1, 2016  
Source: Blue Chip Economic Indicators

1/ The question formulated is the following: "If you expect that the next Federal Open Market Committee's movement will be an interest rate increase, in what meeting will it be disclosed?"

To the extent that the US monetary normalization derives from better economic performance, said process may be considered as a favorable event, particularly for economies—such as the Mexican economy—having a high degree of trade integration with the US economy. Nonetheless, as a result of this monetary normalization process, there may also be global episodes of higher financial volatility and reversals of capital flows in emerging economies. A clear communication policy by the Fed is quintessential to alleviate such risk.

Regarding the repercussions that the above-mentioned factors could have on the Mexican economy and its financial system, it is important to remember that in Mexico, just like in other emerging economies, abundant liquidity in international financial markets enabled foreign funds in highly favorable conditions, both for the public (graph 3a and 3b) and private sector (graph 3c).

**Graph 3**  
**Indicators for Non-Residents' Share in Public and Private Debt**



1/ Corresponds to the total amount of foreign debt of the federal public sector as a percentage of GDP. This figures stem from the Public Finance Timely Statistics by the SHCP, except for the 2016 figure, which was obtained by dividing the debt balance (denominated in nominal million dollars) as of August by the GDP value of the first half of the year (denominated in nominal million dollars with the average fixed exchange rate for the period).

2/ Refers to the holdings of Federal Treasury Bills by non-residents (cetes), Federal Government bonds (bondes), fixed-rate federal development bonds (bonos), federal development bonds in investment units (udibonos), monetary regulation bonds (brems) and savings protection bonds (BPA and BPAT).

3/ Does not include credit from foreign suppliers.

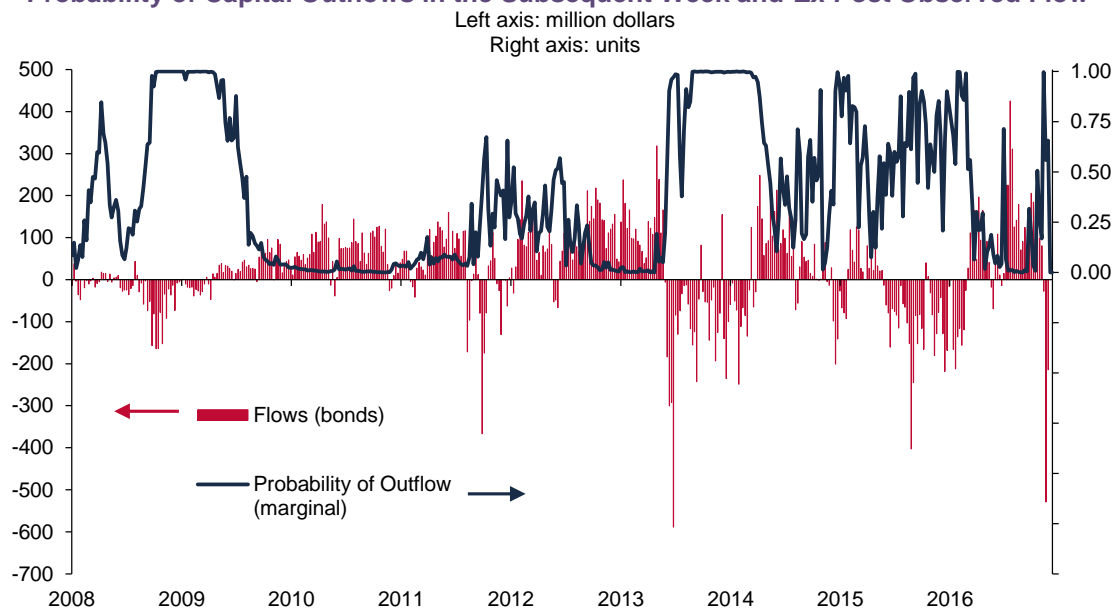
In consequence, the higher exposure of non-residents to Mexican debt, both in foreign and domestic currency, may represent a risk for financial stability, as an abrupt reversal of capital flows is possible, that may trigger disruptions in how financial markets work. The reversal of flows may be caused by a sudden increase of international asset managers' risk aversion, associated with news about the US monetary normalization process. Another factor with an influence on capital flows towards the Mexican economy is the uncertainty over the economic program of the elected government in the United States. Particularly, there is the risk that the new administration might take some actions that hinder economic relations between Mexico and the US.

For these reasons, it is advisable to analyze and follow up factors that may significantly affect foreign capital outflows. In our *Report's* last edition, we presented an econometric exercise aiming at estimating the probability of such an event throughout time, and assessing the relative importance of the factors that may cause it.<sup>4</sup> For this edition, we performed the same estimation using the latest figures, and we came up with the following findings. First, the US 10-year interest rate is one of the most relevant factors to explain the

<sup>4</sup> Banco de México, *Financial System Report* (November 2015), 25–27.

direction of capital flows. Second, unlike last year's exercise, this time, oil prices and the exchange rate volatility were statistically significant (graph 4).

**Graph 4**  
**Probability of Capital Outflows in the Subsequent Week and *Ex Post* Observed Flow<sup>1/</sup>**



Figures as of November 23, 2016

Source: Own estimation with EPFR Global and Bloomberg data

1/ The methodology employed to measure the probability of capital outflows and factors contributing to this event is explained in box 2 (November 2015), p. 27. The model was estimated with weekly data in 2-year moving windows. The explanatory variables are 10-year bond yields both in Mexico and the US, Mexico 1-month interest rate, the VIX, the implied volatility of the MXN/USD exchange rate, the change in the Mexican mix price and the weekly change in the exchange rate with one lag.

In conclusion, both uncertainty raised by the US presidential election results and the Fed monetary policy normalization and its repercussions on longer term US interest rates might reduce foreign funds available in Mexico for private and public sectors. Furthermore, in case of a capital flow reversal, it would be possible to observe upward pressure on interest rates and a higher depreciation of the Mexican peso *vis-à-vis* the US dollar. Both events may impact domestic financial institutions through various channels.<sup>5</sup> Moreover, more stringent financial conditions could lead to an economic slowdown.

### 2.3. Risks Related to the Plunge in Oil Income

Public finances have faced significant challenges derived from the fall in oil income. The reduction in international oil prices and the domestic economic slowdown resulting from the 2008 crisis had an effect on domestic public finances and contributed to the deficit in the primary balance (graph 5b). Although the fiscal adjustment of 2010 helped mitigate the crisis impact on public finances, the downtrend in the oil production capacity and the plunge in oil prices as of 2014

<sup>5</sup> We present the analysis of financial vulnerabilities, which describes those channels, in section 3 of this *Report*,

(graph 5a), together with other factors, have affected both fiscal accounts and public debt.<sup>6</sup> In addition, there has been expenditure pressure on public finances stemming from pensions, contributions to states and municipalities, and the financial cost of public debt.

Nonetheless, the impact on public finances of lower oil income has been offset by two channels. First, by higher tax income generated by the fiscal reform that came into effect in 2014.<sup>7</sup> Second, by the acquisition of oil coverage renovated every year, offering financial protection to oil income in the face of price plunges.<sup>8</sup>

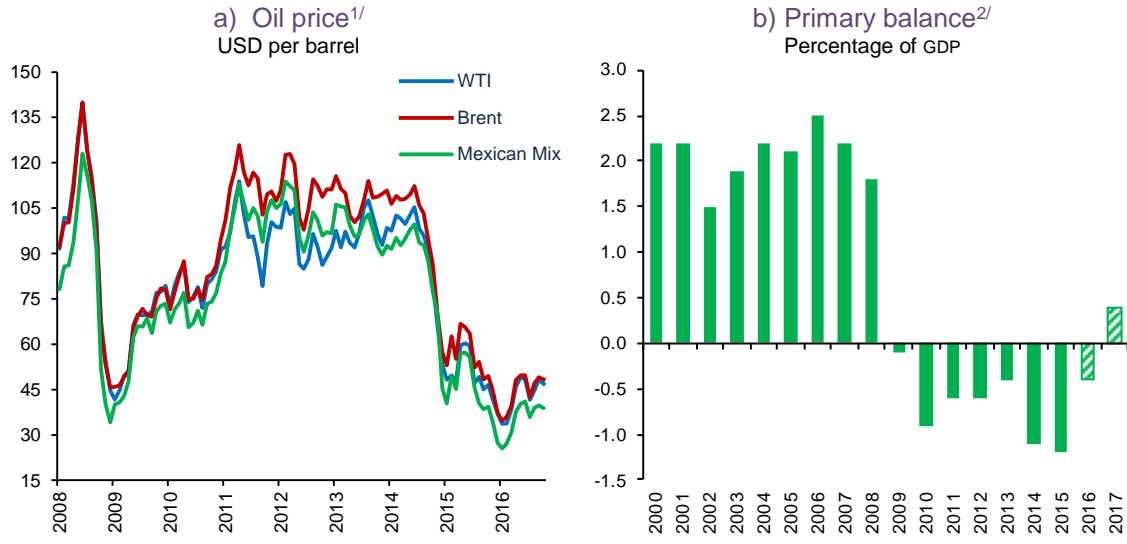
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<sup>6</sup> Public debt as a percentage of GDP has also increased due to exchange rate depreciation, low economic growth and certain particular transactions, such as the acknowledgement of Pemex's liabilities by the Federal Government.

<sup>7</sup> Tax income as a percentage of total public sector income came from 37.4 percent in 2012 up to 55.4 percent in 2015, whereas the percentage relating to oil income decreased from 39.5 percent to 19.8 percent in the same period. The new tax policy, together with improvements in collecting efficiency, led tax income to 13 percent of GDP in 2015, that is, 4.6 percent points above the observed figure in 2012. This increase has offset the fall in oil income, that accounted for 8.9 percent of GDP in 2012 (39.5 percent of total income), whereas in 2015 it only accounted for 4.1 percent of GDP (19.8 percent of total income).

<sup>8</sup> For 2017, a price of 42 USD per barrel has been secured, thanks to two measures: 1) the procurement of put options at a price of 38 USD per barrel; and 2) the creation of a subaccount within the Oil Income Stabilization Fund (FEIP in Spanish) for 18.2 billion pesos.

**Graph 5**  
**Oil Prices and Public Finances**

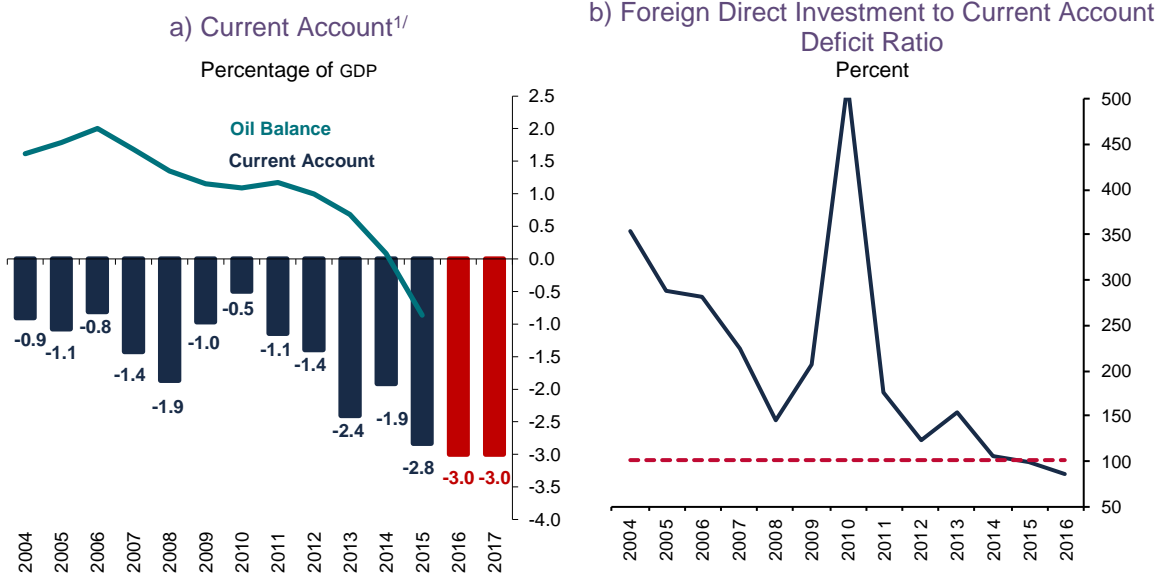


Figures as of October 2016  
Source: IMF

Figures as of October 27, 2016  
Source: SHCP

1/ Quotations at the end of every month.  
2/ 2016 and 2017 figures correspond to values estimated by the SHCP. These values were published in the 2017 Economic Policy General Criteria.

**Graph 6**  
**Current Account and Foreign Direct Investment**



Figures as of November 24, 2016  
Source: Banco de México and INEGI

Figures as of the third quarter of 2016  
Source: Banco de México

1/ Red bars are estimations.

With regard to the foreign sector, oil shocks have also had an impact on the oil trade balance, which reported a deficit in 2015. This has in turn increased the current account deficit (graph 6a). From a macroeconomic standpoint, the increase in this deficit indicates that domestic expenditure has grown at a faster pace than income. In order to get a clearer picture of this deficit increase, it is worth mentioning that funds that have entered the country as foreign direct investment and that are a stable source of foreign financing have decreased down to 85.6 percent of said deficit (graph 6b).

Certain macro-financial risks could materialize, were the domestic macroeconomic framework not to be strengthened. On one hand, a greater fiscal deficit would lead to more sizeable absorption of financial resources by the public sector, which would curtail the supply for the private sector and would pressure interest rates upward. On the other hand, were the uptrend in public debt not to be corrected, an increase in sovereign risk premia could be observed, and thus, its credit rating could be downgraded.<sup>9</sup> As for sovereign risk indicators, even though they had diminished during the first half of the year, they have rebounded as of the end of August, although they haven't reached the levels observed in February (graph 7a). An additional significant factor is Pemex's financial situation and its potential impact on public finances (graph 7b).

Regarding external accounts, the increase in the current account deficit has coincided with a higher consumption level and lower investment in the economy. Moreover, the share of industrial production in the GDP has declined, whereas the services share has increased. Should this trend continue for several years, it might hamper income denominated in foreign currencies, and hence, alter the sustainability of the current account deficit.

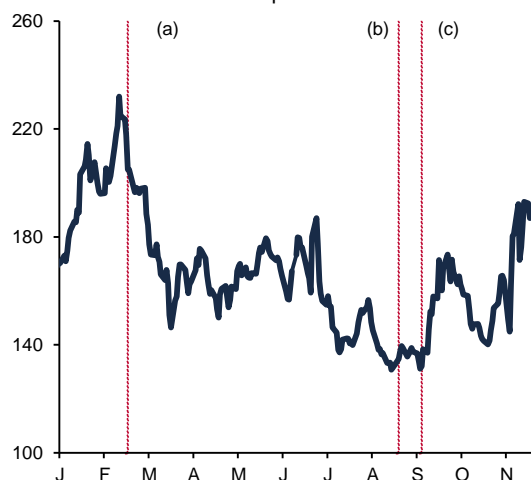
From a financial standpoint, a higher current account deficit would tend to increase foreign credit funds, in a context where the US monetary policy normalization could lead to lower capital flows towards emerging economies. In such scenario, upward pressure on interest rates and higher exchange rate depreciation would be observed.

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<sup>9</sup> Over the course of this year, two rating agencies have changed their perspective on federal public debt, from stable to negative.

**Graph 7**  
**Credit Risk Indicators in Mexico**

a) Federal Government's Credit Default Swaps in 2016 (5-year CDS) Basis points

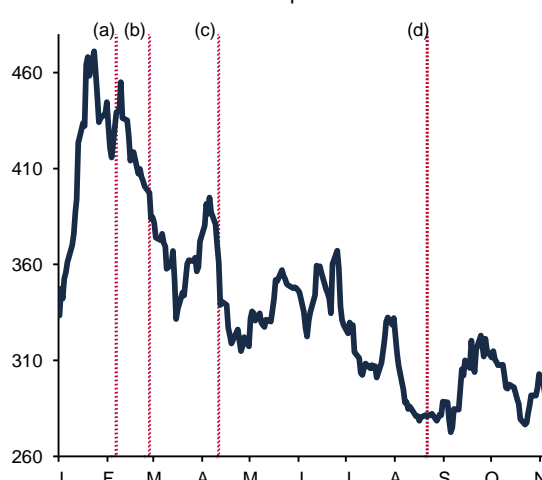


Figures as of November 24, 2016

Source: Bloomberg

(a) joint actions by SHCP, Banco de México and the Foreign Exchange Commission; (b) the S&P rating agency changes the perspective on public debt; and (c) resignation of the Head of the SHCP.

b) Pemex's Credit Default Swaps in 2016 (5-year CDS) Basis points



Figures as of November 24, 2016

Source: Bloomberg

(a) designation of the new Pemex administration, (b) disclosure of details about budget adjustment for Pemex, (c) announcement of the SHCP support package, and (d) announcement of SHCP measures to promote transparency in public finances.

## 2.4. Macroeconomic Policy Response

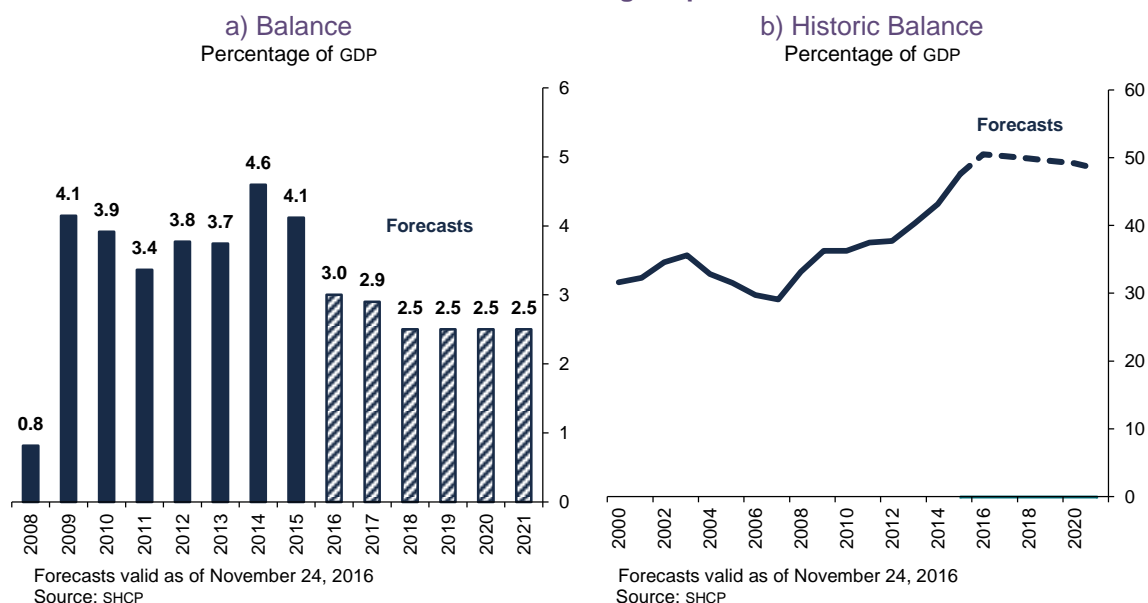
In the face of the described environment, it is quintessential to reinforce the macroeconomic framework. Therefore, during the period covered by this Report, fiscal and monetary policies have been adjusted in order to preserve economic stability. Hence, both policies are contributing to the macroeconomic adjustment that the domestic economy requires.

### Fiscal Policy

A fundamental policy action by the Ministry of Public Credit and Finance (SHCP) is to cut programmable public expenditure, in order to reinforce public finances without higher taxing. Hence, authorities have reduced public sector Borrowing requirements (RFSP) (graph 8a) with the purpose of securing the public debt sustainability as a proportion of GDP (graph 8b).



**Graph 8**  
**Public Sector Borrowing Requirements<sup>1/</sup>**



<sup>1/</sup> According to the new methodology, a positive sign (+) represents a deficit, a negative sign (-) represents a surplus. Forecasts are estimates published in the Economic Policy General Criteria for 2017, SHCP.

During 2016, fiscal authorities announced a series of preemptive adjustments to programmable expenditures, and various actions were taken to tackle Pemex’s financial situation. First, a new administration was appointed to restructure this company. Second, its Board of Directors approved a budget cut. Third, the Federal Government made public, among other measures, an equity contribution to Pemex, and the granting of pension payment facilities in 2014. Fourth, in order to meet obligations with suppliers and contractors, Pemex was granted a 15-billion-peso credit line by development banks.

Additionally, a 2016-2021 business plan for Pemex was released, based on strengthening profitability. For the short term, said document considers measures to adjust cost structure and business strategy in a low-price scenario. For the mid-term, all instruments and flexibility put forth by the energetic reform to improve efficiency were considered.

On the other hand, as part of the continuous improvement process in the field of public finance transparency, at the end of last August, the SHCP published both a timely update of the RFSP for the end of 2016, and a monthly compilation of twelve public income, expenditure and financing indicators that will facilitate follow-up and projection of public finances for the remainder of the year and subsequent years. It was also made known that updates of closing estimates for the fiscal year will be published in the quarterly reports presented at Congress.

Last, in September, the SHCP submitted the 2017 Economic Package to Congress, which was passed in its totality by mid-November. The Economic Policy General Criteria proposes a primary surplus

(0.4 percent of GDP) for the first time since 2008. With that in mind, a cut in programmable public expenditure of 1.2 percent of GDP (*vis-à-vis* last year's budget) has been put forth<sup>10</sup>, the purpose being that the ratio of the historic balance of public sector borrowing requirements (SHRFSP) to GDP stabilizes in 2017 and that it displays a downtrend in subsequent years (graph 8b).

It is worth underscoring that the proposed fiscal measures tend to improve external accounts. A fiscal policy that achieves to moderate domestic expenditure can directly affect the current account deficit. In addition, public expenditure adjustments tend to refrain price increases in non-tradable goods. In particular, to the extent that prices of such goods decline *vis-à-vis* tradable goods, both lower expenditure and higher production of the latter would be encouraged, which would ultimately moderate the current account deficit.

### Monetary Policy

With the purpose of contributing to the strengthening of the domestic macroeconomic framework, during the period covered by this *Report*, Banco de México adjusted its monetary stance on five occasions. As a result, the overnight interbank interest rate target increased by 225 basis points, from 3.00 percent in December 2015 to 5.25 percent in November of this year. These adjustments have aimed at anchoring both inflation and inflation expectations. Undoubtedly, a factor that has contributed to Banco de México's upward adjustment of the reference rate target is the fact that the domestic financial system is well capitalized and with adequate liquidity levels.

As a consequence of the above-mentioned monetary measures, short-term and mid-term interest rates reported an uptrend in line with the increases in the reference rate target. On their part, long-term interest rates remained stable (graph 9a) before such adjustments. Hence, the yield curve tended to flatten in response to the described monetary actions (graph 9b), which can be interpreted as evidence that, despite the substantial shocks that the domestic economy has put up with, inflation expectations remain well anchored –this is quintessential to preserve the purchasing power of the domestic currency. Nevertheless, given the uncertainty raised by the US presidential election, upward pressure on all-term interest rates, both in USD and MXN, has been observed.

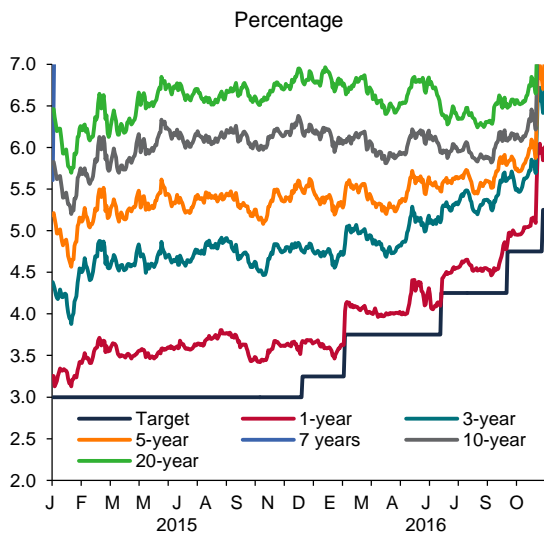
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<sup>10</sup> During 2016, the Federal Government has been undertaking a spending adjustment of 0.9 percent of GDP, which shall become permanent. The additional effort for 2017 will be 0.3 percent.

Graph 9

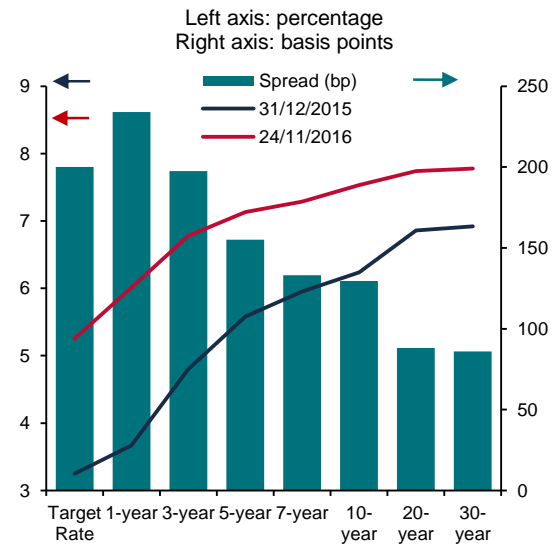
Performance of Interest Rates in Mexico

a) Target Rate and Return Rates of Fixed-Rate Government Bonds at Different Terms



Figures as of November 24, 2016  
Source: Banco de México and Valmer

b) Yield Curve of Fixed-Rate Government Bonds in MXN



Figures as of November 24, 2016  
Source: Valmer

While fostering an environment of low and stable inflation, monetary policy may also contribute to preserving the stability of the financial system. On one hand, while keeping the purchasing power of the domestic currency, households bearing debts with credit institutions will be in better conditions to meet their financial obligations, and, logically, this trend will favorably impact the performance of credit default ratios. On the other hand, while preventing further exchange rate depreciation that might jeopardize price stability, a favorable impact on the financial statements of companies using imported inputs or bearing liabilities denominated in foreign currencies would be generated. In such scenario, companies in this situation will also be in a position to continue fulfilling their financial obligations.

Further, upward adjustments to the monetary policy rate may lessen, through various channels, the growth in households and companies' expenditure, which would make domestic spending grow at a slower pace. Hence, monetary policy actions, together with the public spending cuts mentioned in the previous section, can contribute to positive balances in the current account, and ultimately, to the macroeconomic adjustment required.

Last, to the extent monetary policy actions and the fiscal adjustment process contribute to preserving macroeconomic stability domestically, they will also foster the right conditions to stimulate productive activity. In summary, the implementation of prudential macroeconomic policies, together with the timely and adequate execution of structural reforms aiming at increasing productivity, may generate faster growth and preclude the negative effects that a long phase of low growth may have on financial stability.

## 3. Impact Analysis and Stress Tests

### 3.1. Financial System

The eventual actualization of the risks described in the last section might affect domestic financial institutions via various channels. First, an economic slowdown would negatively impact financial institutions, non-financial companies and households through a fall in their income. In such scenario, credit institutions would surely face higher default rates, as a result of both the economic slowdown and higher credit and refinancing costs imposed on their borrowers (credit risk). Second, domestic interest rate hikes could directly affect financial institutions via losses that would deteriorate their financial balances (market risk). Simultaneously, although the direct effect of the exchange rate depreciation on financial institutions may be moderate, given that regulation limits exchange rate mismatches, credit institutions' borrowers might face difficulties to meet their financial obligations, and this would increase delinquency. Particularly, payment capacity of companies using imported inputs or holding foreign-currency-denominated liabilities may be hindered.

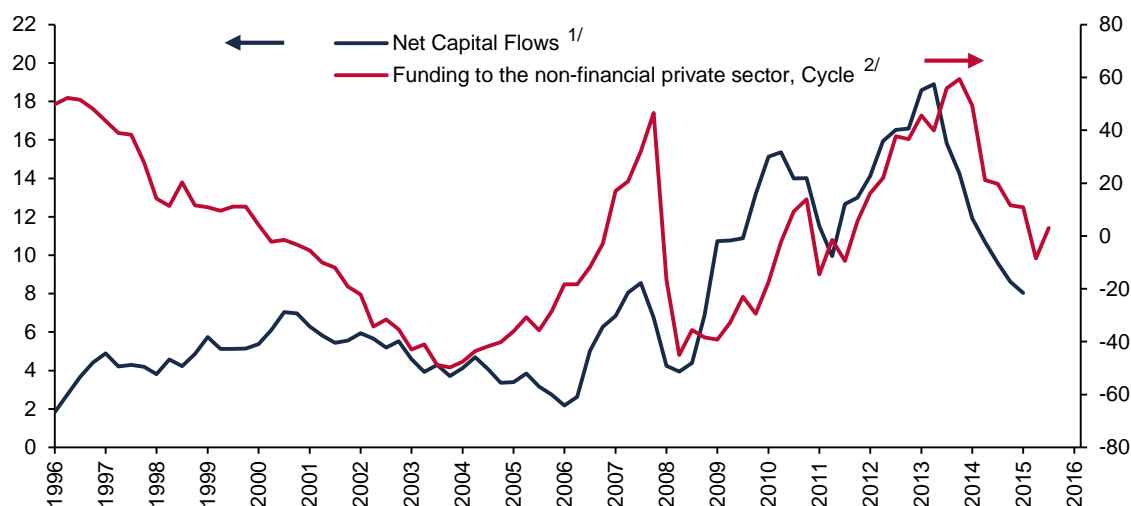
Foreign investors' holdings of public debt represent a source of vulnerability that may magnify the above-mentioned risks. This results from the fact that, in case of significant capital outflows, said investors may decrease their holdings of government securities, and this would add more pressure on interest rates and exchange rates.

#### Credit Risk

Over the last two years, total financing granted to the non-financial private sector has grown at elevated rates (higher than GDP growth). Simultaneously, said financing shifted in parallel with capital inflows towards the Mexican economy (graph 10). Among factors that may have contributed to these events, we find the efforts to increase credit penetration, as well as the ample international liquidity that has granted Mexican companies access to foreign funds in highly favorable conditions, which also released funds in the domestic banking system and made banking credit more accessible to smaller-sized companies. Additionally, the value of the foreign currency-denominated portfolio reflects growth derived from the peso depreciation.

**Graph 10**  
**Net Capital Flows and Financing Cycle in Mexico**

Billions of dollars



Original figures as of the second quarter of 2016

Source: Banco de México and own calculations

<sup>1/</sup> Net capital flows were deseasonalized using a centered moving average of order 4 (quarterly data).

<sup>2/</sup> The cyclical component of credit was obtained by applying a two-tailed HP filter, using a noise-to-signal ratio value of 400 thousand, which is the value suggested by the Basel Committee for quarterly disaggregated financial variables. See Mathias Drehmann and Kostas Tsatsaronis, "The credit to GDP gap and countercyclical capital buffers: questions and answers", *BIS Quarterly Review* (March 2014): 55–73. The higher noise-to-signal ratio for financial variables *vis-à-vis* that used for other variables responds to the fact that financial cycles are longer than business cycles. Particularly, it has been found that the former last between eight and thirty years. See Mathias Drehmann, Claudio Borio and Kostas Tsatsaronis, "Characterizing the financial cycle: don't lose sight of the medium term", *BIS Working Papers* 380 (June 2012).

Credit to the non-financial private sector increased from the second quarter of 2014 to the end of the second quarter of 2016 by 27.6 percent in real terms. Nevertheless, the further weakening of global economic growth and its potential impact on domestic economic activity might put pressure on the quality and the dynamics of domestic banking credit. In that sense, there are concerns that, in the face of an economic slowdown, credit would continue to grow at high rates. In fact, as pointed out by specialized literature, as of the sixties, one out of three banking crises has been preceded by excess credit growth.<sup>11</sup>

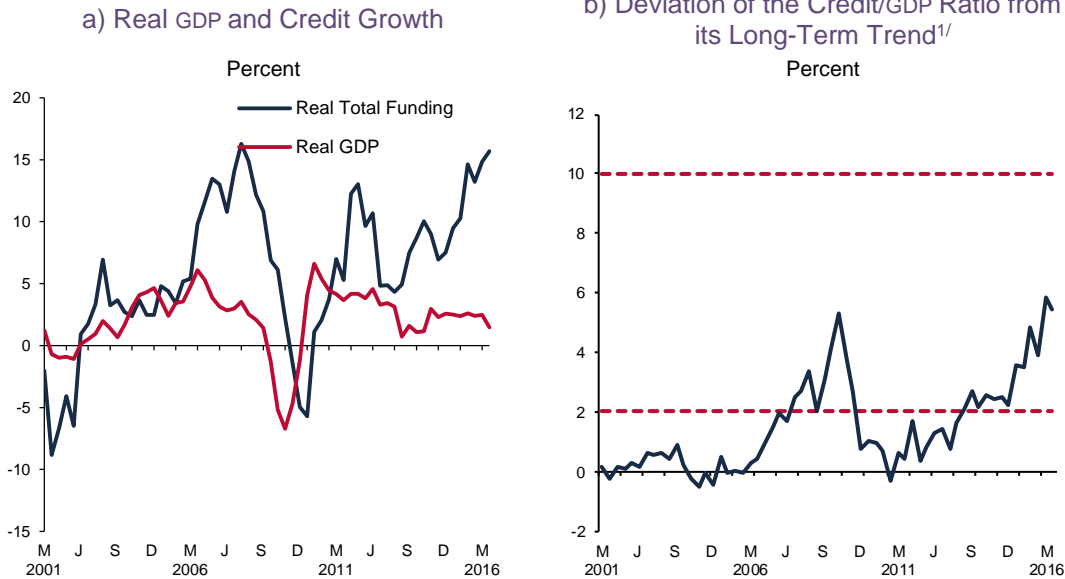
Yet, to determine when credit is exorbitantly growing is not a simple task. In that sense, the Basel Committee on Banking Supervision has put forth a criterion that uses the deviation of the credit-to-GDP ratio from its long-term trend (graph 11).<sup>12</sup> However, as discussed in box 2, this indicator has certain limitations. First, it does not distinguish foreign from domestic credit. Second, it does not distinguish either the quality of granted loans, or whether dynamism

<sup>11</sup> For instance, Xavier Freixas, Luc Laeven and José Luis Peydró, *Systemic Risk, Crises, and Macroprudential Regulation*, (Cambridge, MA: MIT Press, 2015) or Giovanni Dell'Ariccia, D. Iran and Luc Laeven, "Credit Booms and Lending Standards: Evidence from the Subprime Mortgage Market," *Journal of Money, Credit and Banking*, Blackwell Publishing, 44,367-384.

<sup>12</sup> As suggested by the Basel Committee, the long-term trend of this ratio is calculated by applying the one-tailed HP filter with a 400 thousand factor to the credit-to-GDP ratio.

responds to grantors' search for higher returns or a demand increase. Last, it does not consider that credit may be growing from relatively low levels with regard to the GDP; hence, that event might only be reflecting higher financial inclusion.

**Graph 11**  
**Credit Indicators**



Figures as of the second quarter of 2016  
Source: Banco de México

Figures as of the second quarter of 2016  
Source: Banco de México

1/ The long-term trend of this ratio is calculated by applying the one-tailed HP filter with a 400 thousand factor to the credit-to-GDP series. The Basel Committee suggests that when the deviation of this trend exceeds two percent, the countercyclical requirement should be activated; said requirement will reach a maximum value of 2.5 percent when the trend deviation reaches or exceeds 10 percent. The red dotted lines in graph 11b represent the activation area of countercyclical capital.

In box 2, we present the methodology of an analysis performed to identify whether recent credit growth is due to supply or demand factors. This methodology could help to identify the above-mentioned factors for Mexico, capitalizing on the use of financial authorities' microdata. The analysis showed that banking credit expansion in Mexico from 2010 to 2016 has been fueled by corporate credit demand. Yet, as of the first quarter of 2015, supply factors have become statistically significant. These supply factors indicate that a part of recent growth in corporate credit might be due to more aggressive banking policies and not necessarily to a demand increase.

In this model, supply factors are identified when the increase in credit received by a group of companies is statistically explained by increases in banks' fund availability and not by the features of requesting companies.

### *Commercial Bank Credit to Companies*

Despite the recent growth in credit observed, this has not deteriorated the commercial bank portfolio nor resulted in excessive household and corporate indebtedness. Although this is true at an

aggregate level, at some income levels, indebtedness has indeed significantly grown. Both delinquency rates and the value at risk of the commercial bank credit portfolio remain at levels near those observed in recent years (graph 12a and 12b).<sup>13</sup> Further, *var* as a proportion of the portfolio has remained stable (graph 12c), which suggests that the significant growth in all types of credit has not deteriorated risk indicators.

However, the elevated growth of bank loans might put pressure on the quality of their portfolio. On one hand, the economic slowdown could drive banks to grant loans to borrowers with higher risk profiles, aiming at keeping up the growth pace of their portfolio. On the other hand, the portfolio risk, as measured by the *var*, responds in a non-linear way to changes in risk factors, exhibiting, out of sheer growth, a higher sensitivity to changes in the delinquency correlation. Hence, the higher exposures to risk segments with common features may generate further accumulation of risks.

Expansionary monetary policies in advanced economies have contributed to keeping interest rates in their countries at extremely low levels. Back then, this situation led a number of investors to seek for financial assets with higher returns. Companies from emerging economies, including Mexico, have benefitted from that environment, which allowed them to place debt in foreign markets under highly favorable circumstances (with regard to amount, interest rate and terms). This enhanced access to foreign markets has made available funds domestically and encouraged banks to place them among smaller-sized companies that do not necessarily share the same opportunities to access international funds.

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<sup>13</sup> Credit *var* is the percentile attached to a specific confidence level from a probability loss distribution related to a portfolio of assets subject to credit risk, and is calculated using the capitalization and credit risk model (cCyrce). See Note 26 in Banco de México, *Financial System Report* [Novembre 2015], 49.

Box 2

Supply and Demand Factors in Credit Expansion

Apart from following economic cycles, economies also have financial cycles, in which credit is usually the dominant variable. Cyclical movements frequently display accelerated growth patterns during expansionary phases, and abrupt falls during contractionary phases. In that context, banks may amplify financial crises both by contributing to excess growth of credit and by contracting supply. Hence, it has been observed that crises preceded by a credit expansion are usually deeper and last longer.

Aiming at alleviating the adverse effects that excessive credit growth may have on the economy, macro-prudential measures have been taken, such as the countercyclical capital buffer. Nevertheless, one of the main challenges in this area is to identify when credit growth in an economy can be described as excessive.

This is particularly crucial in economies, such as the Mexican economy, whose financial systems are undergoing a deepening process. As it has been historically observed that one out of three credit expansions leads to a crisis, the risk of not identifying growth as excessive, when there are solid grounds for it, is major. A false diagnosis would have significant repercussions on sustainable economic growth.

In order to determine whether growth stems from economic fundamentals, a valuable criterion would be to identify the dominant factor: intermediaries' credit supply or borrowers' credit demand. Growth caused by demand factors is usually based on economic fundamentals, which is not necessarily the case when it is caused by supply factors. Thus, the analytical challenge is to isolate supply and demand factors.

The econometric challenge here is not different from that of estimating supply and demand of any given good. In that case, equilibrium amounts are usually determined by a complex interaction between non-observable supply and demand functions. If only time series data are available, this implies that, whenever a price or quantity change occurs, it is hard to identify whether change was caused by movements in supply, demand or both. Despite these difficulties, it was possible to isolate both effects, following the methodology used by a number of authors.

The use of this identification methodology requires two key elements: a supply shock, an exogenous event that would affect banks' ability to supply loans, and, on the other hand, detailed data about the relationships between banks and borrowers (for those that are granted loans by more than one bank). The model is defined as follows:

$$y_{am} = \alpha + \beta \delta_i + \eta_j + X_i \gamma + \varepsilon_{ij},$$

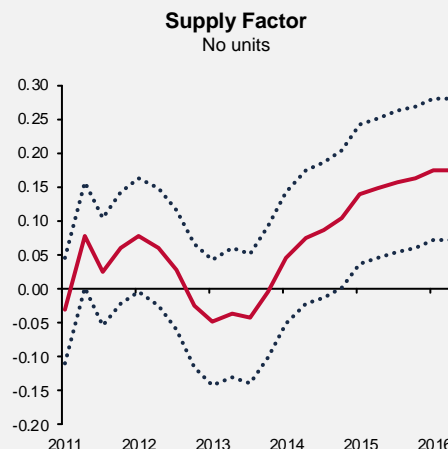
where  $y_{ij}$  is the change in credit granted by the bank  $i$  to the company  $j$ ;  $\alpha$  is a long-term trend,  $\delta_i$  is the supply shock,  $\eta_j$  is a specific factor modeling company  $j$ 's propensity to demand more credit, that is, a demand factor;  $X_i$  are financial controls for bank  $i$ ; and finally,  $\varepsilon_{ij}$  is an error term.

In this estimation, if coefficient  $\beta$  is not significantly different from zero, it would mean that changes in credit received by company  $j$  are not explained by the supply factor employed (holdings of government funds), but possibly by a higher individual demand (demand factor) or other factors. On the contrary, if the coefficient is significantly different from zero, the supply shock is having an effect and significantly contributing to credit growth.

This equation cannot be consistently estimated using Ordinary Squared Minimums; therefore, data from companies receiving loans from more than one intermediary enables the use of fixed effects in the regressions. This effect captures the individual demand factor and, hence, does not introduce inconsistencies in the estimation of  $\beta$ .

The estimation was performed for Mexico.<sup>1</sup> The supply shock used was the entry of Mexican government bonds to the Citigroup World Government Bond Index (WGBI). For that purpose, we used regulatory data of all commercial loans granted to the same company by two or more banks, and controlled for other factors, using banks' assets, rates paid by companies, and the exchange depreciation rate, among other variables. We obtained a) quarterly estimates as of the last quarter of 2010 (one quarter after Mexico's entry to the WGBI), and, b) graphs of the resulting supply factors for every estimation.

The graph shows that the supply factor has been positive and significantly different from zero as of the first quarter of 2015, which suggests that credit growth in Mexico over the last months has a significant supply component.

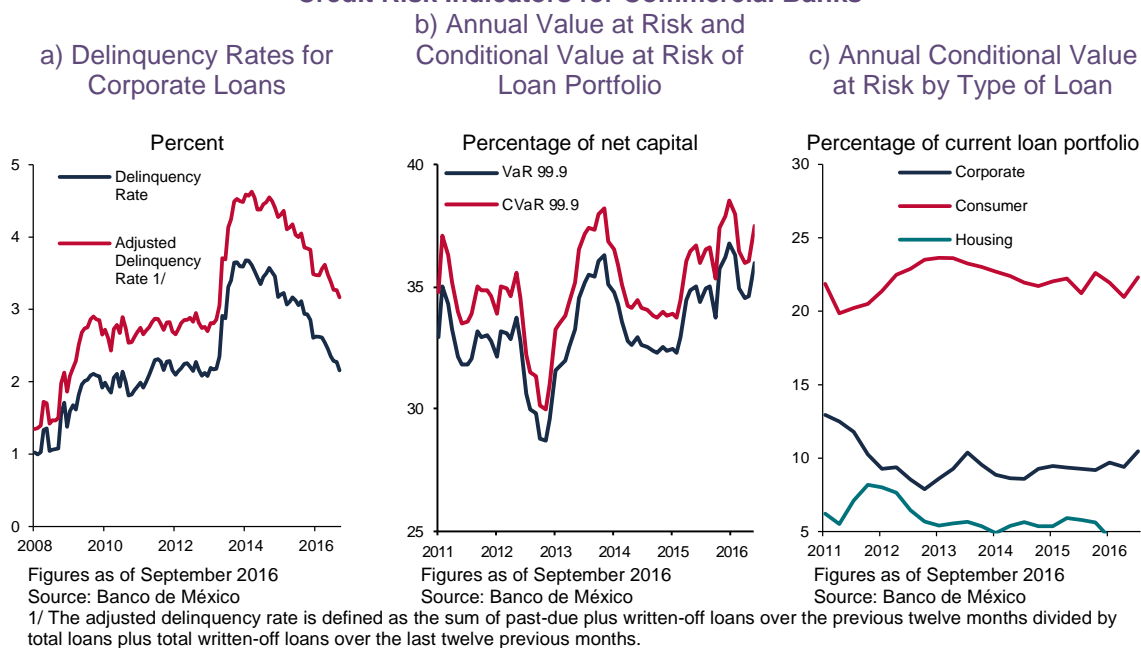


Figures as of June 2016  
Source: Own calculations with figures of CNBV

<sup>1</sup> See Gabriel Levin, Calixto López-Castañón and Fabrizio López-Gallo, "The use of loan level data to identify excess credit growth: an application to the Countercyclical Capital Buffer," Mimeo. Banco de México (2016).



**Graph 12**  
**Credit Risk Indicators for Commercial Banks**



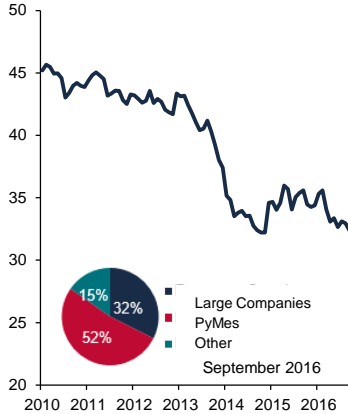
Consequently, the growth of corporate bank loans has also been boosted by credit to pymes. Another relevant factor that could explain this growth is the entry into the sector of a greater number of banking institutions. Particularly, guarantee programs bolstered by development banks have granted smaller-sized companies access to loans in more favorable conditions, although risks in such segment are greater (graph 13b). Smaller-sized banks (middle-sized and niche banks), on their part, have also increased their share in loans to pymes. Yet, due to their lower capacity to take risks and endure losses, these banks have more intensively used guarantee programs and focused on companies with better risk profiles, as reflected by the lower delinquency levels in their portfolios (graph 13c).

Growth of loans to pymes has further diversified bank portfolios. However, credit is still highly concentrated in large corporations (graph 13a). On the other hand, delinquency for the bank loan portfolio denominated in US dollars has slightly gone up over the last twelve months. Yet, said indicator is still below both levels observed in previous years and delinquency related to loans denominated in Mexican pesos (graph 14a).

Graph 13

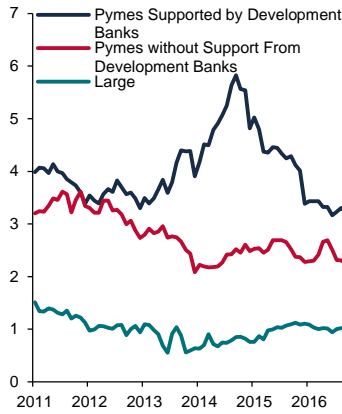
Credit Risk Indicators for Commercial Bank Loans to Small-Sized Companies

a) Large<sup>1/</sup> Companies' Share in Commercial Bank Loans to the Non-Financial Private Sector  
Percent



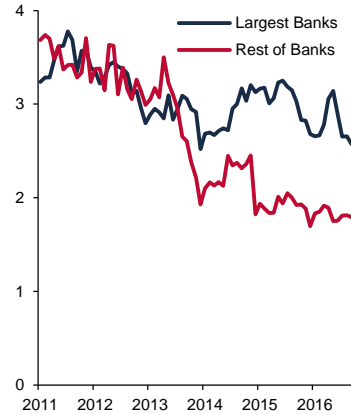
Figures as of September 2016  
Source: CNBV

b) Delinquency Rate<sup>2/</sup> by Company Size and Guarantee<sup>3/</sup>  
Percent



Figures as of September 2016  
Source: CNBV

c) Delinquency Rate<sup>2/</sup> for loans to Pymes by Type of Granting Bank<sup>4/</sup>  
Percent



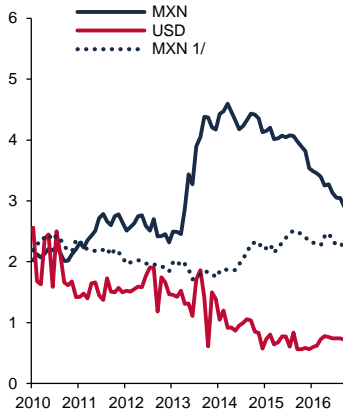
Figures as of September 2016  
Source: CNBV

1/ Large companies are listed companies that are part of the largest 500 companies in the country or have current loans for more than 1 billion pesos.  
2/ Delinquency rate is adjusted to eliminate the effect of house development companies' defaults.  
3/ Classification of a company as pyme depends on both the number of employees and annual sales reported by the company. This categorization is revised for companies with loans for more than a billion pesos.  
4/ Larger banks include the seven most relevant institutions, based on their total assets.

Graph 14

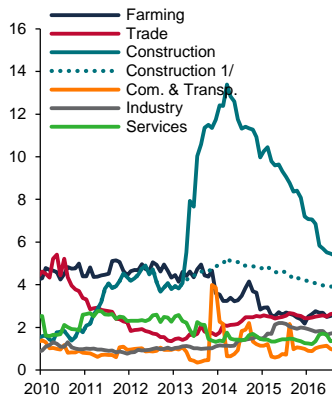
Credit Risk Indicators for Commercial Bank Corporate Loans

a) Delinquency Rate by Loan Currency  
Percent



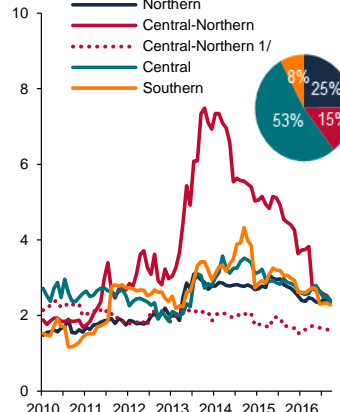
Figures as of September 2016  
Source: CNBV

b) Delinquency Rate by Economic Sector  
Percent



Figures as of September 2016  
Source: CNBV

c) Delinquency Rate by Geographical Region  
Percent



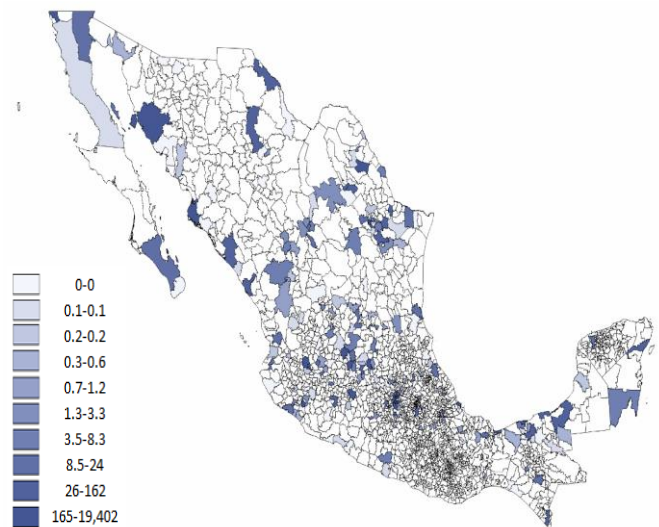
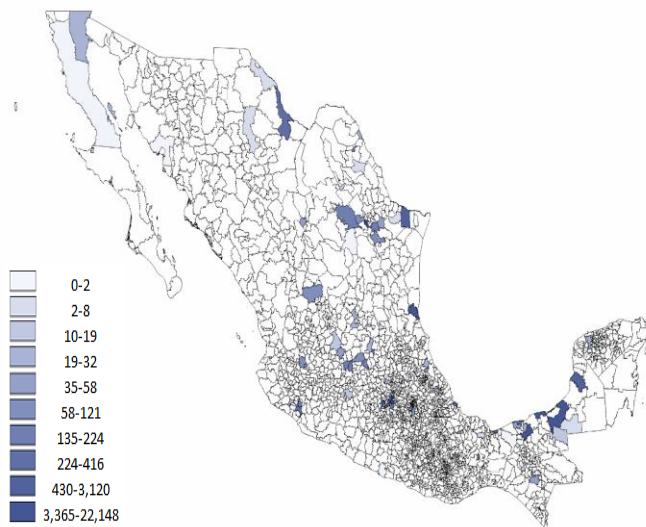
Figures as of September 2016  
Source: CNBV

The fall in oil prices and production capacity has raised concerns over the significant exposure of banks to energy companies, such as Pemex and its supply chain, as well as their weight in the domestic economy and financial system. As can be seen in figure 1, Pemex's supply chain is spread throughout the country. Commercial banks' exposure through loans granted to Pemex and its supply chain, as a proportion of their capital, represented 15.8 and 16.6 at the end of September, respectively. The latter figure considers suppliers of Pemex's suppliers.<sup>14</sup> Commercial banks' exposure to this supply chain has remained stable in recent months, and its credit performance has been similar to that of the rest of the commercial loan portfolio (graph 14b and c).

**Figure 1**  
**Credit Risk Indicators for Commercial Bank Loans to Energy Companies**

a) Geographical Distribution of Bank Loans to Pemex's Direct Suppliers<sup>1</sup>  
Millions of pesos

a) Geographical Distribution of Bank Loans to Suppliers of Pemex's Direct Suppliers<sup>1/2</sup>  
Millions of pesos



1/ Distribution built using corporate loan data in regulatory reports and transactions among them.

2/ A company is considered as a primary supplier if their services are directly provided to Pemex. Companies are regarded as suppliers of Pemex's suppliers if their transactions with a direct supplier represent at least 30 percent of the company's bank credit amount.

Figures as of September 2016

Source: Banco de México and CNBV

<sup>14</sup> A company is considered as a primary supplier if their services are directly provided to Pemex. On the other hand, companies are regarded as suppliers of Pemex's suppliers if they do not provide services directly to Pemex, and their transactions with a direct supplier in any given month represent at least 30 percent of the company's bank credit amount.

In this context, Federal Government programs to inject funds in Pemex and lighten its fiscal burden are noteworthy. This entity hired credit lines from development banks, particularly Nacional Financiera, Banobras and Bancomext, that provided liquidity to meet payments to suppliers. The potential of the new figures introduced by the energetic reform are also worth mentioning. These aim at promoting Pemex's investments in partnership with other companies, and could expedite the fulfillment of investment projects with a more fitting cost structure and greater risk diversification. Fortunately, these support mechanisms have favored that financial corporate hardships do not have an impact on systemic delinquency rates.

### *Consumer Loans*

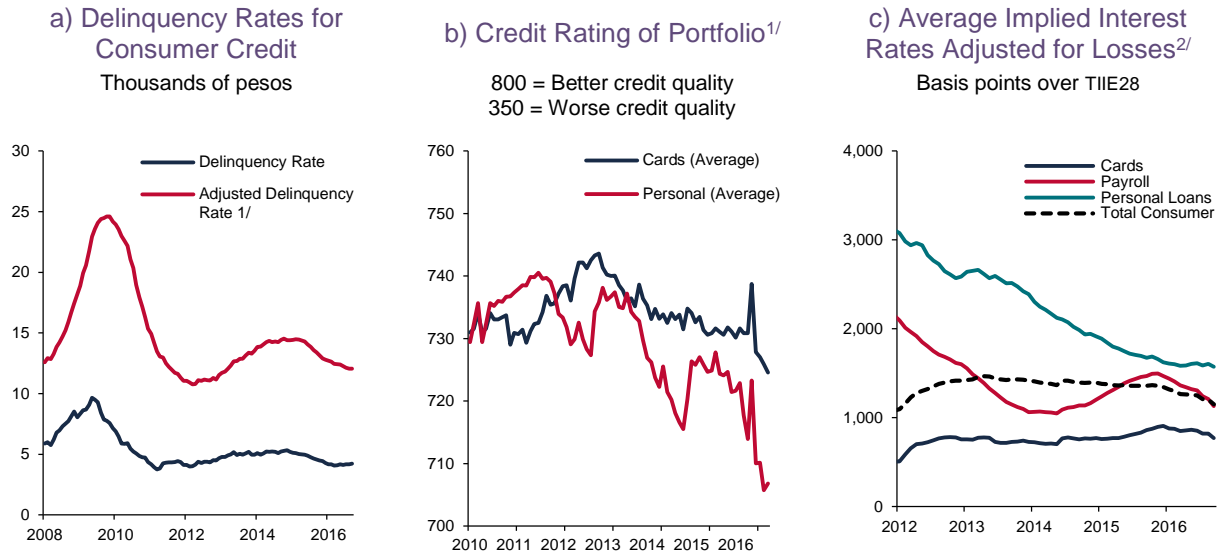
Bank financing to consumption has kept its growth pace in recent years. As of June 2016, consumer loans grew by 11.2 percent vis-à-vis their level of same month last year. Within the consumer credit heading, the growth of payroll and personal loans is worth underscoring. This expansion can be explained to a large extent by the fact that these headings offer highly attractive return margins, even when adjusted for risk level (graph 15c). Even though consumer credit growth has been accompanied by a decline in delinquency rates (graph 15a), such fall is mainly due to the rapid growth of the portfolio, as well as to bank policies to write off delinquent loans, rather than to a risk reduction, as the quality of borrowers of personal and payroll loans has been diminishing (graph 15).<sup>15</sup>

On the other hand, card credit has grown at a moderate pace (graph 16a), with an improvement of risk indicators. There has been a reduction in the average use of credit lines in this heading, although partly owing to more lines offered by banks (graph 16b). On average, the number of cards that people hold has remained stable. This trend is explained by changes in the use of this product. There are more borrowers using it as a means of payment (“totaleros”) than as financing means (graph 16c).

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<sup>15</sup> In order to determine the quality of the portfolio, a credit rating was estimated through a logistic regression model using the loan features reported to the Credit Bureau.

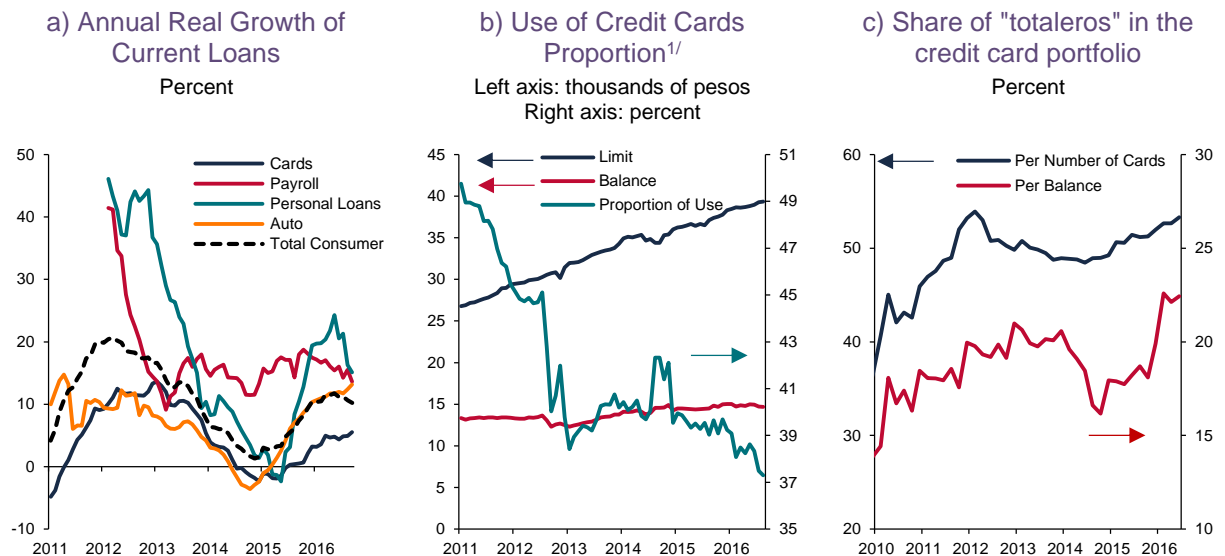
**Graph 15**  
**Credit Risk Indicators for the Consumer Loan Portfolio**



1/ Credit rating obtained through a logistic regression model, using variables about borrowers' payment behavior (existence of delays in payment of other loans), loan features (terms, number of loans or seniority), or macroeconomic conditions (unemployment level, inflation, economic activity or interest rate levels). The regression uses loans 3 months in arrears as a response variable.

2/ The adjusted interest rate is calculated as interests minus reductions and write-offs over the last 12 months divided by the average loan portfolio for the same period.

**Graph 16**  
**Risk Indicators for the Consumer Loan Portfolio**

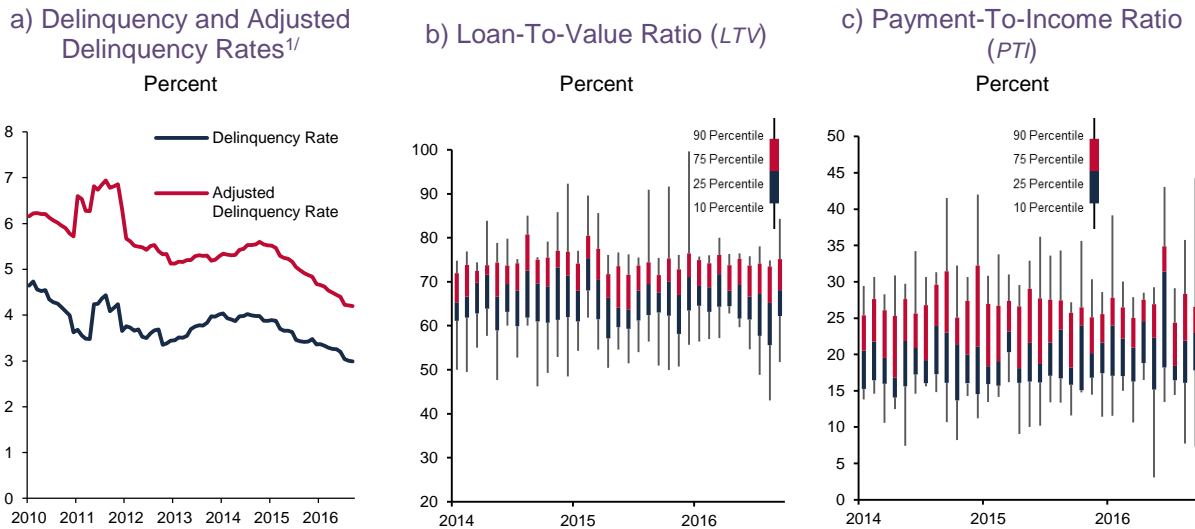


1/ Credit limit includes cards without movements in the last months (inactive cards).

*Commercial Bank Loans for House Purchase*

The real annual growth rate of commercial bank loans for house purchase has remained around 8.5 percent over the last twelve months. Bank loans in this heading have been mainly channeled to the residential segment. The chief indicators of potential risks for this portfolio at the time of loan granting, that is, the Loan-To-Value (*LTV*) and Payment-To-Income (*PTI*) ratios, have remained within their historical values, although with a marginal deterioration in recent months. Empirical evidence shows that there is a close relationship between the *LTV* and the delinquency rate (graph 17b and c). For that reason, the Basel Committee on Banking Supervision proposed a) higher capital requirements for portfolios with higher *LTV* values, and b) to require more granularity than that prescribed by Mexican regulation.<sup>16</sup> These measures would provide adequate incentives for banks to internalize costs related to assuming greater risks.

**Graph 17**  
**Credit Risk Indicators for the Mortgage Loan Portfolio**



Figures as of September 2016  
Source: CNBV

Figures as of September 2016  
Source: CNBV

Figures as of September 2016  
Source: CNBV

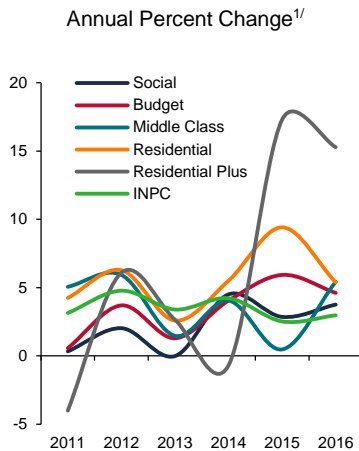
1/ The adjusted delinquency ratio is defined as the sum of past-due plus written-off loans over the previous twelve months, divided by total loans plus total written-off loans over the last twelve previous months.

<sup>16</sup> The last proposal published by the Basel Committee on Banking Supervision in this area can be found online at <http://www.bis.org/bcbs/publ/d347.pdf>.

Average housing prices continue to uptrend, mainly in the higher cost segment; this is more evident in some cities, and delegations of Mexico City. Nevertheless, the rise in Mexican housing prices is still not comparable to that of other Latin America or advanced countries (graph 18).

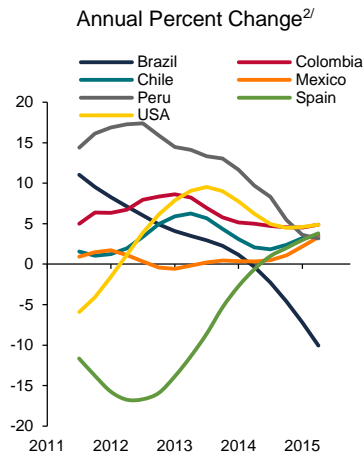
**Graph 18**  
**House Price Indicators**

a) Price per Square Meter by Type of House



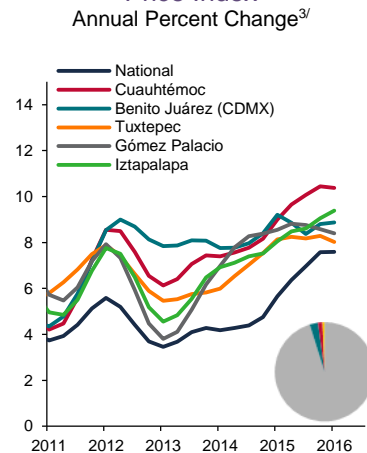
Figures as of September 2016  
Source: Softec, S.C.

b) Real Housing Price Index for Selected Countries



Figures as of December 2015  
Source: Bank for International Settlements

c) Municipalities and Delegations with the Highest Growth in the SHF Price Index



Figures as of September 2016  
Source: SHF and CNBV

1/ The original series is an annual frequency index with base year 2008.

2/ Centered moving average of four quarters. The original series is a quarterly frequency index with base year 2010, published at the end of the period.

3/ Centered moving average of four quarters. The original series is a quarterly frequency index with base year 2013.

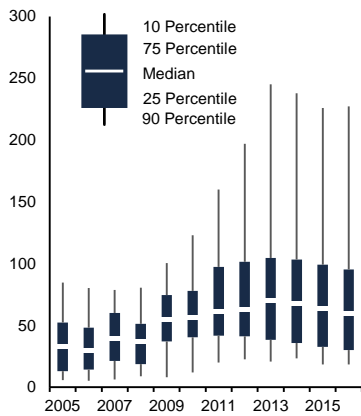
The efficiencies introduced by the financial reform have boosted mortgage loan refinancing (subrogation). An increasing number of borrowers have profited from said efficiencies, having access to credit in better conditions, as banks are confronted with lesser risks, given their payment experience and previous amortization of capital. Risks derived from this process are that “ejecting” banks keep a lower quality portfolio and that competition leads to the underestimation of fund gathering risk, in a scenario of rising rates that may translate into bank losses. Nevertheless, the impact of this kind of transactions is still limited, as it represents less than 5 percent of the mortgage loan portfolio, and it is likely that it will diminish under the current circumstances of rising interest rates. Indeed, in the second quarter of 2016, some institutions started to drive up mortgage loan granting conditions, with rises in applicable interest rates.

*Commercial Bank Loans to States*

Bank loans aimed for state and municipality governments have registered little change over the last two years, and even displayed a contraction as of the last quarter of 2015. This trend can be attributed to the reduction in some states' debt levels (graph 19b). Loan granting conditions have improved, albeit marginally, with longer financing terms (graph 19c). Yet, indebtedness levels are quite heterogeneous (graph 19a). On one hand, we find states like Chihuahua, Coahuila, Nuevo León, Quintana Roo and Veracruz, whose indebtedness levels are higher than their federal contributions. On the other hand, there are entities like Campeche, Guerrero, Querétaro, and particularly, Tlaxcala, with low indebtedness levels.<sup>17</sup>

**Graph 19**  
**Performance of Credit to States and Municipalities**

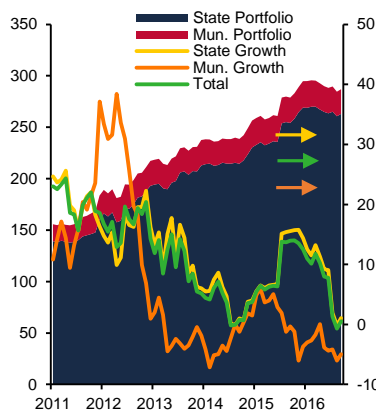
a) Distribution of Debt Owed by States, Municipalities and their Agencies (by State)  
Percentage of contributions



Figures as of September 2016  
Source: SHCP

b) Current Bank Loans and Real Annual Growth

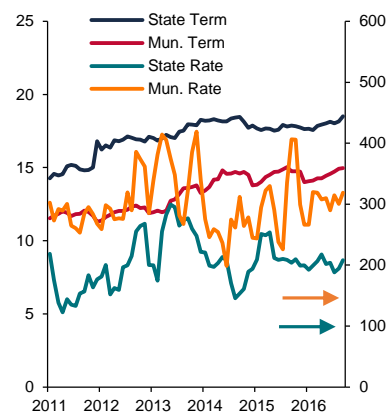
Left axis: billions of pesos  
Right axis: percent



Figures as of September 2016  
Source: CNBV

c) Interest Rate and Average Term of Bank Loans

Left axis: years  
Right axis: basis points over TIIE



Figures as of September 2016  
Source: CNBV

The enactment of the Law for Financial Discipline of States and Municipalities that was released in April 2016 is expected to improve financial discipline in states and municipalities. The general purpose of this act is to put in place more effective checks on states and municipalities' indebtedness, as well as to foster more certainty and transparency in their finance management.<sup>18</sup>

<sup>17</sup> These data can be found on the SHCP State and Municipality Obligations and Loans Registry, which is available on the SHCP website.

<sup>18</sup> The Law considers the possibility that the Federal Government guarantees part of states and municipalities' debt, provided there is an agreement between the local and Federal governments, the corresponding federal contributions are used, guaranteed funds do not exceed local discretionary income, and that, at an aggregate level, debt guaranteed by the Federal Government does not exceed 3.5 percent of national GDP.



The new legal framework also aims at improving competitive conditions in the sector. The hiring of public debt by states has been subject to certain conditions, based on loan terms. For maximum amounts, hiring of these funds must be approved by at least two thirds of local Congress. Refinancing or restructuring does not require authorization from legislative bodies, as long as there is an improvement in interest rates, the outstanding balance is not increased and maturity is not extended. Last, all financing must be hired in best market conditions. In case any state raised money in the stock market, they must justify benefits *vis-à-vis* bank financing.

### Market Risk

Financial institutions are exposed to risks related to changes in the prices of their financial assets. Such risks are actualized by changes in interest rates, exchange rates or stock indexes. Generally speaking, the sensitivity of the portfolio value of Mexican public and private debt securities to interest rate changes slightly increased during the first nine months of 2016, *vis-à-vis* the figures of December 2015. This is mainly the result of changes in the configuration of siefores and development bank portfolios (table 1).<sup>19</sup>

The sensitivity analysis performed with granular data of various investors' portfolios revealed that, in case of a parallel rise in the 300-basis point yield curve, greater losses would be observed in siefores and insurance companies' investment portfolios, due to their longer maturity. In the case of insurance companies, the latest amendments to their regulation require that both assets and liabilities be valued at market prices, so that the aggregate impact of losses can be offset. In the case of siefores, regulation allows for the relaxation of the investment scheme during periods of high volatility.

The results of this analysis also show that losses of different intermediaries, due to a rise in surcharge, have remained at levels similar to those observed 12 months ago. These losses would be lower than those caused by changes in nominal interest rates; this is largely due to the reduced share of instruments subject to surcharge risk in the portfolios. On the other hand, the exchange rate depreciation observed in recent months has not translated into significant losses for commercial banks, thanks to limits to exposure established by current regulation (graph 20).

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<sup>19</sup> We analyzed the effects that changes in the slope and in the shape of the interest rate curve would have on intermediaries' securities portfolio. See for instance Robert L. Litterman and Jose Scheinkman, "Common factors affecting bond returns", *The Journal of Fixed Income*, no. 1 (1) (June 1991): 54–61.

**Table 1**  
**Losses in Securities Portfolios due to Changes in Nominal Interest Rates<sup>1/</sup>**  
 Percentage of Investment Portfolio

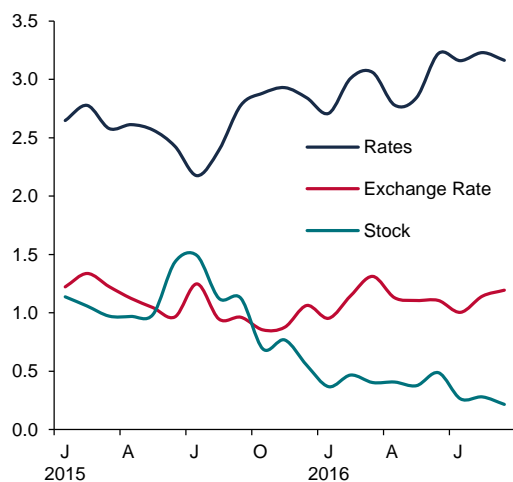
Type of Holder	Nominal Interest Rate			Surcharge		
	300 Basis Point Change			100 Basis Point Change		
	sep-15	dec-15	sep-16	sep-15	dec-15	sep-16
Commercial Banks	3.8	3.9	4.8	1.3	1.3	1.1
Development Banks	2.2	2.0	2.6	2.0	2.1	1.7
Brokerage Firms	1.9	1.8	2.5	1.9	2.0	1.7
Insurance Companies	16.0	16.2	18.2	0.1	0.1	0.3
Siefores	16.1	15.3	12.4	0.1	0.2	0.5
Investment Companies	2.6	2.7	3.2	1.0	0.9	0.8
<b>Weighted Average</b>	<b>6.3</b>	<b>6.2</b>	<b>5.8</b>	<b>1.1</b>	<b>1.1</b>	<b>1.1</b>

<sup>1/</sup> These figures show losses as a proportion of the invested amount when the yield curve increases by 300 basis points or the surcharge increases by 100 basis points.  
 Source: Banco de México

**Graph 20**  
**Market Risk Indicators for Commercial Banks**

a) Value at Risk by Component

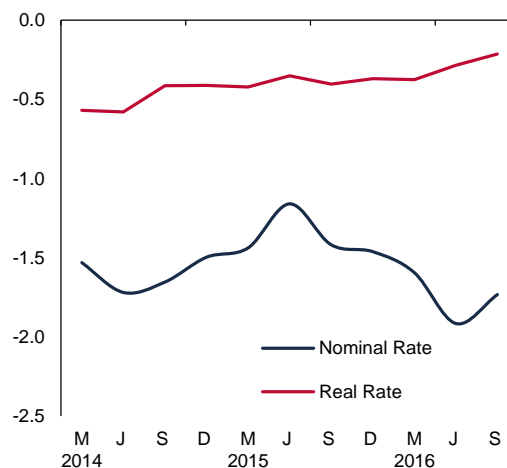
Percentage of net capital



Figures as of September 2016  
 Source: Banco de México

b) Portfolio Sensitivity Given a 100-Basis Point Change in Interest Rates

Percentage of net capital



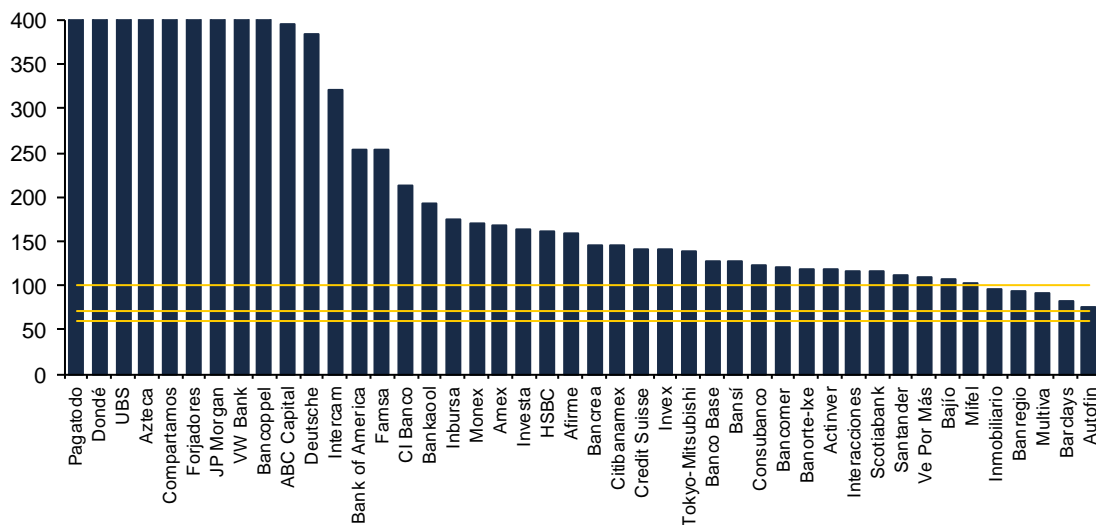
Figures as of September 2016  
 Source: Banco de México

## Liquidity Risk

### Commercial Banks

A new regulation came into effect in January 2015, which binds all commercial banks to keep sufficient liquid assets to face a stress situation for a period of 30 days. This new regulation, known as the Liquidity Coverage Ratio (LCR), is in line with the Basel Committee standards. It establishes minimum requirements that are subject to a gradual increase.<sup>20</sup> This gradual implementation allows banks to a) modify their balance structure, by diminishing transactions or correcting terms that generate higher liquidity requirements, and b) constitute the necessary liquid assets. As of the third quarter of the year, all banks already complied with the required minimum of seventy percent and the vast majority already complied at 100 percent (graph 21).

**Graph 21**  
**Liquidity Coverage Ratio (Average July – September 2016)**  
 Percent



Figures as of September 2016  
 Source: CNBV

<sup>20</sup> In 2015, the initial minimum requirement for the LCR was 60% for the largest banks in the system, and it increases by 10 percentage points per year; up to 100% that will have to be met as of January 2019. All other banks follow a lagged schedule. In particular, for banks with at least five years of operations at the time of implementation of this rule, the required minimum was compulsory as of July 2015 and increases by 10 percentage points in July every year.

Currently, the LCR is reported to authorities once a month. However, looking forward, banks' efforts shall focus on strengthening their ability to accurately calculate and report their LCR on a daily basis. In conformity with the *General Provisions on Liquidity Requirements for Commercial Banks*, as of January 2017, banks must report daily the computation of their LCR, as well as all necessary information for their validation.<sup>21</sup> This will ensure that intermediaries keep enough liquid assets on a daily basis to face any stress shock that may arise. In addition, some banks must continue diversifying their liabilities to preclude excessive financing dependence on a few counterparties.

All banks' efforts put in place so far to meet the LCR have had little impact on the structure of their liabilities. At the moment, the Mexican banking system obtains, on average, less than 20 percent of its total funds in the wholesale market, although this figure has been increasing lightly over the last few years. In turn, funding through repo operations, mainly repos of sovereign bonds, has decreased in about one third over the last two years. This funding has been partially replaced by an increase in unsecured wholesale funding and debt issuances (graph 22a).

It is possible that the replacement of funding through repos with other sources may be due to the coming into effect of the liquidity ratio, as the regulation requires banks to maintain on their balances assets with high credit quality, that are not encumbered as guarantees for repo transactions (graph 22b).

Despite the above-mentioned changes in the structure of liabilities, funding costs for the system as a whole, have not changed significantly, and their recent evolution reflects changes in Banco de México's 1-day target rate (graph 22c).

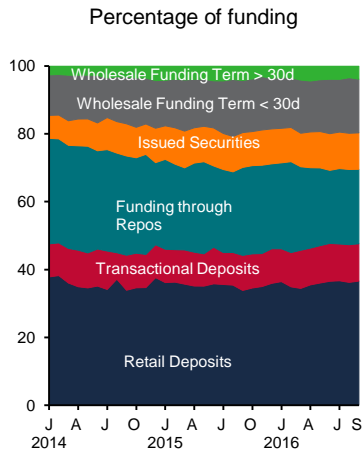
In the short term, banks must undertake additional adjustments to their funding structure, with the purpose of meeting the second liquidity standard of the Basel Committee, the Net Stable Funding Ratio (NSFR). Since this is a liquidity requirement of structural nature, the necessary adjustments to the funding structure could be meaningful for some banks, in order to meet this standard. It should be stressed that banks, as a whole, have enough stable funding to cover their loan portfolio (graph 23).

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<sup>21</sup> Nevertheless, during 2017 banks will continue to use data pertaining to the last day of the month, to be classified based on their LCR level.

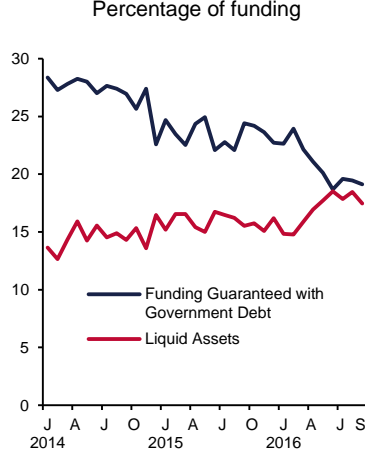
**Graph 22**  
**Evolution of Funding Received by Banks and its Cost**

a) Changes in Banks' Liability Composition



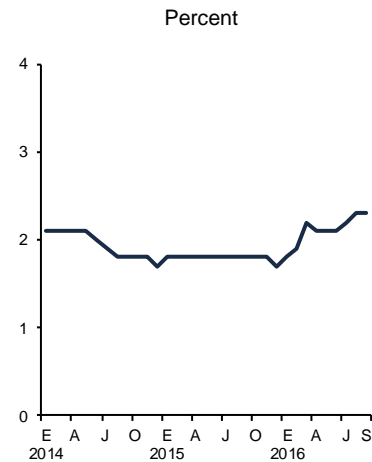
Figures as of September 2016  
 Source: Banco de México

b) Funding through Repos with Government Debt and Liquid Assets



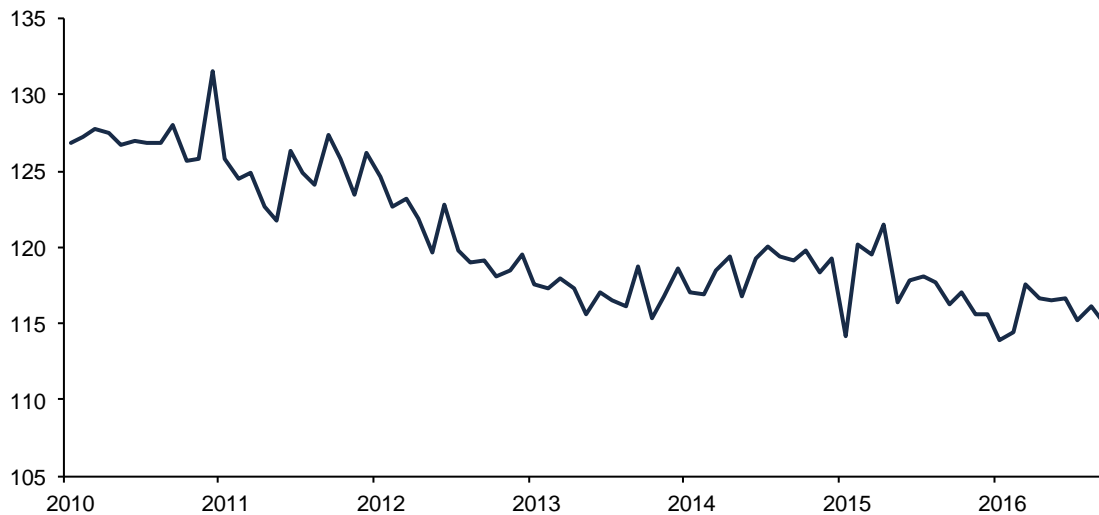
Figures as of September 2016  
 Source: Banco de México

c) Total Cost of Funding



Figures as of September 2016  
 Source: Banco de México

**Graph 23**  
**Stable Funding Over Loan Portfolio <sup>1/</sup>**



Figures as of September 2016  
 Source: Banco de México

<sup>1/</sup> Stable funding consists of demand deposits and deposits from the general public, funds with term to maturity longer than one year, and stockholders' equity.

### *Debt Funds*

Investment funds represent an appealing alternative for savers and investors, as they provide market yields and represent an immediate or short-term liquidity option. However, precisely these liquidity features could make intermediaries more vulnerable to massive withdrawals during stress scenarios.

For the purpose of making up a diversified mix in terms of liquidity and return, investment funds typically invest certain percentage of their portfolios in liquid assets, and the rest in other less liquid instruments. In case an investment fund portfolio suffers a loss, intermediaries are not legally bound to reimburse their customers the original invested amounts, but the adjusted value of the stocks, using their respective market price.

During episodes of financial turbulence, savers using investment funds may anticipate a deterioration in the value of the portfolio and have incentives to request the redemption of their stocks. If redemptions multiply and exhaust the liquid assets of funds, managers will be forced to start selling less liquid assets, possibly with a significant loss. Were this anticipated deterioration to actualize, clients would experience losses in their investments, and a “run” against the fund could be triggered, as customers would try to withdraw their funds before losses are bigger.<sup>22</sup>

For all these reasons, investment funds must manage their liquidity risk in a prudent and proactive manner. This means they will have to do so according to their portfolio configuration, redemption conditions agreed with customers (according to prospectus: cap on redemptions during turbulence episodes and maximum term to payment), their customers’ profile, and the available crisis management tools (suspensions, side-pockets, redemption fees, etc.).

In Mexico, the prices of certain investment funds’ assets fell sharply during the 2008 crisis, as a result of considerable investors’ redemptions. Nevertheless, since that year, a constant growth of resources channeled to investment funds has been observed (both debt and equity). Since then, assets managed by these funds have gone up fourfold.

Currently, the features of debt funds in Mexico have made them less vulnerable to potential episodes of massive redemptions. There are at least two reasons for this: first, the proportion of debt funds that offer daily liquidity to their clients has been gradually going down since 2008 (graph 24a)<sup>23</sup>; second, government securities and highly liquid assets make up the majority of the portfolio of debt funds

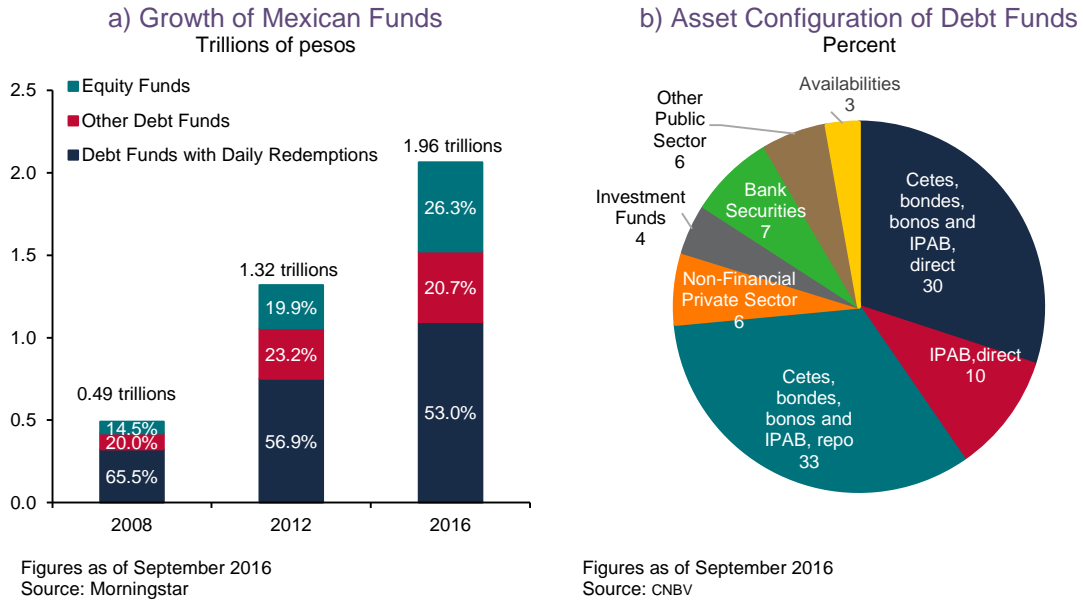
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<sup>22</sup> If this occurred simultaneously in various funds, in fear of possible contagion, investors from other unaffected funds might also have incentives to request the repurchase of their stocks.

<sup>23</sup> As shown by this graph, debt funds manage 73.5 percent of all investment fund assets. In 2008, when the fund industry was just starting, debt funds managed 85.5 percent of all funds.

(graph 24b). Therefore, most of these funds have enough liquidity to face potential simultaneous redemptions, even during times of stress.

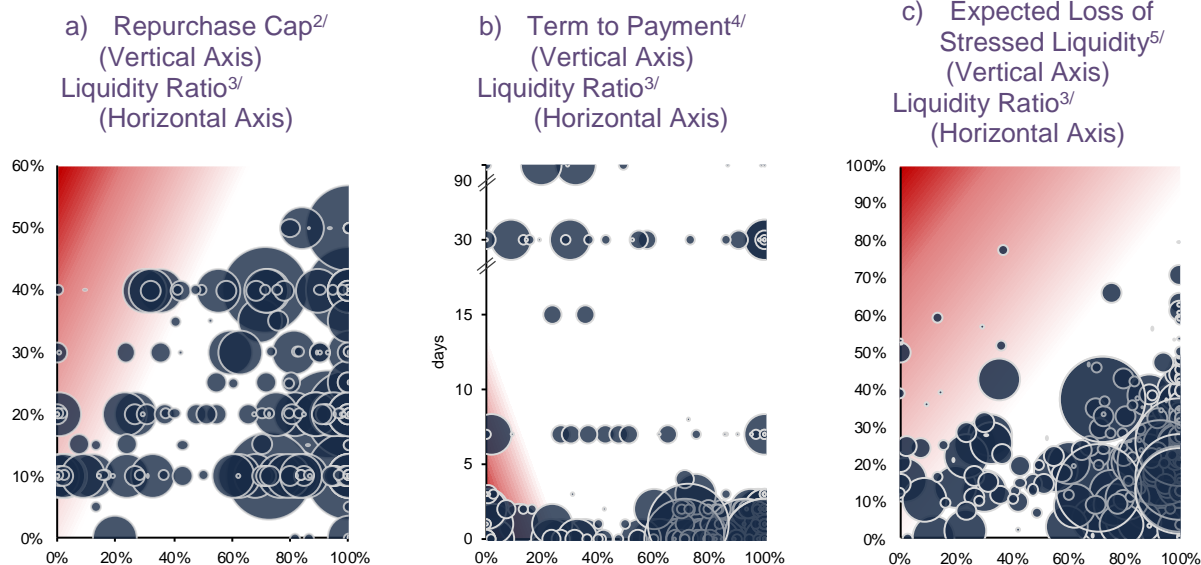
**Graph 24**  
**Growth and Configuration of Mexican Funds**



An analysis of debt funds in Mexico confirms that most of them have enough liquidity to face withdrawals, in accordance with the three following concepts: repurchase cap, maximum term to payment and redemptions under stress scenarios (graph 25). The first concept measures if each fund has enough liquid assets to face unforeseen redemptions, according to the mandatory minimum redemption specified in the prospect. The second concept assesses whether the fund, according to the compulsory term to payment, has enough liquid assets to redeem in time (the shorter the term, the greater the need to have liquid assets). The third concept measures whether a fund has enough liquid assets to face an episode of redemptions of a magnitude similar to that of the most adverse scenarios faced since January 2008.

The analysis based on these three factors confirmed that, as of today, and in accordance with their features and history, the vast majority of funds have enough liquid assets. However, there are still certain funds that, on the basis of one or more of the above-mentioned criteria, must increase their holdings of liquid assets.

**Graph 25**  
**Liquidity Risks of Investment Funds<sup>1/</sup>**



Figures as of September 2016

Source: CNBV, Morningstar and investment fund prospects

1/ Each circle represents a debt fund. The size of the circles is associated with the size of funds, which have been classified into five groups according to net assets. After ordering funds from smaller to larger sizes, the first quartile funds are classified into group one, the second quartile into group two, and the third quartile into group three. Group four is made up of funds from the last quartile, except for the 7 largest funds, which are part of group five.

2/ The repurchase cap corresponds to the minimum amount of the nominal value of stocks, expressed as a proportion of total net assets that the fund agreed to repurchase in any given request period.

3/ The liquidity ratio is the proportion of liquid assets divided by total assets. Liquid assets are bank deposits, cetes, bondes, bonos, udibonos, and direct and repo BPA.

4/ The repurchase term is defined as the days that go by between the stock repurchase request and its effective settlement. It includes the request, execution and settlement periods.

5/ The expected loss of stressed liquidity is defined as the average outflows in the 95 or highest percentile of the corresponding distribution, according to historical data.

Additionally, in conformity with prudential regulation issued by the CNBV, funds could eventually resort to other tools in case of rare episodes of redemption requests.

Interestingly enough, some of those tools already existed before the international crisis of 2008. For instance, in the face of disorderly market conditions and high volatility, investment funds can suspend redemptions to prevent runs that may trigger anticipated sales of assets that would cause losses in their portfolios. Investment funds may also establish caps to daily stock repurchases.<sup>24</sup>

With the purpose of improving the regulatory framework, the CNBV issued a series of additional reforms aiming at providing funds with more instruments to withstand liquidity pressures in stress scenarios. In particular:

- a. *Investment Service Obligations.* Although requirements to issue investment recommendations to customers were already

<sup>24</sup> See Article 9 of the Investment Fund Act.



applicable to banks and brokerage firms, in October 2015, the CNBV prescribed the same obligations for investment fund managers and distributors supplying portfolio management and consultancy services. Specifically, those entities must identify their customers' financial situation, knowledge and expertise, as well as investment objectives, and maintain consistency between their customers' investment profile, the financial products they offer and the diversification policies of their portfolio both for mentored and non-mentored services. This measure seeks to align fund investment strategies with customers' risk tolerance.<sup>25</sup>

- b. *Side-pockets*. As of January 2014, funds were granted the possibility to split up, with previous authorization by CNBV, either by disappearing or carrying on operations with special permits. This allows highly volatile assets to be separated from the portfolio and that such part remains in operation as a closed fund. It also contributes to more efficient risk management, thereby reducing the impact on the price of other assets with a regular performance.<sup>26</sup>
- c. *Tiered Pricing*: With the purpose of curbing incentives to panic repurchases, in case of disorderly market conditions, as of the financial reform of 2014, investment funds can apply a downward spread to the repurchase valuation price in their stocks, provided said conditions prevail.<sup>27</sup>

Additionally, in June 2016, the Financial Stability Board (FSB) published a consultative paper whereby some structural vulnerabilities related to asset managers' activities were identified (including investment fund managers).<sup>28</sup> This document puts forth a series of recommendations to cope with such vulnerabilities, that are classified in four areas: i) mismatches between repurchase promises offered by funds in their prospectuses and their investment liquidity;<sup>29</sup> ii) leveraging; iii) transactional risk; and iv) securities loans. The FSB shall issue a final document by the end of this year. Once published, the IOSCO shall issue, as of the end of 2017, more concrete guidelines about FSB recommendations.

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<sup>25</sup> Regarding the major aspects related to investment fund services, see articles 39 bis through 39 bis 5 of the Investment Fund Act, as well as the *General Provisions Applicable to Financial Entities and Other Persons Providing Investment Services*.

<sup>26</sup> See article 14 bis 4 of the Investment Fund Act.

<sup>27</sup> See article 15 of *General Provisions Applicable to Investment Funds and their Suppliers*.

<sup>28</sup> Financial Stability Board, Consultative Document: Proposed Policy Recommendations to Address Structural Vulnerabilities from Asset Management Activities (June 22, 2016), <http://www.fsb.org/wp-content/uploads/FSB-Asset-Management-Consultative-Documents.pdf>

<sup>29</sup> Among FSB recommendations to deal with fund liquidity problems, we find: higher requirements for fund managers' disclosure to investors and authorities, and the execution of stress tests following financial authorities' guidelines.

### *Brokerage Firms*

Brokerage firms are not free from exposure to liquidity risk, which could materialize as a result of any given market shock. In consequence, it is plausible to assess these intermediaries' ability to cope with a market stress scenario and a potential adverse liquidity situation, thereby measuring the sensitivity of their portfolio's value to changes in interest rates.

We have therefore performed stress tests on margin calls<sup>30</sup> to which brokerage firms could be subjected, in case of extreme, albeit plausible, scenarios. We also performed an estimation of the impact of extreme losses in government securities on the value of brokerage firms' liquidity reserves. Once the assessment of the possible impact on margin calls and available liquidity was concluded, we estimated liquidity surpluses or deficits for every brokerage firm. For this, we considered, as a starting point, transactions with derivatives and repo transactions with government securities as of June 2016, as well as available liquid assets as of that date.

Results showed that, in a stress scenario, some brokerage firms with significant liability repo positions would not have enough liquidity to cope with margin calls, and thus, they could have difficulties to keep on financing their securities holdings through those transactions. This situation could be alleviated by increasing haircuts to repo transactions.

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<sup>30</sup> Margin calls are the demand of a compensatory deposit in cash or securities, with the purpose of reestablishing the initially agreed value of a guarantee, which was previously constituted to ensure payment of a financial obligation. See Banco de México, "Las 'llamadas al margen' y el apalancamiento" (Margin calls and Leverage), [www.banxico.org.mx](http://www.banxico.org.mx).

### Effects of International Regulation

In spite of volatility observed over this year in international markets, Mexican debt liquidity has not suffered significant changes. Nevertheless, an econometric exercise suggests that changes introduced by international regulation have had a negative impact on liquidity levels (box 3).<sup>31</sup> On one hand, the increase applicable to capital requirements for trading positions has diminished appetite for risk among financial intermediaries; and thus, it has also affected their share in debt markets.

In particular, this study threw evidence that regulatory changes that directly and indirectly affect banks' incentives to hold securities on their balances also reduced their liquidity positions,<sup>32</sup> whereas those that increased transparency in market transactions (Dodd-Frank Act and Volcker rule) did not have a negative impact.

Graph 26 shows in blue the weekly turnover rate of Mexican government securities. This index is defined as the traded volume of securities divided by outstanding securities; the higher the ratio, the more liquid the market.

The smoothed series of weekly turnover is presented in red. This suggests that there has been a decline in market liquidity, derived from the lower turnover of securities. Estimates indicate that turnover decreased by 11.1 percent due to the introduction of Basel 2.5, and by 16.7 percent due to Basel III. Last, the aggregate effect of regulatory changes was a reduction of 20 percent.<sup>33</sup>

From a different perspective, in order to demonstrate whether regulatory changes can be regarded as structural changes, we used certain econometric methodologies. The basic notion thereof is to be able to identify the "likeliest" moments in which a structural change can be observed in the government securities turnover time series. Structural changes identified thanks to this exercise were related to the 2008 financial crisis, as well as to the publication of the above-mentioned regulatory changes.

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<sup>31</sup> The regulatory changes analyzed include: (i) Basel 2.5, (ii) Basel III, (iii) the Liquidity Coverage Ratio, (iv) the Dodd-Frank Act and (v) the Volcker rule.

<sup>32</sup> As implied by the liquidity requirement, either by an increase in the capital requirement (Basel 2.5), general increases in capital (Basel III), or by the obligation to keep securities untraded.

<sup>33</sup> International standards contained in Basel 2.5 came into effect in July 2009, and those stemming from Basel III in December 2010.

Box 3

**Impact of International Regulation on the Liquidity of Debt Markets**

According to the International Monetary Fund, debt securities market liquidity has been declining in recent years.<sup>1</sup> It has been observed that the average amount of government debt securities has diminished, and the weekly turnover of such instruments has a negative trend. Hence, in order to assess whether market liquidity changes can be explained by the introduction of international regulations, we performed an analysis of the performance of various liquidity measures for debt securities denominated in pesos issued by the Mexican government. For this purpose, the following econometric model was employed:

$$L_t = \alpha + \sum_i \beta_i D_{it} + \sum_j \gamma_j VC_{jt} + v_t,$$

where  $L_t$  is a liquidity measure that can be explained by a series of dichotomic variables,  $D_{it}$ , which take the value of 1 when the regulatory change occurred (Basel 2.5, Basel III, LCR, Dodd-Frank Act and the Volcker rule),  $VC_{jt}$  is a set of global and local dAe control variables (VIX, VIMEX, S&P 500 return, MXBOL return, MXN/USD exchange rate, 28-day TIE and US federal fund rates). The following box shows the results of model estimation for the weekly turnover of debt securities ( $L_t$ ):

**Estimation Results**

Turnover <sup>2</sup>	
Variables	Coefficients
Basel 2.5	-0.0136** (0.0057)
Basel III	-0.0378*** (0.0103)
LCR	-0.03805*** (0.0075)
Dodd-Frank Act	0.0300*** (0.0099)
Volcker Rule	0.0300*** (0.0069)

$R^2 = 0.1288$ , Observations: 561, constant: yes.  
Robust standard errors in parenthesis \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

These results suggest that the publication of Basel 2.5, Basel III and the LCR have indeed negatively affected liquidity in Mexican sovereign debt securities. In contrast, the effect of the Dodd-Frank Act and the Volcker rule has been positive. It is worth mentioning that the Dodd-Frank Act does not penalize transactions with government securities, and this undoubtedly contributes to inducing a positive effect on sovereign securities liquidity. For the Mexican government debt securities market, the above-mentioned conclusion validates the IF hypothesis that implemented regulatory changes have translated into severe constraints on banks' balance configuration and the reduction of liquidity (Basel 2.5, Basel III and the LCR); whereas, in the opposite sense, norms promoting greater transparency (Dodd-Frank Act and Volcker rule) have increased debt securities liquidity. Results for other liquidity measures such as price-quantity elasticity and the change in government securities holdings by foreigners were similar in quantitative and qualitative terms.

Last, in order to verify the robustness of the model, a control variable was introduced, so as to capture the effects of the global financial crisis on Mexico.<sup>3</sup> Other econometric

specifications were estimated to include endogenous structural changes in the analysis.

As far as robustness tests are concerned, we ultimately used the Quandt statistic to analyze whether there was a structural change in the government securities weekly turnover.<sup>4</sup> The Quandt statistic can be expressed as follows:

$$Q = \sup_{t \in T} \{WT_1, WT_2, \dots, WT_N\},$$

where  $WT_\tau$  represents the Chow statistic<sup>5</sup> for the turning date  $\tau$  and the set  $T = \{1, \dots, N\}$  contains all dates on which a structural change can be observed. Andrews demonstrated that the Quandt statistic has the following asymptotic distribution<sup>6</sup>:

$$Q \sim \sup_{s \in T} \frac{Z(s)'Z(s)}{s}$$

where  $Z(s)$  is a dimension vector  $p$  with Brownian independent processes. With this distribution, it is possible to estimate the critical values for the Quandt statistic.

In order to estimate said statistic, we used an econometric model that assumes that government securities turnover follows a constant average:

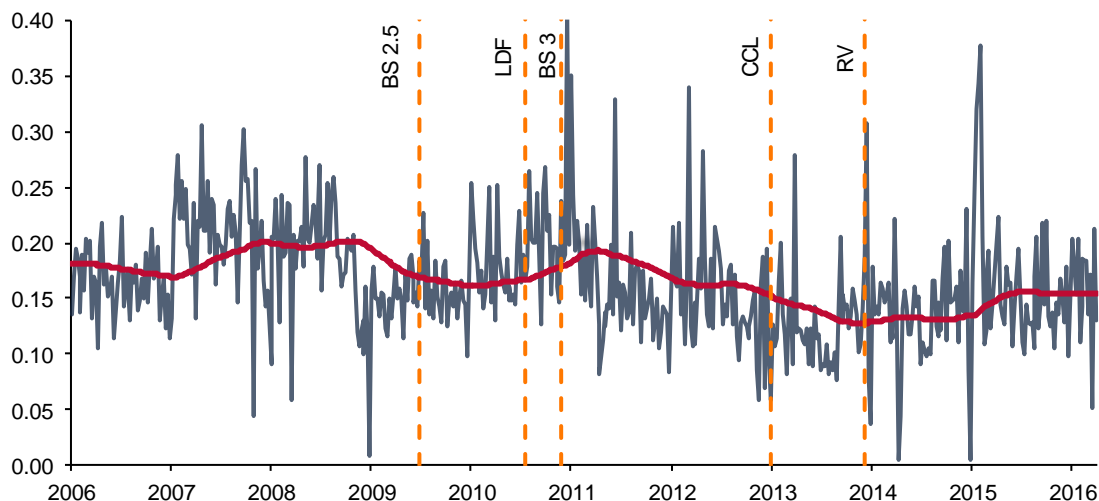
$$R_t = \alpha + v_t.$$

In order to verify this model, we selected a date from which data were divided into two subsamples (prior and after that date). Then, the model was estimated for both subsamples. Finally, this process was replicated for all dates that are part of the sample.

We found statistical evidence that shows that the weekly turnover of government securities suffered structural changes in the weeks following the publication of regulatory changes. These results, together with the initial exercises, support the conclusion that changes in the international regulatory market did affect the liquidity of Mexican government debt securities.

<sup>1</sup> International Monetary Fund, "Market Liquidity—Resilient or Fleeting" in *Global Financial Stability Report* (October 2015): 51-52.  
<sup>2</sup> Normality assumptions were validated. The HAC model was run using the correction for residuals. Also, individual time series were analyzed for other sectors (banking and corporate), with similar results. The model is robust with different econometric specifications.  
<sup>3</sup> Michael Dooley and Michael Hutchison, "Transmission of the US subprime crisis to emerging markets: Evidence on the decoupling–recoupling hypothesis", *Journal of International Money and Finance* 28 no. 8 (December 2009): 1331-1349.  
<sup>4</sup> Richard Quandt, "Tests of the Hypothesis that a Linear Regression Obeys Two Separate Regimes", *Journal of the American Statistical Association* 55, no. 290 (June 1960): 324–30.  
<sup>5</sup> The Chow statistic is introduced in Gregory C. Chow, "Tests of Equality Between Sets of Coefficients in Two Linear Regressions", *Econometrica* 28 no. 3 (1960): 591–605.  
<sup>6</sup> Donald W.K. Andrews, "Tests for Parameter Instability and Structural Change with Unknown Change Point", *Econometrica* 61 no. 4 (July 1993): 821–856.

**Graph 26**  
**Weekly Turnover of Government Securities<sup>1/</sup>**  
 Times the number of placed debt securities



Figures as of August 2016

Source: Banco de México

1/ The red series represents the weekly turnover of government debt securities using an exponential double filter with  $\lambda=0.05$ .

### Contagion Risk

The financial system structure and the degree of interconnection among its participants can be characterized and studied via the transactions that financial institutions conclude between them. These financial transactions trigger a network of bilateral risk exposure, which changes in time depending on business needs of participants in the financial system.

The analysis of the bilateral exposure network is useful to perform simulations of contagion risk within the financial system. We present below the risk analysis results of direct contagion to the rest of the system that would actualize, given the unexpected default on payment obligations by one financial entity.<sup>34</sup>

<sup>34</sup> The contagion risk analysis presented in this *Report* is similar to those performed in previous editions. In particular, we used a methodology similar to that explained in the *Financial System Report* published in May 2007. According to this methodology, direct contagion actualizes when an institution defaults on obligations, making other institutions not honor their financial transactions. Just as in the *Financial System Report 2014*, we analyzed a network that not only includes commercial banks, but also insurance companies, development banks, brokerage firms, investment funds, foreign central governments, siefores and other domestic and foreign financial institutions. For every date of the period considered for this study, we used the worst chain of potential contagion as reference, which is defined as that which would generate a greater impact on the system. Impact is measured as the sum of the value of banks' and brokerage firms' assets, whose capital adequacy ratio was below 8 percent and capital consumption index above 100 percent, respectively. The aggregate bilateral exposures that we studied in these direct contagion exercises were generated from: net creditor position for deposits and loans, securities holdings, positive net valuation of derivatives contracts, and net creditor position of guarantees, repos, securities loans and value date transactions.

Contagion risk was analyzed for two sets of data. The first set is based on monthly data, whereas the second on daily data. Both databases cover the period from October 2013 through June 2016. As for coverage, monthly data include a broad group of financial institutions,<sup>35</sup> whereas daily information only takes into account the exposure network of and between banks and brokerage firms. The objective of using two sets of data is to capture contagion risk change and performance on a daily basis, and to compare it with the results obtained from available monthly data at the end of the month. Hence, it is possible to study both the effect of regulatory requirements that intermediaries must meet on banks, and the impact on contagion risk in the financial system as a whole.

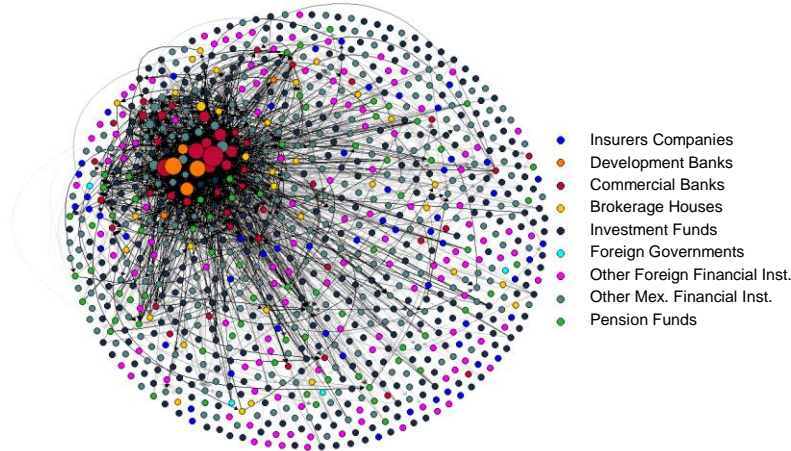
Figure 2 shows the exposure network among diverse entities that are part of the Mexican financial system as of June 30, 2016. This image also illustrates the performance of the most relevant intermediaries, measured by the size of their exposure (width of arches). Thanks to this image, we can describe this network as heterogenous and complex, and having a great number of connections. The concentration and high connectivity of commercial banks, development banks and brokerage firms (red, orange and yellow nodes, respectively) are also worthy of mention. Commercial bank nodes are generally bigger than those of other entities, which suggests a greater number of connections with other nodes in the network.<sup>36</sup>

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<sup>35</sup> The risk analysis of monthly direct contagion includes a broad set of financial institutions; namely, 119 foreign financial groups, 133 foreign non-bank financial intermediaries, 47 commercial banks, 6 development banks, 33 brokerage firms, 327 investment funds, 77 siefors, 56 insurance companies, and other 125 financial intermediaries.

<sup>36</sup> The size of nodes (or apexes) presented in the graph is proportional to every node's degree within the network, where a node's degree is defined as the number of arches involved in said node (number of arches incident to the node, in the case of a directed network).

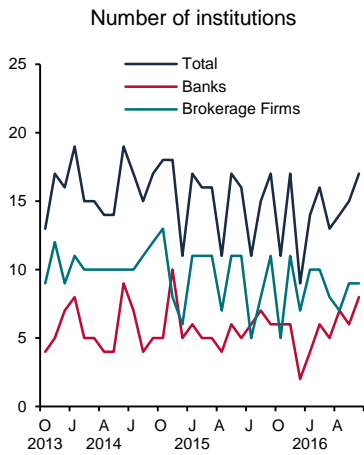
**Figure 2**  
**Mexican Financial System Exposure Network**



Figures as of June 30, 2016  
Source: Banco de México

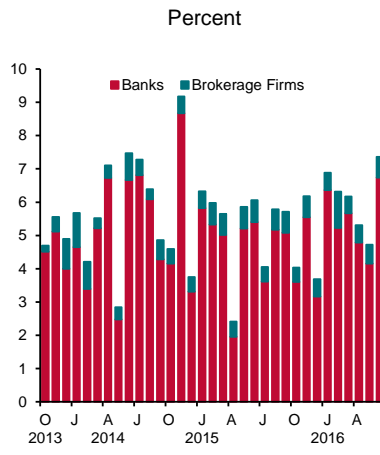
**Graph 27**  
**Indicators of Direct Contagion in the Financial System**

a) Banks and Brokerage Firms with Capital Levels Below 8 Percent in Case of Worst Chain of Contagion



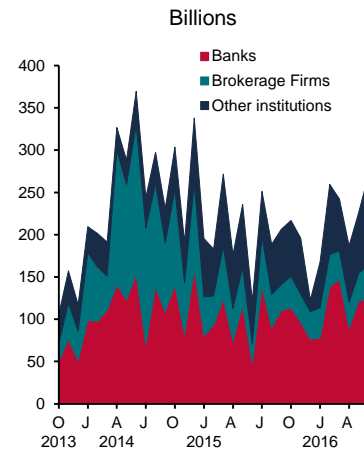
Figures as of June 2016  
Source: Banco de México

b) Percentage of Total Assets of Banks and Brokerage Firms Involved in Worst Chains of Contagion



Figures as of June 2016  
Source: Banco de México

d) Maximum Loss by Type of Intermediary in Case the Worst Chain of Contagion was Triggered



Figures as of June 2016  
Source: Banco de México

As can be seen in graphs 27a and 27b, the number of institutions and percentage of assets that might be severely affected, in case the worst possible chain of contagion was triggered, has remained relatively constant throughout time. Yet, graph 27c also shows that all system losses, given exposure to institutions that would go bankrupt, would be lower in 2016 than in 2014. This indicates that the magnitude of exposures of institutions that are more vulnerable to contagion risk has diminished. An institution is more vulnerable to contagion risk when its exposure to other intermediaries is large and very concentrated.

Although regulations relative to capital and liquidity set forth daily obligations, the data that authorities use to verify compliance belong to the last bank working day of the corresponding month. Hence, the fact that institutions subject to regulation modify exposures affecting their capital and liquidity at the end of the month, with the purpose of improving minimum levels required by regulation, is a widely accepted international practice. For this reason, authorities have increased the frequency and granularity of data collected by such institutions.<sup>37</sup>

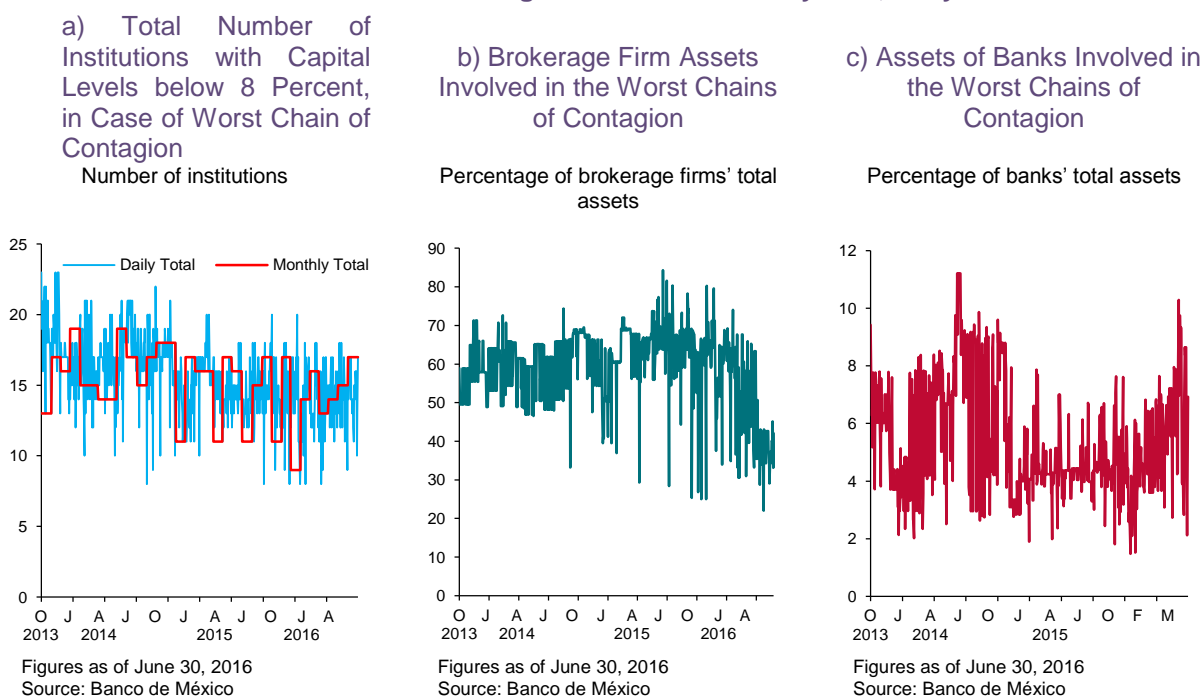
Particularly, when comparing the results of analysis performed with daily and monthly data, we found that the latter underestimate the number of institutions involved in the worst chain of contagion (graph 28a), but not the amount of associated losses. This last result indicates that smaller-sized institutions more frequently undertake the practice of modifying exposures at the end of the month. On the other hand, the use of daily data indicates that brokerage firms could exhibit higher vulnerability to the system, in case of a contagion process (graphs 28b and c).

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<sup>37</sup> This performance is an example of the Goodhart's law, that states that, when a measure becomes a policy target, it loses its effectiveness as indicator. In this case, when liquidity or capital requirements are established in terms of any given variable, they lose their effectiveness as risk indicators, as they can become part of banks' strategic game to comply with regulation. See Charles A. E. Goodhart, "Problems of Monetary Management: The UK Experience", *Papers in Monetary Economics*, Reserve Bank of Australia.



**Graph 28**  
**Indicators of Direct Contagion in the Financial System, Daily Data**



### Other Financial Entities and Activities

There is a growing trend at an international level to grant financing via market instruments, as well as via entities not subject to traditional banking regulation. This process is also contributing to technological innovation, which enables the application of mechanisms that relate credit suppliers and demanders. These mechanisms have allowed a rapid growth of new funding channels characterized by lower costs and the fact of not being subject to traditional banking regulation.

Within the instruments created in recent years in Mexico besides securitizations, we find: development capital certificates (DCCs), exchange-traded funds (ETFs), infrastructure and real estate trusts (Fibras), investment projects senior trusts bonds (cerpis) and national education infrastructure certificates (CIEN).

In addition to the above-mentioned instruments, some non-bank financial intermediaries are already financing certain economic sectors. The implied risks therein depend on the specific business model chosen, and this is why there is specific regulation for most of them (table 2). In Mexico, most of these activities are regulated and overseen in order to mitigate incurred risks. In fact, efforts have been made to include entities and activities that were not regulated before within the regulatory perimeter.<sup>38</sup> The size of funding granted by

<sup>38</sup> With the coming into effect of financial reform initiatives in January 2014, a new requirement was introduced for non-regulated sofomes issuing debt in markets or having property links with other regulated financial entities. They were required to turn into regulated entities with special regulation, as the case may be (see table 4 in Banco de México,

entities and instruments not subject to traditional banking regulation is small, considering the size of the financial system (18.8 percent as of June 2016); and some activities have recorded high growth from a very low base.

### Fintech Financial Services

Specifically, technological development and the search for more efficient financial services have led financing through platforms to gain in importance. The group of intermediaries offering this type of financial services is known as *Fintech (Financial Technology)*.<sup>39</sup> The technological progress has brought down the costs of financial data gathering, processing and dissemination.

In Mexico, there are already certain financial intermediaries that have adopted various Fintech models. In particular, some have specialized in offering microcredit to individuals and small- and medium-sized companies through internet (*online lending*),<sup>40</sup> whereas others have applied *crowdfunding*.

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*Financial System Report* [November 2015], 74). Furthermore, available data on borrowers' performance improved substantially, as these entities are bound to report their profile to at least one credit information bureau. This information allows both financial authorities and other intermediaries to perform analyses about both customers and the risks faced by such intermediaries.

<sup>39</sup> *Fintech* platforms can be classified according to the type of business model they develop: i) crowdfunding platforms, which can execute debt, capital and rewards transactions, ii) electronic money platforms, through which it is possible to store value digitally *vis-à-vis* receipt of legal tender, in order to effect payments or transfers, iii) virtual asset platforms, which are digital units whose creation and transaction are based on cryptography. Although this does not represent a legal tender nor has withdrawal effects, it can be used as a means of exchange to carry out commercial transactions or store value in a digital medium convertible into legal tender; and iv) development platforms, which are at an initial operating stage, aiming at implementing a new type of model that will bring along technological innovation.

<sup>40</sup> According to *Finnovista (Fintech Radar)* data, these represent 16 percent of *Fintech* in Mexico. In order to assess credit risk, some of these entities use social media analysis, statistical algorithms and *Big data*.

**Table 2**  
**Regulation and Risks Related to Other Financial Entities and Activities <sup>1/</sup>**

Entity / Instruments / Activity	Type of Risk:			Total Assets Billions of pesos	Real Annual Change 2T16-2T15 Percent	Regulation:		
	Term Transfer	Leverage	Runs			Capitalization	Liquidity	Leverage
Debt Funds	✓		✓	1,498	1.0		✓	
Infrastructure and Real Estate Trusts (fibras) 2/		✓		260	2.5			✓
Real Estate Trusts (no fibras) 2/	✓	✓		12	28.0			✓
Development Capital Certificates (DCC) 2/		✓		115	21.0			✓
Energy and Infrastructure Trusts (fibra E) (cerpis)		✓		n.a.	n.a.			✓
Education Infrastructure Certificates (CIEN) 2/		✓		14	n.a.			
Local Exchange Traded Funds (ETFs) investing in Debt 2/		✓	✓	3.3	9.0			
Socaps (basic tier)	✓	✓		n.a.	n.a.			
Socaps (tiers 1-4)	✓	✓		108	10.6	✓	✓	
Sofipos (tiers 1-4)	✓	✓	✓	28	10.7	✓	✓	
Credit Unions	✓	✓		48	5.9	✓	✓	
Regulated Sofomes with Property Links with:	Banks	✓	✓	287	-0.5	✓		
	Financial Groups	✓	✓	110	30.7	✓		
	Other Institutions 3/	✓	✓	n.a.	n.a.	✓		
Regulated Sofomes issuing Debt	✓	✓	✓	290	n.a.			
Non-Regulated Sofomes 4/	✓	✓		68	-62.9			
Deposit Warehouses	✓	✓		12	-14.3			✓
Financial credit, Factoring and Leasing Companies 5/	✓	✓		61	0.5			
Companies Granting Consumer Loans	✓	✓		41	21.1			
Debt Crowdfunding: Social Lending (peer-to-peer, P2P) 6/	✓		✓	0.1	94.9			
Brokerage Firms	✓	✓	✓	541	-2.4	✓	✓	
Credit Insurers	✓			22	9.7	✓	✓	
Public Sector Mortgage Securities (Infonavit y Fovissste) 2/	✓	✓		226	1.7			
Bank & Sofomes Mortgage Securities 2/	✓	✓		67	-2.5			
Local Exchange Traded Funds (ETFs) Using Derivatives to Replicate Indexes 2/		✓	✓	2.2	0.5			

Figures as of June 2016, except for credit insurance companies (as of December 2015).

Source: Banco de México, CNBV, CNSF and AMFE

The FSB classifies non-bank entities involved in credit intermediation into 5 economic functions. This approach enables the identification of entities by economic functions or activity and not by legal figure, with the objective of pinpointing the source of risks for such entities.

1/ Red check marks indicate cases where the described behavior could occur or currently occurs only in some of the entities of this specific sector in Mexico. Risks in the columns are defined as:

- Maturity transformation risk: arises from obtaining short-term funds to invest in long-term assets (maturity mismatch).
- Leveraging risk: arises from the use of techniques or strategies in which one borrows funds to subsequently purchase assets, with the purpose of increasing potential investment profits (losses).

2/ Figures at market prices.

3/ Consolidated either with socaps, sofipos or credit unions.

4/ Figures as of March 2016. Only sofomes assets that belong to the AMFE are included.

5/ E.g., financial branches of auto makers, non-financial companies undertaking leasing and factoring activities.

6/ We only include data of platforms with public data. With available information, it is not possible to know whether peer-to-peer lending entities incur risks similar to those incurred by entities and activities not subject to banking regulation. Yet, for the sake of conservatism, we assumed these risks could actualize for these entities.

Among these intermediaries, some have specialized in a model connecting all parts between themselves, called *peer-to-peer lending (P2P)*.<sup>41</sup> Regarding the way entities have been incorporated in this heading, some follow the figure of investment promotion corporation (SAPI), while others are non-regulated sofomes, and only one is a sofipo.<sup>42</sup> Although the financial sector related to the described financial innovations is still minor in Mexico, growth has been undoubtedly rapid (graph 29). The promotion of their development is expected, as there are funds available to be invested in the search for higher returns than those offered by banks and other institutional intermediaries. Looking into the future, traditional banks are expected to start making substantial investments in this heading in pursuit of competitiveness. Hence, banks are expected to absorb competitors from this subsector to establish partnerships with entities whose business models prove to be successful.

Business models offered under this scheme may contribute to the deepening of financing in the economy and to a more efficient credit intermediation. Nonetheless, they could also lead to the excessive leverage of companies and households, and to the fact that this is not adequately reflected in credit statistics and ratings, as they are not part of formal financial system creditors. Further, the growth of these entities and the mechanisms they operate may affect other credit suppliers.

It is essential to analyze potential risks to financial stability, resulting from new market financing schemes. It is crucial that these platforms accurately disclose the credit profile of their borrowers, and that information about granted loans is reflected in the credit profile of agents and be disclosed to other credit suppliers through any information bureau operating in Mexico. This will allow proper risk assessment.

This is particularly relevant now, since companies in this sector have not been able yet to prove their models during a whole credit cycle, and hence, there could be a disconnection between interest rates applied and real credit risk (non-observable). Further, these models' operational risk can be high due to their technological nature, and can be concentrated in few suppliers providing technological services or account management.

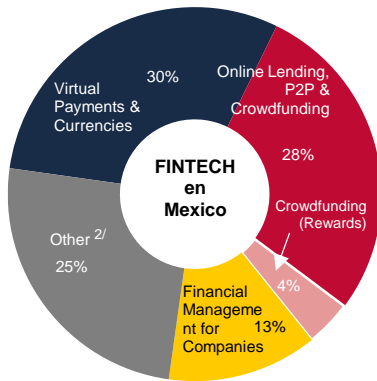
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<sup>41</sup> According to *Finnovista (Fintech Radar)*, as of August 2016, there were 16 companies doing *crowdfunding* (financial and non-financial non-profit, or in exchange for rewards in kind). Also, only 9 companies specifically doing P2P have been detected. In particular, in the real estate sector, there are already 4 companies doing *real estate crowdfunding*.

<sup>42</sup> The company Kubo Financiero came from being a P2P platform to requesting authorization to operate as a sofipo in 2014.

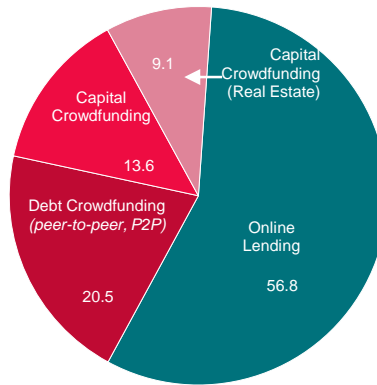
**Graph 29**  
**Fintech Sector in Mexico**

a) Distribution of Entities Participating in the Fintech Sector<sup>1/</sup>  
Percent



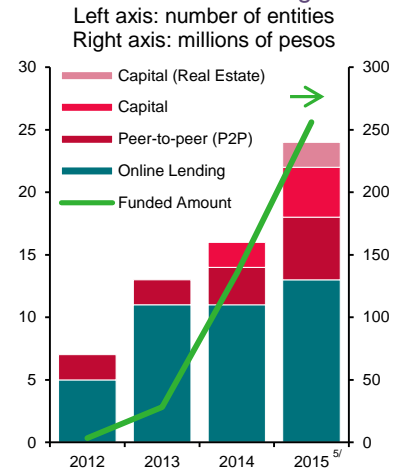
Figures as of August 2016  
Source: Fintech Innovation Radar, Finnovista

b) Distribution of Entities Doing Crowdfunding and Online Lending<sup>3/</sup>  
Percent



Figures as of August 2016  
Source: Finnovista, CNBV and platform websites

c) Performance of Selected Entities Doing Crowdfunding and Online Lending<sup>4/</sup>  
Left axis: number of entities  
Right axis: millions of pesos



Figures as of December 2015  
Source: CNBV, Condusef and platform websites

1/ Distribution of 158 entities with available data as of August 2016.

2/ Others includes: Insurance, financial education tools, fraud detection tools, property management and trading.

3/ Does not include platforms doing royalty crowdfunding

4/ The evolution in the number of entities includes those that can be identified thanks to the public registry of Condusef and the *National Report on Financial Inclusion* published by the CNBV in 2016. Also, the funded amount refers only to the amount granted by crowdfunding platforms (it includes one platform having a non-financial model, meaning that projects grant royalties to investors) and does not include entities lending online, as they are incorporated as non-regulated sofomes.

5/ Estimate as of July, made by the CNBV. See CNBV, *National Report on Financial Inclusion*, No. 7, (2016): 126.

On the international scene, organizations like the Financial Stability Board (FSB) and the International Organization of Securities Commissions (IOSCO), among others, are already analyzing the performance of this sector at a global scale, in order to detect potential vulnerabilities in a timely manner. Particularly, the IOSCO has been studying existing regulation in diverse jurisdictions, and the results suggest that some jurisdictions apply the already existing regulatory framework in the securities market to this case, allowing certain flexibilities to the operation of crowdfunding platforms. In other jurisdictions, specific norms have been introduced to regulate the sector, or their introduction has been proposed. Meanwhile, the FSB has recommended to closely monitor the sector to detect vulnerabilities and risks that may arise from its operation. It is clear that in the next years, greater regulation and supervision capacity must be developed in Mexico to offer security to users and ensure a level playing field to other intermediaries, without inhibiting innovation.

### Development Institutions

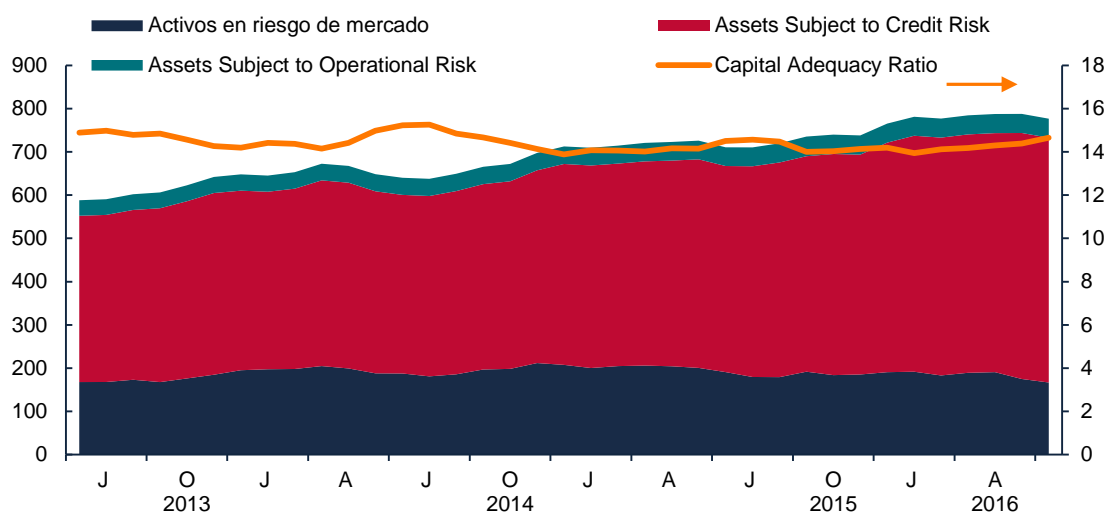
In general terms, development institutions have the necessary financial strength to face possible adverse scenarios, both derived from lower economic growth and adjustments in exchange rates and interest rates. As a starting point, the development banking system is adequately capitalized, registering as of June 2016 a capital adequacy ratio of 14.7 percent (graph 30). Another element that heightens development banks' resilience to economic shocks is the Ministry of Finance and Public Credit's ability to transfer capital surpluses among institutions. This possibility strengthens the whole system. Nonetheless, current domestic and foreign events might give way to extreme situations. Hence, the identification and supervision of risks, inherent to development banks' financial intermediation activities, have become more relevant.

### *Credit Risk*

Currently, the development bank portfolio is properly diversified, although given their nature and legal object, some institutions' portfolios are concentrated in one specific economic activity. It is noteworthy that, over the last year, development banks' exposure to energy corporations increased significantly. Yet, its regulatory coverage for expected and unexpected losses is currently adequate and prudential; the vast majority of these institutions have high credit quality. Particularly, most financing for Pemex and CFE was granted to strategic infrastructure projects (projects with their own source of payment), and this is why development banks have not been immediately affected by these companies' financial situations.

**Graph 30**  
**Capital Adequacy Ratio for the Development Banking System**

Left axis: millions of pesos  
 Right axis: percent



Figures as of June 2016  
 Source: CNBV and Banco de México

On the other hand, Banobras’s credit portfolio might be affected by an eventual reduction in the activities of the infrastructure sector. Also, budgetary cuts being applied may bring down the rating for some states. Yet, most of Banobras’s loans are structured transactions with their own source of payment, and this mitigates risk.

Excluding the SHF,<sup>43</sup> the past-due loan portfolio of development banks exhibits low and manageable levels. Moreover, there is no evidence that cases recently categorized as past-due loans stem from the loosening in origination criteria. However, an abrupt slowdown of the domestic economy may affect some of development banks’ borrowers, leading to a hike in the delinquency rate, and in the expected loss of both credit products and guarantees. Yet, for development banks, the impact on guarantees would be lesser, as most count on state counter-guarantees.

*Market Risk*

Broadly speaking, large loans and financing structures within development banks’ portfolios have partial or total market risk coverage. As it is well known, these coverages lessen the impact of eventual hikes in interest rates or changes in the exchange rate on borrowers, and hence, limit the possibility of default.

Market risks to which development bank institutions are exposed derive from either their positions in securities denominated in domestic currency or their positions in foreign currencies. There are

<sup>43</sup> The past-due loan portfolio of the SHF derives from the crisis of mortgage sofomes observed in the 2008-2009 period.

only three institutions in the sector with significant securities holdings, which are mainly reported to institutional customers. For development banks in that situation there is a moderate risk related to potential surcharge increases.

Regarding foreign exchange rate risks, institutions in this subsector as a whole do not have relevant open positions. Yet, Bancomext is a particular case, due to its faculty to place loans denominated in foreign currencies, which translates into reductions in the capital adequacy ratio when their credit risk assets are revalued. With the purpose of stabilizing its capital adequacy ratio, this bank recently issued subordinate debt denominated in USD. And it is also the reason why Bancomext continues to explore additional measures to lessen the volatility of the capital adequacy ratio.

### *Operational and Liquidity Risk*

Liquidity gaps do not pose considerable risks in this subsector. Additionally, it has been observed throughout time that, in times of liquidity astringency, development banks' funding tends to remain the same. This can be explained by the "search for safe assets effect", as these intermediaries' liabilities are guaranteed by the Federal Government. Although operational risk does not represent a systemic risk, some institutions in this subsector have some weaknesses that must be addressed.

### *Direct and Induced Credit*

Owing to the financial reform,<sup>44</sup> development banks' funding has kept high growth rates. Over the last three years, development banks' credit balance has grown at a real average annual rate of 14.1 percent, and hitherto, no risks related to this growth are observed. Nonetheless, it would be appropriate to monitor that this expansion complements that of the private sector, and that it does not imply a crowding out of commercial banks nor potential impairments on the origination process.

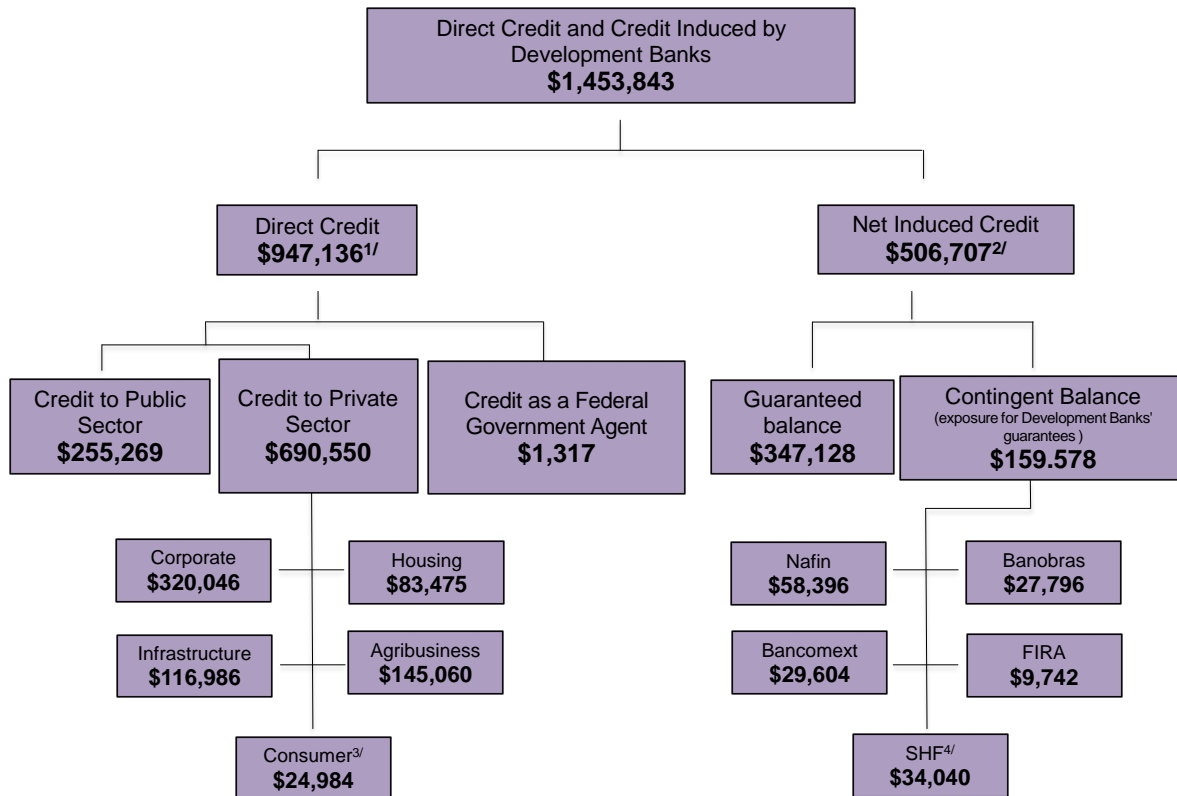
As of June 2016, the balance of loans granted by development banks was 1,454 billion pesos (figure 3); this accounted for 28.8 percent of total loans granted by the banking system 4.6 percent of GDP. Additionally, direct loans accounted for 65 percent of total funding and net induced credit for the remaining 35 percent.

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<sup>44</sup> Amendments introduced by the financial reform that came into effect in 2014 granted more flexibility to development banks. In their programs, these institutions have agreed to financing targets that imply growth rates of between three to four times the GDP projected growth for the period 2012-2018.



**Figure 3**  
**Direct Credit and Credit Induced by Granted Guarantees**  
 Millions of pesos



Figures as of June 2016

Source: CNBV y Banco de México

1/ Development banks' on-balance credit.

2/ "Net induced credit" refers to the total balance of loans granted by private financial intermediaries, partially guaranteed by development banks, FIRA and FN, and without development banks' funding.

3/ Consumer credit is comprised of loans granted by Banjército to army forces, payroll loans granted by Bansfehi, and loans granted to development banks' employees as employment benefits.

4/ Includes guarantees issued by the SHF Mortgage Insurance Division (scv in Spanish).

### 3.2. Non-Financial Private Companies

The ample liquidity that prevailed in international financial markets in recent years allowed Mexican companies to issue debt in foreign markets in very favorable conditions when it comes to interest rates and terms. A part of these issues denominated in foreign currencies was used to replace more cumbersome liabilities, such as those contracted with foreign banks. Yet, another part contributed to a significant increase in leverage.

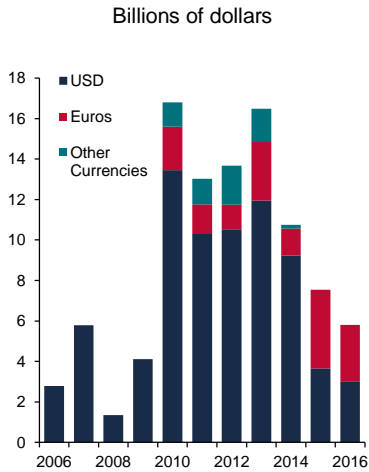
The increase in leverage is more prominent in listed companies that can issue debt denominated in foreign currencies than in the total set of companies listed on the Mexican Stock Exchange (BMV), owing not only to the amount of issuances but also to the peso depreciation (graph 32a). The level of indebtedness of companies in some sectors, such as the construction and telecommunications sectors, are worthy of mention (graph 32b). Withal, most companies gathering funds kept their exposure within acceptable ranges *vis-à-vis* their annual operational flows (graph 32c).

As of 2015 and during 2016, placements have fallen, and they were primarily used to refinance liabilities (graph 31b). Unlike what occurred in the previous years, during 2015 and 2016, net placements did not translate into a higher debt balance. Issues denominated in euros increased thanks to the lower interest rates offered in that currency (graph 31a). Additionally, most issues continued to be fixed and long-term (graph 31c).

The majority of issuing companies have wisely managed their liabilities, and they do not pose significant risks for short-term maturities or payment of interest. Nonetheless, some companies are more vulnerable to adverse movements in interest rates or the exchange rate, as well as to an economic slowdown.

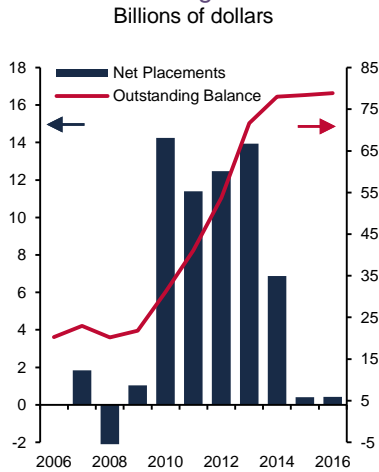
**Graph 31**  
**Foreign Financing to Non-Financial Private Companies**

a) Debt Placements in Foreign Markets per Currency



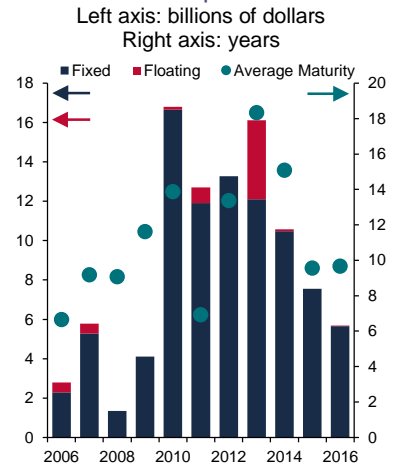
Figures as of November 15, 2016  
 Source: Bloomberg

b) Net Debt Placements in Foreign Markets and Outstanding Balance



Figures as of September 2016  
 Source: Bloomberg and Banco de México

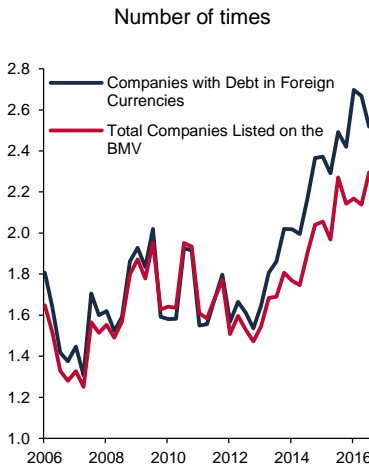
c) Debt Placements in Foreign Markets per Type of Coupon



Figures as of November 15, 2016  
 Source Bloomberg

**Graph 32**  
**Leverage of Non-Financial Private Companies Listed on the BMV**

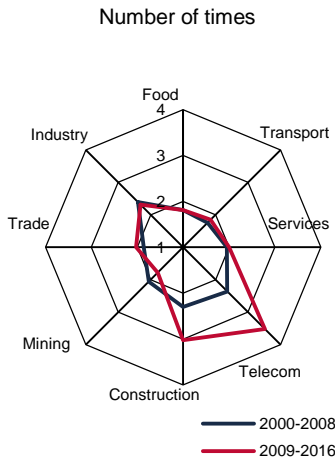
a) Net Debt to EBITDA Ratio<sup>1/</sup>



Figures as of September 2016  
 Source: BMV

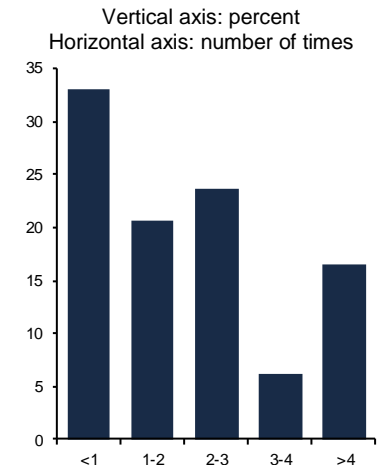
<sup>1/</sup> EBITDA stands for Earnings Before Interest, Taxes, Depreciation and Amortization.

b) Equity Multiplier (Total Assets to Equity Ratio) per Sector



Figures as of September 2016  
 Source: BMV

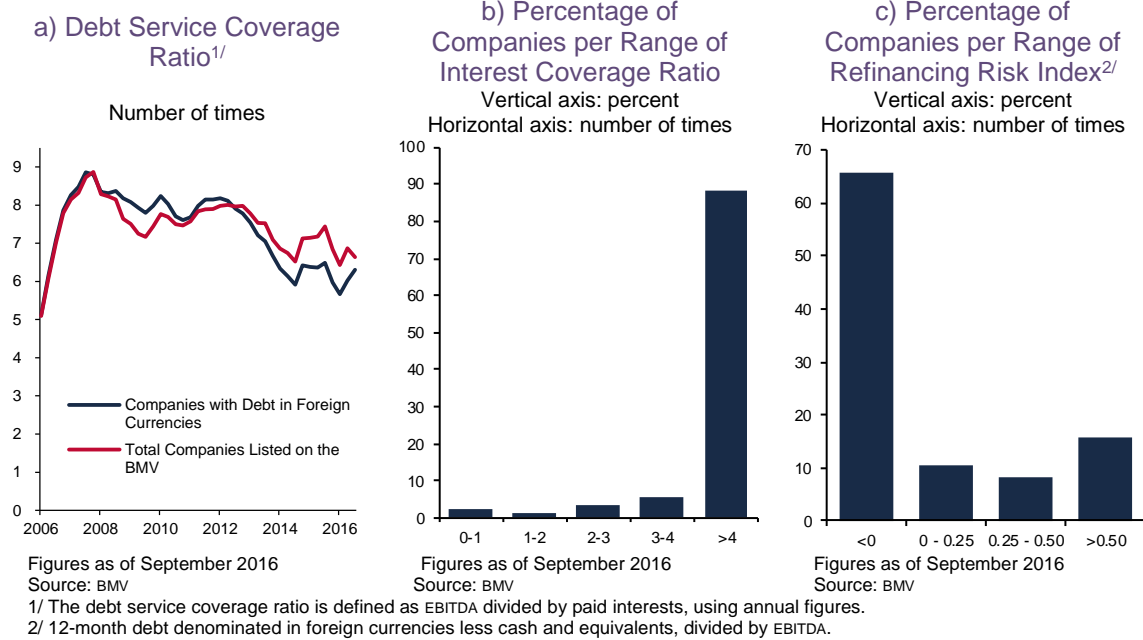
c) Percentage of Companies per Range of Net Debt to EBITDA Ratio<sup>1</sup>



Figures as of September 2016  
 Source: BMV

The depreciation of the Mexican peso *vis-à-vis* the US dollar has increased the debt service denominated in foreign currencies (graph 33a). Nevertheless, the vast majority of companies with liabilities denominated in foreign currencies generate an operational flow that more than triples their debt service amount (graph 33b). Further, a rise in interest rates is not expected to have a significant impact on debt service, as most have contracted liabilities via issues with fixed interest rates.

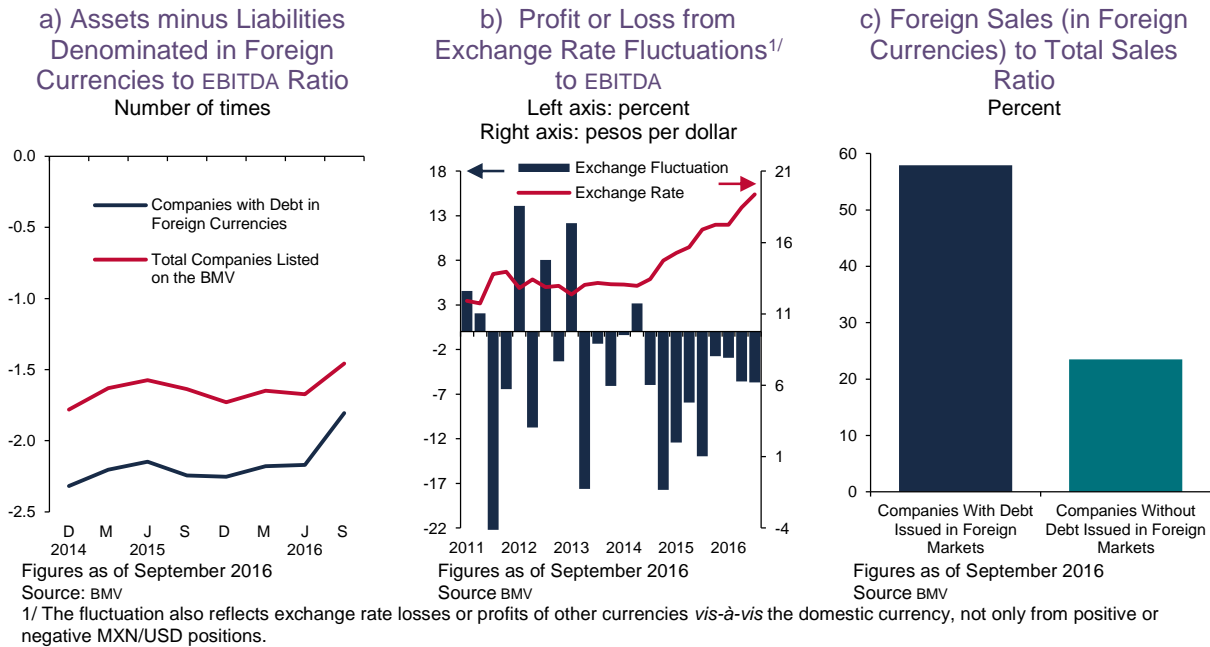
**Graph 33**  
**Debt Service Coverage and Refinancing Needs of Non-Financial Private Companies Listed on the BMV**



The refinancing risk of companies under those circumstances is limited (graph 33c), as maturities of issues denominated in foreign currencies are scattered throughout a number of years. Only 9.3 percent of these companies' liabilities are due within the next two years. Moreover, several companies have managed to satisfactorily refinance their maturities by redeeming in advance bonds and placing other liabilities in longer terms. The companies that are more vulnerable to this type of risk have been striving to diminish indebtedness denominated in foreign currencies, aiming at reducing their exposure to exchange rate risk; namely, by selling assets to pay liabilities, amending investment plans, adjusting the operational scale and reducing production costs.

Graph 34

Exchange Rate Risk for Non-Financial Private Companies Listed on the BMV



Companies with access to foreign financing exhibit a greater imbalance between assets and liabilities denominated in foreign currencies than the average of companies listed on the Mexican Stock Exchange (graph 34a), what makes them more vulnerable to exchange rate changes. Over the last quarter, the depreciation of the Mexican peso vis-à-vis the US dollar has been accompanied by exchange rate losses from revaluations in these companies' balance sheets (graph 34b). These losses have not necessarily meant cash outflows for borrowing companies, as debt terms are usually long, and thus, payment for principal will occur in the future.

Companies in this heading count on other exchange rate mitigating factors. First, via income denominated in the foreign currencies of liabilities -this income naturally provides coverage. The proportion of foreign sales to total sales is greater for companies issuing debt abroad (graph 34c). Second, companies with debt denominated in foreign currencies can also mitigate risk by hiring financial derivatives (27% of non-financial companies listed on the BMV already have an exchange rate coverage variant). In general, companies that have resorted to the use of exchange rate derivatives coverage have done this because the natural coverage only covers partially their foreign currency needs to pay their obligations. These data suggest that there are some companies that, despite having exchange rate mismatches between their assets and liabilities denominated in foreign currencies, have not resorted to any kind of coverage to lessen the risk they are exposed to. Yet, companies in this situation do not pose a systemic risk.

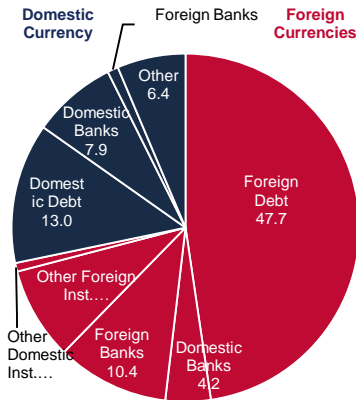
Over the last years, substantial efforts have been made to improve the quality of information released by companies. Nevertheless, it is

imperative to broaden this information so that investors can better assess the quality of these companies' risk management, and hence, to better evaluate the risks they face when they invest therein.

From a general perspective, the risk to which the Mexican financial system is exposed by liabilities in foreign currencies of companies listed on the BMV is relatively moderate. Although 71.7 percent of these companies' liabilities is denominated in foreign currencies (graph 35a), most of this funding comes from foreign creditors (93.0 percent).

**Graph 35**  
**Indicators for Non-Financial Companies' Indebtedness**

a) Origin of Funds Granted to Companies Listed on the BMV (in Different Currencies)<sup>1</sup>  
Percent

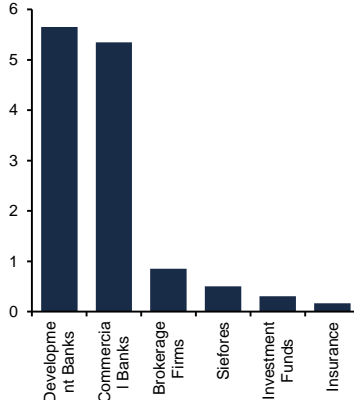


Figures as of September 2016  
Source: BMV

1/ Includes all companies listed on the BMV. It does not include foreign suppliers.

2/ The companies selected for the analysis of financial intermediaries' current exposures are companies listed on the BMV with net leverage indexes fivefold the EBITDA; or with debt service coverage ratios lower than twofold the EBITDA; or with debt refunding indexes greater than 50 percent the EBITDA over the next 12 months.

b) Exposure of Financial Intermediaries to Selected Companies<sup>2/</sup>  
Percentage of equity



Figures as of June 2016  
Source: BMV and CNBV

c) Spread of Returns between Various Issuers' Debt and US Treasury Bonds  
Basis points



Figures as of November 2016  
Source: Bloomberg

Commercial and development banks have exposures to companies with high leverage indexes or weaker debt service indicators (5.3 and 5.7 percent<sup>45</sup> of their equity, respectively) (graph 35b). Moreover, commercial and development banks' capital adequacy ratio would remain above the required minimum in case all the above-mentioned companies defaulted. Other intermediaries' exposures to these companies, such as pension and investment funds, are also limited. In case of astringent credit and market conditions, the funding of companies' liabilities would become more expensive (graph 35c). If that were the case, companies would seek to replace foreign with domestic financing, and this would shrink the supply of financial funds for smaller-sized companies.

Further, the current post electoral climate in the US and prevailing uncertainty related to possible changes in NAFTA may have an impact on growth of the Mexican sectors and companies with more trade links to the US. Nevertheless, effects would hardly be recognizable in the short run, as domestic companies that form the current production chains between both countries are not easily replaceable. In recent years, Mexico has been an appealing destination for fixed investment, given the high competitiveness of some sectors.

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<sup>45</sup> These figures do not include other companies, not listed on the BMV, who also have liabilities in USD with commercial and development banks.

### 3.3. Stress Tests for Commercial Banks

The aim of Banco de México's stress tests is to assess commercial banks' solvency in case of extreme adverse, albeit feasible, macroeconomic scenarios. The hereby presented scenarios must not be regarded as macroeconomic forecasts, but merely as a reference for simulation analysis. For every stress test performed, we considered two subsets of two thousand scenarios each. Although it is possible to design sets of scenarios with diverse features, those evaluated in this *Report* represent extreme shocks that aim at testing banks' resilience to adverse events that may trigger greater vulnerabilities. The central trajectories for these scenarios are characterized by the features mentioned below.

The first group of scenarios reflects an environment of relative stability in the US, with moderate growth expectations. Industrial activity in the US would grow at a reasonable pace, whereas interest rates would adjust slowly. In that context, we assumed that Mexico would face a turbulence period with a significant exchange rate depreciation, a fall in the stock index, inflationary pressure, and, owing to all previous factors, interest rates would rise. In consequence, there would be certain effects on the real sector in the aftermath: the deceleration of GDP and credit, and a rising unemployment rate.

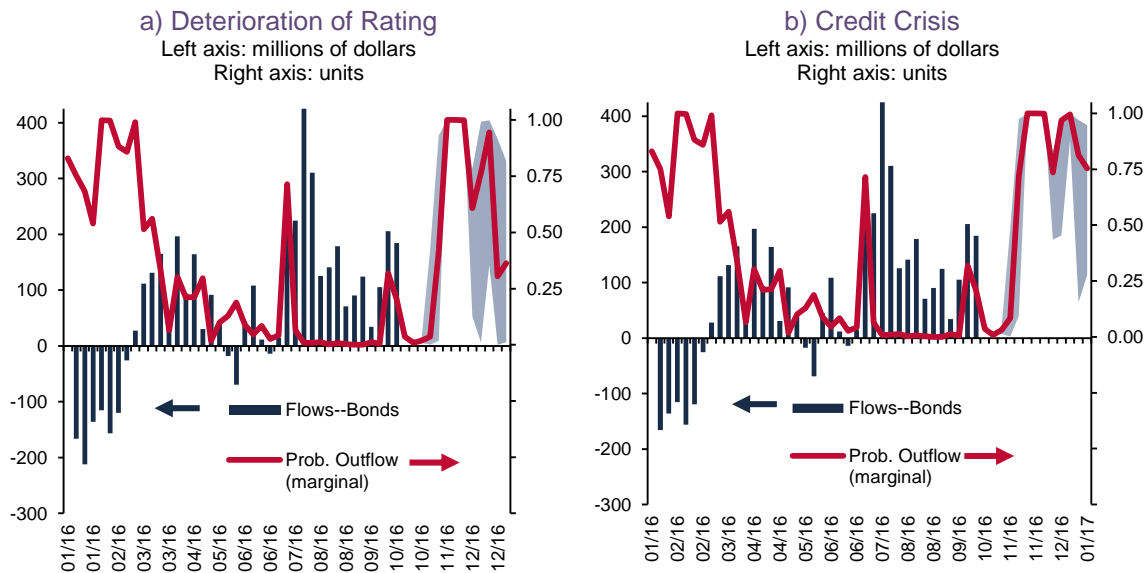
The second set of scenarios is characterized by the following assumptions. Firstly, the US economy has a better growth outlook, as reflected by higher interest rate levels. In Mexico, there's a rapid credit expansion, which, together with the higher industrial activity in the US translates into higher GDP growth. Nevertheless, a few months later, a domestic adverse shock impacts the quality of intermediaries' loan portfolio curbing credit growth, and thus, economic activity. Immediately thereafter, the exchange rate depreciates, interest rates hike, owing to inflationary pressure, and the GDP plummets.

In the first set of scenarios, Mexico's credit rating would fall below the investment grade. In the second set, those effects would actualize in case a crisis was triggered by a period of accelerated and disorderly credit expansion.

Following our methodological approach of previous years, we used a 3-year prospective horizon for the simulation of macroeconomic scenarios (June 2016 - June 2019). The purpose is to analytically evaluate the possible effects on banking institutions' financial variables, given the projected performance of macroeconomic variables. In addition, with the model used in the previous section, we also assessed the probability of a capital outflow in the Mexican economy. Results indicate that, given the severity and features of the stress scenarios put forth, we can expect a significant increase in the probability that, at the time of the shock, there would be a capital flow reversal, which would subside in the weeks that follow (graph 36).



**Graph 36**  
**Estimated Probability of Capital Outflows and Observed Flows<sup>1/</sup>**



Figures as of October 2016  
 Source: Banco de México, EPFR Global and Bloomberg  
<sup>1/</sup> Observed flows as of October 5, 2016. As of this date, the probability of outflows reflects the estimation results thereof. The Interval represents the probability range thrown by the model for each of the two thousand stress scenarios in both subsets.

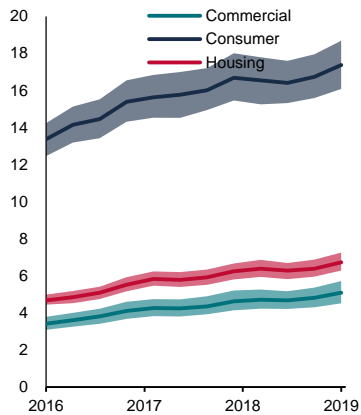
These projections also allowed to determine impacts on banks' profitability, solvency and capitalization in all of analyzed scenarios. For the tests, we took into consideration losses derived from market, credit and contagion factors. Tests only included banks in operation and with sufficient track records that would enable an approximate estimate of probabilities of default on their loan portfolio. An additional substantial assumption is that during episodes of difficulties, banks do not inject capital, and derivatives and repo positions and credit lines remain constant throughout the simulated horizon.

The estimation of probabilities of default for the portfolios analyzed (corporate, consumer and housing) required an econometric model that made it possible to project the possible trajectories of probability of default for every bank and its portfolio in all scenarios. Thus, it was possible to translate macroeconomic scenarios into a deterioration of banking loan portfolios. As in previous years, loss given default was estimated for every loan portfolio and institution.<sup>46</sup> Probability of default also allowed the modeling of deterioration in banks' delinquency rate, together with the loss that would cause default (graph 37).

<sup>46</sup> Loss given default (LGD) is estimated using the Vasicek model. See Jon Frye, "The simple link from default to LGD", *Risk* (March 2014). The LGD built upon said model depends on probability of default and not on the type of loan portfolio.

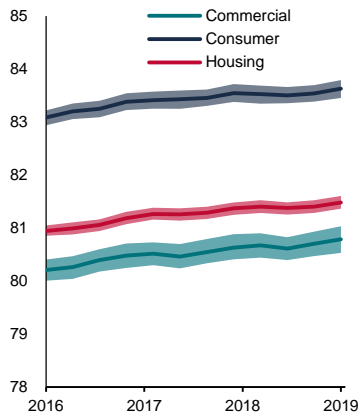
**Graph 37**  
**Performance of Default Indicators and Losses**

**a) Probabilities  
 (Deterioration of Rating)**  
 Percent



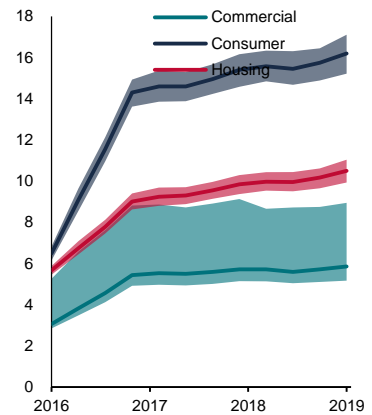
Figures as of June 2016 and 3-year simulations thereafter  
 Source: Banco de México

**b) Loss Given Default  
 (Deterioration of Rating)**  
 Percent



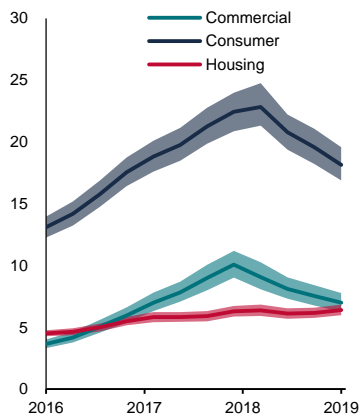
Figures as of June 2016 and 3-year simulations thereafter  
 Source: Banco de México

**c) Delinquency Rate  
 (Deterioration of Rating)**  
 Percent



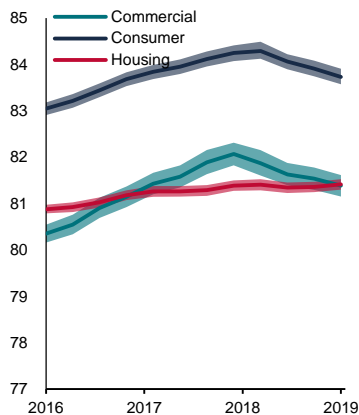
Figures as of June 2016 and 3-year simulations thereafter  
 Source: Banco de México

**d) Probabilities  
 (Credit Crisis)**  
 Percent



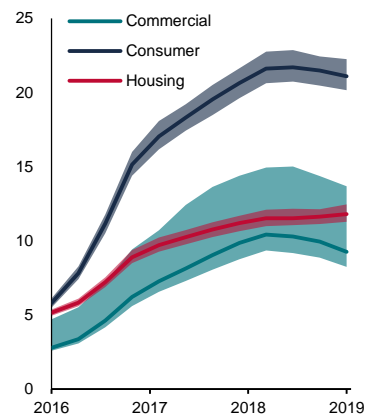
Figures as of June 2016 and 3-year simulations thereafter  
 Source: Banco de México

**e) Loss Given Default  
 (Credit Crisis)**  
 Percent



Figures as of June 2016 and 3-year simulations thereafter  
 Source: Banco de México

**f) Delinquency Rate  
 (Credit Crisis)**  
 Percent



Figures as of June 2016 and 3-year simulations thereafter  
 Source: Banco de México

Using probabilities of default and assuming that loan portfolio growth depends on economic conditions in every scenario, it was also possible to generate trajectories for portfolio performance, reserve constitution and changes in the past-due loan portfolio for every bank. As in our analysis of 2015, we also considered the concentration effect of the corporate loan portfolio,<sup>47</sup> which was modeled simulating that the largest creditors defaulted. Moreover, using the performance of loan portfolios, it was possible to model effects on the profitability of intermediaries.

It is well known that the profitability of any given intermediary relies on several factors, among which the financial margin and operational expenses are worthy of mention. In the first case, the margin trajectory was generated with a) the interest rates we used in the scenarios, and b) the elasticity of active and passive rates for every institution. In the second case, expenses were modeled as a proportional amount of every bank's loan portfolio.<sup>48</sup>

Finally, stress test results indicate that the domestic banking system has reasonable capital adequacy ratios that would allow them to absorb losses derived from a highly adverse scenario. Although in certain scenarios, some institutions would experience capital shortfalls, across the board, the system would remain solvent. At the end of the analyzed period, the capital adequacy ratio of the system as a whole, displayed average levels, above the regulatory minimum for both subsets of scenarios (graph 38).

The analysis also enabled the identification of banks whose business model would be particularly affected by economic shocks, thereby leading some institutions to exhibit insufficient capital levels in some of the scenarios analyzed (graph 39).

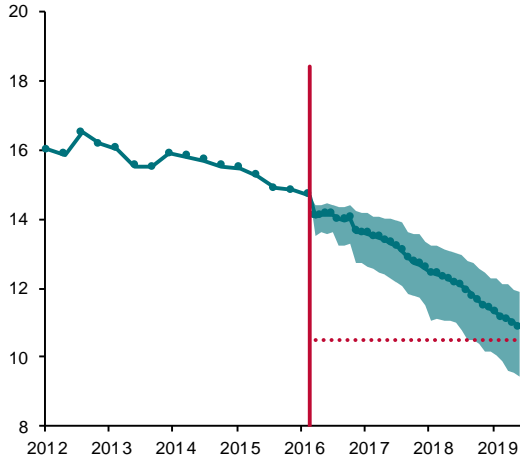
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<sup>47</sup> The analysis only includes exposures to the non-financial private sector.

<sup>48</sup> Intermediation payoffs, non-financial income and other expenses were also simulated.

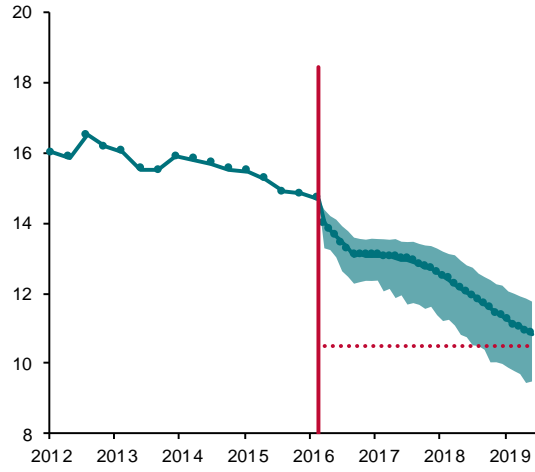
**Graph 38**  
**Stress Test Results**

a) Capital Adequacy Ratio  
(Deterioration of Rating)  
Percent



Figures as of June 2016 and 3-year simulations thereafter  
Source: Banco de México

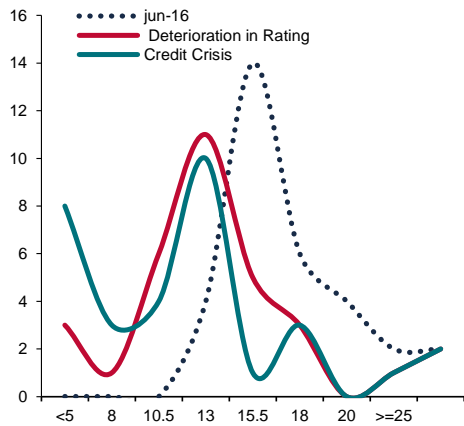
b) Capital Adequacy Ratio  
(Credit Crisis)  
Percent



Figures as of June 2016 and 3-year simulations thereafter  
Source: Banco de México

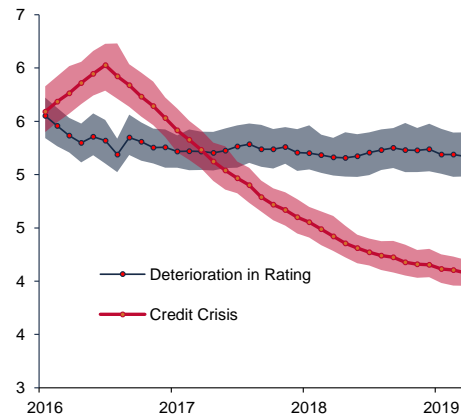
**Graph 39**  
**Stress Test Results**

c) Distribution of Capital Adequacy Ratio  
Percent



Figures as of June 2016 and 3-year simulations thereafter  
Source: Banco de México

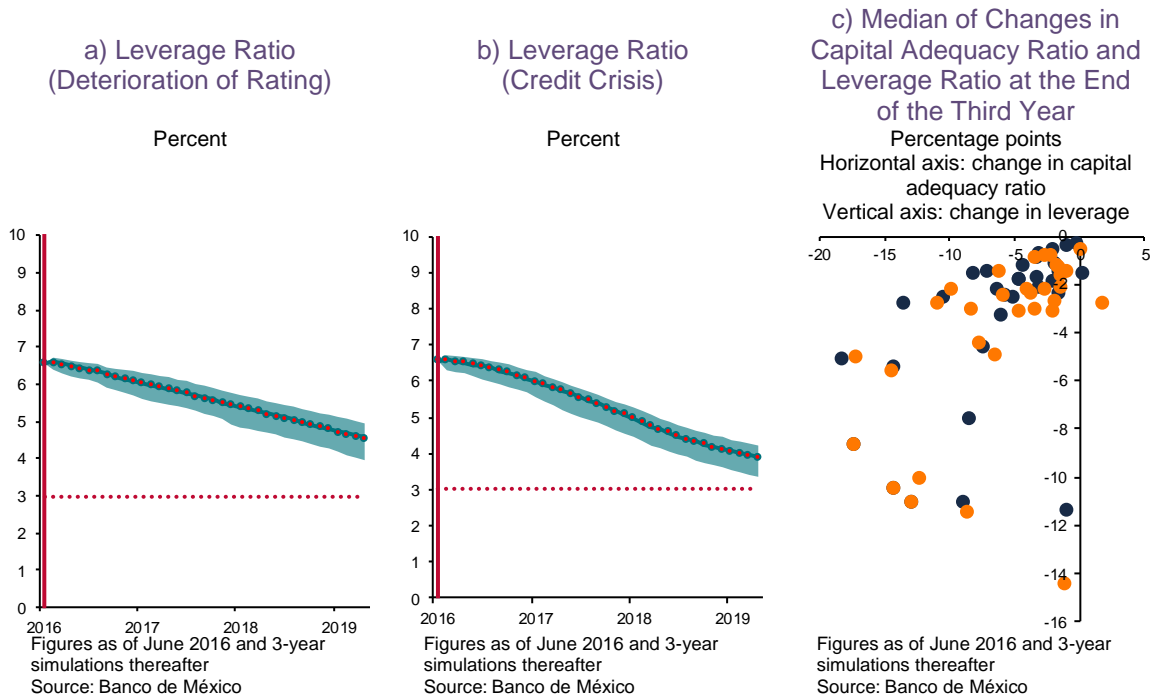
d) Performance of Risk-Weighted Assets  
Billions of pesos



Figures as of June 2016 and 3-year simulations thereafter  
Source: Banco de México

The analysis considered not only the evolution of the capital adequacy ratio, but also the potential effects on the leverage ratio, measuring this indicator as the proportion of tier capital *vis-à-vis* total assets. Although current regulation does not consider any requirements for the latter concept, most institutions will start disclosing it as of December 2016.<sup>49</sup> For the analysis, we assumed a minimum value of 3 percent for this ratio, in line with the international standard. Nonetheless, this level could change before it becomes adopted as a regulatory minimum requirement -this should be considered when analyzing institutions' leverage results.

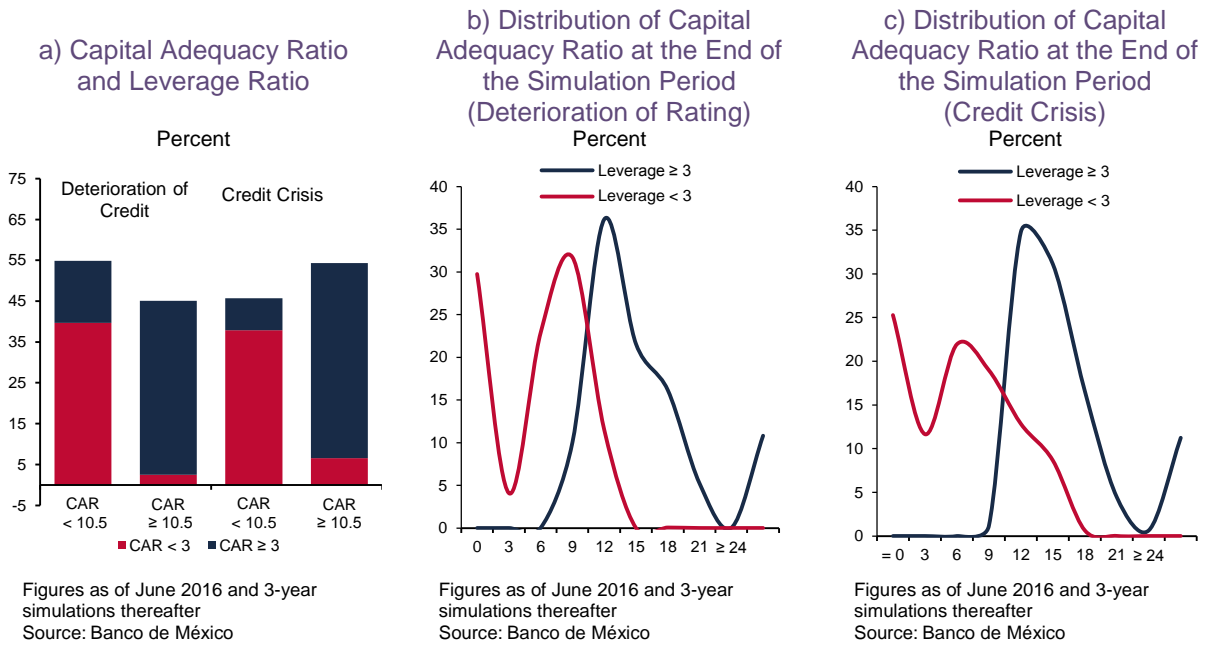
**Graph 40**  
**Stress Test Results**



<sup>49</sup> Institutions regarded as having local systemic importance must disclose data pertaining to September 2016, together with data from the three previous months. Other commercial and development banks must start disclosing their leverage ratio as of December 2016.

Special attention was paid to relationships between impacts on the capital adequacy ratio and the leverage ratio (capital divided by assets). Results showed that, although the leverage ratio of the system remained above three percent in the two subsets of scenarios, some banks ended up with a ratio below that level, even when their capital adequacy ratios remained above the regulatory minimum (graph 40). Banks that exhibited the greatest falls in their capital adequacy ratio also saw their leverage ratios decline (graph 41).

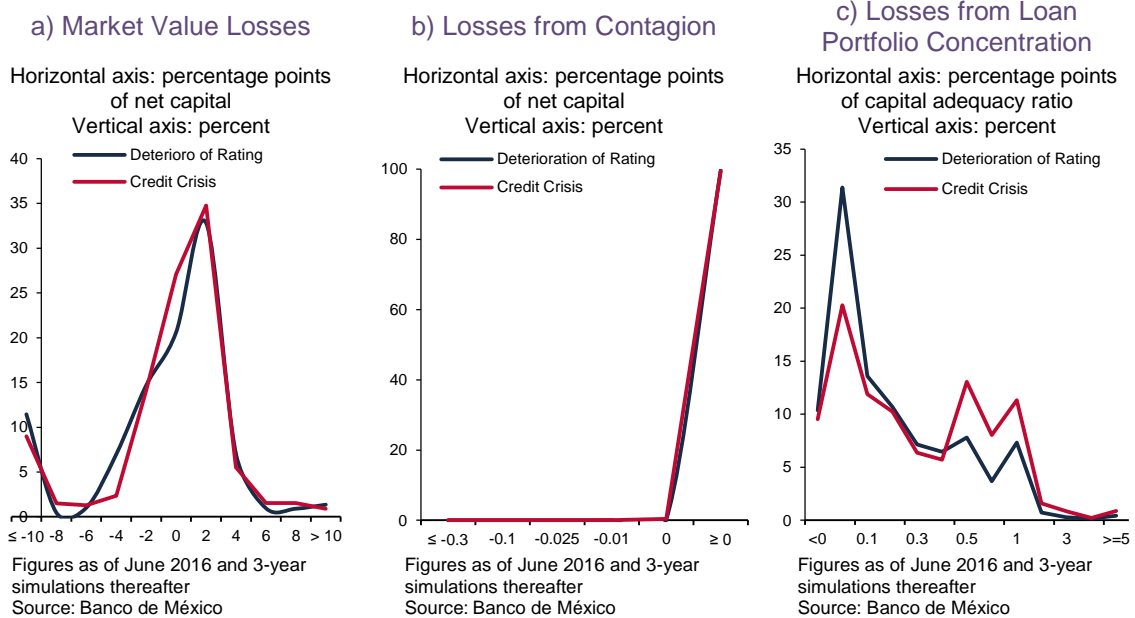
**Graph 41**  
**Relationship between Leverage and Capitalization in Stress Scenarios**



The analysis also considered losses in securities positions that may be triggered by changes in interest rates and the exchange rate, in a horizon of 20 working days, and assuming banks do not reconfigure their portfolios. In case said losses affected the solvency of any institution, the model evaluates the possibility of a contagion process being triggered into other institutions. For this analysis, we considered exposures between intermediaries by securities positions, deposits, loans, derivatives and repos. In both subset of scenarios, results showed that contagion risk is limited.

The reasons for this are: on one hand, that market losses at the beginning of the year are relatively moderate, and thus limit the possibility of insolvency risk for any given institution; on the other hand, the swiftness with which institutions respond to changes in key variables, such as the exchange rate or interest rates (most of them would be better positioned in the short run to resist a market shock). Despite the concentration effect could significantly impact certain institutions, the aggregate effect was not a decisive factor for institutions with poor performance (graph 42).

**Graph 42**  
**Losses by Type of Factor in Stress Scenarios**



## 4. Conclusions

The Mexican economy and financial system are currently facing a complex environment in which diverse external and internal factors could have an effect on economic activity, interest rates and the price of the domestic currency.

On the international scene, there have recently been periods of high financial volatility related to events such as the US monetary normalization and the uncertainty over the results of the US electoral process. Said factors have visibly affected domestic interest rates and the exchange rate. Currently, it is not possible to rule out new bouts of volatility that might put additional pressure on domestic financial markets, especially if we consider the prevailing protectionist rhetoric during the US presidential campaign and the uncertainty over policy actions that the new government might undertake in that direction. Furthermore, it is possible that the world economy sees a long period of low economic growth, and this could translate into lower growth rates in Mexico.

On the internal side, the fall in oil prices and production capacity have affected public finances and external accounts. This, together with lower economic growth and the exchange rate depreciation, have contributed to the rise in the proportion of public debt to GDP. The current account deficit has also increased over the last years. In this context, the further weakening of domestic economic activity, sharp rises in interest rates and the higher depreciation of the exchange rate could become risks for the stability of the domestic financial system.

In the described environment, the strengthening of macroeconomic fundamentals has gained in importance. With that in mind, and in order to preserve macroeconomic stability, monetary and fiscal policies have already been adjusted. Regarding fiscal policy, measures aiming at stabilizing, and hence, reducing the public debt to GDP ratio, as well as those aiming at improving transparency in public finances are worth underscoring. As for monetary policy, the central bank has modified its reference rate target with the purpose of anchoring inflation and inflationary expectations. To sum up, both policies are contributing to macroeconomic adjustment, in the face of the above-mentioned shocks.



As far as the financial system is concerned, banks have sufficient capital and liquidity to face extreme situations. Capital and liquidity rules to which banks operating in Mexico are subject have included the strictest international standards issued by the Basel Committee on Banking Supervision (known as Basel III). Banks' capital is mostly composed by shareholders' contributions, and the leverage level is lower than the international median. In line with Basel Committee agreements, efforts are being made to prepare a complementary liquidity regulation that will oblige banks to comply with the Net Stable Funding Ratio, the purpose thereof being to prevent mismatches in institutions' balances that may hamper their liquidity.

Over the last four years, bank credit has grown rapidly in Mexico. It is worth mentioning that this growth has come from very low financial penetration levels and a credit to GDP ratio far below those observed in countries with similar development levels to Mexico. Nevertheless, it is essential that credit institutions operating in the country cautiously assess their growth capacity and maintain high origination standards, particularly in an environment of high volatility and moderate economic growth. Moreover, they should also ensure that the borrowers' leverage levels do not become unsustainable.

As for credit, it will be imperative to closely follow up the evolution of new funding mechanisms via entities and platforms not subject to traditional banking regulation. Although these operators' activity does not represent a significant amount of total financing to the economy, it has significantly increased. Undoubtedly, these activities tend to increase the competition level in the loan granting market, but also contribute to raising leverage, and thus, risks, as financial system members do not have all the information to assess those associated risks.

The expansionary monetary policy adopted in advanced countries led to a substantial decline in asset returns in such countries, pushing investors to seek better returns in emerging economies. This allowed non-financial private companies of various emerging countries to have access to international debt markets. Even though part of the funds that were obtained this way were used to refinance liabilities, another part of the issues increased leverage. This situation has raised concerns over refinancing, debt service and leverage risks of borrowing companies. The majority of issues placed abroad by domestic companies have been long term and at fixed rates; additionally, those companies count on natural or financial hedges that alleviates exchange rate risk. Nevertheless, some of these companies have higher vulnerability levels, and will have to persevere in taking measures to diminish risks, particularly in an environment of volatility and lower economic growth. It is worth mentioning that the exposure of the financial system to these issuing companies does not represent a systemic risk.

Stress tests applied to banks, using extreme albeit plausible macroeconomic scenarios, showed that the sector as a whole counts with enough capital to maintain its solvency. Nevertheless, results

also indicate that the capital adequacy ratio of certain institutions could eventually fall below the regulatory minimum. Although this is a possible outcome, as shown by the simulation of extreme scenarios, it is yet vital that institutions in a less robust situation strengthen their capital levels and diminish risk-weighted assets.

In conclusion, and as mentioned in previous editions of this Report, credit ratings imputed by specialized agencies should not be underestimated, given their rising influence on global investors' and financial intermediaries' decisions. These ratings have an influence on capital flows and financing costs for governments and companies. Therefore, it is key to preserve the soundness of the Mexican macroeconomic framework, and to continue implementing structural reforms, in order to be in a better position to face all the challenges posed by the economic environment.

## List of Initials and Acronyms

<b>AMFE</b>	Mexican Association of Specialized Financial Entities
<b>BMV</b>	Mexican Stock Exchange
<b>bondes</b>	Federal Development Bonds
<b>bonos</b>	Federal Development Bonds with Fixed Rates
<b>BPA</b>	Savings Protection Bonds
<b>BPAT</b>	Federal Development Bonds with Quarterly Payment of Interest
<b>BREMS</b>	Monetary Regulation Bonds
<b>CDS</b>	Credit Default Swaps
<b>cerpis</b>	Senior Trust Bonds for Investment Projects
<b>cetes</b>	Federal Treasury Bills
<b>CFE</b>	Federal Electricity Commission
<b>CFEN</b>	Net Stable Funding Ratio
<b>CIEN</b>	Education Infrastructure Certificates
<b>CNBV</b>	National Banking and Securities Commission
<b>CNSF</b>	National Insurance and Surety Commission
<b>CPB</b>	CPB Netherlands Bureau for Economic Policy Analysis ( <i>Central Planning Bureau</i> )
<b>DCC</b>	Development Capital Certificates
<b>EBITDA</b>	Earnings Before Interest, Taxes, Depreciation and Amortization
<b>EPFR</b>	Emerging Portfolio Fund Research
<b>FEIP</b>	Budget Revenue Stabilization Fund
<b>fibras E</b>	Energy and Infrastructure Investment Trusts
<b>fibras</b>	Infrastructure and Real Estate Trusts
<b>FIRA</b>	Agricultural Trusts
<b>FN</b>	National Funds for Farming, Rural, Forestry and Fisheries Development
<b>FSB</b>	Financial Stability Board
<b>GDP</b>	Gross Domestic Product
<b>HP</b>	Hodrick-Prescott Filter
<b>IMF</b>	International Monetary Fund
<b>INEGI</b>	National Institute of Statistics and Geography
<b>IOSCO</b>	International Organization of Securities Commissions
<b>LCR</b>	Liquidity Coverage Ratio
<b>LDSEFM</b>	Law of Financial Discipline for States and Municipalities

## Banco de México

<b>LTV</b>	Loan-to-Value
<b>PTI</b>	Payment-to-Income
<b>PYMES</b>	Small- and medium-sized companies
<b>RFSP</b>	Public sector financial requirements
<b>SAPI</b>	Investment promotion corporation
<b>SCV</b>	Housing Credit Insurance (insurance entity)
<b>SHCP</b>	Ministry of Finance and Public Credit
<b>SHF</b>	Federal Mortgage Society
<b>siefores</b>	Pension Funds
<b>socaps</b>	Savings and Loan Cooperatives
<b>sofipos</b>	Popular Finance Corporations
<b>TIE</b>	Interbank Equilibrium Interest Rate
<b>udibonos</b>	Federal Development Bonds Denominated in Investment Units
<b>vaR</b>	Value at Risk
<b>VIX</b>	Chicago Board Options Exchange Volatility Index
<b>VIMEX</b>	Mexican Volatility Index (published by the Mexican Derivatives Market)
<b>WTI</b>	West Texas Intermediate