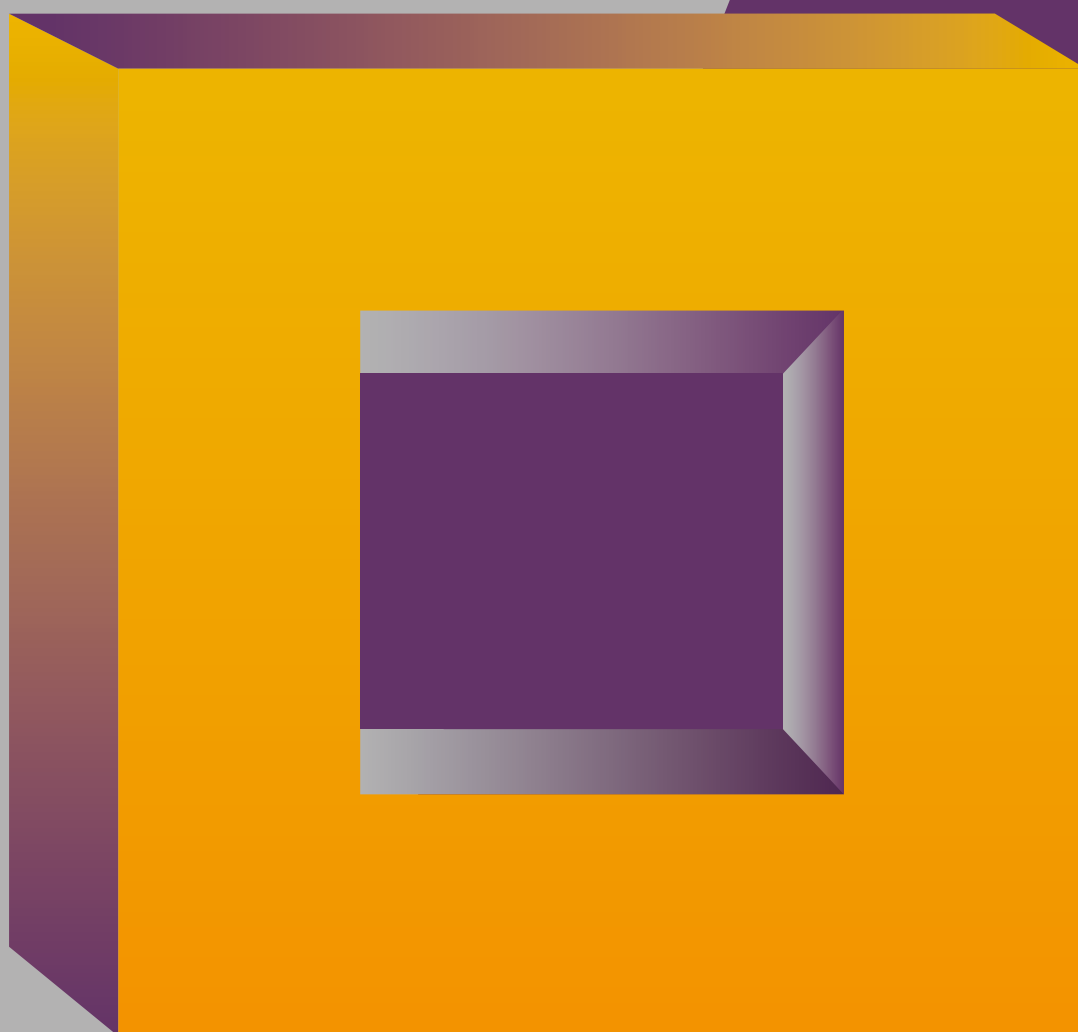

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FINANCIAL **STABILITY REPORT**



By Constitutional mandate, *Banco de la República* is responsible for safeguarding price stability of the economy. The proper implementation of this task depends crucially on maintaining financial stability.

Financial stability is understood as a general condition in which the financial system (financial institutions, markets, and infrastructures):

1. Assesses and manages financial risks in such a way that it facilitates the performance of the economy and the efficient allocation of resources;
2. Is capable of autonomously absorbing, dissipating, and mitigating the materialization of the risks that may arise as a result of adverse events.

This Financial Stability Report (FSR) presents the Central Bank's appreciation on the recent performance of credit institutions and their debtors, as well as on the main risks and vulnerabilities that could affect the financial stability of the Colombian economy. The FSR is intended to keep both the participants in financial markets and the general public informed, besides promoting public debate on the trends and risks related to the financial system. The results herein presented also serve as a basis for the monetary authority to make decisions that promote financial stability in the general context of the constitutional objectives of price and macroeconomic stability.

This FSR is complemented by the Payment Systems Report, published annually by *Banco de la República*, which reports on the performance of the financial infrastructures of the Colombian economy.

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Glossary

API: Application Program Interface	NLR: Net Liquidity Requirements
AT1C: Additional Tier 1 Capital	NPL: Non-Performing Loans
BCBS: Basel Committee on Banking Supervision	OB: Open Banking
BDBR: Board of Directors of <i>Banco de la República</i>	PEF: Private Equity Funds
BF: Brokerage Firms	PFM: Pension and Severance Fund Managers
BIS: Bank of International Settlements	PILA: Integrated Template for Liquidation of Contributions
bp: Basic Points	PUC: Single Accounting Plan
CDT: Term Deposit	QRI: Quality Risk Indicator
CET1: Common Equity Tier 1 Capital	ROA: Return on Assets
CI: Credit Institutions	ROE: Return on Equity
CIF: Collective Investment Funds	IRPR: Indicator of Risk Perception by Rating
CIR: Inter-sectoral Resolution Commission	RUNEOL: Single National Registry of Payroll Deductible Loan Operators
CMA: Competition and Market Authority	RWA: Risk Weighted Assets
COP: Colombian Pesos	SB: Shadow Banking
CPI: Consumer Price Index	SES: Superintendence of Solidary Economies
CSB: Central Security Depository	SFC: Office of the Financial Superintendent of Colombia
DD: Distance to Default	SMES: Small and Medium-Sized Enterprises
DSR: Debt-Service Ratio	SS: Superintendence of Corporate Affairs
EUR: Euros	SYSMO: Systemic Stress Model
FDI: Foreign Direct Investment	T2C: Tier 2 Capital
FED: Federal Reserve of the United States	TC: Trust Companies
FNA: National Savings Fund	TES: Colombian Public Debt Bonds
FSB: Financial Stability Board	USD: US dollar
FTD: Fixed-Term Deposit Effective Rate	UVR: Real Value Unit
GDP: Gross Domestic Product	VAR: Vector Auto-Regression Model
IBR: Interbank Reference Rate	WATM: Weighted Average Term to Maturity
IC: Credit Intermediation	
ICE: Indicator of Consolidated Exposure	
IEFIC: Debt Service and Financial Education Survey	
IFRS: International Financial Reporting Standard	
IIE: Indicator of Individual Exposure	
IMC: Foreign Exchange Market Intermediaries	
IMC: Investment Management Companies	
IMF: International Monetary Fund	
IPS: Health Service Providers	
LIH: Low Income Housing	
LRI: Liquidity Risk Indicator	
LSRR: Liabilities Subject to Reserve Requirements	
MADR: Ministry of Agriculture and Rural Development	
MER: Market Exchange Rate	
MT: Maturity Transformation	
NAFTA: North American Free-Trade Agreement	
NBF: Non-Banking Financial Institutions	
NIM: Net Interest Margin	

Executive Summary and Heatmap

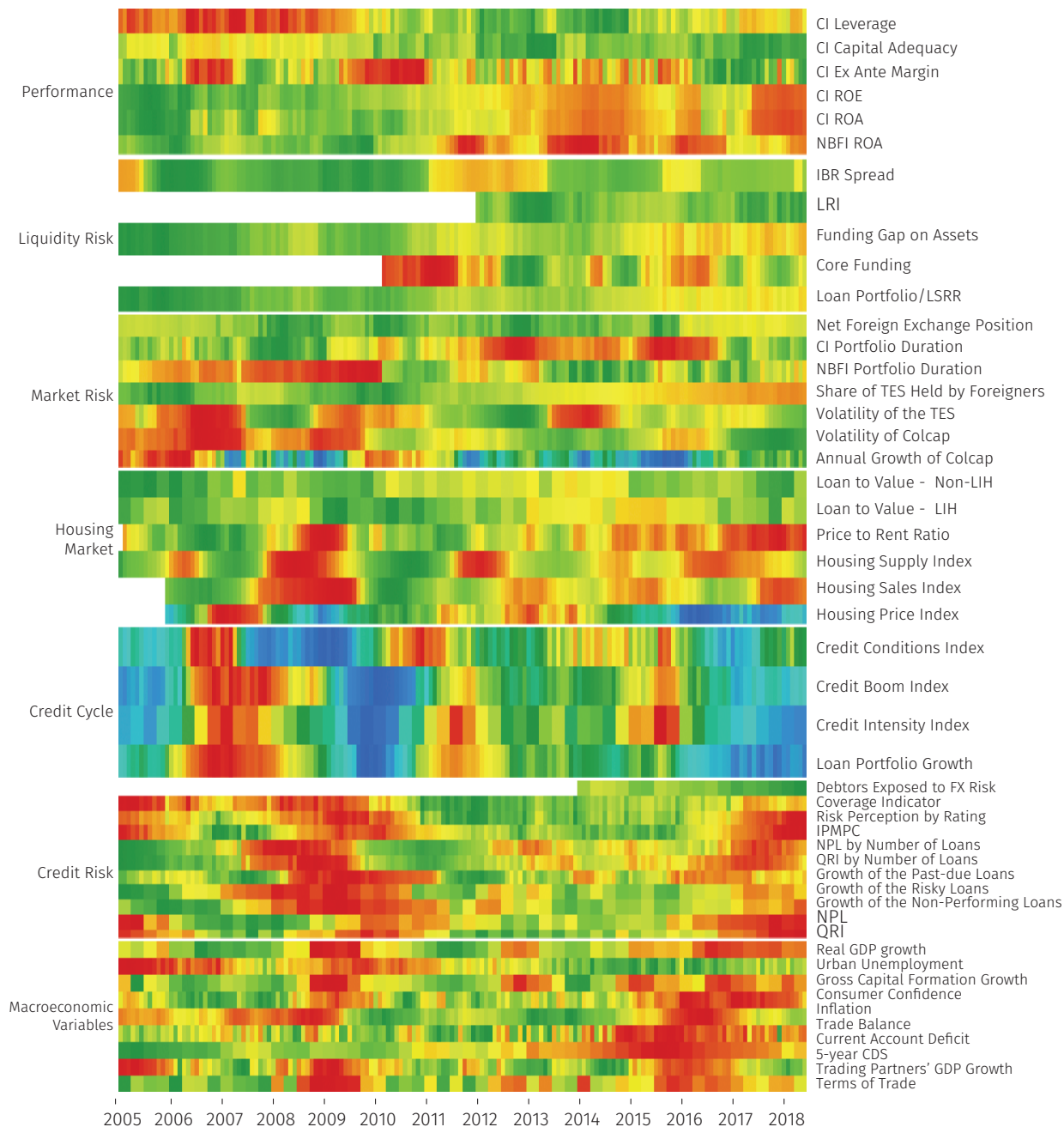
In the last few months, the Colombian financial system has continued to advance in its process of adjustment to the shocks experienced by the Colombian economy since mid-2014. This process has been characterized by the gradual materialization of credit risk (in the form of increases in non-performing and risky loans), low profitability (caused by greater loan-loss provisions expenditures), and low growth of the loan portfolio and of the funding sources of credit institutions. During this adjustment period, indicators of capital adequacy and liquidity remained persistently sound, an evidence of the resilience of the financial system.

As a result of the adjustment, the vulnerabilities that were identified in the previous edition of this Financial Stability Report, which were associated with the lagged effects of low economic growth on credit risk, have been gradually mitigated. Based on the analysis presented in Graph A,¹ the favorable change in the macroeconomic environment has made it possible for the relevant macroeconomic variables to gradually abandon red shades. In line with this, the growth rate of the non-performing and risky loan portfolios has declined (see Graph B). In any case, the indicators of profitability are in the red at the same time as the growth of the loan portfolio remains at low levels.

In this context, the main vulnerability that the financial stability of the Colombian economy currently faces is the risk of greater restrictions on international finance in a context of rising global interest rates and possible turmoil in emerging economies with its potential effect on aggregate demand. This vulnerability could affect the financial system through i) the higher loan-loss provisions expenditures for credit institutions that would be caused by a deterioration in the quality of the loan portfolio in a context in which the aggregate demand is adjusting, and ii) the possible valuation caused by eventual turbulences in international financial markets.

¹ The technical details on the reading of, construction of, and variables used on maps A and B are presented in Box 1 of the September 2017 Financial Stability Report.

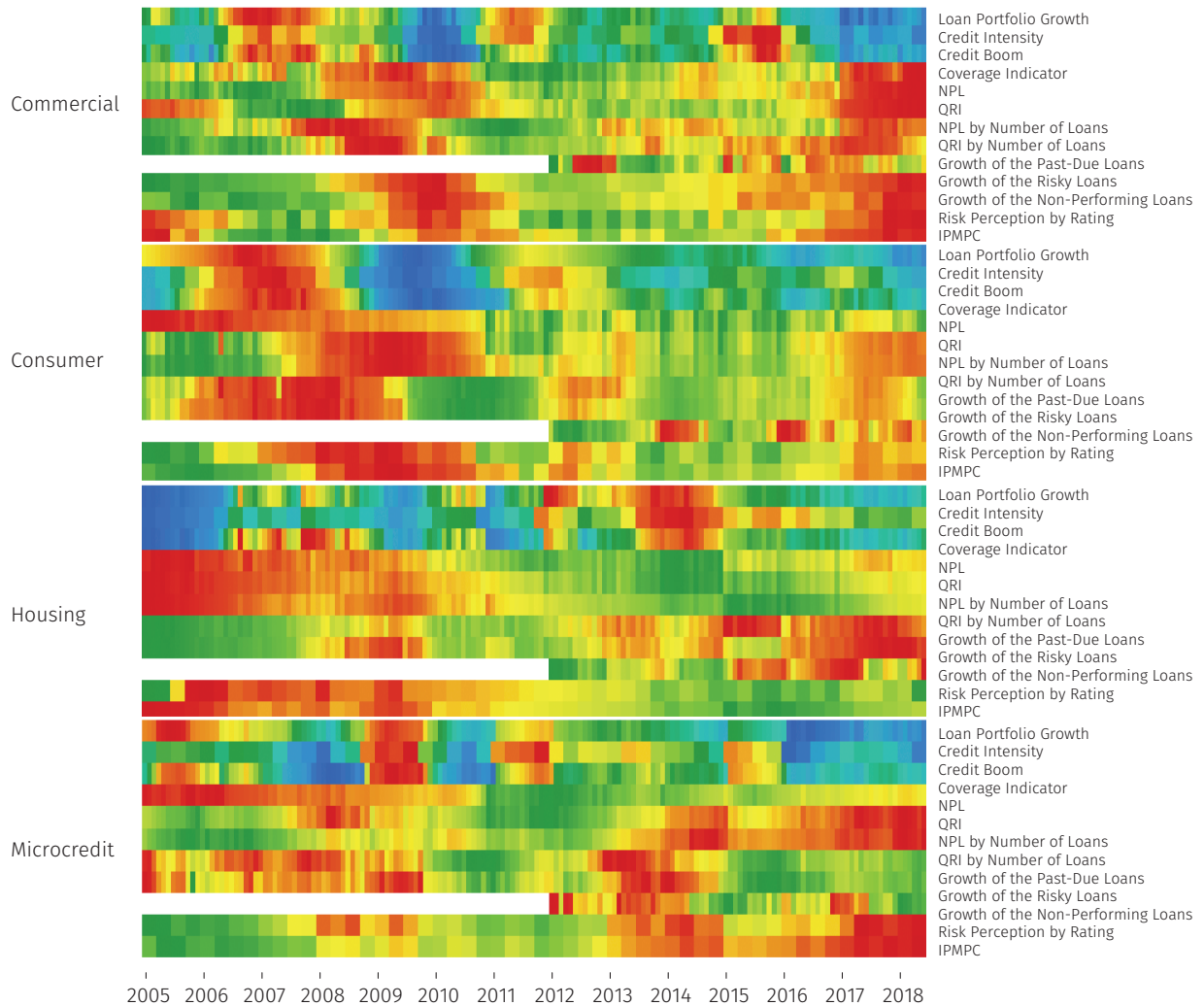
Graph A
Risk Heatmap of the Colombian Financial System



Source: *Superintendencia Financiera de Colombia* (hereinafter Office of the Financial Superintendent of Colombia), DANE, Fedesarrollo, Bloomberg, and *Banco de la República*, calculations by *Banco de la República*

In the domestic front, credit risk is continuing to materialize in economic sectors such as construction and agriculture and, to a lesser extent, in the housing loan portfolio. With regard to market risk, although both the fixed income and equity markets have had a favorable performance in the recent past (which is shown in different shades of green in the majority of the variables in this category in Graph A and in the performance of Non-banking Financial Institutions), there has been a recent rise in the share of medium-term public debt securities held by foreign investors. In the event of a withdrawal of these investors

Graph B
Map of Credit Risk



Source: *Superintendencia Financiera de Colombia* (hereinafter Office of the Financial Superintendent of Colombia), DANE, Fedesarrollo, Bloomberg, and *Banco de la República*, calculations by *Banco de la República*

from the local market, the impact would probably be seen most strongly in a broader segment of the yield curve of Colombian public debt.

In order to adopt a prospective approach in light of those vulnerabilities, chapter 3 of this Report presents a stress test that evaluates the resilience of credit institutions in the event of an extreme hypothetical scenario. The scenario includes a severe slowdown in the Colombian economy during the remainder of 2018 that would continue until mid-2020, rising constraints in international financial markets, materialization of credit risk in vulnerable sectors and foreign investors withdrawing from the local public debt markets. The results suggest that aggregate indicators of overall and core (Tier 1) capital adequacy would probably remain at levels exceeding the regulatory limits during the horizon of the scenario in spite of the potential declines in profitability and in the volume of the loan portfolio.

Banco de la República, in compliance with its constitutional objectives, will continue to monitor the situation of credit institutions and will take those decisions that will ensure levels of inflation and growth that are consistent with macroeconomic stability and long-term economic development. The analysis of the vulnerabilities presented in this Report constitutes a call to participants in the financial markets to make sure that the risks which they find themselves exposed to are evaluated and managed appropriately and prudently.

Juan José Echavarría
Governor

01

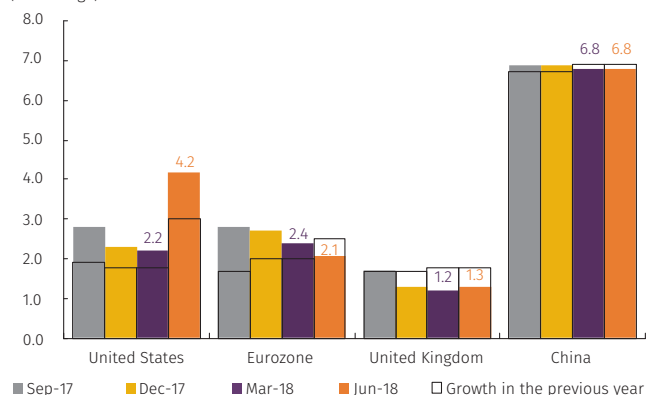
Macroeconomic Environment

The major economies continued to show positive economic performances in the first half of 2018 with the exception of the United Kingdom. Nevertheless, the risks of lower growth have risen in the last six months. In the United States, where a significant upswing occurred, faster increases than the initially anticipated are expected in the monetary policy rate.

The United States registered the largest economic growth since September 2014 (Graph 1.1) in the second quarter of 2018. The above has occurred jointly with a reinforcement of its labor market given the strong job creation and an unemployment rate with the best record in eighteen years. Inflation, in turn, is close to the 2.0% target for both the general price level and the indicator excluding food and energy. This robust performance led the Federal Open Market Committee of the Federal Reserve (Fed) to increase the range of the federal fund rates at their September 2018 meeting. The market data indicate that, for what remains of the year, this range could rise by an additional 25 basis points (bp) (Graph 1.2).

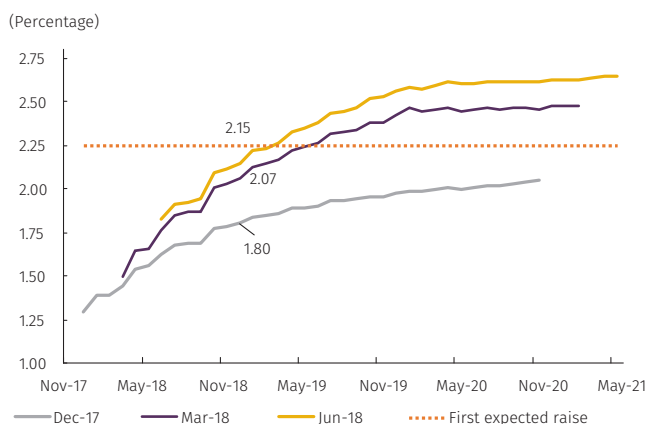
The euro zone, on the other hand, has shown slowdowns over the past four quarters although expansions that are higher than the average for the last four years continue to occur (Graph 1.1). Regarding inflation, the core indicators have been stable in recent months and, as a result, increases in the monetary policy rate are not envisaged yet. At the same time the Governing Council of the European Central Bank lowered the amount in the reinvestment program from EUR 30 billion (b) monthly to EUR 15 b starting in October 2018. This level will remain the same until December, at which time, the program could terminate depending on the medium-term inflation data.

Graph 1.1
Annual Real Annual Economic Growth of the Main World Economies (Percentage)



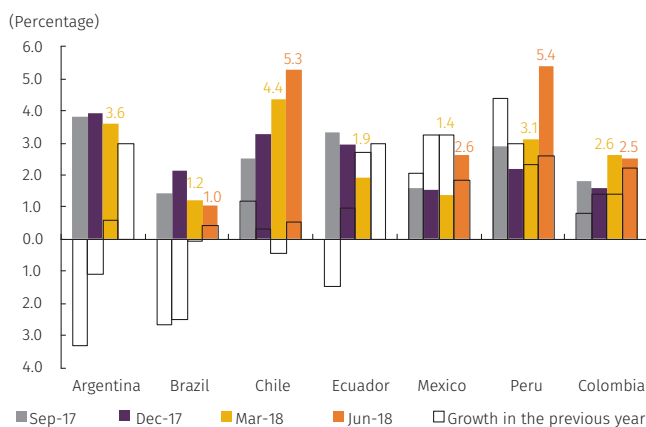
Note: Corresponds to the official annual growth record for each country.
Source: Bloomberg.

Graph 1.2
Federal Fund Rate Expectations (Percentage)



Source: Bloomberg.
Note: Rate expectations are derived from futures contracts and federal fund options. Data labels correspond to the data expected for December 2018.
Source: Bloomberg.

Graph 1.3
Annual Real Economic Growth for some Latin-American Countries (Percentage)



Note: Corresponds to the official annual growth record for each country.
Source: Bloomberg.

China has registered a slight slowdown in the last two quarters (Graph 1.1). This performance had been anticipated given the changes in its economic policy, which seeks to develop the domestic market in order to create a lower dependence on foreign demand. In the last six months, the downside risks have risen significantly in view of the tariff increases that the United States imposed on Chinese imports. This situation is an additional challenge for this economy given the restrictive monetary conditions that were implemented in order to lower financial leverage. In this respect, this financial stability objective would work against a monetary stimulus to spur economic growth in these turbulent times. The first impacts of the trade restrictions are expected to appear towards the end of the second half of 2018.

The majority of the Latin American economies, in turn, showed economic upswings over the course of 2018. In spite of the recovery that Argentina has experienced, a combination of monetary turbulence and twin deficits have caused capital outflows and sharp currency devaluations over the last few months.

The growth of the Latin American economies showed an improvement in the first half of 2018 (Graph 1.3). This trend was mainly driven by Peru and Chile, which registered the largest expansions in five and six years respectively as a result of better performances in private consumption and due to the negative shocks that occurred a year ago. Brazil and Ecuador continue to show growth although they have had slowdowns in recent quarters.

With respect to Mexico, an upturn was registered in the second quarter after the weak performance that has been seen since September 2017. The negative effects of one of the factors that generated the greatest uncertainty in this economy, the renegotiation of the North American Free Trade Agreement (NAFTA), have dissipated because of the preliminary agreement that the United States, Mexico, and Canada reached. In spite of the above and just as is the case in the rest of the economies in the region, some

downward risks related to the decrease in the appetite for the risk involved in emerging market assets persists.

Argentina is the economy with greatest difficulties in the region. The persistence of the twin deficits (fiscal and current account) and the country's monetary turmoil added to the negative shocks for emerging markets (such as the Turkish crisis and the normalization of monetary policy in the United States) led to a massive outflow of capital that caused a sharp devaluation of the Argentine peso. The government resorted to an adjustment program with the International Monetary Fund (IMF), which provided credit for their monetary adjustment in exchange for a fiscal adjustment. By the same token, the foreign currency exchange system was modified by establishing a system of floating bands within which there shall be no interference in the market and introducing a new monetary policy that seeks to keep the level of the seasonally adjusted nominal monetary base from rising until June 2019.

Colombia had a growth figure of 2.5% in June 2018. The majority of the main sectors experienced upswings with respect to the same quarter in 2017. There were real contractions in the sectors of construction, and mining and quarrying.

In the case of Colombia, real annual growth of 2.5% was registered for the second quarter of 2018, which is higher than the 2.2% seen a year ago (Table 1.1). When sector performance is evaluated, it is evident that the area of construction was the most sluggish followed by mining and quarrying (the only ones with real decreases). The greatest growth was seen in professional, scientific, administrative, and support occupations as well as in public administration, defense, education, and social services. Note that the manufacturing industry showed growth after having presented contractions throughout 2017. The forecasts calculated by the technical staff at *Banco de la República* indicate a growth of 2.7% in 2018. This possible surge is based on the expectation of a more favorable outlook for the terms of trade as well as greater demand from abroad that could be expected to result from a positive performance by the country's trading partners.¹

The macroeconomic imbalances in some emerging economies have had negative impacts on the appetite for investment in these markets. With the above added to the monetary normalization in developed countries, greater uncertainty for economies like Colombia's has been generated.

The response of international investors to the fiscal and external imbalances in economies such as Argentina's and Turkey's, in a situation in which advanced economies are going through monetary

¹ See the minutes for the September 28, 2018 meeting of the Board of Directors of *Banco de la República*.

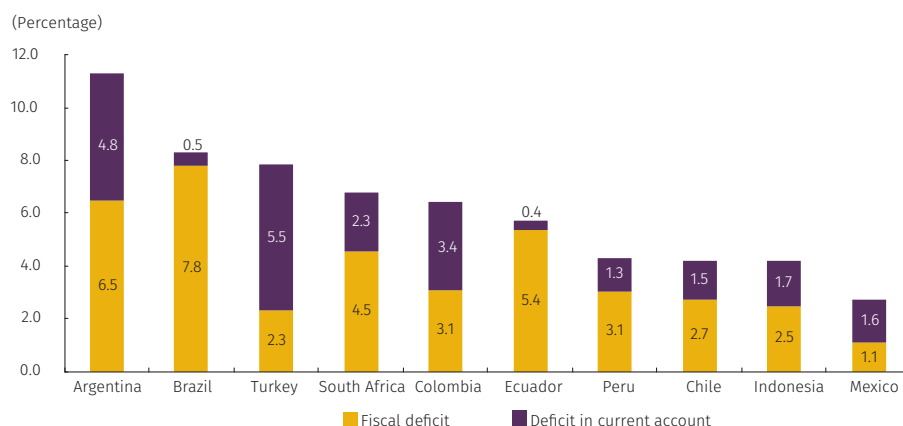
Table 1.1
GDP Annual Real Growth by Economic Activity Sectors: Seasonally Adjusted Series
(percentage)

	2017-II	2018-II
Agricultural, forestry, hunting and fishing	7.6	4.7
Mining and quarrying	-1.8	-5.0
Manufacturing industry	-2.7	1.7
Electricity, gas and water	1.0	2.4
Construction	-2.5	-7.4
Trade, repairs, restaurants and hotels	1.5	3.3
Information and communication	0.5	2.5
Financial and insurance	7.3	4.0
Real estate activities	2.8	2.1
Professional, scientific, administrative and support	3.6	7.6
Public administration, defense, education and social services	4.8	4.8
Art, entertainment and other services	2.7	3.1
Subtotal added-value	1.9	2.5
Taxes minus subventions	5.0	2.6
GDP	2.2	2.5

Source: DANE (National Bureau of Statistics).

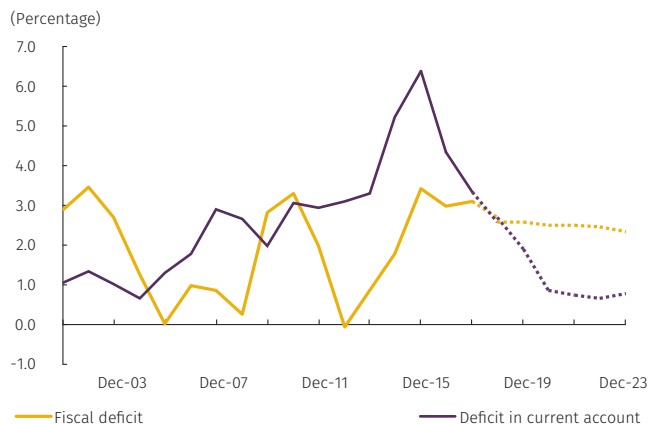
normalization, makes it clear that the Colombian economy could be exposed to these types of reactions in a scenario where the fiscal and current account deficit close less than expected (Graph 1.4). In spite of the above, if the IMF forecasts materialize, an improvement will probably be seen in these indicators in the coming years (Graph 1.5). Another mitigating factor in the Colombian economy is the effectiveness of local monetary policy in comparison to the most vulnerable economies where the Central Bank has low credibility.

Graph 1.4
Twin Deficits in Emerging Economies
(percentage of the GDP)



Note: Data for 2017
Source: International Monetary Fund

Graph 1.5
Colombia's Twin Deficit to GDP



Source: IMF

Given the above, it becomes relevant to study the resilience of the Colombian financial system in an environment in which these risk factors materialize. That is why this *Report* is presenting a stress test that calculates the potential impact of a hypothetical scenario that includes low medium-term growth, which results in some economic sectors having more limited creditworthiness. It likewise seeks to measure a set of risks for the banking system materializing as a result of that shock. The usefulness of the exercise lies in providing an estimate of the potential losses that would be seen in this scenario and reveal the possible transmission channels through which the vulnerabilities identified could end up affecting financial stability.

The results show a drop in the aggregate capital adequacy of credit institutions, which remains above the regulatory minimum at the end of the test. This is accompanied by a reduction in the levels of profitability and the strength of the portfolio. That underscores the need to continue carefully monitoring both the debtors' and entities' financial situations as well as the changing conditions in the macroeconomic environment. These results are obtained from a hypothetical scenario and using a set of restrictive assumptions. It is to be expected, therefore, under shocks that are smaller in magnitude, or using weaker assumptions, the impact on financial stability will presumably be lower.

Box 1 Risk Indicators for Shadow Banking in Colombia

Pamela Cardozo
Jorge Cely
Óscar Jaulín*

In Box 3 of the *Financial Stability Report* for the second half of 2016¹ the measurement of *shadow banking* (SB) in Colombia was presented based on the methodology of the Financial Stability Board (FSB) and a calculation for measuring risk proposed by the IMF for entities that are part of SB was explained. In this box, SB is measured with a cut-off as of December 2017, broken down by activities and its risks are measured based on the indicators proposed by the FSB.²

The FSB defines SB as the intermediation of credit by entities or activities outside (totally or partially) of the banking system. Based on this definition, the SB in Colombia as of December 2017 was COP137 billion (Graph B1.1; 16.4% of the GDP and 22.5% of the assets of credit institutions).

In order to obtain a measurement of SB that is more accurate and identify specific sub-sectors that can generate significant risks that have characteristics similar to bank risks, the FSB excludes funds that are concentrated in stock shares on the grounds that they do not do credit intermediation and the rest of the components that are not classified into one of the following activities: investment funds subject to runs (A1), loan provision that is dependent on short-term funding (A2), intermediation of market activities dependent on short-term funding (A3), facilitating the credit creation (A4), and securitization (A5). Graph B1.2 presents a more accurate measurement of SB for Colombia as of 2017 and breaks it down by activities;³ there are no entities that facilitate the creation of credit in this

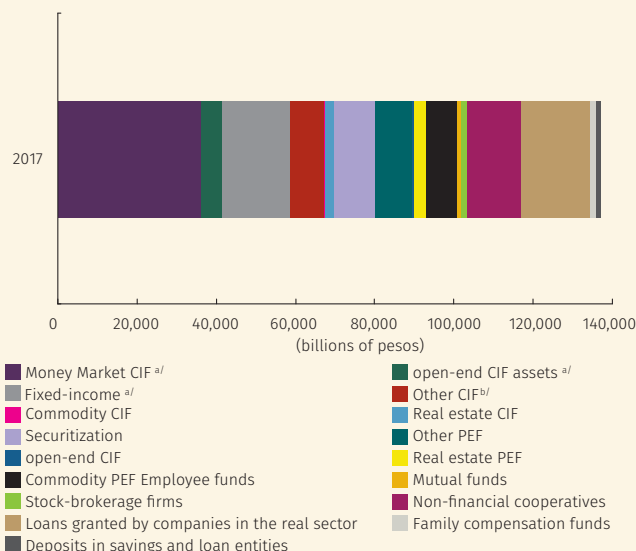
* The authors are fully responsible for the opinions herein contained and do not compromise *Banco de la República* or its Board of Directors.

1 *Banco de la República*, Financial Stability Report, September 2016, Box 3: Analysis of shadow banking in Colombia.

2 FSB, *Global Shadow Banking Monitoring Report*, 2017.

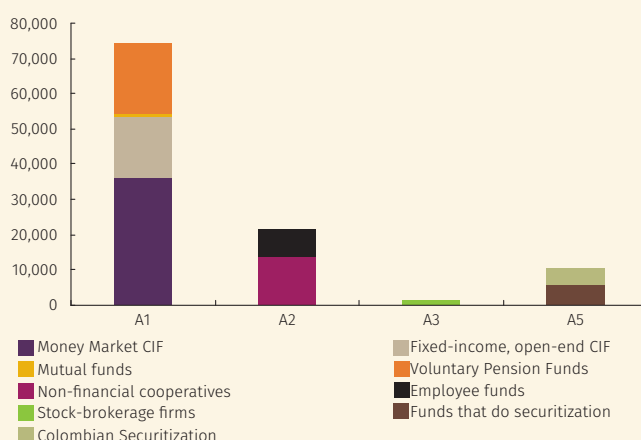
3 For a larger breakdown, securitization (A5) is divided into autonomous equities that do securitization and into the securitization done by the *Titularizadora Colombiana*.

Graph B1.1
SB in Colombia based on measurement by FSB



PEF: private equity funds,
a/ In accordance with Appendix 3 in External Circular 003/2015 issued by the Office of the Financial Superintendent of Colombia.
b/ Closed and open-end CIF with penalties for withdrawals on unscheduled dates. Source: Office of the Financial Superintendent of Colombia, Office of the Superintendent of Economic Solidarity, *Colombian Securitization*, calculations by *Banco de la República*. Source: Office of the Financial Superintendent of Colombia and DANE, calculations by *Banco de la República*.

Graph B1.2
Measurement of SB by Activity



Sources: Office of the Financial Superintendent of Colombia, Office of the Superintendent of Economic Solidarity, *Colombian Securitization*, calculations by *Banco de la República*.

country. The voluntary pension funds that are not included in the more accurate measurement of the FSB but that in Colombia can have features that are similar to the collective investment funds (CIF) are added to this measurement. The estimate of the SB by activity for Colombia in 2017 is COP107 billion, and 69% corresponds to funds that may be subject to runs. Due to the regulations of the *Office of the Financial Superintendent of Colombia*, the money market CIF and the open-end fixed-income CIF have had to comply with a liquidity indicator to control this risk since 2015.⁴

4 External Circular 003/2015.

The FSB proposes the following risk indicators for SB:

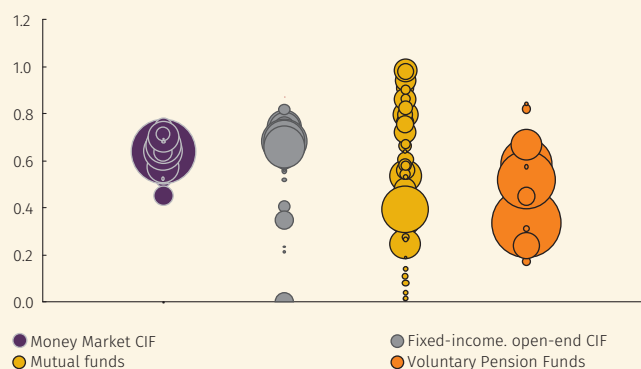
- Credit Intermediation (CI)
 - CI1 = credit assets⁵/total financial assets
 - CI2 = loans/ total financial assets
- Maturity transformation (MT)
 - MT1 = (long-term assets - (long-term liabilities + equity))/total financial assets
 - MT2 = short-term liabilities⁶/short-term assets⁷
- Liquidity Transformation
 - LT = (total financial assets - liquid assets + short-term liabilities)/total financial assets
- Leverage (A)
 - A = total financial assets / equity

The risk indicators for each activity are given below. The sizes of the circles represent the assets of each element. These can be compared within categories but not between categories.

A1: investment funds subject to runs⁸

- Indicators of credit intermediation. The CI1 (Graph B1.3) shows a high heterogeneity primarily in the mutual funds. The monetary market CIF had the lowest heterogeneity. The CI2 (Graph B1.4) is only calculated for mutual funds, since they are the only ones which can make loans. Note that the largest mutual fund has a value very close to zero thus indicating that it grants very few loans while one of the smallest has a CI2 of 0.42.

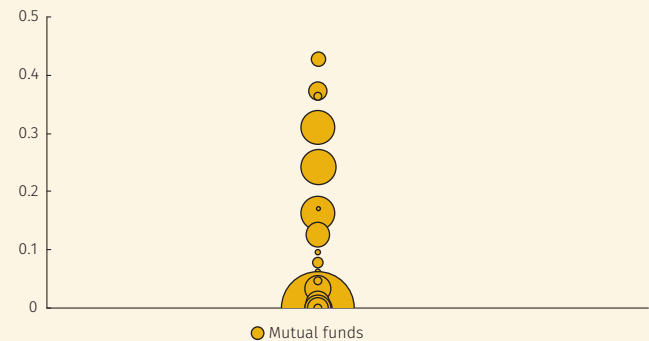
Graph B1.3
CI1 = Credit Assets/A1 Total Financial Assets



Source: Office of the Financial Superintendent of Colombia, calculations by Banco de la República

- 5 For Colombia: loans, bonds (excluding TES), CD.
- 6 For open-end funds, equity is included as a short-term liability. The voluntary pension funds and mutual investment funds are considered open-end funds for these indicators.
- 7 With a maturity of less than one year. Cash is included.
- 8 At the close of 2017, there were 29 money market CIF, 4 open-end, fixed-income CIF, 52 mutual funds, and 13 voluntary pension funds.

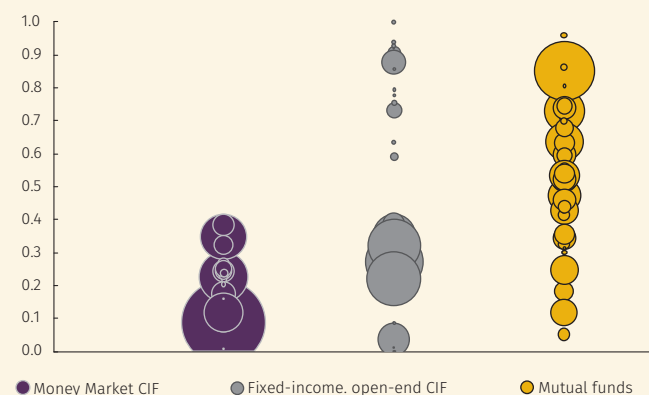
Graph B1.4
CI2 = Loans / A1 Total Financial Assets



Source: Office of the Financial Superintendent of Colombia, calculations by Banco de la República

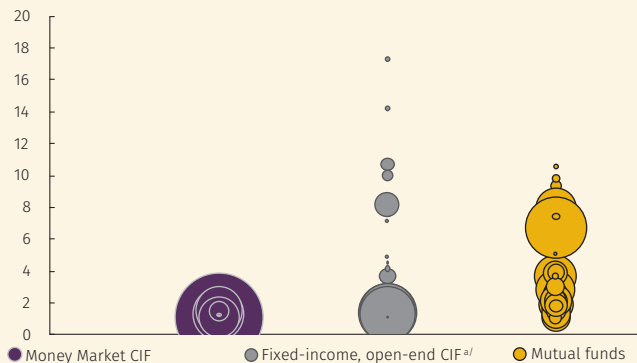
- Indicators of maturity transformation in general, the monetary CIF are the ones that carry out a smaller maturity transformation and the ones that have a smaller dispersion in the indicators (Graphs B1.5 and B1.6). Given that the long-term liabilities are small, the MT1 is very close to long-term assets/financial assets in the majority of the cases. A value close to 1 indicates that most of the assets are long-term. With respect to MT2, given that the short-term liabilities come from the equity, a value of 1 implies that the fund has its investments in short-term assets.
- Indicator of liquidity transformation the short-term liabilities largely consist of the equity of the funds. Therefore, a value close to 2 shows that the fund does not have liquid assets. Again the mutual funds are those which carry out the greatest transformation of liquidity (Graph B1.7).
- Indicator of leverage. The leverage of the funds is close to 1. For mutual funds and voluntary pension funds, leverage is restricted by regulations. Mutual funds may only incur debt for the acquisition of securities when these match the specifications of the respective

Graph B1.5
MT1=(Long-Term Assets – Long-Term Liabilities) / A1 Total Financial Assets



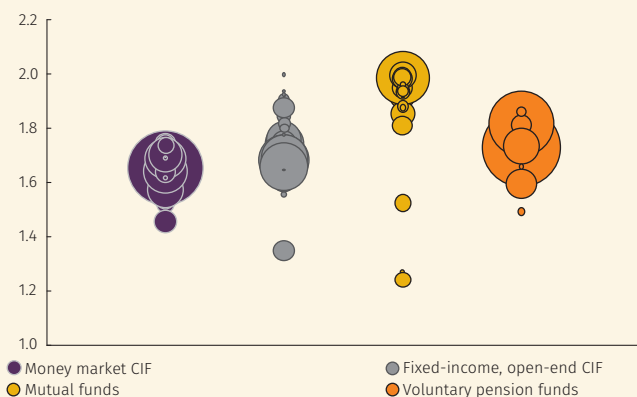
Note: the long-term assets cannot be determined for the voluntary pension funds. Long-term liabilities = total liabilities - short-term liabilities. Short-term liabilities = accounts payable + liabilities in the money market + equity.
Source: Office of the Financial Superintendent of Colombia, calculations by Banco de la República

Graph B1.6
 $MT2 = \text{Short-Term Liabilities} / A1 \text{ Short-Term Assets}$



a/ An atypical case with an indicator that is close to 1,000 is eliminated. This case corresponds to a CIF that invests in foreign funds denominated in dollars.
 Source: Office of the Financial Superintendent of Colombia, calculations by *Banco de la República*

Graph B1.7
 $LT = (\text{Financial Assets} - \text{Liquid Assets} + \text{Short-Term Liabilities}) / A1 \text{ Financial Assets}$

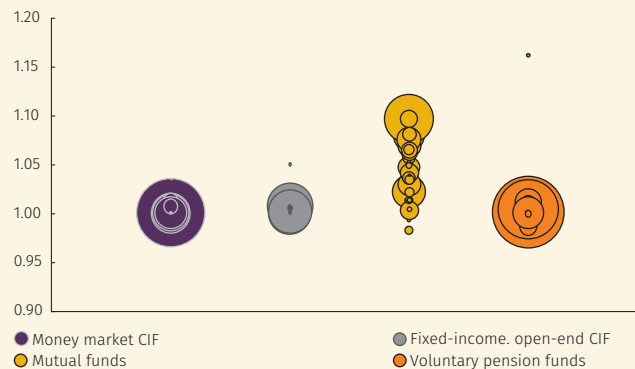


Source: Office of the Financial Superintendent of Colombia, calculations by *Banco de la República*

issue,⁹ and the voluntary pension funds may not incur in debt (Graph B1.8).¹⁰

A2: loan provision that is dependent on short-term funding;¹¹ this is the second largest operation in the analysis of SB in Colombia and the one that consists of a larger number of entities. Only the second indicator of credit transformation (CI2) and the leverage indicator can be calculated. The others cannot be because it is not possible to break the assets and liabilities down between short and long term nor to know what the investments in bonds and CD are. With respect to the transformation of credit, in the majority of entities, loans represent more than 50% of their financial assets (Graph B1.9). However, the largest

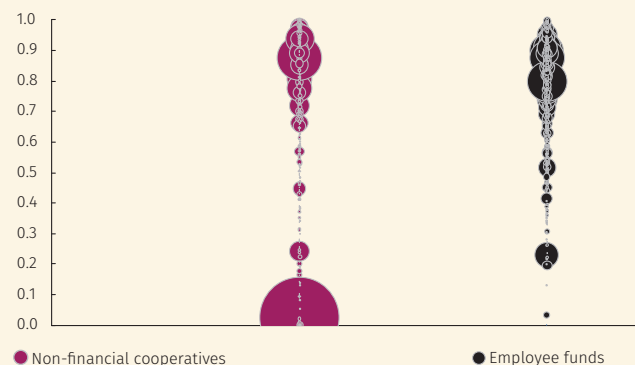
Graph B1.8
 $A = \text{Financial Assets} / A1 \text{ Capital}$



Source: Office of the Financial Superintendent of Colombia, calculations by *Banco de la República*

cooperative does almost no credit intermediation. The cooperatives have an average leverage (weighted by financial assets) of 2.51 and the employee funds have an average leverage of 4.55 (Graph B1.10).¹² Nine small cooperatives and two employee funds registered a value higher than 33.33 (the maximum allowed in accordance with Basel III for banks).

Graph B1.9
 $CI2 = \text{Loans} / A2 \text{ Total Financial Assets}$



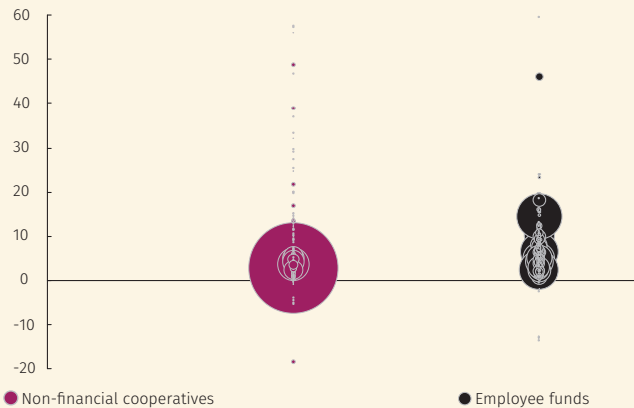
Source: Office of the Financial Superintendent of Colombia, calculations by *Banco de la República*

A3: intermediation of market activities dependent on short-term funding;¹³ the stock-brokerage firms (SBF) carry out limited credit intermediation. The CI1 on average (weighted by assets) is 0.13, and the CI2 is 0 for all entities.¹⁴ The majority of the financial assets of some SBF in the sector that are not very large consists of liquid assets and, as a result, their LT indicator is close to 0. The highest

9 Decree 2555, Article 2.19.1.1.5.
 10 Article 171, number 3 of the Statutory Law of the Financial System.
 11 At the end of 2017, there were 1,436 non-financial cooperatives and 1,308 employee funds.

12 The negative data are due to entities that report negative capital.
 13 At the close of 2017, there were 21 stock brokerage companies.
 14 The loans that SBF can grant correspond to financing their clients so that they can acquire securities (with prior permission from the Office of the Financial Superintendent of Colombia) and to make good on the stock market trades that their clients have not carried through. The first funding is found in account 161615 of the balance sheet. The second is registered in account 161695 (others), but is not broken down. Therefore, it is not included in the calculation of the CI2.

Graph B1.10
A = Total Financial Assets / A2 Equity

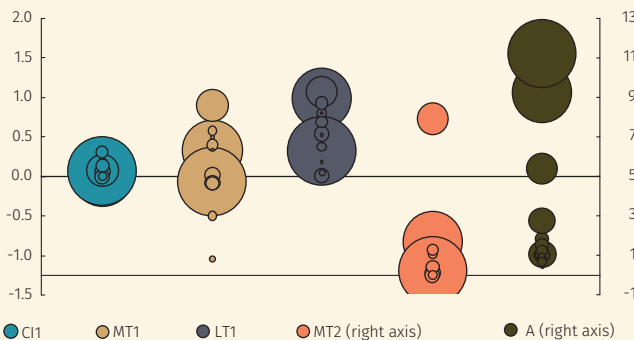


Source: Office of the Financial Superintendent of Colombia, calculations by Banco de la República

value is 1.08 which indicates that the liquid assets of this entity are less than its short-term liabilities (Graph B1.11). The high values in TM2 are explained by the liability sell/buy-back positions. With regards to leverage, the two largest SBF have the highest value.

A5: *Securitization*:¹⁵ just as in the case of the entities in activity 2, only the second indicator of credit transforma-

Graph B1.11
Risk Indicators for Stock Brokerage Firms



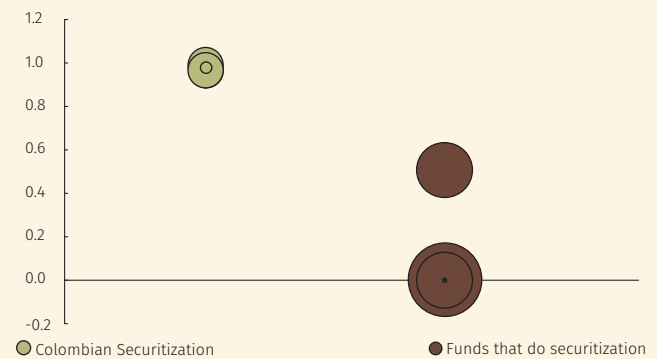
Source: Office of the Financial Superintendent of Colombia, calculations by Banco de la República

tion (CI2) and the leverage indicator can be calculated. The others cannot be because it is not possible neither to break the assets and liabilities down between short and long term nor to know what the investments in bonds and CD are. The leverage indicator for the securitizations carried out by the Colombian Securitization is not calculated since the universe of securities are special purpose vehicles and, therefore, they do not have equity nor carry out leverage operations. While the CI2 is very close to 1 for the universe of securities in Colombian Securitization, it

is 0 for the funds that do securitization with the exception of one fund. This shows that the funds, for the most part, do not do securitizations for loan portfolios, and the Colombian Securitization does (Graph B1.12). The leverage of funds that do securitization is, on average (weighted by financial assets), 0.55. In these funds, the values close to 0 are due to the fact that a significant share of their assets are in the accounts receivable and material assets (Graph B1.13)

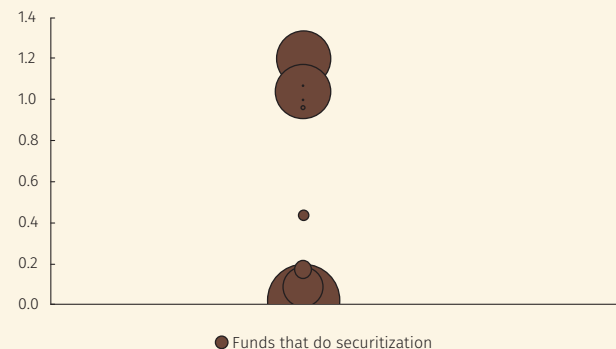
Graph B1.14 gives the average (weighted by total financial assets) of each risk indicator for each group of entities that take part in one of the SB operations (defined by the FSB). Note that mutual funds carry out a high level of maturity transformation and that the employee funds, the SBFs, and the financial cooperatives registered leverages that were greater than 2. Moving forward, it would be desirable to have the balance sheets of the voluntary pension funds, non-financial cooperatives, employee funds, universes of securities of the Colombian Securitization as well as of the funds that do securitization broken down further in order to be able to calculate all their risk indicators.

Graph B1.12
CI2 = Loans / A5 Total Financial Assets



Sources: Office of the Financial Superintendent of Colombia, Colombian Securitization, calculations by Banco de la República.

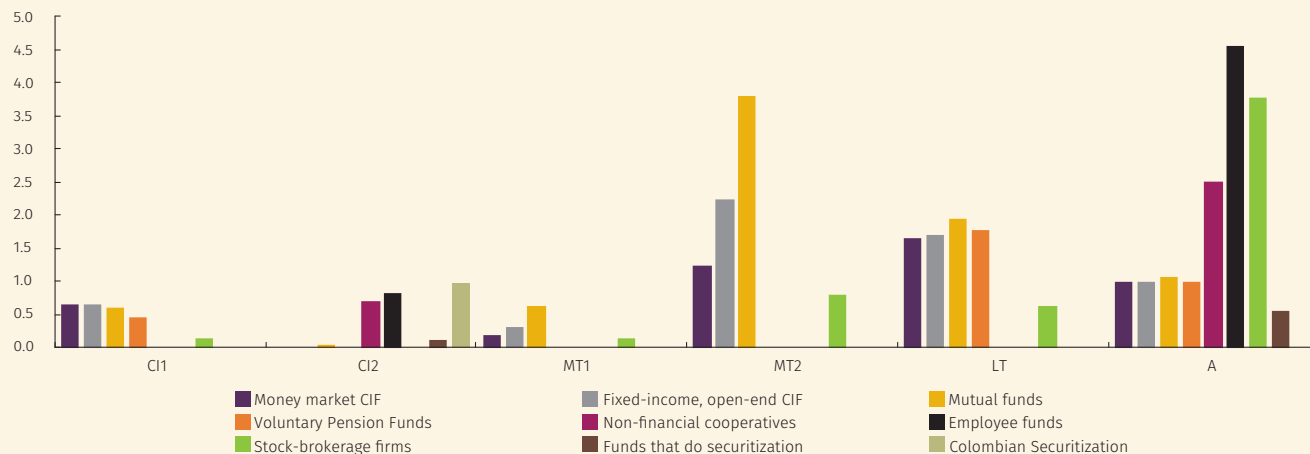
Graph B1.13
A = Total Financial Assets / A5 Equity



Sources: Office of the Financial Superintendent of Colombia, Colombian Securitization, calculations by Banco de la República.

15 At the close of 2017, there were 32 trust business that did securitization and 41 universes of securities in the *Titularizadora Colombiana*.

Graph B1.14
Risk Indicators for SB in Colombia



Sources: Office of the Financial Superintendent of Colombia, Office of the Superintendent of Economic Solidarity, Colombian Securitization, calculations by Banco de la República.

02

Vulnerabilities of the Financial System²

Given the potential risks that have been identified in Chapter 1, the exposure of financial intermediaries to these possible sources of vulnerability are evaluated in this section. In a context of economic downturn, the financial system has adjusted to the recent macroeconomic shocks, and this has led to a gradual deterioration in the risk indicators. An overview of the financial system and an analysis of the credit, market, liquidity and banking book interest rate risks that financial entities are exposed to are presented below.

2.1 Current Situation of the Financial System

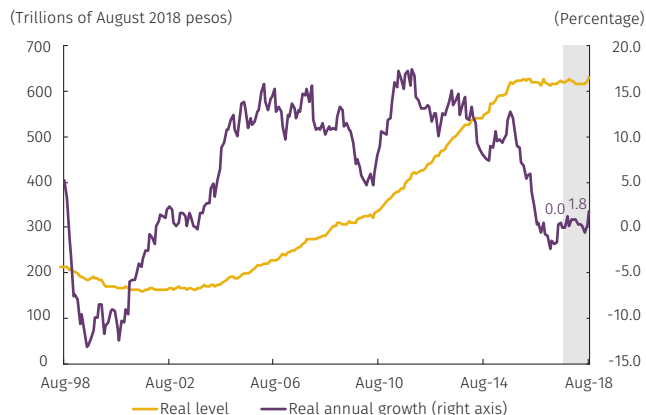
The balance sheets of the credit institutions continue to present low levels of real growth, although they are higher than those reported a year ago due to the investments dynamics.

As of August 2018, the credit institutions (CI) assets came to COP 632.3 trillion (t) which represented a real annual expansion of 1.8%.³ This growth is higher than that reported a year ago, but it still remains below the average for the last five years (Graph 2.1). The prolonged sluggishness of asset growth has been seen for almost two years and is a trend that has not been registered since the financial crisis of 1998. In line with the faster pace of assets growth, the liabilities of the CI grew at a higher rate than the one seen a year ago.

² The data presented herein is dated to August 2018.

³ The real growth was calculated by using the consumer price index (CPI) excluding food.

Graph 2.1
CI Assets



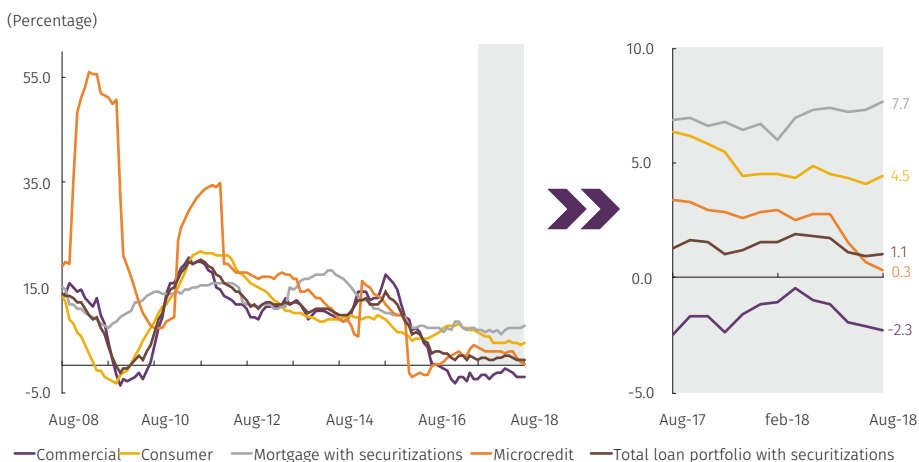
Sources: Office of the Financial Superintendent of Colombia, calculations by Banco de la República.

The better growth of the assets has been explained primarily by the expansion of investments that rose to represent 19.0% of the total assets, in comparison to the 17.8% from a year ago. Regarding the loan portfolio, since mid-2016 the growth rates for the different types of credit have remained stable at low levels. This contrasts with the fast rebound they registered after the international financial crisis in 2009 (Graph 2.2). This performance coincided with a lower demand for loans within the economy and with an increase in the requirements for credit granting (Graph 2.3). However, in the most recent survey on the credit situation in Colombia, the CI indicated that they perceived an increase in the demand, primarily for the consumer and micro-credit portfolios. In addition, a lower percentage of entities raised their credit requirements.

percentage of entities raised their credit requirements.

Therefore, in a favorable macroeconomic context that improves the debtors' ability to pay and that invigorate demand, loan portfolios could show better performances within the near future.

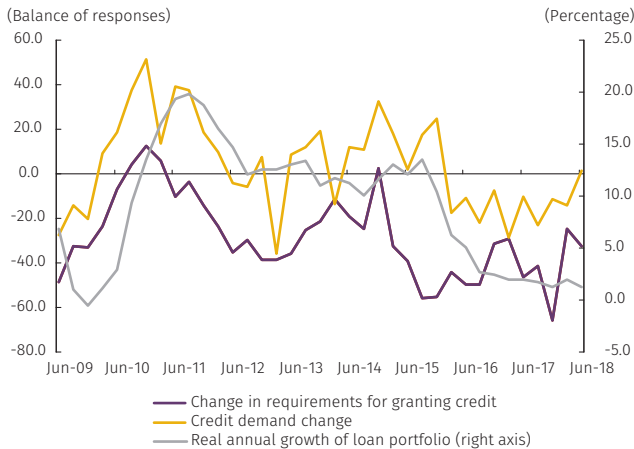
Graph 2.2
Annual Real Growth of Loan Portfolios by Type



Source: Office of the Financial Superintendent of Colombia, calculations by Banco de la República

The indicators of credit risk continued to deteriorate, but at a slower pace, as a result of the slowdown in the risky and non-performing loan portfolios. The loan deterioration was driven by the commercial and housing loan portfolios dynamics.

Graph 2.3
Perception Change of Credit Supply and Demand

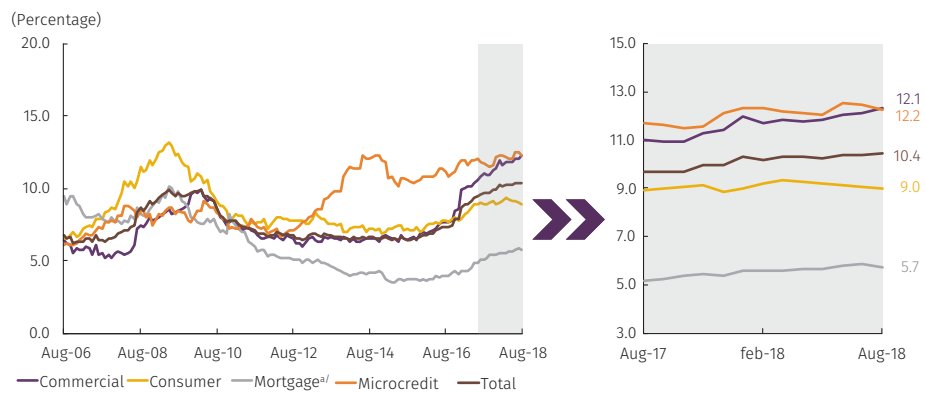


Source: Report on the Credit situation in Colombia, Banco de la República.

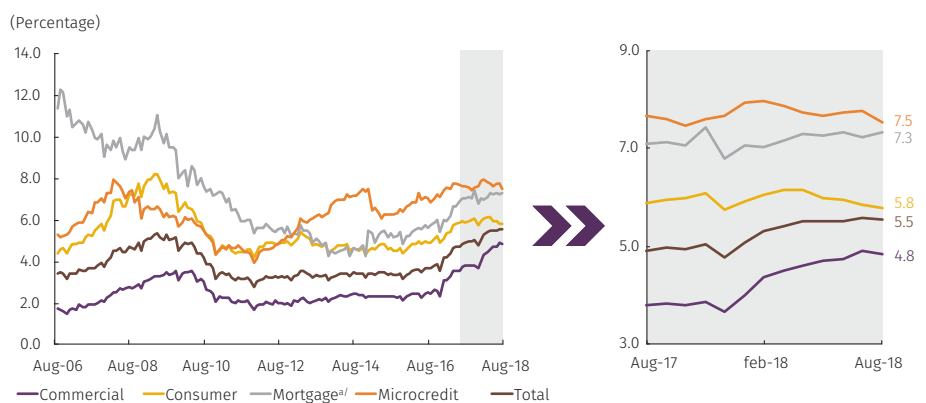
During the last six months, the quality risk indicator (QRI)⁴ for the total loan portfolio continued showing rises and stood at 10.4%. By type of credit, the indicator of commercial and housing loan portfolios rose although to a lesser extent than what was registered in previous months. In the meantime, the QRI of the consumer and micro-credit portfolios exhibited a decline. The QRI seen for both the commercial and total loan portfolios is higher than the one during the international financial crisis in 2009 (Graph 2.4, panel A). On the other hand, the non-performing loan indicator (NPI)⁵ shows similar performance to the QRI) as it registered a level of 5.5% in August 2018, a value that was higher than that seen

Graph 2.4

A. Quality Risk Indicator (QRI)



B. Non-Performing Loans Indicator (NPI)



a/ mortgage loans do not include securitizations.
Source: Office of the Financial Superintendent of Colombia, calculations by Banco de la República

- 4 The QRI is defined as the ratio between the risky and the total loan portfolios (the risky loan portfolio corresponds to credits with ratings other than A on a scale from A to E where A is the best rating).
- 5 The NPI is calculated as the ratio between the non-performing and total loan portfolios (non-performing loans includes credits that have been in arrears for a period of more than 30 days).

during the time of the international financial crisis in 2009 (Graph 2.4, panel B). The increase over the past year is explained by the performance of the commercial and housing loan portfolios, while the indicators for the consumer and micro-credit portfolios reported declines.⁶ In the case of the commercial loan portfolio, the rise in the indicator is partly due to the denominator effect through the low growth of loans. Furthermore, the non-performing portfolio slowed down for all types of loan portfolios and showed a real annual growth of 12.6% as of August 2018. This rate is lower than the maximum registered during the international financial crisis (55.1%).

The downward trend in profitability indicators reversed itself in recent months due to the slowdown in expenditures on loan-loss provisions.

In August 2018, the return on assets (ROA) indicator stood at 1.4%. This presented a recovery from the drop seen over the last few months and reached levels similar to those from a year ago (Graph 2.5).⁷ Likewise, the return on equity (ROE) closed at 10.7% showing a similar trend to that of the ROA.

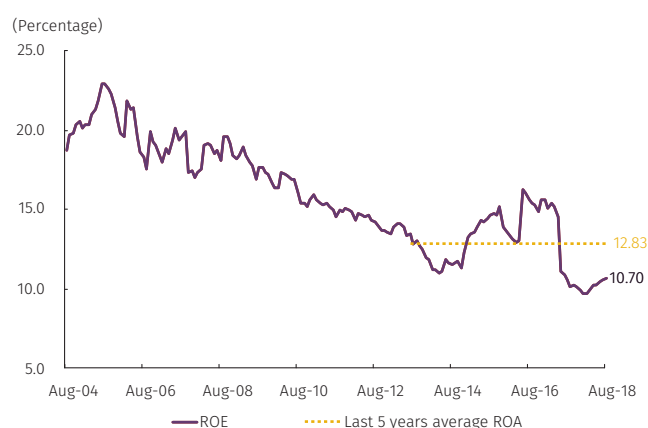
Although the profitability indicators are below the average for the past five years, a reversal has been seen recently in the declining trend observed since the end of 2015. This performance is due the slowdown in the expenditures on loan-loss provisions and a smaller growth in administrative and labor expenses. Furthermore, the common equity tier 1 ratio at the individual basis rose 12 bp while the total capital adequacy ratio fell 34 bp, when it stood at 11.4% and 16.4% respectively.⁸ At the consolidated basis, these indicators were 9.7% and 13.5%, respectively, as of June 2018.

Graph 2.5
Profitability of Credit Institutions

A. Return on Assets (ROA)



B. Returns on Equity (ROE)



Source: Office of the Financial Superintendent of Colombia, calculations by Banco de la República

6 When write-offs are included in the calculation of the NPI, the trends of the indicators are similar for all modalities with the exception of the consumer loan portfolio, which has increased at a faster rate than the NPI excluding write-offs since the beginning of 2015.

7 The positive jump that was seen in June 2016 was due to the decision made by the Banco de Bogota against consolidating Corficolombiana.

8 The regulatory limits for total capital adequacy and common equity tier 1 ratios are 9.0% and 4.5% respectively.

Assets held by non-banking financial institutions in proprietary and managed accounts registered a slowdown compared to the one observed six months earlier.

In August 2018, Non-banking Financial Institutions' assets (NBFI) in proprietary account stood at COP 85.7 t and represented 5.1% of the financial system assets (Table 2.1). In real terms, its annual growth rate was lower than in February 2018. During this period, proprietary assets of insurance companies grew at a slower pace and those held by brokerage firms (BF) declined, which was partly explained by the decrease in the outstanding amount of money market operations and investments within their balance sheet between April and June.

On the other hand, the NBFI's total assets under management amounted to COP 809.1 t as of August 2018, which is equivalent to 48.2% of the total assets of the financial sector. The real growth rate of these portfolios showed a downturn relative to February 2018. This was a response to the fact that the assets managed by the trust companies (TC), which represent about 64% of the total assets under management, registered a growth of 6.2% compared to the 7.5% observed six months previously.

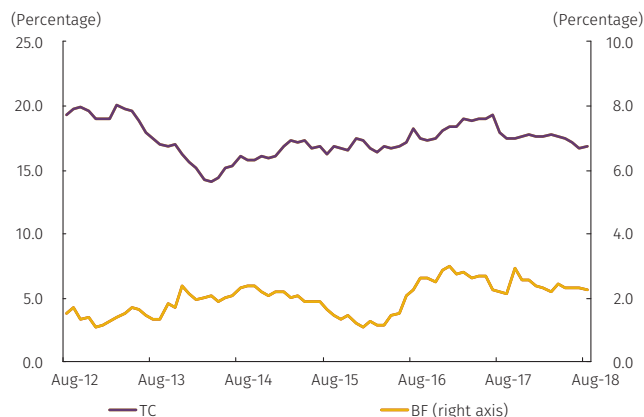
Table 2.1
Non-Banking Financial Institutions' Proprietary and Third-Party Assets

Non-bank Financial Institution Assets	Feb-18		Annual real growth	Aug-18		Annual real growth
	Trillions of Colombian pesos	Financial system asset percentage		Trillions of Colombian pesos	Financial system asset percentage	
Proprietary Position	83.1	5.2	9.2	85.7	5.1	5.5
Pension Fund Managers (PFM)	5.8	0.4	8.9	6.1	0.4	6.5
Trust Companies (TC)	3.2	0.2	8.5	3.6	0.2	10.3
Brokerage Firms (BF)	5.2	0.3	23.7	4.2	0.2	-3.9
Insurance Companies	68.9	4.3	8.3	71.9	4.3	5.7
Assets Under Management	773.4	48.5	8.6	809.1	48.2	6.1
PFM: mandatory pensions	225.9	14.2	10.5	237.4	14.2	6.2
PFM: Voluntary Pensions	17.2	1.1	9.8	18.0	1.1	7.2
PFM: Severances	15.1	0.9	6.1	12.2	0.7	5.2
TC	492.9	30.9	7.5	515.6	30.7	6.2
SBF	22.3	1.4	13.9	25.9	1.5	3.6
Total Non-bank Financial Institutions	857.5	53.8	8.7	895.8	53.4	6.1
Total Financial system	1,593.5	100.0	6.2	1,677.0	100.0	6.0

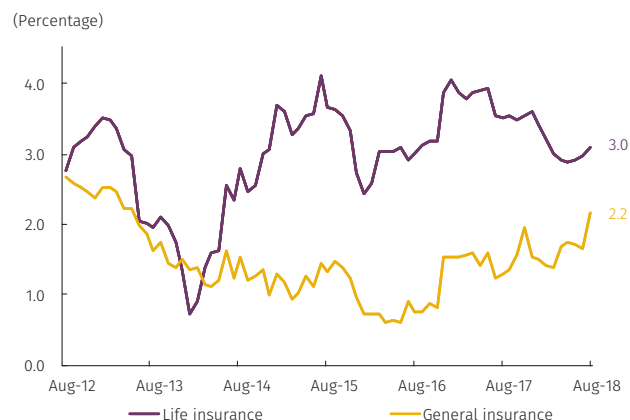
Note: data expressed in August 2018 Colombian pesos.
Source: Office of the Financial Superintendent of Colombia, calculations by Banco de la República.

Graph 2.6
Returns on Assets of Non-banking Financial Institutions

A. Trust Companies and Brokerage Firms



B. General and Life-Insurance Companies



Source: Office of the Financial Superintendent of Colombia, Banco de la República calculations.

Between February and August 2018, ROA of NBFIs experienced a slight decline, but remains above the average of the last five years.

Regarding to NBFI’s profitability indicators, ROA of both BF and TC stood at 2.3% and 16.8%, respectively, in August 2018. These figures are slightly lower than those registered in last February (Graph 2.6, panel A). The ROA for life insurance companies, in turn, remained at levels closed to 3.0%, while the indicator for general insurance companies⁹ showed considerable growth as it went from 1.4% in February 2018 to 2.2% six months later (Graph 2.6, panel B). This improvement of ROA for general insurance companies was explained by a decrease in operating expenses related to loss reserves and foreign reinsurance.

Financial institutions performance has been influenced by overall economic conditions. However, the transmission channel has been different depending on the type of entity.

To conclude, in recent months there has been a reversal of the declining trend of CI’s profitability ratios due to a slowdown of risky and non-performing loans ratios, and therefore, of loan loss provisions. NBFI’s indicators have been fluctuating around their historical averages.

2.2 Credit Risk

The analysis of credit risk that is presented below is divided between the corporate sector and households. The development of corporate sector indebtedness and the perception and materialization of private companies’ credit risk is analyzed by economic sector in the first subsection. Furthermore, the indebtedness and financial burden on households are identified in the second sub-section and some risk indicators, related to the performance of this portfolio, are presented.

9 Includes information on insurance cooperatives.

2.2.1 Corporate Sector¹⁰

2.2.1.1 Change in corporate sector indebtedness

The corporate sector reduced its debt as a percentage of GDP. This decrease occurred in both the public corporate sector due to a drop in the debt denominated in foreign currency and the private corporate sector where debt denominated in legal tender fell.

As of June 2018, the total indebtedness of the corporate sector as a share of the annualized GDP stood at 54.6% and represented a reduction with respect to what had been registered in December 2017. Of the total, the private corporate sector¹¹ contributed 46.1 pp. This sector presented a greater decrease than that of the public sector (Graph 2.7, panel A). The decrease in private sector indebtedness was due largely to a reduction in loans denominated in national currency from national financial entities, whereas in the case of the public sector this was essentially due to a lower amount in bonds issued abroad¹² (Graph 2.7, panel B).

In addition to the above, note that the main sources of funding for the private sector at the time the analysis was done continued to be loans in legal currency from local financial institutions and, in foreign currency, from foreign lenders while, for the public sector, the sources are bonds issued in the foreign markets. It is also evident that the sources of financing that are used the least by the two sectors are, respectively, bonds issued abroad and foreign providers.

When indebtedness is analyzed by type of currency, it is evident that private companies still acquire the majority of their debt in pesos and the decline in aggregate debt is due to the drop in debt denominated in national currency. The public companies, in turn, have preferred to borrow in foreign currency although this indebtedness has been showing a decline as a percentage of the GDP since 2015 (Graph 2.8).

Debt denominated in foreign currency may be a source of vulnerability for the corporate sector to the extent that it exposes the entity to movements in the exchange rate. Nevertheless, the exposure to exchange rate risk is mitigated if the company is an exporter, if it is hedged (through the use of derivatives), or if it has the backing of a

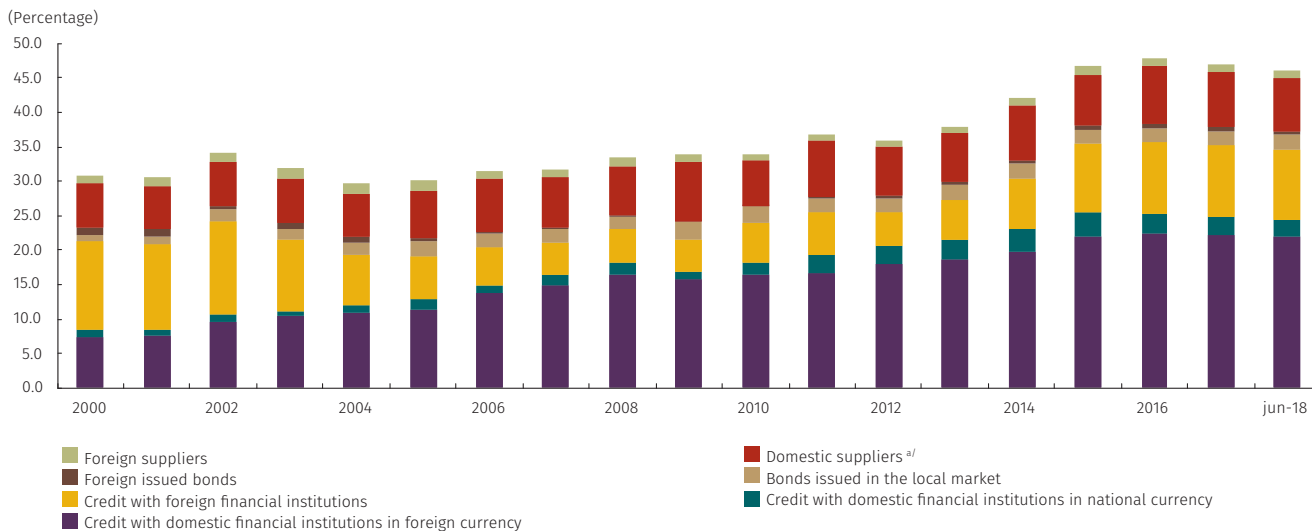
10 Due to availability of information from the FSC Format 341 "Individual Information by Debtor: Active Credit Transactions," the figures in this section were submitted as of June 2018.

11 Throughout the entirety of this section, the term "private corporate sector" refers to private companies and excludes those that are monitored by the FSC.

12 As a percentage of the GDP, the debt in bonds issued abroad was 0.5 pp less with respect to what was registered in December 2017. This decrease was largely because of prepayments on the debt made by Ecopetrol and the *Grupo de Energía de Bogotá*.

Graph 2.7
Corporate Sector Financial Debt as a Percentage of GDP by Instrument

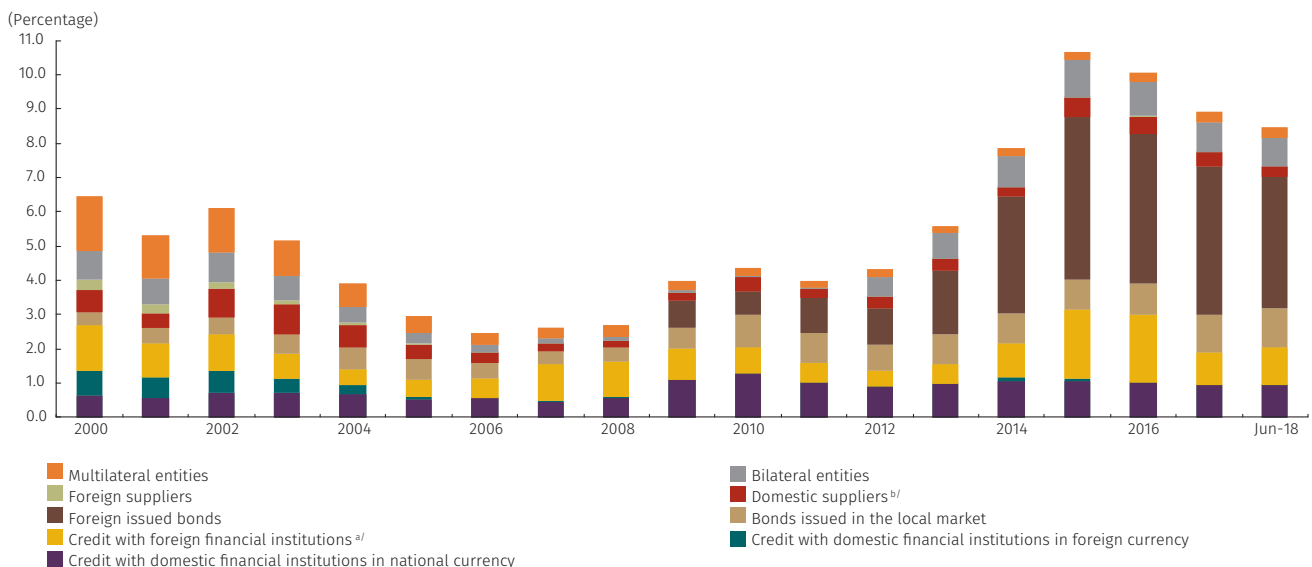
A. Private Corporate Sector



a/ This only includes information from companies that report their financial statements to the Office of the Superintendent of Corporate Affairs. In the year 2017, all of the companies registered their financial statements using IFRS which did not make it possible to determine the balance of debt owed to national entities. Therefore, in order to do an approximation of the data from these companies, the average percentage that the short and long-term providers reported under current and non-current liabilities respectively, during this period, for the companies that reported between 2007 and 2015 using the UAP was calculated, and an equal percentage for the entities that submitted financial statements in 2017 was assumed. Based on data availability as of June 2017, a provider balance that is equal to what was estimated for December 2017 is assumed.

Sources: Office of the Financial Superintendent of Colombia, Office of the Superintendent of Corporate Affairs, and Banco de la República, calculations by Banco de la República

B. Public Corporate Sector



a/ Does not include financial leasing operations.

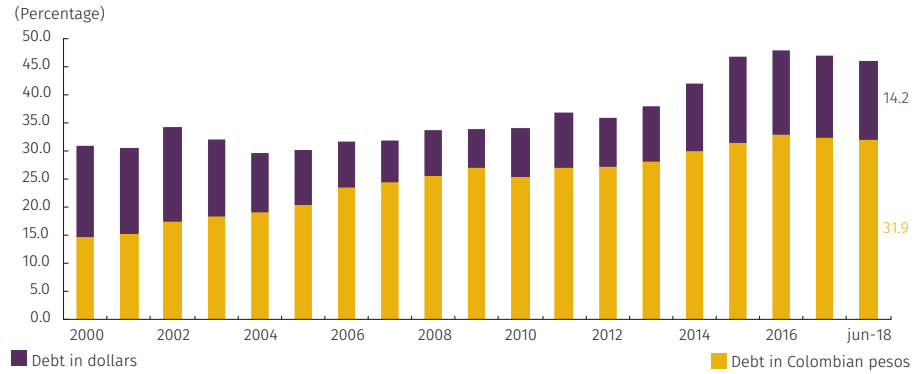
b/ Includes information from the account payable balance of the public sector non-financial companies.

Sources: Office of the Financial Superintendent of Colombia, General Accounting Office, Ministry of Finance and Public Credit; calculations by Banco de la República.

foreign entity (i.e., through Foreign Direct Investment, FDI). Based on information to 2017, Graph 2.9 shows the private corporate sector's financial debt by currency hedging and by the debtor's foreign trade as a share of the GDP. An analysis of this graph shows that, in recent years, there has been an increase in the amount of debt in foreign currency in the hands of non-exporting companies with FDI and no

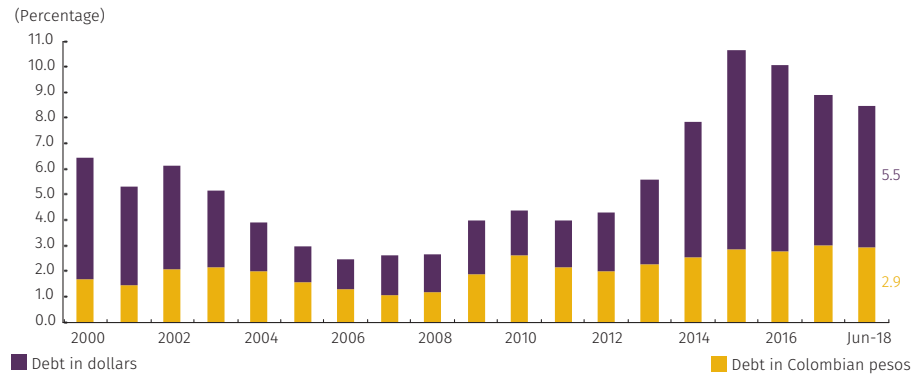
Graph 2.8
Corporate Sector Financial Debt as a Percentage of GDP by Currency

A. Private Corporate Sector



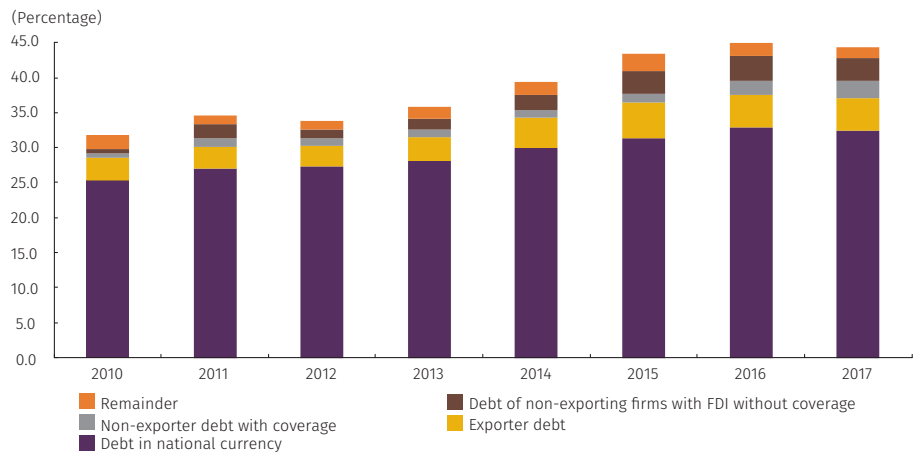
Note: Calculated with the same data as Graph 2.7, panel A.
Sources: Office of the Financial Superintendent of Colombia, Office of the Superintendent of Corporate Affairs, and Banco de la República, calculations by Banco de la República.

B. Public Corporate Sector



Note: calculated with the same data as Graph 15, panel B.
Sources: Office of the Financial Superintendent of Colombia, General Accounting Office, Ministry of Finance and Public Credit; calculations by Banco de la República.

Graph 2.9
Private Corporate Sector Financial Debt as a Share of GDP by Exchange Rate Coverage and Debtor Foreign Trade



Note: the debt in foreign currency includes only loans (excluding leasing) and bonds. Suppliers are not included since the information is not available by TIN.
Sources: Office of the Financial Superintendent of Colombia, DANE, and Banco de la República, calculations by Banco de la República.

hedging although this declined in 2017 compared to what was seen a year ago. In addition, the share of the debt denominated in foreign currency held by non-exporters that use hedging rose in the last two years. Finally, the debt held by entities which are the most exposed to exchange rate risk (remainder) shows stability and was the debt with the lowest share of the GDP in 2017.

2.2.1.2 *Financial Situation of the Private Corporate Sector*¹³

The financial indicators of the companies showed declines in their operations and their indicators of credit risk in contrast to the improvements in leverage and interest coverage.

At the close of 2017, 18,685 companies had reported their financial statements to the *Office of the Superintendent of Corporate Affairs* (SCA). These companies represented 38.1% of the current balance of the commercial loan portfolio at that date. Eleven financial indicators were calculated for 2016 and 2017 in order to measure different attributes of the companies (Table 2.2). The preceding makes it possible to use different measurements to facilitate the evaluation of their strengths and weaknesses.

In general, the indicators showed a downturn in the sales rates for companies along with a rise in the credit risk indicators which is consistent with the indicators for the commercial loan portfolio (shown above). In spite of the above, the profitability of companies did not change significantly during the period under analysis. With regard to their indebtedness, there was a lower of overall leverage indicator in line with the low growth of the commercial loan portfolio. Measured by the current ratio, there was a slight increase in liquidity, and this indicates that companies still have enough liquid assets to cover their shorter-term liabilities. Last of all, there has been an improvement in the indicator of interest hedging. This could show that the companies' profits have been better in comparison to their financial expenses.

13 For this subsection, the "private corporate sector" is defined as the set of companies monitored by the *Office of the Superintendent of Corporate Affairs* whose financial statements (statement of financial position, overall income statement, and cash flow statement) are available yearly on the website of this superintendent with a cut-off date on 31 December each year.

Table 2.2
Status of Private Corporate Sector Financial Indicators as of December 2017

Financial indicators	Figure in 2016	Figure in 2017
A. Indicator of activity (percentage)		
Annual change in sales		1.7
B. Indicator of profitability (percentage)		
Return on assets (ROA) ^{a/}	5.0	5.2
Return on equity (ROE) ^{b/}	10.9	9.3
C. Indicators of indebtedness		
Ratio of total indebtedness ^{c/} (percentage)	52.4	46.4
Ratio of financial indebtedness ^{d/} (percentage)	15.4	17.1
Leverage indicator ^{e/} (percentage)	88.0	70.6
Indicator of interest hedging ^{f/} (number of times)	1.4	1.7
D. Liquidity indicators		
Current ratio ^{g/} (number of times)		1.4
Annual variation in working capital ^{h/} (percentage)	1.3	
E. Size Indicator		
Annual change in total assets (percentage)	3.3	5.6
F. Risk Indicators (percentage)		
Quality risk indicator (QRI) ^{i/}	6.4	8.5
Non Performing Loans (NPL) ^{j/}	2.0	2.6

Note: The atypical observations by financial indicator (percentiles 1 and 99) were eliminated for each year and the weighted average of the resulting sample was calculated. The annual growth of the indicators were calculated using balanced samples. To be specific, the data for 2014 was calculated based on a data sample of the same size for 2013.

a/ Measured as the ratio between the operating profit and total assets.

b/ Measured as the ratio between the operating profit and total equity.

c/ Measured as the ratio between liabilities and total assets. The total liabilities consist of the following items: financial obligations, suppliers, accounts payable, taxes, levies and charges, labor obligations, loan-loss provisions, deferred payments, "other liabilities," and bonds and commercial paper.

d/ Measured as the ratio between financial obligations (short- and long-term) and total assets. This indicator is significantly lower than the one for total indebtedness due to the fact that the majority of the companies in the sample (take the median and not the mean as the measurement of the central tendency) concentrate their liabilities in instruments other than financing with financial institutions.

e/ Measured as the ratio between total liabilities and total equity.

f/ Measured as the ratio between the operational profit and interest expenses (for information reported with UAP) or financial costs (for what is reported with IFRS).

There was a structural change in the indicator due to the previously described accounting change and the fact that the account for financial costs includes expenditures in addition to the ones paid on financial interests.

g/ Measured as the ratio between current assets (assets that can be converted to cash within a period of less than one year) and current liabilities (a period equal to or less than a year).

h/ Real annual growth of working capital which is equal to the difference between current assets and current liabilities.

i/ The loan portfolio's quality risk indicator is measured as the ratio between the risky loan portfolio and the gross loan portfolio.

j/ The loan portfolio's non performing loans is measured as the ratio between the greater than 30-day delinquency portfolio and the gross loan portfolio.

Source: Office of the Superintendent of Corporate Affairs, Office of the Financial Superintendent of Colombia, calculations by Banco de la República.

2.2.1.3 Sector Analysis¹⁴

In the loan portfolio granted to companies in the private sector, the share held by the economic sectors of transportation, financial and electricity rose.

14 In this subsection, abbreviations will be used for the following sectors: 1) real estate, rentals and business: real estate; 2) agriculture, animal husbandry, hunting, forestry, and fishing: agricultural; 3) mining and quarrying: mining; 4) electricity, gas and water: electricity; 5) transportation, warehousing, and communications: transportation; and 6) financial intermediation: finance.

The economic sectors with the largest share of the loan portfolio granted to private companies were trade, manufacturing, and construction which, as a whole, accounted for 55.4% of this portfolio as of June 2018. In contrast, the mining, restaurant and hotels, and health sectors are the ones with the lowest share.

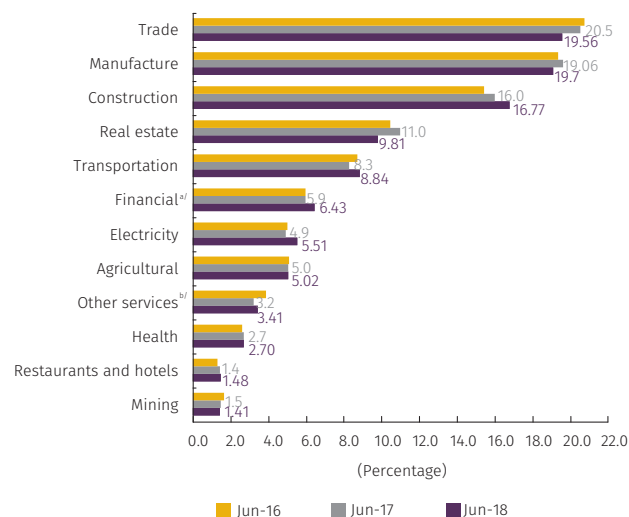
With respect to reports from a year ago, the transportation, financial and electricity sectors were the ones that saw their share rise the most (Graph 2.10). In the case of construction, there has been a rise that is primarily due to reclassifications of existing loan portfolios and not to an increase in lending to this sector.¹⁵ The share held by real estate, manufacturing, and trade, in turn, declined while the last one has notably been representing a progressively lower percentage of the loans granted to the private corporate sector since 2014.

The analysis of various indicators makes it possible to infer that the economic sectors in which the credit risk has risen the most are construction, agriculture, and health.

Between June 2017 and one year later, both the perception of credit risk for this type of loan and its materialization have increased since the indicators of credit risk for the commercial loan portfolio have shown a deterioration. The QRI exhibited an increase and stood at 12.1% in June 2018, whereas the increase in the NPL was smaller and reached 4.7%.

When the QRI is calculated by economic sector, it shows that the health, agricultural, real estate, transportation, construction, and trade sectors are the ones that have experienced major deterioration during the period under analysis (Graph 2.11, panel A). In addition to showing increases in the indicator during the past year, construction and trade are the ones that contributed the most to the deterioration of the aggregate QRI of the private corporate sector (Graph 2.11, panel B). In the trade sector, there was a generalized deterioration in all of the sub-sectors while the retail trade sub-sector was the one that showed the largest increase as it went from 7.5% in June 2017 to 10.2% a year later. In the agricultural sector, in turn, the sub-sectors that spurred the growth of the QRI for that sector the most were poultry raising, oil palm cultivation, and grain crops (excluding rice).

Graph 2.10
Breakdown of Private Corporate Sector Loan Portfolio Balance by Economic Sector



a/ The financial and insurance sector excludes the loan portfolio granted to entities supervised by Office of the Financial Superintendent of Colombia.

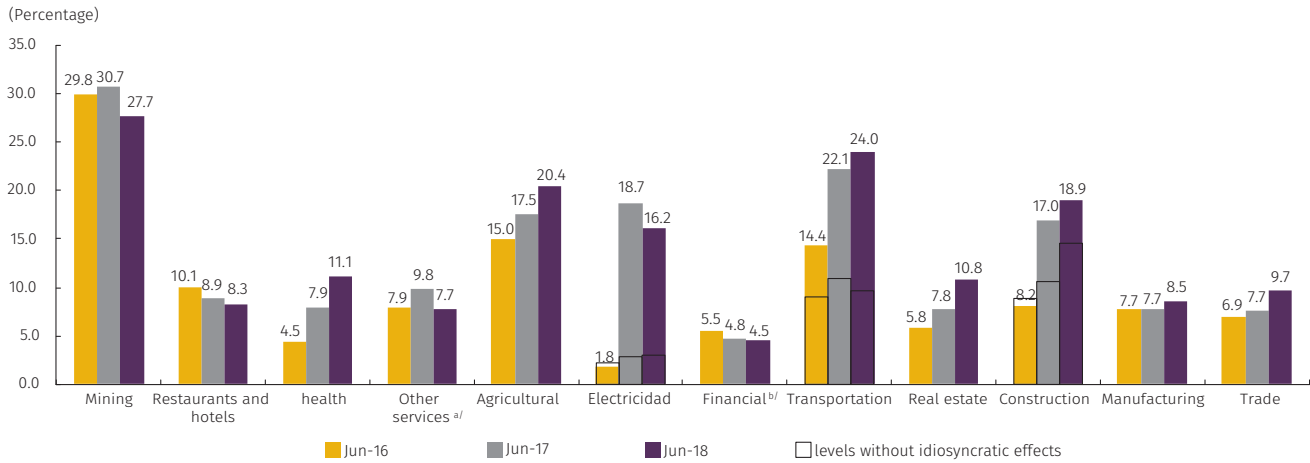
b/ 'Other services' groups firms belonging to the following economic sectors: public administration and defense, education, other community, social and personal service activities, private households with domestic servants, and the organizations and extraterritorial entities.

Sources: Office of the Financial Superintendent of Colombia, Office of the Superintendent of Corporate Affairs, and Banco de la República; Calculations by Banco de la República.

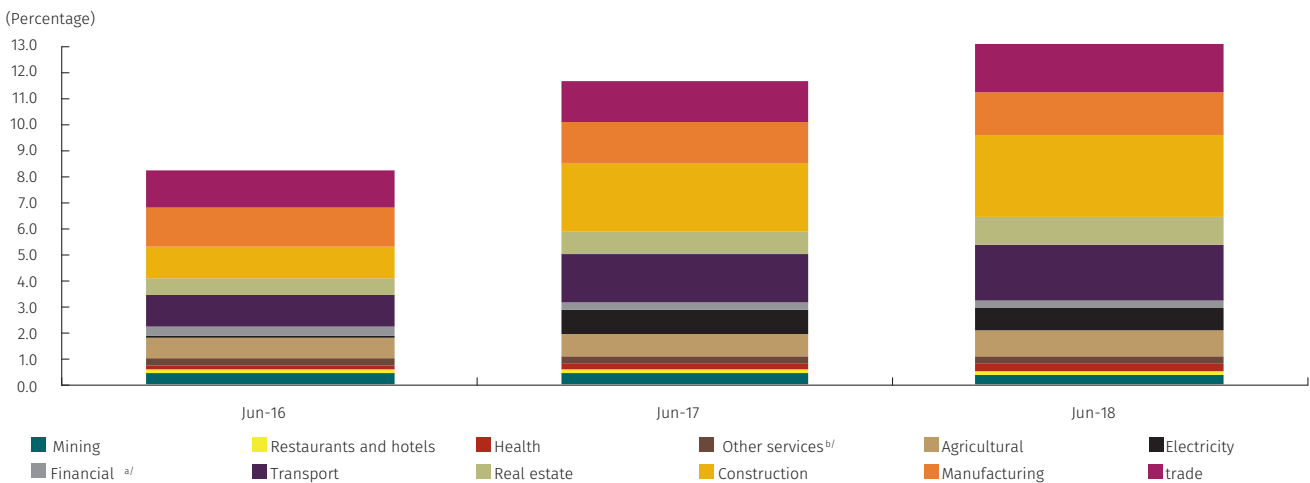
¹⁵ When the effect of reclassifying the construction loan portfolio is ruled out, the share held by this sector would be 16.0%.

Graph 2.11
QRI of the Private Corporate Sector

A. QRI by Economic Sector



B. QRI Contribution by Economic Sector



a/ The financial and insurance sector excludes the loan portfolio granted to entities supervised by Office of the Financial Superintendent of Colombia.
 b/ 'Other services' groups firms belonging to the following economic sectors: public administration and defense, education, social and health services, other community, social and personal service activities, private households with domestic servants, and the organizations and extraterritorial entities.
 Sources: Office of the Financial Superintendent of Colombia, Office of the Superintendent of Corporate Affairs, and Banco de la República; Calculations by Banco de la República.

The high levels of the risk indicators in the construction, electricity, and transportation sectors are largely due to idiosyncratic components. The first sector has been affected by the situation of the *Concesionaria Ruta del Sol S.A.S*, the second, by the loan portfolio of the *Electrificadora del Caribe S. A.*,¹⁶ and the last, by the performance of the companies that provide mass transportation (passenger). When these effects are ruled out, it turns out that construction may be the only one of the branches that will likely continue to have a significant

16 As of June 2018, the CI had 83.5% of the *Electrificadora del Caribe S.A* loan portfolio covered by loan-loss provisions.

effect on the deterioration of the private corporate sector QRI.^{17,18} The health sector, in turn, reported two consecutive years of increases in the indicator, and in June 2018 the change in that indicator was 6.6 pp. This is the economic sector that has seen the most deterioration in the last two years while discounting the idiosyncratic effect in the areas of electricity, transportation, and construction. This behavior was driven by the health service providers (IPS).

The NPL for the sectors of transportation, agricultural, and construction, in turn, are the ones that rose the most over the past year and that contributed the most to the growth of the indicator for the entire commercial loan portfolio (Graph 2.12). When the idiosyncratic effects are ruled out, the sectors that deteriorated the most were agricultural, real estate, and construction while the ones that contributed the most were construction and agricultural.

In order to do a more thorough analysis of the performance of loans disbursed to firms, two additional indicators of credit risk were calculated which make it possible to identify episodes of greater vulnerability for the CI: the indicator of risk perception by rating (IRPR) and the weighted indicator of migrating to a worse rating.

The IRPR is defined as the percentage of loans, in terms of their balance, that have a worse rating than they would if only the days past due were taken into account.¹⁹ The indicator rose over the past year, but the positive trend it had been registering since the end of 2015 reversed itself in the last two quarters (Graph 2.13, panel A). This may have occurred because the entities began to see a reduced risk or the risks that the entities had previously anticipated began to materialize. By economic sector, the CI are seeing a higher risk for the loans granted to firms in the health and agricultural sectors. Transportation companies still have a high IRPR and are maintaining a growth trend. However, declines in the indicator have been experienced in the last six months. These led to indicator values similar to those registered a year ago (Graph 2.13, panel B).

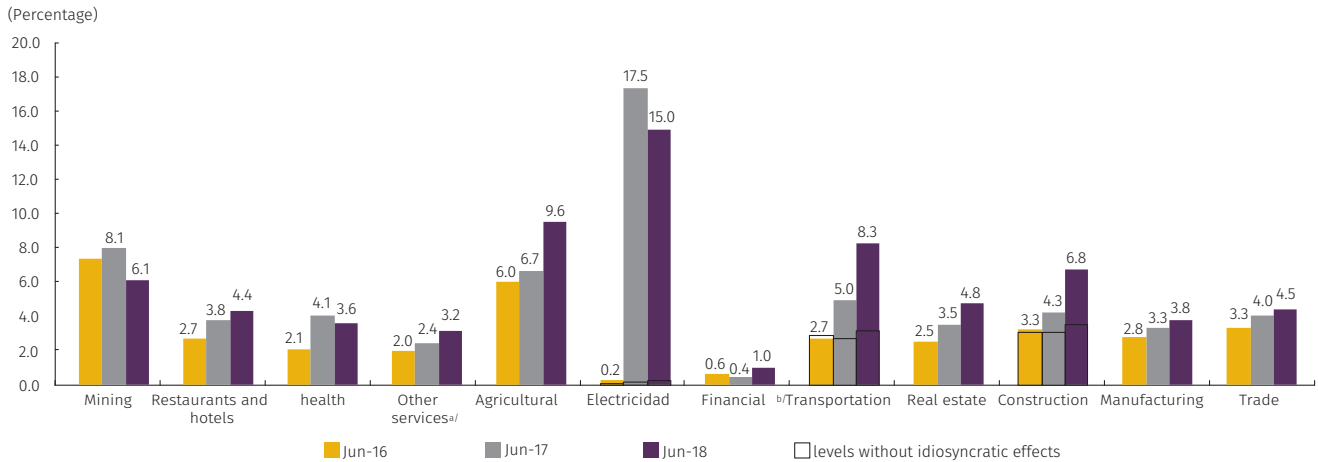
17 When the effect of the idiosyncratic components is ruled out, the QRI for construction rose 4.0 pp while the QRI for transportation declined 1.2 pp between June 2017 and June 2018.

18 Between June 2017 and the same month in 2018, all of the sub-sectors of the construction sector showed a deterioration in both the QRI and the NPL. Construction of residential buildings is the sub-sector that has contributed the most to the rise in these indicators.

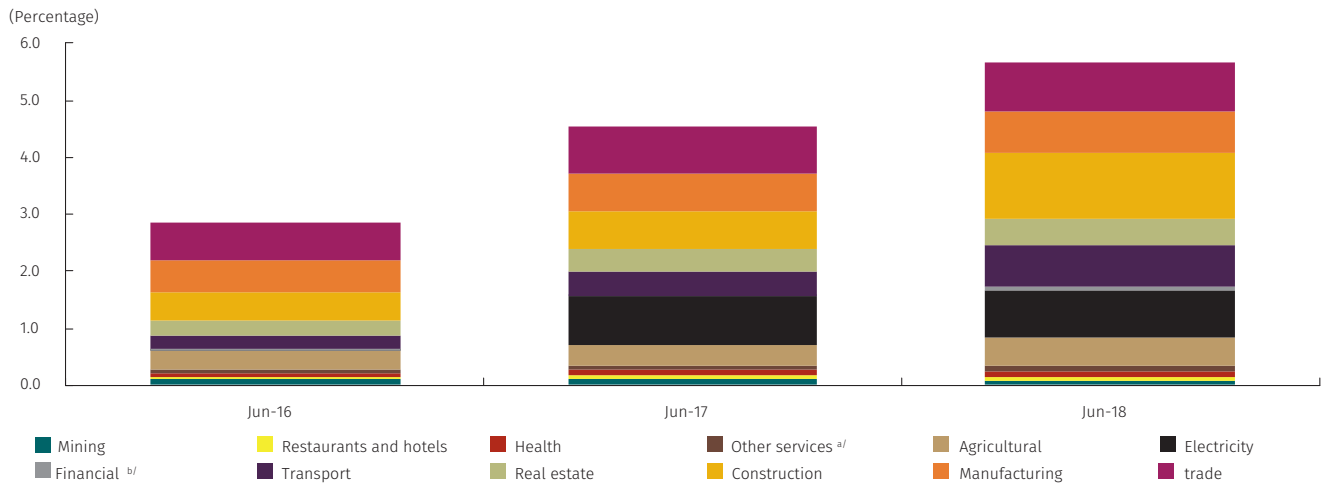
19 According to Chapter II, Appendix 1 of the Basic Accounting and Financial Circular issued by the FSC, if only the days past due were taken into account, the commercial loans should be rated as follows: 1) category A: loans that are past due by a month or less; 2) category B: loans that are past due by one to three months; 3) category C: loans that are past due by more than three and up to six months; 4) category D: loans that are past due by more than six and up to 12 months; and 5) category E: loans past due for more than 12 months.

Graph 2.12
Private Corporate Sector NPL

A. NPL by Economic Sector



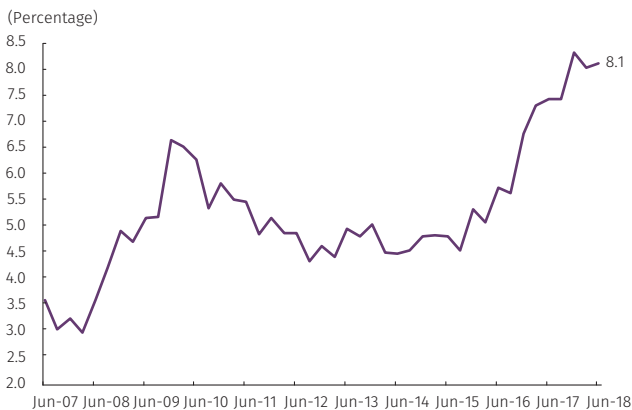
B. NPL Contribution by Economic Sector



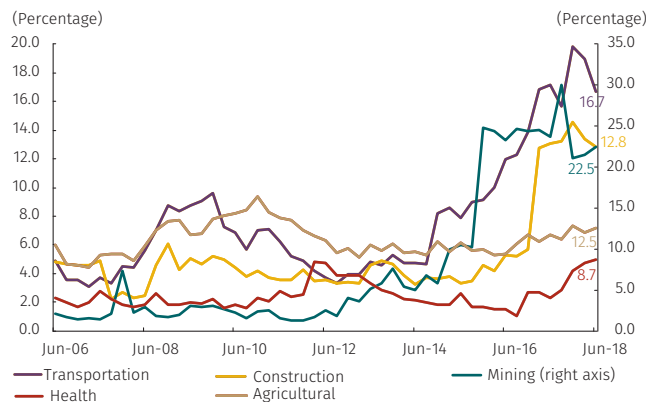
a/ The financial and insurance sector excludes the loan portfolio granted to entities supervised by Office of the Financial Superintendent of Colombia.
 b/ 'Other services' groups firms belonging to the following economic sectors: public administration and defense, education, other community, social and personal service activities, private households with domestic servants, and the organizations and extraterritorial entities.
 Sources: Office of the Financial Superintendent of Colombia, Office of the Superintendent of Corporate Affairs, and Banco de la República; Calculations by Banco de la República.

Graph 2.13
Indicator of Risk Perception by Rating

A. Corporate Sector Total Loan Portfolio



B. By Economic Sector

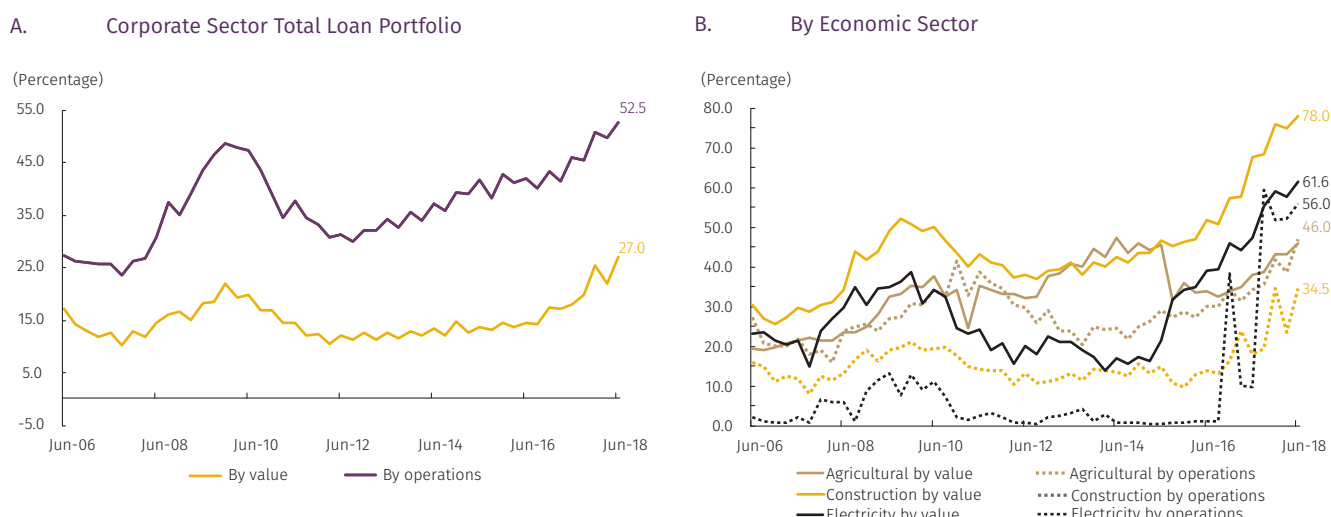


Source: Office of the Financial Superintendent of Colombia; calculations by Banco de la República.

The weighted indicator, in turn, of migrating to a worse rating is calculated by both value of the loans and number of operations.²⁰ Graph 2.14, panel A shows that the aggregate indicator by both value and number of operations has been showing a growth trend since the first quarter of 2012. Furthermore, the difference between the two indicators, which shows whether it is the loans of larger or smaller amounts that are migrating to worst ratings, has remained at stable levels.

When this same analysis is done by economic sector, it is clear that the electricity, construction, and agricultural sectors have been showing rises in the indicator over the last six months by both number of transactions and balance.²¹ The increase has been greater by value of the loans for these three sectors which indicates that loans in increasingly higher amounts are migrating to lower ratings (Graph 2.14, panel B).

Graph 2.14
Weighted Indicator of Migrating to a Lower Rating

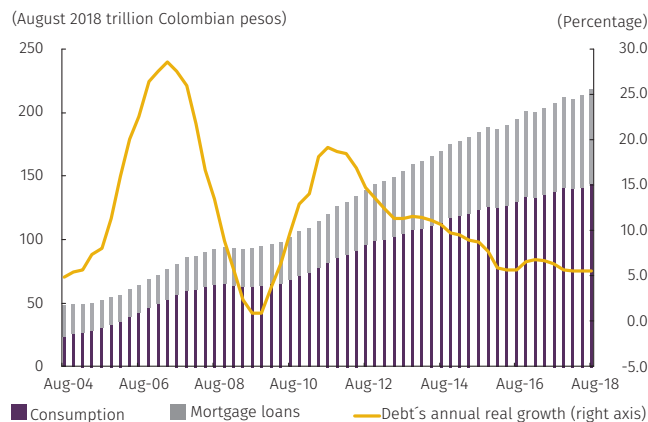


Source: Office of the Financial Superintendent of Colombia; calculations by Banco de la República.

20 This indicator is calculated by using quarterly information from the FSC format 341 (active credit transactions). The term $P(X_{t-1})$ is assigned to the probability that a credit transaction has been rated with the letter X during the quarter prior to the quarter being evaluated and $P(Y_t|X_{t-1})$ to the probability that a credit transaction could migrate to rating Y during the quarter being evaluated given the fact that it was rated with the letter X during the previous quarter. The ratings for the active credit transactions may correspond to any letter within the set {A, B, C, D, E}, where A is the best rating (least risk) and E is the worst (highest risk). Given this, the weighted indicator of migrating towards a worse rating during the quarter is calculated as: $P(B_t|A_{t-1}) \times 1 \times P(A_{t-1}) + P(C_t|A_{t-1}) \times 2 \times P(A_{t-1}) + P(D_t|A_{t-1}) \times 3 \times P(A_{t-1}) + P(E_t|A_{t-1}) \times 4 \times P(A_{t-1}) + P(C_t|B_{t-1}) \times 2 \times P(B_{t-1}) + P(D_t|B_{t-1}) \times 3 \times P(B_{t-1}) + P(E_t|B_{t-1}) \times 4 \times P(B_{t-1}) + P(D_t|C_{t-1}) \times 3 \times P(C_{t-1}) + P(E_t|C_{t-1}) \times 4 \times P(C_{t-1}) + P(D_t|D_{t-1}) \times 3 \times P(D_{t-1}) + P(E_t|D_{t-1}) \times 4 \times P(D_{t-1}) + P(E_t|E_{t-1}) \times 4 \times P(E_{t-1})$. Note that this is a weighted indicator since the worse the rating that a loan migrates to is, the higher the weighting (which is between 1 and 4) is.

21 In the case of the electricity sector, the increase seen in the indicator by balance is due to the deterioration of *Electrificadora del Caribe S. A.* Discounting this effect, the indicator would probably have registered a value of 3.7% in June 2018.

Graph 2.15
Household Debt Composition and Annual Real Growth



Sources: Office of the Financial Superintendent of Colombia, *Superintendencia de la Economía Solidaria* (Superintendent of Solidarity Economy) and *Titularizadora de Colombia* (Colombian Securitization Office); Calculations by *Banco de la República*.

2.2.2 Households

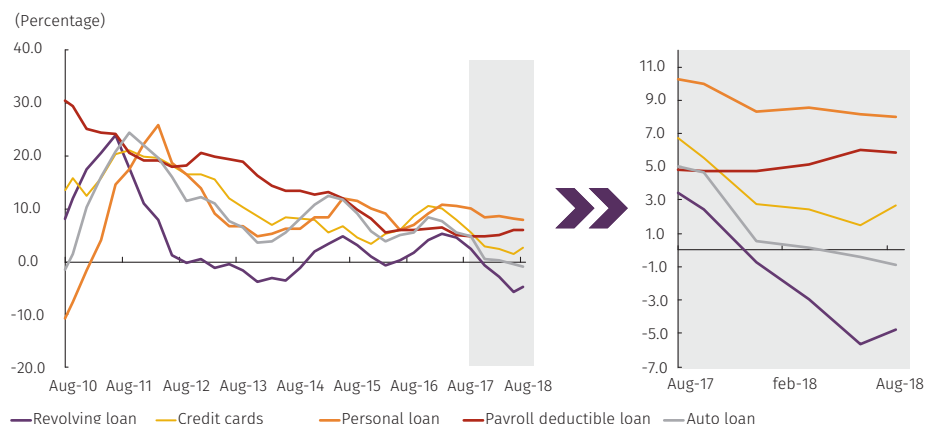
Since the beginning of 2016, the indebtedness of Colombian households has exhibited a moderate expansion. By type of credit, the mortgage loan portfolio is the one that has registered the largest growth over the last year.

The loan portfolio allocated to households²² stood at COP 217.4 t as of August 2018 thus registering a real annual growth rate of 5.5%. Approximately two-thirds of total indebtedness corresponds to consumption loans and the remainder to mortgage. In the recent past, the latter has been gradually rising as a share of the total amount of indebtedness (Graph 2.15).

In August 2018 the housing loan portfolio expanded 7.6%, which is above the average for the past three years. In contrast, even though the consumption loan portfolio has continued to expand 4.4%, it has registered a tendency to decline since April 2017.

This slowdown is due to the downward trend that all of the segments have registered with the exception of loans covered by an automatic payroll deduction. Specifically, the sharpest drops were seen for auto loans, revolving credit, and credit cards where these last two registered the lowest growth in the available history (Graph 2.16).

Graph 2.16
Consumption Loan Portfolio's Annual Real Growth by Credit Type

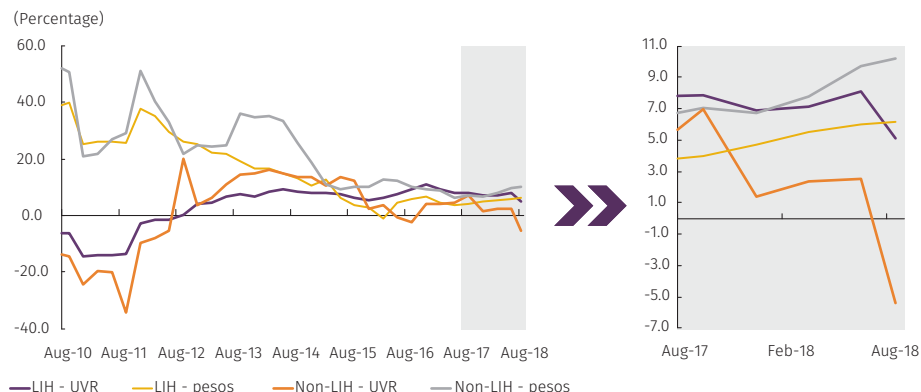


Sources: Office of the Financial Superintendent of Colombia, calculations by *Banco de la República*.

22 By loan portfolio allocated to households, the sum of the loan portfolios for consumption and housing with securitization granted by credit institutions, the National Savings Fund (FNA in Spanish), savings and loan cooperatives, and employee funds is understood.

Regarding the mortgage loan portfolio, the peso-denominated loans allocated to both low-income housing (LIH) and other than low-income housing (non-LIH), which are the most highly represented in this loan portfolio, registered surges over the last year. In contrast, the UVR-denominated loans showed downturns, especially during the last few months (Graph 2.17). The UVR-denominated non-low income housing, which has the lowest weight in the housing loan portfolio, is going through a real contraction.

Graph 2.17
Mortgage Loan Portfolio's Annual Real Growth by Credit Type



Sources: Office of the Financial Superintendent of Colombia, calculations by Banco de la República.

During the past year, the NPL for consumption and mortgage loans have remained relatively stable. In spite of the above, the perception of risk for the housing loan portfolio continues to rise.

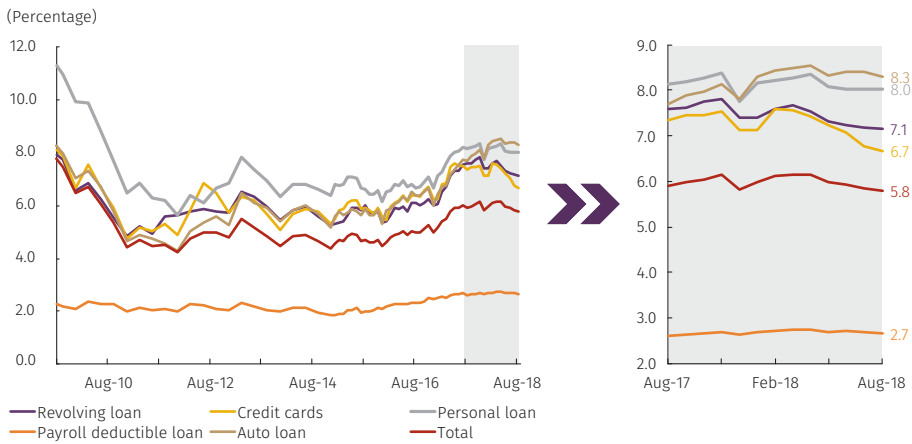
Over the last year, the delinquencies in both the consumption and the mortgage loan portfolios reversed the growth trend they had been experiencing since the beginning of 2017 in spite of the fact that some segments were still showing rises in their NPL as of August 2018. For the consumption loan portfolio, in particular, the NPL for vehicles is the highest since mid-2009 while for mortgage, the UVR-denominated non-LIH loans have deteriorated over the course of the year (Graph 2.18, panels A and B).

In addition, the RPIR and the weighted indicator of migrating to a worse rating are analyzed. For the consumption loan portfolio both indicators remained stable. The RPIR for housing, in turn, continued to show deterioration. For both the aggregate and the two segments analyzed, this indicator reached levels that have not been seen in more than seven years. In spite of the above, the RPIR remains below the historical peaks seen in 2009 (Graph 2.19).

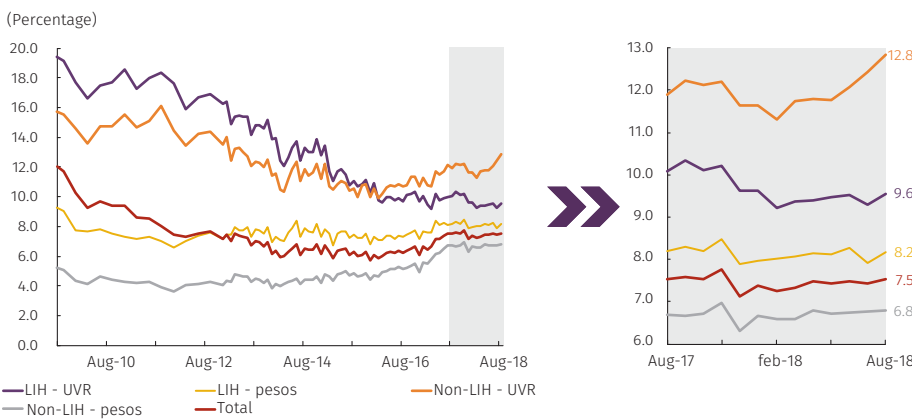
In line with the above, the weighted indicator of migrating to a worse rating exhibited a growth trend over the last year (Graph 2.20). The deterioration has been seen in both the LIH and non-LIH segments although the trend is not homogeneous. On one hand, there were greater increases in the indicator for LIH by the number of loans registered which indicates that loans for larger amounts in this segment are not as likely to migrate

Graph 2.18
Non-Performing Loans Indicator (NPL)

A. NPL for Consumption Loan Portfolio



B. NPL for Mortgage Loan Portfolio



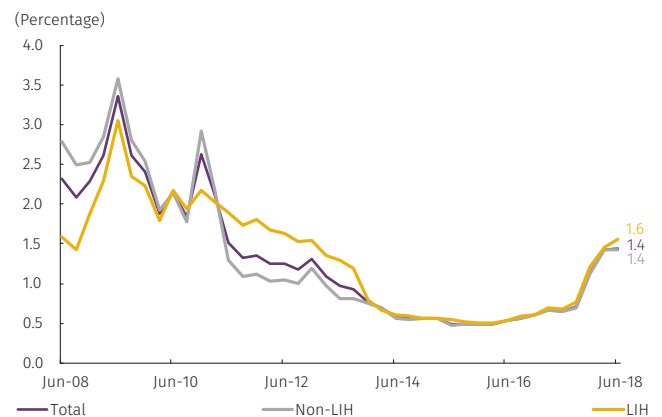
Source: Office of the Financial Superintendent of Colombia, calculations by Banco de la República

to worse ratings as the loans for smaller amounts. On the other, the indicators for non-LIH loans have shown almost identical results by number of entries and balance which indicates that all of the loans have presented displacements of the same magnitude.

According to the information from the LEFIC survey, the financial burden of households has declined due to a higher increase in income compared to monthly debt service.

The debt-service-ratio (DSR),²³ defined as the ratio of interest payments and payments against

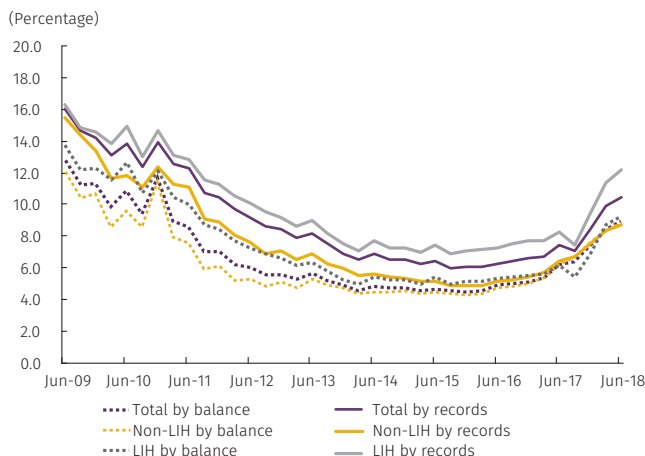
Graph 2.19
Risk Perception Indicator by Rating for the Mortgage Loan Portfolio



Source: Office of the Financial Superintendent of Colombia, calculations by Banco de la República

23 This indicator is built based on the information from the survey of financial burden and financial education (IEFIC in Spanish) prepared by Banco de la República and DANE. The indicator is constructed using a moving average of 12 months, given its volatility.

Graph 2.20
Weighted Indicator of Migrating to a Lower Rating for the Mortgage Loan Portfolio



Source: Office of the Financial Superintendent of Colombia, calculations by Banco de la República

the debt principle to income, continued to show a decrease and as of August 2018 it stood at 16.0% (Graph 2.21, panel A). Of this percentage, the DSR associated with consumption is 13.9% while the remaining 2.1% corresponds to mortgage. The decline in the indicator was mainly the result of an increase in income more than proportional with respect to the monthly installment (Graph 2.21, panel B).

By income quintiles, the larger decreases in the DSR were presented by the lower-income households where, at the same time, the values that the indicators had on the date of the analysis are the minimum ones since information has been available (Graph 2.22).

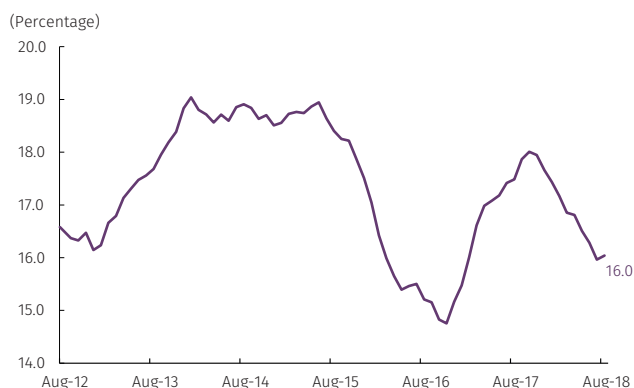
2.3 Market Risk

The public debt market showed mixed behavior. The peso-denominated TES curve surged as devaluations appeared in the long-term tranche while UVR-denominated TES curve showed a slight appreciation.

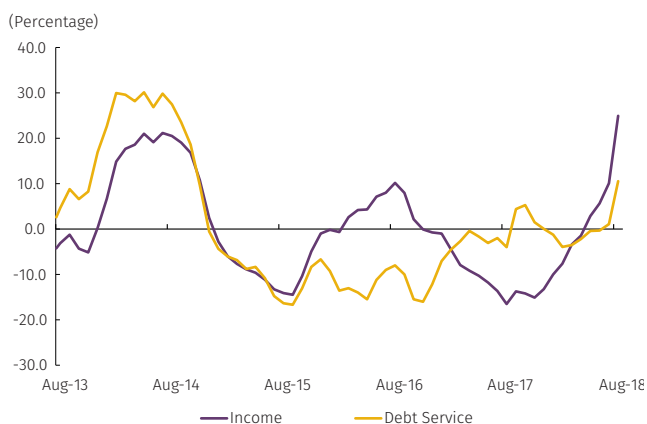
The spike in the peso-denominated TES curve is mainly explained by international factors. The increase in the policy rate in the United States, in particular, along with the increase in risk aversion were the principal causes of the increases on the long tranche of the curve (Graph 2.23, panel A). The appreciation of the UVR-indexed

Graph 2.21
Debt-Service Ratio (DSR)

A. Annual Moving Average

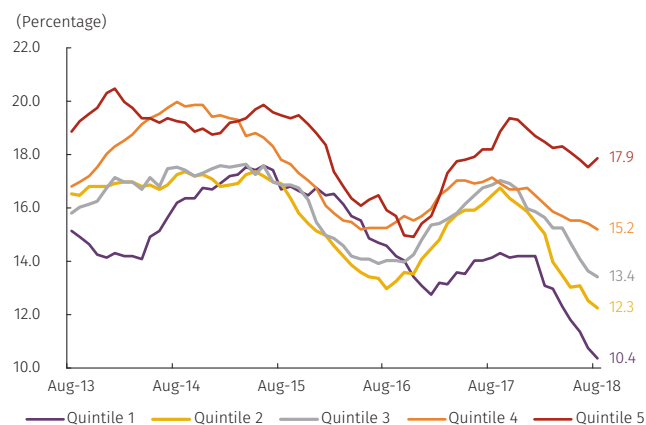


B. Annual Growth of Components



Source: Banco de la República and DANE

Graph 2.22
DSR by income Quintiles



Source: Banco de la República and DANE

securities curve, in turn, may have occurred primarily due to a higher seasonal appetite for these types of securities (Graph 2.23, panel B). Based on the box on the seasonal adjustment of break even inflation in the document “Determinantes de las dinámicas de los mercados de capitales,” (Determiners of capital market dynamics)²⁴ agents raised the demand for indexed securities during the last few months of the year as a hedging strategy against the inflation that accumulates at the beginning of the upcoming year.

Banco de la República’s rate has remained stable since April 2018 and, according to the September 2018 survey of the expectations of economic analysts, the market expects it to stay at 4.25% until early 2019. That is why the market does not expect significant movements in the curves coming from changes in the monetary policy stance in the short term (Graph 2.24).

The private debt market registered a performance that was similar to that of the peso-denominated public debt to such an extent that the determiners of public debt behavior also affected the performance of corporate securities.

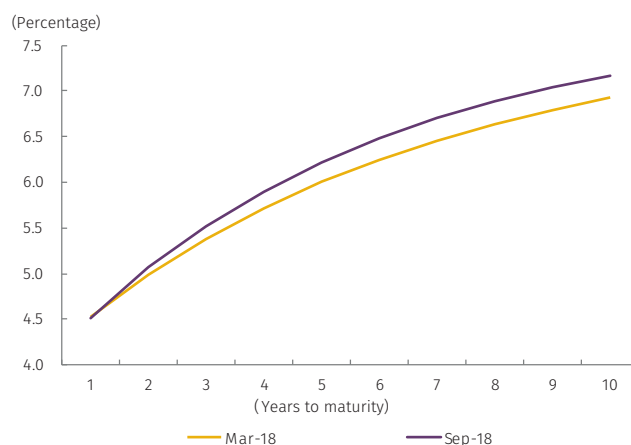
In the meantime, the variable income market registered significant fluctuations during the period under analysis. This led to the volatility of the Colcap remaining at high levels.

The variable income market price, measured by the Colcap index, showed an appreciation of 3.4% between March and September 2018 (Graph 2.25). However, this increase was not homogeneous throughout the six-month period. Even though there was an appreciation in the value of stock shares between March and August, a significant slump was registered in September over a period of six working days (between August 31 and September 10). This drop was driven by stocks in the sector of construction materials due to

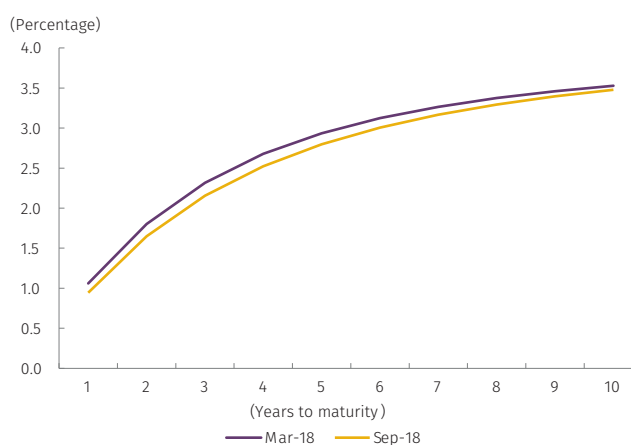
24 This document was published in January 2017 and is part of the working documents of the Board of Directors of Banco de la República. It is available at http://www.banrep.gov.co/sites/default/files/paginas/amjdetes_ene_2017.pdf

Graph 2.23
Zero-Coupon TES Curve

A. Colombian Pesos

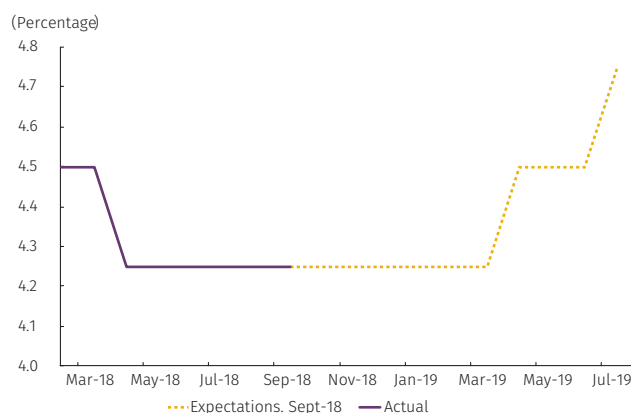


B. UVR



Source: Infovalver, calculations by Banco de la República

Graph 2.24
Policy Interest Rate Expectations



Source: Monthly survey of economic expectations, calculations by Banco de la República.

Graph 2.25
Colcap



Source: Bolsa de Valores de Colombia (Colombia Stock Exchange)

expectations of a possible sale of these stock shares on the part of foreign investors. Stocks in the financial and energy sectors contributed the most to the growth of Colcap over the last six months (Table 2.3).

Due to the stock performance in September, there was a rebound in volatility²⁵ of this market during the past month and it remains at values that are similar to those recorded at the beginning of the year (Graph 2.26). This rise implies a higher market risk due to the increased uncertainty in the prices for these types of assets. Meanwhile, the volatility in the prices of private

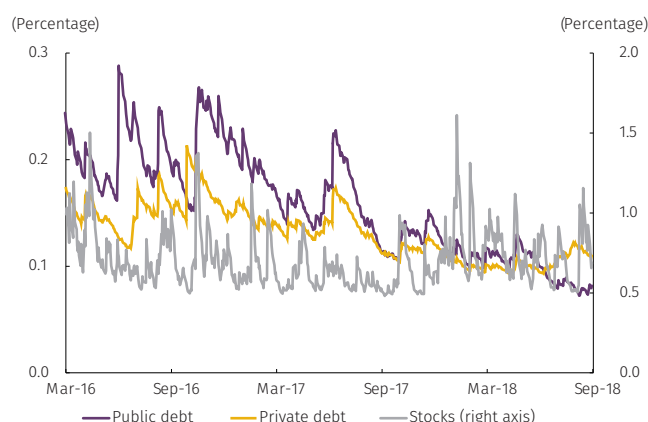
and public debt securities remains at low levels. However, there was a slight increase in the private debt indicator.

Table 2.3
Breakdown and Appreciation

Sector	Share (percentage)	Appreciation ^{a/} (percentage)
Finance	43.2	1.9
Utilities	20.6	53.1
Consumption	13.9	-1.8
Industrial	12.5	-17.5
Energy	8.9	-8.3
Raw Materials	0.8	-32.7
Communications	0.1	-16.5

a/ Between March 30, 2018 and September 28, 2018
Source: Bolsa de Valores de Colombia (Colombian Stock Exchange) and Bloomberg; calculations by Banco de la República

Graph 2.26
Conditional Volatility of Fixed Income and Stock Markets



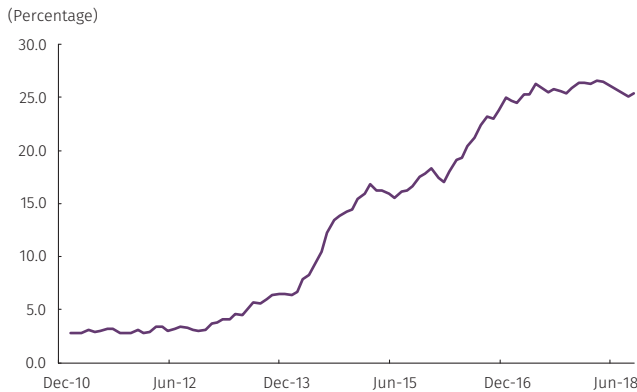
Source: Bolsa de Valores de Colombia (Colombian Stock Exchange) and Infovalmer; calculations by Banco de la República

The TES portfolio held by foreigners continues to be important within the total TES issued. Even though this portfolio remains concentrated in long-term debt, its importance has risen in the medium term.

As was mentioned in chapter 1 of this report, international financing is a vulnerability of the Colombian economy. The rise in international rates as well as the persistence of the country's twin deficits makes it possible to see a latent risk in investment by foreigners in the national economy. The above is relevant to the degree that this

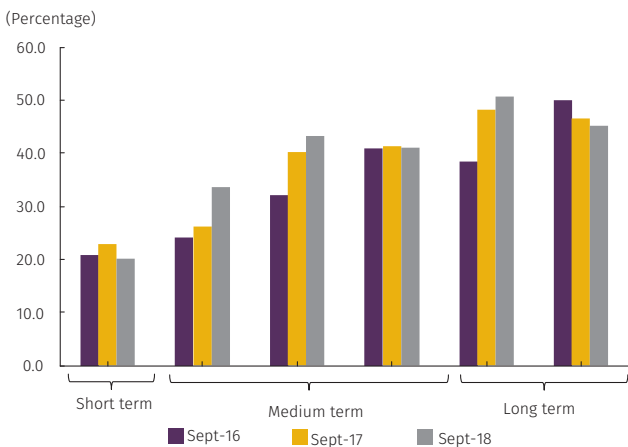
25 Volatility is calculated using a GARCH model (1.1). In the case of variable income, the daily returns of the Colcap index were used, whereas, the daily differences in the first main component of each curve were used for fixed income.

Graph 2.27
Share of TES held by Foreign Investors



Source: DCV, calculations by Banco de la República

Graph 2.28
Share of Total Debt Issued Held by Foreigners by Time to Maturity



Sources: DCV and Infovalmer, calculations by Banco de la República

type of investor continues to remain one of the main groups holding sovereign debt securities. As of September 30, 2018, foreigners held a total of COP 75.1 t which represents 25.4% of the debt issued in TES (Graph 2.27). That portfolio consists of 97.1% peso-denominated TES and 2.9% indexed securities.

The distribution of flows by period to maturity suggests that the TES portfolio held by foreigners is concentrated in long-term securities²⁶. However, investment in medium-term securities has increased in the last two years (Graph 2.28). Due to this fact, movements by these investors could affect the level of the curve to a large extent.

The main exposure to market risk on the part of the financial entities is concentrated in fixed income.

Exposure to fixed and variable income markets measured as an investment in securities exposed to market risk²⁷ is concentrated in the fixed income securities where government bonds have the largest share. However, the insurance companies have a higher investment in private debt securities which is why the NBFI aggregate shows a high exposure to this market. With regards to credit institutions, the highest share is found in the public debt market with the banks being the type of entity with the highest investment in these kinds of securities (Table 2.4).

There are risks in the future that, should they materialize, could affect the financial health of the system. For example, as was mentioned in Chapter 1, there are expectations of increases in the Fed rate for what remains of the year 2018 and during 2019 and 2020. Should this increase materialize more rapidly than expected, it could lead to a sell off of foreign positions that would probably generate a depreciation of the securities in the fixed income market. Furthermore, the risks coming from the persistence of the country's twin debts could translate into a lower valuation of the securities. Due to the above,

26 Short term is considered to be less than one year in this section. Medium term is from one to seven years and long term, seven years and beyond.

27 This balance is at market prices and is calculated according to the guidelines of the Basic Accounting and Financial Circular. The balance in shares was analyzed for the equity instruments of domestic issuers while, for debt securities, the ones that are marketable and available for sale were analyzed.

Table 2.4
TES (in Colombian pesos and Real Value Units, UVR), Private Debt Securities and Stocks Exposed to Market Risk

Type of entity	TES ^{a/}	Private debt	Stocks	Total	TES ^{a/}	Private debt	Stocks	Total
	(Balance trillion Colombian pesos)				(variación porcentual últimos seis meses)			
Credit institutions	43.62	4.01	6.80	54.44	4.31	-11.23	10.67	3.71
Commercial banks	40.42	3.69	0.00	44.11	4.28	-12.68	0.00	2.61
Financial corporations	3.10	0.22	6.80	10.12	1.62	2.69	10.68	7.56
Financing companies	0.10	0.07	0.00	0.17	1621.76	19.14	-0.87	162.85
Financial cooperatives	0.00	0.04	0.00	0.04	0.00	44.98	0.00	44.98
Non-banking Financial Institutions	8.43	11.65	6.08	26.16	3.23	2.60	-0.05	2.17
Pension fund managers: proprietary position	0.08	0.63	0.11	0.83	-61.76	2.05	-14.85	-14.49
Stock brokerage firms: proprietary position	1.80	0.16	0.20	2.16	-13.10	-42.18	-2.77	-15.48
Trust funds: proprietary position	0.23	0.22	0.84	1.29	9.38	-25.71	1.49	-3.39
Insurance Companies	6.32	10.64	4.93	21.88	11.45	4.71	0.20	5.49
System: proprietary position	52.06	15.67	12.88	80.60	4.13	-1.33	5.34	3.21
Third-party Position								
Stock brokerage firms: third-party position	1.10	10.21	6.56	17.87	10.30	1.35	8.94	4.55
Trust companies: third-party position ^{a/}	99.92	42.49	47.15	189.56	9.21	4.37	3.69	6.69
System	153.08	68.37	66.59	288.04	7.43	2.56	4.50	5.56

a/ Does not include pension liabilities managed by trust companies.

b/ The value of the proprietary position is obtained from "Investment Portfolio" on format 351 while the value of the managed position is obtained CSD data.

Sources: Central Value Deposit (DCV), Office of the Financial Superintendent of Colombia; Calculations by Banco de la República.

the risk of depreciation as a product of the previous factors will be considered in the stress test presented in chapter 3.

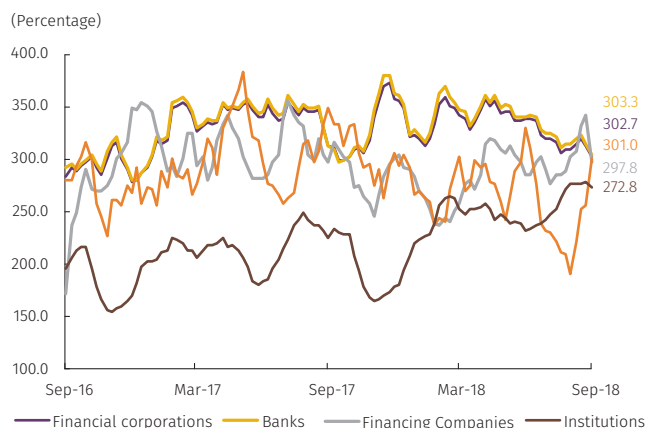
2.4 Liquidity and Trading Book Interest Rate Risk

2.4.1. Liquidity Risk

The short-term liquidity of CI -measured with the Liquidity Risk Indicator (LRI)- declined during the last six months.

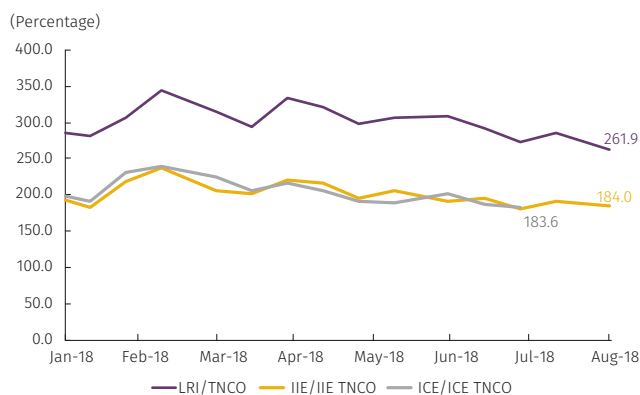
As of September 2018, the aggregate liquidity of CI -measured by the Liquidity Risk Indicator (LRI) calculated for a 30 day horizon- decreased to below the levels observed six months ago, which was mainly explained by an increase in banks' total net cash outflows (TNCO). Although a mixed performance was seen by type of financial institution

Graph 2.29
Weighted Average 30-day Liquidity Risk Indicator (LRI) for CI^{a/}



Note: Average that gives greater weight to the most recent data
Source: Office of the Financial Superintendent of Colombia; Calculations by Banco de la República.

Graph 2.30
Short-term Liquidity Indicators as a Percentage of Total Net Cash Outflows^{a/}



a/ As of the publication date of this Report, ICE data with a cut-off date of September 14, 2018 were available.
Source: Office of the Financial Superintendent of Colombia, Banco de la República's calculations.

throughout the period, in all cases the LRI exceeded the regulatory minimum requirement²⁸ (Graph 2.29).

In the same vein, short-term liquidity exposure indicators computed on an individual and consolidated basis (IIE and ICE), also showed declines.

When assessing CI's liquidity based on the Indicator of Individual Exposure (IIE) and the Indicator of Consolidated Exposure (ICE)²⁹ as a percentage of the TNCO, the 30-day IIE represented, on average, two times the CI's TNCO throughout the year. Likewise, CI that consolidate financial statements, in compliance with the instructions of the FSC, registered on average an ICE of 202% as a percentage of the TNCO of its parent company (Graph 2.30).

In keeping with the CI assets performance, funding continued to register low rates of growth. Notwithstanding the foregoing, a recovery was seen in August 2018...

In terms of structural liquidity, CI's funding (liabilities and equity) continued to register annual growth rates close to zero throughout the year. However, a recovery occurred in August 2018 and CI's funding achieved its highest growth since mid-2016. The above was due to a larger contribution of demand deposits, bank loans and other financial obligations, and other liabilities (Graph 2.31).

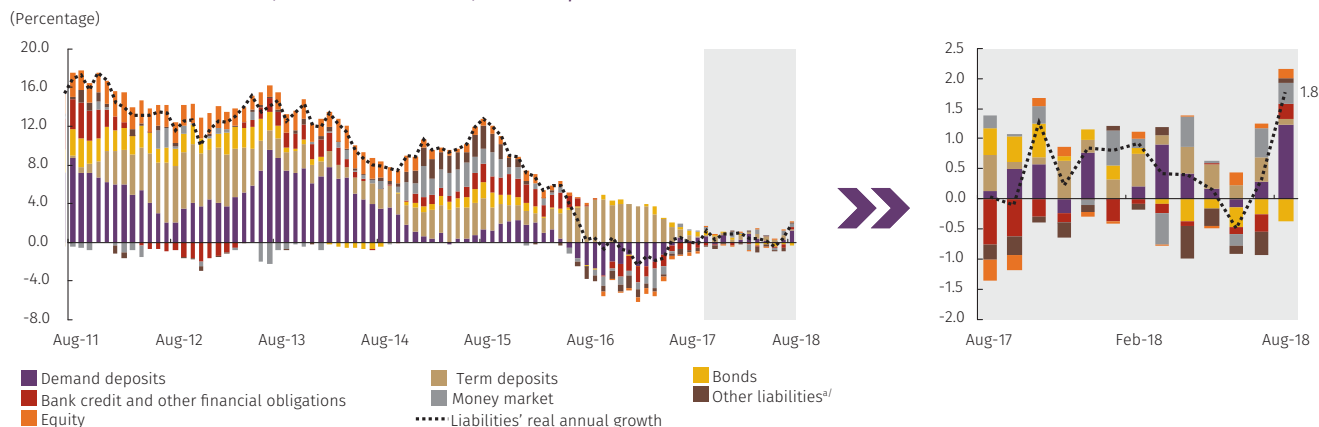
...that was sustained mainly by a greater contribution of demand deposits of legal entities.

Demand deposits, which represent 41.3% of the CI's liabilities, had expanded at a real rate of 3.5% as of August 2018. Just as in the case of total funding, this growth rate has not been seen since mid-2016. Even though demand deposits held by all agents increased, the rebound

28 An institution is considered to have an LRI level close to the regulatory minimum relative to its volatility, if its actual indicator is less than one median average deviation from 100%. As of September 2018, 10.2% of the CI registered an indicator close to the regulatory minimum relative to its volatility.

29 The IIE and ICE indicators measure the liquidity risk of the CI registered as exchange market intermediaries (EMI) over a horizon of 30 days, on both individual and consolidated basis. IIE and ICE are calculated in a similar fashion as LRI, but the former apply haircuts on the currencies where the intermediary has an excess of liquidity. For more information on the calculation of these indicators, please refer to the External Regulatory Circular DODM-361.

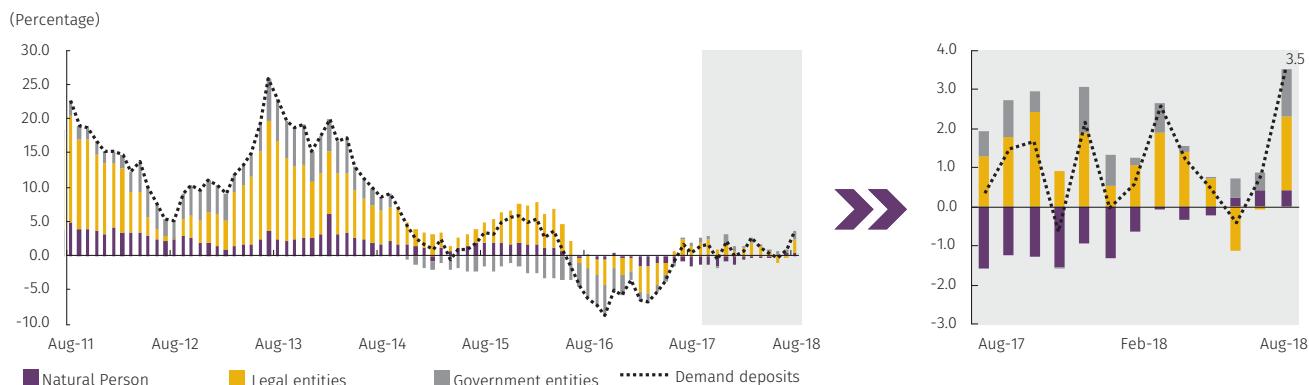
Graph 2.31
Credit Institution Liabilities, Annual Real Growth, and Component Contribution



Note: other liabilities correspond to: outstanding acceptances and derivatives, capital contributions, banks and correspondents, bonds convertible into shares (Bocas for its Spanish acronym), bonds mandatory convertible into shares (Boceas for its Spanish acronym), Term savings certificates (CDAT for its Spanish acronym), accounts payable, electronic deposits, affiliate establishments, other deposits and current liabilities with and without amortized cost, labor obligations, provisions and collection services.
Source: Office of the Financial Superintendent of Colombia; Calculations by *Banco de la República*.

observed was mainly explained by a larger contribution of deposits held by legal entities, which, on average, accounted for more than a half of these deposits. The contribution coming from deposits held by individuals registered a slight recovery as of August 2018, reversing the negative trend seen most of the year (Graph 2.32).

Graph 2.32
Demand Deposits' Real Annual Growth and Contribution by Counterparty



Source: Office of the Financial Superintendent of Colombia, calculations by *Banco de la República*.

2.4.2 Banking Book Interest Rate Risk

The structure of the interest rates in the CI balance sheets is analyzed in this section as well as their exposure to banking book interest rate risk.³⁰ The measurement of this risk seeks to estimate how changes in

³⁰ The interest rate risk has two dimensions: the first is analyzed in the section on market risk and refers to the risk of devaluations of the assets on the trading book in the event of interest rate movements; the second, which is analyzed in this section, corresponds to changes in the net interest income caused by interest rate changes, considering the information of the banking book.

the interest rates for assets and liabilities affect net interest income.

The share of variable interest rate assets continued showing a decreasing trend while the percentage of variable interest rate liabilities began to acquire more relevance.

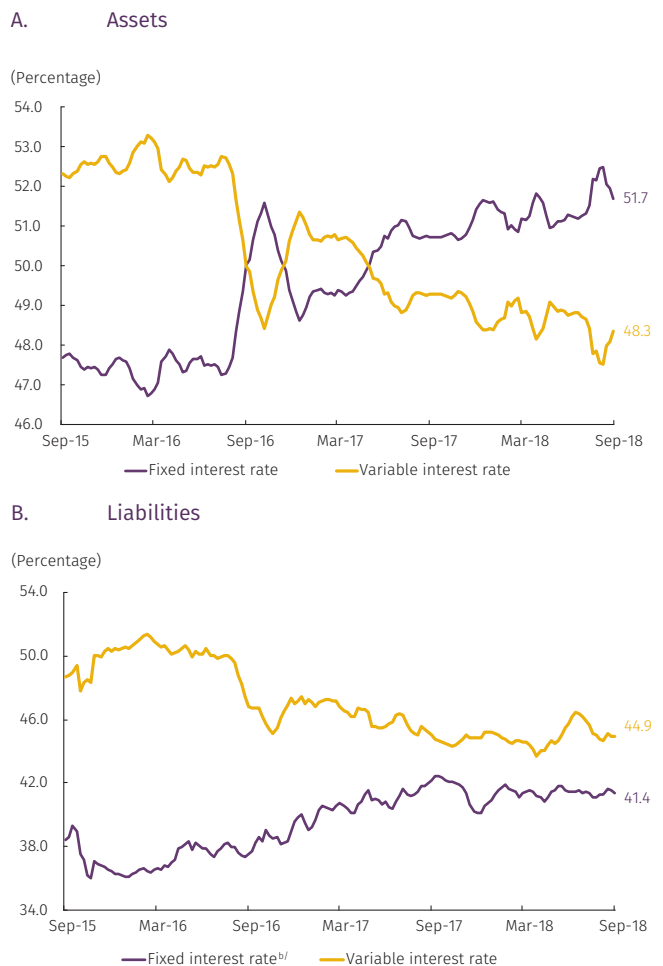
Between March and September 2018, the share of variable interest rate assets of the CI continued their downward trend that has been observed since the beginning of 2017 and remained below the share of fixed interest rate assets. The variable interest rate liabilities as a share of the assets, in turn, registered an increase during the period under analysis. This was the result of an increase in term deposits at variable interest rate (Graph 2.33).

Regarding the structure and components of the balance sheet accounts agreed upon variable interest rate, the asset positions indexed at the benchmark rates are more relevant than the ones associated with inflation³¹ which is the opposite of what happens with liabilities contracted at variable interest rates (Graph 2.34).

The exposure to banking book interest rate risk, measured by the WATM gap, registered a decline and reached the levels observed in late 2016.

To measure the exposure to the banking book interest rate risk, the weighted average term to maturity (WATM) gap was calculated. This is defined as the difference between assets and liabilities that are sensitive to changes in interest rates for different periods. When this indicator is equal to a negative value, it means that an increase of the same magnitude in lending and deposit rates would generate a reduction in the net interest income. This measurement of interest rate risk depends primarily on two factors: the share of assets and liabilities contracted at variable interest rates, and the term to maturity of fixed interest rate assets and liabilities.³²

Graph 2.33 Evolution of Assets and Liabilities by Type of Interest Rate^{a/}



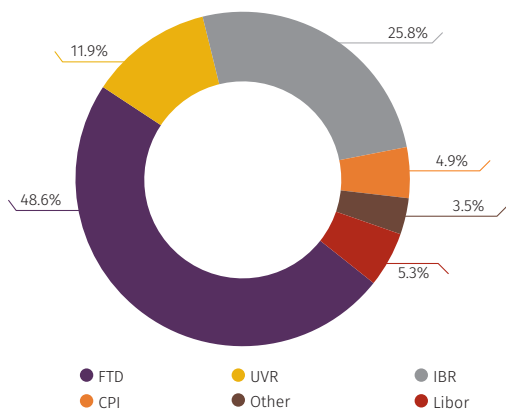
a/ Liabilities at fixed and variable interest rates are presented as a share of the total assets.
 b/ The amount of liabilities at fixed rate incorporates demand deposits of individuals while the demand deposits of legal entities and government entities are included in the liabilities contracted at variable rates.
 Source: Office of the Financial Superintendent of Colombia (FSC); Calculations by Banco de la República.

31 The benchmark interest rates correspond to FTD and IBR while those associated with inflation are the UVR and CPI.

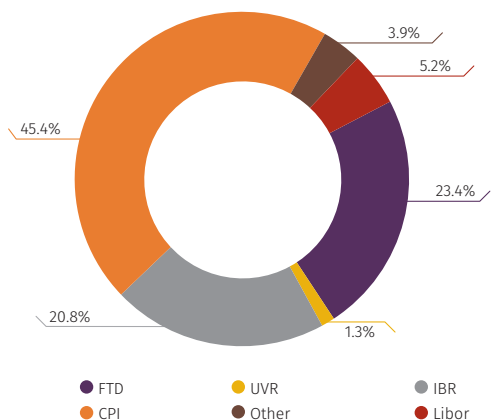
32 For more detail on the calculation of the WATM Gap, see the box “Interest Rate Risk of the Colombian Credit institutions’ Banking Book” in the September 2015 Financial Stability Report.

Graph 2.34
Breakdown of the Variable Interest Rate Assets and Liabilities by Type of Interest Rate, September 2018

A. Assets



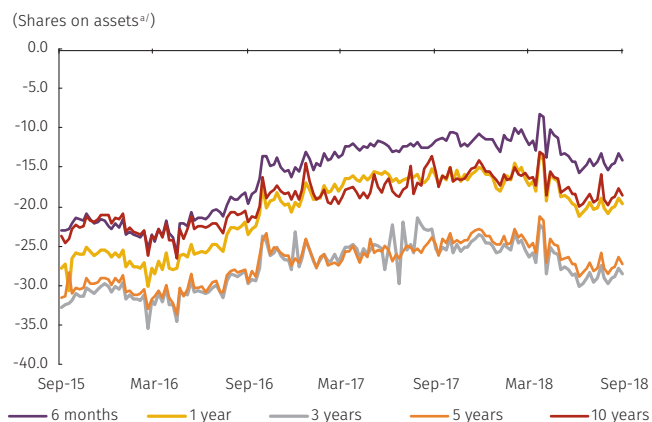
B. Liabilities



Source: Office of the Financial Superintendent of Colombia (FSC); Calculations by Banco de la República.

The indicator has negative values for all the time horizons analyzed. In addition, there was a slight decrease in the *WATM gap* between March and September 2018 for all of the maturities analyzed. This was mainly the result of the increase in the liabilities contracted at variable interest rate (Graph 2.35).

Graph 2.35
WATM Gap



a/ These assets correspond to those that generate interest income.
Source: Office of the Financial Superintendent of Colombia (FSC); Calculations by Banco de la República.

Box 2

Change in the Disbursements of the Commercial Loan Portfolio by Amount and Credit History of the Debtor

Carlos Quicazán
Wilmar Cabrera

This box introduces a measurement that approximates the risk profile of the debtors to whom new commercial loans were granted using their delinquency history. This exercise complements the monitoring of NPL and QRI and it allows to check the composition of the disbursements according to the risk profile of each debtor. This new measurement is presented in this box and is broken down by amount disbursed and the economic branch the debtor is involved in. For future editions of the Report, this exercise is expected to be replicated for all of the types of credit.

The disbursements are presented in real terms and are an approximation using Format 341 provided by the *Office of the Financial Superintendent of Colombia (SFC)*¹ between June 2000 and June 2018. This format allows for a granular analysis of disbursements since it has the information on the size of the debtor, the sector of the economy it belongs to, and loan delinquencies as well as other relevant variables. The disbursements are classified using the following criteria:

Risk profile of the debtor: this was built using the two years moving window average delinquency of each debtor. In order to identify various risk profiles, the sample of clients to whom new credits had been granted each quarter was divided into four groups:

* The authors are fully responsible for the opinions herein contained and do not compromise *Banco de la República* or its Board of Directors.

1 The 341 format, "Single Report per debtor – Active credit operations," registers the information on the individual indebtedness of the financial system on a quarterly basis. Given that this format registers capital balances, the disbursements were approximated in terms of loans that were created in the quarter under analysis or those that presented an increase in the balance from one quarter to the next.

- Group 1: new customers (there is no information on the debtor in the last two years of information).
- Group 2: debtors with zero days of delinquency.
- Group 3: debtors whose average historical delinquency were between one and thirty days.
- Group 4: debtors whose average historical delinquency were greater than 30 days.

Amount disbursed: the sample was divided into six groups with group 1 representing the smallest loans and group 6, the largest ones. To identify the thresholds that define each group, five equidistant values were calculated in the empirical distribution of the logarithm of the amount disbursed. Group 1 in particular, includes the loans that are less than COP 2.2 million (m) and group 6 includes those loans that are larger than COP 109.32 billion (b).

Economic branch of debtor: each loan is related to one of the various economic activities established in the classification tables of the ISIC.

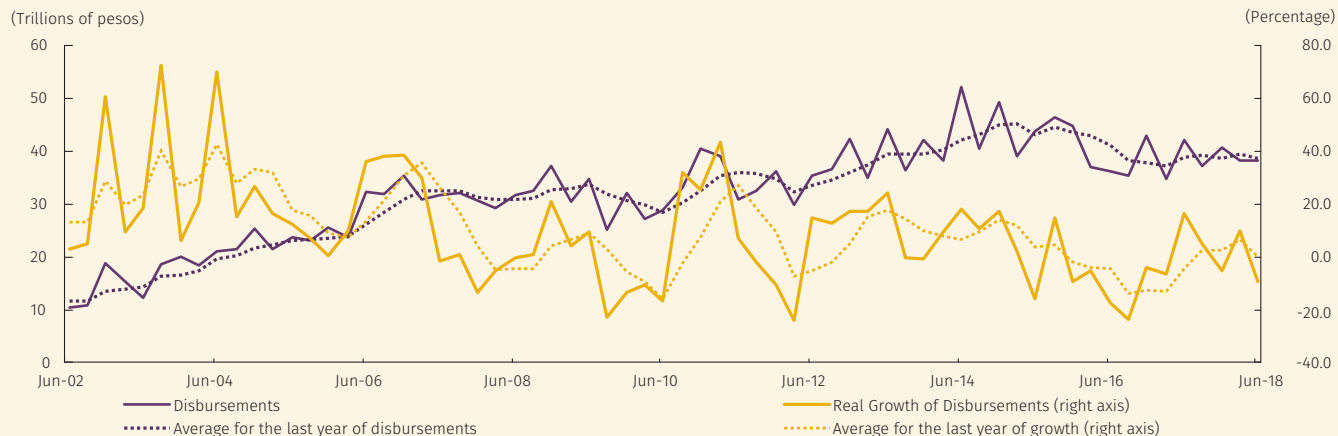
The level of disbursements in real terms has exhibited a positive trend over time (Graph B2.1, panel A). When the disbursements are broken down by the amount granted, it is clear that the share of high-amount loans (group 6) has risen, and this has been reflected in a greater contribution by these debtors to the growth rate of disbursements (Graph B2.1, panels B and C).

Even though the high-amount disbursements have increased over time, the ratio of these disbursements to the total loan portfolio of each credit establishment has declined during the period under analysis. When the disbursements are analyzed by branch of the economy, a reduction in the percentage of capital disbursed to companies classified as manufacturing industry and others can be seen, whereas the branches that have gained a larger share are those of construction, trade, and real estate business (Graph B2.2). With regards to the loans disbursed to the high-amount group (group 6) during the period under analysis, these are mainly made up of disbursements to the trade sector (19.1%) followed by the ones allocated to the manufacturing industry (16.7%), financial intermediation (14.1%), the electricity, gas, and water sector (12.8%), and construction (9.8%).

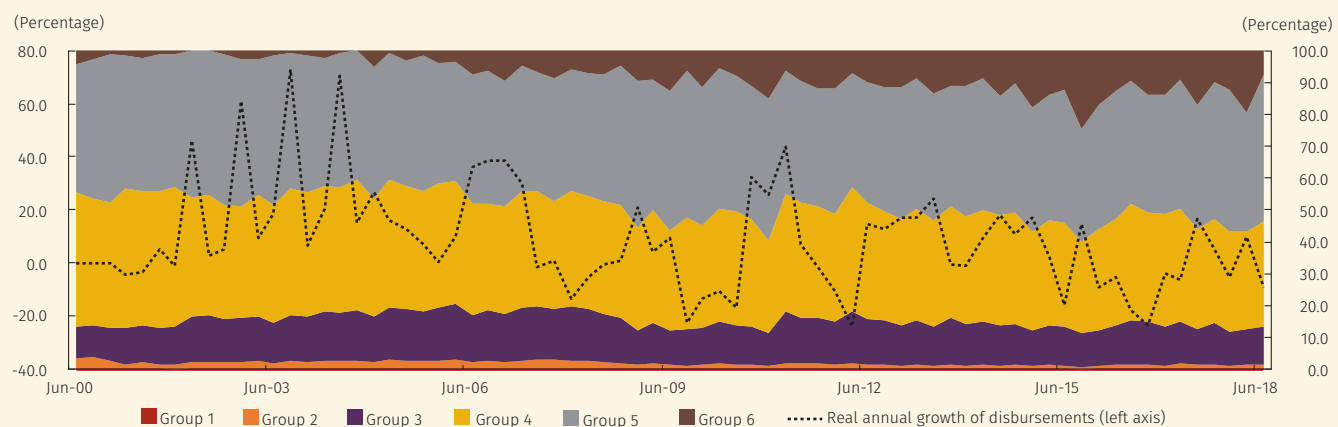
The change in the breakdown of the disbursements by risk profile of the debtor, in turn, shows that the ones allocated to debtors without delinquent payments, i.e., the least risky debtors, has been rising (Graph B2.3, panel A). The same thing is seen when high-amount loans are broken down based on the risk profile of the debtors (Graph B2.3, panel B). A feature of the change in the risk profile for the high-amount disbursements is the increase at the beginning of 2014 and the subsequent correction at the end of 2015 of the amount disbursed to debtors with a risk profile associated with group 3.

Graph B2.1

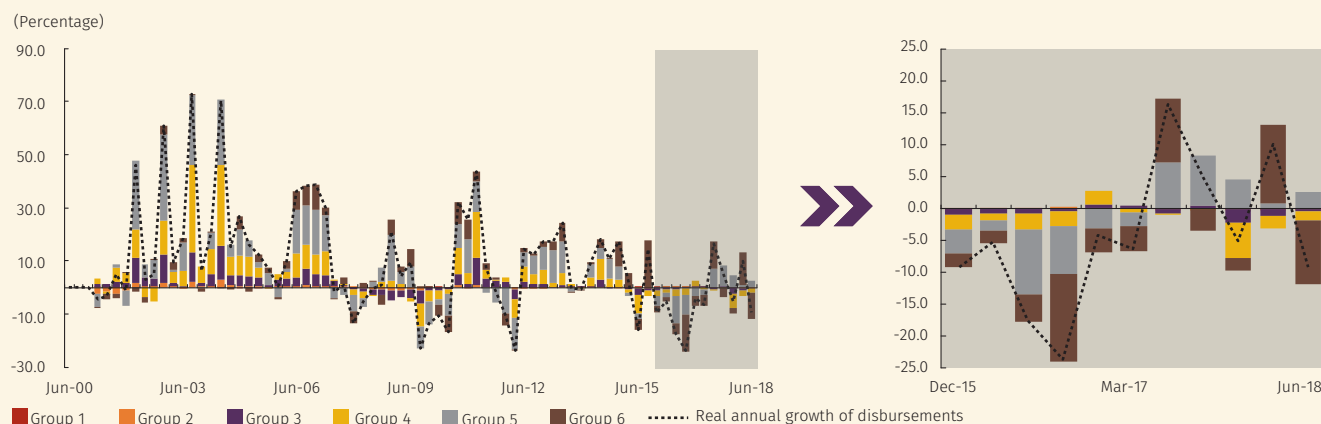
A. Balance and Growth of Commercial Loan Portfolio Disbursements



B. Breakdown by size of Amount Disbursed



C. Contribution to the Growth of Disbursements by Amount

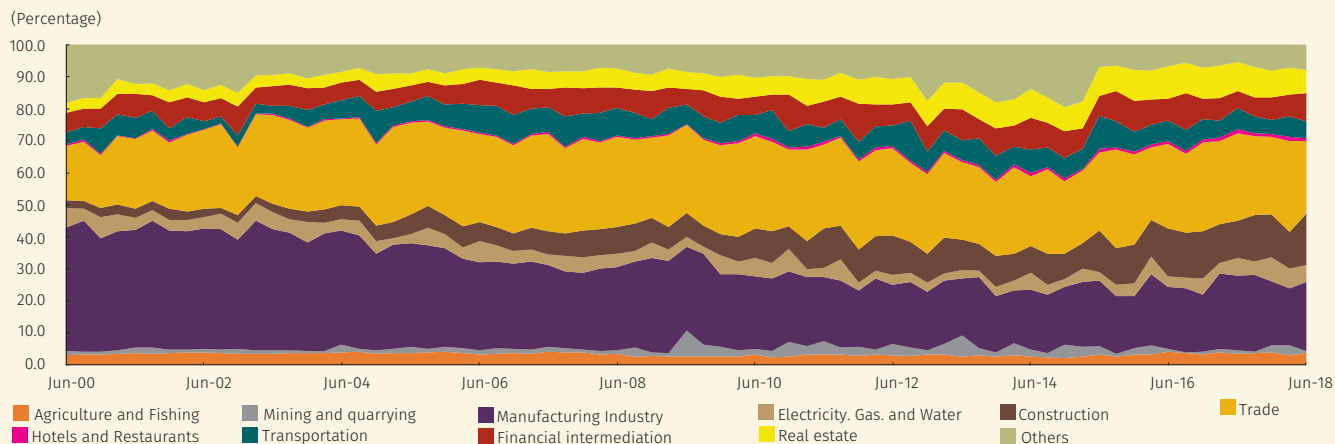


Source: Office of the Financial Superintendent of Colombia, calculations by Banco de la República.

In spite of the rise in the credit risk indicators for the commercial loan portfolio (see chapter 2 of this Report), there is no indication that this is a reaction to a transfer of

disbursements to riskier debtors (based on their history of delinquent payments) or those allocated to a particular economic occupation.

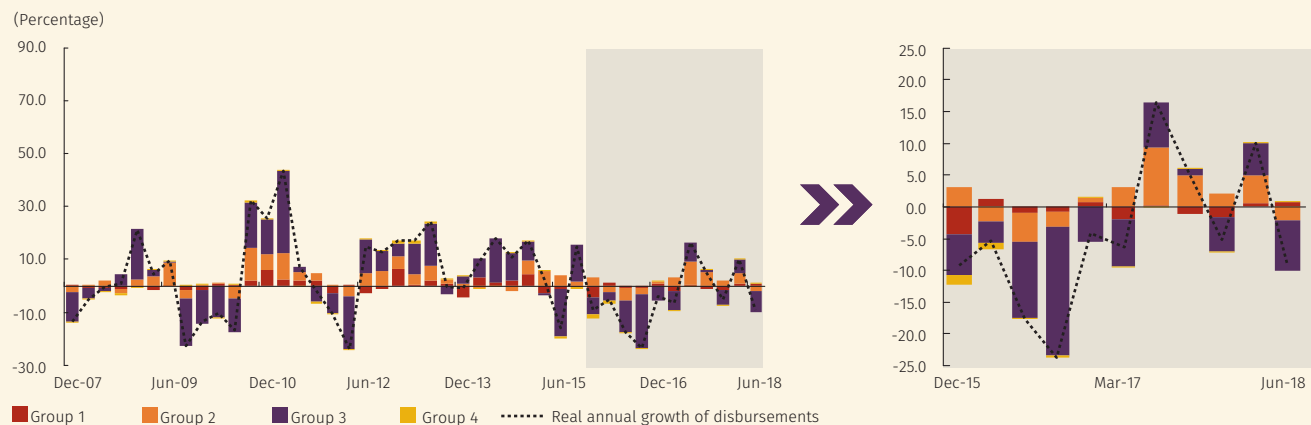
Graph B2.2
Breakdown of the Disbursements by Economic Branch



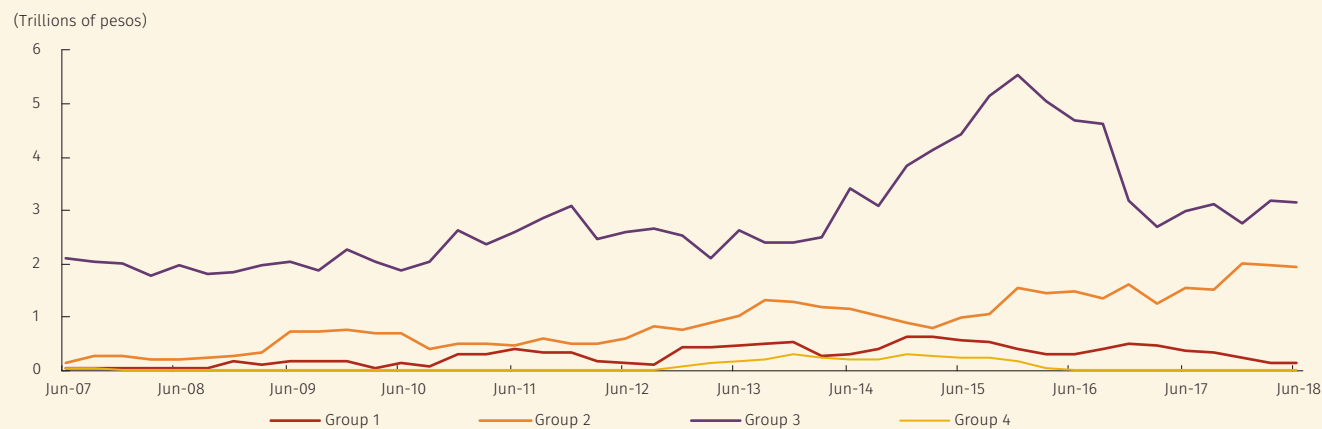
Note: the jump seen at the end of 2015 is mainly due to the adoption of the new classification for economic activities (ISIC), 4th revision. This change occurred in December of that year.
 Source: Office of the Financial Superintendent of Colombia, calculations by Banco de la República.

Graph B2.3

A. Contribution to the Growth of Disbursements by Risk Profile



B. Balance of High-Amount Disbursements by Risk Profile of the Debtor



Source: Office of the Financial Superintendent of Colombia, Banco de la República's calculations.

Box 3 Financial Burden, Maturity and Interest Rate for Household Indebtedness in Colombia: Implications for Financial Stability

Angélica Lizarazo
Juan Carlos Mendoza
Daniel Osorio*

1. Financial burden, maturity and interest rate

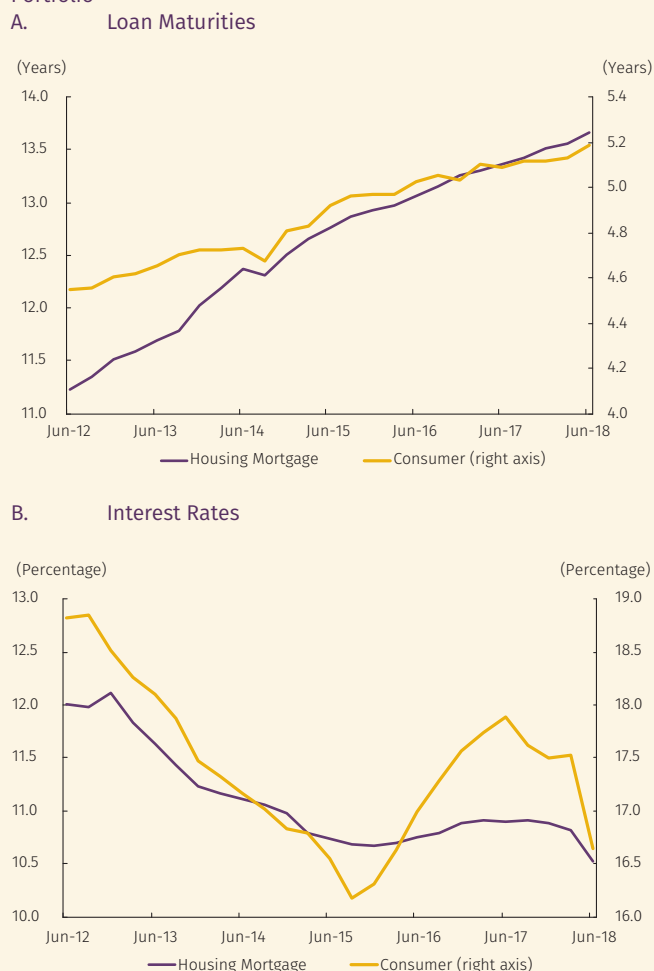
Based on what was presented in section 2.2.2, between the first quarter of 2012 and the second quarter of 2018, the financial burden of Colombian households (that is the ratio of loans payments to monthly income) has fluctuated around the historical average of 17.3%. The relative stability of the financial burden over time has coincided with a steady increase in the ratio of the loan portfolio granted to households (housing and consumption) to national income, which went to 19.5% from 13.1% during the same period.

The growth of household indebtedness has been consistent with the stability of the financial burden for two main reasons: 1) the extension of the loan portfolios maturity for consumption and housing, and 2) the reduction of interest rates during the same period (Graph B3.1).

Indeed, if a model for estimating the financial burden is used, based on the standard formula used to calculate the cost of a loan repayment installments (Drehmann et al, 2015), it is possible to establish that if the interest rates and maturities have remain constant since the first

* The authors are professionals in the Financial Stability Department at Banco de la República. The views expressed here do not commit the Bank or its Board of Directors. Errors or omissions that persist are the sole responsibility of the authors.

Graph B3.1
Maturities and Interest Rates of the Consumer and Housing Loan Portfolio



Source: Office of the Financial Superintendent of Colombia, calculations by Banco de la República.

quarter of 2012, the financial burden as of June 2018 would have been approximately 23% higher than what is actually registered.

Accordingly, there have been permanent changes in the term structure of household indebtedness. This has made it possible to keep the financial burden below the international standards of risky or vulnerable levels. In this regard, it is important to analyze the potential implications of the increase in loans maturity on the financial stability of the Colombian economy.

2. Potential implications for financial stability

The extension of loans maturity for the household loan portfolio has advantages for these agents, since it allows them to improve their cash flow and their access to sources of financing that are consistent with their ability to pay, without having to increase their level of financial burden.

However, this also generates an increase in different risks for the financial system¹.

First, the increase in maturities facilitates rising the households leverage. As was seen in the case of this economic agents, this allowed their level of debt to grow significantly in recent years while their levels of financial burden did not grow. This greater leverage represents a higher exposure and, thus, a vulnerability for credit institutions to events that could affect households' creditworthiness, and this could jeopardize the stability of the financial system.

Second, longer maturities could increase the maturity mismatch between assets and liabilities that the credit institutions usually have in their intermediation service. This, in turn, would result in an increase of two risks: the banking book interest rate risk and the liquidity or structural funding risk.

With respect to the first, the extension of the maturities in the household portfolio, which is usually at a fixed rate, could generate a larger gap between assets and liabilities that are sensitive to movements in the monetary policy interest rate. Thus, if the liability structure does not change, increases in assets and liabilities rates of the same magnitude could generate a reduction in net interest income for the credit institutions. Moreover, the duration gap between assets and liabilities will probably rise and, as a result, at higher interest rates there will be greater reductions in banks' equity value.

Regarding structural liquidity risk, an increase in loan maturity creates the need of increasing the stable funding sources for financial intermediaries. If not, these agents will be more exposed to sudden stop of financing sources or to the non-renewal of their funding.

References

Drehmann, Mathias; Illes, Anamaria; Juselius, Mikael; Santos, Marjorie (2015). "How Much Income is used for Debt Payments? A New Database for Debt Service Ratios." BIS Quarterly Review, September.

1 That is why Circular 047/2016 issued by the Office of the Financial Superintendent of Colombia, within the framework of the credit risk management system, modified the calculation of the expected loss in the reference model for the consumer loan portfolio, by adding the adjustment component by maturity for those credit operations with a maturity longer than 72 months.

03

Stress Test

This section describes the scenario and the results of the stress test on the credit institutions (CI) that *Banco de la República* carries out every six months. This test, known in the international literature as a stress test, seeks to measure the resilience of the CI in the event of a hypothetical adverse scenario. The results suggest that the aggregate indicators of the system's capital adequacy were would not show values lower than the prudential limits in the considered scenario.

The stress test is a quantitative analysis that evaluates the resilience of the CI in the event of an unlikely, hypothetical adverse macroeconomic scenario. The results indicate that the impact of the scenario on the aggregate capital adequacy of the institutions would have a limited magnitude.

Considering the vulnerabilities that have been identified throughout this *Report*, this chapter seeks to calculate the impact on the CI of a hypothetical scenario in which the growth rate of the Colombian economy declines starting in the third quarter of 2018 and continuing into mid-2020. The adverse scenario considered has been intentionally designed to reflect an extreme situation for the Colombian economy given that it incorporates a variety of shocks occurring simultaneously, but would not be very. In this respect, the results of the test do not constitute any kind of forecast of future changes in the Colombian

economy. Rather, the results should be interpreted as a quantitative evaluation of the resilience of the institutions in the event of an extreme scenario based on their current financial conditions and under restrictive assumptions. Likewise, the exercise assumes that the economic authorities respond to the macroeconomic stress but that there is no policy reaction to the deterioration of the institutions' financial statements nor preventive measures based on the monitoring of their risk management which would presumably have made the impact of the adverse scenario smaller.

The usefulness of the test lies in providing an estimate of the potential losses that would be seen if the extreme scenario were to materialize. Finally, the test helps shed light on the possible transmission channels by means of which the vulnerabilities identified could affect financial stability.³³

The results indicate that there would be negative effects on aggregate indicators of total and core (Tier 1) capital adequacy although they would remain at levels above the regulatory limits during the period of the exercise. In addition, the loan portfolio and the CI's profitability would deteriorate. This reflects the impact that the adverse scenario could have on the ability of the banking system to grant credit and carry out its intermediation operations.

3.1 Macroeconomic Scenario and Materializing Risks

The trajectories of the adverse scenario include a slowdown of the economy over the course of the analysis horizon.

The stress test seeks to capture the effects of an adverse macroeconomic context, which would involve a sustained economic downturn between June 2018 and June 2020. Under this scenario, the trajectories of the aggregate variables in the Colombian economy are constructed using a general equilibrium model. The scenario assumes a decline in the aggregate demand that could be associated with restrictions on external financing resulting from turmoil in the international financial markets. In addition, a depreciation of the exchange rate of the Colombian peso with respect to the US dollar and a gradual rise in the lending rates to levels that correspond to the maximum historical *spreads* with respect to the policy interest rate are included.³⁴ Under

³³ The technical details of the model used in this test which include a description of the performance of the entities in a hypothetical scenario and the channels through which their financial health could be affected are presented in the series *Borradores de Economía* No. 1028 "SYSMO I: A Systemic Stress Model for the Colombian Financial System," *Banco de la República*.

³⁴ *The largest spreads of the commercial, consumer, housing, and microcredit loan portfolios were 7.6 pp (November 2016), 20.6 pp (February 2003), 13.5 pp (May 2004), and 31.1 pp (August 2016) respectively.*

these assumptions, the model predicts a lower-than-expected economic growth, a rise in unemployment, and an increase in inflation.³⁵

A hypothetical scenario of a sustained economic slowdown and high interest rates could entail, during the first stage, the materialization of some of the risks (credit, market and foreign exchange) that CI face. The endogenous response of the CI to the scenario could, at a second stage, unleash the materialization of additional risks that would be likely to have a direct impact on the financial statements of each institution (funding, liquidity, interest rate, and contagion risks).

Concerning credit risk, two elements are considered. For one thing, the natural consequence of a macroeconomic deterioration would increase the default rates of economic. The hypothetical trajectories of the quality risk indicator (QRI) of the various types of loan portfolios are presented in Graph 3.1.³⁶ The shaded area corresponds to the analysis horizon of the exercise. For another, the exercise assumes that the adverse scenario would trigger a gradual two-level displacement in the rating of the commercial loan portfolio granted to vulnerable companies. These include firms exposed to exchange rate risk³⁷ and belonging to the construction sector (excluding public works) and the health sector.³⁸ In addition, given the idiosyncratic behavior of certain companies in the electrical and mass transportation sectors, the total displacement of these debtors was assumed.³⁹

Concerning market risk, two elements are considered. For one thing, the macroeconomic trajectories of the hypothetical scenario generate

35 This macroeconomic scenario is constructed in such a way as to take into account the feedback effects between the financial sector and the productive sector of the Colombian economy. The level of economic growth in the stressed scenario is determined by using a methodology that allows for the construction of a trajectory with a predetermined level of statistical confidence. In order for the scenarios in different Reports to be comparable, the average rate of economic growth is fixed at a confidence level of 3.0%. For more detail on this methodology see Box 1 of the *Financial Stability Report* for the first half of 2018.

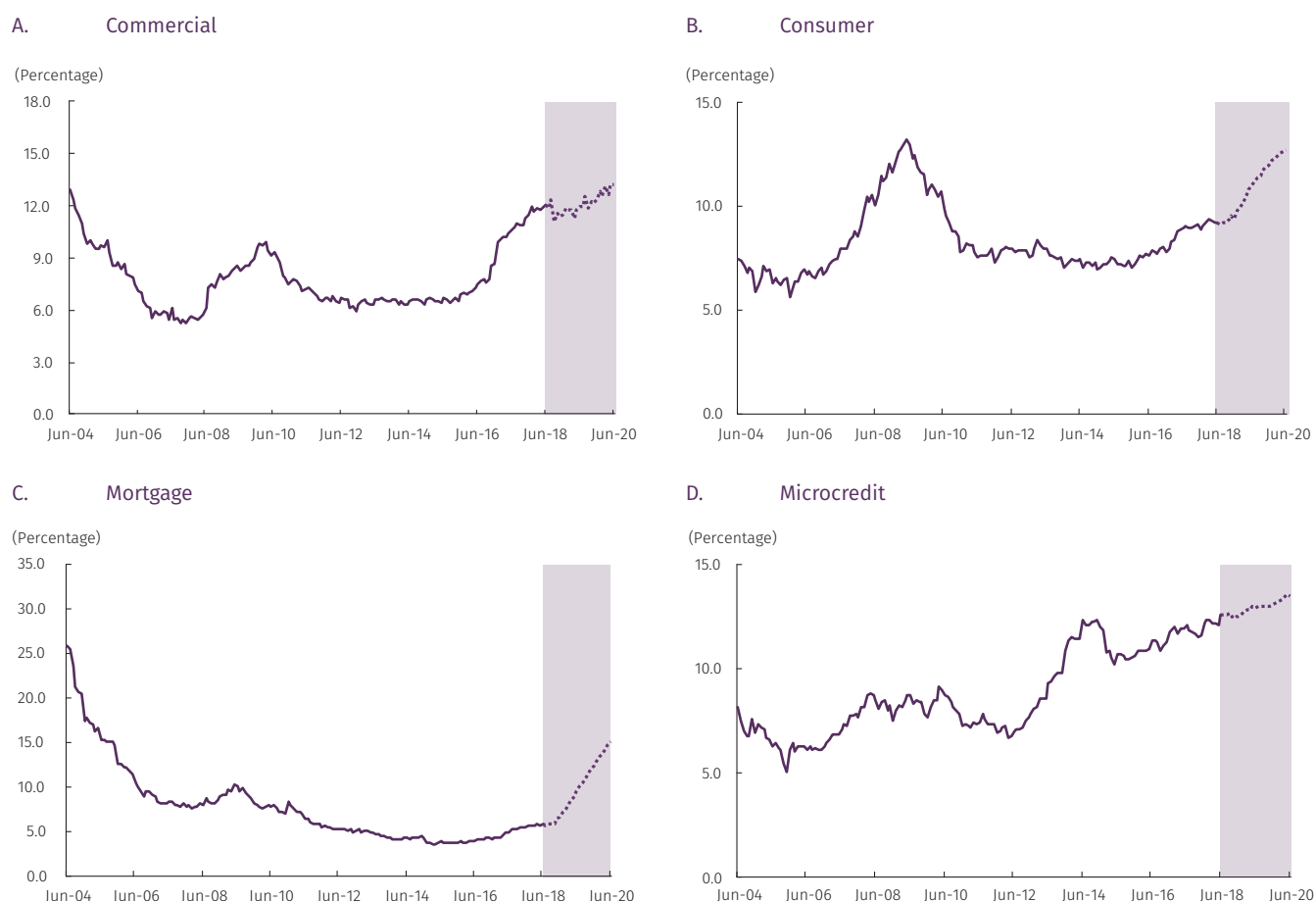
36 To establish these hypothetical trajectories, a vector auto-regression (VAR) model was used for the quality risk indicators of each one of the types of portfolios.

37 The companies exposed to exchange rate risk are the ones that present a negative exchange rate mismatch (liabilities in foreign currency greater than assets in foreign currency) and, taking into account four indicators, are classified as vulnerable: i) the value of the currency mismatches to total assets, ii) trade balance to operating income, iii) share of foreign capital in the total capital of the company and iv) depreciation of the equity in the event of a 15% depreciation.

38 As of June 2018, the loan portfolio allocated to companies in the construction sector (excluding public works) represented 8.4% of the total commercial loan portfolio, the one allocated to companies in the health sector amounted to 2.6%, and the companies exposed to exchange rate risk accounted for 13.5% of the total commercial portfolio.

39 The loan portfolio of these companies represented 1.6% of the total commercial loan portfolio as of June 2018. The exercise considers the fact that the CI have loan-loss provisions for close to 58.5% of the loans granted to these companies on the same date.

Graph 3.1
QRI Trajectory by Credit Type



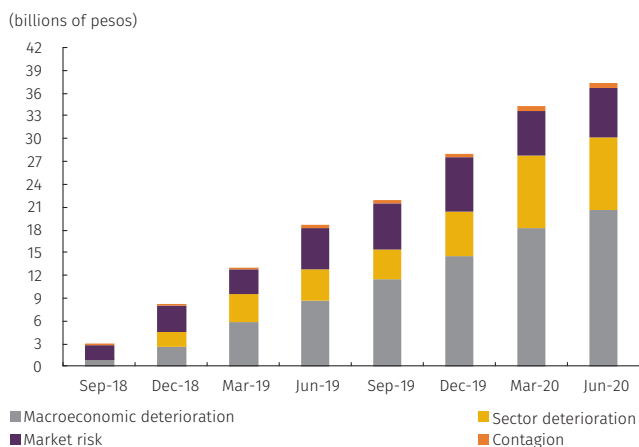
Source: Office of the Financial Superintendent of Colombia (before June 2018); Calculations by Banco de la República (from July 2018 to June 2020).

displacements of the zero-coupon TES curve and the private fixed income curve. As a result, a widespread depreciation of the curve is generated with a higher magnitude in the shorter periods thus flattening the yield curve. In addition, the exercise assumes that the general deterioration of macroeconomic conditions would cause a gradual and permanent exit of foreign bond holders from the local public and private debt market during the first year of the test. As a result, additional displacements are posited coming from the sale of the entire portfolio on the part of foreign investors.

3.2 Results

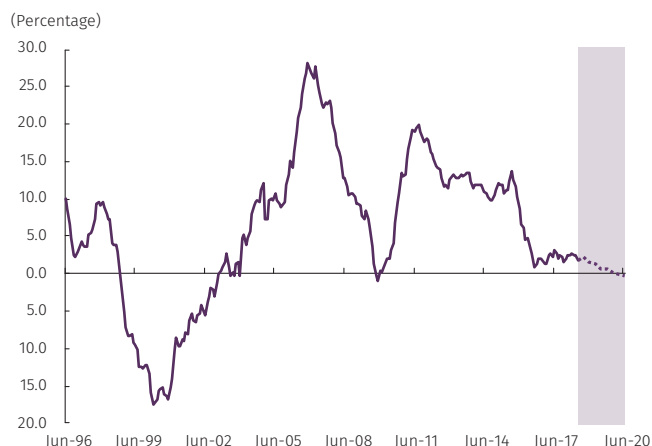
Graph 3.2 presents the cumulative expenditures that the CI would experience in the adverse scenario as a consequence of the outlays on loan-loss provisions and the losses from the valuation of investments. Out of a total of COP 37.4 trillion (t) as of June 2020, COP 20.5 t would correspond to the overall deterioration in the quality of the loan portfolio, COP 9.6 t to the cost of loan-loss provisions caused by the changes in the portfolio granted to vulnerable debtors, COP

Graph 3.2
Cumulative Losses of Credit Institutions



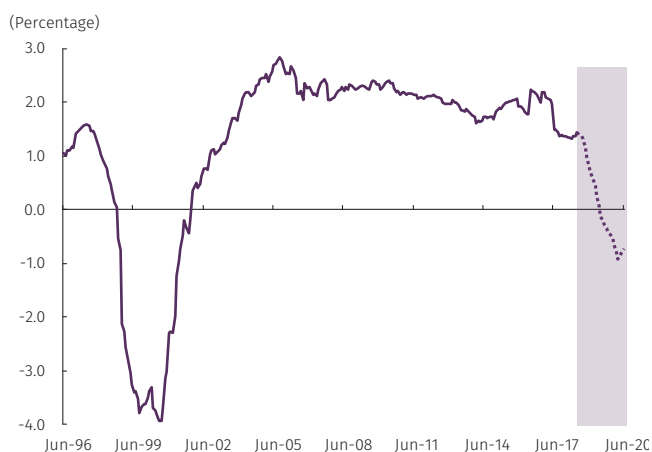
Calculations by *Banco de la República*.

Graph 3.3
Loan Portfolio Growth



Source: Office of the Financial Superintendent of Colombia (before June 2018); Calculations by *Banco de la República* (from July 2018 to June 2020).

Graph 3.4
Return on Assets (ROA)



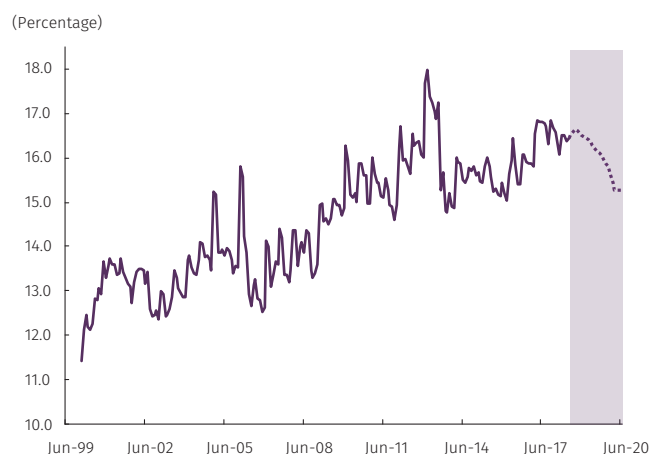
Source: Office of the Financial Superintendent of Colombia (before June 2018); Calculations by *Banco de la República* (from July 2018 to June 2020).

6.7 t to the losses due to market risk materialization, and COP 0.6 t to the losses generated by contagion among CI. The total expenditures on cumulative loan-loss provisions over the horizon of the test is 3.3 times the spending observed in the last two years (June 2016 to June 2018).

The trajectories of the aggregate variables of the CI could develop in the stressed scenario in line with what is shown in Graphs 3.3 to 3.6. The real annual growth of the loan portfolio would probably remain at low levels (Graph 3.3), and this would be consistent with the greater sluggishness of the aggregate liabilities in the macroeconomic scenario. The lower profits, in turn, caused by the joint materialization of risks would probably bring about a decrease in the ROA of the CI. This would likely fall, going from 1.4% to -0.7% between June 2018 and two years later (Graph 3.4). This drop illustrates the severity of the effects of the stressed scenario on the intermediaries. As a consequence of the lower profits, the ratios of the capital and Core Tier I adequacy ratios would probably experience a reduction although they would remain above their corresponding regulatory minimums (Graph 3.5 and 3.6).

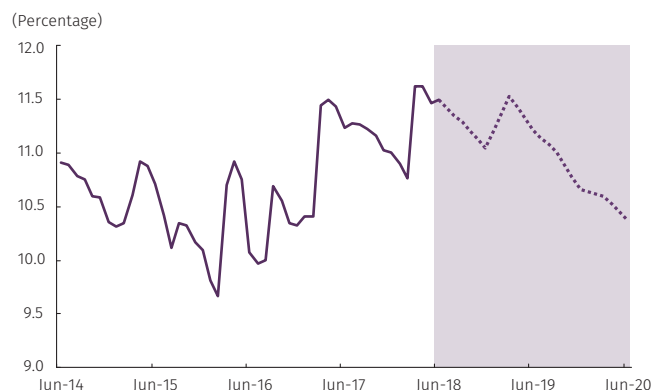
Finally, even though the aggregate indicators of the CI may not have presented high levels of deterioration in the scenario under study, the results per institution are heterogeneous (Graphs 3.7 and 3.8). With regards to the ROA, the CI with

Graph 3.5
Capital Adequacy Ratio (Tier II)



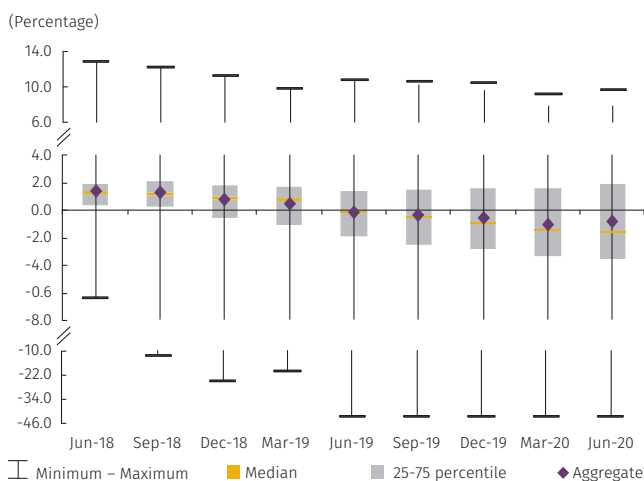
Source: Office of the Financial Superintendent of Colombia (before June 2018); Calculations by *Banco de la República* (from July 2018 to June 2020).

Graph 3.6
Core Equity Tier I Ratio



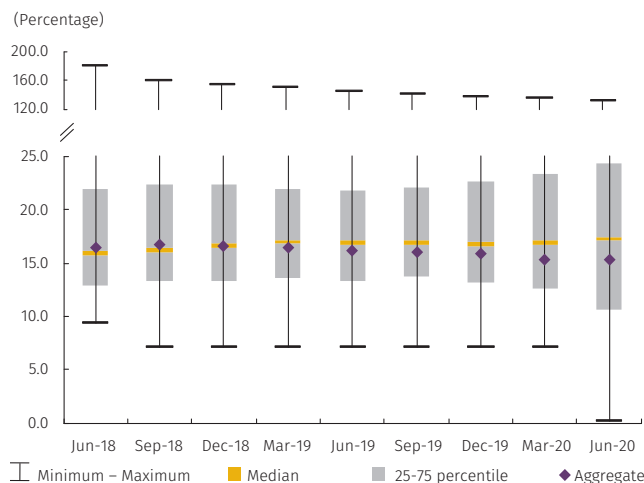
Source: Office of the Financial Superintendent of Colombia (before June 2018); Calculations by Banco de la República (from July 2018 to June 2020).

Graph 3.7
Distribution of Return on Assets



Source: Office of the Financial Superintendent of Colombia (before June 2018); Calculations by Banco de la República (from July 2018 to June 2020).

Graph 3.8
Capital Adequacy Ratio Distribution



Source: Office of the Financial Superintendent of Colombia (before June 2018); Calculations by Banco de la República (from July 2018 to June 2020).

a negative indicator would probably go from representing 5.8% to 52.7% of the total assets in the system at the end of the period. In the case of capital adequacy ratio at individual level, the stressed scenario would probably cause some entities to register levels below the regulatory minimum (these entities would represent less than 5.8% of the total CI assets as of June 2018).

3.3 Final Comments

The results of the exercise suggest that the majority of the CI would be able to keep their aggregate capital and core tier I adequacy ratios above the regulatory minimum in spite of the severity of the macroeconomic scenario and the resulting reduction in their profitability and ability to grant credit. This reflects the current resilience of the institutions in the event of a macroeconomic scenario like the one described above.

As has been discussed, the stress test presented in this section is built on the basis of a set of assumptions that, by incorporating various shocks that occur simultaneously, reflects an adverse situation and one that is very unlikely for the Colombian economy. For one thing, it assumes that the economic authorities do not take action in response to the deterioration of the CEs' financial situation. At the same time, the entities' shareholders are presumed to be excessively passive to the degree that they only capitalize the profits without taking any other kind of strategic initiative in order to face the financial stress.⁴⁰ If, however, any one of these assumptions is eliminated, the size of the losses to the system would be expected to be cushioned so that the impact of the adverse scenario would presumably be smaller. Finally, the starting point for the analysis are the individual capital adequacy ratios apart from any consolidated capital adequacy. Therefore, the results at consolidated level may differ from those presented here.

⁴⁰ Specifically, the shareholders do not inject capital into the business operation, they do not seek synergies or mergers between the institutions, nor manage them in order to increase the efficiency of their operations.

Box 4 SRISK and Distance to Default for the Colombian Financial System

Juan Sebastián Lemus Esquivel
Carlos Quicazán*

The 2008 financial crisis motivated regulators and central banks to increase their monitoring of systemic risk and to reinforce the measurement of soundness and the credit risk of agents in the financial system. This box describes the results of *SRISK* (first time for Colombia) as a measurement of systemic risk and the *distance to default* (DD) as an indicator of credit risk for the Colombian banks listed on the stock exchange. Both balance sheet and market information are used to calculate these indicators. In the latter case, the greater availability of the information is a benefit.

The box is a valuable contribution to the set of indicators that *Banco de la República* uses to monitor the systemic and credit risks for the financial system. The measures proposed complement the traditional ones that are built on the basis of accounting information since they incorporate market information. Last of all, this box presents *SRISK* and the *DD* in simple terms due to the fact that its purpose is to serve as a starting point of reference for later work.

1. SRISK

One of the lessons of the 2008 global crisis is that systemic risk should not be understood only in terms of the bankruptcy of a single financial institution (FI) but rather in the context of the institution's contribution to the total bankruptcy of the system. For an FI that is traded on the stock exchange, the *SRISK*¹ is obtained from the market

* The authors are fully responsible for the opinions herein contained and do not compromise *Banco de la República* or its Board of Directors.

1 See Brownlees, C.; Engle, R. (2017). "SRISK: A conditional Capital Shortfall Measure of Systemic Risk," Working Paper Series, no. 37, European Systemic Risk Board, March, and Acharya, V; Pedersen, L; Phillipon, T; Richardson, M. (2017). "Measuring Systemic Risk," The Review of Financial Studies, vol. 30, Issue 1, January, pp. 2-47.

information on its equity (*EQ*) and the book value of its liabilities (*D*). The indicator is built in accordance with the size and leverage of the entity as well as the depreciation of the market value of its capital contingent on a shock to the stock market from a crisis event.² For each entity, the *SRISK* estimates the extra level of capital (in addition to the reserve assets) that a FI could require to continue operating. Those with the *highest SRISK* are those that contribute the most to the reduction of capital in the financial system. In addition, the *SRISK* of the system can be understood as an overall measurement of systemic risk since it would be the liquidity that the governments inject into their financial systems to guarantee its functioning in a crisis scenario.

The results for Colombian banks that are listed on the stock exchange were calculated repeatedly and daily between July 2003 and August 2018. In Table B4.1, it can be seen that four entities (1, 2, 3, and 7) have submitted a *null SRISK* over time; i.e., they have not shown a capital deficit over the long term since there has been no possible financial crisis that could cause the worst historical scenario in the local stock market (for this box, the daily return of COLCAP, in absolute terms, is assumed to be the event in which this return will be equal to the daily minimum percentage change in history). On the other hand, the average indicator for banks 4 and 5 in 2018 is found to be close to the historical maximum. When the indicator is seen in terms of either percentages or the contribution of the entity's debt to the risk level of the system, the averages for 2018 are lower than the historical average for banks 5 and 6. At the end of August 2018, the total *SRISK* for the system is COP 4.7 trillion.³

Last of all, the *SRISK* has shown a rising trend for banks 4, 5, and 6 since February 2013 (Graph B4.1). Historically, the average levels of overall capital adequacy of these entities have been the lowest for the sample analyzed. Moreover, in terms of the depreciation of the banks' stocks in the event of a crisis (*LRMES*), it is notable that the average level in 2018 for entity 1 is close to the historical minimum.

2 In a crisis scenario, the *SRISK* is defined as the expected capital shortfall that the FI could face, i.e., $SRISK_{i,t} = \max(ECS_{i,t}, 0)$, where $ECS_{i,t} = kD_{i,t} - (1-k)(1-LRMES_{i,t})EQ_{i,t}$ y $LRMES_{i,t} = -E_t[r_{i,t}r_{m,t} \leq -\alpha]$, where $r_{i,t}$ and $r_{m,t}$ are the daily returns on the stock prices of the bank and the stock index. In this box, it is assumed that a financial crisis occurs when the maximum daily fall of COLCAP within a year is greater than 13.25% in absolute terms (i.e., $\alpha = -13.25\%$), since, for that index, this is the historical minimum for daily returns over a moving period of 252 days. As such, the *LRMES* captures the covariance of the stock price and the stock market index in a crisis scenario for the stock market, i.e., its Beta which is estimated daily (or dynamically) for this box. A high level of *LRMES* could be explained by a high correlation between the stock prices of the bank and the performance of the index during the defined crisis scenario. In addition, *k*, in this exercise is defined as the minimum level of capital adequacy in order for a FI to not go into bankruptcy and is assumed as 11%.

3 The aggregate *SRISK* for a system of *N* agents is $SRISK = \sum_{i=1}^N SRISK_{i,t}$ and the individual contribution ($SRISK\%_{i,t}$) is calculated as follows:

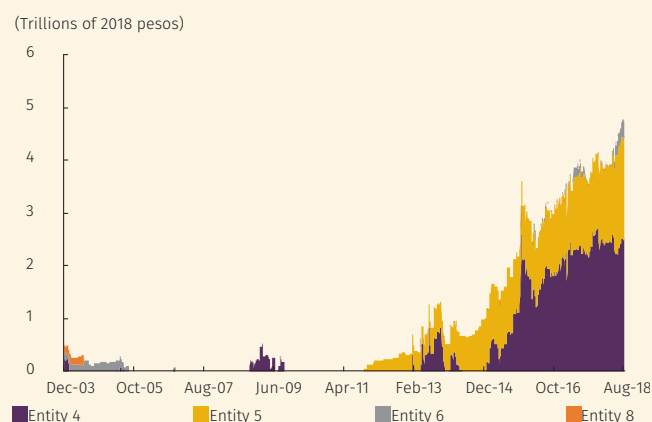
$$SRISK\%_{i,t} = \frac{SRISK_{i,t}}{SRISK}, \text{ si } SRISK_{i,t} > 0$$

Table B4.1
SRISK, SRISK percentage, and LRMES for Colombian Banks listed on the Stock Exchange

Entity	SRISK (percentage)		SRISK (trillions of August 2018 pesos)			LRMES (percentage)			
	Historical average	Average 2018	Historical average	Average 2018	Historical maximum	Historical average	Average 2018	Historical minimum	Historical maximum
Entity 1	0.0	0.0	0.0	0.0	0.0	-14.2	-21.6	-23.6	-7.3
Entity 2	0.0	0.0	0.0	0.0	0.0	-6.6	-4.6	-13.3	-1.5
Entity 3	0.0	0.0	0.0	0.0	0.0	-9.6	-9.2	-15.9	-2.7
Entity 4	35.4	58.4	0.5	2.4	2.7	-0.8	0.3	-7.6	6.9
Entity 5	47.3	39.1	0.4	1.6	1.9	-1.1	0.0	-11.7	0.3
Entity 6	14.8	2.5	0.0	0.1	0.3	0.3	0.9	-2.8	4.0
Entity 7	0.0	0.0	0.0	0.0	0.0	-1.2	0.2	-5.9	1.7
Entity 8	2.6	0.0	0.0	0.0	0.2	-0.3	0.2	-3.7	1.8

Sources: Banco de la República, Bloomberg, Colombia Stock Market, and Office of the Financial Superintendent of Colombia, authors' calculations.

Graph B4.1
SRISK for the Colombian case



Sources: Banco de la República, Bloomberg, Colombia Stock Market, and Office of the Financial Superintendent of Colombia, authors' calculations.

Finally, when one looks at the sample, the ones who would have higher LRMES are the largest banks (1, 2 and 3).

2. Distance to default (DD):⁶

According to Merton (1974)⁵, the market value of the equity (E) of a company can be modeled as a call option with the

4 For more detail on what is explained in this box, see Gropp, R.; Vesala, J.; Vulpes, G. (2006). "Equity and Bond Market Signals as Leading Indicators of Bank Fragility," *Journal of Money, Credit and Banking*, 399-428. In the case of Colombia, Capera *et.al* (2011) "Measuring Systemic Risk in the Colombian Financial System: A Systemic Contingent Claims Approach" implemented the *distance to default* using monthly information from the banks between September 2001 and March 2011. Our approach is different due to the fact that we use daily information and a larger window of time.

5 See Merton, R. C. (1974). "On the Pricing of Corporate Debt: The Risk Structure of Interest Rates." *The Journal of Finance*, vol. 29, no. 2, pp. 449-470.

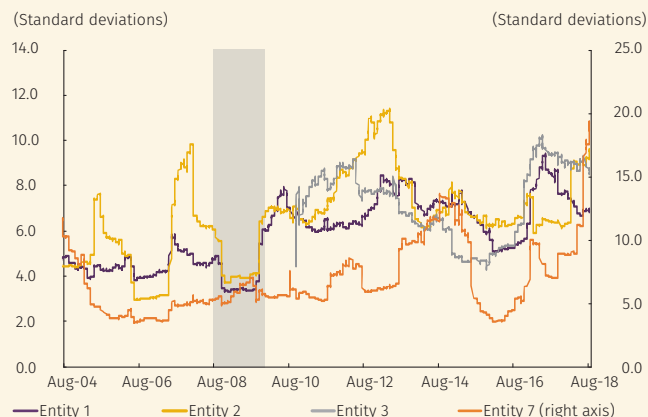
price of accounting period equal to the book value of its debt (D), which is assumed to act like a zero-coupon bond. The value at market price for the assets and their volatility, which are not observable (V_A y σ_A respectively), are estimated through E , using the theory of option valuation.⁶ In this case, *default* is understood as a situation in which $V_A = D$, and the distance to *default*, DD , as $(V_A - D)^+$, which is understood as the number of standard deviations from the point that determines a firm's financial bankruptcy. In addition, the implicit likelihood of bankruptcy (PIQ), is the probability that the market value of the company's assets will be less than or equal to the book value of its debt when it comes due in T , in other words: $PIQ \equiv P[LnV_A^T \leq LnD] = N(-DD)$, based on the assumption that the distance to the *default* follows a normal standard distribution.

By means of the daily historical information on the stock prices of four Colombian banks⁷ as well as the one-year zero-coupon TES rate (*proxy* for the risk-free rate in Colombia), the DD between December 2004 and August 2018 was calculated. As can be seen in Graph B4.2, in the global financial crisis of 2008, there was a drop in the DD for the entire sample. In addition, starting in December 2013

6 A call option is a financial instrument that gives its purchaser the option but not the obligation to buy an underlying asset at a specific price and time. With the Black-Scholes-Merton model, the value of the equity is defined as: $V_E = VN(d1) - De^{-rt}N(d2)$, where, $d1 = \frac{Ln(\frac{V}{D}) + (r + \frac{\sigma^2}{2})T}{\sigma\sqrt{T}}$, $d2 = d1 - \sigma\sqrt{T}$, $N(*)$ represents the standard normal cumulative distribution, r the risk free rate and T the remaining period for the debt (in line with the literature, a year is assumed). This model also defines the $DD \equiv \frac{Ln(\frac{V}{D}) + (r + \frac{\sigma^2}{2})T}{\sigma\sqrt{T}}$.

7 For the banks that are publicly traded, in three cases, their shares were not traded on the majority of the trading days throughout the year due to which they were excluded from the analysis in this section.

Graph B4.2
Distance to Default for the Colombian Financial System



Sources: Banco de la República, Bloomberg, Colombia Stock Market, and Office of the Financial Superintendent of Colombia, authors' calculations.

and continuing until the same month in 2015, there was a decline in this indicator that was accompanied by lower market values for the assets as well as by higher levels of debt for some of the banks analyzed. Note the increase in the indicator since the beginning of 2017 for all entities that were analyzed. This could be related to a better situation for their balance sheets compared to previous periods. Moreover, in spite of the high volatility of the *DD* over time, when the *PIQ* is analyzed, it is generally found to be zero. However, in the 2008 global financial crisis one entity showed a probability of default that was close to 1.0%.

04

Financial Regulation

In this chapter, a description is given of some of the new measures and local regulatory changes published between April and September 2018 that could have an impact on financial stability.

Decree 774/May 8, 2018: appropriate level of capital for financial conglomerates

In accordance with Act 1870/2017, the objective of this decree is to regulate the proper level of capital for financial conglomerates. In particular, it established the definitions for the regulatory capital and the required capital of the financial conglomerate and determined that the *financial holding* company is responsible for compliance with the requirement that the regulatory capital is never allowed to drop below the level of the required capital at any time.

The conglomerate's regulatory capital is defined as the sum of the regulatory capital elements of each of the entities that belong to the conglomerate in conformity with the regulations for each entity. In the case that one or more of the entities in the conglomerate does not have a legal definition of regulatory capital, the current regulations applied to the entities involved in similar activities and under the oversight of the Office of the Financial Superintendent of Colombia (in Spanish, *SFC*) will be used. Likewise, the value of direct or indirect investment in equity instruments of other entities of the financial conglomerate will be deducted from the regulatory capital whenever these investments generate a duplication in the assessment of the elements that the financial conglomerate capital consists of. Regarding the required capital, the minimum required levels of regulatory capital of each of the entities in the conglomerate are added together while excluding the value of direct or indirect investments in entities of the financial conglomerate and the exposures among these entities.

Once this decree was promulgated, the financial *holdings* were given a period of eighteen months to comply with the appropriate level of capital for the financial conglomerate.

Decree 923/May 28, 2018: resolution plans

Given the interest in bringing the Colombian financial regulations more in line with the international guidelines, this decree incorporates the figure known as resolution plans and establishes parameters with regard to its characteristics and content. In addition, the Intersectoral Resolution Committee (IRC) is created as a technical body to coordinate and guide functions related to the entities' resolution processes.

The resolution plan is understood as “[...] the adoption of measures that are intended to allow for a comprehensive and orderly solution for situations of financial stress [...], including an eventual liquidation [...]” One of the functions of the IRC shall be to establish the criteria to determine if an entity faces a situation of material stress and report those entities that, in its opinion, should draw up plans of resolution and their respective submission schedules to the SFC and the Fund of Guarantees for Financial Institutions (*Fogafin* in Spanish). The SFC, in turn, must communicate with the entities concerning the fact that they have been selected to prepare and submit the resolution plans as well as the term and method by means of which they must comply with this obligation and the guidelines for preparing and submitting it.

The IRC shall have a maximum of 6 months starting from the date of publication of the decree to define the group of entities that they thing should carry out the resolution plan as well as the features that the plan should include.

Decree 959/June 05, 2018: default assignment to affiliates in the multifund plan

This decree is intended to improve the individual savings account balances by encouraging contributors to the pension system to invest a proportion of their resources in assets with a higher expected return, specifically during the initial or early stages of their participation in the labor market and the individual savings regime.

Thus, the resources allocation of non-pensioned affiliates who have not chosen a type of fund is established by taking into account their characteristics in terms of their position within a normal life cycle that match the returns and risks that are inherent in each one of the saving funds. As a result, young contributors who have a longer life span horizon will probably invest a greater proportion of their funds in the highest risk portfolio (which implies a greater expected return in the long term), while older contributors will probably invest a greater amount of their resources in moderate and conservative funds (which implies a lower risk in the short term).

In this regard, when non-pensioned affiliates do not choose a type of fund, the decree establishes the following rules:

Flows of contributions: the contributions will be allocated according to the gender and age of the non-pensioned affiliates, as follows (Table 4.1):

Table 4.1
Flows of Contributions

Age		High risk fund	Moderate risk fund
Women	Men		
< 42	< 47	100.0	0.0
42	47	80.0	20.0
43	48	60.0	40.0
44	49	40.0	60.0
45	50	20.0	80.0
46 to 51	51 to 56	0.0	100.0

Source: Ministry of Finance and Public Credit.

Convergence to the moderate fund: The balance of the individual pension savings accounts of those affiliates who have not chosen a type of fund will go into the moderate fund based on the sex and age of the non-pensioned affiliates as follows: (Table 4.2):

Table 4.2
Convergence to the Moderate Risk Fund

Age		Minimum balance in the moderate risk fund
Women	Men	
< 42	< 47	0.0
42	47	20.0
43	48	40.0
44	49	60.0
45	50	80.0
46 to 51	51 to 56	100.0

Source: Ministry of Finance and Public Credit.

FSC External Circular 009/June 5, 2018: modifications to the liquidity risk indicator (LRI)

The objective of this regulation is to incorporate various changes into the calculation of the LRI in order to have a more accurate standard for estimating the short-term liquidity risk and integrate some of the guidelines proposed by the Basel Committee on Banking Supervision (BCBS). On one hand, one of the main changes consists in the modification of the minimum net withdrawals factors classified by type of

depositor in the calculation of net liquidity requirements. The idea is to recognize the differences that the deposits could have in terms of stability.

On the other, the haircuts of some liquid assets were updated based on their credit rating. Under the former rules, a *haircut* of 20% was applied to the fair exchange price of the securities not received by *Banco de la República* to carry out repo transactions, regardless of the credit rating of the debt security. Under the new regulation, a *haircut* of 15% is established for those securities with a credit rating of AA or above, while the *haircut* for the securities with a rating between A+ and BBB- is 20%, and for securities with a rating lower than BBB-, the *haircut* is 50%. The changes set out in this circular shall go into effect on March 29, 2019.

External Circular 007/June 5, 2018: instructions related to the minimum requirements for management of cyber-security risks

Given the increase in the exposure to cyber risks brought about by the recent boom in the digitalization of financial services, the greater interconnectivity between agents, and the massive use of electronic channels, the SFC added chapter V – “Minimum Requirements for the Management of Cyber-security Risks” – to its Basic Legal Circular.

The measures defined in this chapter must be adopted by the entities that are subject to the inspection and oversight of the SFC and by operators of the information contained in the integrated pension contribution form (PILA), with some exceptions, within a period of six months. The chapter establishes that the aforementioned entities must have the policies, procedures, and technical and human resources needed to effectively manage cyber-security risks. It also stipulates a minimum set of measures in the field of cyber-security that must be adopted.

Last of all, a minimum number of stages that the entities should consider for the proper management of both information security and cyber-security are put forward. The prevention phase, where the ability to limit or contain the impact of a possible incident of cyber-security is recognized; the protection and detection stage, which allows for the timely discovery of cyber-security events and incidents and how to protect themselves against them; the response and communication stage, in which procedures and mechanisms for responding to and reporting incidents are established; and the recovery and learning stage, in which operations to maintain resilience plans and restore any capability or service that has been affected by a cyber-security incident are implemented.

Act 1902/June 22, 2018: general framework for Payroll deductible loan or direct discount

The Act establishes an overall framework for granting payroll deductible loans or direct discount in which a definition of these types of loans and which entities may issue them are specified. In particular, it determines that these loans may be issued by corporate entities or autonomous equity institutions legally authorized to manage the public savings accounts or the contributions of their affiliates (for example, credit institutions). In addition, it stipulates that corporate entities without this authorization are allowed to issue payroll deductible loans as long as they do so using their own resources. The law also establishes that all issuers of payroll deductible loans must indicate both the issuance of these types of loans and the sources of the funds used in these operations in their corporate purpose. Moreover, all issuers of payroll deductible loans must have a department of financial risks.

The monitoring and control of these entities, as the case may be, will fall under the supervision of the SFC, the *Superintendence of Corporations*, and the Superintendence of Solidarity Economy (SES in Spanish). However, with the exception of the entities supervised by the SFC, the Superintendent of Industry and Commerce will be in charge of ensuring customer protection with regard to loans covered by automatic payroll deduction. Furthermore, the issuers of payroll deductible loans that are not supervised by the SFC and that intend to sell such loans to individuals or entities not supervised by the SFC shall only be able to do so through special purpose vehicle managed by fiduciary companies subject to the oversight of the SFC and through collective investment funds.

In addition, the Act establishes measures to protect buyers of payroll deductible loans portfolios from operators not supervised by the SFC. For example, that the buyer is able to learn about the financial situation of the issuer of these payroll deductible loans, the risk management it applies to the portfolio, etc. Likewise, all purchase and sale transactions as well as taxes related to securities derived from payroll deductible loans granted by entities that are not under the supervision of the SFC must be included in the Single National Registry of Entities Issuers of payroll deductible loans (*Runeol* in Spanish). Lastly, retentions of a maximum of 50% of the debtors' salary or pension can be ordered when the payroll deductible loans are granted by entities under the supervision of the SES. This law will go into effect six months after its promulgation.

Decree 1357/July 31, 2018: crowdfunding activities

In line with the promotion of financial inclusion and the international experience that reveals the potential of crowdfunding to allocate scarce resources, this decree introduces the regulatory framework for the entities authorized to operate in this business and for the suppliers and recipients of the funds intermediated by these entities. Initially, the crowdfunding activity is defined as "that carried out by authorized entities [...], based on an electronic infrastructure [...], through which numerous

contributors and recipients who request financing in their own name for allocation to a productive investment project contact each other.”

This decree is focused on establishing guidelines intended to reduce information difficulties associated with the productive projects to be financed, the source of the funds used by suppliers, and the management of the resources received by crowdfunding entities through their business, along with other guidelines. Specifically, two types of crowdfunding activities are defined (through securities that represent either debt or capital stock), a maximum amount for financing projects, and investment limits for contributors classified as non-qualified are defined. In addition, the section that specifies the scope of application also determines that the guidelines set forth in this decree are not “applicable to those operations carried out by Colombian residents through entities or platforms of collaborative financing or *crowd-funding* registered abroad.” This decree shall go into effect on the date of its publication.

Decree 1477/Aug. 6, 2018: Regulatory capital requirements for credit institutions

This decree defines other capital requirements as a complement of the total capital ratio and the common equity tier 1 ratio in order to align some limits and definitions in Colombian regulation with those proposed by the Basel Committee on Banking Supervision (BCBS). Likewise, some criteria for classification of instruments as core tier I and tier II capital are modified, the measurement of risk weighted assets (RWA) is updated, and the conservation and systemic capital buffers are implemented.

Complementary Minimum Capital Requirements:

- Additional tier I must be at least 6.0% of RWA:

$$\text{Additional Tier 1} = \frac{(CET 1 + AT 1)}{RWA + \frac{100}{9} VaR} \geq 6\%$$

where *CET1* corresponds to the common equity tier 1 after deductions, *ATI* to the additional tier 1, *RWA* to the risk weighted assets and *VaR* to the market value at risk.

- The leverage ratio must be at least 3.0%:

$$\text{leverage ratio} = \frac{(CET 1 + AT 1)}{E} \geq 3\%$$

where *E* corresponds to a measurement of exposure that includes the value of the assets (net of collateral) and the contingencies.

Compliance with these capital requirements must be done individually and on a consolidated basis by each credit institution.

Changes to the measurement of the total regulatory capital:

- The decree includes various modifications to the calculation of the credit institutions' CET1 that seek to harmonize this measurement with the international standards:
 - Included in the CET1: the equity account of the other comprehensive income (OCI), all the current and retained profits as well as the occasional reserves.
 - Deducted from the CET1: all the goodwill or capital gain and intangible assets as well as the value of the asset revaluation account.
- In addition, the decree introduces two modifications to the perpetuity criteria of the instruments that make up additional tier 1 and tier 2 capital..

Changes to the RWA

The decree gives a detailed classification of the different assets and includes weighting by risk that is shifted to depend on an external credit rating or on the balance-guarantee ratio (depending on the type of asset).

Conservation and systemic capital buffers

The decree also seeks to follow the guidelines of the BCBS by including a requirement of additional tier 1 which is internationally known as the "capital conservation buffer." In line with that, the credit institution must maintain 1.5% of the RWA in CET1 instruments in addition to what is required to comply with the other capital requirements.

In addition, a requirement of additional tier 1 is included for those entities that are systemically important. This requirement corresponds to 1.0% of the RWA and it must be complied with CET1 instruments. The SFC should publish the list of systemic entities annually.

The decree provides that those entities which fail to comply with any of these buffers must enter an adjustment plan with the SFC.

Transition Regime

The decree includes a period of eighteen months following its publication for the adjustments in the measurement of total regulatory capital and RWA as well as the limit on the leverage ratio. For the limits on the additional tier 1 ratio and the systemic and conservation buffers, in turn, an additional period of four years is defined in which

these limits will gradually converge with the ones established in the decree.

Decree 1486/Aug. 6, 2018: related parties criteria, exposure limits, concentration of risks and conflicts of interest for financial conglomerates

The criteria that define a related part of a financial conglomerate and a *financial holding company*⁴¹ as well as the criteria that the entities which are part of a conglomerate use to identify, manage, and disclose conflicts of interest are established in this decree. Additionally, it establishes policies, limits of exposure, and risk concentrations for transactions between entities in the conglomerate and between these and their affiliates. These policies should be issued and approved by the board of directors of the *financial holding company* and must include the minimum aspects stipulated in the decree.

Moreover, the decree establishes that, where the counterparties are entities that are part of the same financial conglomerate as the entity managing those funds, the sum of the exposure levels of each one of the mandatory pension funds and severance payment funds must not exceed 8.0% of the value of each fund.

Finally, the decree grants powers to the SFC to require that adjustments to policies mentioned above be implemented when they determine it to be prudent. Starting from the date of publication of this decree, the financial conglomerates will have 18 months to apply it.

⁴¹ The criteria that define an affiliate of a financial conglomerate can be divided into two groups depending on their relationship with respect to at least one of the entities that is part of the conglomerate: 1) control, subordination and/or business group, and 2) meaningful participation.

Box 5

Components of the change in the Funding of the Collective Investment Funds

Oscar Fernando Jaulín Mendez

The collective investment funds (CIF) constitute one of Colombians' investment vehicles. These are autonomous equities that serve as a mechanism for acquiring deposits or managing sums of money or other assets. They are made up of contributions from a number of individuals and the funds are managed collectively to earn economic results that are also collective (Decree 1242/2013). As of September 30, 2018, the assets managed by the CIFs came to COP 95.2 trillion (t) which represents 11.5% of the total funds managed by the financial system.

Within these funds, the open-end CIFs, which do not have a permanency agreement (open-end CIF), are of particular interest because they could be susceptible to massive withdrawals on the part of their investors and, hence, have repercussions on the country's financial stability. These types of funds are the largest ones in the CIF market since they hold 62.2% of the total assets of the CIFs.

Due to the above, it is appropriate to monitor the deposits into and withdrawals of capital from the open-end CIFs so as to determine if the changes in the assets managed are the result of movements made by investors or variations in the appreciation of the investments. To determine the component of capital deposit or withdrawal, the total amount in deposits made into and withdrawals from the CIFs must be totaled for a specific period of time. However, this information is incomplete for several periods and it is not reported opportunely.

The purpose of this box is to propose a methodology that would make it possible to identify (approximately) whether or not the change in the assets of these types of funds is due to appreciations of their investments, movements in

the number of units issued by the autonomous equities, or to changes in liabilities. This methodology is an estimate that uses information from two separate days and is useful when all of the information on contributions to and withdrawals from the funds is not available. However, the more distant the dates of analysis are from each other, the less accurate the estimation.

Change in asset

According to chapter 11 of the Basic Accounting and Financial Circular, the value of a fund's assets can be expressed as follows:

$$Asset_t = Liability_t + Equity_t$$

$$Equity_t = VUO_t (NUC_t)$$

Where VUO_t is the value per unit and NUC_t is the number of units that the CIF has.¹ Thus, the change in the value of the assets between two dates can be expressed as:

$$Asset_t - Asset_{t-1} = Liability_t - Liability_{t-1} + VUO_t (NUC_t) - VUO_{t-1} (NUC_{t-1})$$

$$\Delta Asset_t = \Delta Liability_t + VUO_t (NUC_t) - VUO_{t-1} (NUC_{t-1})$$

In order to interpret the asset change in terms of a change in the variables, the term $VUO_t (NUC_{t-1})$ is added and subtracted to the previous expression so as not to alter the result. With this, the expression would be:

$$\Delta Asset_t = \Delta Liability_t + \Delta VUO_t (NUC_{t-1}) - VUO_t (\Delta NUC_t)$$

The term $\Delta VUO_t (NUC_{t-1})$ indicates the change in the equity caused by the appreciation of the units that were initially in the fund. That is why this term is understood in this box as the change produced by the appreciation. However, to the degree in which the appreciations of the units that entered after the initial date are not taken into consideration (only the appreciations of the initial units), it is only an approximation. The shorter the distance is between the end date and the starting date, the greater the probability that the bias will be lower.

The term $VUO_t (\Delta NUC_t)$ corresponds to the change in equity due to the movements in the number of units. In this box, this term corresponds to the change resulting from deposits or withdrawals of capital. Just as in the case of appreciation, this is also an approximation because it is included in the appreciation of the units that were admitted after the starting date.

* The author is fully responsible for the opinions herein contained and do not compromise Banco de la República or its Board of Directors.

1 The VUO_t is the division between the pre-close equity (value of the equity the day before plus the results of the day without considering either withdrawals or deposits) and the number of units on the day of the analysis.

Data on the assets and liabilities were taken from the balance sheets of the CIFs while the value of the unit and number of units was taken from the reports on fund yields (available on the website of the *Office of the Financial Superintendent of Colombia*: FSC).

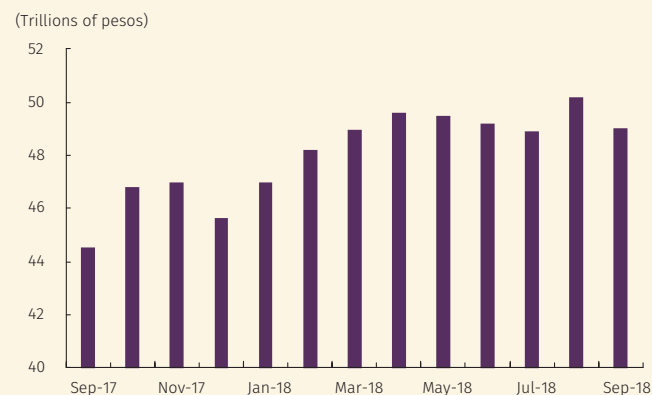
Changing the assets of open-end CIF

The end-of-the-month data for fifty open-end CIFs lacking permanence agreements that had all the information needed to do the calculation on the dates of analysis was taken for this box.² The data are from September 2017 to September 2018.

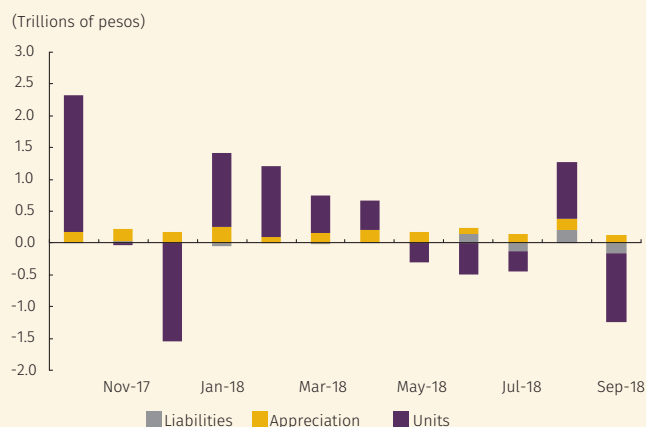
The performance of the total assets over the last year is found on Graph B5.1, panel A. The assets managed by the funds that were analyzed have increased over the past year, and a large part of the monthly changes were due to the trend of the approximation made in this box on the increased capital flow from the investors (Graph B5.1, panel B). The change in the number of units contributed 56.1% to the total change in the assets over the last year while the appreciation (using the approximation) contributed 42.7%. Last of all, liabilities contributed 1.2%.

Graph B5.1
Analyzed Fund Assets

A. Managed Assets



B. Change in Assets by Component



Sources: Office of the Financial Superintendent of Colombia; calculations by *Banco de la República*.

² As of September 2018, the funds that were analyzed accounted for 82.1% of the total open-end CIF assets.

Box 6 Open Banking

Eduardo Yanquen*

Open banking (OB) can be defined as the use of technological tools to produce ecosystems in which third parties can access the financial data of users by means of application programming interfaces (API)^{1,2}. Through these API, applications, services, and tools can be built that would give users greater control over their personal data and a broader range of choice regarding the providers with whom they want to carry out financial transactions. The latter is achieved with the organization and publication of information on each product that the banks offer and the transaction data of the bank clients on a standard form. OB has been driven by a number of factors including a considerable increase in the number of independent companies that use the new technologies to offer financial services (Fintech) who find the low availability of data to be a barrier to their expansion in the market.

The regulatory approaches that have been adopted around the world to broaden the management of clients' banking information has been varied. Currently Mexico, Japan, Hong Kong, Australia, and Canada have revised their banking laws to make it possible for financial entities to implement the API while countries such as the United States, Nigeria, Singapore, and India have only published standards that banks must follow if they want to implement these systems. Other cases include: Malaysia which has created a group to implement OB; the European Union, which has made OB mandatory for all banks³, and the United Kingdom, which has made OB compliance mandatory for the largest banks.

The case of the United Kingdom is one of the most documented. In this country, OB was initiated by an investigation conducted by the Competition and Market Authority

(CMA) which evaluated the practices that were applied between banks and small and medium enterprises (SME) in the banking system of the United Kingdom⁴. Based on this investigation and to encourage competition in the banking market, it was determined that the publication of some transaction and business data related to loans and bank accounts would be mandatory for the nine largest banks in the United Kingdom starting on January 13, 2018⁵. The system that was decided to transmit this information was an API. Although some banks experienced problems complying with the date that had been set initially for the implementation of the API, to date all the entities have been able to get their systems operating. Thus, OB in the United Kingdom is now a reality⁶.

Up to this point, the OB experience in the United Kingdom has a positive outcome. Several applications have emerged using data from the OB initiative to offer financial services such as managing personal finances, predictive analytics for SME, new credit scores based on financial information combined with social networks, etc. However, these companies have not been able to position themselves within the market and at the moment, few users are aware of them. According to a survey conducted by Price Waterhouse Cooper, only 18% of users stated that they were aware of the OB initiatives although it has been estimated that this number will grow significantly in the coming years and will reach 64% by 2022⁷. Moreover, this program has shown benefits even for banks that are required to make their information public: One of them launched an application that makes it possible to see the balances of their users' accounts in both the bank itself and in rival banks and generate reports and recommendations based on their spending habits⁸. Another bank in this group recently announced the launching of another of these applications.

The system implemented in the United Kingdom to open up access to financial data differs from the one in the European Union with respect to the way the information is

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1 The use of data by third parties must have the express authorization of the user.

2 A little broader definition of *open banking* can be found at <https://www.bank-rate.com/uk/open-banking/which-banks-support-open-banking-today/>

3 According to the legislation, compliance with this regulation will be mandatory starting in September 2019.

4 The study is depicted in a case that the CMA called *Review of 2002 SME Banking Undertakings* in which some commitments that the banks had made around 2002 in order to increase competition in the credit market for *pymes* are evaluated.

5 The nine banks that must comply with this directive are Barclays plc, Lloyd's Banking Group plc, Santander, Danske, HSBC, RBS, Bank of Ireland, Nationwide and AIBG.

6 To learn about the difficulties some of the banks showed, go to, <https://www.newstatesman.com/spotlight/fintech/2018/01/six-nine-biggest-banks-have-missed-government-s-open-banking-deadline>

7 These numbers correspond to the responses of individuals. There is also a sample in the report of small and medium-sized businesses in which a greater awareness is evident of the benefits that *open banking* could bring to their business. For the full report, see, <https://www.pwc.co.uk/industries/financial-services/insights/seize-open-banking-opportunity.html>

8 With respect to the application and its main features, please consult, <https://www.computerworlduk.com/applications/hsbc-first-big-uk-bank-launch-standalone-open-banking-app-3676905/>

collected. While, in the European Union, access to data is done by means of a technique which requires the users to submit their access data to the banks (a technique that is known as screen scraping), in the United Kingdom this is avoided through the API technology which does not require access data and, therefore, is perceived as safer⁹. This is a matter of concern in view of the cybernetic risk inherent in the technologies that the Fintech companies use. Moreover, this is an aspect that takes on greater importance given the recent increase in cases of hacking in financial institutions¹⁰. In this context, one of the strategies that traditional banks could use to keep their clients in an OB environment would be to appeal to the trust they have developed with them over the years through their security systems that, in general, have more experience dealing with these types of attacks.

In the case of Colombia, there are no legislative advances with regard to OB. Based on the number of initiatives by Fintech companies, Colombia is currently number three in the region. However, these initiatives lack the necessary information to compete with traditional operators in the credit market since the only information they have free access to is from their own clients. This limited access to information prevents them from developing credit scores, raises barriers against the entry of the new technology companies, and makes it difficult for customers of the system to compare rates.

The development of OB in Colombia could make the credit market more dynamic, increase financial inclusion, raise competition, reduce the costs of some services, and at the same time, it could give the current clients of the financial system new alternatives for financing, tools for managing their financial information, and for obtaining valuable information through it. All of this is possible as long as a legal framework is established in order to effectively control the type of information one would have access to, regulate the companies that would have access to this information, and design a financial education plan available to the users regarding the risks and benefits of giving access to their financial information.

9 For more information about the handling of passwords by the entities involved, see, <https://www.ft.com/content/55f4503e-cb95-11e7-ab18-7a9fb-7d6163e> y <https://www.which.co.uk/money/banking/switching-your-bank/open-banking-sharing-your-financial-data-anscq4g8p62h>

10 See "Box 7: Cybernetic risk: relevance and approaches for its regulation and supervision," published in the September 2017 Financial Stability Report.

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