

Box 2: Financial Market Pressure Index for Colombia and a Group of Countries in the Region

1. Introduction

For monetary and financial authorities, the timely identification of potential signs of stress or financial pressures is a key input for the supervision and preservation of financial and economic stability. In this regard, financial stress and pressure indices play an important role among the tools used to monitor the conditions of the financial system and/or financial markets (Mota *et al.*, 2021). In line with this, this box proposes an indicator to synthesize and analyze financial pressures in Colombia and a group of economies in the region, particularly Brazil, Mexico, and Peru.

In an increasingly interconnected financial environment, it is essential to have aggregate indicators that coherently and timely synthesize information from the different segments of financial markets. The literature has highlighted that this type of tool enables the identification of stress episodes characterized by heightened uncertainty, changes in liquidity preferences, and shifts in agents' risk perceptions, which tend to manifest simultaneously across multiple markets (Carlson *et al.*, 2013). By integrating signals from the foreign exchange, stock, and fixed-income markets, along with measures of international and sovereign risk, aggregate indicators provide a more comprehensive view of overall market conditions and facilitate the continuous monitoring of financial market developments.

The indicators for these economies capture both major episodes of financial pressure caused by international events and stress episodes specific to the economies under analysis.

This approach allows for the assessment of financial pressures dynamics relative to each country's historical experience over the previous 15 years, as well as a cross-country comparison within the region. One feature of this indicator is the timeliness of the information it provides, insofar as its construction relies on daily data with minimal lag, although the indicator can be aggregated and expressed at weekly or monthly frequencies. For simplicity and without affecting its overall interpretation, this box focuses on its monthly performance.

This document consists of five sections, including this introduction. The second section presents the literature review, the third addresses the methodology and data used to construct the Financial Market Pressure Index (FMPI), the fourth presents the results, and the final section presents - the conclusions.

2. Literature review

The Financial Market Pressure Index (FMPI) has its own objective-oriented formulation; however, it largely shares the conceptual framework of Financial Market Stress Indices

(FMSIs). The objective of FMSIs is to monitor the current state of financial markets¹, insofar as they capture certain key characteristics of financial stress, such as i) heightened uncertainty regarding the fundamental value of assets and investor behavior; ii) greater willingness to hold liquid assets; iii) reduced willingness to hold risky assets (flight to quality); and iv) increased information asymmetry (Carlson *et al.*, 2013).

This box presents the construction of the FMPI for Colombia, Brazil, Mexico, and Peru. The indicator aims to capture the key features of pressures or stress in the financial markets of these economies. This is achieved by synthesizing information from local variables in the foreign exchange, stock, and fixed-income markets, together with signals associated with international and sovereign risk. Consequently, the FMPI serves to i) identify episodes of heightened volatility and lower preference for local assets; and ii) conduct regional comparisons of the evolution of financial pressures.

Accordingly, both FMSIs and FMPIs focus on detecting situations involving disruptions or alternations in the normal functioning of financial markets. These indicators analyze information on the overall state or functioning of the markets and on stress scenarios that may arise within them.

The FMPI is distinct from financial conditions indicators, as the latter analyze the relationship between economic activity and financial markets, whereas FMSIs capture specific scenarios of heightened uncertainty and increased risk perception among market participants.

Furthermore, the construction of these indicators differs in the selection of variables, the methods used to capture their informational content, and the definition of their purposes. According to Lombardi *et al.* (2025), financial conditions, in general terms, provide an overview of the cost and availability of financing faced by economic agents (financial intermediaries, firms, households, and governments²).

3. Methodology and data

FMPIs seek to identify the common dynamics of financial pressures across a set of relevant time series. Consequently, high FMPI values reflect greater pressures relative to the past 15 years under analysis, while lower values indicate the opposite. Therefore, the contribution of each series to the construction of the final indicator is obtained through Principal Component Analysis (PCA), which allows for the identification of an indicator that captures the common dynamics of the analyzed markets. In particular, the FMPI is constructed as the first principal

¹ In contrast, there are other indicators focused on monitoring financial stress at the systemic level, encompassing the financial system as a whole.

² In this regard, it should be emphasized that variables covering credit aggregates, survey results regarding loan availability and lending conditions, financial market fluctuations, spreads between assets with different levels of risk, among others, may provide additional information on financial conditions and influence the dynamics of economic growth through their impact on consumption, savings, investment, and ultimately real economic activity (Angelopoulou *et al.*, 2013).

component of the selected set of variables. Hence, it is a linear combination³ of the standardized series⁴, using fixed weights⁵. Although the index is calculated at both daily and monthly frequencies, this box focuses on the latter, as it facilitates the identification of financial markets trends. It should be noted that high-frequency variables (daily series) are used, with information covering the period from April 2011 to March 2026.

Table B2. 1. Variables Used in the Construction of the FMPI

Categories	Variables	Expected sign
Stock market metrics	One-month realized volatility of the stock market index ⁶	+
	<i>price/earnings ratio</i> ⁷	-
Foreign exchange market metrics	One-month realized volatility of the nominal ⁸ exchange rate	+
	One-month implied volatility of foreign exchange ⁹ options	+
	Bid-Ask Spread (BAS) in the foreign exchange market	+
Public debt market metrics	Yield curve slope (absolute value of the spread between 10-year and 2-year bond rates)	+
	One-month realized volatility of 2- and 5-year zero-coupon rates ¹⁰	+
International risk perception	VIX, VSTOXX, and DXY	+
Sovereign risk perception	EMBIG, 5-year CDS, and 10-year CDS	+

³ The indicator formula is presented below for each variable i (14 series in total) and each day t (from 1 April 2011 to 31 March 2026), where w_i denotes the weight of each variable and $Z_{i,t}$ the corresponding standardized series for each day t :

$$IPMF_t = \sum_{i=1}^{14} w_i \cdot Z_{i,t}$$

⁴ Each series is standardized by subtracting its mean and dividing by its standard deviation.

⁵ The weights are obtained through PCA and indicate the statistical importance of each series or variable in explaining the system's joint variance (a measure of dispersion). Thus, a high (low) weight indicates that the variable captures, to a greater (lesser) extent, the latent (unobservable) or common factor underlying financial pressures. A positive value indicates that the variable contributes to an increase in the indicator or in financial pressures, and vice versa.

⁶ Bloomberg calculates realized volatility as the annualized standard deviation of the logarithmic returns of stock indices over a rolling one-month window.

⁷ This ratio is calculated as the ratio between the latest stock market index price and the aggregate projected earnings per share over the next 12-month horizon. Source: Bloomberg.

⁸ Realized volatility refers to the effective or historical dispersion of the logarithmic returns of the nominal exchange rate over a one-month period. Source: Bloomberg.

⁹ Implied volatility represents the volatility that the market anticipates from each day until the maturity of the one-month at-the-money option. Source: Bloomberg.

¹⁰ Realized volatility of zero-coupon rates is constructed as the 1-month rolling standard deviation of daily variations (first differences) in the rates.

Source: Market Operations and Analysis Department (DOAM in Spanish) - *BanRep* (*Banco de la República*, the Central Bank of Colombia). Note: a positive (negative) expected sign implies that increases (decreases) in the variable tend to be reflected in increases (decreases) in the FMPI. All series are obtained from Bloomberg, except for Colombia's zero-coupon rates (source: DOAM) and the Emerging Markets Bond Index Global (EMBIG) (source: J.P. Morgan).

The selection of variables is based on theoretical and empirical criteria derived from the literature, prioritizing those that reflect episodes of market stress, are relevant for continuous monitoring purposes, and do not present availability constraints for the countries under analysis. In the monthly-frequency indicator, the daily series are averaged and subsequently standardized, excluding the 2020–2021 period (pandemic), with the aim of avoiding distortions in the underlying long-term dynamics.

Additionally, the indicator can be disaggregated into five market categories, allowing for an analysis of their relative contribution. The details of this classification and the associated variables are presented in *Table B2. 1*.

4. Results

Given that the country indicators capture episodes of financial pressure driven by international events; while also responding to relevant idiosyncratic factors, a description of the common global catalysts is first presented:

- Between 2011 and 2012, international financial conditions remained relatively accommodative¹¹; therefore, all index categories by country contributed to keeping the indicator mostly in negative territory (indicating lower financial pressures relative to the previous 15 years). Expansionary monetary policies in advanced economies and low global interest rates stood out, fostering capital inflows into emerging markets, higher commodity prices, and a lower perception of international and domestic risk, reflected in lower financial pressures, for instance, through reductions in regional CDS spreads and appreciations of regional currencies (COP, BRL, MXN, and PEN) against the USD.
- In 2013, following the Taper Tantrum¹², regional indicators increased gradually and in a synchronized manner, driven by depreciations of their respective currencies against the USD, wider CDS spreads, and a partial reversal of capital flows.
- Between 2014 and 2016, the normalization of U.S. monetary policy¹³ and the sharp decline in commodity prices, particularly oil prices, kept financial pressures elevated.
- In March 2020, the pandemic represented the most abrupt and synchronized shock of the period (except in Peru), with sharp increases in the FMPI driven by liquidity disruptions and a lower investor appetite for risky assets.
- The rebound in global inflation and the monetary tightening cycle that began in 2022 kept FMPIs in positive territory (reflecting higher financial pressures).

¹¹ Except for late 2011, when the sovereign debt crisis in some European countries increased global risk perception and led to higher FMPIs.

¹² Announcement by the Federal Reserve (Fed) of a reduction in its bond purchases, which were part of its quantitative easing policy.

¹³ On 16 December 2015, the Fed raised its policy rates from 0%–0.25% to 0.25%–0.50%.

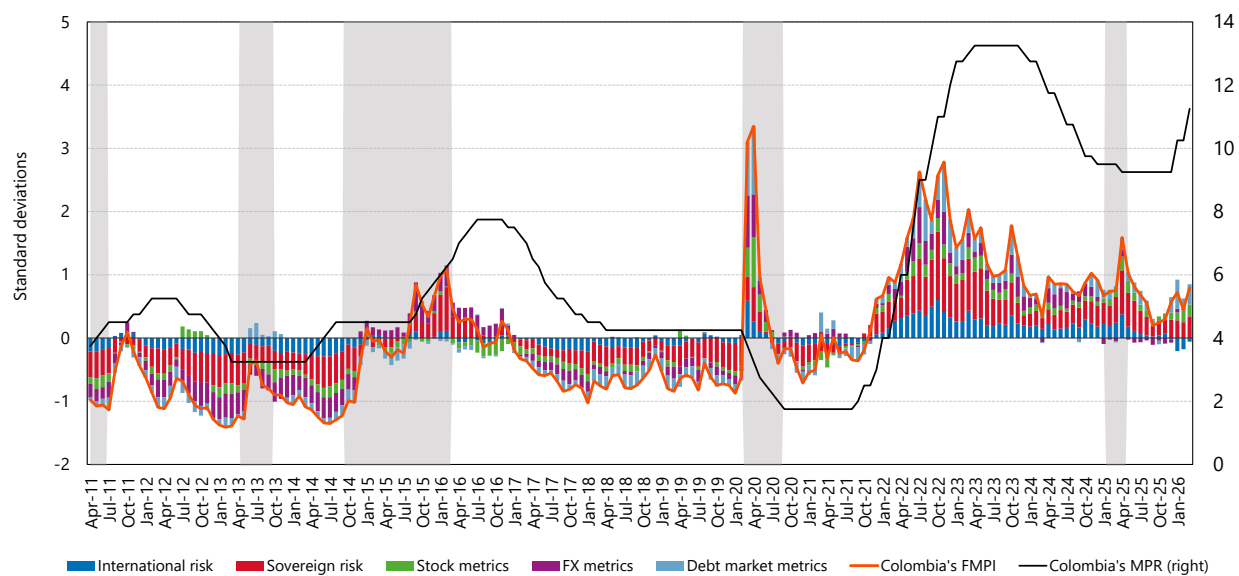
- From late 2023 and throughout 2024, a gradual moderation in financial pressures was observed. However, since early 2025, global trade tensions and heightened international uncertainty have led to a renewed increase in financial pressures in the region, similar to that observed in the first quarter of 2026, driven by geopolitical factors.

The FMPI for Colombia tracks the previously highlighted episodes of financial pressure and, in turn, reflects the influence of domestic factors (*Graph B2. 1*):

- In the first half of 2011, the index stood in negative territory, reflecting lower financial pressures amid the appreciation of the COP and declining risk premiums. This trend was further reinforced by capital inflows and S&P's decision (16 March) to upgrade the sovereign foreign-currency credit rating to long-term investment grade ('BB+' to 'BBB-').
- Between late 2011 and 2014, financial pressures were, on average, lower, although some corrections were observed in certain periods, in line with the gradual improvement in the financial environment, rising commodity prices, and gains in emerging market stock indices. In this context, lower sovereign risk, and the strength of the COP against the USD were the main factors contributing to the decline in the indicator.
- A period of heightened financial pressures stands out between late 2014 and 2016, driven by the decline in oil prices, the El Niño phenomenon, and a contractionary domestic monetary policy stance, among other catalysts. In addition, significant increases in the EMBI and CDS were observed.
- Following a gradual normalization of these pressures between 2016 and 2019, the 2020 pandemic marked the peak of tension.
- Since late 2021, the FMPI has remained in positive territory, indicating higher financial pressures than in the previous 15 years (for example, in 2022, the COP/USD exchange rate reached its highest level on record).
- From late 2023, the indicator has moderated, although it increased significantly again in the first quarter of 2025¹⁴.
- Toward the end of 2025, a correction was observed, partly supported by a decline in CDS, an appreciation of the COP, among other factors.

¹⁴ For instance, sovereign risk and debt metrics (particularly the former) were influenced by factors such as the activation of the Fiscal Rule's escape clause and credit rating downgrades by Moody's and S&P in June.

Graph B2. 1. Colombia's FMPI – 15-Year Window

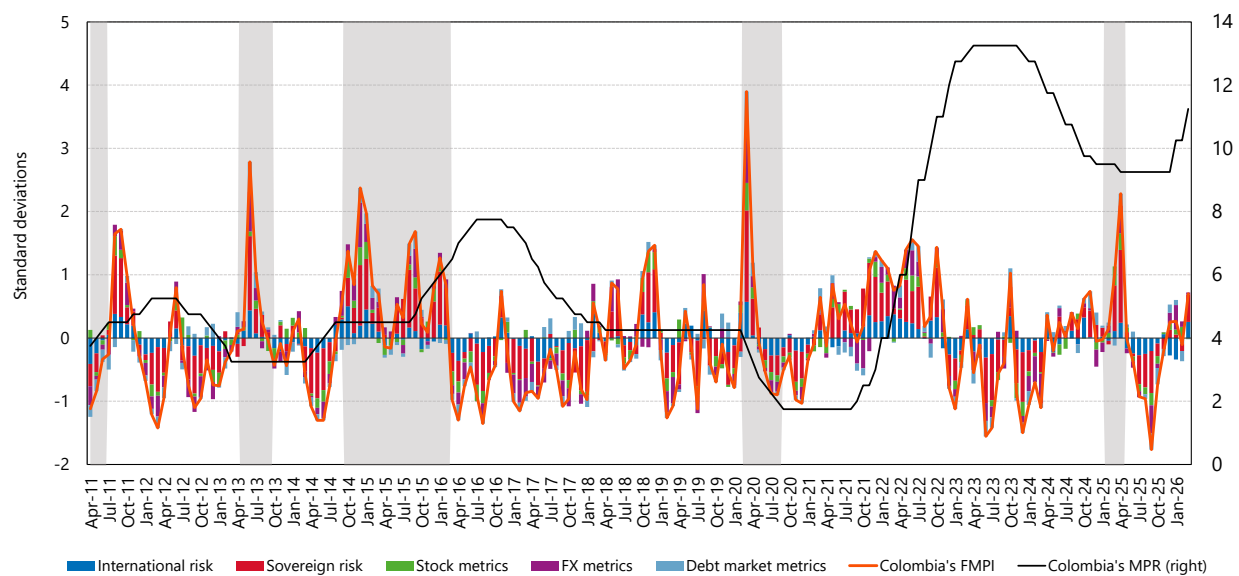


Source: DOAM – *BanRep*. Notes: Frequency: monthly. Colombia's MPR is presented on the right axis.

On the other hand, a robustness exercise was conducted for Colombia (Graph B2. 2), in which an indicator was constructed that assigns greater weight to more recent observations¹⁵. However, this modification makes the index more volatile. Consequently, from early 2022 onwards, the main differences between the two approaches became apparent, suggesting the possible presence of relevant structural changes in the domestic economy in recent years, which may have caused, among other effects, shifts in the mean and variance of the time series.

¹⁵ From a methodological perspective, in particular, the calculation of the sample mean and volatility (employed, as a first step, in the standardization of the variables) was modified through the Exponentially Weighted Moving Average (EWMA) methodology. Thus, a weighting factor of 0.98 is applied to the daily-frequency series (it should be noted that the model began running in January 2010). Subsequently, fixed weights are determined using PCA on the daily variables, and, unlike the first FMPI specification, this new monthly index is computed as the average of its daily values, given the importance of the number of observations for the EWMA calculation.

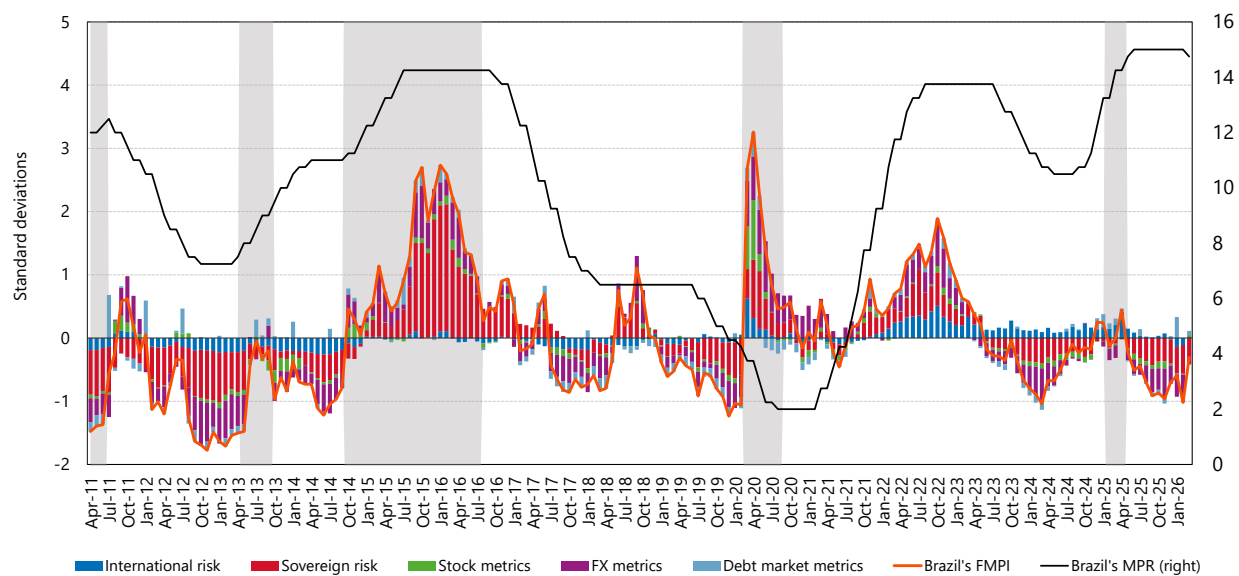
Graph B2. 2. Robustness Exercise: Colombia's FMPI (EWMA) – 15-Year Window



Source: DOAM – *BanRep*. Notes: Frequency: monthly. Colombia's MPR is presented on the right axis.

In Brazil, episodes of elevated financial pressures are mainly concentrated in the 2015–2016 period, driven by fiscal pressures observed in the country, although the FMPI reached its highest level during the 2020 pandemic, after which it gradually dissipated. In addition, an increase in the index was observed in 2025 amid renewed domestic tensions (Graph B2. 3). In this latter regard, the 2015–2016 period stands out, as it was associated with fiscal deterioration that heightened risk perception and ultimately led to the loss of investment-grade status for Brazilian sovereign bonds. As a result, CDS increased, accompanied by a contractionary policy stance by the country’s Central Bank. At the same time, the pandemic triggered a sharp increase in the index, followed by renewed pressures in 2021 and 2025 linked to fiscal tensions, domestic political developments, and an inflationary rebound, among other factors.

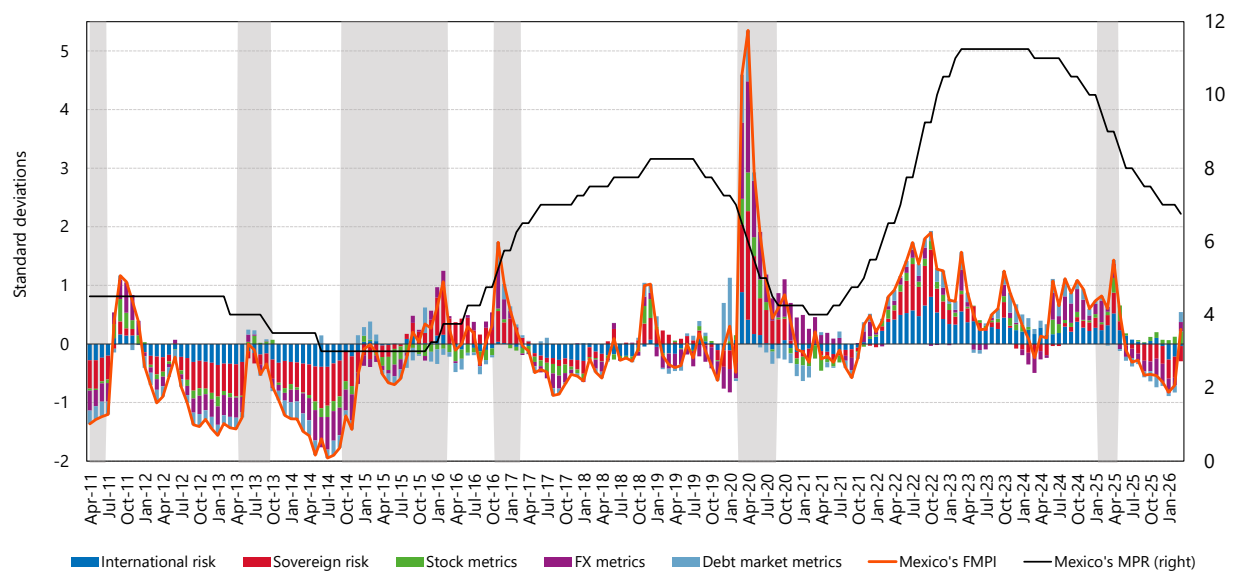
Graph B2. 3. Brazil's FMPI – 15-Year Window



Source: DOAM – *BanRep*. Notes: Frequency: monthly. Brazil's MPR is presented on the right axis.

The FMPI for Mexico exhibits a more stable performance relative to its peers, with increases concentrated in specific episodes such as those associated with bilateral tensions with the U.S. in 2017 and 2025 (Graph B2. 4). In addition to the pandemic, increases in the FMPI related to certain bilateral tensions with the U.S. are noteworthy; in particular, Mexican assets came under temporary pressure during President Donald Trump’s first term in 2017, while the impact was far-reaching in early 2025 due to tariff and trade policy developments. In this latter episode, for instance, between the second and third quarters, decisions by Fitch and S&P to maintain sovereign debt investment-grade ratings helped contain pressures, as reflected in decreases in the sovereign risk category.

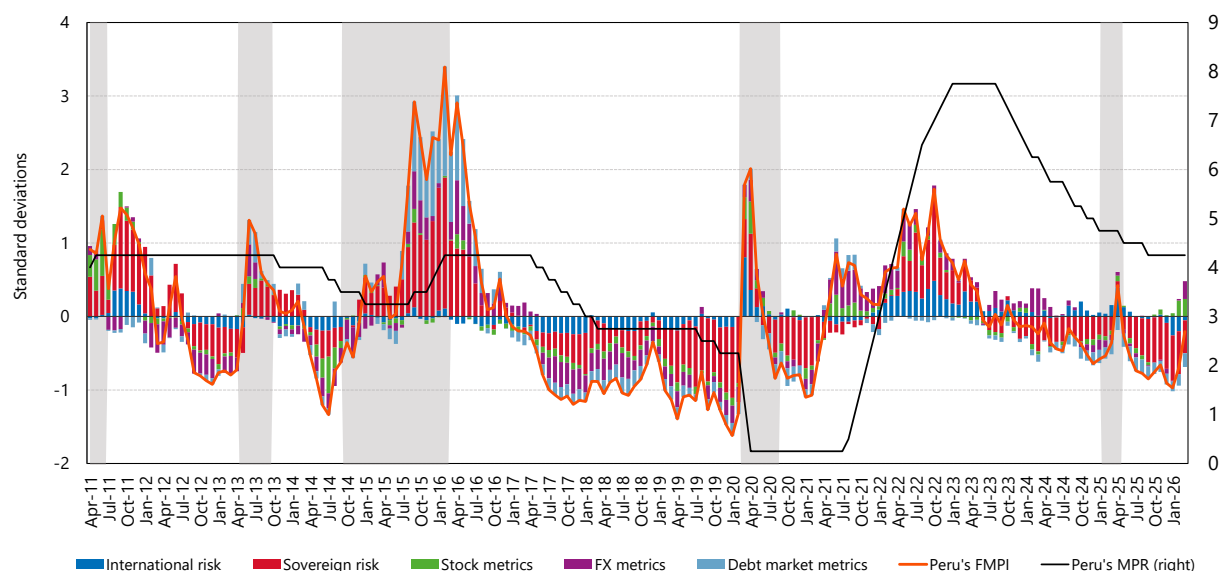
Graph B2. 4. Mexico's FMPI – 15-Year Window



Source: DOAM – *BanRep*. Notes: Frequency: monthly. Mexico's MPR is presented on the right axis.

The FMPI for Peru, as is the case for Mexico, maintains a relatively stable profile compared to the other economies analyzed during certain periods (*Graph B2. 5*); notable exceptions include the period of political uncertainty in early 2011, the decline in commodity prices during 2014–2016 (which, in contrast to its peers, represented the episode of greatest financial pressure for the country), and the inflation surge in 2021. Thus, in early 2011, the Peruvian FMPI diverged from its peers, reflecting political uncertainty surrounding the presidential elections at the time, which is mainly captured in the sovereign risk category. On the other hand, the largest increase in the FMPI occurred during the 2014–2016 period, driven by the decline in commodity prices. Additionally, certain pressure emerged in 2021 due to rising inflation.

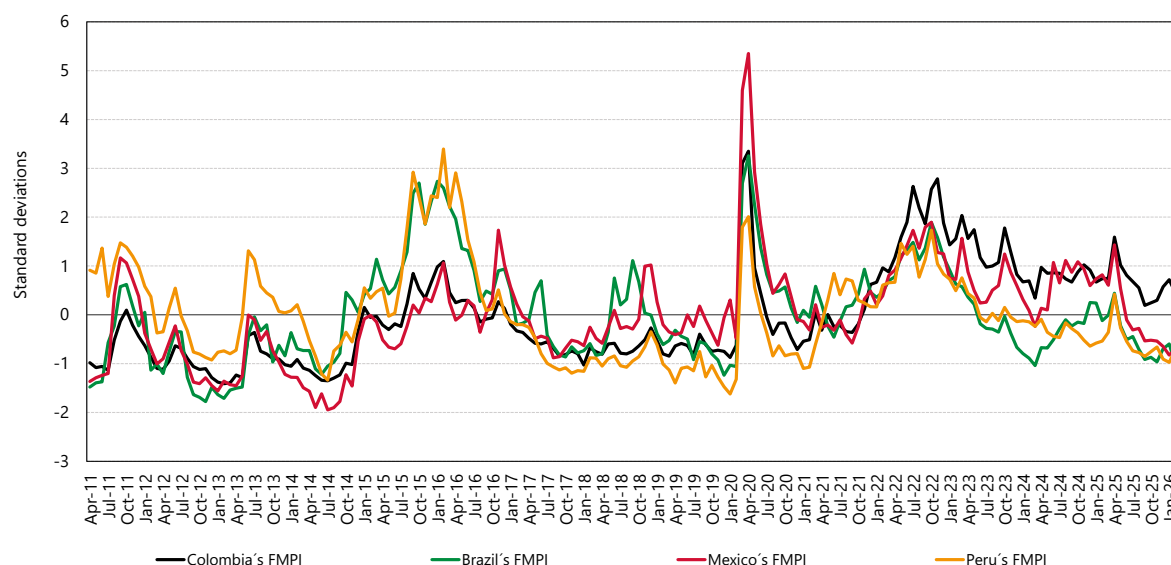
Graph B2. 5. Peru's FMPI – 15-Year Window



Source: DOAM – *BanRep*. Notes: Frequency: monthly. Peru's MPR is presented on the right axis.

In the main global episodes, the FMPIs of the four countries exhibited a relatively synchronized performance, although with some differences in magnitude due to idiosyncratic factors (*Graph B2. 6*). Notably, since late 2021, Colombia has maintained persistently elevated FMPI levels, reflecting pressures higher than those of its peers and/or a shift in the economy.

Overall, results indicate that the FMPI effectively captures both episodes of abrupt stress and phases of more persistent pressures in financial markets. It is worth noting that across all countries analyzed, the sovereign risk category emerged as a relatively important component in the construction of the indices. In particular, the 2020 pandemic stands out as the most severe and synchronized event in the sample period, reflecting significant liquidity disruptions, a marked deterioration in risk perception, and a reduced willingness to hold risky assets. More recently, the index's performance suggests that, although pressures have gradually moderated from their peaks, they have remained at historically elevated levels in some cases, associated with a more uncertain international environment and relevant domestic factors. These findings highlight the usefulness of the FMPI for the continuous monitoring of financial market conditions and for an integrated assessment of stress episodes of different origins and durations.

Graph B2. 6. FMPI Regional Comparison - 15-Year Window

Source: DOAM – *BanRep*. Notes: Frequency: monthly.

5. Conclusions

In conclusion, the Financial Market Pressure Index (FMPI) constitutes a relevant tool for the integrated monitoring of financial market performance in Colombia and a group of regional economies, as it synthesizes information across different market segments and risk dimensions. The results show that the indicator captures both abrupt, highly synchronized stress episodes —such as the one observed during the 2020 pandemic— and phases of more persistent pressures associated with changes in the international environment and relevant domestic factors. In this context, the FMPI complements other indicators used in market analysis, such as those focused on financial conditions, market-specific metrics, or systemic risk measures, by providing an aggregate view of the pressures simultaneously faced across different assets and markets. This feature expands the set of tools available for the continuous monitoring of financial markets, facilitates the early identification of risk build-ups, and contributes to a more comprehensive understanding of the evolution and transmission of financial shocks over time and across countries.

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