Public Debt, Fiscal Deficit Expectations, and Their Transmission to the Cyclical Component of Long-Term Interest Rates*

José Vicente Romero† Hernando Vargas-Herrera‡

The views expressed in this document are the sole responsibility of the authors and do not commit Banco de la República or its Board of Directors.

Abstract

This paper examines how public debt dynamics and fiscal deficit expectations affect the cyclical component of the long-term interest rate and the slope of the yield curve in Colombia. Drawing on FocusEconomics surveys of domestic and international analysts, we construct a series of fiscal deficit expectations for the period 2005–2025, which allows us to identify shocks to the expected fiscal stance. The empirical strategy relies on Bayesian VAR models with exogenous variables and time-varying parameters (TVP-BVARX), which include domestic and external financial conditions as controls and make it possible to document variations in the intensity of transmission over the sample. The results show that deteriorations in public debt and in the expected fiscal deficit lead to statistically significant increases in the cyclical component of the long-term interest rate and in the slope of the curve. Historical and variance decompositions further indicate that fiscal shocks account for a relevant share of the fluctuations in both variables, highlighting the importance of fiscal credibility in determining the cost of public borrowing.

Keywords: Interest rate determination, fiscal expectations, public debt, yield curve.
JEL Codes: E43, H63, D84, G12.

*The authors thank Davide Debortoli, Jesús Bejarano, and the participants of the 28th Internal Research Seminar at Banco de la República for their helpful comments. A previous working paper version of this document can be found in Spanish at https://ideas.repec.org/p/bdr/borrec/1355.html.

†Researcher, Macroeconomic Modeling Department, Banco de la República. E-mail: jromerch@banrep.gov.co.

‡Deputy Technical Governor, Banco de la República. E-mail: hvargahe@banrep.gov.co.

1 Introduction

The persistent rise in fiscal deficits and public debt globally following the COVID-19 pandemic, coupled with recurring episodes of international financial volatility, has renewed interest in understanding how fiscal conditions influence the cost of sovereign financing and the term structure of interest rates (Eichengreen and Zoli, 2025; International Monetary Fund, 2025; Chen, 2025). In Colombia, the fiscal deterioration of recent years and the observed increase in government bond yields (Banco de la República, 2025a,b) underscore the importance of understanding the mechanisms through which this deterioration has affected long-term interest rates. However, empirical studies quantifying the impact of fiscal variables and their expectations remain scarce, especially for small open emerging economies such as Colombia.

Estimating the effects of debt and the fiscal deficit on interest rates poses significant challenges in terms of identification and data availability, which helps explain why the recent empirical literature focuses on advanced economies and a small group of large emerging economies (Jaramillo and Weber, 2013; Nose and Menkulasi, 2025; Furceri et al., 2025). The central challenge is to isolate the genuine effects of fiscal policy from other macroeconomic determinants. In response, several studies (Engen and Hubbard, 2004; Laubach, 2009; Kumar and Baldacci, 2010) have relied not only on contemporaneous indicators of fiscal deterioration but also on expectations regarding its future trajectory. This approach, originally proposed by Laubach (2009), is based on the premise that fiscal expectations capture agents' views on the sustainability of public finances and, by incorporating forward-looking information, are less subject to the endogeneity arising from the cyclical response of fiscal policy.

In this context, this paper examines the role played by the evolution of public debt and agents' expectations regarding the fiscal deficit in determining the cyclical component of long-term real interest rates[1] and the slope of the TES yield curve. The analysis focuses on the cyclical component because structural changes in fiscal sustainability or in the long-term risk premium affect the neutral interest rate and require a different empirical framework, beyond the scope of this research; focusing on cyclical variation also allows us to identify the transitory channels through which fiscal shocks are transmitted to market rates.

This study contributes to the literature on two fronts. First, it constructs a series of fiscal deficit expectations for the 2005-2025 period based on the FocusEconomics survey, which consistently compiles projections from local and international analysts. Second, it provides evidence on the effect of debt dynamics and fiscal expectations on long-term interest rates and the slope of the TES yield curve, and documents changes in the intensity of this transmission over time using Bayesian VAR models with time-varying parameters and exogenous variables (TVP-BVARX). The results indicate that deteriorations in public debt and the expected fiscal deficit generate statistically significant increases in the cyclical component of the long-term real interest rate and in the slope of the yield curve, with indications of greater transmission in the post-COVID-19 period. Historical and variance decompositions also show that fiscal shocks explain a significant portion of the dynamics of both variables.

[1] The real 10-year TES rate is taken as a benchmark for the cost of long-term sovereign financing in Colombia.

The paper is organized as follows. Section 2 reviews the literature on the role of public debt and fiscal expectations in determining sovereign interest rates. Section 3 describes the data and presents stylized facts. Section 4 details the empirical strategy. Section 5 analyzes and discusses the results. Section 6 concludes.

2 Public debt, fiscal expectations, and interest rates: a review of the literature

The relation between fiscal conditions and long-term interest rates is a central topic in macroeconomics (Engen and Hubbard, 2004). The basic mechanism is that higher levels of deficits and public debt lead to a greater supply of sovereign bonds, which puts upward pressure on the rates required by investors. Additionally, expectations of fiscal deterioration can increase perceived risk if markets perceive a higher probability of default on debt payments. However, quantifying these effects poses significant empirical challenges because both fiscal variables and interest rates respond to macroeconomic conditions, generating spurious correlations and complicating causal identification. For example, financial conditions or the exchange rate may simultaneously affect the fiscal position and interest rates on public debt, creating a correlation between the two without a direct causal relationship. Therefore, identification methods must include these types of variables as controls.

Laubach (2009) proposed an identification strategy to address this problem. His methodology uses long-term projections (five years ahead) of fiscal variables to isolate structural expectations from cyclical effects. His results indicate that a one-percentage-point increase in the projected deficit-to-GDP ratio raises long-term *forward* rates by about 25 basis points, and that a 10-percentage-point increase in the projected debt-to-GDP ratio has an effect of similar magnitude. Furceri et al. (2025) update this analysis by incorporating an additional 20 years of data (1976-2025) and expanding the set of controls to include projections of population growth, risk aversion, real GDP growth, and foreign holdings of U.S. debt. Their estimates confirm the original findings in terms of magnitude and significance, but document that the relationship is not stable over time: during the period of fiscal prudence around the turn of the century, the link between fiscal variables and rates was close to zero, and it has increased as the fiscal position has deteriorated, with an additional spike following the pandemic evident in their moving-window regressions. A recurring finding in this literature is that markets react more to expectations of future deficits than to observed deficits. Along the same lines, Kameda (2014), in a study of Japan, finds that announcements and communications related to projected deficits raise rates by 26 to 34 basis points, while observed deficits have smaller effects. This result is consistent with models in which investors are forward-looking and consider future fiscal sustainability.

Meanwhile, the literature on emerging economies presents findings consistent with those for advanced economies, albeit with specific characteristics. The effects tend to be larger, reflecting less deep financial markets and risk premiums that are more sensitive to fiscal conditions. There is evidence that deficits and debt significantly raise interest rates in emerging economies, with effects ranging from 10 to 120 basis points per percentage-point increase in the deficit, depending on the context and methodology (Kumar and Baldacci, 2010; Jaramillo and Weber, 2013). Nose and Menkulasi (2025) analyze domestic sovereign bond yields in 75 emerging and developing economies. They

use local projections and find that a one-percentage-point increase in the expected primary deficit (four years ahead) generates a persistent rise of approximately 36 basis points in 10-year bond yields, peaking after 2.5 years. They also document that sensitivity to fiscal policy increased following the pandemic. An important contribution of this work is to show how the composition of debt holders modulates these effects: the impact of fiscal deterioration is amplified in countries where local banks hold high exposures to public debt.

Specific evidence for Colombia on the effect of fiscal deficit expectations on public debt interest rates is limited. Vargas et al. (2015) document how the fiscal reforms implemented in Colombia over the previous two decades—aimed at reducing the structural deficit, correcting unsustainable debt trajectories, decreasing the government's currency mismatch, and deepening the local fixed-rate public debt market—transformed the macroeconomic response to policy shocks. Their results show that these improvements increased the public spending multiplier (with values close to one) and strengthened the transmission of monetary policy shocks to market interest rates. Ardila-Dueñas and Rincón-Castro (2019) analyze the effect of public debt on the slope of the term structure of interest rates in Colombia for the period 2003-2017. Using a state-space model to estimate the *spread* and time-series models to quantify the effect of debt, they find that debt has a positive effect on the *spread*, with differences depending on the type of issuance: floating-rate debt primarily affects the short end, while fixed-rate debt has a stronger impact on the long end. Their analysis, however, focuses on observed debt and does not incorporate forward-looking expectations regarding the fiscal stance. Garda et al. (2026) show, using local projections with high-frequency identification, that negative fiscal surprises immediately and persistently raise five-year sovereign CDS spreads in Colombia and lead to an exchange rate depreciation. For his part, Chen (2025) finds that unanticipated fiscal deficits in Colombia are associated with higher inflation levels, a widening output gap, rising inflation expectations, and a depreciation of the real exchange rate; while his study addresses fiscal shocks, it does not assess their transmission to the yield curve. Overall, the available evidence for Colombia has focused on observed debt or the macroeconomic effects of fiscal shocks, without assessing the role of deficit expectations in determining long-term real rates and the slope of the TES curve, a gap that this paper addresses.

Furthermore, recent analyses by Banco de la República indicate that long-term interest rates are determined, to a large extent, by structural factors as well as by macroeconomic and financial conditions (Banco de la República, 2025a), and that the rise in government bond yields since early 2024 is mainly explained by the additional compensation demanded by investors to cover the risks associated with the state of public finances, rather than by the policy rate (Banco de la República, 2025b).

Figure 1 illustrates the channel through which an increase in debt and deficit expectations alters the supply and demand for sovereign bonds and is transmitted to interest rates and the slope of the yield curve. Panels (A) and (B) show the bond market at the short and long ends of the curve, respectively.[2] A deterioration in current levels of public debt and increases in deficit expectations shift bond supply to the right (due to increased issuance) and reduce demand (due to a higher perception of risk or the anticipation of a larger future supply of bonds). At the short end, where the central bank anchors rates through monetary policy, the effect on prices is smaller. At the long end,

[2]The supply and demand graphs depict prices and quantities in the bond market for simplicity. Increases (decreases) in bond prices are equivalent to decreases (increases) in the interest rate on the debt.

the persistence of the deterioration in fiscal conditions generates a larger price adjustment. Panel (C) shows the resulting effect on the yield curve: a steepening, with more pronounced increases in long-term rates, $\Delta y_{long} > \Delta y_{short}$.

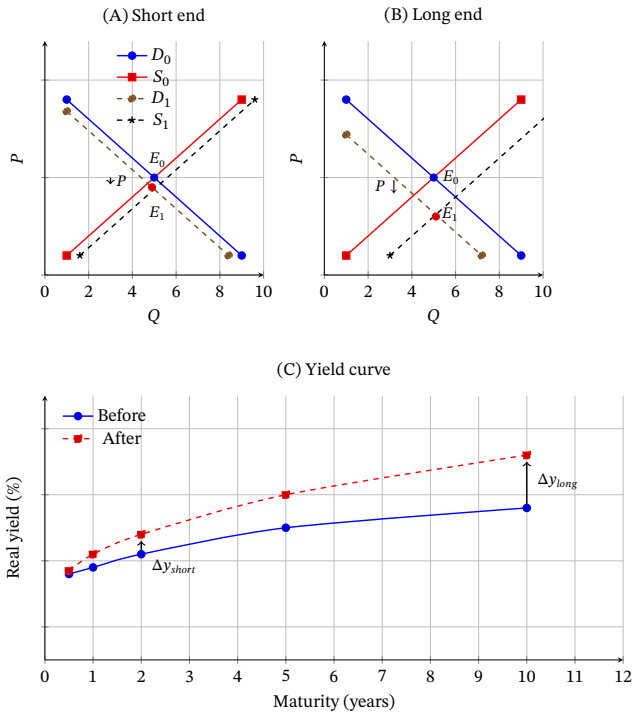


Figure 1: Transmission channel of fiscal deterioration to the yield curve. Prepared by the authors.

3 Description of the data and some stylized facts

This section describes the main variables used in the analysis and presents some stylized facts regarding fiscal dynamics and their relationship with long-term interest rates in Colombia. The data are quarterly and cover the period 2005Q1-2025Q3. First, the evolution of public debt and the fiscal deficit is characterized; then, their correlation with the cyclical component of the real interest rate and the slope of the yield curve is examined; and finally, the construction of the fiscal expectations series—one of the contributions of this study—is described.

Figure 2 shows the evolution of the gross debt of the Central National Government (CNG) as a percentage of GDP, along with a debt deterioration indicator. This indicator is calculated as the difference between the debt level in period t and its moving average over the previous eight quarters (starting at $t-1$): $Debt_Deterioration_t = d_t - \frac{1}{8}\sum_{i=1}^{8} d_{t-i}$, where d_t represents gross debt as a percentage of GDP. Positive values indicate that debt is above its recent trend, capturing episodes of deterioration in the fiscal position. Public debt showed a moderate upward trend until 2019, followed by a sharp increase beginning with the COVID-19 pandemic. The deterioration indicator captures

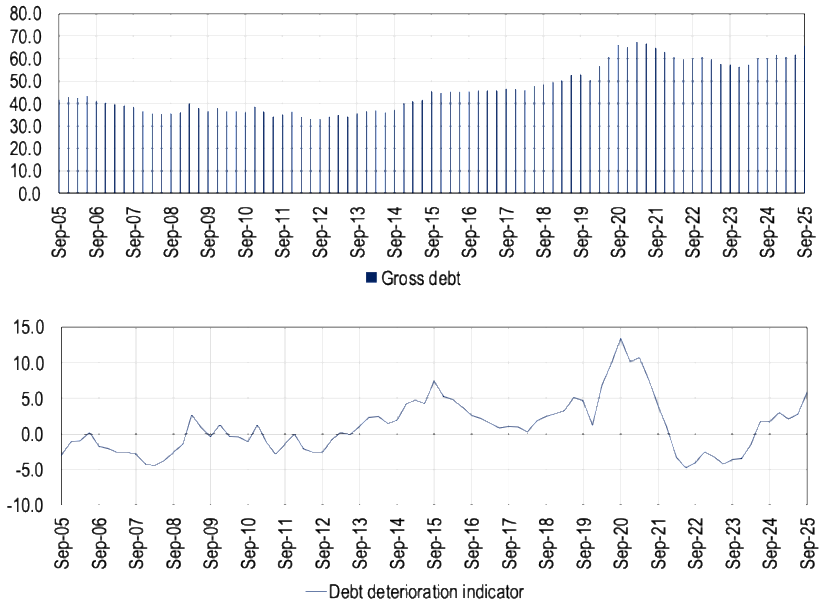


Figure 2: Gross public debt as a percentage of GDP and debt deterioration indicator. Source: Ministry of Finance and authors' calculations.

this episode, peaking in 2020–2021. In the most recent observations, the indicator remains in positive territory, reflecting that current levels are above their recent trend despite the peso's appreciation at the end of the sample period, which lowers the peso value of external debt.

Figure 3 shows the evolution of the CNG's total deficit and primary deficit. The primary deficit excludes debt interest payments. Both indicators reveal a significant deterioration beginning in 2020. While the total deficit reached levels exceeding 7% of GDP during the pandemic, the primary deficit also increased and has remained at persistently high levels in subsequent years. This persistence of the primary imbalance is significant because it determines the future dynamics of public debt.

But what is the relationship between the fiscal position and long-term interest rates and the term structure of interest rates? Figure 4 examines the relationship between the primary deficit, the cyclical component of the real interest rate on 10-year TES, and the slope of the yield curve. To isolate short- and medium-term movements in the real rate, the trend associated with changes in the Colombian economy's neutral interest rate is removed.[3]

The graph suggests a positive correlation between the primary deficit and both interest rate variables: periods of higher deficits tend to coincide with higher long-term real interest rates and a steeper yield curve. In the empirical analyses of this study, the slope is defined as the difference between the 10-year TES rate and the 1-year TES rate. This pattern is consistent with the mechanism

[3]The neutral rate corresponds to the estimates made by the technical team of Banco de la República and published quarterly in the Monetary Policy Reports.

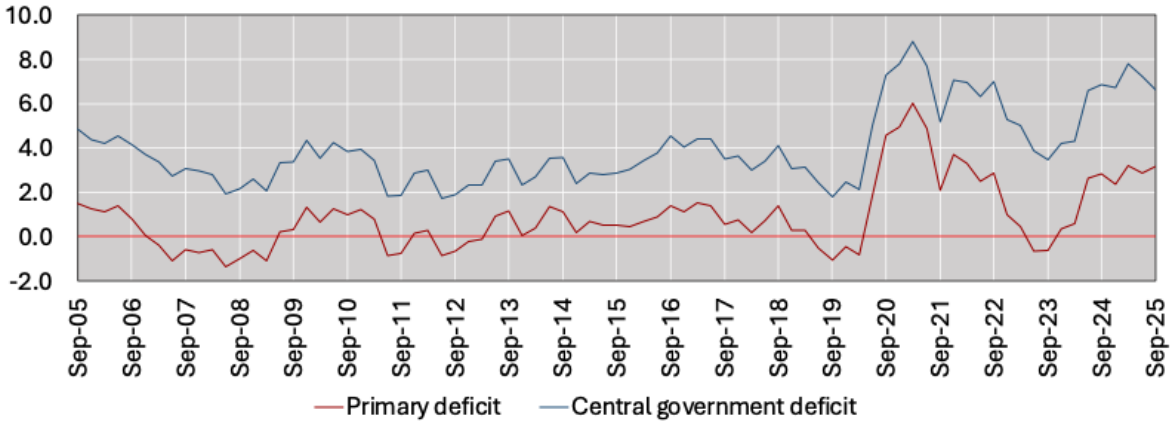


Figure 3: CNG fiscal deficit and primary deficit as a percentage of GDP. Source: Ministry of Finance and authors' calculations.

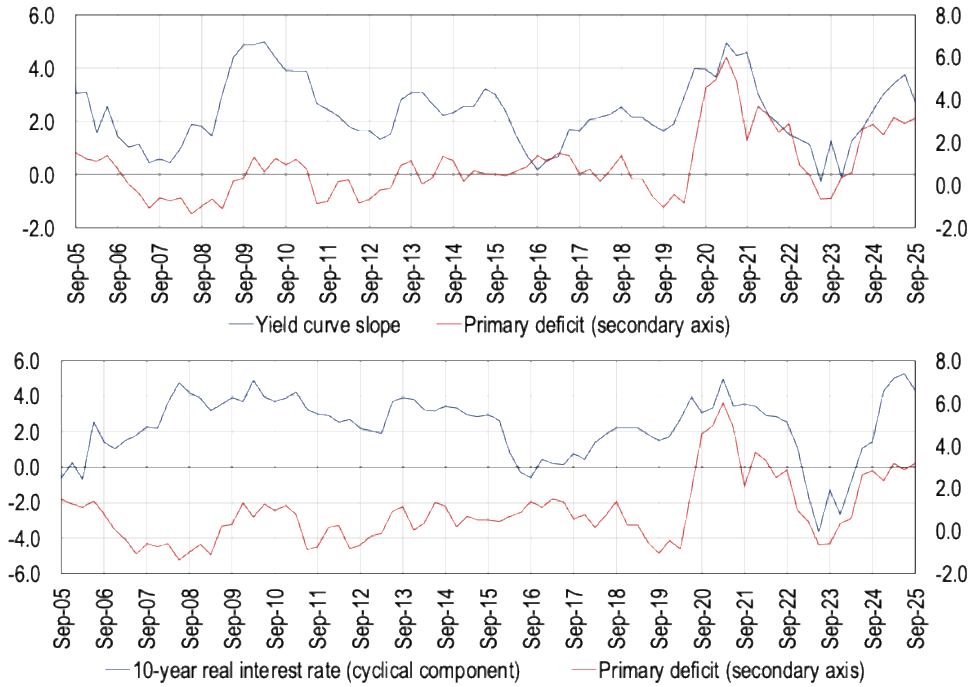


Figure 4: Primary deficit as a percentage of GDP versus long-term real interest rates (cyclical component, %) and yield curve slope. Source: Ministry of Finance, Banco de la República, and authors' calculations.

described in Figure 1, where fiscal deterioration exerts greater upward pressure on long-term rates. However, this correlation does not allow for causal conclusions, given that the variables may respond simultaneously to common factors such as the economic cycle or global financial conditions. The econometric strategy presented in Section 4 seeks precisely to address this identification problem.

As Laubach (2009) argues, long-term interest rates incorporate expectations about future deficits, not just the current deficit. Consequently, fiscal expectations provide a more informative measure of perceptions of intertemporal sustainability than contemporaneous fiscal data. Figure 5 presents the fiscal deficit expectations series constructed for this study based on the FocusEconomics survey. This survey compiles monthly projections from local and foreign analysts on various macroeconomic variables, including the CNG's fiscal balance. Since the FocusEconomics survey reports forecasts for fixed events (the end of the current year and the end of the following year) rather than fixed horizons, an interpolation procedure is used to construct expectations over a constant 12-month horizon. Following the methodology used in the literature that works with this type of survey (Siklos, 2013; Yetman, 2018; Ojeda-Joya and Romero, 2023), fixed-horizon expectations are approximated using a weighted average of the available forecasts: $\hat{d}_{t+12|t} = \frac{k}{12}\hat{d}_{t+k|t} + \frac{12-k}{12}\hat{d}_{t+12+k|t}$, where $\hat{d}_{t+k|t}$ is the forecast for the end of the current year, $\hat{d}_{t+12+k|t}$ is the forecast for the end of the following year, and k is the number of months remaining until the end of the current year. This approach yields a series that is comparable over time and reflects agents' expectations regarding the future fiscal position.

The resulting series shows several episodes of significant revisions in expectations. Notable is the abrupt deterioration during 2020, when deficit expectations rose rapidly in response to the fiscal measures adopted during the pandemic. In subsequent years, expectations have remained at high levels, consistent with the observed persistence in the primary deficit. In this regard, the unit root test with a structural break indicates that the series is stationary with a shift in the mean in the second quarter of 2020 (see Appendix A.1).

To illustrate the importance of using fiscal deficit expectations, Figure 6 compares the kernel distribution of one-year expectations among FocusEconomics analysts in February, March, and April 2020. The graph shows that, in response to the COVID-19 outbreak, analysts quickly adjusted their outlook on the deficit, shifting the mean of the distribution and acknowledging greater uncertainty. The example highlights the advantage of using expectations, as they incorporate new information more quickly than observed deficit data, which would only reflect the fiscal deterioration several quarters later.

4 Econometric strategy

This paper uses TVP-BVARX models to assess the impact that deteriorations in debt and fiscal deficit expectations have on the cyclical component of the real interest rate on 10-year TES and the slope of the yield curve. Among the advantages of this approach is the ability to obtain more precise and robust estimators than frequentist estimates, particularly when using small data samples. Another benefit of using a Bayesian approach is the flexibility to estimate time-varying coefficients. A com-

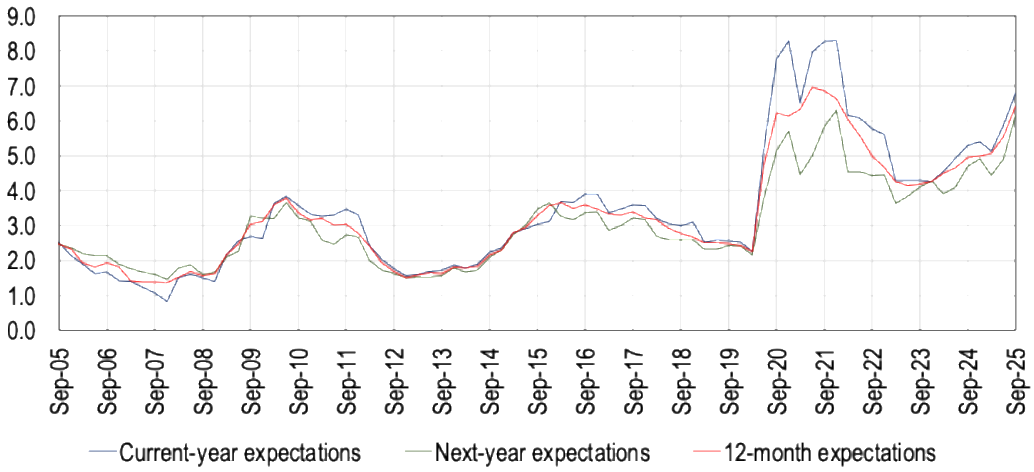


Figure 5: CNG fiscal deficit expectations (percentage of GDP) one year ahead. Source: FocusEconomics and authors' calculations.

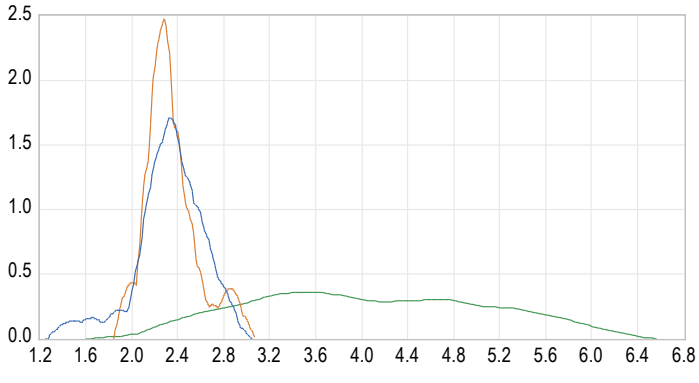


Figure 6: Kernel distribution of individual expectations for the one-year fiscal deficit (percentage of GDP) in February, March, and April 2020. February 2020: Blue line. March 2020: Orange line. April 2020: Green line. Source: FocusEconomics and authors' calculations.

prehensive discussion of the advantages and disadvantages of using BVAR models can be found in Dieppe et al. (2016).

4.1 TVP-BVARX model

According to Primiceri (2005), the TVP-BVARX model can be expressed as:

$$y_t = A_{1,t} y_{t-1} + A_{2,t} y_{t-2} + \ldots + A_{p,t} y_{t-p} + C x_t + \varepsilon_t \tag{1}$$

In this equation, y_t is the vector of endogenous variables. The matrices $A_{1,t}, \ldots, A_{p,t}$ represent the time-varying parameters, n is the number of endogenous variables, and p is the number of lags in the system. The vector of exogenous regressors is x_t, and the residual vector ε_t is assumed to follow a multivariate normal distribution:

$$\varepsilon_t \sim \mathcal{N}(0, \Sigma) \tag{2}$$

In the estimation, the variance-covariance matrix is assumed to be constant over time (Dieppe et al., 2016). Thus, the model can be reformulated in compact form as follows:

$$y_t = \bar{X}_t \beta_t + \varepsilon_t \tag{3}$$

where

$$\bar{X}_t = I_n \otimes X_t, \quad X_t = \begin{pmatrix} y'_{t-1} & y'_{t-2} & \ldots & y'_{t-p} & x'_t \end{pmatrix} \tag{4}$$

and

$$\beta'_t = \operatorname{vec}(B_t), \quad \beta_t = \begin{pmatrix} A'_{1,t} \\ A'_{2,t} \\ \vdots \\ A'_{p,t} \\ C'_t \end{pmatrix} \tag{5}$$

Given the sample size and the interest in capturing possible temporal changes in transmission, Bayesian techniques are used for estimation. Bayesian estimation allows for the incorporation of information (*priors*) about the coefficients of the matrices $A_{1,t}, \ldots, A_{p,t}$ or the variance-covariance matrix of the residuals Σ. This information, combined with statistical inference from the data using Bayes' rule, allows us to obtain a distribution (*posterior*) of the coefficients conditional on the observed data.

The *prior* used for the parameters of the TVP-BVARX model consists of a random walk, which is standard for this type of model:

$$\beta_t = \beta_{t-1} + v_t, \quad v_t \sim \mathcal{N}(0, \Omega) \tag{6}$$

The covariance matrix Ω is assumed to be a random variable determined endogenously by the model. The parameters of interest to be estimated in the TVP-BVARX are the coefficients $\beta = \{\beta_1, \ldots, \beta_T\}$, the covariance matrix Ω for the shocks in the dynamic process, and the covariance matrix of the residuals Σ. The models are estimated using quarterly data from 2005Q1 through 2025Q3. Standard information criteria were used to select the lag structure.

4.2 Identification of fiscal shocks

In the proposed specification for evaluating the dynamics of the yield curve slope, the vector y_t is given by:

$$y_t \equiv \begin{pmatrix} RER_Gap_t \\ IDOAM_t \\ Debt_Deterioration_t \\ Deficit_Expectations_t \\ Yield_Curve_Slope_t \end{pmatrix} \tag{7}$$

To assess the effect on the 10-year real interest rate, the vector y_t consists of:

$$y_t \equiv \begin{pmatrix} RER_Gap_t \\ IDOAM_t \\ Debt_Deterioration_t \\ Deficit_Expectations_t \\ Real_Rate_Gap_10Y_t \end{pmatrix} \tag{8}$$

In these specifications, $IDOAM_t$ is a broad financial conditions index, in which decreases (increases) signal tighter (looser) financial conditions, implying lower (higher) aggregate demand;[4] RER_Gap_t is the real exchange rate gap (cyclical component);[5] $Debt_Deterioration_t$ is the public debt deterioration indicator presented in Section 3; $Deficit_Expectations_t$ corresponds to FocusEconomics' fiscal deficit expectations one year ahead.[6] $Real_Rate_Gap_10Y_t$ is the cyclical component of the real interest rate on 10-year TES, obtained by deflating the nominal rate with core

[4] A description and analysis of some of the main stylized facts regarding this index can be found in Botero-Ramírez et al. (2025).

[5] The estimates use the real exchange rate gap produced by the technical staff of Banco de la República.

[6] As mentioned above, the fiscal deficit expectations series is stationary with a structural break in the post-pandemic period. The specification with time-varying parameters is appropriate in this context, as it allows the intercept to adjust gradually to changes in level without imposing discrete breaks. Inspection of the identified structural shocks shows no evidence of atypical behavior.

inflation and subtracting the trend associated with the neutral interest rate estimated by Banco de la República. $Yield_Curve_Slope_t$ corresponds to the slope of the yield curve (the 10-year TES rate minus the one-year TES rate).[7] In both specifications, the structure of the system is identical, with only the variable of interest in the last position of the ordering changing. The vector of exogenous variables x_t includes the slope of the U.S. Treasury yield curve, an indicator that reflects changes in external financial conditions and affects global fixed-income markets.[8]

The structural identification of the shocks is based on a recursive scheme of contemporaneous exclusion restrictions on the impact matrix and the inclusion of fiscal expectations as a *forward-looking* variable in the system. The identification framework and the transmission of shocks are summarized in Figure 7. In the endogenous block, the adopted ordering places the real exchange rate gap first, under the assumption that this variable has the greatest capacity for contemporaneous adjustment within the time horizon considered, as it immediately incorporates macroeconomic surprises. Second, the financial conditions index is included, which is assumed to respond contemporaneously to innovations in the exchange rate gap and external financial conditions, but not to fiscal variables within the quarter[9]. The fiscal variables—the public debt deterioration indicator and fiscal deficit expectations—are placed later in the system, consistent with the fact that adjustments in public finances occur more slowly than exchange rate and financial adjustments and are contemporaneously dependent on prevailing macro-financial and exchange rate conditions. Additionally, the quarterly frequency of the data implies that the ordering captures the average sequence of adjustment within the period, without attempting to describe interactions at higher frequencies, which is consistent with a short- and medium-term interpretation of fiscal transmission.

Unlike traditional fiscal VAR models, which use observed data on public spending or revenue, the inclusion of expectations regarding the future deficit allows us to capture agents' reactions to the arrival of new information. By placing expectations after the exchange rate, financial conditions, and debt deterioration variables, the shock associated with this variable is identified as a surprise regarding the expected path of public finances, orthogonal to the contemporaneous information contained in the preceding variables. This interpretation is consistent with the literature on *fiscal news shocks*, in which revisions to expectations constitute information about the future fiscal stance not contained in realized fiscal variables (Ramey, 2011).

Finally, the yield curve slope and the cyclical component of the 10-year real TES rate are placed at the end of the ordering, allowing them to contemporaneously incorporate the information contained in financial, exchange rate, and fiscal shocks. Under the adopted recursive framework, fiscal shocks are defined as orthogonal innovations in fiscal variables that are not contemporaneously attributable to financial or exchange rate disturbances, a condition that allows us to identify their transmission to the yield curve in the following sections.

[7] The variables included in the system are stationary and are presented in Appendix A.1.

[8] Additional exercises using other commonly employed indicators, such as the VIX or financial conditions indices, yield qualitatively similar results. However, the slope of the U.S. Treasury yield curve is used given its impact on global fixed-income markets.

[9] Changes in the ordering of these two variables do not generate significant differences in the results.

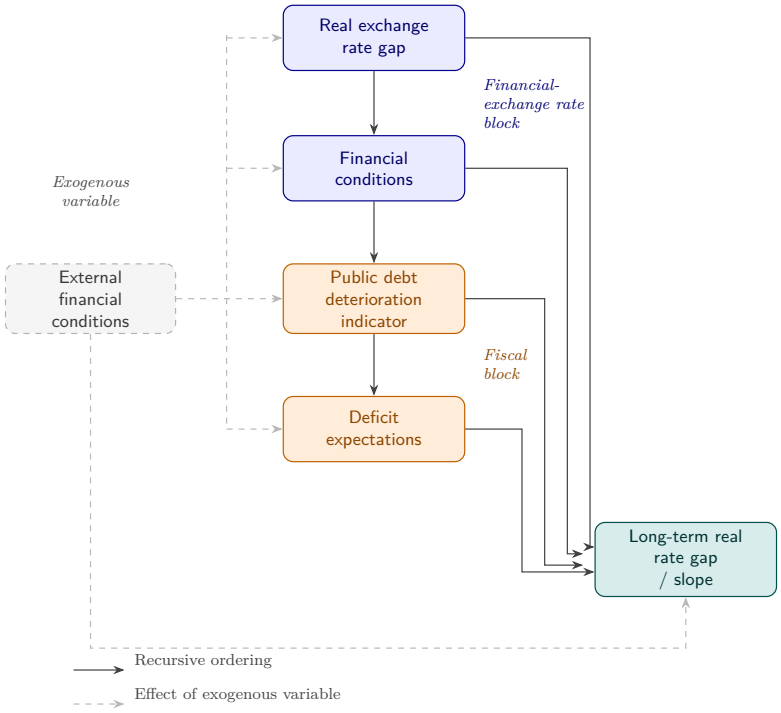


Figure 7: Transmission channels in the proposed identification. Prepared by the authors.

5 Results

5.1 Long-term real interest rate

This subsection analyzes the results of the TVP-BVARX model for the cyclical component of the real interest rate on 10-year TES. It examines the median impulse-response functions, their evolution over time, the variance decomposition, and the historical decomposition, with the aim of assessing the role of fiscal shocks. Figure 8 presents the median impulse-response functions to fiscal shocks at the end of the sample period. Both the deterioration of public debt and upward revisions in fiscal deficit expectations generate statistically significant increases in the cyclical component of the 10-year real rate.[10] Figures 9a and 9b show the time evolution of these responses to fiscal shocks. Starting in the post-COVID-19 period, the magnitude of the responses increases. Both shocks associated with debt deterioration and those related to deficit expectations exhibit greater transmission to the long end of the curve in recent years.

The variance decomposition presented in Figure 10 confirms the relevance of fiscal shocks. In particular, shocks associated with debt deterioration and deficit expectations account for a significant

[10]The initial impact of a one-standard-deviation increase in the debt deterioration indicator generates an increase of 28 bps on impact and a cumulative increase of 119 bps over one year in the cyclical component of the 10-year real interest rate. A one-standard-deviation increase in deficit expectations raises the long-term rate by 33 bps on impact and by a cumulative 103 bps over one year.

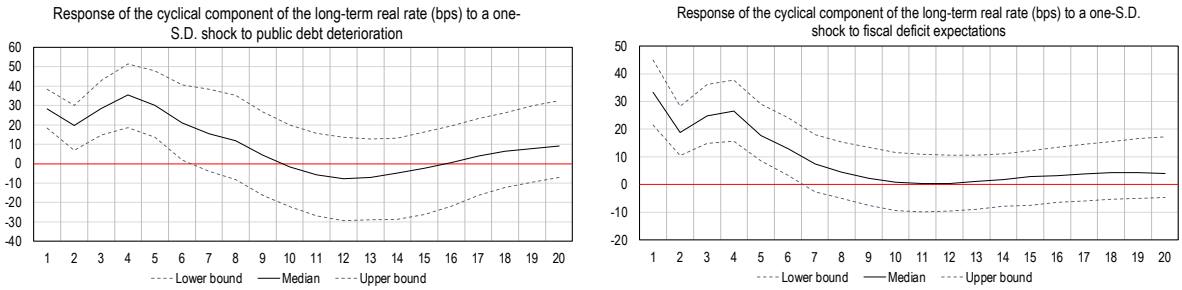
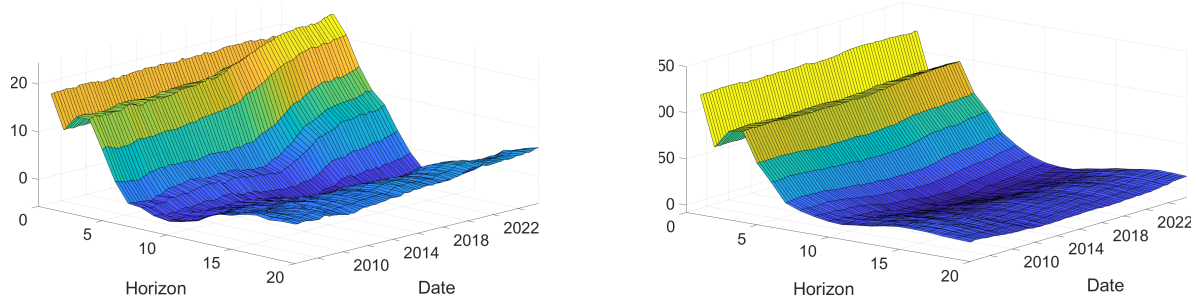


Figure 8: Response of the 10-year real interest rate (cyclical component) to shocks to fiscal variables in the system. Response to one-standard-deviation shocks in the fiscal variables. The dotted lines represent the 68 % credibility intervals. Source: Authors' calculations.



(a) Debt deterioration shock

(b) Deficit expectation shock

Figure 9: Time-varying response of the 10-year real interest rate (cyclical component) to fiscal shocks. Source: Authors' calculations.

portion of the variance as the analysis horizon is extended.[11] Meanwhile, the historical decomposition shown in Figure 11 allows us to identify specific episodes in which fiscal shocks contributed significantly to deviations of the long-term real rate from its steady state. During the 2020-2022 period, a substantial positive contribution from shocks associated with debt deterioration and deficit expectations is observed. In the most recent periods included in the estimation (lower panel), the persistence of high real rates is consistent with a heightened perception of fiscal risk.[12]

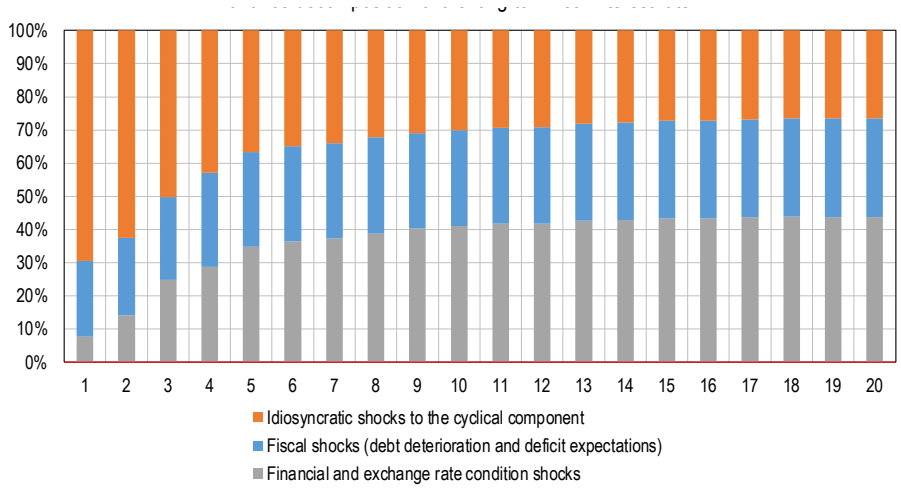


Figure 10: Variance decomposition of the 10-year real interest rate (cyclical component). Source: Authors' calculations.

Overall, the results indicate that fiscal shocks (debt deterioration and deficit expectations) have statistically significant effects on the long-term real interest rate, and that the dimension captured by expectations is particularly relevant.

[11] Debt deterioration and fiscal expectations explain 22 % of the variance in the first quarter and 30 % at five years.

[12] In the three quarters analyzed for 2025, the combined contribution of debt deterioration and deficit expectations to the cyclical component of the long-term real interest rate ranged between 100 and 149 bps.

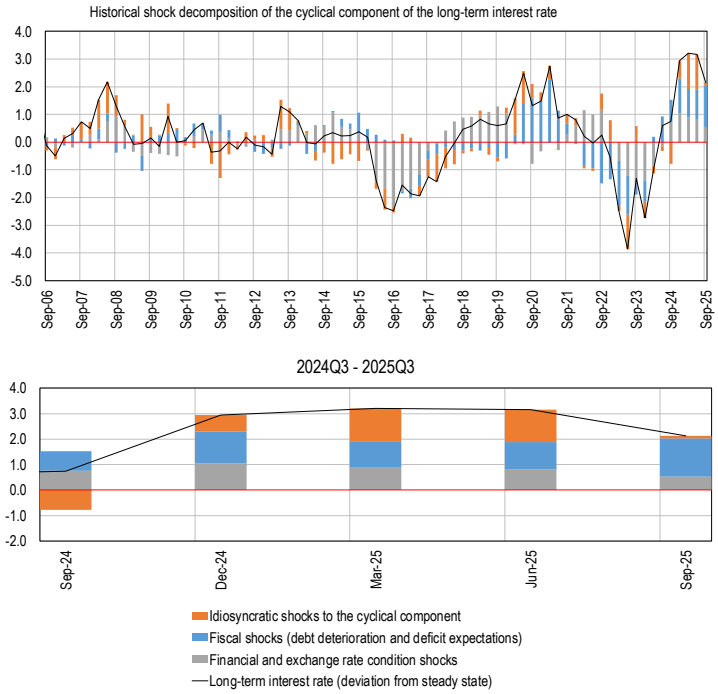


Figure 11: Historical decomposition of the 10-year real interest rate (cyclical component). Deviations from the model's steady state (%). Source: Authors' calculations.

5.2 Yield curve slope

Figure 12 presents the median impulse-response functions of the yield curve slope to shocks in fiscal variables. Both a deterioration in public debt and an increase in deficit expectations cause the curve to steepen. This result indicates that fiscal shocks affect the long end more intensely than the short end, as perceptions of fiscal risk are primarily incorporated over longer horizons.[13] Figures 13a and 13b show the time evolution of these responses over the analysis period. Starting in the post-COVID-19 period, the magnitude of the steepening induced by fiscal shocks increases. The effect associated with revisions in deficit expectations becomes more persistent and larger in magnitude in recent years. This behavior suggests that market sensitivity to changes in perceptions of fiscal sustainability may have intensified in a context of higher debt levels and structurally elevated deficits.

The variance decomposition presented in Figure 14 confirms the relevance of fiscal shocks in the dynamics of the slope.[14] Finally, the historical decomposition shown in Figure 15 allows us to identify episodes in which fiscal shocks contributed significantly to the steepening of the curve. During the 2020-2022 period, a significant positive contribution from shocks associated with debt deterioration and deficit expectations is observed, consistent with the behavior documented for the

[13]The impact of a one-standard-deviation increase in the debt deterioration indicator generates an increase of 19 bps on impact and a cumulative increase of 84 bps over one year in the slope of the curve. A one-standard-deviation increase in deficit expectations raises the slope by 15 bps on impact and by a cumulative 46 bps over one year.

[14]Debt deterioration and fiscal expectations explain 16 % of the variance in the first quarter and 28 % at one year. This contribution remains around 30 % up to 20 quarters ahead.

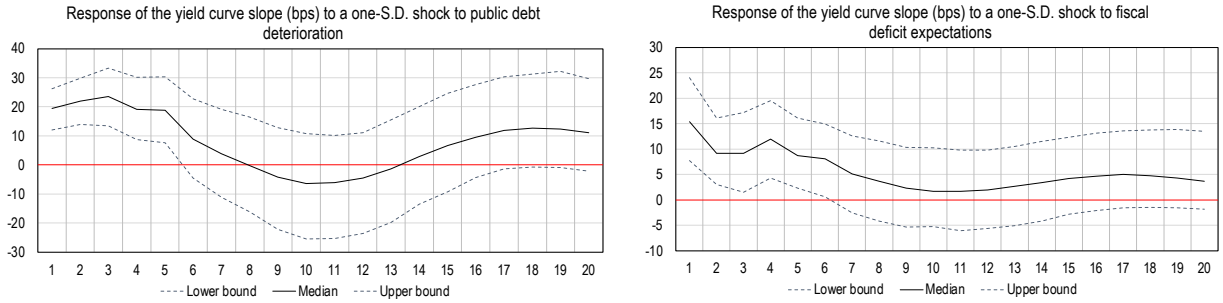
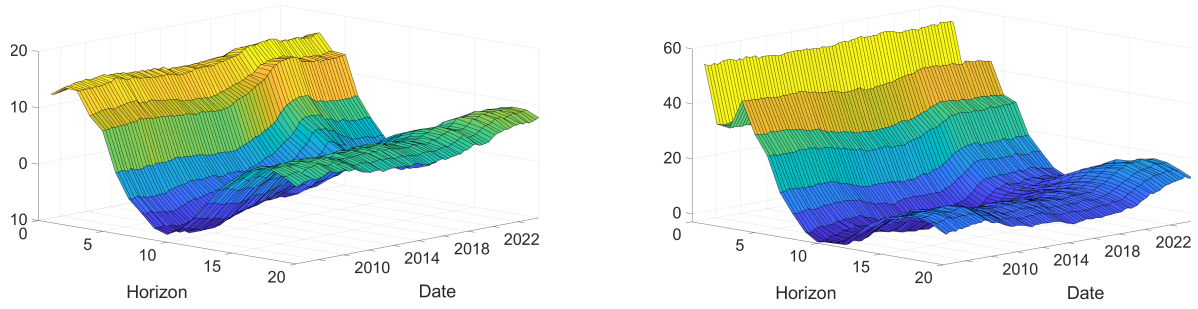


Figure 12: Response of the yield curve slope to shocks to fiscal variables in the system. Response to one-standard-deviation shocks in the fiscal variables. The dotted lines represent the 68 % credibility intervals. Source: Authors' calculations.



(a) Debt deterioration shock

(b) Deficit expectation shock

Figure 13: Time-varying response of the yield curve slope to fiscal shocks. Source: Authors' calculations.

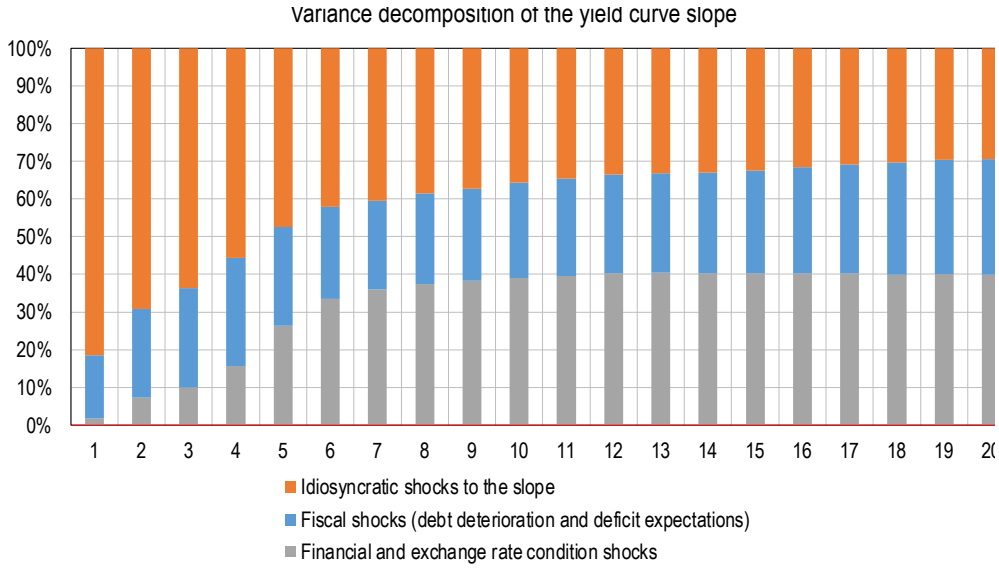


Figure 14: Variance decomposition of the yield curve slope. Source: Authors' calculations.

long-term real rate. In more recent periods, the persistence of a steep slope reflects the interaction between tight financial conditions and perceptions of higher fiscal risk.[15]

In summary, the results indicate that fiscal shocks not only raise the long-term real rate but also alter the term structure, generating steepening consistent with a higher risk premium over long horizons. This pattern reinforces the evidence that the forward-looking dimension of fiscal policy is an important determinant in the formation of the yield curve and has important implications for the funding structure of the Central National Government (CNG).[16]

[15] In the three quarters analyzed for 2025, debt deterioration contributed between 58 and 70 additional basis points to the slope of the curve.

[16] The results are robust to alternative specifications. Appendix A.2 presents three complementary exercises whose results are qualitatively similar in sign, magnitude, and time pattern to those reported in this section.

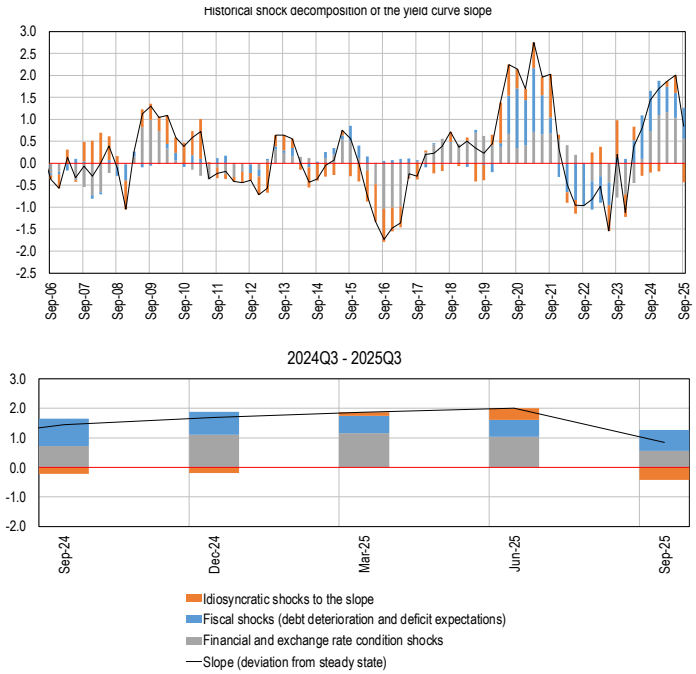


Figure 15: Historical decomposition of the yield curve slope. Deviations from the model's steady state (%). Source: Authors' calculations.

6 Conclusions

This paper presents an initial attempt to analyze the effect of public debt dynamics and fiscal deficit expectations on the cyclical component of the long-term interest rate in Colombia and the slope of the yield curve. To this end, a series of fiscal deficit expectations was constructed based on the FocusEconomics survey for the period 2005-2025, and TVP-BVARX models were estimated to capture changes in the transmission mechanisms.

The results indicate that both debt deterioration and upward revisions in deficit expectations generate statistically significant increases in the cyclical component of the real 10-year TES rate and a steepening of the yield curve. The response to shocks in expectations is persistent and underscores the importance of the forward-looking dimension of fiscal policy in determining long-term rates. Additionally, the magnitude of the transmission has intensified in the post-COVID-19 period, consistent with an environment of higher debt levels and persistent deficits. The historical decomposition reveals that fiscal shocks account for a significant portion of the recent increase in long-term real rates and in the slope of the yield curve.

These findings have important implications for economic policy. First, they highlight the role of perceptions regarding the state and outlook of public finances in determining the cost of public borrowing. In this regard, deteriorations in perceptions of fiscal sustainability translate into higher financing rates for the government. Second, the fact that markets react to expectations and not only to observed fiscal outcomes suggests that fiscal policy announcements and communication

regarding the future path of public finances are relevant to price formation in the debt market. Third, the intensification of fiscal transmission in recent years suggests that, in the current context of high debt levels, fiscal policy space is more limited and the costs of further deterioration may be higher than in the past.

Since this study focuses on the cyclical component of long-term interest rates and the slope of the yield curve, future research could explore how the fiscal stance and expectations affect the trend component of interest rates and sovereign risk premiums. It is also relevant to examine the possible existence of nonlinearities—for example, debt thresholds beyond which transmission becomes amplified—and to assess whether the fiscal expectations series constructed in this study can be extended to other countries in the region for which the FocusEconomics survey provides comparable coverage.

A Appendix

A.1 Unit root tests for the variables used

Table 1: Unit root tests (ADF) for the system variables

Variable	t-statistic	p-value
Endogenous variables		
Financial conditions index ($IDOAM_t$)	-4.814^{***}	0.000
Real exchange rate gap (RER_Gap_t)	-5.034^{***}	0.000
Cyclical component of the 10-year real interest rate ($Real_Rate_Gap_10Y_t$)	-8.333^{***}	0.000
TES yield curve slope ($Yield_Curve_Slope_t$)	-3.770^{***}	0.005
Exogenous variable		
U.S. Treasury yield curve slope (UST_Slope_t)	-8.568^{***}	0.000
Variables used in robustness exercises		
10-year TES–IBR spread ($TES_IBR_Spread_10Y_t$)	-3.365^{**}	0.015
Cyclical component of the 10-year UVR rate ($UVR_Rate_Gap_10Y_t$)	-2.838^{*}	0.058
Oil price gap (WTI_Gap_t)	-4.494^{***}	0.000

Notes: The null hypothesis is that the series has a unit root. The test specification includes a constant. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. One-sided asymptotic p-values from MacKinnon (1996). Lags selected according to the Schwarz criterion.

Table 2: Unit root test with structural break — Analysts' one-year forecast of the CNG fiscal deficit ($Deficit_Expectations_t$).

	t-statistic
ADF with structural break	-6.474^{***}
Critical values	
1%	-4.949
5%	-4.444
10%	-4.194

Notes: Null hypothesis: the series has a unit root. Trend and break specification: intercept only. Break type: *innovational outlier*. Break date: 2020Q1, selected by minimizing the Dickey-Fuller statistic. Lags selected according to the Schwarz criterion (4 lags selected, maximum of 11 evaluated). One-sided asymptotic p-value from Vogelsang (1993): < 0.01. *** indicates rejection of the null hypothesis at the 1% level.

A.2 Robustness exercises

To assess the sensitivity of the results to methodological and measurement choices, three alternative specifications of the TVP-BVARX model were estimated. In all of them, the ordering, *priors*, and lag structure of the baseline model are maintained, modifying only the variable of interest or the set of exogenous controls.

In the first exercise, the yield curve slope is replaced by the *spread* between the 10-year TES rate and the IBR, following a calculation similar to that used by Ardila-Dueñas and Rincón-Castro (2019). This specification addresses two considerations simultaneously: on the one hand, it reduces the sensitivity of the results to the method used to extract the cyclical component of real interest rates; on the other hand, it more directly isolates the effects attributable to the monetary policy stance by subtracting a very short-term market rate directly linked to Banco de la República's policy rate. The results confirm that fiscal shocks generate a widening of the *spread*, with magnitudes and time patterns consistent with those obtained in the baseline model, as shown in Figure 16.

In the second exercise, international oil prices (WTI) are included as an additional exogenous variable, together with the slope of the U.S. Treasury yield curve. This specification is not adopted as the baseline because the relative importance of oil in national income and the fiscal accounts may have declined in recent years, which could limit its ability to capture external shocks throughout the entire sample. Nevertheless, its inclusion allows us to verify that the estimated effects of fiscal shocks are not being contaminated by movements in oil prices. The results are qualitatively equivalent to those of the baseline model for both the cyclical component (Figure 17) and the slope (Figure 18).

In the third exercise, the 10-year TES UVR rate in excess of the neutral interest rate estimated by Banco de la República is used as an alternative measure of the long-term real component. This specification has the advantage of avoiding the core inflation deflator used in the construction of the baseline variable by directly using an inflation-indexed instrument. The results confirm the role of expectation shocks (Figure 19).

Taken together, the three exercises support the central conclusion of the paper: fiscal shocks—

in particular, surprises in deficit expectations—constitute an important determinant of long-term real interest rates and the slope of the yield curve in Colombia.

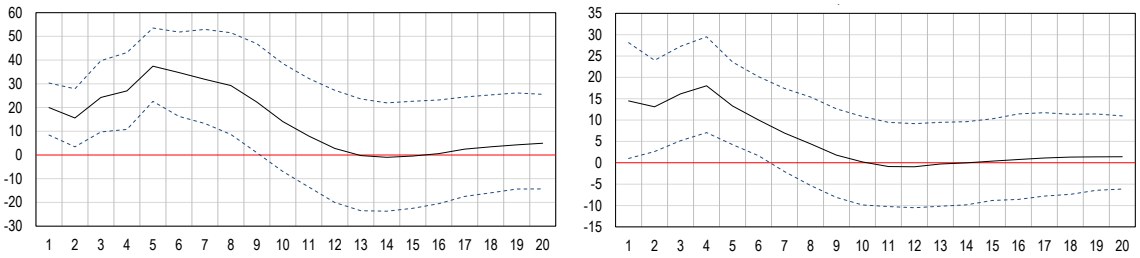


Figure 16: Response of the spread between the 10-year TES rate and the IBR rate to one-standard-deviation shocks to the fiscal variables in the system. Left panel: response to the debt indicator. Right panel: response to the expected fiscal deficit. The dotted lines represent the 68% credible intervals. Source: Authors' calculations.

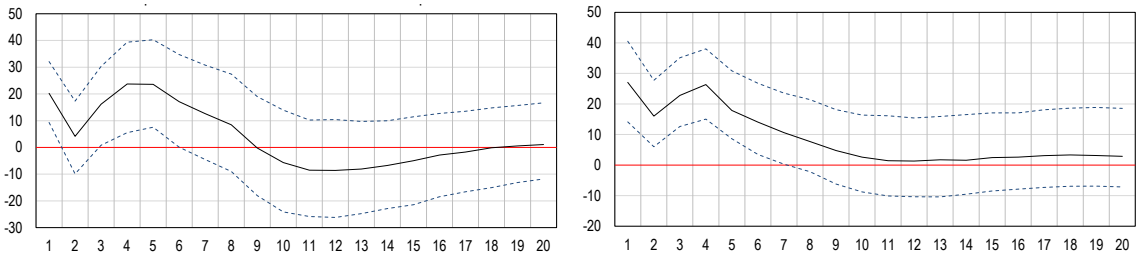


Figure 17: Response of the cyclical component of the long-term real interest rate to shocks to fiscal variables in the system, controlling for oil prices. Response to one-standard-deviation shocks in the fiscal variables. Left panel: response to the debt indicator. Right panel: response to the expected fiscal deficit. The dotted lines represent the 68 % credibility intervals. Source: Authors' calculations.

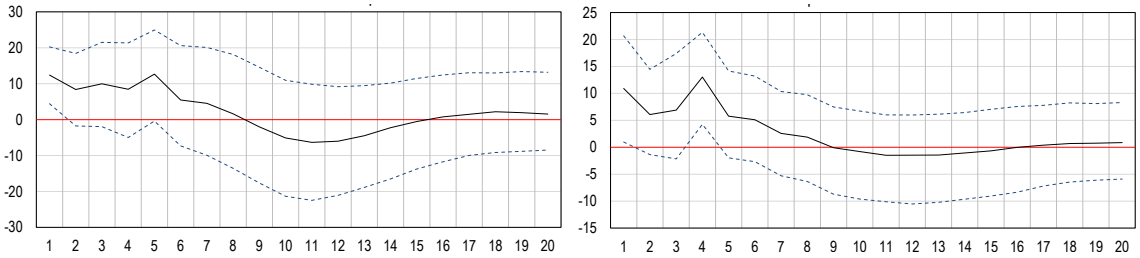


Figure 18: Response of the yield curve slope to shocks to fiscal variables in the system, controlling for oil prices. Response to one-standard-deviation shocks in the fiscal variables. Left panel: response to the debt indicator. Right panel: response to the expected fiscal deficit. The dotted lines represent the 68 % credibility intervals. Source: Authors' calculations.

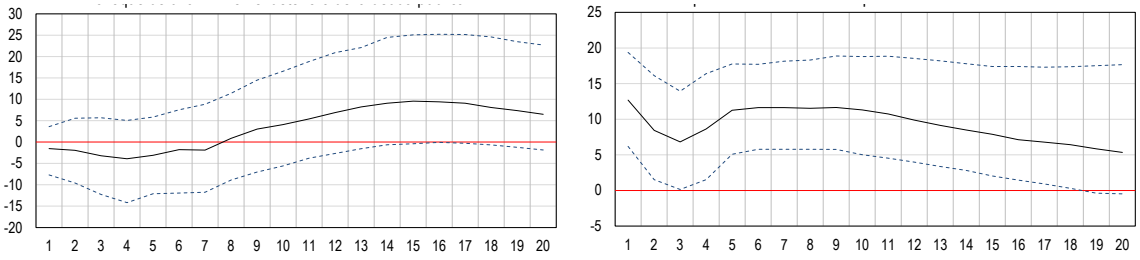


Figure 19: Response of the cyclical component of the 10-year UVR rate to shocks to fiscal variables in the system. Response to one-standard-deviation shocks in the fiscal variables. Left panel: response to the debt indicator. Right panel: response to the expected fiscal deficit. The dotted lines represent the 68 % credibility intervals. Source: Authors' calculations.

References

Ardila-Dueñas, C. D. and Rincón-Castro, H. (2019). ¿Cómo y qué tanto impacta la deuda pública a las tasas de interés de mercado? *Borradores de Economía*, 1077.

Banco de la República (2025a). Determinantes de las tasas de interés de la deuda soberana a diferentes plazos. In *Informe de la Junta Directiva al Congreso de la República – Julio 2025*. Banco de la República, Bogotá. Recuadro 3.

Banco de la República (2025b). ¿Por qué el comportamiento de las tasas de interés de los bonos públicos ha sido tan diferente al de la tasa de intervención desde 2024? Blog BanRep. Consultado el 10 de febrero de 2026.

Botero-Ramírez, O., Murcia, A., and Vargas-Herrera, H. (2025). Global risk transmission to local financial conditions and the participation of foreign investors in emerging market economies' sovereign bond markets: The case of Colombia. Technical report, Banco de la Republica de Colombia.

Chen, S. (2025). The inflationary risks of expansionary fiscal policy. IMF Selected Issues Paper SIP/2025/144, International Monetary Fund, Western Hemisphere Department, Washington, DC. Prepared in the context of Colombia's 2025 Article IV Consultation.

Dieppe, A., Legrand, R., and Van Roye, B. (2016). *The BEAR toolbox*. Number 1934 in 2016. ECB working paper.

Eichengreen, B. and Zoli, E. (2025). The IMF's advice on public debt management. In *IMF Advice on Fiscal Policy*, number BP/25-01/04 in IEO Background Paper, chapter 3, pages 70–114. International Monetary Fund, Washington, DC.

Engen, E. M. and Hubbard, R. G. (2004). Federal government debt and interest rates. *NBER macroeconomics annual*, 19:83–138.

Furceri, D., Goncalves, C., and Li, H. (2025). The impact of debt and deficits on long-term interest rates in the US. IMF Working Paper WP/25/142, International Monetary Fund.

Garda, P., Koelle, M., and Molina, L. (2026). La transmisión de las sorpresas fiscales al tipo de cambio y al riesgo soberano en Brasil y Colombia. Technical Report 3, Banco de España, Madrid.

International Monetary Fund (2025). 2025 global debt monitor. Technical report, International Monetary Fund, Fiscal Affairs Department, Washington, DC. Prepared by Carlos Eduardo Gonçalves (team leader), Marcos Poplawski-Ribeiro (co-lead), Gabriel Hegab, and Victoria Haver, under the guidance of Davide Furceri and Vitor Gaspar.

Jaramillo, L. and Weber, A. (2013). Bond yields in emerging economies: It matters what state you are in. *Emerging Markets Review*, 17:169–185.

Kameda, K. (2014). Budget deficits, government debt, and long-term interest rates in Japan. *Journal of the Japanese and International Economies*, 32:105–124.

Kumar, M. S. and Baldacci, E. (2010). Fiscal deficits, public debt, and sovereign bond yields. IMF Working Paper WP/10/184, International Monetary Fund.

Laubach, T. (2009). New evidence on the interest rate effects of budget deficits and debt. *Journal of the European economic Association*, 7(4):858–885.

Nose, M. and Menkulasi, J. (2025). Fiscal determinants of domestic sovereign bond yields in emerging market and developing economies. IMF Working Paper WP/25/59, International Monetary Fund.

Ojeda-Joya, J. and Romero, J. V. (2023). Global uncertainty shocks and exchange-rate expectations in latin america. *Economic Modelling*, 120:106185.

Primiceri, G. E. (2005). Time varying structural vector autoregressions and monetary policy. *The Review of economic studies*, 72(3):821–852.

Ramey, V. A. (2011). Identifying government spending shocks: It's all in the timing. *The Quarterly Journal of Economics*, 126(1):1–50.

Siklos, P. L. (2013). Sources of disagreement in inflation forecasts: An international empirical investigation. *Journal of International Economics*, 90(1):218–231.

Vargas, H., González, A., and Lozano, I. (2015). Macroeconomic gains from structural fiscal policy adjustments: The case of colombia. *Economía*, 15(2):39–81.

Yetman, J. (2018). The perils of approximating fixed-horizon inflation forecasts with fixed-event forecasts. Technical report, Bank for International Settlements.