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The Empirics of Long-Term Mexican Government Bond Yields

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ABSTRACT

This paper presents empirical models of Mexican government bond (MGB) yields based on monthly macroeconomic data. The current short-term interest rate has a decisive influence on MGB yields, after controlling for inflation and growth in industrial production. John Maynard Keynes claimed that government bond yields move in lockstep with the short-term interest rate. The models presented in the paper show that Keynes's claim holds for MGB yields. This has important policy implications for Mexico. The empirical findings of the paper are also relevant for ongoing debates in macroeconomics.

KEYWORDS: Mexican Government Bonds; Long-Term Interest Rate; Short-Term Interest Rate; Monetary Policy; Banco de México (BdM); Banxico

JEL CLASSIFICATIONS: E43; E50; E58; E60; G10; G12

I. INTRODUCTION

The central bank's actions have a decisive influence on the long-term interest rate on government bonds, according to John Maynard Keynes (1930). Keynes held that the long-term interest rate mostly moves in lockstep with the short-term interest rate, which in turn depends primarily on the central bank's policy rate. This paper models the relationship between the short-term interest rate and the long-term interest rate in Mexico using monthly data. It shows that the short-term interest rate plays an important role in the dynamics of the long-term interest rate on Mexican government bonds (MGBs) of various maturity tenors after controlling for macroeconomic variables, such as the rate of inflation and the growth of industrial production. The empirical models presented here demonstrate that the Keynesian perspective provides useful insights about the dynamics of long-term MGB yields.

Relationship to the Literature

Keynes's views on the short-term interest rate's influence on the long-term interest rate have been empirically modeled in recent years. The Keynesian perspective on modeling government bond yields has been applied mostly to advanced economies, such as the United States (Akram and Li 2017, 2020a; Akram and Das 2019b; Levrero and Deleidi 2019), Japan (Akram and Das 2014; Akram and Li 2018, 2019, 2020b, 2020c), the eurozone (Akram and Das 2017), the United Kingdom (Akram and Li, forthcoming), Canada (Akram and Das 2020a; Das and Akram 2020), and Australia (Akram and Das 2020b). However, there are only a limited number of studies on the short-term interest rate's influence on the long-term interest rate for emerging markets. Models of long-term government bonds yields, including studies related to India (Akram and Das 2015, 2017), selected Latin American countries (Simoski 2019), and Brazil (Akram and Uddin 2020), have shown the relationship between the short-term interest rate and the long-term interest rate that Keynes posited appears to also hold in emerging markets. But more studies are required to establish whether this empirical regularity holds in other emerging markets. Thus, it is relevant to ask whether the short-term interest rate influences government bond yields in Mexico.

This paper applies the Keynesian perspective on modeling long-term government bonds yields for Mexico. It also contributes to the ongoing debate between the Keynesian and neoclassical schools of thought concerning government bond yield dynamics. The findings obtained from the empirical models estimated in this paper are relevant for macroeconomic debates in Mexico.

The Keynesian school maintains that interest rates have a psychological and sociological foundation in a world characterized by ontological uncertainty (Davidson 2015) in which investors' liquidity preference plays a central role. The Keynesian view is that the long-term interest rate is primarily determined by the central bank's actions, such as the setting of benchmark policy rates, repurchase and reverse repurchase agreements, forward guidance about policy rates, and decisions concerning the central bank's monetary base and balance sheet, intermediated through the short-term interest rates. Drawing on Riefler's (1930) pioneering empirical analysis of the dynamics of the short-term interest rate and the long-term interest rate in the United States in the 1920s and 1930s, Keynes (1930) argued that there is a tight connection between the short-term and long-term interest rates. Keynes (1930, [1936] 2007) provides theoretical arguments for why such a connection exists. Kregel (2011) has encapsulated Keynes's thoughts on interest rates, particularly why investors, driven by herding, animal spirits, and uncertainty, take their cue about long-term government bond yields from the movements of the short-term interest rate. The Keynesian argument has its roots in theoretical arguments in the literature, such as Bindseil (2004), Davidson (2015), Goodheart (1998), Lerner (1943, 1947), Sims (2013), and Tcherneva (2011). It is also based on empirical analysis and policy discussions, such as Malliaropulos and Migiakis (2018), Mattos et al. (2019), Patra et al. (2016), and Sau (2018).

In contrast to the Keynesian school, the neoclassical school maintains that government bonds yields are a function of the demand for and supply of loanable funds. In this view, various exogenous factors, such as government debt and deficits ratios, exert influence on government bonds yields. The neoclassical view of the drivers of the long-term interest rate is the predominant perspective in the existing literature. Recent empirical studies advancing the neoclassical view include Ardagna, Caselli, and Lane (2007), Baldacci and Kumar (2010), Gurber and Kamin (2012), Horioka, Nomoto, and Tera-Hagiwara (2014), Hoshi and Ito (2014), Min et al. (2003), Poghosyan (2014), Reinhart and Rogoff (2019), and Tkačevs and Vilerts (2019).

Structure of the Paper

The paper proceeds as follows. Section II presents a Keynesian model of the long-term interest rate. Section III narrates the evolution of MGB yields in the context of macroeconomic developments in Mexico. Section IV introduces the data and the relevant variables used in the behavioral equations in the models. Section V explains the econometric methodology, reports the estimated models, and interprets the findings from these models. Section VI concludes with some reflections on the policy implications of the empirical findings.

II. A KEYNESIAN MODEL OF THE LONG-TERM INTEREST RATE

The interest rate model is based on Akram's (2020) interpretation of Keynes's theory of the long-term interest rate, as articulated in his *Treatise on Money* and *General Theory*.

The notations used in the model are explained here. The long-term interest rate is r_{LT}; the short-term interest rate is r_{ST}; and the central bank policy rate is r_{CB}. Interest rate volatility is $V \geq 0$; the rate of inflation is Π; and the growth of industrial production is Y. The correlation between the Weiner process, dz, and inflation is ρ_{Π}; and the correlation between the Wiener process, dz, and the growth of industrial production is ρ_Y.

This model is represented in the following equations.

$$dr_{LT} = \mu r_{ST} dt + \sqrt{V} r_{ST} dz \quad [1]$$

$$dr_{ST} = \alpha(r_{CB} - r_{ST})dt + \varepsilon_t \quad [2]$$

$$dV = \kappa(\theta - V)dt + \sigma\sqrt{V} \sum_{i=1}^{N}(d\Pi + dY) \quad [3]$$

$$dzd\Pi = \rho_{\Pi} dt \quad [4]$$

$$dzd\mathrm{Y} = \rho_Y dt \quad [5]$$

Equation [1] states that the long-term interest rate follows a geometric Brownian motion that satisfies the above stochastic differential equation. Here, dz is a Weiner process and μ is the drift term, while V is the volatility of the long-term interest rate. The drift term is a constant.

Equation [2] states that the short-term interest rate, r_{ST}, is a mean reverting function of the central bank's policy rate, r_{CB}, at a pace of α. Here, ε_t is an error term.

Equation [3], the equation for volatility, implies that the volatility of the long-term interest rate, V, is a mean reverting to θ at a rate set by κ. Here, σ is the standard deviation of the volatility and are $d\Pi$ and dY random variables that, respectively, represent shocks from inflation and the growth of industrial production.

In equation [4], ρ_{Π} is the correlation between the Weiner process, dz, and inflation, $d\Pi$. In equation [5], ρ_Y is the correlation between the Weiner process, dz, and the growth of industrial production, dY.

III. THE EVOLUTION OF THE MEXICAN ECONOMY

Figure 1 shows the evolution of MGBs' long-term interest rates. Long-term interest rates were quite high in 2004 but began to moderately decline in 2005; they were fairly stable between 2006 to 2007. Long-term interest rates rose in 2008 but fell notably during the global financial crisis. Long-term interest rates continued to decline in the years immediately after the crisis. These interest rates traded sideways between 2011 and 2016. However, long-term interest rates gradually rose in 2017–18.

Figure 1. The Evolution of Key Long-term Interest Rates on Mexican Government Bonds, 2004–18

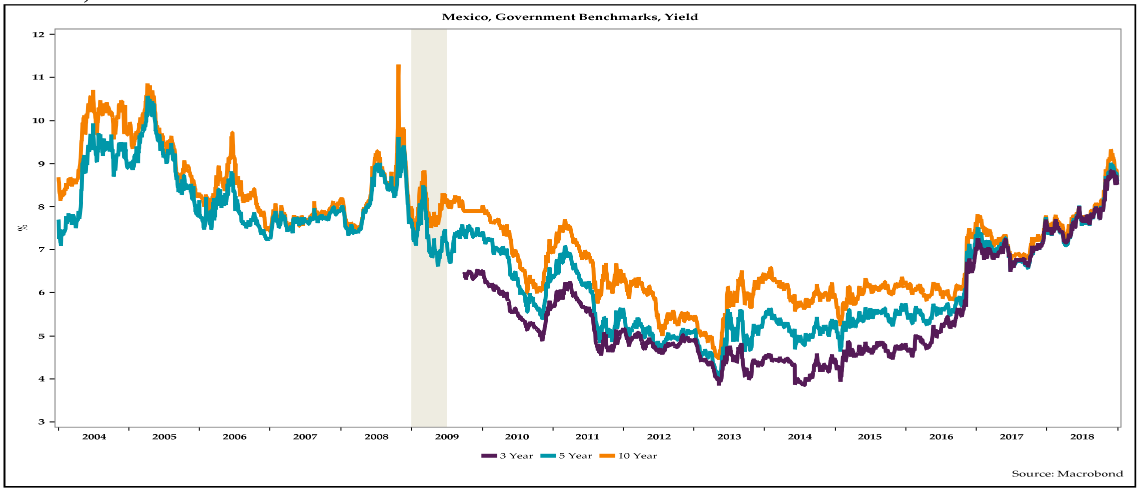


Figure 2 displays the evolution of the short-term interest rate along with the overnight target policy rate set by the Banco de Mexico (BdM), the country's central bank. It shows that the short-term interest rate moves mostly in tandem with the central bank's overnight target policy rate. Short-term interest rates rose in 2004 and early 2015 but declined with the BdM's policy rate cut. Short-term interest rates were steady until the global financial crisis but fell with the onset of the crisis. These rates were stable from mid-2009 to late 2012 but declined moderately between 2012 and late 2015 as the BdM reduced its overnight target policy rate. Short-term interest rates gradually rose from late 2015 to late 2018 in tandem with the steady hikes in BdM's overnight policy target rate during the same period.

Figure 2. The Evolution of Policy Rates and Short-term Interest Rates in Mexico, 2004–18

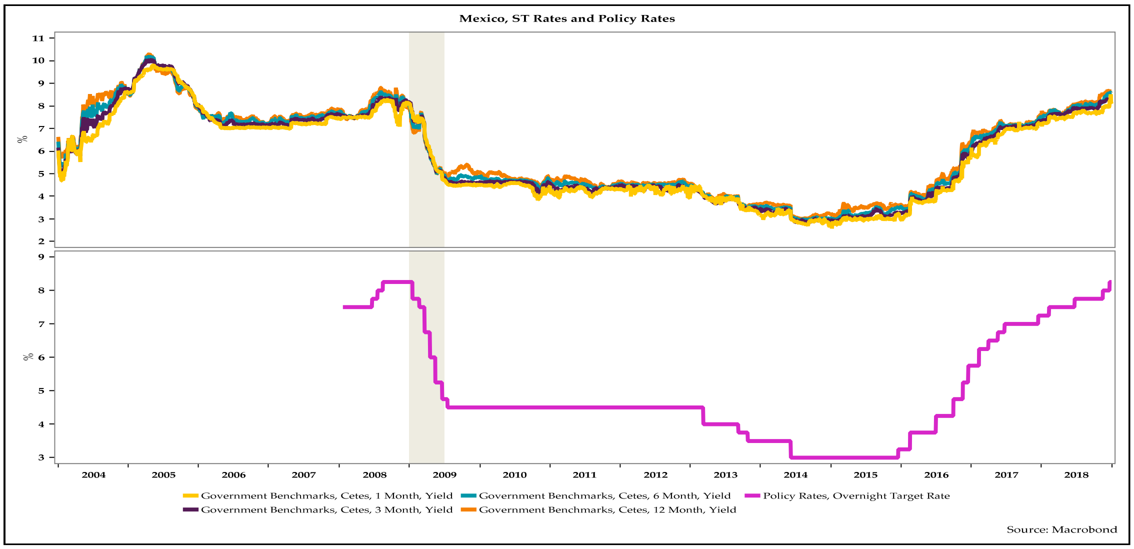


Figure 3 traces the evolution of Mexico's real GDP growth and industrial production. Economic growth in Mexico was quite moderate during the period. Growth was soft in the years immediately preceding the global financial crisis. During the global financial crisis, the Mexican economy contracted notably. Real GDP growth and the growth in industrial production in Mexico are strongly correlated, as is shown in the scatterplot displayed in figure 4.

Figure 3. The Evolution of Growth in Real GDP and Industrial Production in Mexico, 2004–18

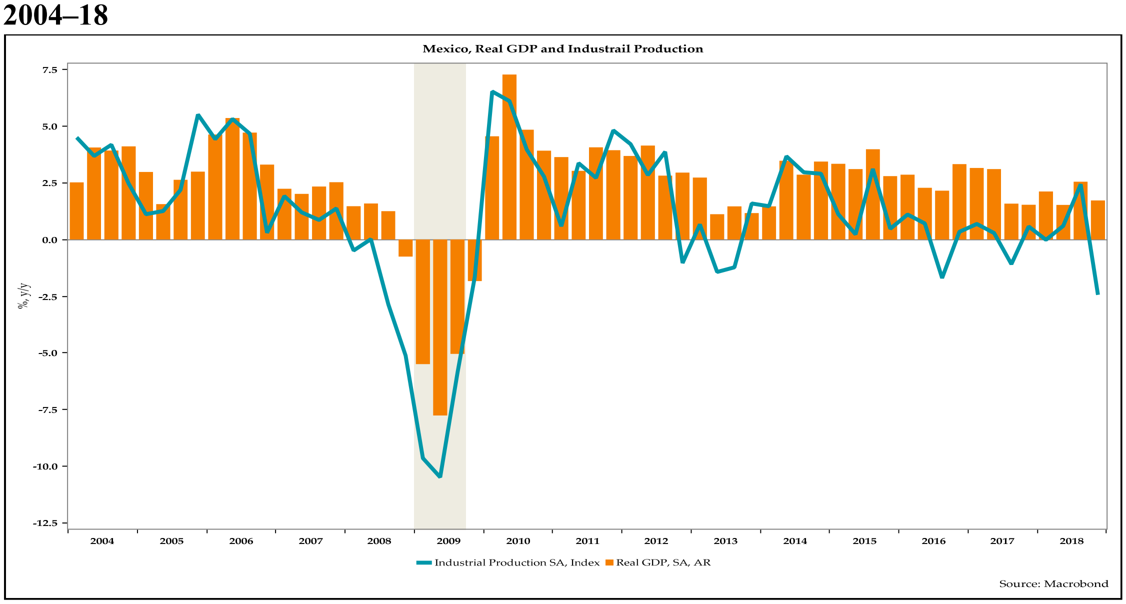


Figure 4. Scatterplot of Growth in Real GDP and Industrial Production in Mexico, 2004–18

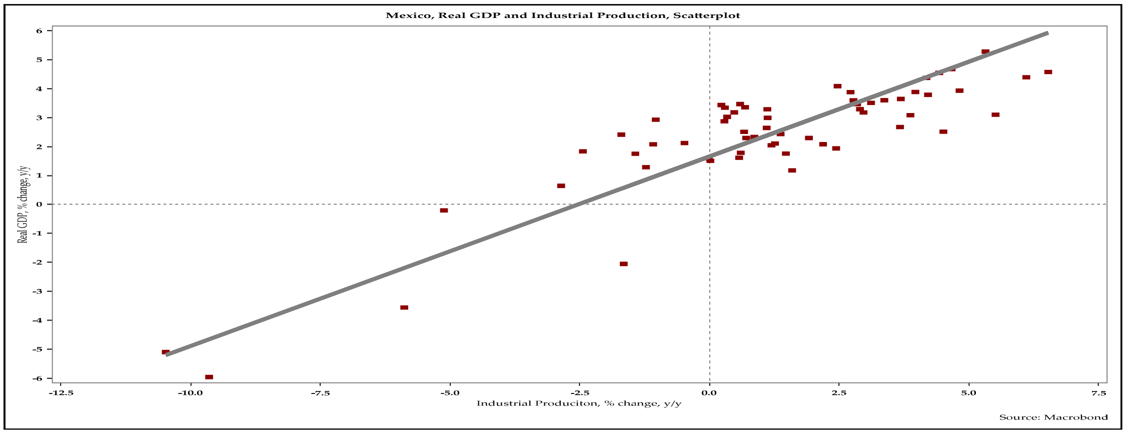
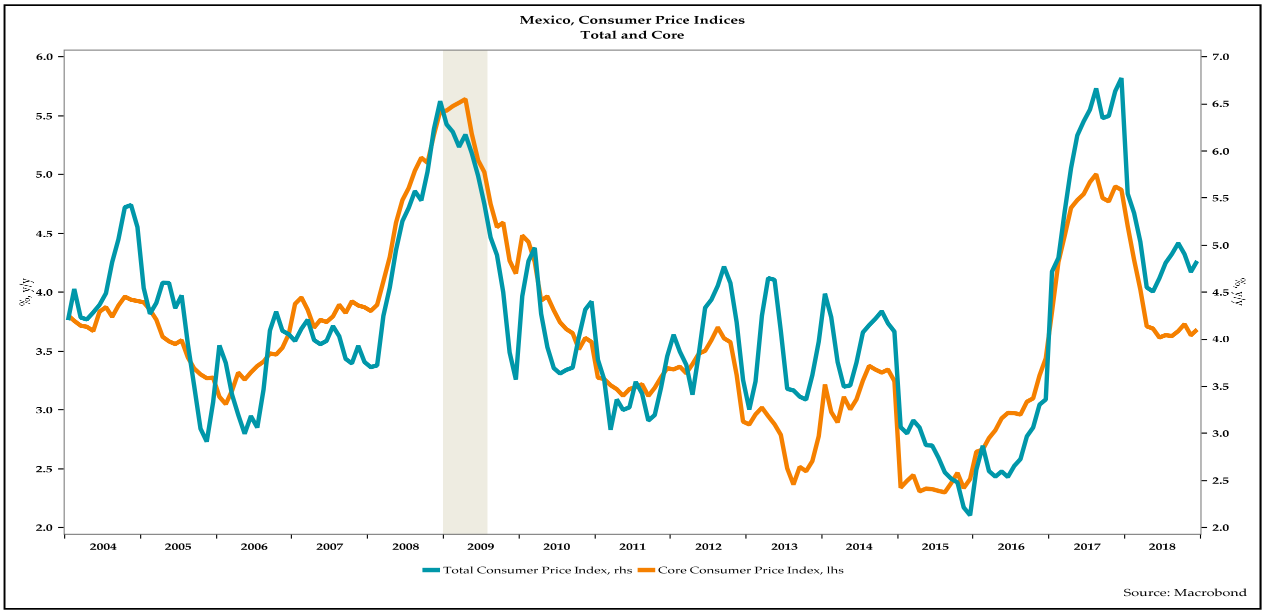


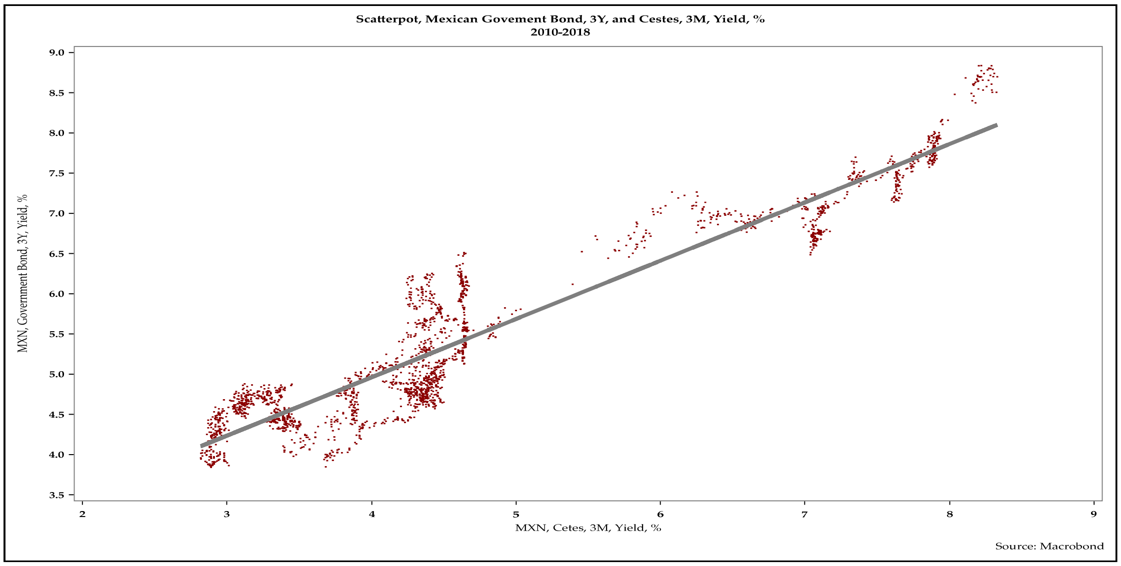
Figure 5 presents the evolution of inflation in Mexico as measured by year-over-year changes in the indices of total consumer price inflation and core consumer price inflation. It is clear that total inflation tends to be more volatile than core inflation. The pace of inflation rose in the years prior to the global financial crisis but fell in the years after the crisis. Inflation rose sharply in early 2017 but partly abated in mid-2018.

Figure 5. The Evolution of Total and Core Consumer Price Index Inflation in Mexico, 2004–18



The figures below display several scatterplots. Figure 6 is a scatterplot of the yields of 3-year MGBs and 3-month Cetes.[1] Figure 7 is a scatterplot of the year-over-year percentage point change in the yields of 3-year MGBs and 3-month Cetes. Figure 8 is a scatterplot of the yields of 5-year MGBs and 3-month Cetes. Figure 9 is a scatterplot of the year-over-year percentage point change in the yields of 5-year MGBs and 3-month Cetes. Figure 10 is a scatterplot of the yields of 10-year MGBs and 3-month Cetes. Figure 11 is a scatterplot of the year-over-year percentage point change in the yields of 10-year MGBs and 3-month Cetes.

Figure 6. Scatterplot of the Yields of 3-year Mexican Government Bonds and 3-month Cetes, 2010–18



[1] The *Certificados de la Tesorería de la Federación* (Certificates of the Federal Treasury) are debt instruments issued by the Mexican federal government. These are widely known as "Cetes." These securities are zero-coupon bonds that are traded at a discount below their face value. These securities do not pay any interest and are settled at their face value at their maturity date. Typically their maximum term is 12 months.

Figure 7. Scatterplot of the Year-over-Year Percentage Point Changes in the Yields of 3-year Mexican Government Bonds and 3-month Cetes, 2011–18

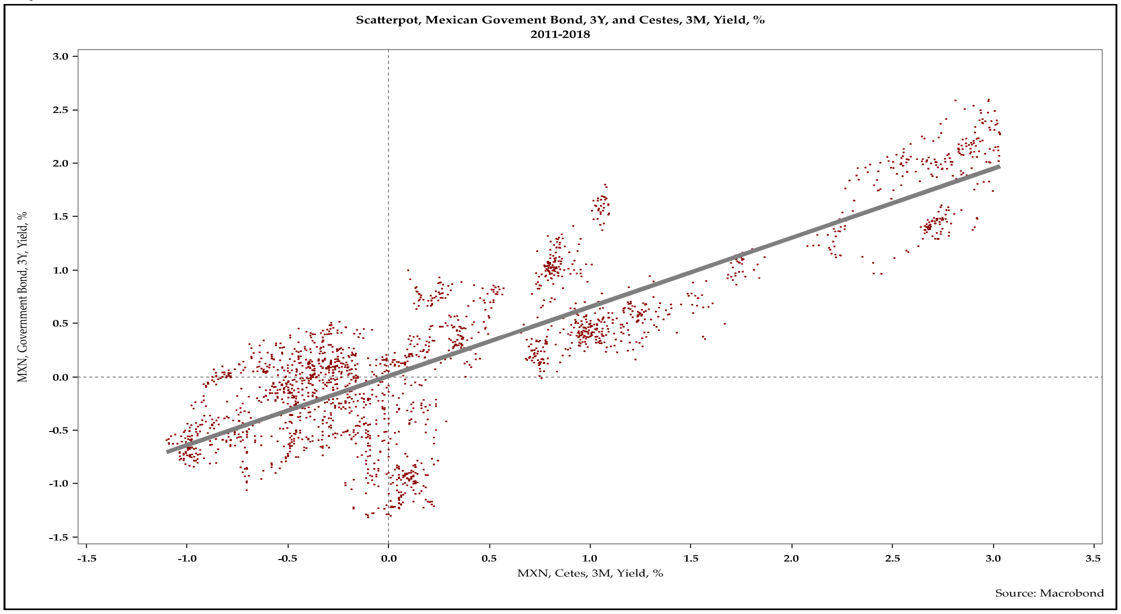


Figure 8. Scatterplot of the Yields of 5-year Mexican Government Bonds and 3-month Cetes, 2004–18

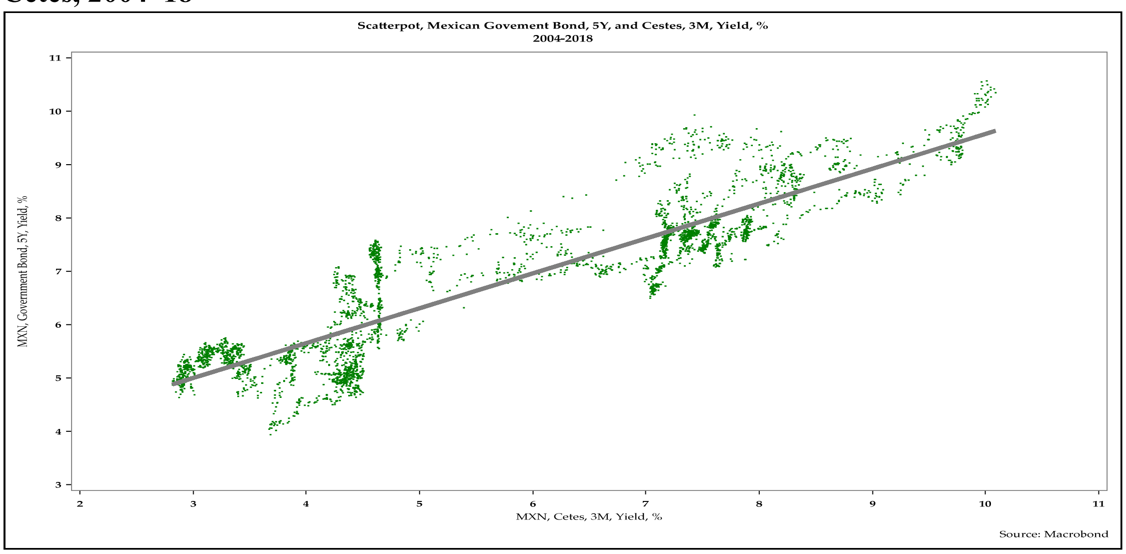


Figure 9. Scatterplot of the Year-over-Year Percentage Point Changes in the Yields of 5-year Mexican Government Bonds and 3-month Cetes, 2005–18

Figure 10. Scatterplot of the Yields of 10-year Mexican Government Bonds and 3-month Cetes, 2004–18

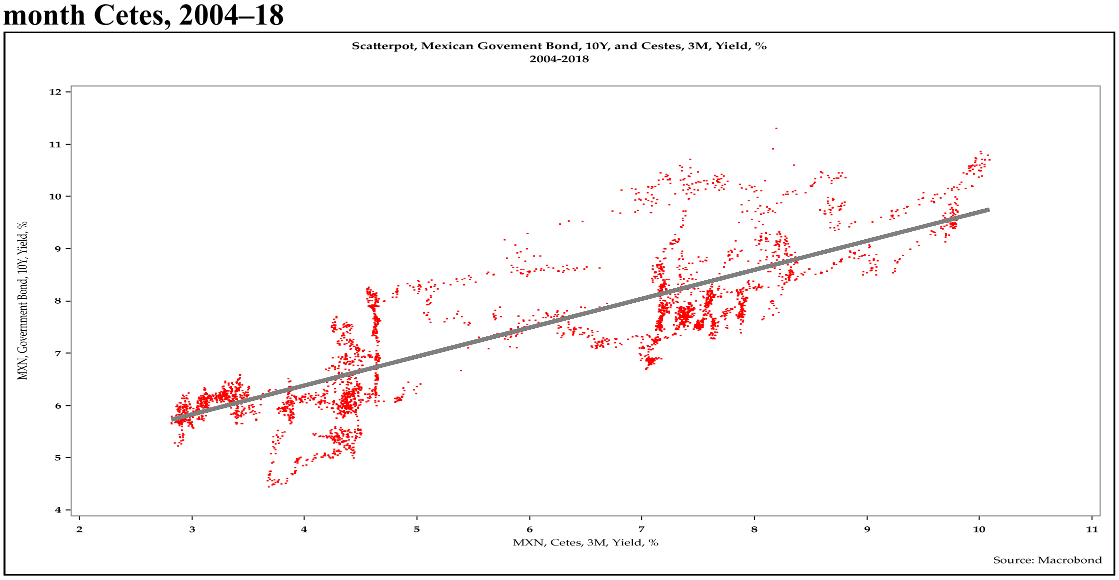
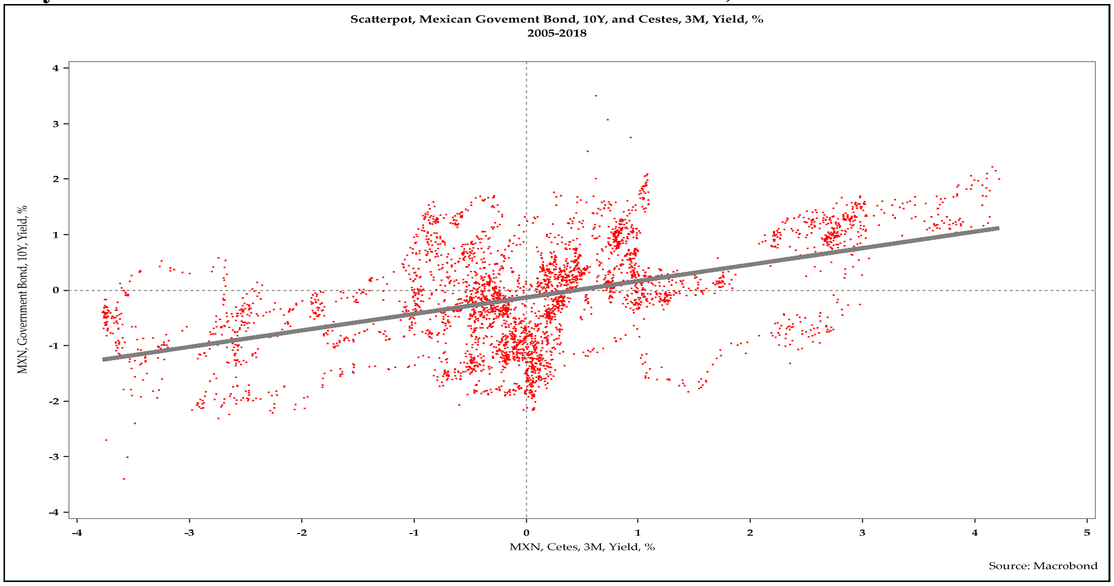


Figure 11. Scatterplot of the Year-over-Year Percentage Point Changes in the Yields of 10-year Mexican Government Bonds and 3-month Cetes, 2005–18



The scatterplots of the yields of MGBs of various tenors, 3-month Cetes, and the year-over-year percentage point changes of these yields reveal some interesting patterns. First, there is a fairly strong positive correlation between the levels of the yields of MGBs of various tenors and 3-month Cetes. Second, there is also a positive correlation between the year-over-year percentage point changes in the yields of MGBs of various tenors and 3-month Cetes but theses correlations are weaker than that of the correlations in the levels of yields. Third, the correlations between the levels of MGBs' and 3-month Cetes' yields and between the year-over-year percentage point changes of MGBs' and 3-month Cetes' yields become less strong with the increase of the MGBs' maturity tenor.

IV. DATA

Table 1 below summarizes the data and variables used in the paper. The first column gives the variable labels. The second column describes the data and provides the date range. The third column provides the original frequency of the data and states whether it has been converted to monthly frequency. The final column lists the sources of the data.

The paper uses data on short-term interest rates, as measured by the yields of Mexican Cetes with a maturity between 1–12 months. It also uses data on long-term interest rates, as measured by the yields of MGBs of various maturity tenors across the yield curve from 3 to 10 years. For inflation, it relies on two measures as reflected in the total consumer price index and the core consumer price index, both measured a year-over-year percentage change basis. The indicator of economic activity is based on the index of industrial production and real GDP, measured in year-over-year percentage change.

The time period covered in this paper is from January 2004 to December 2018, covering 204 months. Monthly data are used in the empirical analysis. The daily data from the bond market are converted to monthly frequency.

Table 1. Summary of the Data and the Variables

Variable labels	Data description, date range	Frequency	Sources
Short-term interest rates			
CETES1M	Mexican Cetes, 1-month, yield, %, January 2014 – December 2018	Daily; converted to monthly	Banco de Mexico; Macrobond
CETES3M	Mexican Cetes, 3-month, yield, %, January 2014 – December 2018	Daily; converted to monthly	Banco de Mexico; Macrobond
CETES6M	Mexican Cetes, 6-month, yield, %, January 2014 – December 2018	Daily; converted to monthly	Banco de Mexico; Macrobond
CETES12M	Mexican Cetes, 12-month, yield, %, January 2014 – December 2018	Daily; converted to monthly	Banco de Mexico; Macrobond
Government bond yields			
MGB3Y	Mexican government bonds, 3-year, yield, %, January 2014 – December 2018	Daily; converted to monthly	Macrobond
MGB5Y	Mexican government bonds, 5-year, yield, %, January 2014 – December 2018	Daily; converted to monthly	Macrobond
MGB10Y	Mexican government bonds, 10-year, yield, %, January 2014 – December 2018	Daily; converted to monthly	Macrobond
Rate of core inflation			
TCPI	Consumer price index, total, index, % change, y/y, January 2014 – December 2018	Monthly	National Institute of Geography and Statistics; Macrobond
CCPI	Consumer price index, core, index, % change, y/y, January 2014 – December 2018	Monthly	National Institute of Geography and Statistics; Macrobond
Pace of economic activity			
IP	Industrial production, SA, index, % change, y/y, January 2014 – December 2018	Monthly	National Institute of Geography and Statistics; Macrobond

V. EMPIRICAL MODELS AND INTERPRETATION OF THE FINDINGS

Methodology

This paper uses the autoregressive distributed lag (ARDL) approach to model the dynamics of MGB yields. It will be explained below why this modeling choice is appropriate given the unit root properties of the time series data. To run an ARDL model several basic steps need to be completed.

First, unit root tests are performed to test for stationarity. Unit roots tests are conducted for each series. Tables 2a and 2b show that all the independent variables and dependent variables, except IP, are nonstationary at levels but stationary at first difference. These variables are a mix of both I(0) and I(1). None of the variables are I(2). This suggests that it is appropriate to use an ARDL approach to model the dynamic relations between these variables.

Second, cointegration tests are applied to determine if there is a long-run relationship between the variables. Bound tests, based on the Pesaran, Shin, and Smith (2001), are deployed to check the long-run relationships among the variables. Table 3 shows that the null hypothesis of no long-run relationship between the variables can be rejected for most models.

Third, the long-run equilibrium relationship and multivariate short-run dynamic error correction models are estimated. These models testify there is a relationship between MGB yields and the short-term interest rate in both the long run and the short run.

Unit Root Tests

The stationarity properties in the time series are established by executing the following unit root tests: (1) the Augmented Dickey-Fuller (ADF) (Dickey and Fuller 1981) and (2) Phillips-Perron (PP) (Phillips and Perron 1988) tests. The tests are executed on levels and the first difference forms for each variable. Table 2a shows the unit root test results.[2] Table 2b displays the unit root tests for the first differences for the same variables. It is evident from tables 2a and 2b that most of the variables are nonstationary in their levels but are stationary

[2] Phillips and Perron unit root tests are also conducted. The results yield identical conclusions. The results are provided in appendix A.

in their first differences. CETES3M, MGBs, TCPI, and CCPI are I(1) at the 1 percent level of significance. However, IP is stationary both in level and first difference forms at a 5 percent level of significance. Thus, the unit root tests show that there is a mixture of I(1) and I(0) processes among the variables that will be used in the model(s). Therefore, the bounds testing approach is more appropriate than the Johansen cointegrating approach for analyzing long-run behavior.

Table 2a. Augment Dickey-Fuller Unit Root Tests under Different Specifications in Level

Variable	Type	Test Stat
CETES1M	Drift	-1.560
	Trent	-1.181
	No constant	-0.305
CETES3M	Drift	-1.628
	Trent	-1.250
	No constant	-0.374
CETES6M	Drift	-1.403
	Trent	-0.888
	No constant	-0.233
CETES12M	Drift	-1.267
	Trent	-0.777
	No constant	-0.116
MGB3Y	Drift	0.101
	Trent	-1.203
	No constant	0.749
MGB5Y	Drift	-1.460*
	Trent	-1.180
	No constant	-0.064
MGB10Y	Drift	-1.642
	Trent	-1.409
	No constant	-0.209
TCPI	Drift	-1.416
	Trent	-1.226
	No constant	-0.051
CCPI	Drift	-2.088
	Trent	-1.996
	No constant	0.018
IP	Drift	-2.100**
	Trent	-2.138**
	No constant	-2.082**

Note: * and ** indicate statistical significance at the 10 percent and 5 percent levels, respectively.

Table 2b. Augmented Dickey-Fuller Unit Root Test under Different Specifications in Their First Difference

Variable	Types	Test statistic	Integration order
ΔCETES1M	Drift	-3.929***	I(1)
	Trent	-4.025***	I(1)
	No constant	-3.932***	I(1)
ΔCETES3M	Drift	-4.039***	I(1)
	Trent	-4.197***	I(1)
	No constant	-4.059***	I(1)
ΔCETES6M	Drift	-4.243***	I(1)
	Trent	-4.442***	I(1)
	No constant	-4.262***	I(1)
ΔCETES12M	Drift	-5.055***	I(1)
	Trent	-5.267***	I(1)
	No constant	-5.078***	I(1)
ΔMGB3Y	Drift	-11.540***	I(1)
	Trent	-12.330***	I(1)
	No constant	-11.522***	I(1)
ΔMGB5Y	Drift	-13.980***	I(1)
	Trent	-14.020***	I(1)
	No constant	-14.020***	I(1)
ΔMGB10Y	Drift	-13.040***	I(1)
	Trent	-13.070***	I(1)
	No constant	-13.080***	I(1)
ΔTCPI	Drift	-4.744***	I(1)
	Trent	-4.772***	I(1)
	No constant	-4.754***	I(1)
ΔCCPI	Drift	-4.450***	I(1)
	Trent	-4.528***	I(1)
	No constant	-4.447***	I(1)
ΔIP	Drift	-6.419***	I (0)/ I(1)
	Trent	-6.386***	I (0)/ I(1)
	No constant	-6.418***	I (0)/ I(1)

Note: *** indicates statistical significance is at the 1 percent level.

Bounds Tests

The general form of the ARDL models used in this paper are as follows:

$$MGB10Y_t = a_0 + a_1 t + \sum_{i=1}^{P} a_{2i} MGB10Y_{t-i} + \sum_{j=0}^{J} a_{3j} CETES3M_{t-j} + \sum_{k=0}^{K} a_{4k} CCPI_{t-k} + \sum_{l=0}^{L} a_{5k}\, IP_{t-l} + \varepsilon_t \qquad [6a]$$

$$MGB10Y_t = b_0 + b_1 t + \sum_{i=1}^{I} b_{2i} MGB10Y_{t-i} + \sum_{j=0}^{J} b_{3j} CETES3M_{t-j} + \sum_{k=0}^{K} b_{4k} TCPI_{t-k} + \sum_{l=0}^{L} b_{5l}\, IP_{t-l} + \varepsilon_t \qquad [6b]$$

where $P \geq 1$; $J, K,$ and $L \geq 0$. Here equation [6a] has CCPI as a regressor, while equation [6b] has TCPI as a regressor.

In this paper the conditional error correction forms of a general ARDL model are as follows:

$$\Delta MGB10Y_t = c_0 + c_1 t + \sum_{i=1}^{P} c_{2i} \Delta MGB10Y_{t-i} + \sum_{j=0}^{J} c_{3j} \Delta CETES3M_{t-j} + \sum_{l=0}^{K} c_{4k} \Delta CCPI_{t-k} + \sum_{l=0}^{L} c_{5l}\, \Delta IP_{t-l} + \varepsilon_t \quad \ldots\ldots \qquad [7]$$

$$\Delta MGB10Y_t = d_0 + d_1 t + \sum_{i=1}^{P} d_{2i} \Delta MGB10Y_{t-i} + \sum_{j=0}^{J} d_{3j} \Delta CETES3M_{t-j} + \sum_{k=0}^{K} d_{4k} \Delta TCPI_{t-k} + \sum_{l=0}^{L} d_{5l}\, \Delta IP_{t-l} + \varepsilon_t \quad \ldots\ldots \qquad [8]$$

where equation [7] has CCPI as a regressor, while equation [8] has TCPI as a regressor. Other independent variables are the same. The order of the lags (P, J, K, L) in the bounds testing procedure are selected using the Akaike information criterion (AIC). Since the data series are monthly, the maximum number of lags is set equal to 24 months. The null (H_0) hypothesis is no cointegration among variables, while the alternative (H_a) hypothesis is that there is cointegration among the variables.

Based on the assumptions made by Pesaran, Shin, and Smith (2001), five models are specified for the cointegrating bounds test (see table 3):

- Model 1: contains no intercepts and no trends
- Model 2: contains restricted intercepts and no trends
- Model 3: contains unrestricted intercepts and no trends
- Model 4: contains unrestricted intercepts and restricted trends
- Model 5: contains unrestricted intercepts and unrestricted trends

According to Pesaran, Shin, and Smith (2001), the null hypothesis cannot be rejected if the calculated F-statistic is less than the critical value for lower-bound regressors and the null is rejected if the calculated F-statistic is higher than the critical value for upper-bound regressors. Similarly, the null hypothesis cannot be rejected if the calculated t-statistic is higher than the critical value for lower-bound regressors, but it is rejected if the calculated t-statistic is lower than the critical value for upper-bound regressors. Table 3 for model 1 shows the calculated and critical values of the F-statistic and t-statistic based on the bounds test.[3]

From table 3, for model 1, F-values are lower than critical values for each level of significance test, while calculated t-values are higher than the critical t-values for each level of significance tests. The findings concerning model 1 are inconclusive about any long-run relation because one cannot reject the null hypothesis of no level cointegration. However, for models 2–5, the F-values are in between the upper and lower bound of critical F-values at 1 percent significance, while the calculated F-values are higher than the upper bound of F-values at the 5 percent and 10 percent significance levels. Hence, the null hypothesis of no level relationship in the long run can be rejected. Besides the F-test, the t-value from the bounds test also confirms the validity of the long-run level relationship among the variables.

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[3] Pesaran, Shin, and Smith (2001) shows that a long-run association is present among the variables if the calculated F-values are greater than the value of the upper bound; no long-run association exists if the calculated F-statistic's value is less than the lower-bounds value and the decision is inconclusive if the calculated F-statistic's value falls between the lower- and upper-bounds value. If the calculated F-value is higher than the upper-bound value, there is cointegration. If the calculated F-statistic is lower than the lower-bound critical value, then there is no cointegration. Hence, there is no long-run relationship.

From table 3 it is evident that, except model 1, all the models are showing that the calculated F-statistics is higher than the critical value for upper bounds at a 5 percent significance level. Therefore, the evidence suggest that theses variables possess a long-run relationship.

Except for model 1, all other models have a calculated t-value higher than critical t-values at the 5 percent and 10 percent significance levels. Therefore, there is evidence of a long-run cointegrating relationship among the variables in most models under consideration.

With the confirmation of the long-run equilibrium relationship among MGB10Y yields, the short-term interest rate, core inflation, and the growth of industrial production, a dynamic multivariate vector error correction (VEC) model is estimated.

Table 3. Pesaran, Shin, and Smith (2001) Bounds Test for MGB10Y

		Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 5**	
		F	**t**	**F**	**t**	**F**	**t**	**F**	**t**	**F**	**t**
Test statistic		1.802	-1.610	4.533	-4.188	5.652	-4.188	4.635	-4.071	5.455	-4.071
Critical values											
10 percent	Lower bound	2.023	-1.615	2.398	-2.558	2.742	-2.558	2.987	-3.120	3.492	-3.120
	Upper bound	3.106	-2.981	3.223	-3.424	3.790	-3.424	3.781	-3.825	4.489	-3.825
5 percent	Lower bound	2.469	-1.943	2.814	-2.863	3.258	-2.863	3.444	-3.415	4.063	-3.415
	Upper bound	3.655	-3.322	3.704	-3.755	4.393	-3.755	4.301	-4.148	5.14	-4.148
1 percent	Lower bound	3.469	-2.578	3.724	-3.454	4.393	-3.454	4.437	-3.992	5.305	-3.992
	Upper bound	4.840	-3.962	4.736	-4.381	5.688	-4.381	5.408	-4.764	6.531	-4.764
p-value	Lower bound	0.140	0.101	0.002	0.001	0.002	0.001	0.007	0.008	0.008	0.008
	Upper bound	0.415	0.552	0.014	0.017	0.010	0.017	0.031	0.060	0.035	0.060

Note 1: H_0: no level relationship.
Note 2: Dependent variable is MGB10Y and independent variables are CETES3M, CCPI, and IP.
Note 3: Model 1: no intercept and no trend; Model 2: restricted intercept and no trend; Model 3: unrestricted and no trend; Model 4: unrestricted intercept and trend; and Model 5: unrestricted intercept and trend.

A dynamic VEC model is used for estimating short-run coefficients by restricting long-run relationships through the cointegrating equations. The error correction term gives the speed of adjustment. The error correction term shows how long-run equilibrium is achieved over time from a short-run deviation.[4]

Tables 4a and 4b present the estimation of VEC models using the cointegrating bounds test. Table 4a presents the long-run coefficients of the estimated models, while table 4b presents the short-run coefficients and the adjustment coefficients from short-run to long-run equilibrium for the same models.

Table 4a. Long-run Coefficients of Models Using the ARDL Technique for MGB10Y

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
CETES3M	0.572^{***}	0.551^{***}	0.551^{***}	0.429^{***}	0.429^{***}
	(0.0907)	(0.1530)	(0.1530)	(0.1200)	(0.1200)
CCPI	-0.172	-0.159	-0.159	-0.0378	-0.0378
	(0.1940)	(0.3300)	(0.3300)	(0.2200)	(0.2200)
IP	-0.156^{*}	-0.198	-0.198	-0.179^{*}	-0.179^{*}
	(0.0681)	(0.1210)	(0.1210)	(0.0778)	(0.0778)
Trend				-0.010^{*}	
				(0.0042)	
Constant		4.921^{***}			
		(1.3150)			
N	171	177	177	177	177
Adj. R^2	0.308	0.293	0.293	0.305	0.305

Note 1: Standard errors in parentheses, $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.
Note 2: Dependent variable is MGB10Y and independent variables are CETES3M, CCPI, and IP.
Note 3: Model 1: no intercept and no trend; Model 2: restricted intercept and no trend; Model 3: unrestricted and no trend; Model 4: unrestricted intercept and trend; and Model 5: unrestricted intercept and trend.

[4] The short-run relation can be found from the ARDL model using the following equation:

$$\Delta MGB10Y_t = \gamma_0 + \sum_{i=1}^{P} \gamma_{1i} \Delta MGB10Y_{t-i} + \sum_{j=0}^{J} \gamma_{2j} \Delta CETES3M_{t-j} + \sum_{k=0}^{K} \gamma_{3l} \Delta CCPI_{t-k} + \sum_{l=0}^{L} \gamma_{4l}\, \Delta IP_{t-l} + \varepsilon_t$$

Table 4b. Short-run and Error Correction Coefficients Using the ARDL Technique Using Equation [7]

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Speed of adjustment					
MGB10Y (-1)	-0.139***	-0.084**	-0.084**	-0.128***	-0.128***
	(0.033)	(0.030)	(0.030)	(0.037)	(0.037)
Short-run dynamics					
ΔCETES3M	0.730***	0.781***	0.781***	0.823***	0.823***
	(0.105)	(0.010)	(0.010)	(0.101)	(0.101)
ΔCETES3M (-1)	-0.333**	-0.359***	-0.359***	-0.291**	-0.291**
	(0.101)	(0.010)	(0.010)	(0.105)	(0.105)
ΔCETES3M (-2)	-0.149				
	(0.105)				
ΔIP	0.028			0.027	0.027
	(0.017)			(0.017)	(0.017)
Trend					-0.001
					(0.001)
Constant	0.658***		0.412*	1.368*	1.368*
	(0.178)		(0.163)	(0.553)	(0.553)
N	171	177	177	177	177
Adj. R^2	0.308	0.293	0.293	0.305	0.305
ARDL Lag structure	(1 3 0 1)	(1 3 0 1)	(1 3 0 1)	(1 3 0 1)	(1 3 0 1)

Note 1: Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Note 2: ADJ presents the adjustment coefficients and short-run presents the short-run coefficients.
Note 3: Dependent variable is MGB10Y and independent variables are CETES3M, CCPI, and IP.

From table 4a, for all five models, the main variable of concern, namely, the short-term interest rate (CETES3M), is positively related to MGB10Y. The estimated elasticity ranges from 0.42 to 0.57. This indicates that a 1 percentage point increase in the short-term interest rate is associated with a long-run increase of around 42 to 57 basis points in MGB10Y's yield. The core consumer price inflation and the growth of industrial production are negatively correlated with MGB10Y yields. The estimated elasticities range from 0.037 to 0.172 and 0.15 to 0.19, respectively, for core inflation and the growth of industrial production.

Most of the empirical results obtained are in concordance with the Keynesian hypothesis that the short-term interest rate is the main driver of the long-term interest rate. The results show that a higher (lower) short-term interest rate leads to a higher (lower) long-term yield on MGBs. The findings concerning the effect of the rate of inflation and the growth of industrial production are somewhat counterintuitive, but there are plausible economic and econometric explanations.

The results show that an increase (decrease) in the rate of core inflation is associated with a lower (higher) MGB yield. The results also show that as the growth of industrial production increases (decreases), long-term MGB yields fall (rise). If the BdM's policy actions are motivated by a Taylor-type rule, then it responds by raising (lowering) the policy rate due to incoming information about either observed inflationary pressures and/or expectations of higher inflation. The short-term interest rate changes with BdM's policy actions. Thus, the effect of core inflation on a government bond yield is negative rather than positive, after controlling for the short-term interest rate.

Likewise, if the BdM raises (lowers) the policy rate because of the strength (weakness) of industrial production, the effect of industrial production's growth on government bond yields could be negative rather than positive. The collinearity between the short-term interest rate and other relevant variables, such as inflation and the growth of industrial production, may also explain the apparent anomalies.

The coefficients of the error correction term in the long-term interest rate equation are significant at the 1 percent level with the expected negative sign (table 4b). This confirms the results of the bounds test for cointegration. The coefficients of the error correction term range from 0.083 to 0.139. This implies that about 11 percent (8–14 percent) of the disequilibria caused by shocks on the short-term interest rate, inflation, and the growth of industrial production are corrected within a span of one month. The results of the short-run error correction model are presented in the panel of short-run coefficients in table 4b. Most of the short-run coefficients are significant, except for a few lagged differences in the short-term interest rates. The signs of the short-run dynamic impacts are consistent with the long-run results.

Diagnostic tests are conducted to assess misspecifications, autocorrelations, and heteroscedasticity. The results are shown in table 5 below.

Table 5. Parameter Stability Test for MGB10Y Using Equation [7]

	Model 1	Model 2	Model 3	Model 4	Model 5
a. Breusch-Pagan test for heteroscedasticity					
chi2	0.090	0.170	0.170	0.130	0.130
p-value	0.761	0.684	0.684	0.716	0.716
b. Breusch-Godfrey test for autocorrelation					
chi2	0.058	0.091	0.091	0.407	0.407
p-value	0.810	0.764	0.764	0.523	0.523
c. Ramsey RESET test					
F- statistic		0.890	0.890	0.580	0.580
Prob > F		0.4469	0.4469	0.6298	0.6298
d. Structural Break: Unknown break date					
wald	15.132	25.278	25.278	21.183	21.183
p-value	0.2284	0.0501	0.0501	0.1634	0.1634
Break Date	2008m6	2008m6	2008m6	2008m3	2008m3
e. Normality Test: Jarque-Bera test					
Chi2	3.563	5.390	5.390	2.513	2.513
p-value	0.1683	0.0676	0.0676	0.2846	0.2446

First, the Breusch-Pagan test of heteroscedasticity is implemented.[5] The p-values are higher than 0.10 for all five models. This implies the failure to reject the null hypothesis of homoscedasticity (panel [a] in table 5).

Second, the Breusch-Godfrey Lagrange multiplier test of autocorrelation in the residuals is implemented. The null hypothesis is that there is no autocorrelation. The results from the multiplier test (panel [b] in table 5) show that for all models the null hypothesis of no autocorrelation cannot be rejected.

Third, the Ramsey RESET test is used to check for the omitted-variable bias, where the null hypothesis is that the model has no omitted variables. Panel (c) of table 5 shows that the model does not have an omitted-variable bias since the p-value is higher than the usual threshold of 0.05 (95 percent significance). The null hypothesis of omitted-variable bias or misspecification of the functional form cannot be rejected. Hence, additional variables are not required in the model.

[5] If the p-value is below a certain threshold (common choices are 0.01, 0.05, and 0.10) then there is sufficient evidence to say that heteroscedasticity is present.

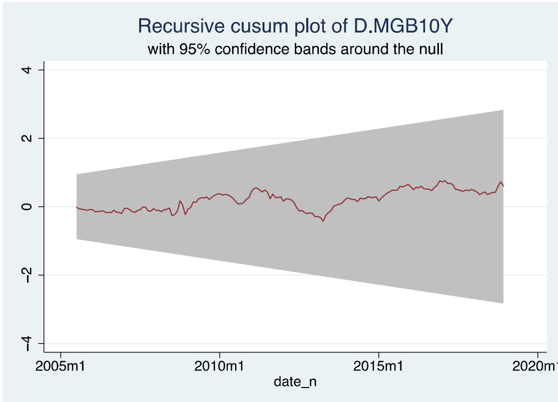
Fourth, panel (d) of table 5 presents structural break tests. The null hypothesis of no structural break in the intercept when there is no break in any other coefficient in all the models cannot be rejected.

Fifth, the cumulative sum of residuals (CUSUM), proposed by Brown, Durbin, and Evans (1975), is employed to investigate the stability of the estimated coefficients attached to the cointegrating vector and the error correction terms. Figure 12 plots the recursive CUSUM to detect if there are any signs of the structural break. These figures show that CUSUM statistics are within the 95 percent confidence bands. This implies that there is no evidence of any statistically significant breaks. Figures showing the cumulative of squared residuals (CUSUMSQ) for the same models are available upon request.

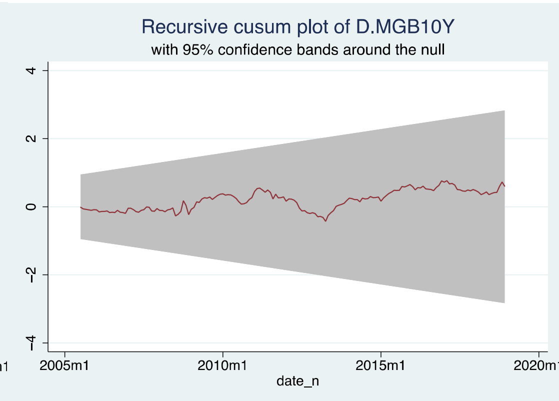
Finally, panel (e) of table 5 presents the normality test for residuals based on the Jarque-Bera (JB) test. The null hypothesis is that the residuals are normally distributed. From panel (e) it is evident that for all the models the null hypothesis that the residuals are normally distributed cannot be rejected, as the p-value is larger than 0.05. Therefore, it is concluded that there is no violation of the error term's normal distribution. Figure 13 presents the density plots of the residuals for all the models, which gives a visual representation of the residuals. These figure shows that the residuals appear to be normally distributed.

Figure 12. Cumulative Sum of Residuals Test for Parameter Stability

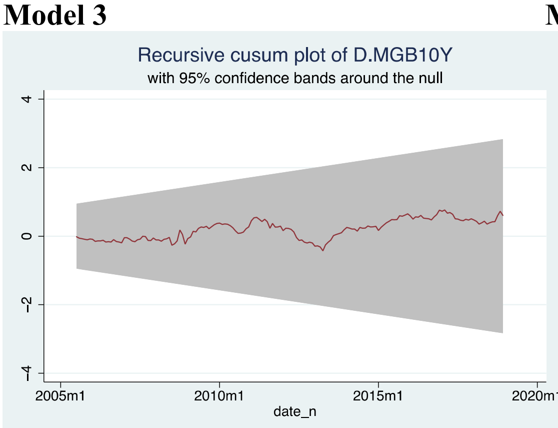
Model 1



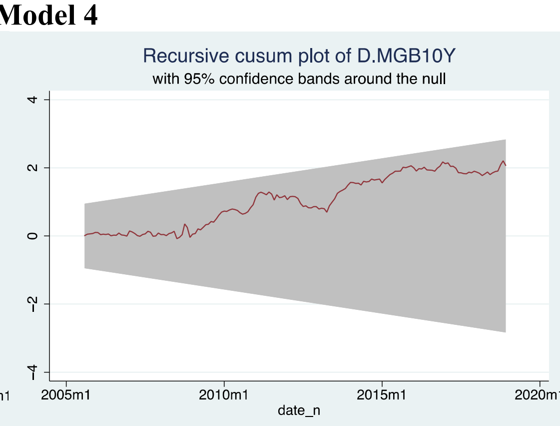
Model 2



Model 3



Model 4



Model 5

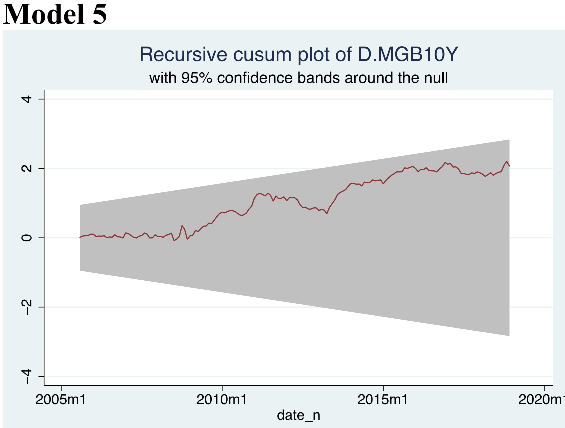
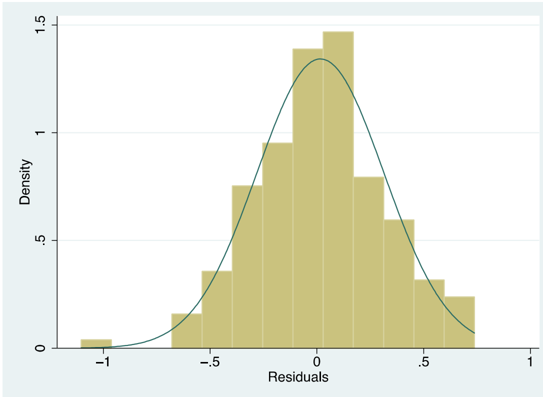
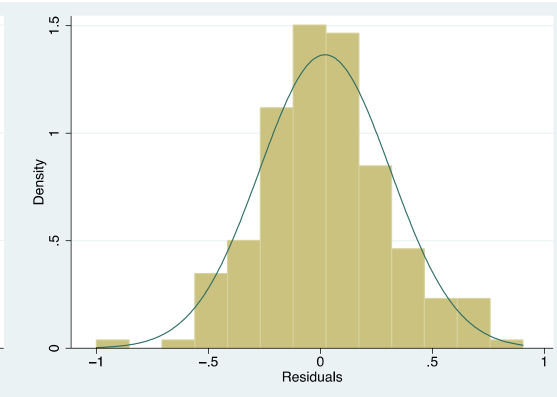


Figure 13. Residual-based Normality Plots for MGB10Y, CETES3M, CCPI, and IP

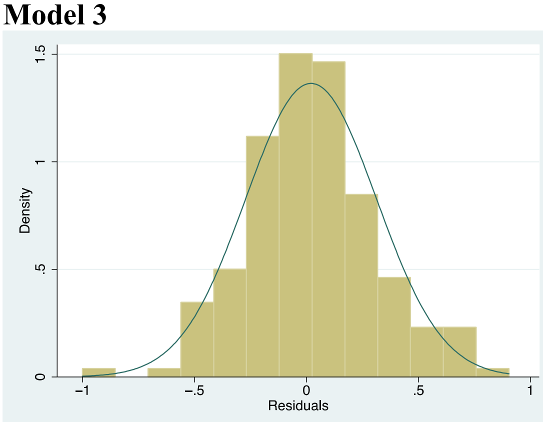
Model 1



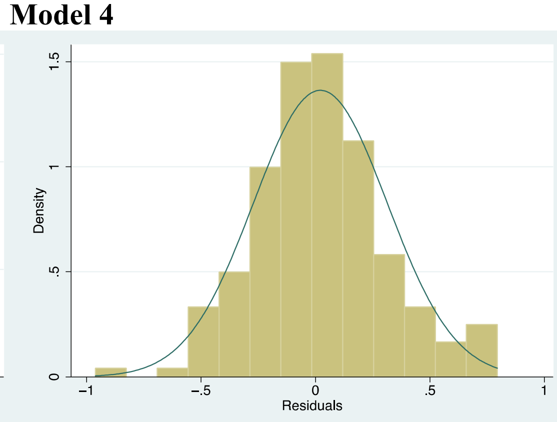
Model 2



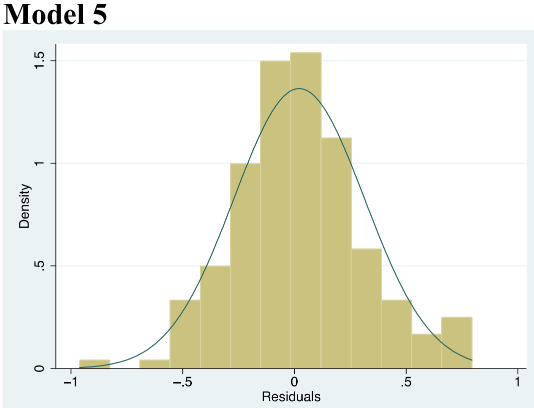
Model 3



Model 4



Model 5



Robustness Check: Using MGB5Y as a Dependent Variable

In order to check the estimation's robustness, bond yields of a different maturity tenor (namely, MGB5Y instead of MGB10Y) will be used to estimate the model while keeping all the independent variables same as before.[6] The following regression for MGB5Y using an ARDL model is estimated:[7]

$$MGB5Y_t = \varphi_0 + \beta\varphi_1 t + \sum_{i=1}^{P}\varphi_{2i}MGB5Y_{t-i} + \sum_{j=0}^{J}\gamma\varphi_{3j}CETES3M_{t-j} + \sum_{k=0}^{K}\gamma\varphi_4 lCCPI_{t-k} + \sum_{l=0}^{L}\gamma\varphi_{5l}IP_{t-l} + \varepsilon_t \quad \ldots\ldots\ldots \quad [9]$$

From table 6 in model 1, the F-value is in between the upper and lower bound of critical F-values at the 1 percent of level of significance, while the calculated F-values are higher than the upper bound of F-values at the 5 percent and 10 percent significance levels, thus the null hypothesis of no level relationship in the long run can be rejected. For models 2–5, the calculated F-values are higher than the upper bound of F-values at the 1 percent, 5 percent, and 10 percent significance levels. Thus, one can reject the null hypothesis of no level relationship in the long run. Besides the F-test, the values of the t-statistic from the bounds test also confirm the evidence of a long-run level relationship among the variables. Except for model 1, all other variables have calculated t-values higher than critical t-values at the 5 percent and 10 percent significance levels.

Tables 7a and 7b present the estimation of VEC models using the cointegrating bounds test. Table 7a presents the long-run coefficients of the estimated models, while table 7b presents the short-run coefficients and the adjustment coefficients from the short- to long-run equilibrium for the same models. From table 7a, for all five models the main variable of concern—the short-term interest rate (CETES3M)—is positively related to the MGB5Y yield with an estimated elasticity ranging from 0.59 to 0.75. This indicates that a 1 percentage point increase in the short-term interest rate is associated with a long-run increase of around 59 to

[6] The robustness check is also conducted using an MGB of another maturity tenor, namely MGB3Y. Additional results using MGB3Y are provided in appendix B.

[7] For the long-run estimation, the following equation is used:

$$MGB5Y_t = d_0 + d_1\, MGB5Y_{t-1} + d_2 CETES3M_{t-1} + d_3 CCPI_{t-1} + d_4 IP_{t-1} + \eta_t$$

For the short-run estimation, the following equation is used:

$$\Delta MGB5Y_t = d_5 + \sum_{i=1}^{P} d_{6i}\Delta MGB5Y_{t-i} + \sum_{j=0}^{J} d_{7j}\Delta CETES3M_{t-j} + \sum_{l=0}^{K} d_{8k}\Delta CCPI_{t-k} + \sum_{k=0}^{L} d_{9l}\,\Delta IP_{t-l} + \varepsilon_t$$

75 basis points in MGB5Y yields. Core consumer price inflation and the growth of industrial production are negatively correlated (except for model 1) with the MGB5Y's yield with the estimated elasticities ranging from 0.097 to 0.616 and 0.14 to 0.44, respectively.

Table 6. Pesaran, Shin, and Smith (2001) Bounds Test for MGB5Y

		Model 1		Model 2		Model 3		Model 4		Model 5	
		F	t	F	t	F	t	F	t	F	t
Calculated value		4.052	-1.875	5.075	-3.299	6.312	-3.299	4.847	-4.428	5.916	-4.428
10 percent	Lower bound	2.003	-1.610	2.368	-2.539	2.711	-2.539	2.987	-3.120	3.492	-3.120
	Upper bound	3.111	-2.954	3.227	-3.394	3.792	-3.394	3.781	-3.825	4.489	-3.825
5 percent	Lower bound	2.447	-1.940	2.782	-2.846	3.225	-2.846	3.444	-3.415	4.063	-3.415
	Upper bound	3.663	-3.299	3.712	-3.730	4.400	-3.730	4.301	-4.148	5.14	-4.148
1 percent	Lower bound	3.444	-2.578	3.691	-3.443	4.357	-3.443	4.437	-3.992	5.305	-3.992
	Upper bound	4.863	-3.947	4.758	-4.364	5.710	-4.364	5.408	-4.764	6.531	-4.764
p-value	Lower bound	0.004	0.058	0.001	0.015	0.001	0.015	0.005	0.002	0.004	0.002
	Upper bound	0.030	0.430	0.006	0.119	0.005	0.119	0.023	0.025	0.021	0.025

Note 1: H_0: no level relationship.

Note 2: Dependent variable is MGB10Y and independent variables are CETES3M, CCPI, and IP.

Note 3: Model 1: no intercept and no trend; Model 2: restricted intercept and no trend; Model 3: unrestricted and no trend; Model 4: unrestricted intercept and trend; and Model 5: unrestricted intercept and trend.

Table 7a. Long-run Relationship between MGB5Y and CETES3M

	Model 1	Model 2	Model 3	Model 4	Model 5
CETES3M	0.745**	0.670***	0.670***	0.586***	0.586***
	(0.260)	(0.088)	(0.088)	(0.078)	(0.078)
CCPI	0.616	-0.0874	-0.0874	-0.0979	-0.0979
	(0.363)	(0.192)	(0.192)	(0.145)	(0.145)
IP	-0.445	-0.228**	-0.228**	-0.141**	-0.141**
	(0.324)	(0.082)	(0.082)	(0.047)	(0.047)
Trend				-0.004	
				(0.003)	
Constant		3.396***			
		(0.768)			
N	168	168	168	168	168
Adj. R^2	0.350	0.380	0.380	0.350	0.350

Note 1: Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Note 2: Dependent variable is MGB5Y and independent variables are CETES3M, CCPI, and IP.
Note 3: Model 1: no intercept and no trend; Model 2: restricted intercept and no trend; Model 3: unrestricted and no trend; Model 4: unrestricted intercept and trend; and Model 5: unrestricted intercept and trend.

Table 7b. Short-run Relationship between MGB5Y and CETES3M

	Model 1	Model 2	Model 3	Model 4	Model 5
Speed of adjustment					
MGB5Y(-1)	-0.047	-0.139**	-0.139**	-0.194***	-0.194***
	(0.0249)	(0.0420)	(0.0420)	(0.0438)	(0.0438)
Short-run dynamics					
ΔMGB5Y(1)	-0.199**	-0.166*	-0.166*		
	(0.0662)	(0.0668)	(0.0668)		
ΔMGB5Y(-2)	-0.216**	-0.188**	-0.188**		
	(0.0648)	(0.0648)	(0.0648)		
ΔMGB5Y(-3)	-0.105	-0.078	-0.078		
	(0.0685)	(0.0678)	(0.0678)		
ΔMGB5Y(-4)	-0.155*	-0.145*	-0.145*		
	(0.0653)	(0.0642)	(0.0642)		
ΔMGB5Y(-5)	-0.106	-0.111	-0.111		
	(0.0654)	(0.0652)	(0.0652)		
ΔMGB5Y(-6)	-0.176**	-0.153*	-0.153*		
	(0.0650)	(0.0642)	(0.0642)		
ΔMGB5Y(-7)	-0.099	-0.078	-0.078		
	(0.0653)	(0.0644)	(0.0644)		
ΔMGB5Y(-8)	-0.159*	-0.145*	-0.145*		
	(0.0654)	(0.0642)	(0.0642)		
ΔMGB5Y(-9)	-0.097	-0.104	-0.104		
	(0.0628)	(0.0618)	(0.0618)		
ΔCETES3M	0.950***	0.891***	0.891***	0.805***	0.805***
	(0.1070)	(0.1080)	(0.1080)	(0.1050)	(0.1050)
ΔCETES3M(-1)				-0.237*	-0.237*
				(0.1080)	(0.1080)
ΔIP		0.032	0.032	0.030	0.030
		(0.0171)	(0.0171)	(0.0170)	(0.0170)
Trend					-0.009
					(0.0006)
Constant			0.470*	1.274*	1.274*
			(0.1820)	(0.5040)	(0.5040)
N	168	168	168	168	168
Adj. R^2	0.350	0.380	0.380	0.350	0.350
ARDL Lag Structure	(9 1 0 0)	(9 1 0 1)	(9 1 0 1)	(9 2 0 1)	(9 2 0 1)

Note 1: Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Note 2: Dependent variable is MGB5Y and independent variables are CETES3M, CCPI, IP.
Note 3: Model 1: no intercept and no trend; Model 2: restricted intercept and no trend; Model 3: unrestricted and no trend; Model 4: unrestricted intercept and trend; and Model 5: unrestricted intercept and trend.

The coefficients of the error correction term in the long-term interest rate equation are significant at the 1 percent level with the expected negative sign (table 7b). This confirms the results of the bounds test for cointegration, except for model 1. The coefficients of the error correction term range from 0.139 to 0.194. This implies that about 16 percent (14–19 percent) of disequilibria caused by shocks to the short-term interest rate, inflation, and economic activity is corrected within one month. The results of the short-run error correction model are presented in the panel of short-run coefficients in table 7b. Most of the short-run coefficients are significant, except for a few lagged differences in short-term interest rates. The signs of the short-run dynamic impacts are consistent with the long-run results. It is evident from table 7b that models 1–3 include 9 lags in their different form, but no lags for independent variables; among the 9 lags, the 1st, 2nd, 4th, 6th, and 8th lags are statistically significant. Several diagnostic tests are presented in table 8 to assess misspecifications, autocorrelation, and heteroscedasticity in the estimated models.

Table 8. Parameter Stability Tests for MGB5Y Using Equation [9]

	Model 1	Model 2	Model 3	Model 4	Model 5
a. Breusch-Pagan test for heteroscedasticity					
chi2		1.690	1.690	0.810	0.810
Prob > chi2		0.1933	0.1933	0.3678	0.3678
b. Breusch-Godfrey test for autocorrelation					
chi2	0.004	0.445	0.445	0.067	0.067
Prob > chi2	0.94471	0.5047	0.5047	0.7964	0.7964
c. Ramsey RESET test					
F- statistic		0.620	0.620	0.570	0.570
Prob > F		0.6014	0.6014	0.6331	0.6331
d. Structural Break: Unknown break date					
wald	30.172	30.790	30.790	27.070	27.070
p-value	0.1160	0.1976	0.1976	0.0282	0.0282
Break date	2009m1	2009m1	2009m1	2011m8	2011m8
e. Normality: Jarque-Bera test					
JB test stat	41.610	32.700	32.700	28.570	28.570
P-value	0.0000	0.0000	0.0000	0.0000	0.0000

First, the Breusch-Pagan test of heteroscedasticity is implemented.[8] The p-values are higher than 0.10 for all five models. This implies that the null hypothesis of homoscedasticity (panel [a] in table 8) cannot be rejected.

Second, the Breusch-Godfrey Lagrange multiplier test of autocorrelation in the residuals is implemented. The null hypothesis is that there is no autocorrelation. The results from the multiplier test (panel [b] in table 8) show that for all models the null hypothesis cannot be rejected.

[8] If the p-value is below a certain threshold (common choices are 0.01, 0.05, and 0.10) then there is sufficient evidence to say that heteroscedasticity is present.

Third, the Ramsey RESET test is used to check for the omitted-variable bias, where the null hypothesis is that the model has no omitted variables. Panel (c) of table 8 shows that the model does not have an omitted-variable bias: the p-value is higher than the usual threshold of 0.05 (95 percent significance). Hence, the null hypothesis cannot be rejected. It reasonable to conjecture that there is no need to add more variables to the model.

Fourth, panel (d) of table 8 presents a structural break test. The results imply a failure to reject the null hypothesis of no structural break in the intercept when there is no break in any other coefficient in all the models.[9]

Finally, panel (e) of table 8 presents the normality test for residuals. The null hypothesis is that the residuals are normally distributed. From panel (e) it is evident that all the models suggest rejecting the null hypothesis, as the p-value is smaller than 0.05. Therefore, there is a violation of the normal distribution of the error terms.

Alternative Models Using Total Inflation

The analysis is checked using a model with *total* inflation instead of *core* inflation. For this alternative specification, the following equation is used to estimate the ARDL model, with MGB10Y as the dependent variable:

$$MGB10Y_t = \chi_0 + \chi_1 t + \sum_{i=1}^{P} \chi_{2i} MGB10Y_{t-i} + \sum_{j=0}^{J} \chi_{3j} CETES3M_{t-j} + \sum_{k=0}^{K} \chi_{3k} TCPI_{t-k} + \sum_{l=0}^{L} \chi_{4l} IP_{t-l} + \varepsilon_t \qquad [10]$$

Here total inflation, TCPI, is used instead of core inflation, CCPI, used earlier.

[9] In addition, the CUSUM and the CUSUMSQ tests are employed to investigate the stability of the estimated coefficients attached to the cointegrating vector and the error correction terms. Figures are available upon request. These results show that CUSUM and CUSUMSQ statistics are within the 95 percent confidence bands. This implies that there is no evidence of a statistically significant break.

Table 9. Pesaran, Shin, and Smith (2001) Bounds Test for MGB10Y based on Equation [5]

		Model 1		Model 2		Model 3		Model 4		Model 5	
		F	t	F	t	F	t	F	t	F	t
Calculated value		1.892	-1.810	2.522	-2.699	3.142	-2.699	3.594	-3.419	4.315	-3.419
10 percent	Lower bound	2.020	-1.615	2.405	-2.564	2.749	-2.564	2.985	-3.120	3.490	-3.120
	Upper bound	3.106	-2.977	3.219	-3.432	3.787	-3.432	3.778	-3.825	4.486	-3.825
5 percent	Lower bound	2.466	-1.943	2.820	-2.867	3.265	-2.867	3.441	-3.415	4.060	3.415
	Upper bound	3.655	-3.319	3.697	-3.761	4.387	-3.761	4.295	-4.147	5.134	-4.147
1 percent	Lower bound	3.464	-2.578	3.727	-3.456	4.396	-3.456	4.429	-3.991	5.297	3.991
	Upper bound	4.841	3.959	4.721	4.384	5.672	4.384	5.397	4.760	6.519	4.760
p-value	Lower bound	0.122	0.067	0.083	0.074	0.059	0.074	0.039	0.050	0.036	0.050
	Upper bound	0.382	0.471	0.249	0.318	0.199	0.318	0.126	0.206	0.119	0.206

Note 1: Dependent variable is MGB10Y and independent variables are CETES3M, TCPI, and IP.
Note 2: Model 1: no intercept and no trend; Model 2: restricted intercept and no trend; Model 3: unrestricted and no trend; Model 4: unrestricted intercept and trend; and Model 5: unrestricted intercept and trend.

Tables 10a and 10b present the estimation of VEC models using the cointegrating bounds test.

Table 10a. Long-run Regression for MGB10Y with CETES3M, TCPI, and IP

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
CETES3M	0.622	0.563^{**}	0.563^{**}	0.459^{***}	0.459^{***}
	(0.325)	(0.169)	(0.169)	(0.122)	(0.122)
TCPI	0.945	-0.255	-0.255	-0.218	-0.218
	(0.524)	(0.518)	(0.518)	(0.332)	(0.332)
IP	-0.199	-0.212	-0.212	-0.203^{*}	-0.203^{*}
	(0.258)	(0.138)	(0.138)	(0.089)	(0.089)
Trend				-0.009^{*}	
				(0.004)	
Constant		5.125^{**}			
		(1.651)			
N	171	177	177	177	177
Adj. R^2	0.249	0.293	0.293	0.307	0.307

Note 1: Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Note 2: Dependent variable is MGB10Y and independent variables are CETES3M, TCPI, and IP.
Note 3: Model 1: no intercept and no trend; Model 2: restricted intercept and no trend; Model 3: unrestricted and no trend; Model 4: unrestricted intercept and trend; and Model 5: unrestricted intercept and trend.

Table 10b. Short-run Adjustment Coefficients for ΔMGB10Y with ΔTCPI

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Speed of adjustment					
MGB10Y(-1)	-0.044	-0.081^{**}	-0.081^{**}	-0.126^{***}	-0.126^{***}
	(0.0241)	(0.0300)	(0.0300)	(0.0368)	(0.0368)
Short-run dynamics					
ΔCETES3M	0.768^{***}	0.780^{***}	0.780^{***}	0.822^{***}	0.822^{***}
	(0.1090)	(0.0999)	(0.0999)	(0.1010)	(0.1010)
ΔCETES3M(-1)	-0.360^{***}	-0.362^{***}	-0.362^{***}	-0.293^{**}	-0.293^{**}
	(0.1050)	(0.0996)	(0.0996)	(0.1050)	(0.1050)
ΔCETES3M(-2)	-0.152				
	(0.1090)				
ΔIP				0.0281	0.0281
				(0.0174)	(0.0174)
Trend					-0.001
					(0.0006)
Constant			0.415^{*}	1.430^{*}	1.430^{*}
			(0.1640)	(0.5570)	(0.5570)
N	171	177	177	177	177
Adj. R^2	0.249	0.293	0.293	0.307	0.307
ARDL Lag Structure	(1, 3, 0, 0)	(1,2,0,0)	(1,2,0,0)	(1,2,0,1)	(1,2,0,1)

Note 1: Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Note 2: Dependent variable is MGB10Y and independent variables are CETES3M, TCPI, and IP.
Note 3: Model 1: no intercept and no trend; Model 2: restricted intercept and no trend; Model 3: unrestricted and no trend; Model 4: unrestricted intercept and trend; and Model 5: unrestricted intercept and trend.

Table 10a presents the long-run coefficients of the estimated models, while table 10b presents the short-run coefficients and the adjustment coefficients from the short- to long-run equilibrium for the same models. From table 10a, for all five models the main variable—short-term interest rates (CETES3M)—is positively related to the MGB10Y yield with an estimated elasticity ranging from 0.46 to 0.62. This indicates that a 1 percentage point increase in the short-term interest rate causes a long-run increase of around 46 to 62 basis points in the government treasury bonds rate. The total consumer price index and industrial production index are negatively correlated (except for model 1) with the government bond yields, with the estimated elasticities ranging from 0.21 to 0.25 and 0.20 to 0.22, respectively.

The coefficients of the error correction term are statistically significant at the 5 percent level with the expected negative sign, except in model 1 (table 10b). The coefficients of the error correction term range from 0.08 to 0.13, implying that about 10 percent (8–13 percent) of disequilibria caused by shocks to the short-term interest rate, inflation, and growth of industrial production is corrected within one month. Most of the short-run coefficients are significant, except for a few lagged differences in the short-term interest rate.

Table 11 displays several diagnostic tests to assess misspecifications, autocorrelations, and heteroscedasticity.

Table 11. Parameter Stability Test for MGB10Y Using Equation [10]

	Model 1	Model 2	Model 3	Model 4	Model 5
a. Breusch-Pagan test for heteroscedasticity					
chi2		0.080	0.080	0.000	0.000
Prob > chi2		0.7830	0.7830	0.9479	0.9479
b. Breusch-Godfrey test for autocorrelation					
chi2	0.034	0.059	0.059	0.536	0.536
Prob > chi2	0.8534	0.8084	0.8084	0.4642	0.4642
c. Ramsey RESET Test					
F- statistic		1.260	1.260	1.430	1.430
Prob > F		0.2903	0.2903	0.2352	0.2352
d. Structural Break: Unknown break date					
wald	24.925	38.112	38.112	40.655	40.655
p-value	0.0175	0.0001	0.0001	0.0002	0.0002
Break date	2008m7	2006m7	2006m7	2007m1	2007m1
e. Normality test: Jarque-Bera test					
Test stat	7.362	2.305	2.305	2.158	2.158
P-value	0.0252	0.3159	0.3159	0.3399	0.3399

Note 1: Dependent variable is MGB10Y and independent variables are CETES3M, TCPI, and IP.
Note 2: Model 1: no intercept and no trend; Model 2: restricted intercept and no trend; Model 3: unrestricted and no trend; Model 4: unrestricted intercept and trend; and Model 5: unrestricted intercept and trend.

First, the Breusch-Pagan test of heteroscedasticity (panel [a] in table 11) is implemented. The p-values are higher than 0.10 for all five models. The null hypothesis of homoscedasticity cannot be rejected.

Second, the Breusch-Godfrey Lagrange multiplier test of autocorrelation (panel [b] in table 11) in the residuals is implemented. The null hypothesis is that there is no autocorrelation. The results from the multiplier test show that for all models the null hypothesis cannot be rejected.

Third, the Ramsey RESET is used to test to check for the omitted-variable bias. In panel (c) of table 11, the p-value is higher than the usual threshold of 0.05 (95 percent significance). It shows that the null hypothesis that the model does not have an omitted-variable bias cannot be rejected. There is no need for more variables in the model.

Fourth, panel (d) of table 11 presents a structural break test. The null hypothesis of no structural break in the intercept when there is no break in any other coefficient in all the models can be rejected.

Finally, panel (e) of table 11 presents the normality test for residuals. The null hypothesis is that the residuals are normally distributed. It is evident that all the null hypotheses can be rejected, as the p-value is smaller than 0.05. Therefore, there is a violation of the normal distribution of the error terms.

A similar exercise is conducted with MGB5Y as the dependent variables and TCPI as an independent variable using the equation given below.

$$\begin{aligned} MGB5Y_t = {} & \alpha + \beta_1\, MGB5Y_{t-1} + \beta_2 CETES3M_{t-1} + \beta_3 TCPI_{t-1} + \beta_4 IP_{t-1} \\ & + \sum_{i=1}^{P} \gamma_1 \Delta MGB10Y_{t-i} + \sum_{j=0}^{J} \gamma_2 \Delta CETES3M_{t-j} + \sum_{K=0}^{K} \gamma_3 \Delta TCPI_{t-k} \\ & + \sum_{l=0}^{L} \gamma_4\, \Delta IP_{t-l} + \varepsilon_t \quad [11] \end{aligned}$$

The results are provided in table 12, table 13, and table 14 but are not described in detail. Suffice to say, the results are similar, which further corroborates that the findings are robust.

Table 12. Pesaran, Shin, and Smith (2001) Bounds Test for MGB5Y, CETES3M, TCPI, and IP

		Model 1		Model 2		Model 3		Model 4		Model 5	
		F	t	F	t	F	t	F	t	F	t
Calculated value		3.775	-1.141	3.019	-3.273	3.773	-3.273	4.499	-4.169	5.538	-4.169
10 percent	Lower bound	2.006	-1.610	2.405	-2.564	2.749	-2.564	2.985	-3.120	3.490	-3.120
	Upper bound	3.109	-2.958	3.219	-3.432	3.787	-3.432	3.778	-3.825	4.486	-3.825
5 percent	Lower bound	2.449	-1.940	2.820	-2.867	3.265	-2.867	3.441	-3.415	4.06	-3.415
	Upper bound	3.661	-3.302	3.697	-3.761	4.387	-3.761	4.295	-4.147	5.134	-4.147
1 percent	Lower bound	3.446	-2.578	3.727	-3.456	4.396	-3.456	4.429	-3.991	5.297	-3.991
	Upper bound	4.858	-3.948	4.721	-4.384	5.672	-4.384	5.397	-4.760	6.519	-4.760
p-value	Lower bound	0.006	0.226	0.035	0.017	0.025	0.017	0.009	0.006	0.007	0.006
	Upper bound	0.043	0.701	0.132	0.134	0.102	0.134	0.038	0.047	0.032	0.047

Note 1: Dependent variable is MGB5Y and independent variables are CETES3M, TCPI, and IP.
Note 2: Model 1: no intercept and no trend; Model 2: restricted intercept and no trend; Model 3: unrestricted and no trend; Model 4: unrestricted intercept and trend; and Model 5: unrestricted intercept and trend.

Table 13a. Long-run Regression for MGB5Y with CETES3M, TCPI, and IP

	Model 1	Model 2	Model 3	Model 4	Model 5
CETES3M	0.885	0.633^{***}	0.633^{***}	0.550^{***}	0.550^{***}
	(0.4670)	(0.1150)	(0.1150)	(0.0853)	(0.0853)
TCPI	0.468	-0.106	-0.106	-0.111	-0.111
	(0.7200)	(0.3450)	(0.3450)	(0.2300)	(0.2300)
IP	-0.655	-0.143	-0.143	-0.154^{**}	-0.154^{**}
	(0.7030)	(0.0855)	(0.0855)	(0.0582)	(0.0582)
Trend				-0.008^{**}	
				(0.0029)	
Constant		3.662^{**}			
		(1.0980)			
N	171	177	177	177	177
Adj. R^2	0.347	0.341	0.341	0.360	0.360

Note 1: Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Note 2: Dependent variable is MGB5Y and independent variables are CETES3M, TCPI, and IP.
Note 3: Model 1: no intercept and no trend; Model 2: restricted intercept and no trend; Model 3: unrestricted and no trend; Model 4: unrestricted intercept and trend; and Model 5: unrestricted intercept and trend.

Table 13b. Short-run Regression for MGB5Y with CETES3M, TCPI and IP

	Model 1	Model 2	Model 3	Model 4	Model 5
Speed of adjustment					
MGB5Y(-1)	-0.035	-0.118**	-0.118**	-0.176***	-0.176***
	(0.0304)	(0.0359)	(0.0359)	(0.0421)	(0.0421)
Short-run dynamics					
ΔMGB5Y(-1)	-0.210**				
	(0.0676)				
ΔMGB5Y(-2)	-0.210**				
	(0.0661)				
ΔMGB5Y(-3)	-0.098				
	(0.0684)				
ΔMGB5Y(-4)	-0.163*				
	(0.0654)				
ΔMGB5Y(-5)	-0.104				
	(0.0642)				
ΔMGB5Y(-6)	-0.195**				
	(0.0623)				
ΔMGB5Y(-7)	-0.087				
	(0.0626)				
ΔMGB5Y(-8)	-0.166**				
	(0.0634)				
ΔCETES3M	0.954***	0.861***	0.861***	0.904***	0.904***
	(0.107)	(0.0993)	(0.0993)	(0.0992)	(0.0992)
ΔCETES3M(-1)		-0.287**	-0.287**	-0.200	-0.200
		(0.0994)	(0.0994)	(0.105)	(0.105)
ΔIP				0.029	0.029
				(0.0172)	(0.0172)
Trend					-0.001*
					(0.0006)
Constant			0.430**	1.575**	1.575**
			(0.1560)	(0.5140)	(0.5140)
N	171	177	177	177	177
Adj. R^2	0.347	0.341	0.341	0.360	0.360
ARDL ag Structure	(9,1,0,0)	(1,2,0,0)	(1,2,0,0)	(1,2,0,1)	(1,2,0,1)

Note 1: Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Note 2: Dependent variable is MGB5Y and independent variables are CETES3M, TCPI, and IP.
Note 3: Model 1: no intercept and no trend; Model 2: restricted intercept and no trend; Model 3: unrestricted and no trend; Model 4: unrestricted intercept and trend; and Model 5: unrestricted intercept and trend.

Table 14. Parameter Stability Tests for MGB5Y, TECES3M, TCPI, and IP

	Model 1	Model 2	Model 3	Model 4	Model 5
a. Breusch-Pagan test for heteroscedasticity					
chi2		0.030	0.030	0.370	0.370
Prob > chi2		0.8553	0.8553	0.5444	0.5444
b. Breusch-Godfrey test for autocorrelation					
chi2	0.001	0.475	0.475	0.027	0.027
Prob > chi2	0.9719	0.4907	0.4907	0.8688	0.8688
c. Ramsey RESET Test					
F- statistic		1.280	1.280	1.220	1.220
Prob > F		0.2840	0.2840	0.3037	0.3037
d. Structural Break: Unknown break date					
wald	32.352	31.402	31.402	39.830	39.830
p-value	0.0430	0.0015	0.0015	0.0002	0.0002
Break Date	2009m1	2006m7	2006m7	2011m8	2011m8
e. Normality test: Jarque-Bera test					
Test stat	39.810	28.300	28.300	39.130	39.130
P-value	0.0000	0.0000	0.0000	0.0000	0.0000

Note 1: Dependent variable is MGB5Y and independent variables are CETES3M, TCPI, and IP.
Note 2: Model 1: no intercept and no trend; Model 2: restricted intercept and no trend; Model 3: unrestricted and no trend; Model 4: unrestricted intercept and trend; and Model 5: unrestricted intercept and trend.

Additional models are estimated in appendix B. These results are broadly aligned with the findings shown in the paper.

VI. CONCLUSIONS

The empirical results in this paper's model estimates strengthen the case that the Keynesian approach can be useful and insightful for modeling the dynamics of MGB yields. The results evince that the BdM can exert a substantial influence on long-term MGB yields. The BdM's actions appear have a decisive influence on the Treasury yield curve, as the short-term interest rate affects the long-term interest rate on MGBs of various maturity tenors. A higher (lower) short-term interest rate is associated with a higher (lower) government bond yield, after controlling for other variables such as inflation and the growth of industrial production. The BdM influences MGB yields through the effect the overnight policy rate on the short-term interest rate, as reflected in Cetes' interest rates (ranging from 1-month to 12-month tenors). If the BdM is willing to keep short-term interest rates low by keeping its overnight policy rate low, then it can prevent a spike in MGB yields over the long-run horizon. The

BdM can exert upward pressure on MGB yields over the long-run horizon by exerting pressure on the short-term interest rate through its overnight policy target rate. In particular, if the BdM controls the short-term interest rate through the overnight policy rate in combination with other instruments of monetary policy actions, such as large-scale asset purchases or sales, forward guidance, and so forth, there is no reason to doubt the central bank's ability to keep the long-term interest rate low, both over the long- and short-run horizon.

The findings discussed in the paper reveal that the BdM's monetary policy actions are a key driver of the long-term interest rate and the shape of the yield curve in Mexico. Under a regime of monetary sovereignty, the BdM has the operational ability and flexibility to effectively exercise control bond yields and the yield curve in local currency government debt. The BdM's policy rate decision is affected by: (1) the overall economic and financial conditions and inflationary pressures in Mexico, (2) the economic and financial conditions and inflationary pressures in its main trading and economic partner (the United States), and (3) the US Federal Reserve's monetary policy and the bond market. Furthermore, the BdM's statutory mandates, policy objectives, and its assessment of economic and financial conditions influence its policy decisions.

The findings from this paper can inform policy issues and discussions on monetary and fiscal policy in Mexico. They can also have policy implications for government bond yields in other emerging market countries, both in Latin America (Martinez, Tercenoa, and Teruelb 2013) and elsewhere (Jaramillo and Weber 2013).

The results obtained provide empirical information that can be useful to both long-standing debates and ongoing controversies in macroeconomic theory on a wide range of topics, such as the effects of monetary policy, quantitative easing, operational issues in central banking (Bindseil 2004; Fullwiler [2008] 2017), the fiscal theory of price (Sims 2013), the efficient market hypothesis, the government's debt sustainability (Fullwiler 2016), fiscal policy, fiscal-monetary coordination (Tcherneva 2011), functional finance (Lerner 1943, 1947), modern money and chartalism (Wray 2012), and government bond markets in emerging economics (Turner 2002).

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APPENDIX A: ADDITIONAL RESULTS FOR UNIT ROOT TESTS

This appendix presents additional results for unit roots using Phillips-Perron tests.

Table A1. Phillips-Perron Unit Root Tests

	Levels		**First differences**	
Types of test	Variables	Test statistic	Variables	Test statistic
No constant	CETES1M	0.287	ΔCETES1M	-13.070***
Trend	CETES1M	-0.737	ΔCETES1M	-13.120***
No constant	CETES3M	0.299	ΔCETES3M	-11.770***
Trend	CETES3M	-0.708	ΔCETES3M	-11.820***
No constant	CETES6M	0.327	ΔCETES6M	-12.140***
Trend	CETES6M	-0.602	ΔCETES6M	-12.200***
No constant	CETES12M	0.298	ΔCETES12M	-12.600***
Trend	CETES12M	-0.527	ΔCETES12M	-12.650***
No constant	MGB5Y	-0.025	ΔMGB5Y	-14.050***
Trend	MGB5Y	-1.085	ΔMGB5Y	-14.070***
No constant	MGB10Y	-0.191	ΔMGB10Y	-13.090***
Trend	MGB10Y	-1.393	ΔMGB10Y	-13.090***
No constant	MXN	1.379	ΔMXN	-13.270***
Trend	MXN	-2.216	ΔMXN	-13.410***
No constant	TCPI	-0.433	ΔTCPI	-9.5770***
Trend	TCPI	-1.919	ΔTCPI	-9.5280***
No constant	CCPI	-0.480	ΔCCPI	-8.9940***
Trend	CCPI	-2.597	ΔCCPI	-8.9440***
No constant	IP	-2.939	ΔIP	-15.770***
Trend	IP	-3.066	ΔIP	-15.700***

APPENDIX B: ADDITIONAL REGRESSION RESULTS USING DIFFERENT SHORT-TERM INTEREST RATES

This appendix presents the additional regression results for different specifications of the models for MGB yields of different tenors with different short-term interest rates (CETES1M, CETES6M, and CETES12M). Here only the long-run and short-run coefficients for different models are provided. Additional details are available upon request.

Tables B1–B6 display results for MGB10Y yields. Tables B7–B12 display results for MGB5Y yields. Table B13–B18 display results for MBG3Y yields.

Tables for MGB10Y Yields

Table B1. Long-run Regression for MGB10Y, CETES6M, CCPI, and IP

	Model 1	Model 2	Model 3	Model 4	Model 5
CETES6M	0.608^{***}	0.562^{***}	0.562^{***}	0.410^{***}	0.410^{***}
	(0.0847)	(0.142)	(0.142)	(0.113)	(0.113)
CCPI	-0.106	-0.119	-0.119	0.0165	0.0165
	(0.1770)	(0.3000)	(0.3000)	(0.2030)	(0.2030)
IP	-0.131^{*}	-0.234	-0.234	-0.185^{*}	-0.185^{*}
	(0.0606)	(0.1180)	(0.1180)	(0.0735)	(0.0735)
Trend				-0.0100^{*}	
				(0.0039)	
Constant		4.645^{***}			
		(1.1910)			
N	171	177	177	177	177
Adj. R^2	0.437	0.418	0.418	0.430	0.430

Note 1: Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Note 2: Dependent variable is MGB10Y and independent variables are CETES6M, CCPI, and IP.
Note 3: Model 1: no intercept and no trend; Model 2: restricted intercept and no trend; Model 3: unrestricted and no trend; Model 4: unrestricted intercept and trend; and Model 5: unrestricted intercept and trend.

Table B2. Short-run Regression for ΔMGB10Y, ΔCETES6M, ΔCCPI, and ΔIP

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Speed of adjustment					
MGB10Y(-1)	-0.137***	-0.0833**	-0.0833**	-0.125***	-0.125***
	(0.0307)	(0.0279)	(0.0279)	(0.0339)	(0.0339)
Short-run regression					
ΔCETES6M	0.832***	0.851***	0.851***	0.879***	0.879***
	(0.0880)	(0.0825)	(0.0825)	(0.0827)	(0.0827)
ΔCETES6M(-1)	-0.216*	-0.296***	-0.296***	-0.232**	-0.232**
	(0.0874)	(0.0818)	(0.0818)	(0.0865)	(0.0865)
ΔCETES6M(-2)	-0.104				
	(0.0859)				
ΔCETES6M(-3)	-0.146				
	(0.0879)				
ΔCETES6M(-4)	-0.216*				
	(0.0870)				
ΔIP	0.023	0.026	0.026	0.029	0.029
	(0.0153)	(0.0156)	(0.0156)	(0.0155)	(0.0155)
Trend					-0.002*
					(0.0006)
Constant	0.571***		0.387*	1.388**	1.388**
	(0.160)		(0.149)	(0.495)	(0.495)
N	171	177	177	177	177
Adj. R^2	0.437	0.418	0.418	0.430	0.430

Note 1: Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Note 2: Dependent variable is MGB10Y and independent variables are CETES6M, CCPI, and IP.

Note 3: Model 1: no intercept and no trend; Model 2: restricted intercept and no trend; Model 3: unrestricted and no trend; Model 4: unrestricted intercept and trend; and Model 5: unrestricted intercept and trend.

Table B3. Long-run Regression for MGB10Y, CETES12M, CCPI, and IP

	Model 1	Model 2	Model 3	Model 4	Model 5
CETES12M	0.617***	0.600***	0.600***	0.431***	0.431***
	(0.0924)	(0.1390)	(0.1390)	(0.1090)	(0.1090)
CCPI	-0.123	-0.0839	-0.0839	0.0396	0.0396
	(0.1880)	(0.2860)	(0.2860)	(0.1930)	(0.1930)
IP	-0.141*	-0.200	-0.200	-0.168*	-0.168*
	(0.0656)	(0.1080)	(0.1080)	(0.0682)	(0.0682)
Trend				-0.010**	
				(0.0036)	
Constant		4.187***			
		(1.1340)			
N	171	177	177	177	177
Adj. R^2	0.468	0.471	0.471	0.480	0.480

Note 1: Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Note 2: Dependent variable is MGB10Y and independent variables are CETES12M, CCPI, and IP.
Note 3: Model 1: no intercept and no trend; Model 2: restricted intercept and no trend; Model 3: unrestricted and no trend; Model 4: unrestricted intercept and trend; and Model 5: unrestricted intercept and trend.

Table B4. Short-run Regression for MGB10Y, CETES12M, CCPI, and IP

	Model 1	Model 2	Model 3	Model 4	Model 5
Speed of adjustment					
MGB10Y(-1)	-0.125***	-0.0831**	-0.0831**	-0.125***	-0.125***
	(0.0308)	(0.0278)	(0.0278)	(0.0334)	(0.0334)
Short-run coefficient					
ΔCETES12M	0.746***	0.810***	0.810***	0.815***	0.815***
	(0.0766)	(0.0715)	(0.0715)	(0.0708)	(0.0708)
ΔCETES12M(-1)	-0.185*	-0.212**	-0.212**	-0.162*	-0.162*
	(0.0743)	(0.0696)	(0.0696)	(0.0731)	(0.0731)
ΔCETES12M(-2)	-0.129	-0.0959	-0.0959		
	(0.0734)	(0.0690)	(0.0690)		
ΔCETES12M(-3)	-0.0568				
	(0.0753)				
ΔCETES12M(-4)	-0.137				
	(0.0741)				
ΔIP	0.0282	0.0279	0.0279	0.0317*	0.0317*
	(0.0148)	(0.0149)	(0.0149)	(0.0148)	(0.0148)
Trend					-0.00121*
					(0.000555)
Constant	0.515**		0.348*	1.335**	1.335**
	(0.155)		(0.143)	(0.467)	(0.467)
N	171	177	177	177	177
Adj. R^2	0.468	0.471	0.471	0.480	0.480

Note 1: Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Note 2: Dependent variable is MGB10Y and independent variables are CETES12M, CCPI, and IP.
Note 3: Model 1: no intercept and no trend; Model 2: restricted intercept and no trend; Model 3: unrestricted and no trend; Model 4: unrestricted intercept and trend; and Model 5: unrestricted intercept and trend.

Table B5. Long-run Regression for MGB10Y, CETES1M, CCPI, and IP

	Model 1	Model 2	Model 3	Model 4	Model 5
CETES1M	0.538***	0.543**	0.543**	0.458**	0.458**
	(0.1030)	(0.1710)	(0.1710)	(0.1730)	(0.1730)
CCPI	-0.150	-0.0971	-0.0971	-0.0275	-0.0275
	(0.2200)	(0.3610)	(0.3610)	(0.3100)	(0.3100)
IP	-0.120	-0.118	-0.118	-0.114	-0.114
	(0.0714)	(0.1170)	(0.1170)	(0.0976)	(0.0976)
Trend				-0.006	
				(0.0062)	
Constant		4.742**			
		(1.4340)			
N	171	177	177	177	177
Adj. R^2	0.166	0.133	0.133	0.131	0.131

Note 1: Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Note 2: Dependent variable is MGB10Y and independent variables are CETES1M, CCPI, and IP.

Note 3: Model 1: no intercept and no trend; Model 2: restricted intercept and no trend; Model 3: unrestricted and no trend; Model 4: unrestricted intercept and trend; and Model 5: unrestricted intercept and trend.

Table B6. Short-run Regression for MGB10Y, CETES1M, CCPI, and IP

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Speed of adjustment					
MGB10Y(-1)	-0.134***	-0.0842**	-0.0842**	-0.101**	-0.101**
	(0.0348)	(0.0318)	(0.0318)	(0.0385)	(0.0385)
Short-run coefficient					
ΔCETES1M	0.381***	0.439***	0.439***	0.458***	0.458***
	(0.1010)	(0.1030)	(0.1030)	(0.1060)	(0.1060)
ΔCETES1M(-1)	-0.283**	-0.313**	-0.313**	-0.287**	-0.287**
	(0.1010)	(0.1020)	(0.1020)	(0.1080)	(0.1080)
Trend					-0.005
					(0.0007)
Constant	0.653***		0.399*	0.846	0.846
	(0.1910)		(0.1780)	(0.6010)	(0.6010)
N	171	177	177	177	177
Adj. R^2	0.166	0.133	0.133	0.131	0.131

Note 1: Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Note 2: Dependent variable is MGB10Y and independent variables are CETES1M, CCPI, and IP.

Note 3: Model 1: no intercept and no trend; Model 2: restricted intercept and no trend; Model 3: unrestricted and no trend; Model 4: unrestricted intercept and trend; and Model 5: unrestricted intercept and trend.

Tables for MGB5Y yields

Table B7. Long-run Regression for MGB5Y and CETES6M, CCPI, and IP

	Model 1	Model 2	Model 3	Model 4	Model 5
CETES6M	0.717^{**}	0.691^{***}	0.691^{***}	0.655^{***}	0.655^{***}
	(0.255)	(0.070)	(0.070)	(0.086)	(0.087)
CCPI	0.628	-0.110	-0.110	-0.084	-0.084
	(0.365)	(0.146)	(0.146)	(0.143)	(0.143)
IP	-0.498	-0.140^{**}	-0.140^{**}	-0.139^{**}	-0.139^{**}
	(0.342)	(0.052)	(0.052)	(0.049)	(0.049)
Trend				-0.002	
				(0.003)	
Constant		3.252^{***}			
		(0.586)			
N	171	171	171	171	171
Adj. R^2	0.513	0.526	0.526	0.524	0.524

Note 1: Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Note 2: Dependent variable is MGB5Y and independent variables are CETES6M, CCPI, and IP.
Note 3: Model 1: no intercept and no trend; Model 2: restricted intercept and no trend; Model 3: unrestricted and no trend; Model 4: unrestricted intercept and trend; and Model 5: unrestricted intercept and trend.

Table B8. Short-run Regression for MGB5Y and CETES6M, CCPI, and IP

	Model 1	Model 2	Model 3	Model 4	Model 5
Speed of adjustment					
MGB5Y(-1)	-0.0416	-0.155***	-0.155***	-0.166***	-0.166***
	(0.0220)	(0.0348)	(0.0348)	(0.0392)	(0.0392)
Short-run coefficient					
ΔMGB5Y(-1)	-0.207***	-0.129	-0.129	-0.121	-0.121
	(0.0562)	(0.0758)	(0.0758)	(0.0769)	(0.0769)
ΔMGB5Y(-2)	-0.155**				
	(0.0552)				
ΔMGB5Y(-3)	-0.100				
	(0.0578)				
ΔMGB5Y(-4)	-0.193***				
	(0.0562)				
ΔMGB5Y(-5)	-0.0663				
	(0.0549)				
ΔMGB5Y(-6)	-0.152**				
	(0.0534)				
ΔMGB5Y(-7)	-0.0883				
	(0.0540)				
ΔMGB5Y(-8)	-0.164**				
	(0.0545)				
ΔCETES6M	1.028***	0.964***	0.964***	0.968***	0.968***
	(0.0830)	(0.0861)	(0.0861)	(0.0865)	(0.0865)
ΔCETES6M(-1)		-0.0531	-0.0531	-0.0446	-0.0446
		(0.112)	(0.112)	(0.113)	(0.113)
ΔCETES6M(-2)		-0.113	-0.113	-0.0984	-0.0984
		(0.0838)	(0.0838)	(0.0874)	(0.0874)
ΔCETES6M(-3)		-0.149	-0.149	-0.137	-0.137
		(0.0830)	(0.0830)	(0.0852)	(0.0852)
ΔCETES6M(-4)		-0.226**	-0.226**	-0.218**	-0.218**
		(0.0819)	(0.0819)	(0.0830)	(0.0830)
ΔIP		0.0220	0.0220	0.0233	0.0233
		(0.0145)	(0.0145)	(0.0147)	(0.0147)
Trend					-0.00035
					(0.00057)
Constant			0.504***	0.590**	0.590**
			(0.144)	(0.202)	(0.202)
N	171	171	171	171	171
Adj. R^2	0.513	0.526	0.526	0.524	0.524

Note 1: Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Note 2: Dependent variable is MGB5Y and independent variables are CETES6M, CCPI, and IP.

Note 3: Model 1: no intercept and no trend; Model 2: restricted intercept and no trend; Model 3: unrestricted and no trend; Model 4: unrestricted intercept and trend; and Model 5: unrestricted intercept and trend.

Table B9. Long-run Regression for MGB5Y with CETES12M, CCPI, and IP

	Model 1	Model 2	Model 3	Model 4	Model 5
CETES12M	0.729^{**}	0.701^{***}	0.701^{***}	0.570^{***}	0.570^{***}
	(0.252)	(0.093)	(0.093)	(0.073)	(0.073)
CCPI	0.586	-0.0520	-0.0520	-0.0226	-0.0226
	(0.363)	(0.195)	(0.195)	(0.131)	(0.131)
IP	-0.367	-0.213^{**}	-0.213^{**}	-0.153^{**}	-0.153^{**}
	(0.275)	(0.085)	(0.085)	(0.047)	(0.047)
Trend				-0.007^{*}	
				(0.003)	
Constant		2.921^{***}			
		(0.782)			
N	171	171	171	171	171
Adj. R^2	0.568	0.577	0.577	0.561	0.561

Note 1: Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Note 2: Dependent variable is MGB5Y and independent variables are CETES12M, CCPI, and IP.
Note 3: Model 1: no intercept and no trend; Model 2: restricted intercept and no trend; Model 3: unrestricted and no trend; Model 4: unrestricted intercept and trend; and Model 5: unrestricted intercept and trend.

Table B10. Short-run Regression for MGB5Y, with CETES12M, CCPI, and IP

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Speed of adjustment					
MGB5Y(-1)	-0.041	-0.112^{**}	-0.112^{**}	-0.171^{***}	-0.171^{***}
	(0.0226)	(0.0352)	(0.0352)	(0.0391)	(0.0391)
Short-run coefficient					
ΔMGB5Y(-1)	-0.178^{***}	-0.148^{**}	-0.148^{**}	-0.0959	-0.0959
	(0.0526)	(0.0529)	(0.0529)	(0.0544)	(0.0544)
ΔMGB5Y(-2)	-0.132^{*}	-0.120^{*}	-0.120^{*}		
	(0.0521)	(0.0520)	(0.0520)		
ΔMGB5Y(-3)	-0.039	-0.041	-0.041		
	(0.0544)	(0.0537)	(0.0537)		
ΔMGB5Y(-4)	-0.146^{**}	-0.143^{**}	-0.143^{**}		
	(0.0530)	(0.0523)	(0.0523)		
ΔMGB5Y(-5)	-0.089	-0.069	-0.069		
	(0.0528)	(0.0522)	(0.0522)		
ΔMGB5Y(-6)	-0.075	-0.069	-0.069		
	(0.0514)	(0.0508)	(0.0508)		
ΔMGB5Y(-7)	-0.037	-0.036	-0.036		
	(0.0522)	(0.0511)	(0.0511)		
ΔMGB5Y(-8)	-0.141^{**}	-0.117^{*}	-0.117^{*}		
	(0.0516)	(0.0511)	(0.0511)		
ΔCETES12M	0.955^{***}	0.883^{***}	0.883^{***}	0.858^{***}	0.858^{***}
	(0.0703)	(0.0734)	(0.0734)	(0.0735)	(0.0735)
ΔIP	0.024	0.029^{*}	0.029^{*}	0.032^{*}	0.032^{*}
	(0.0144)	(0.0140)	(0.0140)	(0.0138)	(0.0138)
ΔIP(-1)	-0.015				
	(0.0144)				
ΔIP(-2)	-0.027				
	(0.0143)				
Trend					-0.001^{*}
					(0.0005)
Constant			0.328^{*}	0.713^{***}	0.713^{***}
			(0.1400)	(0.1800)	(0.1800)
N	171	171	171	171	171
Adj. R^2	0.568	0.577	0.577	0.561	0.561

Note 1: Standard errors in parentheses, $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.
Note 2: Dependent variable is MGB5Y and independent variables are CETES12M, CCPI, and IP.
Note 3: Model 1: no intercept and no trend; Model 2: restricted intercept and no trend; Model 3: unrestricted and no trend; Model 4: unrestricted intercept and trend; and Model 5: unrestricted intercept and trend.

Table B11. Long-run Regression for MGB5Y with CETES1M, CCPI, and IP

	Model 1	Model 2	Model 3	Model 4	Model 5
CETES1M	0.674**	0.629***	0.629***	0.615***	0.615***
	(0.2520)	(0.0823)	(0.0823)	(0.0994)	(0.0994)
CCPI	0.653	-0.147	-0.147	-0.135	-0.135
	(0.3450)	(0.1750)	(0.1750)	(0.1790)	(0.1790)
IP	-0.0857	-0.106	-0.106	-0.106	-0.106
	(0.1660)	(0.0554)	(0.0554)	(0.0542)	(0.0542)
Trend				-0.0009	
				(0.0039)	
Constant		3.882***			
		(0.695)			
N	171	171	171	171	171
Adj. R^2	0.111	0.177	0.177	0.173	0.173

Note 1: Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Note 2: Dependent variable is MGB5Y and independent variables are CETES1M, CCPI, and IP.
Note 3: Model 1: no intercept and no trend; Model 2: restricted intercept and no trend; Model 3: unrestricted and no trend; Model 4: unrestricted intercept and trend; and Model 5: unrestricted intercept and trend.

Table B12. Short-run Regression for MGB5Y, CETES1M, CCPI, and IP

	Model 1	Model 2	Model 3	Model 4	Model 5
Speed of adjustment					
MGB5Y(-1)	-0.057*	-0.171***	-0.171***	-0.175***	-0.175***
	(0.0272)	(0.0408)	(0.0408)	(0.0446)	(0.0446)
Short-run coefficients					
ΔCETES1M	0.449***	0.433***	0.433***	0.439***	0.439***
	(0.1060)	(0.1030)	(0.1030)	(0.1060)	(0.1060)
ΔCETES1M(-1)	-0.236*	-0.196	-0.196	-0.188	-0.188
	(0.1050)	(0.1020)	(0.1020)	(0.1080)	(0.1080)
Trend					-0.0002
					(0.0007)
Constant			0.664***	0.700**	0.700**
			(0.1820)	(0.2380)	(0.2380)
N	171	171	171	171	171
Adj. R^2	0.111	0.177	0.177	0.173	0.173

Note 1: Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Note 2: Dependent variable is MGB5Y and independent variables are CETES1M, CCPI, and IP.
Note 3: Model 1: no intercept and no trend; Model 2: restricted intercept and no trend; Model 3: unrestricted and no trend; Model 4: unrestricted intercept and trend; and Model 5: unrestricted intercept and trend.

Tables for MGB3Y Yields

Table B13. Long-run Regression for MGB3Y, CETES6M, CCPI, and IP

	Model 1	Model 2	Model 3	Model 4	Model 5
CETES6M	0.708	0.772***	0.772***	0.755***	0.755***
	(0.551)	(0.083)	(0.083)	(0.084)	(0.084)
CCPI	0.682	-0.098	-0.098	-0.106	-0.106
	(0.779)	(0.107)	(0.107)	(0.105)	(0.105)
IP	-0.453	0.014	0.014	0.038	0.038
	(0.652)	(0.050)	(0.050)	(0.055)	(0.055)
Trend				0.004	
				(0.004)	
Constant		2.084***			
		(0.328)			
N	102	102	102	102	102
Adj. R^2	0.554	0.555	0.555	0.554	0.554

Note 1: Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Note 2: Dependent variable is MGB3Y and independent variables are CETES6M, CCPI, and IP.
Note 3: Model 1: no intercept and no trend; Model 2: restricted intercept and no trend; Model 3: unrestricted and no trend; Model 4: unrestricted intercept and trend; and Model 5: unrestricted intercept and trend.

Table B14. Short-run Regression for MGB3Y, CETES6M, CCPI, and IP

	Model 1	Model 2	Model 3	Model 4	Model 5
Speed of adjustment					
MGB3Y(-1)	-0.037	-0.240**	-0.240**	-0.245**	-0.245**
	(0.0321)	(0.0748)	(0.0748)	(0.0750)	(0.0750)
Short-run coefficient					
ΔMGB3Y(-1)	-0.276*	-0.110	-0.110	-0.105	-0.105
	(0.1120)	(0.1200)	(0.1200)	(0.1200)	(0.1200)
ΔMGB3Y(-2)	0.053	0.266*	0.266*	0.270*	0.270*
	(0.1140)	(0.1160)	(0.1160)	(0.1160)	(0.1160)
ΔMGB3Y(-3)	-0.008	0.283*	0.283*	0.289*	0.289*
	(0.0820)	(0.1130)	(0.1130)	(0.1130)	(0.1130)
ΔMGB3Y(-4)	-0.198*				
	(0.0792)				
ΔMGB3Y(-5)	0.055				
	(0.0787)				
ΔMGB3Y(-6)	-0.148				
	(0.0785)				
ΔMGB3Y(-7)	-0.177*				
	(0.0797)				
ΔMGB3Y(-8)	-0.117				
	(0.0829)				
ΔCETES6M	1.046***	0.912***	0.912***	0.890***	0.890***
	(0.1110)	(0.1210)	(0.1210)	(0.1230)	(0.1230)
ΔCETES6M(-1)	0.192	0.005	0.005	-0.018	-0.018
	(0.1600)	(0.1640)	(0.1640)	(0.1650)	(0.1650)
ΔCETES6M(-2)	-0.250	-0.436**	-0.436**	-0.453**	-0.453**
	(0.1540)	(0.1520)	(0.1520)	(0.1530)	(0.1530)
ΔCETES6M(-3)		-0.314*	-0.314*	-0.331*	-0.331*
		(0.1510)	(0.1510)	(0.1520)	(0.1520)
ΔCETES6M(-4)		-0.103	-0.103	-0.113	-0.113
		(0.1140)	(0.1140)	(0.1150)	(0.1150)
ΔCETES6M(-5)		0.204	0.204	0.196	0.196
		(0.1130)	(0.1130)	(0.1130)	(0.1130)
Trend					0.001
					(0.0010)
Constant			0.500**	0.416*	0.416*
			(0.1850)	(0.2050)	(0.2050)
N	102	102	102	102	102
Adj. R^2	0.554	0.555	0.555	0.554	0.554

Note 1: Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Note 2: Dependent variable is MGB3Y and independent variables are CETES6M, CCPI, and IP.
Note 3: Model 1: no intercept and no trend; Model 2: restricted intercept and no trend; Model 3: unrestricted and no trend; Model 4: unrestricted intercept and trend; and Model 5: unrestricted intercept and trend.

Table B15. Long-run Regression for MGB3Y, CETES12M, CCPI, and IP

	Model 1	Model 2	Model 3	Model 4	Model 5
CETES12M	0.890^{*}	0.790^{***}	0.790^{***}	0.811^{***}	0.811^{***}
	(0.4030)	(0.0855)	(0.0855)	(0.0857)	(0.0857)
CCPI	0.358	-0.099	-0.099	-0.144	-0.144
	(0.5210)	(0.1210)	(0.1210)	(0.1160)	(0.1160)
IP	-0.259	0.008	0.008	0.027	0.027
	(0.4030)	(0.0491)	(0.0491)	(0.0518)	(0.0518)
Trend				0.003	
				(0.0037)	
Constant		1.909^{***}			
		(0.3420)			
N	102	102	102	102	102
Adj. R^2	0.676	0.684	0.684	0.685	0.685

Note 1: Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Note 2: Dependent variable is MGB3Y and independent variables are CETES12M, CCPI, and IP.

Note 3: Model 1: no intercept and no trend; Model 2: restricted intercept and no trend; Model 3: unrestricted and no trend; Model 4: unrestricted intercept and trend; and Model 5: unrestricted intercept and trend.

Table B16. Short-run Regression for MGB3Y, CETES12M, CCPI, and IP

	Model 1	Model 2	Model 3	Model 4	Model 5
Speed of adjustment					
MGB3Y(-1)	-0.040	-0.202**	-0.202**	-0.217**	-0.217**
	(0.0303)	(0.0693)	(0.0693)	(0.0698)	(0.0698)
Short-run coefficient					
ΔMGB3Y(-1)	-0.254*	-0.098	-0.098	-0.128	-0.128
	(0.1050)	(0.1100)	(0.1100)	(0.1140)	(0.1140)
ΔMGB3Y(-2)	0.116	0.285**	0.285**	0.303**	0.303**
	(0.1050)	(0.1070)	(0.1070)	(0.1070)	(0.1070)
ΔMGB3Y(-3)	0.009	0.124	0.124	0.238*	0.238*
	(0.0717)	(0.0685)	(0.0685)	(0.1060)	(0.1060)
ΔMGB3Y(-4)	-0.072				
	(0.0665)				
ΔMGB3Y(-5)	0.008				
	(0.0665)				
ΔMGB3Y(-6)	-0.134*				
	(0.0660)				
ΔMGB3Y(-7)	-0.140*				
	(0.0658)				
ΔCETES12M	1.099***	0.962***	0.962***	0.933***	0.933***
	(0.0916)	(0.1050)	(0.1050)	(0.1080)	(0.1080)
ΔCETES12M(-1)	0.188	0.007	0.007	0.029	0.029
	(0.1440)	(0.1480)	(0.1480)	(0.1550)	(0.1550)
ΔCETES12M(-2)	-0.428**	-0.568***	-0.568***	-0.616***	-0.616***
	(0.1370)	(0.1420)	(0.1420)	(0.1460)	(0.1460)
ΔCETES12M(-3)				-0.205	-0.205
				(0.1460)	(0.1460)
ΔCCPI		-0.048	-0.048	-0.050	-0.050
		(0.0495)	(0.0495)	(0.0495)	(0.0495)
ΔCCPI(-1)		-0.034	-0.034	-0.018	-0.018
		(0.0523)	(0.0523)	(0.0534)	(0.0534)
ΔCCPI(-2)		0.098	0.098	0.102*	0.102*
		(0.0512)	(0.0512)	(0.0513)	(0.0513)
Trend					0.001
					(0.0008)
Constant			0.386*	0.350*	0.350*
			(0.156)	(0.171)	(0.171)
N	102	102	102	102	102
Adj. R^2	0.676	0.684	0.684	0.685	0.685

Note 1: Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Note 2: Dependent variable is MGB3Y and independent variables are CETES12M, CCPI, and IP.
Note 3: Model 1: no intercept and no trend; Model 2: restricted intercept and no trend; Model 3: unrestricted and no trend; Model 4: unrestricted intercept and trend; and Model 5: unrestricted intercept and trend.

Table B17. Long-run Regression for MGB3Y, CETES1M, CCPI, and IP

	Model 1	Model 2	Model 3	Model 4	Model 5
CETES1M	0.989	0.832***	0.832***	0.600	0.600
	(1.0230)	(0.1190)	(0.1190)	(0.4710)	(0.4710)
CCPI	0.732	-0.171	-0.171	0.114	0.114
	(1.3760)	(0.1630)	(0.1630)	(0.6570)	(0.6570)
IP	-0.939	-0.040	-0.040	-0.146	-0.146
	(1.8310)	(0.0732)	(0.0732)	(0.3980)	(0.3980)
Trend				0.039	
				(0.0644)	
Constant		2.419***			
		(0.506)			
N	102	102	102	102	102
Adj. R^2	0.194	0.141	0.141	0.216	0.216

Note 1: Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Note 2: Dependent variable is MGB3Y and independent variables are CETES1M, CCPI, and IP.
Note 3: Model 1: no intercept and no trend; Model 2: restricted intercept and no trend; Model 3: unrestricted and no trend; Model 4: unrestricted intercept and trend; and Model 5: unrestricted intercept and trend.

Table B18. Short-run Regression for MGB3Y, with CETES1M, CCPI, and IP

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Speed of adjustment					
MGB3Y(-1)	-0.026	-0.207**	-0.207**	-0.067	-0.067
	(0.0390)	(0.0709)	(0.0709)	(0.1030)	(0.1030)
Short-run coefficient					
ΔMGB3Y(-1)	-0.247*			-0.241	-0.241
	(0.1110)			(0.1350)	(0.1350)
ΔMGB3Y(-2)	-0.061			-0.061	-0.061
	(0.1070)			(0.1220)	(0.1220)
ΔMGB3Y(-3)	-0.045			-0.048	-0.048
	(0.1090)			(0.1180)	(0.1180)
ΔMGB3Y(-4)	-0.257*			-0.276*	-0.276*
	(0.1060)			(0.1140)	(0.1140)
ΔMGB3Y(-5)	0.095			0.066	0.066
	(0.1050)			(0.1080)	(0.1080)
ΔMGB3Y(-6)	-0.076			-0.094	-0.094
	(0.1040)			(0.1090)	(0.1090)
ΔMGB3Y(-7)	-0.239*			-0.258*	-0.258*
	(0.1040)			(0.1110)	(0.1110)
ΔMGB3Y(-8)	-0.228*			-0.248*	-0.248*
	(0.1060)			(0.1110)	(0.1110)
ΔCETES1M	0.445***	0.334*	0.334*	0.393**	0.393**
	(0.1300)	(0.1280)	(0.1280)	(0.1400)	(0.1400)
ΔCETES1M(-1)	0.337*			0.296*	0.296*
	(0.1370)			(0.1420)	(0.1420)
Trend					0.003*
					(0.0013)
Constant			0.501*	-0.148	-0.148
			(0.2050)	(0.3170)	(0.3170)
N	102	102	102	102	102
Adj. R^2	0.194	0.141	0.141	0.216	0.216

Note 1: Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Note 2: Dependent variable is MGB3Y and independent variables are CETES1M, CCPI, and IP.

Note 3: Model 1: no intercept and no trend; Model 2: restricted intercept and no trend; Model 3: unrestricted and no trend; Model 4: unrestricted intercept and trend; and Model 5: unrestricted intercept and trend.