

Non-linear Dynamics in Indian Government Bond Yields: The Role of Fiscal Deficit, Monetary Policy, and Global Risk Spillovers

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Abstract

This study examines the determinants of Indian 10-year government securities (G-Sec) yields from February 2015 to December 2025 using the Autoregressive Distributed Lag (ARDL) bounds testing framework. Based on 131 monthly observations sourced from Bloomberg, RBI, MOSPI, and FRED, the analysis explores the influence of fiscal deficit, monetary policy, inflation, exchange rate dynamics, and global risk factors on sovereign bond yields within the NAVI (Non-linear, Accelerated, Volatile, Interconnected) paradigm. The Pesaran-Shin-Smith bounds test confirms long-run co-integration ($F = 3.85$, significant at 5%). The US 10-year Treasury yield is identified as the dominant long-run driver with a near-unity coefficient (0.999), while the VIX index exerts a significant negative effect, consistent with a domestic flight-to-safety mechanism. The fiscal deficit, although theoretically central, is statistically insignificant in the full-sample ARDL, indicating that active debt management by the RBI absorbs the crowding-out channel. Sub-period analysis demonstrates that the repo rate pass-through declined from 0.60 pre-COVID to near zero post-COVID. These findings have implications for monetary-fiscal coordination and sovereign debt management.

Keywords: G-Sec yields, ARDL bounds test, fiscal deficit, monetary policy transmission, global risk spillovers, NAVI framework, India

1. Introduction:

Government bond yields are foundational to financial market architecture, serving as the risk-free rate benchmark, a barometer of sovereign creditworthiness, and the anchor for monetary policy transmission. In India, the 10-year Government Securities (G-Sec) yield underpins the entire fixed-income market, directly influencing corporate borrowing costs, bank lending rates, insurance valuations, and pension fund returns.

The trajectory of Indian G-Sec yields over 2015–2025 has been characterized by pronounced non-linearity. The period encompasses a domestic rate-cutting cycle (2015–2019), the COVID-19 pandemic shock that pushed yields to a decade-low of 5.77% in July 2020, a global inflationary surge and synchronized monetary tightening (2022–2023), and a gradual easing cycle from 2024 as inflation moderated. Yields ranged from 5.77% to 8.02%, a volatility profile that motivates the NAVI (Non-linear, Accelerated, Volatile, Interconnected) framework—the thematic lens of this conference.

This study addresses three primary questions. First, does India's fiscal deficit exert a statistically significant crowding-out effect on sovereign yields when tested with continuous monthly data? Second, how efficiently does the RBI's Repo rate transmit to long-term yields, and has this transmission changed after COVID-19? Third, what is the magnitude of global risk

spillovers from US Treasury yields and the VIX into Indian sovereign bond markets? The ARDL bounds testing methodology of Pesaran, Shin, and Smith (2001), which accommodates mixed integration orders, is employed. The dataset comprises 131 monthly observations with a complete series for all variables, including monthly fiscal deficit as a percentage of GDP—a granularity not available in earlier studies that relied on annual fiscal data. This paper provides the most contemporaneous ARDL analysis of Indian G-Sec yields, encompassing both the COVID structural break and the post-Ukraine global inflation regime.

2.Literature Review:

The theoretical framework draws from three strands. The loanable funds theory (Bernheim, 1987) posits that government borrowing crowds out private investment, raising yields. The expectations hypothesis (Shiller, 1979) holds that long-term yields reflect expected future short-term rates. The international capital market integration literature (Frankel, 1992) recognizes that domestic yields in open economies are partially determined by global risk-free rates.

Non-linear theoretical extensions include the fiscal theory of the price level (Cochrane, 2001) and the debt sustainability literature (Blanchard, 2019), which suggest the yield-deficit relationship is regime-dependent. At moderate deficit levels, crowding-out may be muted by central bank liquidity management; beyond sustainability thresholds, the relationship intensifies.

Empirically, Laubach (2009) finds that a one percentage point increase in projected US fiscal deficit raises long-term yields by approximately 25 basis points. Baldacci and Kumar (2010) document that fiscal deterioration raises emerging market sovereign spreads by 10–150 basis points. Jaramillo and Weber (2013) find that global factors dominate domestic determinants in emerging-market bond pricing, while Peiris (2010) documents significant effects of foreign portfolio flows on Asian sovereign yields.

India-specific evidence includes Mohanty (2012), who documents partial monetary policy transmission through the yield curve. Sahoo (2017) finds that fiscal deficit significantly raises G-Sec yields, while RBI liquidity operations moderate this effect. Garg and Prabheesh (2021) confirm significant India-US yield co-movement. Akram and Das (2019) provide ARDL evidence on the determinants of Indian government bond yields, finding that fiscal and monetary variables are significant over a shorter sample. Pattanaik et al. (2023) document that the RBI's unconventional COVID-era measures—targeted LTROs, G-SAP, and Operation Twist—fundamentally altered yield dynamics by decoupling G-Sec yields from the policy rate. Despite the existing literature, no study covers the full 2015–2025 period with complete monthly fiscal deficit data within a unified ARDL framework. The present analysis addresses this gap by directly testing the crowding-out hypothesis with monthly fiscal deficit granularity for the first time.

3.Data and Methodology:

3.1Data and Variables:

Monthly data spanning February 2015 to December 2025 are employed, yielding 131 observations. A distinctive feature of this dataset is the complete monthly fiscal deficit series expressed as a cumulative percentage of GDP, constructed from Controller General of Accounts (CGA) releases and MOSPI GDP estimates. Table 1 summarizes the variables.

Table 1: Variable Definitions and Data Sources

Variable	Code	Unit	Role	Source
10-Year G-Sec Yield	GSEC10Y	% p.a.	Dependent	Bloomberg / Cogencis
RBI Repo Rate	REPO	% p.a.	Monetary Policy	RBI DBIE
CPI Inflation (YoY)	CPI	%	Inflation	MOSPI
Fiscal Deficit (% of GDP)	FISDEF	% GDP	Fiscal	CGA / MOSPI
USD/INR Exchange Rate	USDINR	₹/\$	FX Risk	Bloomberg / RBI
US 10-Year Treasury Yield	US10Y	% p.a.	Global Rate	Bloomberg / FRED
CBOE VIX Index	VIX	Index	Risk Aversion	Bloomberg / FRED

Note: FISDEF is expressed as a cumulative deficit-to-GDP ratio (monthly frequency), with higher values indicating larger fiscal deficits. Brent Crude Oil and M3 Growth are tested in robustness specifications.

3.2 Summary Statistics:

The dependent variable, GSEC10Y, has a mean of 6.94% (SD = 0.58). The Repo rate averaged 5.79%, with a range of 4.00% to 7.75%. Monthly fiscal deficit averaged 4.99% of GDP (SD = 1.41), ranging from 0.0% (April months when the fiscal year resets) to 9.2% (March 2021, reflecting COVID-era fiscal expansion). The VIX index exhibits extreme leptokurtosis (kurtosis = 16.33) driven by the March 2020 spike to 53.06. Sub-period analysis reveals statistically significant regime shifts: mean G-Sec yields declined by 53 basis points post-COVID ($p < 0.001$), while CPI inflation increased by 101 basis points ($p < 0.001$) and USD/INR depreciated by ₹13 ($p < 0.001$).

3.3 Methodology:

The ARDL bounds testing approach is utilized because unit root tests reveal mixed integration orders: GSEC10Y, REPO, USDINR, US10Y, and FISDEF are $I(1)$, while VIX is stationary at levels by ADF ($t = -4.54$, $p = 0.001$). The Unrestricted ECM is specified as:

$$\Delta GSEC10Y_t = \alpha_0 + \delta_1 GSEC10Y_{t-1} + \delta_2 REPO_{t-1} + \delta_3 CPI_{t-1} + \delta_4 FISDEF_{t-1} + \delta_5 USDINR_{t-1} + \delta_6 US10Y_{t-1} + \delta_7 VIX_{t-1} + \Sigma \beta \Delta X + D_COVID + \varepsilon_t \quad (1)$$

The null hypothesis $H_0: \delta_1 = \delta_2 = \dots = \delta_7 = 0$ is tested using the PSS F-statistic. Lag orders are selected by AIC. A COVID-19 dummy ($D_COVID = 1$ from March 2020) captures the pandemic regime shift. Long-run coefficients are derived by normalizing level terms, and short-run dynamics are captured by differenced terms.

4. Empirical Results:

4.1 Unit Root Tests:

Table 2 reports ADF and KPSS test results. GSEC10Y, REPO, USDINR, US10Y, CPI, and FISDEF are $I(1)$, while VIX is $I(0)$ by ADF. The mixed integration orders confirm ARDL as the appropriate methodology, as Johansen (1991) co-integration requires all variables to be $I(1)$.

Table 2: Unit Root Test Results

Variable	ADF Lev	p	ADF 1D	p	KPSS Lev	5% CV	Order	Inference
GSEC10Y	-3.29	0.069	-3.3	0.066	0.156	0.146	I(1)	Non-stationary
REPO	-2.09	0.55	-3.79	0.017	0.33	0.146	I(1)	Non-stationary
CPI	-1.08	0.933	-4.7	0.001	0.201	0.146	I(1)	Non-stationary
FISDEF	-2.02	0.592	-3.28	0.07	0.132	0.146	I(1)	Non-stationary
USDINR	-2.6	0.279	-11.94	0	0.221	0.146	I(1)	Non-stationary
US10Y	-1.6	0.794	-10.58	0	0.308	0.146	I(1)	Non-stationary
VIX	-4.54	0.001	-5.88	0	0.193	0.146	I(0)*	Stationary

Notes: ADF with constant and trend; lag selection by AIC. * VIX is I(0) by ADF but borderline non-stationary by KPSS. ARDL accommodates both I(0) and I(1) variables (Pesaran et al., 2001).

4.2 Bounds Test and Long-Run Estimates:

The PSS bounds test yields an F-statistic of 3.85 ($k = 6$), exceeding the I(1) upper bound of 3.61 at 5%, thereby confirming long-run co-integration among Indian G-Sec yields and the six regressors. The Error Correction Term (ECT) of -0.0995 is negative and significant ($p = 0.046$), indicating that 10.0% of disequilibrium is corrected per month, corresponding to a mean-reversion horizon of approximately 10 months. Table 3 presents the key estimates.

Table 3: ARDL-ECM Estimates (Dependent: $\Delta GSEC10Y$, $N = 128$)

Variable	Coeff.	Std Err	t-stat	p-value	Sig.	Long-Run β
L1.GSEC10Y (ECT)	-0.0995	0.0493	-2.018	0.046	**	Speed: 10.0%/month
L1.US10Y	0.0995	0.0455	2.185	0.031	**	0.999
L1.USDINR	-0.0209	0.0072	-2.913	0.004	***	-0.21
L1.VIX	-0.0077	0.0041	-1.854	0.067	*	-0.077
L1.REPO	-0.0497	0.04	-1.241	0.218		-0.499
L1.FISDEF	0.0081	0.0131	0.614	0.541		0.081
L1.CPI	-0.0049	0.0175	-0.279	0.781		-0.049
$\Delta US10Y$	0.1439	0.0629	2.288	0.024	**	—
$\Delta USDINR(-1)$	0.0274	0.0156	1.759	0.081	*	—

$\Delta YGSEC_{10Y}(-1)$	-0.2666	0.1015	-2.628	0.01	***	—
D_COVID	0.1307	0.0999	1.309	0.193		—
$R^2 = 0.359$ $DW = 1.846$ $ARCH\ p = 0.168$ $RESET\ p = 0.232$ $F\text{-bounds} = 3.85^{**}$						

Notes: ***, **, * denote 1%, 5%, 10% significance. Long-run $\beta = -\delta_i/\delta_1$. Bounds test critical values for $k=6$: 5% $I(1)$

= 3.61, 1% $I(1)$ = 4.43. Only significant short-run terms shown.

US Treasury yield dominance: The US 10-year yield enters with a near-unity long-run coefficient of 0.999 ($p = 0.031$), indicating that a 100 basis point increase in US yields raises Indian G-Sec yields by 100 basis points in the long run. This represents a statistically significant and economically substantial global spillover, suggesting strong integration. In the short run, ΔUS_{10Y} is the only individually significant regressor (0.144, $p = 0.024$), reflecting rapid intra-month contagion. This near-complete transmission highlights the deep integration of Indian sovereign bond markets into the global yield network, consistent with the “Interconnected” dimension of the NAVI framework.

VIX and domestic flight-to-safety: The VIX exhibits a negative and significant long-run coefficient (-0.077 , $p = 0.067$), indicating that a 10-point VIX spike reduces Indian G-Sec yields by approximately 77 basis points. This finding reflects the established pattern in which global risk-off episodes prompt domestic investor reallocation from equities and corporate bonds into government securities, accompanied by RBI emergency liquidity injections and rate cuts, as observed during COVID-19 when the VIX spiked to 53 and yields declined sharply.

Fiscal deficit: statistically insignificant. The fiscal deficit enters with the expected positive sign (long-run $\beta = 0.081$) but is not statistically significant ($p = 0.541$). This finding is notable: despite the availability of complete monthly fiscal deficit data, the crowding-out channel does not operate in a statistically detectable manner within the ARDL framework. This result does not imply that fiscal deficits are irrelevant; rather, it suggests that the RBI’s active debt management through OMOs, G-SAP, and auction management effectively absorbs the supply-side pressure of government borrowing, thereby preventing it from translating into higher yields. This is consistent with the “fiscal dominance” literature (Blanchard, 2019) and Sahoo’s (2017) finding that RBI operations moderate the deficit-yield nexus.

Repo rate and CPI: Neither variable achieves statistical significance in the full-sample ARDL. The CPI result is consistent with the RBI’s credible inflation targeting framework: once markets internalize that inflation will be addressed through policy rate adjustments, the direct inflation-yield channel is subsumed by the monetary policy variable. The Repo rate’s insignificance over the full sample is attributable to the structural break in transmission documented in the sub-period analysis below.

4.3 Sub-Period Analysis and Structural Breaks:

OLS regressions on levels for pre-COVID (February 2015–February 2020, $n = 61$) and post-COVID (March 2020–December 2025, $n = 70$) sub-periods reveal dramatic parameter instability (Table 4).

Table 4: Sub-Period OLS Estimates (Dependent: $GSEC_{10Y}$)

Variable	Pre-COVID	p	Post-COV	p	Full Sample	p	Shift	Direction
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REPO	0.601***	0	-0.027	0.723	0.225***	0	YES	Collapsed
FISDEF	-0.073***	0.006	0.011	0.531	0.022	0.558	YES	Reversed
CPI	0.184***	0	0.122***	0	0.101***	0	Minor	Weakened
USDINR	0.053***	0	-0.033*	0.081	-0.048***	0	YES	Reversed
US10Y	0.599***	0	0.448** *	0	0.328***	0	Stable	Dominant
R ²	0.748		0.733		0.656			

Notes: HC1 robust standard errors. ***, **, * denote 1%, 5%, 10% significance.

Three structural shifts stand out. First, the Repo rate pass-through collapsed from 0.60 (pre-COVID) to an insignificant -0.027 (post-COVID), confirming that the RBI's unconventional instruments—Operation Twist, G-SAP, and expanded OMOs—effectively severed the link between the policy rate and long-term yields (Pattanaik et al., 2023). Second, the fiscal deficit coefficient reversed sign: it was significantly negative pre-COVID (-0.073, $p = 0.006$)—an initially counter-intuitive result likely reflecting the fiscal consolidation–rate cut regime of 2015–2019, where deficit reduction coincided with lower yields, and became insignificant post-COVID when massive fiscal expansion was absorbed by RBI's bond purchases. Third, a rolling Chow test identifies February 2022 (Russia-Ukraine conflict) as the most statistically significant structural break ($F = 44.92$), rather than March 2020, indicating that the global monetary tightening pivot represented a deeper regime change than the COVID shock itself.

5. Discussion and Policy Implications:

The findings have three primary implications. First, regarding monetary policy effectiveness, the collapse of Repo rate pass-through post-COVID suggests that the RBI's ability to influence long-term yields through the policy rate alone has diminished. Active yield curve management through balance sheet tools has become the primary transmission mechanism, indicating that the RBI must maintain its OMO and auction management infrastructure as permanent instruments.

Second, in the context of sovereign debt management, the near-unity US 10-year yield coefficient indicates that India's borrowing costs are substantially determined by Federal Reserve policy. During the 2022–2023 Fed tightening cycle, US yields increased from 1.5% to 4.9%, mechanically raising Indian yields by approximately 340 basis points through this channel—a magnitude exceeding any domestic fiscal effect. This finding suggests that government borrowing should be front-loaded during periods of lower US yields and that hedging strategies against US rate risk should be developed.

Third, the insignificance of the fiscal deficit in the ARDL framework, despite the availability of complete monthly data, provides important empirical evidence for the “financial repression” hypothesis. The RBI's statutory liquidity ratio (SLR) requirements, combined with active market intervention, create a captive demand base that insulates G-Sec yields from fiscal supply pressure. While this supports short-term cost stability in borrowing, it raises long-term questions regarding the efficiency of interest rate signals and the allocation of capital in the Indian economy (Reserve Bank of India, 2024).

6. Conclusion:

This study presents an ARDL bounds testing analysis of Indian G-Sec yield determinants over

February 2015 to December 2025, utilizing 131 monthly observations with complete data for all variables, including monthly fiscal deficit—a granularity not available in prior studies. The bounds test confirms cointegration ($F = 3.85$, significant at the 5% level). The US 10-year Treasury yield is identified as the dominant long-run driver with a near-unity coefficient (0.999), the VIX captures a negative domestic flight-to-safety channel (-0.077), and the fiscal deficit is statistically insignificant despite its theoretical centrality, a finding attributable to the RBI's active debt management absorbing fiscal supply pressure.

The most consequential finding is the structural collapse of Repo rate pass-through from 0.60 pre-COVID to near zero post-COVID, confirming that unconventional monetary tools have fundamentally altered the yield determination process. The speed of adjustment (10.0% per month, approximately 10-month mean reversion) offers a concrete empirical foundation for fixed-income investment strategies.

Future research could explore asymmetric ARDL (NARDL) specifications (Shin et al., 2014) to capture non-linear yield responses to monetary tightening versus easing, and examine whether Repo rate transmission recovers as the RBI normalizes its balance sheet. The impact of India's recent inclusion in global bond indices (JP Morgan GBI-EM, Bloomberg) as a structural demand shifter for G-Sec also warrants investigation as more post-inclusion data become available.

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