



# The Influence of Trading Activity in Price Discovery of Reissued Bonds in Sub-National Bond Markets in India

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## ABSTRACT

This study investigates the pricing determinants of reissued Indian state government bonds (State Development Loans), focusing on the influence of secondary market dynamics. Analysing a panel of 36 unique bonds across 163 reissue events, it explores how past market behavior shapes outcomes in the primary auction market. The research employs a dynamic panel data model using the Arellano-Bond Generalized Method of Moments (GMM) estimator, effectively addressing endogeneity and bond-specific unobserved effects. Key independent variables include the volume-weighted average price (VWAP), trading volume from the secondary market, bond maturity, and macroeconomic controls such as the policy repo rate. Findings reveal that secondary market VWAP and trading volume significantly impact reissue pricing, while the repo rate plays a limited role. Notably, in 78.5% of reissues, bonds are priced below their secondary market VWAP, with an average discount of  $-0.58$ , reflecting investor yield expectations in light of fixed coupon structures. These insights have important implications for public debt management, suggesting that secondary market sentiment drives primary market pricing. While central bond price discovery is well-studied, this paper uniquely addresses the neglected area of reissue pricing at the subnational level, offering valuable empirical evidence on auction dynamics and market efficiency in India's state bond markets.

**Keywords:** State Development Loan, Government Bond Market, Reissued Bonds, Bond Market Efficiency, Dynamic Panel Regression

**JEL Classifications:** G12, H63, C33, H74

## 1. INTRODUCTION

The sovereign bond market in India has undergone considerable development in recent decades, driven by fiscal decentralization, financial reforms, and the increasing demand for infrastructure financing at the state level (Singh, 2015). State Development Loans (SDLs)<sup>1</sup>, issued by individual states, are an essential tool for raising funds to meet developmental and fiscal objectives. The RBI acts as the debt manager for marketable internal debt for the state governments by an agreement under the RBI Act, 1934 (Wells et al., 2008). Unlike corporate bonds or central government

securities, SDLs represent the borrowing obligations of individual Indian states, adding a layer of complexity due to differences in creditworthiness, fiscal policy, and investor perception across states. State borrowings in India are governed by the provisions of the Constitution of India, 1950 and Financial Responsibility and Budget Management (FRBM) Act, 2003. An efficient and well-developed bond market, characterized by depth and liquidity, plays a vital role in promoting fiscal discipline among States through robust price discovery mechanisms (Pandey et al., 2024).

One of the defining features of the India's Government bond market is the use of reissues rather than fresh issuances. In case of reissue of bonds, the coupon rate and tenure of the bond remain fixed. However, when an earlier bond is reissued, the investor bids

<sup>1</sup> SDLs are a subset of State Government Securities (SGS) which is a broader term referring to any debt instrument issued by a state government.

on the price as the coupon rate remains fixed. It seems that if the current market rate of interest is more than the coupon rate, the investor would be ready to buy the bond at a discount and *vice-versa*, keeping other factors remaining constant. The reissue of bonds is also called price-based bidding. It reduces the number of outstanding bonds as the same bond is issued further but increases the repayment risk because the government will have to repay the amount it raised either through fresh issue or issue on the maturity date (RBI, 2020). Central government bonds are reissued more frequently than of the state government's bonds. Another point to note is that dealers possess varying levels of information and rely on diverse sources for their insights (Valseth, 2013). The number of reissue of bonds as a percentage of total number of issues during the period 2015-16 to 2024-25 is shown in Figure 1. Reissuing existing bonds enables the creation of benchmark securities, enhances liquidity, and simplifies debt servicing. However, the pricing of these reissues in the primary market is influenced by several factors, including prevailing interest rates, macroeconomic signals, and crucially, the behavior of investors and dealers in the secondary market. When bonds trade actively in the secondary market, their price and yield provide valuable signals to primary market participants, influencing their bidding strategies and the eventual cut-off price determined during auctions (Goldstein et al., 2019). In India, the reissuance of State Development Loans (SDLs) is a widely adopted practice intended to improve market liquidity and build benchmark securities. Unlike fresh issues, reissued bonds carry the same fixed coupon rate as their original issuance. The price, however, is determined through investor bidding in the primary auction. In the recent past there is a noticeable shift by states from issuing 10-year bonds to longer-dated securities, in response to growing investor demand for extended maturities<sup>2</sup>. The share of 10-year maturity in issuance has declined from 53.18% in FY 2020 to 14.13% in FY 2025<sup>3</sup>. The tenor-wise issuance of reissued bonds is shown in Figure 2.

Understanding how the secondary market affects reissue pricing is especially relevant in India's context, where secondary market liquidity varies considerably across bonds and over time. The secondary market remained volatile during the period FY 2015-16 to FY 2023-24. The year-on-year growth of the SDL trading market is depicted in Figure 3. Despite the growing emphasis on market-based price discovery, empirical research focusing on the feedback loop between the secondary and primary markets for SGSs remains limited. Most existing studies focus either on central government securities or treat the primary and secondary markets in isolation. This study aims to fill that gap by empirically investigating whether and how secondary market variables—particularly the weighted average trade price (VWAP) and trading volume—affect reissue pricing in the primary market.

In this paper, we develop a dynamic panel dataset consisting of multiple bond reissues and their associated secondary market activity in the days leading up to each reissue. By incorporating a lagged dependent variable, we account for the path-dependent nature of pricing behavior, where past reissue prices influence

current outcomes. We also control for macroeconomic factors such as the policy repo rate and bond-specific factors like time to maturity to isolate the impact of market-driven variables. The findings from this research offer valuable insights for public debt managers, investors, and policymakers aiming to improve the efficiency and transparency of the Indian bond market.

## 2. LITERATURE REVIEW

Studies examining government securities market in India, particularly the interaction between secondary market activity and primary issue have increased in recent years to capture the increasing role of market oriented public debt management.

A particularly suitable framework for dynamic panel estimation of datasets with short-time dimensions and endogenous regressors was developed by Arellano and Bond (1991). Their approach has inspired many empirical applications using monetary and policy variables. Such refinements by Blundell and Bond (1998) of the System GMM have also led to increased efficiency when the sample size is small. Empirical evidence in the context of Indian government bonds has reinforced the significant relationship between trading activity and price discovery efficiency. The empirical studies on the Indian Government securities market have shown that trading activity in the market is strongly related to efficiency in price discovery.

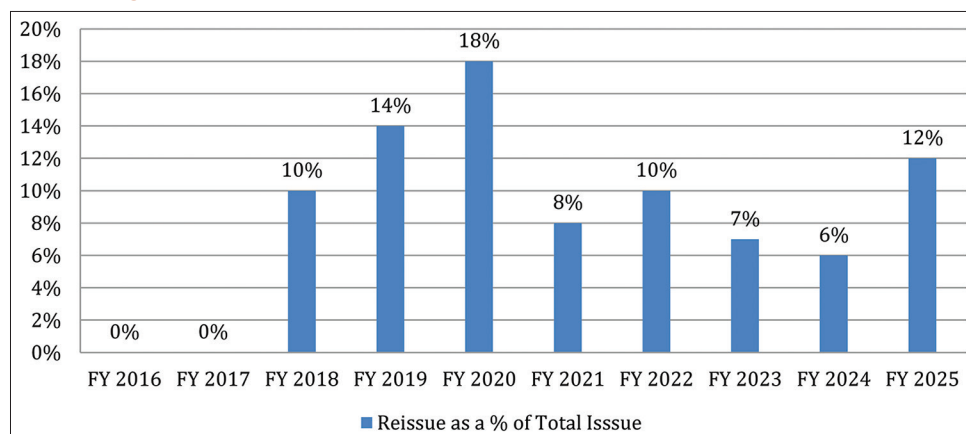
The International Monetary Fund (2001) observed that bonds issued by state governments generally exhibit lower liquidity and greater fragmentation in comparison to central government securities, with markedly lower trading volumes. These characteristics hinder effective price discovery, particularly in the case of reissued state bonds, which often lack the active trading environment enjoyed by central government issues. While the academic literature points to solutions such as transitioning trading activities to electronic platforms and introducing benchmark issues to improve market functioning, direct empirical evidence concerning state-level bonds remains sparse.

Fleming et al. (2015) highlight that a significant transformation occurred with the advent of the NDS-OM electronic trading system, which notably enhanced liquidity and transaction volumes in the secondary market. Their study links the shift toward electronic trading with reduced search frictions, real-time access to information, and greater transparency in price formation—especially for benchmark and newly issued securities. In a subsequent study, Fleming et al. (2016) further investigate the dynamics of trading in the Indian government bond market, concluding that securities classified as benchmarks, those issued in larger amounts, and recently issued or reissued bonds exhibit higher trading frequency. Although the transition to platforms like NDS-OM decreased the overall probability of a bond being traded, for bonds that were traded, the volume of activity rose—most noticeably among benchmark and high-volume issues. Another study has observed that the state-wise fiscal prudence or lack of it does not impact the cost of borrowing and the spreads are similar irrespective of the issuer state (Nath et al., 2019).

2 SDL Quarterly by CCIL, January – March, 2025, p. 1

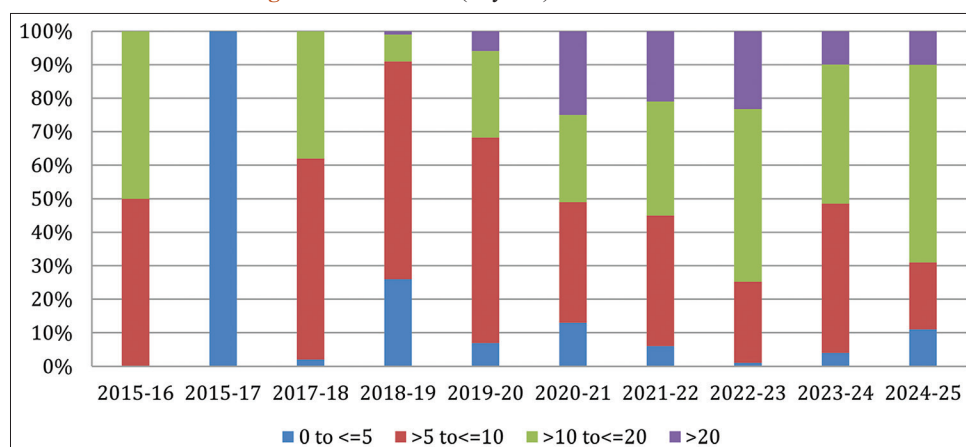
3 Ibid.

**Figure 1:** Number of Reissues of State Government Bonds as a % of total issues



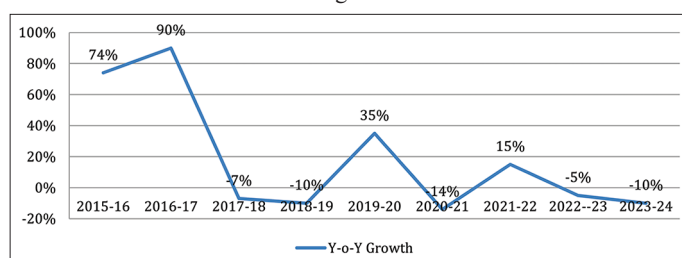
Source: Compiled by authors from RBI's weekly press release

**Figure 2:** Tenor-wise (in years) Reissuance of SDL



Source: Computer by authors from the reissuance information available in weekly press release of RBI

**Figure 3:** Year-on-year growth in SDL Secondary Market Trading in India



Source: Factbook, 2023-24, CCIL, p. 48

Shankar and Bose (2008) in their study noted that the pricing strategies of different types of investors in government bond auctions vary notably. Primary dealers, who act as “market-makers”, tend to bid based on expected market movements—reflecting a “common-value” approach. In contrast, long-term investors like insurance companies often follow a “private-value” approach, basing their bids on the bond’s value to their specific portfolio needs over the long run. This leads to clear differences in how these two groups assess and price the same bond during auctions.

Goyal (2019) offers a comprehensive analysis of the mechanisms of price discovery within the Indian government securities market, underscoring the significant roles of both trading intensity and liquidity in shaping yield curves and pricing signals. According to her findings, a surge in trading volumes alongside the implementation of electronic trading platforms led to a marked improvement in the efficiency of price discovery, assessed through the information share of various market segments. Complementing these insights, Endo (2022) examines the endogenous evolution of government securities markets in emerging economies, providing further context to the structural development of these markets. This underscores the self-reinforcing nature of trading activity and liquidity, where higher trading volumes attract more participants, further deepening the market and improving price discovery.

Despite extensive research on price discovery and auction dynamics in central government securities, there is a noticeable gap in understanding the pricing behavior of reissued state government bonds, particularly at the subnational level in India. Existing literature largely overlooks how secondary market dynamics influence reissue pricing in state debt markets. Against this backdrop, this study contributes to the literature by examining whether and how secondary market dynamics—specifically

VWAP and trade volume—influence the pricing of reissued state bonds. The dynamic panel approach applied herein builds on the theoretical foundations laid by Arellano and Bond (1991) and subsequent refinements in panel econometrics. Together, this literature informs the present study's focus on how secondary market trading activity—specifically VWAP and trading volume—influences the pricing of bond reissues, with a dynamic panel regression framework used to account for temporal dependencies and endogeneity.

The objective of the present study is two-fold, as noted below:

1. To examine the impact of secondary market trading activity—specifically the volume-weighted average price (VWAP) and trade volume—on the reissue pricing of Indian state government bonds.
2. To evaluate whether reissued bonds in the primary market are typically priced at a premium or discount compared to their contemporaneous secondary market values.

The first objective seeks to analyse how recent trading behavior in the secondary market serves as a signal to investors and influences their bidding strategies in primary auctions. By employing a dynamic panel regression model, the study isolates the role of market-derived variables in determining reissue outcomes, while controlling for historical price behavior and bond characteristics.

The second objective explores the pricing efficiency and strategic considerations in the reissuance of State Development Loans (SDLs). By comparing reissue prices with the VWAP from the immediate pre-auction trading window, the study investigates whether reissues are used to incentivize participation through attractive pricing or reflect other market-based risk assessments.

### 3. DATA AND METHODOLOGY

#### 3.1. Data Description

Data on reissue of state government securities have been obtained for the period 1.4.2015 to 31.03.2025 i.e. for 10 years. We found a total 5708 scripts have been issued in the primary market during this period, including 532 reissued scripts. The state-wise number of issues in primary market and number of reissues are depicted in the Tables 1 and 2 respectively. It appears that a total 30 states and union territories have issued securities in the primary market. Out of this, 18 states have reissued securities. The states which reissued maximum number of securities are Tamil Nadu, Punjab, Maharashtra, Karnataka, Madhya Pradesh & Rajasthan. The cumulative total of these states stands 471 reissues which is 88.53% of total reissues. Thus, chosen reissued securities of only these states have been considered in this study.

Next, for the selected states, only those bonds are considered which were originally issued and also reissued at least thrice during the period under study. The criteria for choosing at least three reissues in a single bond is to have the better weightage on the number of reissued bonds. Accordingly, a total 40 unique bonds with 177 reissues for 5 different states are found. However, it is also noted that in case of 7 re-issues, no prior trading happened in the secondary market and thus, these re-issues have been eliminated.

On elimination of these 7 reissues, the total reissue on a single bond which has at least 3 reissues fell from 40 to 36 and total number of reissues now stands at 163. The state-wise details are shown Table 3.

Accordingly, this study employs a panel dataset comprising 36 unique bonds having 163 observations of reissued State Government Securities (SGSs) in India over the period FY 2016 to FY 2025. Each observation represents a specific bond reissued on a given date, forming a panel structure of Bond ID  $\times$  Reissue Date. This section presents a comprehensive overview of the empirical framework employed to investigate the influence of secondary market activity on the reissue pricing of Indian state government bonds.

The study utilizes a dynamic panel data regression model estimated using the Arellano-Bond Generalized Method of Moments (GMM) estimator. This econometric approach is particularly suited for panel data with a short time dimension and a larger number of cross-sectional units (bonds), where the inclusion of lagged dependent variables and the potential for unobserved heterogeneity across bonds present challenges to traditional estimation techniques.

#### 3.2. Rationale for Dynamic Panel Modeling

The reissue pricing of state government securities is inherently dynamic and path-dependent. Market participants—primarily institutional investors—routinely reference prior auction prices to inform their bidding strategies. This results in a form of price persistence or inertia that cannot be effectively captured using static models. To accommodate this characteristic, the present study introduces the lagged reissue price as a regressor. However, the inclusion of this lagged dependent variable raises endogeneity concerns due to its likely correlation with the unobserved fixed effects component of the model error term.

Fixed effects estimators, though popular, produce biased estimates in dynamic panels with a lagged dependent variable. To address this issue, the Arellano-Bond estimator is implemented. This technique first-differences the data to eliminate time-invariant fixed effects and then employs lagged levels of the endogenous variables as instruments for their differenced counterparts. This allows for consistent and unbiased estimation even when traditional assumptions regarding exogeneity are violated.

The Arellano-Bond approach is well-established in the literature for its suitability in financial applications where dynamic behavior and unobserved heterogeneity are prevalent. By transforming the model and applying internal instruments, the estimator controls for omitted variable bias and simultaneity, thus ensuring the robustness of coefficient estimates.

#### 3.3. Data Source

The dataset has been meticulously compiled from multiple sources including the Clearing Corporation of India Limited's (CCIL) official portal, Reserve Bank of India's auction reports, and macroeconomic indicators such as the policy repo rate. The details of the sources of data are tabulated in Table 4.



**Table 1: State-wise total number of SDL issues in primary market during the period 2015-16 to 2024-25**

State	Number of Issues in Primary Market										Total
	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	
Andhra Pradesh	15	20	14	30	49	53	53	73	83	77	467
Arunachal Pradesh	2	3	4	2	4	4	2	1	3	3	28
Assam	4	5	15	19	24	28	23	21	22	23	184
Bihar	5	8	6	7	25	15	15	22	24	31	158
Chhattisgarh	6	3	9	15	9	13	4	1	32	21	113
Goa	10	11	11	16	20	28	18	13	24	9	160
Gujarat	14	20	21	29	31	31	21	33	27	30	257
Haryana	13	13	16	13	21	17	20	47	42	37	239
Himachal Pradesh	6	5	9	9	17	12	8	22	14	13	115
Jammu & Kashmir	6	8	13	13	17	15	14	12	28	26	152
Jharkhand	7	7	9	8	6	8	4	4	1	2	56
Karnataka	9	12	15	22	47	68	39	16	38	46	312
Kerala	18	15	14	16	22	31	21	20	29	33	219
Madhya Pradesh	10	10	8	26	25	32	11	18	23	28	191
Maharashtra	20	16	45	14	17	38	38	30	48	79	345
Manipur	6	8	3	6	7	9	10	8	10	7	74
Meghalaya	9	9	8	7	7	11	13	7	6	7	84
Mizoram	3	2	4	-	7	10	7	11	10	11	65
Nagaland	7	9	5	5	6	7	7	8	8	4	66
Odisha	5	11	13	10	11	4	-	-	-	20	74
Puducherry	4	5	8	7	7	9	8	6	7	11	72
Punjab	16	24	28	28	39	38	24	40	45	36	318
Rajasthan	17	17	19	32	49	78	58	43	67	69	449
Sikkim	3	4	5	6	4	7	6	6	5	3	49
Tamil Nadu	21	21	27	41	63	66	72	42	57	89	499
Telangana	14	27	19	20	28	34	29	46	50	58	325
Tripura	3	4	3	6	6	6	1	-	-	-	29
Uttar Pradesh	19	22	21	18	28	32	25	19	40	19	243
Uttarakhand	9	10	19	22	15	9	5	5	8	10	112
West Bengal	17	18	20	20	25	29	29	31	31	33	253
Total	298	347	411	467	636	742	585	605	782	835	5,708

Source: Compiled from the RBI's weekly press release on auction of state government securities

### 3.4. Construction of Key Variables

The key variables constructed are as follows in Table 5.

VWAP and Volume are computed only for active trading days (not calendar days), ensuring accurate market signals. VWAP reflects pricing trends, while volume captures liquidity and market depth. Bond specific risk is represented by the remaining tenor of the bond. Control Variable ‘Repo Rate’ is included to address macroeconomic dimensions.

### 3.5. Empirical Model Specification

The empirical model is estimated using the one-step Arellano-Bond GMM procedure, which is efficient under the assumption of homoskedasticity and robust to heteroskedastic errors when estimated with robust standard errors. The general form of the regression is as follows:

$$Reissue\ Price_{it} = \alpha + \lambda\ L1\_Reissue\ Price_{it} + \beta_1\ VWAP_{it} + \beta_2\ Volume_{it} + \beta_3\ Time\ to\ Maturity_{it} + \beta_4\ Repo\ Rate_{it} + \varepsilon_{it}$$

Where:

$Reissue\ Price_{it}$  = Reissue price of bond  $i$  at time  $t$ ,

$L1\_Reissue\ Price_{it}$  = Lagged reissue price,

$VWAP_{it}$  = Volume-weighted average price from the secondary market (last 3 trading days),

$Volume_{it}$  = Trading volume over the same 3 days,

$Time\ to\ Maturity_{it}$  = Remaining life of the bond at the time of reissue,

$Repo\ Rate_{it}$  = Policy repo rate at time  $t$ ,

$\varepsilon_{it}$  = Error term,

$\alpha$  = Constant (intercept),

$\lambda, \beta_1, \beta_2, \beta_3, \beta_4$  = Coefficients to be estimated

### 3.6. Regression Diagnostics Summary

To verify the validity of the model and instruments, several diagnostic tests have been conducted:

- AR (1) Test: The Arellano-Bond estimator anticipates first-order serial correlation in the differenced residuals. The AR (1) test yields a P-value of 0.0018, indicating significant first-order correlation and validating the model's dynamic structure.
- AR (2) Test: Critical for checking the validity of instruments, the AR (2) test yielded a P-value of 0.5213, confirming the absence of second-order serial correlation. This result supports the assumption that the instruments are uncorrelated with the error term.
- Hansen J-Test: The overidentifying restrictions test returned a Hansen J-statistic of 23.23 with a P-value of 0.314, suggesting that the instruments are valid and correctly specified.

**Table 2: State-wise number of reissues (SDL) in primary market during the period 2015-16 to 2024-25**

State	Number of Issues in Primary Market										Total
	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	
Andhra Pradesh	-	-	-	-	-	-	-	-	-	-	-
Arunachal Pradesh	-	-	-	-	-	-	-	-	-	-	-
Assam	-	-	-	-	-	-	-	-	-	-	-
Bihar	-	-	-	-	2	-	-	-	-	-	2
Chhattisgarh	-	-	-	-	-	-	-	-	-	10	10
Goa	-	-	-	-	-	-	-	-	-	-	-
Gujarat	2	-	-	-	9	-	-	-	-	-	11
Haryana	-	-	-	2	2	1	-	-	-	-	5
Himachal Pradesh	-	-	-	2	-	-	-	-	-	-	2
Jammu & Kashmir	-	-	-	-	-	-	-	-	-	1	1
Jharkhand	-	-	-	-	-	-	-	-	-	-	-
Karnataka	-	-	-	-	26	-	-	-	-	13	39
Kerala	-	-	-	-	-	-	-	-	-	-	-
Madhya Pradesh	-	-	-	16	4	7	5	4	1	-	37
Maharashtra	-	1	30	10	3	2	10	5	10	32	103
Manipur	-	-	-	-	-	-	-	-	-	-	-
Meghalaya	-	-	-	-	-	-	7	-	-	-	7
Mizoram	-	-	-	-	-	-	-	-	-	-	-
Nagaland	-	-	-	-	-	-	-	-	-	-	-
Odisha	-	-	1	-	-	-	-	-	-	-	1
Puducherry	-	-	-	-	-	-	-	2	2	3	7
Punjab	-	-	-	14	23	16	12	19	20	7	111
Rajasthan	-	-	-	-	2	-	2	7	10	15	36
Sikkim	-	-	-	-	-	-	-	-	-	-	-
Tamil Nadu	-	-	12	21	36	31	20	8	5	12	145
Telangana	-	-	-	-	7	-	-	-	-	-	7
Tripura	-	-	-	-	-	-	-	-	-	-	-
Uttar Pradesh	-	-	-	-	-	-	-	-	1	5	6
Uttarakhand	-	-	-	-	-	-	-	-	-	-	-
West Bengal	-	-	-	-	-	-	-	-	-	2	2
Total	2	1	43	65	114	57	56	45	49	100	532

Source: Compiled from the RBI's weekly press release on auction of state government securities

**Table 3: State-wise number of selected bonds applying the criteria**

S. No.	State	No. of bond with issue and more than 3 reissues (within April 01, 2015 to March 31, 2025)	No. of Reissues
1	Tamil Nadu	15	75
2	Punjab	2	13
3	Maharashtra	11	57
4	Karnataka	5	16
5	Madhya Pradesh	3	9
Total		36	177

Source: Computed by the authors

- **Multicollinearity Assessment:** Although VIF is not applicable in GMM frameworks, we conducted VIF checks on the level variables. All VIF scores are below 5, indicating no serious multicollinearity issues (Table 6). This confirms the distinctiveness and validity of the included explanatory variables.

These diagnostic results collectively affirm the robustness of the Arellano-Bond estimation. The statistically significant AR (1) result is expected and acceptable in differenced models. The non-significant AR (2) and Hansen P-values confirm the appropriateness of the instruments and model specification. These

outcomes reinforce confidence in the empirical estimates derived from the model.

### 3.7. Model Justification

The selection of the Arellano-Bond dynamic panel regression model is grounded in both theoretical considerations and the empirical characteristics of the dataset. The dataset comprises 36 distinct bonds reissued over multiple periods, yielding a moderately balanced short panel. On average, each bond is reissued approximately 4.5 times. Descriptive statistics reveal that the mean reissue price is around ₹99.42 with a standard deviation of 2.81, while the mean volume-weighted average price (VWAP) is ₹100.00 with a standard deviation of 2.54. The average trading volume over the three-day window preceding each reissue is ₹265.83 crore, highlighting considerable variability in market activity. Time to maturity ranges from 1.2 to 14.5 years, with a mean of approximately 6.9 years, reflecting a broad spectrum of bond tenors. The repo rate, used as a macroeconomic control, varies between 4.00% and 6.50% during the study period.

Given this variation and the time-dependent nature of bond pricing, the inclusion of lagged reissue price as a regressor is essential. However, it introduces potential endogeneity, which cannot be addressed using static models like OLS or fixed effects. The Arellano-Bond estimator effectively mitigates this concern by employing internal instruments and eliminating bond-specific

**Table 4: Data description and their source**

S. No.	Data description	Source
1	Reissue price of individual bonds	RBI's weekly press release on the "Result of Yield/Price Based Auction of State Government Securities". Obtained from the Press Release section of RBI's official website.
2	Trading information (trade date, price, volume etc.)	Trade by Trade information from CCIL's official website.
3	Bond's time to maturity	RBI's time series publication on 'Details of State Governments Market Borrowings'
4	Repo Rate	RBI's – Monetary Policy Statement/Database on Indian Economy ( <a href="https://www.rbi.org.in">https://www.rbi.org.in</a> / <a href="https://dbie.rbi.org.in">https://dbie.rbi.org.in</a> )

**Table 5: Construction of key variables**

S. No.	Variable	Description
1	Reissue Price	Reissue Price of each of the bond in the primary auction.
2	Lagged Reissue Price (L1_ReissuePrice)	It is calculated for each bond using its previous auction cut-off price. It helps model how past pricing influences current bidding behavior.
3	Volume-weighted average trading price of bonds (VWAP)	It is computed from the secondary market trades considering all trades for last 3 trading days that has happened before each reissue.
4	Trading Volume (Volume)	Average secondary market trading volume for each bond over the same 3-day period as considered for VWAP
5	Time to Maturity of Bond (Time to Maturity)	The remaining tenor (in years) of the bond at the time of reissue.
6	Repo Rate	The RBI's policy repo rate on the reissue date.

**Table 6: Variance inflation factor (VIF) analysis**

Variable	VIF
Lagged Reissue Price	3.67
VWAP (3-day average)	3.94
Trading Volume	1.01
Repo Rate	1.23
Time to Maturity	1.13

**Table 7: Key Regression Output (Estimated Coefficients)**

Variable	Coefficient	Standard error	Significance
Lagged Reissue Price	0.312	0.072	***P<0.01
VWAP (3-day average)	0.765	0.089	***P<0.01
Trading Volume	0.012	0.004	**P<0.05
Repo Rate	0.118	0.078	Not significant
Time to Maturity	-0.057	0.013	***P<0.01

Significance levels are denoted as \*P<0.01, P<0.05. Source: Author's own computation)

fixed effects through first differencing. Moreover, the estimator is designed for datasets with relatively short time dimensions and multiple entities, making it particularly suitable here.

## 4. EMPIRICAL RESULTS

The results of the Arellano-Bond regression yield important insights into how recent market behavior influences the pricing of state government bonds in India. By accounting for time-lagged dependencies and bond-specific effects, this model helps reveal the dynamics of investor expectations and market efficiency. The key regression result is shown in Table 7.

The coefficient on the lagged reissue price is positive and statistically significant ( $\beta = 0.312$ ,  $P < 0.01$ ), indicating a strong degree of price inertia in bond reissuance. This result is consistent with theoretical expectations and empirical literature on dynamic pricing mechanisms in sovereign bond markets. Investors appear to incorporate historical auction outcomes when formulating their bid strategies, likely due to benchmarking behavior or reliance on past market consensus in the absence of drastically new information. This dynamic effect underlines the importance of past issuance performance in determining current auction competitiveness.

The coefficient for VWAP is highly significant and economically substantial ( $\beta = 0.765$ ,  $P < 0.01$ ), confirming that recent secondary market prices play a critical role in shaping primary market expectations. As a contemporaneous measure of market value,

VWAP encapsulates real-time pricing information and reflects investor sentiment leading up to the auction. The magnitude of the coefficient suggests that when secondary market prices increase by 1 unit, the reissue price responds with a nearly proportional increase, reinforcing the efficient transmission of price signals from the trading floor to the auction platform. This finding substantiates the informational efficiency of India's sub-national bond market and highlights VWAP as a reliable predictor of primary auction outcomes.

The positive and statistically significant impact of trading volume ( $\beta = 0.012$ ,  $P < 0.05$ ) suggests that liquidity conditions materially affect investor willingness to bid aggressively in auctions. Bonds with higher turnover in the secondary market likely benefit from lower perceived transaction costs and better exit options, making them more attractive to investors. This result underscores the liquidity premium theory and indicates that bond market depth contributes to improved borrowing terms for issuing state governments.

Although the repo rate shows a positive coefficient ( $\beta = 0.118$ ), it is not statistically significant at conventional levels. This result implies that the transmission of monetary policy to state bond auction pricing is limited or indirect. One plausible interpretation is that policy rates are already embedded in secondary market valuations (VWAP), rendering their direct effect on reissue pricing

redundant in the presence of more immediate market signals. Alternatively, state-level debt instruments may be priced with a greater emphasis on credit risk or bond-specific fundamentals than on short-term interest rate movements.

As expected, the time to maturity variable has a negative and statistically significant coefficient ( $\beta = -0.057$ ,  $P < 0.01$ ), consistent with duration risk theory. Longer-tenor bonds tend to be priced at a discount to account for higher interest rate risk and uncertainty over extended horizons. This maturity premium is aligned with investor preference for shorter-term instruments in volatile or rising rate environments and indicates that term structure considerations are actively priced into auction behavior.

Collectively, these results provide robust evidence that secondary market activity—especially recent pricing and liquidity—exerts a significant influence on primary market outcomes in India's sub-national debt market. The magnitude and significance of the VWAP and trading volume coefficients suggest that participants in state bond auctions are responsive to current market sentiment and conditions. The findings highlight the importance of strengthening secondary market infrastructure to support efficient debt issuance and deepen market-based price discovery mechanisms.

An additional empirical angle explored in this study is whether reissued bonds in the primary market are generally priced at a premium or discount relative to their contemporaneous secondary market valuations. Specifically, the analysis compares the reissue price with the volume-weighted average price (VWAP) observed over the three most recent trading days prior to each reissue date.

The results reveal that in only approximately 21.5% of observations, the reissue price was higher than the VWAP. In contrast, nearly 78.5% of reissues were priced below their recent secondary market trading value. The average price differential across the dataset was approximately  $-0.58$ , indicating a consistent tendency for reissued bonds to be priced at a discount in the primary market.

This finding is notable for several reasons. First, it suggests that state governments, through their debt management strategies, may be intentionally pricing reissues attractively to ensure successful auction outcomes and broad investor participation. Second, it may reflect a pricing adjustment for perceived risks associated with sub-national fiscal capacity or liquidity concerns in the secondary market.

Moreover, these discounts could serve to stimulate secondary market trading activity by creating arbitrage opportunities for market participants, thereby indirectly supporting the development of the bond market infrastructure. Alternatively, the lower reissue prices might also reflect the market's assessment of credit or duration risk that is not fully captured by VWAP. This dimension complements the core regression analysis and provides further evidence that reissue pricing is influenced not only by past prices and market activity but also by strategic considerations of state-level debt managers seeking to balance cost, risk, and market development objectives.

A critical insight from this study reveals that in nearly 78.5% of reissue events, the bonds were sold below their prevailing secondary market volume-weighted average price (VWAP), with an average price differential of  $-0.58$ . This suggests that investors are reluctant to pay a premium for bonds offering lower fixed coupons in a rising interest rate environment, effectively pushing down the reissue price. From the perspective of the issuing state governments, this implies a higher cost of borrowing in the primary market, as they are forced to accept lower prices due to investor yield expectations. Though the same bonds may be trading at a discount in the secondary market, state governments cannot directly access this market to raise funds. As a result, they have no option but to issue debt at prices investors are willing to pay—often below par. This phenomenon raises important questions about market efficiency and the structural limitations faced by subnational issuers within India's debt framework.

## 5. CONCLUSION

This study provides robust empirical evidence on the dynamic interplay between secondary market activity and reissue pricing in the Indian state government bond market. Using a dynamic panel data approach with the Arellano-Bond estimator, we demonstrate that variables such as recent secondary market prices (VWAP) and trading volume significantly influence investor bidding behavior and, by extension, the reissue price set in primary auctions.

The results highlight the importance of market-based signals in the decision-making processes of institutional investors participating in government bond auctions. VWAP emerges as a strong predictor of reissue pricing, indicating that participants heavily rely on recent market consensus when valuing bonds. Similarly, trading volume serves as a proxy for liquidity, and its significance underscores the role of tradability in enhancing investor confidence and pricing outcomes.

The study also shows that historical pricing behavior, captured through the lagged dependent variable, exerts a meaningful influence on present outcomes. This reflects a behavioral anchoring effect and suggests that past auctions continue to shape market expectations. The findings have important policy implications. First, they validate the need for strong and transparent secondary markets to support efficient price discovery in primary bond issuance. Second, they underline the relevance of liquidity-boosting measures to improve auction competitiveness and borrowing efficiency. Lastly, while the repo rate did not show a direct effect in this specification, its broader impact on market structure and sentiment may still play an indirect role, meriting further investigation.

Future research may expand upon this work by incorporating state-level credit risk indicators, investor composition, and bid-level auction data. Additionally, a comparative analysis across states or over a longer horizon may yield further insights into how market dynamics interact with fiscal policy and debt sustainability at the sub-national level.



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