Endogenous Market Development for Government Securities in Lower-Income Economies[1]

Tadashi Endo
Consultant, Japan

Abstract

Many lower-income economies have difficulty developing government securities markets (GSMs). A "Two-Dimensional Policy Framework for GSM Development" offers a solution to improve upon the twenty-year-old World Bank/IMF's conventional policy framework. It differentiates GSMs by their development phases and presents endogenously phase-coherent policy sets. This research found that the endogenous variables explained 40 percent of trading volume growth in the early phase of India's GSM development and that utilities played a dominant role in increasing trade volumes in the early-phase market. The framework is worth test-applying to GSM development in lower-income economies.

Keywords: Government security; Market development; Low-income economy; Phase-differentiation; Endogenous variable; Utility

JEL classification: H63, O16, O21, and P43

1This paper is abridged and modified as necessary from Endo, T. (2022). Endogenous market development for government securities in lower-income economies. Emerging Markets Review, 50, 100844 https://doi.org/10.1016/j.ememar.2021.100844 .

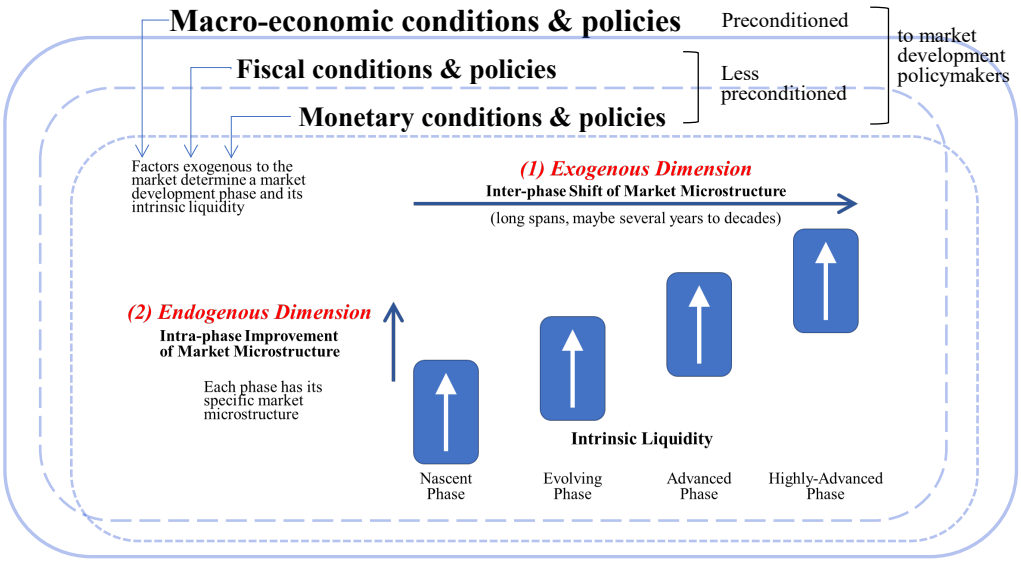
1 INTRODUCTION

The government securities market (GSM) is a core economic infrastructure for modern economic management. Hence, the international development community (IDC), including the World Bank and IMF, established a comprehensive policy framework for GSM development in the early 2000s (the conventional policy framework–CPF) and undertook GSM development initiatives for more than two decades. However, the results are disappointing for lower-income economies (LIEs).[2] The secondary markets of most LIEs remain illiquid or considerably low liquid. (Endo, 2020) The effectiveness of the CPF for LIEs has yet to be reviewed.

This research questions what policy set for GSM development in LIEs is implementable at a low cost and what framework lays out different policy sets for different market development phases. These questions aim at finding a new way for a LIE to facilitate and reinforce its macroeconomic and social achievements through its GSM development. In answer to these questions, I propose a "Two-Dimensional Policy Framework for GSM Development" (TDPF) (Figure 1 and Table 1) to enable the GSM policymaker to focus on endogenous GSM development systematically.

Endogenous market development works on policy variables endogenous to a GSM rather than exogenous. The TDPF is a tool to identify and work on the best set of endogenous policy variables. The framework divides emerging GSMs into four groups by market development phases (phase-differentiation). It reorganizes CPF-based policies[3] by market development

Figure 1: Two-Dimensional Market Development



Source: The Author

[2] This study defines the World-Bank-defined low-income economies (LIEs) and many lower-middle income economies (LMEs) as "lower-income economies" unless otherwise specified. The World Bank defines low-income economies and lower-middle-income economies as those with a GNI per capita of $1,025 or less in 2018 and those with a GNI per capita between $1,026 and $3,995, respectively. (https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups) "Emerging economies" in common parlance include not only "lower-income economies" but also higher-income economies that are not included in "advanced economies."

[3] Policies formulated, advised and implemented under various CPF programs. Most of them are found in World Bank and IMF (2001), World Bank (2007a, 2007b) and the World Bank/IMF's financial sector program documents, such as Financial Sector Assessment Program (FSAP) reports.

Table 1 Two-Dimensional Policy Framework for Government Securities Market Development

June 4, 2022

Market Developmental phase		**1**	**2**	**3**	**4**
		Nascent	**Evolving**	**Advanced**	**Highly-Advanced**
Investor base (minor investors)		Mainly captive/state Commercial banks State pension fund State insurance companies (Retail investors) (Corporate investors)	Less captive/state Commercial banks Pension funds Insurance companies (Retail investors) (Corporate investors)	Private sector dominant Yield-seeking Pension funds Life insurance companies Cooperatives Foreign investors Mutual funds Commercial banks	More private sector dominant Competitive performance Pension funds Life insurance companies Cooperatives Foreign investors Mutual funds Hedge funds Commercial banks
Policy principles	Policy Measures	Simple Minimum Low cost	Focused Efficiency-seeking, Local Scalable	Competitive Efficient Beyond the banking sector Equal footing	Sophisticated Internationally competitive Prudential Resilient
	Goals	Visibly fundamental and functional	Essential to a national economy	Influential across the yield curve	Internationally compatible
Functioning Market Functions*					
Accounting	Policy Measures	Disclosure and governance of institutional investors and intermediaries	Amortization	Mark-to-market (Fair value)	Hedge accounting
	Goals	Trust building in financial intermediation	Reduced price distortion,	Better performance evaluation of asset management Better risk management Competition for better asset management performance More active trading	Derivatives for risk management

Market Developmental phase		1	2	3	4
		Nascent	**Evolving**	**Advanced**	**Highly-Advanced**
Legal affairs	Policy Measures	Modern business law Modern banking law Public debt law Securities Law Immobilization or depository regulation	Trade failure Trade finality Netting arrangements Dematerialization Code of conduct	Payment system law Novation Securities lending Liquidation of collateral and pledged assets Master repo agreement Enhanced prudential supervision and regulation	International harmonization Jurisdictional (re)alignment Legal and jurisdictional coordination regulators
	Goals	Legal basis for debt securities issuance and trading	Certainty and efficiency of trading	International comparability, Legal basis for trading efficiency, settlement certainty, and risk management Enhanced resilience to shocks	International comparability and connectivity
Primary market	Policy Measures	Preannounced auctions Non-competitive bidding Designated/prequalified bidders Treasury bills Short-term maturities	Issue calendar Reopening or buy-back or switching Tap issuance Bidding open to the public Short- to medium-term maturities	Larger issue amounts Syndicate underwriting Long-term maturities Treasury bills for sterilization	Product innovation (like STRIPS)
	Goals	Introduction of market-based public finance	Lower debt cost by pooling liquidity Lower secondary market prices by consolidating issues Broadening of the investor base	Adaptation to institutional investors Liquidity enhancement Extending the benchmark yield curve	A more reliable yield curve (a zero-coupon yield curve)
Debt and cash management**	Policy Measures	Cleanup of public or quasi-public arrears Public debt issuance legislation DM office Timely & accurate debt record keeping The separation between front- and back-office activities	Increase in domestic borrowing DM strategy and reporting Consolidation of DM functions Sensible balancing or separation between DM and monetary policy operation (e.g., agency agreement) Partial risk management Sovereign credit rating	Treasury single account Cash flow forecasting Integrated debt recording system with the rest of the public financial management system Middle office (integrated sovereign risk management, etc.)	Assets and liabilities management framework (integrated approach)
	Goals	Explicit authorization to borrow Clear delegation of responsibilities Confidence building in public finance Timely debt service	Mitigation of the "original sin." Reduced refinance or liquidity risks Enhanced accountability of public	Better controlled refinance or liquidity risks	Increased natural hedging of the state's balance sheet

Market Developmental phase		1	2	3	4
		Nascent	Evolving	Advanced	Highly-Advanced
			debt Transparency		
Secondary market	Policy Measures	Negotiated (dealers' "Club") market Telephone voice trading	Screen-based electronic trading platform Call auction or continuous order-driven Market convention Market surveillance	Electronic OTC market (quote-driven) Continuous trading Partial PD market making Market transparency rules Interdealer brokers	Full-scale PD market-making Connectivity Interdealer brokers
	Goals	Occasional trading	Trade transparency Periodic/regular price discovery Centralized marketplace	Liquid trading Extend price discovery to the medium- and long-term segments	Continuous price discovery across the yield curve High-volume trading
Monetary policy framework***		Reliance on rules-based instruments	Introducing money market instruments	Increasing open market operations	Full reliance on money market operations
Money market	Policy Measures	Treasury bills Call market Reserve averaging	Standing facilities (Central bank repos) Interest rate corridor Bank repos Sporadic open market repos	Repos among financial and non-financial institutions (open repo market) Commercial papers	Forward-rate agreements
	Goals	Reduced volatility of money market rates	Reduced volatility of money market rates Even distribution of fund liquidity Anchoring the yield curve at the short end Introduction of market-based monetary operations	Lower and more stable inventory holding costs for non-bank intermediaries Facilitating a shift from direct instruments to indirect ones	Enhanced hedging function
Derivatives or futures	Policy Measures			Interest rate swaps	Interest futures and options Currency futures and options
	Goals			Interest rate hedging	Higher price discovery and liquidity Reinforced price discovery (yield curve)

Market Developmental phase		1	2	3	4
		Nascent	Evolving	Advanced	Highly-Advanced
Clearing and settlement	Policy Measures	Book-entry CSD	Dematerialization DVP Rolling settlement Multiple-net settlement SWIFT Automation	Integration of payment and securities settlement systems RTGS Central bank money STP	CCP Link to international CSDs Special collateral repos
	Goals	No physical delivery Ownership management	Enhanced Backoffice efficiency Closer market monitoring	Systemic risk reduction	Globalization

Source: Modified from Endo (2022)

Notes:
* Market functions (previously termed "market components") are the categories of policy measures enabling the market structure to function.
** Policy measures for debt management in this Table are those for domestic government debt market development. Emerging economies often resort to external debt before or while their domestic government debt markets develop. Their external debt issuance may require the debt issuing economies to put in place more advanced debt management systems in earlier stages than their domestic debt does.
*** Based on the author's interpretation of Laurens, J. Bernard.2005. Monetary policy implementation at different stages of market development. IMF Occasional paper No. 244. Washington, D.C.: International Monetary Fund, 2005. Available at http://www.imf.org/external/pubs/nft/op/244/op244.pdf

Remarks:
(1) A country's market may shift from a developmental phase to another as its economy goes through a major structural change (inter-phase transition), while most market development likely occurs in a single developmental phase (intra-phase market improvement).
(2) Listed policy measures are, in principle, new policy measures that should be considered in a particular developmental phase. The four phases and their policy measures and goals are ballpark guidelines. They should be flexibly applied in the local context. A country's market may be implementing some policy measures that the two-dimensional Table specifies for the next or previous phase.
(3) The table does not base its developmental phase classification on numerical parameters. A market's developmental phase can be determined by comparing its functioning policy measures and institutional settings horizontally or vertically.
(4) Countries can have different developmental goals. Every economy may not always want to advance to higher market developmental stages.
(5) The pace of policy implementation may vary depending on actual market development and unfolding circumstances.
(6) Some policy measures listed in a developmental phase may conflict.

Acronyms:
CCP = central counterparty; CSD = central securities depository; DM = debt management; DVP = delivery vs. payment; OTC = over-the-counter (market); PD = primary dealer; RTGS = real-time gross settlement; STP = straight-through processing; STRIPS =Separate Trading of Registered Interest and Principal of Securities; SWIFT =Society for Worldwide Interbank Financial Telecommunication.

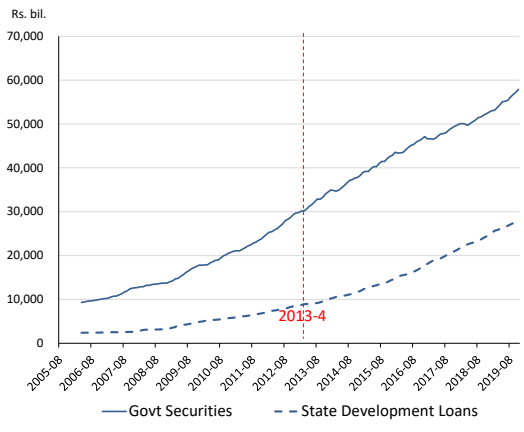
phases (phase-coherency) to form a two-dimensional matrix table. The framework's phase-differentiation helps policymakers and practitioners bundle GSM development policies coherently and friendly to the local context. It is practical for the GSM policymaker to work on the bundle to make the most of given exogenous variables for GSM development. The new framework would help readjust the extant policy set to a GSM's economic or social environment, if any.

In contrast, the CPF was derived primarily from gap analyses between advanced and emerging markets. Policy assessors typically compare their target emerging markets with "best practices" or "global standards" to identify gaps that they think impede market development. The gaps tend to be too wide for LIEs, and the targets too ambitious. Nonetheless, they advise their client governments to fulfill or narrow those gaps. Advised governments usually attempt to implement the advice but end up implementing it only halfway. Their CPF-trapped GSMs remain illiquid or low-illiquid.

The CPF conflates GSMs in different development phases. As such, a CPF-based GSM development initiative is prone to mismatches between policies and realities, which often mislead GSM development in LIEs. The blind reliance on a PD system is an example. Many LIEs have PD systems in place, but the systems are barely functioning (Endo, 2020). The phase-differentiated and phase-coherent TDPF would mitigate this kind of mismatch risk.

India showcases the effectiveness of phase-fit and locally-fit policies in its early GSM development phases. The introduction of innovative market infrastructure and practical market microstructure (collectively "market structure") in the early 2000s accentuated the effectiveness. The new market structure achieved the "transparency and ease" of trading, as Indian PDs described. India built a market structure electronically integrating trading processes from order display to trade settlement to meet local and timely needs. Before a series of GSM reform initiatives that began in 2001 (the GSM Reform), the Indian GSM was a negotiated market (dealers club market), even though it was locally called an "OTC market" and had primary dealers (PDs). In a negotiated market, dealers generally match orders with counterparts for themselves or their customers over the phone. In reforming the GSM, the Reserve Bank of India (RBI) did not adopt a quote-driven market-making PD system, which the CPF-based advisors typically recommend to emerging GSMs. Instead, first, the RBI developed a screen-based order-driven trading platform or the Negotiated Dealing System-Order Matching (NDS-OM) in 2005 with local IT technology. Second, the central bank imposed a continuous two-way firm quote (market-making) obligation for order-driven trading on PDs but has left the two-parameter (the spread and volume) obligation not strictly enforced.

Figure 2: Outstanding Balance of Indian Government Securities and State Development Loans

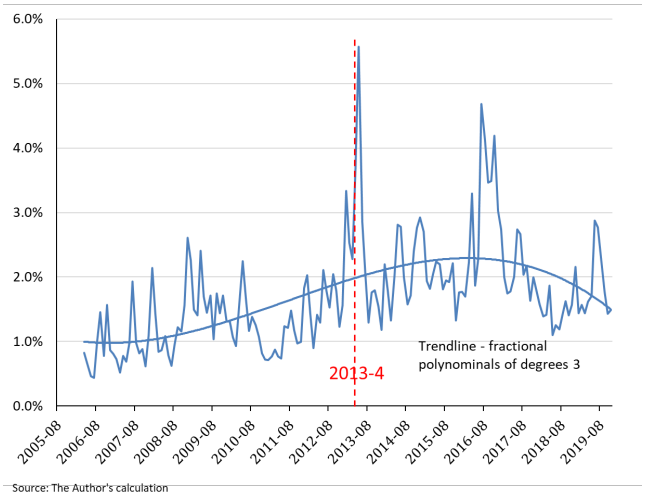


Source: The Author's calculation

Earlier, the RBI organized state-owned financial institutions and private banks to streamline the market infrastructure. It set up the Clearing Corporation of India (CCIL) in 2001, built the Negotiated Dealing System (NDS) in

2002, and assigned its operation to the CCIL (RBI, 2013). The NDS, equipped with a central counterparty (CCP) function, was designed to automate the clearing and settlement of government securities trades. The CCIL linked the NDS-OM to the NDS to achieve straight-through processing (STP). This new market structure enabled the growing GSM (Figure 2) to increase turnover until 2015 (Figure 3).

Figure 3: Monthly Average Daily Turnover of Indian Government Securities



Thus, the South Asian country adeptly caught the momentum of its increasingly favorable macroeconomic, fiscal, and monetary settings for GSM development with phase-fit and locally-fit policy sets. The government launched an economic transformation from a socialistic regime to a market-based one in 1991. The factors exogenous to the market became increasingly favorable for GSM development by the early 2000s. Its GDP growth sustained between 5.24 percent and 8.49 percent (except for 3.09 percent in 2008), with an average of 7.09 percent, from 2003 to 2018. The national consensus for fiscal discipline resulted in the Fiscal Responsibility and Budget Management Act of 2003. The country's public debt[4] to GDP peaked at 84.2 percent in 2003 and stayed between 66.0 percent and 68.8 percent from 2010 to 2018. Since the GSM Reform started in 2001, the inflation rate[5] had been reasonably low before it climbed from 6.7 percent in 2006 to 12.3 percent in 2009. Subsequently, the rate decelerated below 5 percent in 2015 and below 4 percent in 2017.

After its remarkable success in market growth, the initial policy sets have been running out of steam in recent years. For instance, the turnover growth rate appears to have peaked (Table 3). Trading in the GSM does not spread across maturities but concentrates on one or two ten-year issues and the interbank market.

A utility is another essential concept to capture the development dynamics of an early-phase market. In this study, a utility refers to the trader's or the investor's preference or value recognition in trading or market structure relative to alternatives regarding trading objects, quantities, qualities, timings, modes, counterparts, and other trading behavior attributes. Its preference criteria involve non-monetary or psychological values, such as reliability, functionality, and convenience in consuming trading services. Usually, it is not directly measurable. This study refers to it as utility value, utility amount, or utility quantity when its measurement matters.

The rest of the paper is structured as follows: Section 2 surveys literature about GSM development theories, case studies, and consumer theories. Section 3 overviews the Indian GSM. Section 4 presents a descriptive analysis of the CPF in the light of emerging economies. Section 5 lays out the TDPF. Section 6 explores the causalities of phase-fit and locally fit policy

[4] General government gross debt as defined by IMF.
[5] Average consumer prices.

variables to the market development of the Indian GSM. Section 7 discusses the TDPF's implications and India's experience as regards GSM development in LIEs. Section 8 concludes this work.

2 LITERATURE REVIEW

Following studies on GSM microstructure in the 1990s, the World Bank and IMF jointly took the lead in formulating the policy framework for GSM development in emerging economies through their monumental publication. World Bank and IMF (2001) overviewed theories, market structure, and market practices. They laid out policy measures to advance essential components of GSMs. Subsequently, World Bank (2007a, 2007b) assessed 12 emerging markets[6] against the "sound practices" established in their previous publication. As for the dynamics of market development, World Bank (2007b) points out the "chicken and egg" problems in market development (pp. 54 and 92) but stops short of elucidating their mechanism and policy solutions.

A growing body of literature showcased the efforts that emerging economies made for local currency bond market development (Aguilar, 2006; Arif, 2007; Arvai and Heenan, 2008; BIS, 2002; Castellanos & Martinez, 2006; de Brun, Gandelman, Kamil, & Porzecanski, 2006; De la Torre and Schmukler, 2007; Jiang & McCauley, 2004; Leal and Carvalhal-da-Silva, 2006; Sophastienphong, Mu, and Saporito, 2008; Sy, 2007; Szilagyi, Batten & Fetherston, 2003). Some other studies outline how markets have improved (Amante, Araujo, & Jeanneau, 2007; Silva, 2008; Sophastienphong et al., 2008). AfDB (2007, 2010) provides data on African government debt markets' structures. Meanwhile, Blommestein and Horman (2007) and Berensmann, Dafe, and Volz (2015) also overview African debt markets and their debt management practices. IMF and World Bank (2021) compiled recent GSM development experiences and technical issues of middle-income economies.

Macro-level cross-section studies increasingly searched for determinants of local currency bond market development but stopped short of sorting out issues associated with development phases or development dynamics (Abbas & Christensen, 2007; Adelegan & Radzewicz-Bak, 2009; Akamatsu & Puongsophol, 2017; Claessens, Klingebiel, & Schmukler, 2007; Hanson, 2007; IMF & World Bank, 2016; IMF, World Bank, EBRD, & OECD, 2013; Kumhof & Tanner, 2005; Panizza & Urgo, 2008; Smaoui, Grandes & Akindele, 2017; Warnock & Burger, 2006). Consequently, market microstructure approaches were rare until Endo (2020) questioned the validity of the PD system in LIEs.

The prior literature rarely sees GSMs as consumer markets where investors buy trading services to consume. It is observed and theorized in consumer markets that the values, such as functionality, reliability, and convenience, often come before prices (Christensen, 1997a, 1997b; Gurowitz, 2012; Horton, n.d.; Moore, 2014). A life cycle also operates for new products, services, or technologies. The diffusion of innovation theory portrays consumers' technology adoption behaviors with a logistic curve (Roger, 2003). The technology adoption cycle model comprises four adoption stages characterized by consumers' unique psychographic profiles (Moore, 2014).[7]

[6] Bulgaria, Colombia, Costa Rica, Croatia, Indonesia, Kenya, Lebanon, Nicaragua, Pakistan, Sri Lanka, Tunisia, and Zambia (p. ix, World Bank 2007b)

[7] "a combination of psychology and demographics that makes its marketing responses different from those of the other groups" (Moore, 2014, p. 15).

India's GSM development path is well documented. Patil (2001) vividly blueprints the reform of the Indian GSM that the RBI subsequently followedt. Reddy (2002) discusses the issues and dilemmas faced by the Indian debt market until the GSM Reform. Mohan (2004, 2006) reviews the steady developmental path of the Indian GSM relative to its corporate debt market and presents prospective issues for the next leap. Mohan and Ray (2009) analyze the Indian debt market development in three phases. The first phase (1992-95) created the enabling environment, the second phase (1995-2000) built the market and institutional infrastructure, and the third phase (2001-) enhanced the market liquidity and safety. Mohan and Ray (2017) briefly refer to the bond market but discuss more the financial market settings in which the bond market developed.

The literature on the functional improvement of the Indian GSM is growing. Shankar and Bose (2008) confirm the efficiency of the auction system in the Indian GSM. Nath (2013) shows that the Turnover Ratio and the Amihud Illiquidity Ratio indicate the Indian GSM market liquidity well, but impact cost does not. Rajaram and Ghose (2015) review the evolution and explore primary dealers' functions in the Indian GSM. Fleming, Sareen, and Saggar (2015, 2016) show the highly positive impact of the NDS-OM on the secondary as well as primary markets. Deuskar and Johnson (2016) find that Indian government securities' price dynamics are substantially attributable to the RBI's liquidity provision dynamics.

3 THE INDIAN MARKET

3.1 Primary Market

The RBI, on behalf of the central government or state governments, issues government securities through auctions and underwriting. In consultation with the central government, the central bank issues indicative half-yearly auction calendars, which it subsequently updates. Auctions take place for Treasury bills and government bonds on Wednesdays and Fridays. Accepted bids settle on a T+1 basis. Auctions are open to all investors. Commercial banks, PDs, insurance companies, and other institutions that have funds and securities accounts (Subsidiary General Ledger (SGL) accounts) with the RBI bid on the E-Kuber, that is, the RBI's Core Banking Solution platform. Other investors or intermediaries bid through commercial banks or PDs called Aggregators/Facilitators (Fleming, Sareen & Saggar, 2015, 2016; RBI, 2019).

The total government debt outstood at 68.1 percent of the 2018 GDP.[8] Government securities, Treasury bills, and state development loans outstanding amounted to INR[9] 57,913 billion, INR 5,410 billion, and INR 28,158 billion, respectively, at the end of November 2019.[10] They accounted for 28.85 percent, 2.88 percent, and 14.40 percent of 2018-19 GDP, respectively. The outstanding balance of state development loans also grew fast (Figure 2).

3.2 Secondary Market

The great majority of the outstanding government securities trade on the NDS-OM. Other trading platforms include the "OTC market"[11] and stock exchange platforms such as BSE

[8] IMF. "total government debt" is "General government gross debt" as IMF defines at https://www.imf.org/external/datamapper/GGXWDG_NGDP@WEO/IND?year=2020
[9] The Indian Rupee. Spot rate: INR 71.73 per USD at the close of November 29, 2019. Retrieved from https://www.rbi.org.in/scripts/WSSView.aspx?Id=23407
[10] Table 5: Outstanding-Government Securities, Treasury Bills, and State Development Loans. (CCIL, 2019a)
[11] See Footnote **Error! Bookmark not defined.**.

Direct[12] and the NSE's Negotiated Trade Reporting Platform[13] and Order Matching Platform.[14] The NDS-OM quickly overtook the "OTC market" from 49.64 percent of trades in 2004-05 to 91.21 percent in 2012-13, and 93.29 percent in 2019-20 (up to November 2019). Outright trades increased from 77,060 trades and INR 5,134 billion in 2004-5 to 804,146 trades and INR 93,410 billion in 2018-19 at average compound annual rates of 18.24 percent and 23.03 percent, respectively. Meanwhile, the OTC tends to trade larger-sized orders than the NDS-OM. In 2019-20 (up to November 2019), the OTC's average order size was INR 423.9 million compared to INR 113.6 million for the NDS-OM.[15]

The clearing and settlement in the Indian GSM are secured and efficient. The NDS-OM is STP-connected with the NDS. The RBI requires traders to report trades executed on other platforms to the NDS within 15 minutes of their execution and clear and settle them on the NDS (RBI, 2015, Articles 8.4 and 15.1).

3.3 Primary Dealer System

The RBI introduced PDs in 1996 following auctions for primary issuance that began in 1992. The RBI licensed nine PDs, subject to asset and performance criteria. Since the interest rate reverted upward in 2003-4 after consecutive eight years of decline, severe losses made most PDs financially unsustainable. They had been highly leveraged. The FRBM Act of 2003 ended the RBI's intervention in auctions and made the issuance of government securities fully market-based in 2006. Subsequently, the RBI strengthened the PD system by reorganizing it under dual business models in 2006: three standalone PDs and ten bank PDs (Rajaram & Ghose, 2015). As of the end of December 2019, the GSM has seven standalone PDs (three foreign-owned PDs and four domestic PDs) and fourteen bank PDs (six foreign banks, three domestic private banks, and five public sector banks) (Table 2).

The PD system in India's primary market is a hybrid of underwriting and competitive bidding. The issuance procedure of government securities is in two steps. First, the RBI sets and announces a "minimum underwriting commitment (MUC)" amount equal to 50 percent of the issue amount or more.[16] The RBI's Master Direction requires each PD to underwrite the MUC amount equally (a twenty-first of the MUC amount, at present). Second, the RBI auctions the remaining amount or additional competitive underwriting (AUC) amount. The Master Direction requires each PD to bid for at least its MUC amount (a twenty-first of the MUC amount) up to thirty percent of the AUC amount and an "underwriting commission" rate for its AUC bid amount. Bidding can be in uniform- or multiple-price form or on a price- or yield basis, as the RBI determines for each issuance. The RBI pays an "underwriting commission" to successful AUC bidders. The RBI also pays the AUC bidders who have won four percent or more of the issue amount a commission on their underwritten MUC amounts. The commission is at the average rate of auctioned AUC "underwriting commission" rates weighted by accepted AUC bid amounts (RBI, 2019).

India's selective enforcement of the PD's market-making obligations is sensible and effective in exploiting the primary market and simultaneously activating the secondary market (Endo, 2020).-The RBI entices PDs into bidding or underwriting with fees and competitive pressures. The central bank enforces the trading volume norm for the secondary market but

[12] https://www.bseIndia.com/stastic/markets/debt/ncbGsec.html
[13] https://www.nseIndia.com/products/content/debt/wdm/reporting_system.htm
[14] https://www1.nseIndia.com/products/content/equities/slbs/trading.htm
[15] Calculated from the data in Table 27: Trading Platform Analysis of Outright Trades. (CCIL, 2019a)
[16] Currently, the RBI sets the MUC at 50 percent of the issue amount.

not the continuous firm bid-ask quoting obligation. The RBI's Master Direction requires each PD to offer two-way firm quotes (market-making) and trade government securities outright five times or more than its average month-end stock annually (RBI, 2019). PDs' market-making through two-way firm quoting is meant to help non-PD dealers, brokers, and end-investors trade with trading immediacy to meet their diverse needs. However, the RBI has not enforced the obligation on PDs unnecessarily[17].

4 CONVENTIONAL POLICY FRAMEWORK (CPF)

The CPF that the World Bank and IMF jointly developed in the early 2000s considerably disseminated knowledge about GSMs to emerging economies. However, it is subject to some shortcomings for GSM development in LIEs. Firstly, it does not differentiate GSMs by macroeconomic settings. This shortcoming may be called the single-universe problem. Secondly, it disregards the distinction between market components (endogenous factors) and fiscal and monetary preconditions (exogenous factors). This shortcoming may be called the indistinction problem. Thirdly, it fails to identify the coherent groups of interconnected market components. That is the incoherence problem. Fourthly, it overlooks dynamic feedback loops of inter-connected market development processes. This shortcoming may be called the standalone-component problem**.**

The single-universe problem prevents heeding a policy's local specificity, such as the level, size, or properties of an economy. The government's rather limited capacities and resources in an LIE would understandably compel GSM development to share the capacities and resources with other political, economic, and social objectives. Since the development of an LIE GSM is thus dependent on the rest of the local economy[18], locally-tailored approaches would be indispensable.

The indistinction problem makes it hard for the GSM policymaker to focus on endogenous market development issues. This problem blurs the boundaries of responsibilities among fiscal, monetary, and GSM development authorities.

The incoherence problem likely comes from the practice that market development efforts are often piecemealed or assigned discretely to individual specialists without overall coordination. This practice would risk market components being frictional, disorderly, or inefficient as a system, even if they are individually legitimate. A market component's workings are often bound by or pre-conditional to other market components. For example, an electronic trading platform needs dematerialization. A central counterparty function requires novation.

The standalone-component problem may ignore the dynamic nature of market development processes. The processes are interdependent and looped, and they are likely to have different carrying capacities. Accordingly, they have to be managed so that no structural breaks occur in market development. A precedent process in interconnected processes must produce only as much output as its dependent process or processes can absorb economically and operationally. Inversely, a dependent process can accept only as much input as its precedent process or processes can produce economically and operationally. Excessive output or input may be wasteful or harmful to a connected process. Therefore, market development simultaneously involves multiple market components and is endogenously multi-constrained

[17] In the Evolving Phase, it is often observed that the market regulator does not fully enforce the PD's market-making in the secondary market.

[18] A GSM and the rest of its local economy are mutually dependent, forming feedback loops. However, the GMS's feedback effect takes time to show up.

and dynamic. The constrains could be transtemporal. Its progress would be incremental, gradual, and non-linear.

5 THE ANALYTICAL FRAMEWORK

5.1 GSM Development in Two-dimensions

GSM development can be viewed in two dimensions. The horizontal dimension in Figure 1 and Table 1 represents the Exogenous Dimension, consisting of factors exogenous to a GSM. Those factors include macroeconomic, fiscal, and monetary policies or conditions. This Exogenous Dimension broadly divides the universe of emerging markets into four development phases: the Nascent, Evolving, Advanced, and Highly-advanced Phases. GSMs in most LIEs fall in the Nascent or Evolving Phase. Each development phase forms a policy set paradigm[19] for market operations and development.

By contrast, the vertical dimension is the Endogenous Dimension and comprises factors endogenous to a GSM. The GSM policymaker can usually manage these endogenous factors. They are market components, such as accounting rules, legal rules, primary market, secondary market, money market, debt and cash management, clearing and settlement, and derivative and futures market. Thus, the two dimensions form a matrix of market components by market development phases.

A development phase on the Exogenous Dimension gives the GSM policymaker a realistic perspective on its development horizon. The GSM policymaker can hardly upgrade its economy for GSM development in its capacity and during its tenure. Conversely, an economy's position on the Exogenous Dimension sets the exogenous conditions of a GSM. Fiscal and monetary policies or conditions are also exogenous but could be flexible for the GSM policymaker relative to macroeconomic ones. These exogenous factors shape a policy paradigm for a set of market components.

The TDPF determines a market's development phase by comparing its functioning policies and institutional settings horizontally and vertically. A country can develop a GSM in a single development phase (intra-phase market improvement). A country's market may rarely shift from one development phase to another unless its economy undergoes a structural change (inter-phase transition). The policy selection and implementation should be flexible in the local context. Economies can also have different developmental goals and paces.

5.2 The Indian GSM in the Two-Dimensional Framework

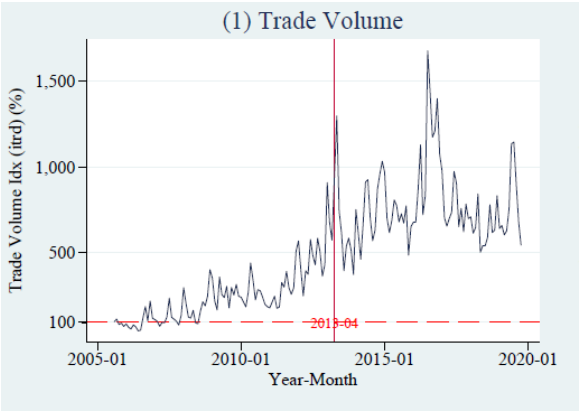
The Indian GSM was in the Nascent Phase before starting the financial market deregulation in 1991 (the Deregulation) and entering the Evolving Phase. The launch of the GSM Reform in the early 2000s enabled the GSM to leap. The strategic focus was a market infrastructure reinforcement. Meanwhile, the World Bank recategorized the country from a lower-income country to a lower-middle-income one in 2007.

India's GSM has been in the Evolving Phase since then. The country systematically improved the GSM in the new phase, though its market development did not follow the CPF. Instead, it implemented the policy goals and measures that were broadly consistent with those prescribed for the Evolving Phase in the TDPF. In the early 2000s, the RBI revamped its policy goals and measures to meet the economy's imminent needs and set realistic goals. Like many

[19] An operational framework of coherent policies set and its associated activities

other emerging markets, India's financial market was bank-centric, and public sector banks were predominant. Yet, the RBI needed to ensure market-based issuance of government securities and enhance secondary market liquidity.

Figure 4: Trade Volume Index in the First-half and Second-half Periods



Source: The Author

The core programs for the market infrastructure reinforcement were the NDS, the automated clearing and settlement system with a CCP function, and the NDS-OM, the screen-based order-driven trading platform. They came into operation in 2001 and 2005 under the CCIL's management. The country supplemented a telephone-voiced, quote-driven OTC market with a screen-based order-driven market as government securities' principal marketplace. Continuous order-driven order-matching, which is typical on stock exchanges, fits well with the market features of a GSM in the late Evolving or early Advanced Phase. The turnover and trading volume of the Indian GSM rose remarkably from 2005 to 2013 (Figures 3 and 4).

The relatively simple trading strategies in the Indian GSM allowed the RBI to capitalize on the order-driven trading platform model that the National Stock Exchange (NSE) successfully deployed in the 1990s.[20] The narrow trading choice largely balanced the supply and demand for immediacy (Grossman & Miller, 1988) and lessened the necessity of two-way quoting. Thus, the NDS and the NDS-OM may be viewed as an extension of the NSE market structure (Patil, 2001).

India has developed a GSM on its bank-centricity rather than on a capital market. Neither was its investor base broad and deep, nor its non-bank intermediaries were well-capitalized. Even if desirable, it would have been impractical to transform India's financial market structure for GSM development in a matter of years. Bank-centricity is common in the Nascent and Evolving Phases. The PD reform in 2006 further reinforced the bank-centricity by reducing standalone PDs and creating bank PDs. Of 21 licensed PDs, seven and fourteen PDs are standalone and banks, respectively, as of the end of December 2019 (Table 2).

Table 2: PD Interviews & Surveys Statistics

	Licensed	Interviewed	Answered to survey
PDs	**21**	**17**	**10**
Standalone	**7**	**5**	**3**
Domestic	4	3	2
Foreign	3	2	1
Banks	**14**	**12**	**7**
Domestic	8	8	6
Public	3	3	3
Private	5	5	3
Foreign	6	4	1

Source: The Author

India's GSM developmental path occasionally deviated from the Framework model favorably or unfavorably. The country equipped its NDS with a CCP function when the market was still in the Evolving Phase. Given India's market development history, the CCP was integral to its strategic market structure. Many other countries may consider installing a CCP in the Highly-Advanced Phase. On the other hand, the Indian market has not fully

[20] The NSE's market structure pointedly addressed the concern of the Indian investment community in the 1990s in the advent of the Harshad Mehta scandal in 1992. The concern centered on the certainty, reliability, and safety of their trading and settlement.

adopted a mark-to-market accounting rule that the framework places as a policy measure of accounting in the Advanced Phase. Its attempt to run STRIPS and When-Issued on the market has not gained momentum.

6 CAUSALITY ANALYSES

6.1 The target variable

This section investigates endogenous market factors' causality to the trade volume growth in the Evolving Phase of the Indian GSM. As such, the trade volume is the target variable or dependent variable in this analysis.

6.2 Trading costs

The analysis indicates that the central bank appropriately employed the market growth policies from 2005 to 2013. The RBI's policies brought about trading "transparency and ease," repo market development, and competitive bid-ask spreads, among other things. The NDS and the NDS-OM have made GSM trading transparent and easy. Repo market development has provided PDs with additional money management tools. Notably, the trading volume requirement the RBI imposed on PDs and linked to auction and underwriting privileges pressured and incentivized PDs to narrow bid-ask spreads.

The reduction of trading costs resulting from these policies appears to have substantially increased trade volumes. Trading costs are inversely correlated to market liquidity (Madhavan,1992). Chaumont (2018) points to "a trade-off between the transaction costs and the trading probability" in the secondary market for sovereign bonds. This trading property is

Table 3: PD Surveys about Market Making – Questions and Aggregated Answers

Survey Questions	Aggregated Answers
(1) Do you calculate the cost of market-making to determine the spread?	Six PDs follow “market trend.” Four PDs look to repos or market liquidity.
(2) Do you build up and hold an inventory of bonds for market-making purposes?	Seven PDs hold an inventory. By contrast, two PDs deny holding any inventory and instead rely on the repo market.
(3) If you take into account the inventory holding costs, do you include: • Interest expenses (funding cost) of the inventory • Market risk costs of the inventory	Five PDs take into account funding costs and market risk. Two foreign PDs look to repo rates.
(4) When the market volatility increases, what do you do? • Widen the spread • Withdraw your orders from the market, or • Others.	Five PDs withdraw their quotes. Four PDs widen their quotes.
How often do you withdraw your offers?	Two of them frequently (multiple times a day) and another rarely withdraw their quotes.
Do you withdraw your orders for: • RBI-predetermined benchmark issues, • Normally, most liquid issues, or • Both?	Of five PDs withdrawing quotes, three withdraw both RBI-designated benchmark issues and most liquid issues. Two withdraw quotes from most liquid issues only
(5) What is the distribution of trades between interbank and non-interbank customers? • 90:10 • 80:20 • 70:30 • 60:40 • Other.	The ratio of interbank trades ranges from 60 to 95 percent. Active PDs tend to be more interbank-oriented. Public bank PDs tend to have more customer transactions than others.

Source: The Author

observed in advanced markets where utilities necessary for trading are available - non-pecuniary trade frictions are minimal. In early phase markets, however, trading costs contain unavailable utilities. Accounting usually does not recognize the elusive utility elements of trading costs. However, they significantly affect trading decisions in India's case.

Indian PDs' trading behavior reflects this broader concept of trading costs. I conducted semi-structured interviews with PDs in the Indian GSM and surveyed their market-making practices in September and October 2019. The interviewees were trading heads and traders of 17 out of 21 PDs. The written survey followed the interviews, and ten PDs voluntarily answered the survey. Table 3 summarizes their responses.

The interviewed traders unanimously attributed their preference for the NDS-OM over the telephone-voiced OTC market to "ease and transparency." Table 4 decomposes the trader's "ease and transparency" and relates its utility elements to the various trading cost elements that the NDS-OM and the NDS are considered to have reduced. Quantifying these utilities and the new market infrastructure building in monetary terms is not straightforward, mainly because their benefits and costs scatter across the economy. However, the trader's increased use of the NDS-OM suggests that the benefits from the utilities or the spread savings or both exceeded the overall costs of the automated platform (market centralizing costs). Accordingly, my causality analyses proxy for the degrees of trading "transparency and ease" using NDS-OM trading percentages.

Table 4: The Trader's Utilities of the NDS-OM

Traders' expressions	Facilitated Functions	Positive Effects	Reduced Costs
"Ease"	Standardized order format	Standardized trade execution, settlement, clearing, depository, and reporting	Order processing costs
	Electronic connectivity (vertically integration)	• Reduced human intermediation • Straight-through processing	
	Shorter execution time	Enhanced trade immediacy	Opportunity costs
	Central counterparty	No fails, no counterparty risk, settlement certainty	Information (credit) search costs Order processing costs Opportunity costs
"Transparency"	Centralized marketplace	Ensured best execution	Information search costs
	Displayed pre-trade information (limited order book)		Dealers' oligopoly rents
	Immediately reported post-trade information	Shorter trading cycle	Opportunity costs

Source: The Author

6.3 Data

This causality analysis sourced the raw market data of the Indian GSM mainly from the CCIL. The CCIL published the time series data from August 2005 to March 2019 in CCIL (2019a, 2019b), and the CCIL individually provided the same time series from April 2013 and October 2019. All the sample variables were monthly averages of their daily values that the CCIL observed on its system.

I took the following two steps to analyze the data. First, I examined my time series variables for autocorrelations to choose the most appropriate model from the vector autoregression (VAR), vector error correction (VEC), and autoregressive distributed lags (ARDL) models. Second, I specified the chosen model by examining the sample variables' properties and

determining their order of integration. To this end, I tested the sample variables for multicollinearity, autocorrelation, optimal lag orders, and unit roots.

Table 5: Summary of Variables

Variable	Variable Label	Obs	Mean	Std. Dev.	Min	Max
Raw Variables						
trd	Av Daily Trades	75	1,447.11	809.66	383	4,689
gsec	G-securities Balance (INR bil)	75	18,671.38	5,899.67	10,203.50	30,173
ndsom_pct	Av Daily NDS-OM Percentages (%)	75	85.96	5.62	58.63	92
trdsize	Trade Value Size	75	0.09	0.01	0.07	0
oldsprd	Av Old Bid-Ask Spreads (%)	75	0.24	0.18	0.04	0
repo	Av Daily Repos	75	204.48	46.66	113	3
Normalized Variables						
itrd	Trade Volume indx (%)	75	248.64	139.12	65.81	805
igsec	G-securities Balance indx (%)	75	182.99	57.82	100	295
indsom_pct	NDS share indx (%)	75	112.41	7.35	76.67	121
itrdsize	Trade Value Size indx (%)	75	125.61	13.7	100	167
ioldsprd	Old spread indx (%)	75	151.9	115.95	28.06	46
irepo	Repo indx (%)	75	116.85	26.66	64.57	181

(2) The Second-half Period

Variable	Variable Label	Obs	Mean	Std. Dev.	Min	Max
Raw Variables						
trd	Av Daily Trades	79	4,004.66	1,235.44	1,936.00	8,647
gsec	G-securities Balance (INR bil)	79	44,215.38	7,248.60	30,623.60	57,227
ndsom_pct	Av Daily NDS-OM Percentages (%)	79	93.11	1.52	87.46	95
trdsize	Trade Value Size	79	0.12	0.01	0.1	0
newsprd	New Bid-Ask Spread (%)	79	0.03	0.03	0.01	0
Normalized Variables						
itrd	Trade Volume indx (%)	79	82.81	25.55	40.03	17
igsec	G-securities Balance indx (%)	79	144.38	23.67	100	186
indsom_pct	NDS share indx (%)	79	98.2	1.6	92.25	100
itrdsize	Trade Value Size indx (%)	79	98.77	10.8	81.84	123
inewsprd	new spread indx (%)	79	85.51	67.16	26.05	438

Source: The Author's calculation

To begin with, I normalized the sample values of the variables relative to 100 at the beginning of each of the two subperiods, January 2007 and April 2013. The normalization (indexation) made their behaviors directly comparable. Table 5 provides the summary statistics of the raw as well as normalized data.

I split the sample period from August 2005 and October 2019 into two subperiods: January 2007 to March 2013 (the first-half period) and April 2013 to October 2019 (the second-half period) for a suspected structural change in the market and a data inconsistency problem. Also, I dropped the 17 months from August 2005 to December 2006 since the period lacks bid-ask spread data. I labeled the variable *ioldsprd* and *inewsprd* for the first- and second-half periods, respectively.

I checked the independent variables' multicollinearity since I estimated regression models with the trade volume (*itrd*) as the dependent variable. Consequently, I dropped the repo trade (*irepo*) for modeling for the second-half period. As a result, I had the independent variables of *igsec, indsom_pct, irepo, itrdsize,* and *ioldsprd* for the first-half period, and *igsec, indsom_pct, itrdsize,* and *inewsprd* for the second half period.

My investigation of the sample variables' properties started by testing them for autocorrelation.[21] I ran Durbin's alternative test. The majority of the level and first difference variables were autocorrelated, so AR(1) models – VAR and VEC models - could not be estimated to fit the variables. Hence, I chose the ARDL model.

I selected optimal lag orders of the level variables for the causality models by the Vector Auto-Regressive Specification Order Criterion (varsoc). Since the sample sizes of the time series were not large (75 and 79 for the first-half and second-half subperiods, respectively), I focused on the SBIC for optimal lag order selections (Ventzislav & Lutz, 2005). I performed the Augmented Dickey-Fuller test and the DF-GLS test (the modified Dickey-Fuller *t*-test) for unit root in the level and first difference variable time series. Finally, I performed the HEGY test on the *itrd* and *indsom_pct* variables for a seasonal unit root.

[21] My statistical software for these analyses was Stata version 16.

6.4 Methodologies

I estimated the ARDL model and its error correction (EC) process (ARDL/EC model) to assess the variables' causality to the target variable. At first, I identified the likely lag order combinations for the valid ARDL/EC model. Then, the likely lag order combinations underwent the bounds tests to determine the possible presence of cointegration (long-run regressive relationship among the level variabtransteles) as well as their post-estimation tests for the satisfaction of the assumptions underlying the ARDL/EC model (the integration conditions of I(0) and I(1) but not I(2)).[22] The post-estimation tests included the Durbin-Watson test (code: estat dwatson) and the Breusch-Godfrey test (code: estat bgodfrey) for autocorrelation in the residuals, White's test for homoskedasticity (code: estat imtest, white), and the cumulative sum test for parameter stability (code: estat sbcusum).

To model my datasets, I expanded a general representation of an ARDL(p, q) model and its ARDL/EC model. The dependent variable for the first-half period was *itrd*. Its independent variables were *igsec*, *indsom_pct, irepo, itrdsize*, and *ioldsprd*. I denoted them by *itr*, *ig*, *in*, *ir, its,* and *ios* for simple representation and prefixed their summation index i with "." to distinguish them from those variable indices. The ARDL/EC model for the first-half period was:

$$\Delta itr = c_0 + c_1 t - \alpha(itr_{t-1} - \boldsymbol{\theta x}_t) + \sum_{i=1}^{p-1} \psi_{itr.i}\, \Delta \boldsymbol{itr}_{t-i} + \sum_{i=0}^{q_{ig}-1} \psi'_{ig.i}\, \Delta \boldsymbol{ig}_{t-i} + \sum_{i=0}^{q_{in}-1} \psi'_{in.i}\, \Delta \boldsymbol{in}_{t-i} + \sum_{i=0}^{q_{ir}-1} \psi'_{ir.i}\, \Delta \boldsymbol{ir}_{t-i} + \sum_{i=0}^{q_{its}-1} \psi'_{its.i} \Delta\, \boldsymbol{its}_{t-i} + \sum_{i=0}^{q_{ios}-1} \psi'_{ios.i}\, \Delta \boldsymbol{ios}_{t-i} + u_t\,. \quad (1)$$

For the second-half period, by omitting *irepo* and replacing *ioldsprd* (*ios*) with *inewsprd* (*ins*), I obtained the following ARLD/EC model:

$$\Delta itr = c_0 + c_1 t - \alpha(itr_{t-1} - \boldsymbol{\theta x}_t) + \sum_{i=1}^{p-1} \psi_{itr.i}\, \Delta \boldsymbol{itr}_{t-i} + \sum_{i=0}^{q_{ig}-1} \psi'_{ig.i}\, \Delta \boldsymbol{ig}_{t-i} + \sum_{i=0}^{q_{in}-1} \psi'_{in.i}\, \Delta \boldsymbol{in}_{t-i} + \sum_{i=0}^{q_{its}-1} \psi'_{its.i} \Delta\, \boldsymbol{its}_{t-i} + \sum_{i=0}^{q_{ins-1}} \psi'_{ins.i}\, \Delta \boldsymbol{ins}_{t-i}\; u_t\,. \quad (2)$$

I ran Equations (1) and (2) on the sample variables with selected lag order combinations to estimate the model's long-run and short-run parameters.

The ARDL/EC model's specification sensitivity centered on selecting lag orders for the sample variables or lags(p q_{ig} q_{in} q_{its} q_{ir} q_{ios}) for the first-half period and lags(p q_{ig} q_{in} q_{its} q_{ins}) for the second-half period. Stata's ARDL software module automatically assigned lag orders for each dependent and independent variable.

[22] The residuals of the ARDL/EC model are homoscedastic, serially uncorrelated, and stable over time (no structural change). (Kripfganz & Schneider, 2018, and others)

Finally, I estimated the impact of the *igec* and *indsom_pct* variables on the ARDL/EC regression's explanatory power by dropping them in sequence and verifying lag order combinations with post-estimation tests. The differences that dropping a variable from the regression makes in R-squared were expected to measure the variable's impact on the *itrd* variable or the trade volume (stepwise method).

6.5 Results

The results of Durbin's alternative test for Autocorrelation and the Autocorrelation Plots confirm my sample variables' autoregressiveness either in level or in first difference or both. Notably, the *indsom_pct* variable was non-autoregressive in level but autoregressive in first difference for the first-half period.

The results of the DF-GLS test and the Augmented Dickey-Fuller for unit root confirm that the sample variables were integrated of order 0 (I(0)) or order 1 (I(1)).

Table 6: Stata output - Cointegration Relationship of itrd and independent variables for the First-half Period (2007-01 - 2013-03)

The First-half Period (2007-01 - 2013-03)
Sample: 2007-03 - Number of obs = 73
R-squared = 0.5107
Adj R-squared = 0.4128
Log likelihood = - Root MSE = 74.3172

D.*itrd*	Coef.	Std. Err.	t	P>|t|	[95%	Interval]
ADJ						
itrd						
L1.	-0.963828	0.1596048	-6.04	0.000	-1.283085	-0.64457
LR						
igsec	1.238424	0.3184949	3.89	0.000	0.6013392	1.875508
indsom_pct	4.71427	2.321337	2.03	0.047	0.070905	9.357634
irepo	0.9855633	0.6519742	1.51	0.136	-	2.289706
itrdsize	1.90578	1.046627	1.82	0.074	-	3.999347
ioldsprd	0.0476454	0.1083383	0.44	0.662	-	0.264354
SR						
itrd						
LD.	0.2718715	0.12608	2.16	0.035	0.0196739	0.524069
igsec						
D1.	-9.161366	6.217188	-1.47	0.146	-21.59759	3.274862
indsom_pct						
D1.	0.5674625	1.729826	0.33	0.744	-2.892704	4.027629
irepo						
D1.	0.2449174	0.7173015	0.34	0.734	-1.189899	1.679734
itrdsize						
D1.	-0.744683	0.9562347	-0.78	0.439	-2.657437	1.168071
ioldsprd						
D1.	-	0.1183265	-0.04	0.966	-	0.231694
_cons	-817.1547	252.2628	-3.24	0.002	-1321.755	-312.554

Source: The Author's calculation

The HEGY test results for seasonal root indicate they had unit roots individually but not jointly and had non-seasonal unit roots (unit roots at the zero-frequency). The results are not entirely consistent with those of the Augmented Dickey-Fuller test. The dubious monthly seasonality in the variables does not seem as significant as it may affect the long-run causality.

The above findings are consistent with the ARDL/EC modeling assumptions subject to the post-estimation tests. The confirmed mixed presence of unit roots disqualifies either a VAR model or a VEC model for modeling my data.

The estimation of the ARDL/EC model parameters with likely lag order combinations was subjected to the post-estimation tests. All the results suggest that the best-fit lag combinations were lags(2 1 1 1 1 1) and lags(1 1 0 1 0) for the first- and second-half periods, respectively.

Tables 6 and 7 present the ARDL/EC's parameters estimated with the best-fit lag combinations for the first-half and second-half periods. The impacts of the government securities balance and the NDS-OM variables are summarized in Tables 8 and 9. Excluding the *igec* variable from the regression lowered the R-squared from 51 percent to 40 percent for the first half period and from 49 percent to 42 percent for the second-half period (Tables 8(1) and 9(1)). Further, ignoring the *indsom_pct* variable reduced the R-squared from 40 percent to 18

percent[23] for the first half period and from 40 percent to 25 percent for the second-half period (Tables 8(2) and 9(2)).

7 DISCUSSION

The CPF has so far failed to deliver expected results to LIEs. This research aimed to improve upon the CPF. It questioned how the GSM policymaker could develop practical policy sets for GSM development in LIEs and if any policy framework could help formulate them.

Table 7: Stata output - Cointegration Relationship of itrd and independent variables for the Second-half Period (2013-04 - 2019-10)

The Second-half Period (2013-04 - 2019-10)
ARDL(1,1,0,1,0)
Sample: 2013-05 - 2019-10 Number of obs = 7
R-squared = 0.487
Adj R-squared = 0.436
Log likelihood = - Root MSE = 16.678

D.*itrd*	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interva
ADJ						
itrd						
L1.	-0.6381263	0.095634	-6.67	0.000	-	-0.4473
LR						
igsec	-0.3353774	0.1787872	-1.88	0.065	-	0.02120
indsom_pct	10.81974	2.306342	4.69	0.000	6.219886	15.419
itrdsize	1.168602	0.4117613	2.84	0.006	0.3473701	1.98983
inewsprd	-0.0286854	0.0512199	-0.56	0.577	-	0.0734
SR						
igsec						
D1.	-2.892274	2.199252	-1.32	0.193	-7.278543	1.49399
itrdsize						
D1.	0.5225009	0.3435998	1.52	0.133	-	1.20778
_cons	-663.3685	142.0962	-4.67	0.000	-946.7704	-379.96

Source: The Author's calculation

The results evidence endogenous market factors' significant contribution to market development in its early phases. This study measured the contribution of an independent variable in terms of differences in R-squared values calculated by stepwise methods. In India's case, all the independent variables explained 51 percent of the trade volume (*itrd*) growth in the first-half period (Table 6). The balance of government securities (*igsec*) was a fiscal policy variable. Excluding it, the endogenous variables explained 40 percent (Table 7(1)). The 51 percent can be broken down into 10 percent for the government securities' balances (*igsec*), 22 percent for the market infrastructure innovation (the NDS-OM percentages) (*indsom_pct*), and 18 percent for the rest of the variables (Table 7(2)). These weights should not be taken as independent since they are cointegrated. Also, more precisely, they contributed to changes but not necessarily growth in the trade volume. Nonetheless, I view their positive changes as contributions to growth.

By contrast, the second half period manifested a fiscal policy variable's limitation. The trade volume could not keep up with the continued growth of government securities balance, and the turnover declined. All the independent variables explained 49 percent of the trade volume changes when its growth was almost flat (Table 7). The NDS-OM percentages and the other endogenous variables accounted for 42 percent, separately 16 percent and 26 percent (Table 9). The balance of government securities was no longer statistically significant at a p-value of 0.065, and its coefficient was negative (Table 7).

The NDS-OM in India's context had two implications: a locally-fit and phase-fit market structure and hidden utility exploitation. Firstly, adopting the new market structure was timely for the Indian GSM in the Evolving Phase. The Indian GSM adopted an order-driven model for its automated trading platform instead of a quote-driven one, which most advanced markets adopt and the IDC usually recommends. In an early development phase, the trading choice is relatively narrow since liquid issues are limited in number, the investor base is small or homogeneous, and trading and investment techniques are simple. The relative simplicity more likely balances the supply and demand for immediacy (Grossman & Miller, 1988). India could

[23] At 18% for the R-squared, the bounds test failed against the 1% critical value of the t-statistic (Table 7).

extend its locally developed and successfully implemented stock market model to the GSM in the 1990s.

Secondly, the NDS-OM also meant uncovering hidden "universal" utilities embedded in the Indian GSM's reformed market structure. Utilities are economic agents' perceptions, and they are not directly measurable. They can be grouped into universal utilities and trader-specific ones. The former affects all traders across the market as the trading "transparency and ease" did. The NDS-OM as a component of a market structure generates "universal" utility values. A utility may also eliminate or reduce a negative market structure component, such as social or political rent in a GSM. They are more apparent in the early stages than the later ones of a market development phase in which most traders become price-takers.[24]

Consumption theories developed in the real economy suggest the dominant role of utilities in the early development phases of the Indian GSM. The observed role of utilities in motivating the investor to trade in the early phases of the Indian GSM is typical of industrial and retail consumers' buying behaviors in imperfect markets. It is known that non-pecuniary values, such as functionality, reliability, or convenience, dominate industrial or retail consumers' buying decisions in the early phases of their product life cycles or imperfect markets (Christensen, 1997a, 1997b; Gurowitz, 2012; Horton, n.d.; Moore, 2014). The Indian investor's behavioral evolution over time in the Evolving Phase has also been consistent with consumption theories. Its utility consumption was gradual, accelerated, decelerated, and stalled in the NDS-OM's capacity life cycle. This pattern fits Roger's innovation-decision process model (Roger, 2003, pp. 168-218) and Moore's technology adoption cycle model (Moore, 2014, pp. 11-17).

The observed bid-ask spread's insignificance suggests that a trade causality analysis should consider utility values before the spread. The bid-ask spread narrowing to as narrow as three basis points did not significantly increase the trade volume throughout the observation period (Table 3). The bid-ask spread is inversely correlated with the trading volume in advanced securities markets (Chaumont, 2018; Madhavan,1992). The trade causality in LIE GSMs, as the Indian GSM exemplifies, is not that straightforward.

These findings indicate that effective GSM development policies are phase-fit. Therefore, the policymaker likely finds high-leverage policies in the column of its development phase in the TDPF table. India's introduction of a screen-based automated trading platform in 2005 typifies a phase-fit policy measure after the country fostered market environments in the 1990s and the early 2000s. Relevance, timeliness, sequence, and coherence are crucial to overall policy effectiveness in the local context. Table 10 shows the general alignment of India's policy measures and the TDPF, though they were independently formulated.

A high-leverage policy's strength would be temporal and conditional, like India's NDS-OM. The high-leverage policy may shift, even in the same development phase. Then, the policymaker may have to reset market development targets or policies to keep up with the changes. The NDS-OM that had saturated the market structure's carrying capacity could no longer raise the turnover ratio in the second half period, even though the government securities balance kept growing (Figure 3).

Some market environments are not always rigidly exogenous to the market. Fiscal and monetary settings could be somewhat manageable for the GSM policymaker compared to macroeconomic ones. The legal or working relationships among market development, fiscal,

[24] The trader-specific utilities are what Harris (2003) analyzes as utilitarian trading benefits (pp. 178-194).

and monetary authorities can make fiscal and monetary environments less rigid. An example is India's Fiscal Responsibility and Budget Management Act of 2003 (Table 10).

Policy consistency pays off. Policies prescribed for a development phase in the TDPF assure policy consistency over the mid- to long-term. Even endogenous market improvement in a

Table 8: R-squared and Post-estimation Tests with Variables Excluded

Lag order combination*	Bounds testing for cointegration (estat ectest) F	t	Durbin-Watson test for autocorrelation (estat dwatson)	Breusch–Godfrey test for autocorrelation (estat bgodfrey, lags(1)) Ho: No autocorrelation	White's test for homoskedasticity (estat imtest, white) Ho: homoskedasity	R-squared	Ho: var = 0 *indsom_pct*	*irepo*
	Reject Ho (no level relationship) at		Normal 1.5 -2.5					
(1) ARDL/EC model controlling for *igsec* for the First-half Period (2007-01 - 2013-03)								
1 0 0 0 0	10%, 5%, 1%	10%, 5%, 1%	1.965487	0.8438	0.0936	**0.4022**	#0.000	#0.023
1 1 0 0 0	10%, 5%	10%, 5%, 1%	1.980802	0.8762	0.3032	0.4024	#0.000	#0.027
1 1 1 0 0	10%, 5%	10%, 5%, 1%	1.972868	0.7909	0.1520	0.4027	#0.000	#0.038
1 1 1 1 0	10%, 5%	10%, 5%, 1%	1.925314	0.4517	0.1804	0.4083	#0.000	0.063
1 1 1 1 1	10%, 5%	10%, 5%	1.922488	0.4358	0.2543	0.4128	#0.000	0.068
2 0 0 0 0	10%, 5%, 1%	10%, 5%, 1%	1.964340	0.8041	0.0075	0.4058	#0.000	#0.018
2 1 0 0 0	10%, 5%	10%, 5%	1.959265	0.5055	0.0658	0.4065	#0.000	#0.028
2 1 1 1 0	10%, 5%	10%, 5%	1.910631	0.5679	0.1678	0.4132	#0.000	#0.049
2 1 1 1 1	10%, 5%	10%, 5%	1.904224	0.4511	0.4512	0.4171	#0.000	0.054
(2) ARDL/EC model controlling for *igsec* and *indsom_pct* for the First-half Period (2007-01 - 2013-03)								
1 0 0 0	10%, 5%, 1%	10%, 5%	1.964616	0.8341	0.4852	**0.1814**	Excluded	#0.015
1 1 0 0	10%	10%, 5%	1.980802	0.8762	0.3032	0.1839	Excluded	#0.016
1 1 1 0	10%	10%, 5%	1.899729	0.4570	0.0873	0.2132	Excluded	0.051
1 1 1 1	10%	10%, 5%	1.900370	0.4606	0.1283	0.2137	Excluded	0.053
2 0 0 0	10%	10%	1.964340	0.8041	#0.0075	0.1894	Excluded	#0.008
2 1 0 0	None	10%	1.988918	0.9343	#0.0183	0.1934	Excluded	#0.007
2 1 1 0	None	10%	1.946091	0.3714	#0.0266	0.2214	Excluded	#0.025
2 1 1 1	None	10%	1.945987	0.3681	0.0955	0.2217	Excluded	0.488

* In the order of *itrd, indsom_pct, irepo, itrdsize,* and i*oldsprd* for (1); and *itrd, irepo, itrdsize,* and *ioldsprd* for (2)
# Reject Ho
Source: The Author's calculation

Table 9: R-squared and Post-estimation Tests with Variables Excluded

Lag order combination*	Bounds testing for cointegration (estat ectest) F	t	Durbin-Watson test for autocorrelation (estat dwatson)	Breusch–Godfrey test for autocorrelation (estat bgodfrey, lags(1)) Ho: No autocorrelation	White's test for homoskedasticity (estat imtest, white) Ho: homoscedasity	R-squared	Ho: var = 0 *indsom_pct*	*irepo*
	Reject Ho (no level relationship) at		Normal 1.5 -2.5					
(1) ARDL/EC model excluding *igsec* for the Second-half Period (2013-04 - 2019-10)								
1 0 0 0	10%, 5%, 1%	10%, 5%, 1%	1.553040	0.0175	0.7832	**0.4213**	#0.000	#0.008
1 1 0 0	10%, 5%	10%, 5%, 1%	1.801236	0.2873	0.8576	0.4511	#0.022	#0.041
1 1 1 0	10%, 5%	10%, 5%	1.991256	0.7260	0.9733	0.4893	#0.022	0.336
1 1 1 1	10%, 5%	10%, 5%	2.023292	0.5191	0.9601	0.4935	#0.048	0.441
2 0 0 0	10%, 5%, 1%	10%, 5%, 1%	#1.483217	#0.0005	0.8401	0.4230	#0.000	#0.010
2 1 0 0	10%, 5%	10%, 5%	1.725438	#0.024	0.9057	0.4590	0.089	0.067
2 1 1 0	10%, 5%	10%, 5%	1.902557	0.6923	0.9604	0.4879	0.077	0.371
2 1 1 1	10%, 5%	10%, 5%	1.943499	0.9288	0.9321	0.4972	0.190	0.526
1 0 0 0	10%, 5%, 1%	10%, 5%, 1%	1.553040	0.0175	0.7832	0.4213	#0.000	#0.008
(2) ARDL/EC model excluding *igsec* and *indsom_pct* for the Second-half Period (2013-04 - 2019-10)								
1 0 0	10%, 5%, 1%	10%, 5%, 1%	1.774259	0.2959	0.6403	**0.2564**	0.135	#0.043
1 1 0	10%, 5%, 1%	10%, 5%, 1%	1.890391	0.7663	0.9461	0.2927	0.549	#0.046
1 1 1	10%, 5%, 1%	10%, 5%, 1%	1.890085	0.7513	0.9623	0.2927	0.555	0.069
2 0 0	10%, 5%, 1%	10%, 5%, 1%	1.766014	#0.0312	0.8115	0.2870	0.117	0.050
2 1 0	10%, 5%, 1%	10%, 5%, 1%	1.867795	0.3191	0.9786	0.3098	0.416	0.055
2 1 1	10%, 5%, 1%	10%, 5%, 1%	1.862177	0.2415	0.8682	0.3112	0.437	0.054
2 2 0	10%, 5%, 1%	10%, 5%, 1%	1.814740	0.0720	0.9857	0.3184	0.634	0.078
2 2 1	10%, 5%, 1%	10%, 5%, 1%	1.805833	#0.0294	0.8820	0.3206	0.673	0.068

* In the order of *itrd, indsom_pct, itrdsize,* and *inewsprd* for (1); and *itrd, itrdsize,* and *inewsprd* for (2)
# Reject Ho
Source: The Author's calculation

development phase may take a few decades. The Indian GSM took 22 years to level off in 2013 and 28 years to reach this research point in 2019. It appears too early to say that the Indian GSM has fully graduated from the Evolving Phase to the Advanced Phase.

India's successful GSM development has left some problems unresolved or given rise to unintended consequences for the next phase. The quality of liquidity is an issue facing the Indian GSM, often the case with other GSMs in the Nascent or Evolving Phases. The three most

actively traded issues accounted for 67 to 87 percent of all trades in 2019. This concentration is presumably responsible for unusually narrow bid-ask spreads by emerging market standards. The liquidity-centric trading in a bank-centric market, unlike yield-seeking trading, tends to converge on a few GS issues through a feedback (self-reinforcing) effect and consequently keep the liquidity inside the interbank market.

Table 10: Policy Measures in Two-Dimensional Framework and India's Implementatio

	1		2	
	Nascent		Evolving	
Market Component	**Policy measures in Two-Dimensional Framework**	**Policy measures in India's implementation**	**Policy measures in Two-Dimensional Framework**	**Policy measures in India's implementation**
Accounting	Disclosure and governance of institutional investors and intermediaries		Amortization	
Legal affairs	Modern business law Modern banking law Public debt law Securities Law Immobilization or depository regulation	The Constitution (Articles 202 and 293) The Reserve Bank of India Act (Articles 21(2) and 21A(1)(b)) SEBI Act 1992	Trade failure Trade finality Netting arrangements Dematerialization Code of conduct	The Payment and Settlement Systems (Amendment) Act, 2015 Dematerialization of Government Securities (1998) DVP-III (2004)
Primary market	Preannounced auctions Non-competitive bidding Designated/prequalified bidders Treasury bills Short-term maturities	Auction of government securities and Treasury bills (1992 and 1993) Non-competitive bidding (2009) PDs (1995)	Issue calendar Reopening or buy-back or switching Tap issuance Bidding open to the public Short- to medium-term maturities	Issuance Calendar for Marketable Dated Securities (2015) Buy-Back (2003) Conversion (Switch)(2019)
Debt and cash management*	Cleanup of public or quasi-public arrears Public debt issuance legislation DM office Timely & accurate debt record keeping The separation between front- and back-office activities	Restricted and prohibited ad-hoc T-Bills (1994 and 1997). Commonwealth Debt Recording and Management System (1986)	Increase in domestic borrowing DM strategy and reporting Consolidation of DM functions Sensible balancing or separation between DM and monetary policy operation (e.g., agency agreement) Partial risk management Sovereign credit rating	Fiscal Responsibility and Budget Management Act (FRBM) (2003) requiring the govt to report to the parliament Medium-term debt management strategy (2015)
Secondary market	Negotiated (dealers' "Club") market Telephone voice trading	Securities Trading Corporation of India (STCI) (1994)	Screen-based electronic trading platform Call auction or continuous order-driven Market convention Market surveillance	NDS-OM (2005) The Fixed Income Money Market and Derivatives Association of India (FIMMDA) (1998)
Monetary policy framework**	Reliance on rules-based instruments		Introducing money market instruments	CP (2017)
Money market	Treasury bills Call market Reserve averaging	Auction of T-bills bills (1993)	Standing facilities (Central bank repos) Interest rate corridor Bank repos Sporadic open market repos	Liquidity Adjustment Facility (LAF) (2000) Repos permitted to SGL a/c holders (1997)
Derivatives or futures				
Clearing and settlement	Book-entry CSD	Subsidiary General Ledger at RBI National Securities Depository Ltd (1995) Depositories Ordinance (1995) Depositories Act (1996)	Dematerialization DVP Rolling settlement Multiple-net settlement SWIFT Automation	Dematerialization of Government Securities (1998) A dematerialized form made mandatory for RBI-regulated entities (2003) DVP I (1995), II (2002), III (2004)

Notes: Desirable policy measures were taken from Table 1. India's Implemented policy measures are not exclusive. The years are those in which the measures were initially undertaken.
Source: The Author compiled data from CCIL (2017), Fleming *et al.* (2015), Mohan and Ray (2009), Rajaram and Ghosh (2015), RBI (2019), and the websites of NSDL, CCIL, the Department of Economic Affairs.

Though familiar with the Nascent and Evolving Phases, these concentrations are undesirable for a GSM of capital market type. First, the concentration may cause non-PD and non-bank traders to perceive adverse selection and information asymmetry problems. Accordingly, these problems may discourage them from actively trading in the GSM, though

their participation would bring in heterogeneous views and improve the GSM's price discovery efficiency. Second, the liquidity concentration and the spread squeeze form an "entry barrier" in the GSM. The entry barrier would make it challenging for non-PD institutions to enter and extend financial efficiency beyond the interbank market in the economy. Third, it may also segment the term structure of interest rates and prevent the transmission mechanism from developing.

The next leap of India's GSM may have to wait for its financial market structure to deepen, broaden, and diversify further. A financial market structure is a long-term set of institutions, policies, laws, and regulations aligned for financial transactions or how they are organized. A government builds and maintains a particular financial market structure to achieve its policy or political goals in the long run. India's current financial market structure is bank-centric. The TDPF suggests broadening the investor base and deepening the financial market structure, among other things, for the next phase.

This research has several limitations. First, it could test the TDPF on an ex-post basis only with the Indian GSM's development path. Empirical studies of other lower-income markets may present different perspectives. Second, my observed endogenous variables may not be exhaustive enough. Third, endogenous factors' interactions with exogenous ones were not addressed. Fourth, most of my data were monthly averages of daily observed values. Nevertheless, since my focus is on long-run relationships, I assume that the monthly averaging had no significant impact on my research results.

Another caution is that India might have had some luck with GSM development. Its luck includes a successful stock market reform experience just before the GSM reform, a pool of local IT talents, and traditional intellectual independence. Other LIEs may not have such luck.

8 CONCLUSION

This research has explored the endogenous policy sets and their framework for GSM development in LIEs and proposed the TDPF. It is also expected to help the academic and policy advisor conceptualize market development programs for the policymaker more practically than before.

LIEs need a practical framework of policy sets to translate their economic and social achievements into implementable GSM development policies. The key concepts underlying the proposed TDPF are sensible differentiation of GSMs by their development phases (phase-differentiation) and endogenously coherent policy sets for phase-differentiated GSMs (phase-coherency).

The Indian GSM showcased that endogenous market factors explained about 40 percent of the trade volume growth. India's leading variable was an automated market structure, which released embedded universal utility values to the trader. Its contribution is estimated at 22 percent of the trade volume growth. These laudable contributions of endogenous market factors compel us to organize GSM development policy sets for LIEs into the TDPF. A phase-fit, locally-fit approach and endogenously phase-coherent policy sets would make LIEs financially more efficient.

An agenda for further research could include ex-ante testing of the TDPF with various LIEs, the role of utilities in market structure's evolution and market phase transition, and the interactions between exogenous and endogenous GSM development factors.

REFERENCES

CCIL (2019a, November). Rakshitra. The Clearing Corporation of India, Limited. Available at https://www.ccilindia.com/Research/CCILPublications/Lists/CCILPubRakshitra/Attachments/307/Rakshitra%20November%202019.pdf

CCIL (2019b). *Factbook 2019 Annexure*. The Clearing Corporation of India, Limited. The current issue available at https://www.ccilindia.com/Research/CCILPublications/Lists/lstfactbook/Attachments/35/ Complete_FACTBOOK.pdf

Chaumont, G. (2018). Sovereign Debt, Default Risk, and the Liquidity of Government Bonds. Available at. https://economics.sas.upenn.edu/system/files/2019-01/ChaumontJMP.pdf.

Christensen, C. M. (1997a). Patterns in the evolution of product competition. *European Management Journal*, 15(2), 117-127. https://doi:10.1016/s0263-2373(96)00081-3

Christensen, C. M. (1997b). *The innovator's dilemma: when new technologies cause great firms to fail*. Boston, MA: Harvard Business School Press. ISBN 978-0-87584-585-2.

Deuskar, P., & Johnson, T. C. (2016). Central Banks And Dynamics Of Bond Market Liquidity. *CFRAL Working Paper*. Centre for Advanced Financial Research and Learning. Mumbai. Available at http://www.cafral.org.in/sfControl/content/Speech/46201664559PM-Deuskar_Johnson_Paper.pdf

Endo, T. (2020). The primary dealer system in lower-income economies. *Emerging Markets Review*, Volume 45, December, 100715. doi:10.1016/j.ememar.2020.100715. Its error-corrected version is available at SSRN: https://ssrn.com/abstract=4084438.

Fleming, M., Sareen, S., & Saggar, S. (2016). Trading Activity In The Indian Government Bond Market. *CFRAL Working Paper*. Centre for Advanced Financial Research and Learning. Mumbai. Available at http://www.cafral.org.in/sfControl/content/Speech/71201624534PMFleming_Sareen_Saggar_Paper_Abstract_June_2016.pdf

Fleming, M., Sareen, S., & Saggar, S. (2015). Structural Changes In The Indian Government Bond Market. *CFRAL Working Paper*. Centre for Advanced Financial Research and Learning. Mumbai. Available at http://www.cafral.org.in/sfControl/content/Speech/46201623614PM-Fleming_Sareen_Paper_Dec_2015.pdf

Grossman, S., & Miller, M. (1988). Liquidity and market structure. J. Financ. XLIII (3), 618–633. Available at https://onlinelibrary.wiley.com/doi/full/10.1111/j.1540-6261.1988.tb04594.x.

Gurowitz, E. (2012) Positioning Products and Services Accurately. Retrieved February 8, 2021, from http://gurowitz.com/2012/12/positioning-products-and-services-accurately/

Horton, G. (n.d.) Refining the Windermere Hierarchy. Retrieved February 8, 2021, from http://www.zephram.de/blog/innovationsstrategie/refining-the-windermere-hierarchy/

IMF & World Bank. (2016). Development of local currency bond markets overview of recent developments and key themes prepared for the G20 IFAWG, International Monetary Fund, Washington, DC. Available at http://www.imf.org/external/np/g20/pdf/2016/121416.pdf

IMF & World Bank. (2021). Guidance Note For Developing Government Local Currency Bond Markets. *Analytical Notes No. 2021/001*. Washington, DC: International Monetary Fund, and World Bank. Available at https://www.imf.org/en/Publications/analytical-notes/Issues/2021/03/17/Guidance-Note-For-Developing-Government-Local-Currency-Bond-Markets-50256

IMF, World Bank, EBRD, & OECD. (2013). Developing Local Currency Bond Markets: A New Diagnostic Framework. Available at http://www.oecd.org/daf/fin/public-debt/Local-Currency-Bond-Markets-Diagnostic-Framework-2013.pdf

Madhavan, A. (1992). Trading mechanisms in securities markets. J. Financ. 47 (2), 607–641. https://doi.org/10.2307/2329117.

Mohan, R. (2004) Decade of Reforms in Government Securities Market in India and the Road Ahead. Keynote Address by Dr. Rakesh Mohan, the then Deputy Governor, Reserve Bank of India at the Annual Conference of FIMMDA on March 20, 2004 at Duba. Available at http://rakeshmohan.com/docs/RBIBulletinNov2004-2.pdf

Mohan, R. (2006) Recent Trends in the Indian Debt Market and Current Initiatives. Available at http://www.rakeshmohan.com/docs/RBIBulletinApril2006-1.pdf

Mohan, R., & Ray, P. (2009). Development of the Indian Debt Market. The Stanford Center for International Development Working Paper 410, December. Available at https://siepr.stanford.edu/sites/default/files/publications/410wp.pdf

Mohan, R., & Ray, P. (2017). Indian Financial Sector: Structure, Trends and Turns. *IMF Working Papers* WP/17/7. Available at https://www.imf.org/~/media/Files/Publications/WP/wp1707.ashx

Moore, G. A. (2014). *Crossing the Chasm: Marketing and Selling Disruptive Products to Mainstream Customers* (3rd ed.). New York, NY: Harper Business [Kindle version]

Nath, G. (2013). Liquidity issues in Indian sovereign bond market. MPRA Paper 51633, University Library of Munich, Germany. Available at https://mpra.ub.uni-muenchen.de/51633/

Patil, R.H.(2001). Broadbasing and Deepening the Bond Market in India. Center for Financial Institutions Working Papers 01-32, Wharton School Center for Financial Institutions, University of Pennsylvania. Available at http://d1c25a6gwz7q5e.cloudfront.net/papers/1171.pdf

Rajaram, S., & Ghose, P. (2015). Two Decades of Primary Dealer Operations in India. *Rakhshitra*. May 2015, Clearing Corporation of India, Ltd. Available at https://www.ccilIndia.com/Documents/Rakshitra/2015/May/Article.pdf

RBI. (2013). Negotiated Dealing System (NDS). Available at. https://rbidocs.rbi.org.in/rdocs/Publications/PDFs/NDSOM290410.pdf.

RBI. (2015). Master Direction – Operational Guidelines for Primary Dealer. Available at. https://rbidocs.rbi.org.in/rdocs/notification/PDFs/34MPBA3C2D6A9B114194A38ACD8C4E90BE50.PDF.

RBI. (2019). Government Securities Market in India – A Primer. Available at. https://rbidocs.rbi.org.in/rdocs/Publications/PDFs/PRI85CEC73A987F41AC89068EE7607A8BEC.PDF

Reddy, Y.V. (2002). Issues and Challenges in the Development of the Debt Market in India. *The Development of Bond Markets in Emerging Economies*, BIS Papers No. 11, June: 117-126. Available at https://www.bis.org/publ/bppdf/bispap11j.pdf

Roger, E. M. (2003). *Diffusion of Innovations*. (5th ed.). New York, NY: Free Press. [Kindle version]

Shankar, R., & Bose, S. (2008). Auctions of Government Securities in India –An Analysis. *Reserve Bank of India Occasional Paper*, 29(3), Available at https://pdfs.semanticscholar.org/2a15/4a8fac6c6df6f2eae65c312ec35caadef3ba.pdf

Ventzislav, I & Lutz, K. (2005).:A Practitioner's guide to lag order selection for VAR impulse response analysis. Stud. Nonlinear Dyn. Econ. De Gruyter 9 (1), 1–36. March. https://doi.org/10.2202/1558-3708.1219.

World Bank & IMF. (2001). *Developing Government Bond Markets: A Handbook*. Washington, DC: World Bank and IMF. Available at https://elibrary.worldbank.org/doi/abs/10.1596/0-8213-4955-4

World Bank. (2007a). Managing Public Debt from Diagnostics to Reform Implementation. Washington, DC: World Bank. Available at https://openknowledge.worldbank.org/handle/10986/6658

World Bank. (2007b). Developing the Domestic Government Debt Market: From Diagnostics to Reform Implementation. Washington, DC: World Bank. Available at https://openknowledge.worldbank.org/handle/10986/13865

For the folllowing references, please refer to https://doi.org/10.1016/j.ememar.2021.100844

Abbas, S. M., & Christensen, J. (2007).; Adelegan, O. J., & Radzewicz-Bak, B. (2009).; African Development Bank. (2007).; African Development Bank. (2010).; Aguilar, C. (2006).; Akamatsu, N., & Puongsophol, K. (2017).; Amante, A., Araujo, M., & Jeanneau, S. (2007).; Arif, M. (2007).; Arvai, Z., & Heenan, G. (2008).; Berensmann, K., Dafe, F., & Volz, U. (2015).; BIS. (2002).; Blommestein, H., & Horman, G. (2007).; Castellanos, S. G., & Martínez, L. (2006).; Claessens, S., Klingebiel, D., & Schmukler, S. L. (2007).; de Brun, J. E., Gandelman, N., Kamil, H., & Porzecanski, A. C. (2006).; De La Torre, A., & Schmukler, S. L. (2007).; Hanson, J. A. (2007).; Harris, L. (2003).; Jiang, G., & McCauley, R. N. (2004).; Kripfganz, S., & Schneider, D.C. (2018).; Kumhof, M., & Tanner, E. (2005).; Leal, R. P. C., & Carvalhal-da-Silva, A. L. (2006).; Moitra, S. K. (1983).; Panizza, Ugo. (2008).; Silva, A. (2008).; Smaoui, H., Grandes, M. & Akindele, A. (2017).; Sophastienphong, K., Mu, Y., & Saporito, C. (2008).; Sundararajan, V., Dattels, P., & Blommenstein, H. J. (1997).; Sy, Amadou. (2007).; Szilagyi, P. G., Batten, J. A., & Fetherston, T. A. (2003).; Warnock, F. E., & Burger, J. D. (2006).