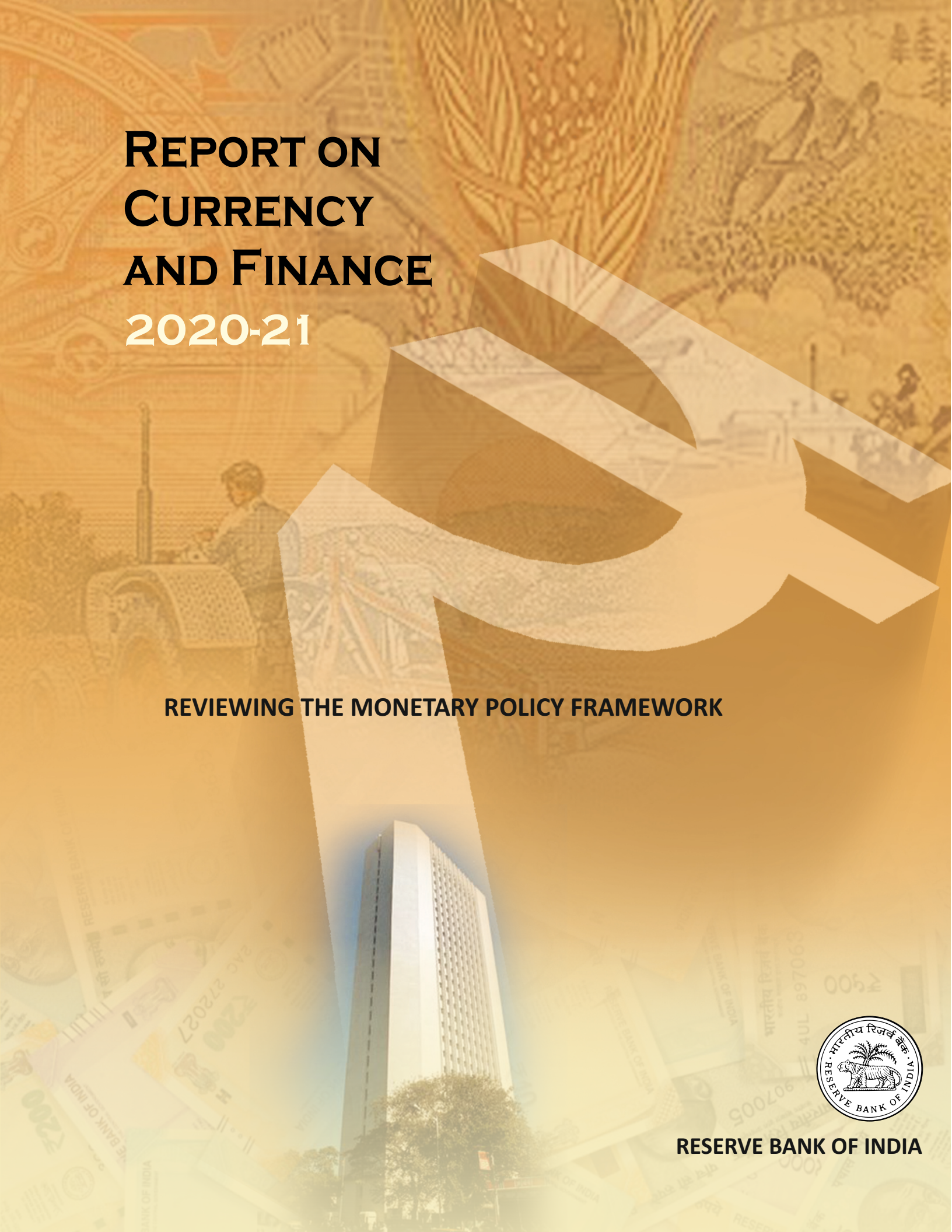
Report on Currency and Finance 2020-21

REVIEWING THE MONETARY POLICY FRAMEWORK



RESERVE BANK OF INDIA

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"The findings, views and conclusions expressed in this Report are entirely those of the contributors from the Department of Economic and Policy Research (DEPR), Monetary Policy Department (MPD) and Department of Statistics and Information Management (DSIM) and do not represent the views of the Reserve Bank of India".

ISSN 0972-8759

Published by Shashidhar M. Lokare for the Reserve Bank of India, Mumbai-400 001 and designed and printed by him at ACME Packs & Prints (I) Pvt. Ltd., A Wing, Gala No.73, Virwani Industrial Estate, Goregaon (E), Mumbai - 400 063.

FOREWORD

The Report on Currency and Finance (RCF) has a long and chequered history, intertwined with that of the Reserve Bank of India (RBI) itself and the Indian economy. It was first published in 1937, covering the years 1935-36 and 1936-37.

2. Those were formative years for the RBI as an institution, years in which history was being made rather than written. On April 1, 1935 the RBI came into being. The Bank Rate was officially announced for the first time on July 4 at 3.5 per cent, followed the next day by official contact with the so-called scheduled banks [included in the Second Schedule of the Reserve Bank of India Act, 1934 on satisfying the criteria laid down *vide* section 42(6)(a) of the Act)] that became eligible for debts/loans at the Bank Rate from the RBI, and membership of the clearing house. That year, the RBI published its first ever Annual Report covering a period of 9 months and declared a dividend of 3.5 per cent per annum, with net profits of Rs. 56.055 lakhs. There were 92,047 shareholders on April 1, 1935 but by December 31, 1936 this number had fallen to 66,273.

3. When the Issue Department took over the management of currency from the Government of India in April 1935, the annual Currency Report that was being prepared by the Controller of the Currency was discontinued. Responding to the ensuing clamour for its revival, the RBI agreed in the interest of 'statistical continuity'[1]. Noting that an Annual Report was being published and that there was also a monthly and annual statistical summary, the RBI decided to publish an annual review that would be different: it would be based generally on the framework of previous Currency Reports, but with a commentary on developments and statistics describing those times, including the changes in circumstances due to the creation of the RBI. It was decided that this report 'should be published annually as soon as possible after the close of each financial year' (RBI, 2005)[2].

4. The first Report (1937) set the tone when it commented on the macroeconomic situation that it discerned from the available statistics. Commodity producing countries were severely hit by the Great Depression. In India, general prices, measured by the Calcutta index of wholesale prices, rose as a result of increasing demand for raw materials. Industrial production improved, driven up by the output of cotton and jute manufactures, iron and steel, and sugar. Non-speculative share prices rose sharply, and speculative shares followed at a moderate pace. The balance of merchandise trade showed a remarkable improvement, and this kept the 'exchange' strong, enabling the RBI to put Government in a position to repay the 5.5 per cent India Bonds 1936-38 amounting to £16,858,000. Easy money market conditions prevailed and were reflected in the Bank Rate being reduced by 0.5 per cent to 3 per cent. A budget surplus was recorded, and record borrowings occurred at record low interest rates. Burma was separated from India (1937) and new provinces of Sind and Orissa were created (1936). Silently and without flourish, a third voice in the RBI was born – the voice of the institution's professional research.

1,2 Report on Currency and Finance, 1937, Introduction (Para. 1).

5. Post-Independence, the contents of the RCF were broadly categorised into two parts – International Economic Developments; and Indian Currency and Finance. The early 1960s saw a change in its contents. Reflecting the changing politico-social dynamics that governed the national narrative those days, the preoccupation with international developments waned and the focus of the RCF increasingly turned inwards. Its contents came to be divided into three parts - Macroeconomic Developments of India; Output and Price Trends; and Statistical Statements. From 1974-75 to 1997-98, two volumes of RCF were published – Volume I covered an Economic Review and Volume II contained Statistical Statements.

6. The year 1998-99 marked a turning point in the history of the RCF, and a watershed in its narrative. In a significant departure from its usual descriptive chronicling, the RCF adopted a theme-based approach and addressed *The Structural Transformation of the Indian Economy*. The events of that time provided the perfect context for this noteworthy transition. The Indian economy was emerging from a cyclical slowdown and the turnaround was accompanied by supply shocks that raised inflation pressures. The external environment was riddled by the after-shocks of the Asian financial crisis and the contagion spread to Russia and several parts of Latin America. In response to its nuclear testing, India faced sanctions from several countries and rating downgrades, prompting the issuance of Resurgent India Bonds overseas.

7. But history was turning over. The tryst with centralised planning since the early 1950s had resulted in inefficiencies, distortions and rent seeking activities. In the early 1990s, India faced a severe balance of payments crisis. Although it was triggered by external factors such as the Gulf war, the dismemberment of the erstwhile USSR, a surge in crude prices and the drying up of remittances, the unsustainable state of the underlying fundamentals of the Indian economy was stark. Structural adjustment was undertaken during the rest of the 1990s through a wide-ranging array of reforms and a shift in the development strategy in favour of market orientation and openness. As the RCF noted, the economy was exhibiting considerable resilience and dynamism on the threshold of the new millennium and this provided the rationale for the theme of the RCF. Consequently, the RCFs that followed in the wake of this turning point imbibed the spirit of transformation. Over the next decade, other evolutionary themes came to be addressed: the financial sector and market integration; revitalising growth; stock taking of the reform process and its outcomes; management of the external sector in an open economy framework; the evolution of monetary policy; the evolution of central banking in India; development of financial markets and role of the central bank; emerging issues and challenges facing the banking sector in India; and the global financial crisis and the Indian economy. The last published RCF was in the year 2013 and it addressed the theme of fiscal-monetary coordination. Since then, there has been a hiatus.

8. Many of those who toiled to give the RCF themes and direction, and later worked with me, expressed a latent passion for reviving it and by doing so, to restore a tradition that is as old as the Reserve Bank. They would often tell me that they drew their inspiration from the book titled *Indian Currency and Finance* written by John Maynard Keynes after he left the British civil service in 1908 to lecture on

Indian monetary issues at the London School of Economics and Cambridge University. It was his first published book in 1913, its publication hastened by the fact that he was offered a position on the Royal Commission on Indian Currency and Finance in that year, which was a major opportunity for him to influence policy. The book itself stands out for its critical exposition of the Indian currency and banking system of that time, with priceless nuggets such as debunking of the hypothesis that a depreciating currency is advantageous to a country's foreign trade, shifting the focus instead to its inflationary consequences; the appropriateness of the gold exchange standard of India at that time rather than a gold standard; the advantage of elasticity in a paper currency system as opposed to a metallic standard; and the need to lower rates of interest to more reasonable level than prevalent in those years.

9. What struck me was his advocacy for a central bank (he called it a State Bank) for India: *"Such a Bank, confining its transactions strictly to Banking principles and business, and established by Act of Parliament and possessed of adequate capital, would, under judicious management and control, become an instrument of general good by facilitating the employment of a portion of the redundant capital of this country for the general improvement of Indian commerce, giving stability to the monetary system of India, and preventing those occasional fluctuations to which it is at present subject…."*. Towards the close of the book he went on to describe from his experiences the Indian banking and financial system incisively with perhaps as much relevance then as now: *"..the Indian system is an exceedingly coherent one. Every part of the system fits into some other part…But the complexity and coherence of the system require the constant attention of anyone who would criticise the parts. This is not a peculiarity of Indian finance. It is the characteristic of all monetary problems…I urge that, in her Gold-Exchange Standard, and in the mechanism by which this is supported, India, far from being anomalous, is in the forefront of monetary progress. But in her banking arrangements, in the management of her note issue, and in the relations of her Government to the money market, her position is anomalous; and she has much to learn from what is done elsewhere*." Indeed, so deep was the impact of Keynes' first book on professional research in the Reserve Bank that in the early decade following Independence, one section of the Report on Currency and Finance was called Indian Currency and Finance.

10. The motivation to restart the Report on Currency and Finance emanated from within. Our research teams would approach me with this fervent plea, appealing as much to history and tradition as to give expression to in-house research and the evolution of ideas which, on several occasions, I found to run ahead of contemporaneous developments in the environment around us. And when a gentle encouragement came from a leading opinion-maker and a long time observer of the Reserve Bank, I agreed[3]. We searched for a theme and what better one in the run up to the mandated re-appraisal of India's inflation target than a comprehensive review of the monetary policy framework! It is an apposite theme. Close to a quinquennium of experience with this major structural reform, inflation targeting is now under the belt of the Reserve Bank in spite of considerable initial – and I suspect, continuing – scepticism and reservation. Till COVID-19 struck, however, it had received a fair measure of acceptance

3 T C A Srinivasa Raghavan in the Business Standard, January 18, 2020.

and even appreciation, both domestically and externally, among international investors, analysts and multilateral institutions. Being a formal framework in the interest of transparency, accountability and clarity of communication, we continue to grapple with its nuances and their intersections with practical day-to-day central banking functioning. There has been also some lively debate on how the Reserve Bank of India would marry the primacy accorded by the framework to price stability with concurrent and often overriding concerns about strong and sustained growth that is so crucial for an emerging economy. Several leading central banks were also undertaking framework reviews around this time.

11. The outbreak of the COVID-19 pandemic brought extreme stress on the people of the world, throwing into disarray lives and livelihoods, and forcing fiscal, monetary and financial policies out of their standard operating procedures into unprecedented responses. Some of us were infected, some hospitalised and all of us lived dangerously. Yet, we survived and live to tell the tale.

12. Drawing on the country experience, this Report, the 12th in the theme-based volumes that made their debut in 1998-99, reflects on the flexible inflation targeting (FIT) framework that was enacted in 2016 as the monetary policy architecture for India, its relevance to the Indian context and the way forward. The Report evaluates the level of the inflation target, and the tolerance band around it from the point of view of its appropriateness in evolving macroeconomic and financial conditions, the objective of growth and its compatibility in the tradition of dual mandates with FIT, the operating procedure and issues in transmission, procedural and institutional processes and the issues that impinge on the conduct of monetary policy in a globalised environment. All this is set in a historical perspective which depicts the conditions under which the monetary policy framework became an imperative, the graduated and calibrated establishment of certain pre-conditions and legislative processes that brought into force *de jure* institutional arrangements for its operation and accountability, and an assessment of the experience with the new framework. Woven into the narrative is a ringside view of the testing challenges that confronted us in these formative years, especially in the global environment, as well as the windfalls that facilitated its adoption. An important caveat to note is that the analyses and narrative exclude the period under the COVID-19 pandemic due to problems in data collection, consistency, coverage and quality.

13. In closing, it might be apposite to say a few words on the team of professional research personnel that has worked tirelessly in pandemic times to convert the evolution of ideas into a living report. The objective of theme-based reports has been to channel policy-oriented research energies in the form of analytical enquiry and empirical validation into topical issues that engage national attention. The purpose is to verify each testable hypothesis with facts and place the findings in the public domain so as to offer to the public readership a comprehensive, balanced and in-depth assessment of the subject in its entirety against the backdrop of contemporaneous developments. For this RCF, issues relating to monetary policy that engage public attention on a daily basis and the first few years under a new monetary policy framework provide a rich opportunity for directing research vitalities for a fruitful public engagement.

14. The team in the RBI pushed itself constantly, challenging every obstacle, every hardship that was flung at it by the pandemic even as timelines on all other work engagements, including other flagship reports, statistics and surveys, and presentations to the monetary policy committee, were assiduously maintained. Team members challenged each other too, with a diversity of views and differences of opinions on several issues that were relevant to the theme. Seniors mentored their younger colleagues, and this helped not only the diversity but also continuity and the building of bench strength. In turn, our younger professional researchers brought in new ideas and challenged the orthodoxy. This competitive evolution of ideas fascinated me and also drew my appreciation.

15. Every crisis provides useful lessons. The COVID-19 pandemic has tested the limits of both conventional and unconventional policies. Monetary policy authorities, in particular, stand at crossroads the world over. Phenomena such as negative interest rates, quantitative and credit easing, and long-term forward guidance are testing the standard models. In addition, they carry on their shoulders the huge burden of unprecedented responses and the trying dilemma of cliff effects, should they unwind and the moral hazard of ramp effects if they have to persevere with policy support for longer. Meanwhile, their policy frameworks are challenged by the simultaneous loss of demand and output, fundamental changes in people's lifestyles and preferences, and tectonic shifts in the environment around them. In this *milieu*, monetary policy authorities must strive to remain effective and relevant. This Report joins this existential debate and hopes to shed light rather than dust. I commend the team in the Reserve Bank for its efforts and I commend the report to its readership.

Shaktikanta Das
Governor

February 26, 2021

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LIST OF ABBREVIATIONS

ABM	Agent-Based Model
ADB	Asian Development Bank
AEs	Advanced Economies
AIC	Akaike Information Criterion
AML	Anti-Money Laundering
ARCH	Autoregressive Conditional Heteroskedasticity
ARCH -LM	Autoregressive Conditional Heteroscedasticity-Lagrange Multiplier
ARDL	Autoregressive Distributed Lag
AREAER	Annual Report on Exchange Arrangements and Exchange Restrictions
ARMA	Autoregressive Moving Average
AQR	Asset Quality Review
BIS	Bank for International Settlements
BoE	Bank of England
BoJ	Bank of Japan
BoK	Bank of Korea
BoP	Balance of Payments
BPLR	Benchmark Prime Lending Rate
bps	Basis Points
BSP	Bangko Sentral ng Pilipinas
CABGDP	Current Account Balance to GDP Ratio
CAD	Current Account Deficit
CASA	Current Account and Savings Account
CBDC	Central Bank Digital Currency
CBLO	Collateralized Borrowing and Lending Obligations
CDs	Certificates of Deposit
CFMs	Capital Flow Management Measures
CFT	Combating the Financing of Terrorism
CiC	Currency in Circulation
CPI	Consumer Price Index
CPI-C	Consumer Price Index - Combined
CPI-IW	Consumer Price Index - Industrial Workers
CPs	Commercial Papers
CROMS	Clearcorp Repo Order Matching System
CRR	Cash Reserve Ratio
CRS	Constant Returns to Scale
CSO	Central Statistics Office
DEPR	Department of Economic and Policy Research
DFM	Dynamic Factor Model
DI	Diversity Index
DSGE	Dynamic Stochastic General Equilibrium
DSIM	Department of Statistics and Information Management
DW	Durbin-Watson
DXY	US Dollar Index
EC	Error Correction
ECB	European Central Bank
ECT	Error Correction Term
ELB	Extended Lower Bound
EMDEs	Emerging Market and Developing Economies
EMEs	Emerging Market Economies
ERM	Exchange Rate Mechanism
ERPT	Exchange Rate Pass Through
ERV	Exchange Rate Volatility

EWMA	Exponentially Weighted Moving Average
FAQs	Frequently Asked Questions
FBIL	Financial Benchmarks India Pvt. Ltd.
FDI	Foreign Direct Investment
FinTech	Financial Technology
FIT	Flexible Inflation Targeting
FMOLS	Fully Modified Ordinary Least Squares
FOMC	Federal Open Market Committee
FPAS	Forecasting and Policy Analysis System
FPI	Foreign Portfolio Investment
FRBM	Fiscal Responsibility and Budget Management
FSI	Financial Stress Index
GARCH	Generalised Autoregressive Conditional Heteroscedasticity
GDP	Gross domestic Product
GFC	Global Financial Crisis
GFD	Gross Fiscal Deficit
GMM	Generalized Method of Moments
GNPA	Gross Non-Performing Assets
GOI	Government of India
GSDP	Gross State Domestic Product
G-Secs	Government Securities
GSI	Global Spillover Index
GST	Goods and Services Tax
GVA	Gross Value Added
HFCs	Housing Finance Companies
HNIs	High Net-worth Individuals
HP	Hodrick-Prescott
HQC	Hannan-Quinn Criterion
I- GARCH	Integrated- Generalised Autoregressive Conditional Heteroscedasticity
IBA	Indian Banks' Association
IBC	Insolvency and Bankruptcy Code
ICOR	Incremental Capital Output Ratio
IDG	Inter-Departmental Group
IE	Inflation Expectations
IESH	Inflation Expectations Survey of Households
IIP	Index of Industrial Production
IMF	International Monetary Fund
INR	Indian Rupee
IRF	Impulse Response Function
IT	Inflation Targeting
KLEMS	Capital, Labour, Energy, Materials and Services
LAF	Liquidity Adjustment Facility
LGD	Loss Given Default
LIBOR	London Inter-Bank Offered Rate
LPG	Liquefied Petroleum Gas
LPR	Lending Prime Rate
LSTR	Logistic Smooth Transition Regression
LTRO	Long-Term Repo Operations
MAE	Mean Absolute Error
MCI	Monetary Conditions Index
MCLR	Marginal Cost of Funds-based Lending Rate
MCMC	Markov Chain Monte Carlo
ME	Mean Errors
MEFS	Medium-Term Expenditure Framework Statement
MFs	Mutual Funds

MIFOR	Mumbai Interbank Forward Outright Rate
MM	Money Multiplier
MoSPI	Ministry of Statistics and Programme Implementation
MPC	Monetary Policy Committee
MPD	Monetary Policy Department
MPR	Monetary Policy Report
MPS	Monetary Policy Strategy
MSE	Micro and Small Enterprise
MSF	Marginal Standing Facility
MSME	Micro, Small and Medium Enterprise
MSPs	Minimum Support Prices
MSS	Market Stabilisation Scheme
MUCSV	Multivariate Unobserved Component Stochastic Volatility
NABARD	National Bank for Agriculture and Rural Development
NAV	Net Asset Value
NBFCs	Non-Banking Finance Companies
NDA	Net Domestic Assets
NDS	Negotiated Dealing System
NDTL	Net Demand and Time Liabilities
NEER	Nominal Effective Exchange Rate
NFA	Net Foreign Assets
NHB	National Housing Bank
NKPC	New Keynesian Phillips Curve
NLLS	Non-Linear Least Squares
NPAs	Non-Performing Assets
NSO	National Statistical Office
OECD	Organisation for Economic Co-operation and Development
OIS	Overnight Indexed Swap
OMOs	Open Market Operations
OTC	Over-the-Counter
PBC	People's Bank of China
PCA	Prompt Corrective Action
PD	Probability of Default
PLR	Prime Lending Rate
POL	Petroleum, Oil and Lubricants
PR	Policy Rate
PSB	Public Sector Banks
PSE	Public Sector Enterprise
Q1	First Quarter
Q2	Second Quarter
Q3	Third Quarter
Q4	Fourth Quarter
QPM	Quarterly Projection Model
QQE	Quantitative and Qualitative Monetary Easing
RBI	Reserve Bank of India
REER	Real Effective Exchange Rate
RMSE	Root Mean Square Error
RPI	Retail Price Index
RTGS	Real Time Gross Settlement
SAAR	Seasonally Adjusted Annualised Rate
SC	Schwarz Criterion
SCBs	Scheduled Commercial Banks
SD	Standard Deviation
SDF	Standing Deposit Facility
SEBI	Securities and Exchange Board of India
SIDBI	Small Industries Development Bank of India
SLR	Statutory Liquidity Ratio
SMEs	Small and Medium Enterprises

SPDs	Standalone Primary Dealers
SPF	Survey of Professional Forecasters
SVAR	Structural Vector Autoregression
TA	Technical Assistance
T-Bills	Treasury bills
TFP	Total Factor Productivity
TLTRO	Targeted Long-Term Repo Operations
ToT	Terms of Trade
TREPS	Triparty Repo Dealing System
TVAR	Threshold Vector Autoregression
TVP-VAR	Time-Varying Parameter Vector Autoregression
UCSV	Unobserved Component Stochastic Volatility
UIP	Uncovered Interest Rate Parity
UK	United Kingdom
UMP	Unconventional Monetary Policy
US	United States
USD	US Dollar
VAR	Vector Autoregression
VAT	Value Added Tax
VIX	Volatility Index
WACR	Weighted Average Call Money Rate
WADTDR	Weighted Average Domestic Term Deposit Rate
WALR	Weighted Average Lending Rate
WPI	Wholesale Price Index
WPS	Working Paper Series

This Report can also be accessed on Internet
URL : www.rbi.org.in

1 FLEXIBLE INFLATION TARGETING (FIT) IN INDIA

"… AND WHEREAS the primary objective of the monetary policy is to maintain price stability while keeping in mind the objective of growth;

AND WHEREAS the monetary policy framework in India shall be operated by the Reserve Bank of India."

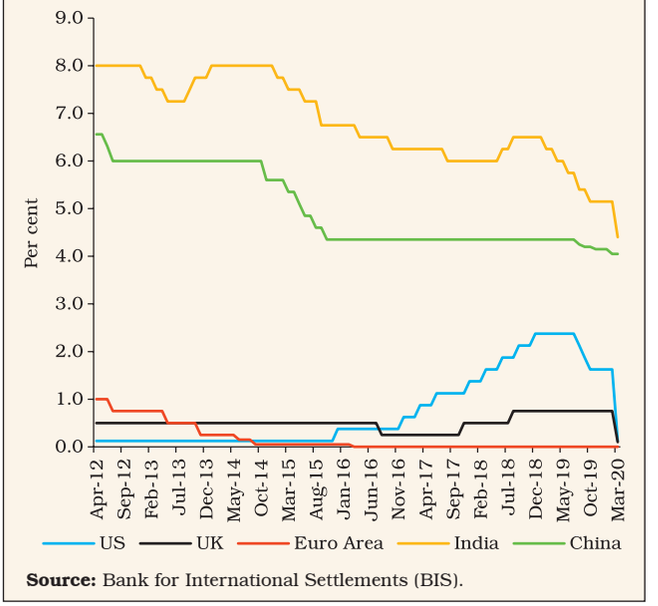
[Excerpted from Preamble to the Reserve Bank of India (RBI) Act, 1934 (amended by the Finance Act, 2016)]

1. Introduction

I.1 Central banks stand for stability – price stability; exchange rate stability; financial stability; regime stability. These nuances of stability fill the lexicon of their vision and mission statements. So sworn are they to the preservation of stability that their day-to-day functioning becomes enigmatic. Illustratively, central banks are destined to live with shocks on a daily basis, but avoid giving 'unpleasant monetary surprises' in the conduct of monetary policy, conscientiously impelled to engage in interest rate smoothing or 'baby-stepping' in their policy actions and stances (Chart I.1).

I.2 Above all, it is regime shifts that draw forth their stiffest resistance. After all, monetary policy frameworks crystallise after protracted and often painful confrontations with the challenges of aligning goals and instruments in the face of long and variable lags, avoiding time inconsistency, remaining forward-looking and accountable, and importantly, free of fiscal dominance. Consequently, it is only a tectonic change – in their environment without, or in their philosophy within – which can force them to make a step in the dark to a new regime. Typically, they are prompted to make the leap by the fear of losing control over instruments or operating procedures. The tryst with and abandonment of policy regimes with monetary aggregates as operating and/or intermediate targets in the 1980s and 1990s, for example, was candidly described by John Crow, former Governor of the Bank of Canada: "We did not leave the monetary aggregates; they left us." The adoption of inflation targeting in the early 1990s, too, was a vault into the unknown. The critics' view was that, like the *aurora australis*, it was an exotica that can happen only UNDER

Chart I.1: Key Policy Rates in Select Economies



Source: Bank for International Settlements (BIS).

This chapter has been prepared by Michael Debabrata Patra, Binod B. Bhoi, Joice John and Kunal Priyadarshi.

(New Zealand) down under (Australia). At the time of releasing this Report, 40[1] countries and counting have adopted it[2]. At this juncture, however, inflation targeting frameworks around the world are being reviewed and time will tell whither goes FIT in the future (Box I.1).

Box I.1
Insights from Country Framework Reviews

Inflation targeting (IT) as a monetary policy framework continues to evolve, based on individual country experiences. Although formal frameworks differ widely across countries, there have been notable operational similarities in target setting; policy communication; and performance assessment. At the same time, there is also more variability than in the early years of its adoption, especially in how the IT frameworks are reviewed and how financial stability considerations are accounted for in the setting of monetary policy (Wadsworth, 2017). Framework reviews provide both a 'laboratory' setting and a rich diversity of experiences thrown up by interactions with country-specific characteristics to introspect and to learn. Interestingly, several such reviews are coinciding, offering glimpses into and around the future of IT.

IT was formally adopted by New Zealand with the passing of the Reserve Bank of New Zealand Act of 1989 by the Parliament on December 15, 1989 and took effect in February 1990. For the first time, price stability was defined as an inflation rate between 0 and 2 per cent to be achieved by December 1992. The Governor was invested with sole legal responsibility for achieving and maintaining inflation within the defined target. Several iterations later and following a framework review, monetary policy objective was redefined with a dual mandate – price stability and support of maximum sustainable employment – and entrusted to a monetary policy committee (MPC) effective April 1, 2019. From an operational perspective, price stability is defined in terms of 1-3 per cent inflation over the medium term, with a focus on the 2 per cent target midpoint[3]. For the objective of maximum sustainable employment, the MPC should consider a broad range of labour market indicators to form a view of where employment is relative to its sustainable level, considering that it is determined by non-monetary factors and is not directly measurable.

Canada, the second country to adopt IT in 1991, undertakes quinquennial reviews of its monetary policy framework. The next review is expected to be completed ahead of the 2021 renewal of the agreement with the government. The inflation target has been 2 per cent, the midpoint of a 1 to 3 per cent target range since the end of 1995. The upcoming review will address key challenges: (i) less conventional policy firepower at a lower neutral interest rate than before; and (ii) excessive risk taking by households and investors, leaving the economy exposed to boom-bust financial cycles. It will also consider (a) a higher target for inflation; (b) a target path for the level of aggregate prices or nominal income; and (c) a dual mandate. The workplan for the review includes options to strengthen the slate of unconventional tools, and due consideration to distributional effects and financial stability.

The UK adopted inflation targeting in 1992 after exiting the Exchange Rate Mechanism (ERM) of the European Monetary System. Even without instrument independence until 1997, the Bank of England (BoE) was successful in controlling inflation through its focus on transparency and communication with the public. In May 1997, the government gave operational independence to the BoE and operational responsibility of monetary policy to its newly created MPC. The inflation target was changed from 2.5 per cent measured in terms of the retail price index (RPI) to 2 per cent measured in terms of the consumer price index (CPI) in 2003. The monetary policy framework of the Bank of England was last reviewed in 2013. While no formal review has been announced so far, the benefits of a critical evaluation have recently been publicly recognised: "Inflation targeting may have proven to be the framework for all seasons, but what if the climate is changing?" (Carney, 2020).

In the US, the Federal Reserve announced in November 2018 that it would conduct a broad review of its monetary policy framework. A key driver for the review is that the US economy, like many other advanced economies, is stuck in a low inflation and low interest rate (falling neutral rate) environment which constrains the efficacy of monetary policy to respond to future downturns – extended lower

(Contd...)

1 The Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER), 2019 of the International Monetary Fund (IMF) records 41 countries that had 'inflation targeting" as their monetary policy framework in 2018.

2 As per the AREAER database, Argentina dropped out in 2018.

3 The remit for the Monetary Policy Committee, Reserve Bank of New Zealand, 14 February 2019.

bound (ELB) episodes can be associated with painfully high unemployment and slow growth or recession (Powell, 2019). The Federal Open Market Committee (FOMC) released a 'Statement on Longer-Run Goals and Monetary Policy Strategy' on August 27, 2020[4] reaffirming 2 per cent inflation to be most consistent over the longer run with its statutory mandate to foster price stability and promote maximum employment. For anchoring longer-term inflation expectations at this level, however, *"the Committee seeks to achieve inflation that averages 2 per cent over time, and therefore judges that, following periods when inflation has been running persistently below 2 per cent, appropriate monetary policy will likely aim to achieve inflation moderately above 2 per cent for some time*". This is popularly termed as a 'make up' strategy.

Since 2003, the primary monetary policy objective of the European Central Bank (ECB) is to maintain price stability, which is defined as inflation rates of below but close to 2 per cent over the medium term. The ECB launched a strategy review in January 2020 to be completed by mid-2021, covering quantitative formulation of price stability, monetary policy toolkit, economic and monetary analyses and communication practices. The review is motivated by profound structural changes in the euro area and the world economy - declining trend growth on the back of slowing productivity and an ageing population; negative interest rates; globalisation; digitalisation; climate change and evolving financial structures – that have transformed the environment in which monetary policy operates, including the dynamics of inflation.

On December 18, 2020, the Bank of Japan (BoJ) announced that it will make an assessment of various measures under its current monetary policy framework [Quantitative and Qualitative Monetary Easing (QQE) with Yield Curve Control] and make available the results by March 2021.

Thus, a common concern among advanced economies has been the fall in the neutral interest rate and the risks of conventional policy tools losing traction in the next cyclical slowdown. Persisting low inflation co-existing with falling trend output growth is an important symptom warranting the reassessment. Emerging market economies (EMEs), on the other hand, are embracing IT whole heartedly and bringing in innovations, including the happy marriage of foreign exchange interventions with IT frameworks (BIS, 2019). Several of them have recently reviewed their monetary policy frameworks. In December 2019, Thailand lowered its inflation target to a range of 1.0-3.0 per cent for 2020 from the point target of 2.5 ± 1.5 per cent. Brazil reduced its inflation target from 4.5 per cent in 2018 to 4.25 per cent in 2019 and 4.0 per cent in 2020 and the target will be reduced by 25 basis points in each of the next two years to 3.5 per cent by 2022. The band around the inflation target has been narrowed from 2 per cent to 1.5 per cent since 2017. Indonesia has also been lowering its inflation target (set by the Government for Bank Indonesia) from 4±1 per cent during 2015-17 to 3.5±1 per cent during 2018-19 and to 3±1 per cent during 2020. The focus among EMEs is to build on the success of disinflation to firmly anchor inflation expectations to the target and provide monetary policy the necessary flexibility to respond to shocks as well as to gradually catch up with advanced economies.

The review of the inflation target in March 2021 in India will coincide with many expected other changes – CPI base change; household consumer expenditure survey; and census. India's FIT framework, with a tolerance band of ±2 per cent, already has in-built characteristics of a "make up" strategy. Structural changes – globalisation; e-commerce; climate change – may test this embedded flexibility. Hence, the lessons learned from framework reviews by peers will be invaluable.

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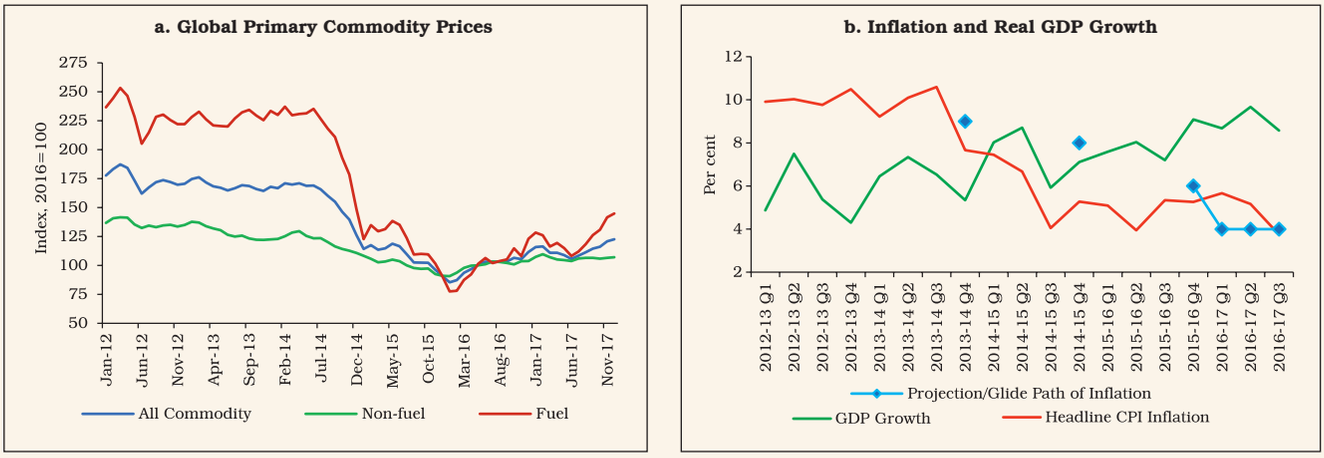
Chart I.2: Global Commodity Prices, Domestic Inflation and GDP Growth



Source: IMF Primary Commodity Prices Database, National Statistical Office (NSO), Government of India (GoI) and Authors' calculations.

I.3 India's moment of reckoning was no less cataclysmic. It arrived, not when it received legislative mandate in 2016, but back in the fateful summer of 2013 as the next section will etch out. Over the next three years, the RBI set about preparing the pre-conditions for the regime shift, learning from country experience, cherry picking the best practices from what worked and where. The journey was arduous, fraught with pitfalls of intellectual scepticism, including among practitioners (Reddy, 2008; Gokarn, 2010; Mohan, 2011; Ahluwalia, 2014; Subbarao, 2016; Jalan, 2017). Yet impossibly, the gods smiled and showered down encouragement in the form of a slump in international commodity prices (Chart I.2a) in those early years to help: after all, fortune favours the brave! Bracing up against the foreboding views of the orthodoxy, the transition to FIT was achieved by minimising the losses of output that typically take their toll in these regime changes (Chart I.2b).

I.4 In 2016, it was heralded as India's most successful structural reform of recent times[5] and was subsequently endorsed by the IMF (Bauer, 2018). With influential voices of approval from academia and practitioners alike, the silent revolution is complete (Box I.2).

I.5 With inflation aligned with the target over the period of FIT so far, *i.e.*, 2016-17 to 2019-20 (excluding the period of the COVID-19 which saw severely distorted macroeconomic outcomes) and remaining below the emerging market and developing economies' (EMDEs') average and growth outperforming the latter, India engages with the global economy with the confidence of price stability (Chart I.3). The new kid on the FIT block has arrived. Yet, in spite of good luck and proactive preparation, the formal launch of FIT in September 2016 turned out to be what has been evocatively described as a 'baptism by fire' (Patra, 2017).

5 Remarks by Honourable Prime Minister of India Shri Narendra Modi in his address to the Nation from the Ramparts of the Red Fort on 70th Independence Day, August 15, 2016 and available at https://www.pmindia.gov.in/en/tag/independence-day/.

Box I.2
Evolution of Ideas on Inflation Targeting in India

Flexible inflation targeting (FIT) is closing on to turning five years old in India. The first monetary policy committee (MPC) completed its term in September 2020 and a new committee was notified in the Gazette of India on October 5, 2020. In its first meeting, the new MPC voted unanimously to maintain *status quo* on the policy rate and the stance as set out by the previous committee, thus preferring continuity.

Early misgivings about 'failure to launch' – FIT being neonate, difficult to deliver, and blinkered – have waned and an eclectic debate, informed by its performance, has coursed through news media and academic papers, throwing up a rich diversity of views on its prospects.

In the net, the MPC turned out to be dovish, to use the ornithological term preferred in the media. It delivered 250 basis points of rate cuts. Its stance was accommodative in 10 meetings, neutral in 12 and there were only two meetings in which it adopted a stance of 'calibrated tightening'. Even so, initial views were that India's underemployment and indebted firms whose balance sheets were sensitive to high interest rates warranted lower real rates at a time when globally, natural rates were at or tending to zero. In this line of argument, it was posited that the MPC 'severely' overestimated both inflation and future growth, and it was not until its February 2018 meeting that flexibility in FIT was utilised to nurture growth. This imposed a larger than necessary output sacrifice on the economy (Goyal, 2018; Mohan and Ray, 2019). Accordingly, a weighted average of five forecasts by market analysts, academics and government agencies with the best past performance was recommended along with the institution of formal reporting to Parliament to increase accountability. An asymmetric band of +3 and -1 per cent around the 4 per cent target – defined as core inflation – was called for, with equal weight to inflation and growth if the former is within the band (Goyal, *op. cit.*).

Monetary policy impulses lost in transmission (Mohan and Ray, *op. cit.*) on account of the structural presence of the large impact of food prices on inflation dynamics were flagged against the backdrop of a long history of unstable prices and drifting inflation expectations as specific challenges confronting FIT in India (Al-Mashat, *et al.*, 2018). On the other hand, estimates from a dynamic stochastic general equilibrium model indicated a strong transmission of monetary policy – especially from large interest rate changes – to output, inflation and interest rates even in comparison to the US, warranting milder monetary policy actions in response to supply shocks (Goyal and Kumar, 2019).

It was believed, though, that inflation forecast targeting can provide an effective strategy for minimising the second round effects of supply shocks by stabilising long-term expectations as the central bank earned credibility over time by achieving the announced target for inflation. To buttress the credibility bonus, the publication of a forecast showing a conditional medium-term path of inflation falling back to target along with an explanation of how policy actions should contribute to this desired outcome was advocated (Al-Mashat, *et al., op. cit.*). Indeed, this suggestion was assiduously embraced and, along with the 12 months ahead forecast in the MPC's resolution and the 18-24 months ahead forecast in the monetary policy report, considerable attention was given to unravelling the deviations of outcomes of both inflation and growth from forecasts; however, likely policy actions to align actual outturns in the future with the target were not explicitly provided and were instead embedded in the stated stance of the MPC at each meeting. It was recognised in the narrative around the FIT's functioning that the assessment of the likely size and duration of each price event presented a monetary policy communication challenge (Al-Mashat, *et al., op cit.*). Nonetheless, delay in responding to supply shocks can be costly in terms of output losses and inflation, and hence assertive policy responses were advocated, in contradiction to arguments that the aggregate demand channel in India was strong and aggressive tightening could result in overreaction and overshooting in terms of output losses (Goyal, *et al., op. cit.*).

By 2019-20, the final year of the first MPC, however, a combination of good luck and good policy had kept inflation aligned with the target with rare occasions of deviations beyond the band, and this turned the tide of opinion. Contrary to conventional wisdom, it was found that food inflation can un-anchor expectations, spillover into core inflation and hence warranted an appropriate monetary policy response rather than benign 'looking through'. This result reinforced the choice of headline inflation as the appropriate inflation metric for India. Also contrary to the earlier mainstream, it was found that instead of neglecting output fluctuations, the RBI had diligently pursued FIT and was as responsive to output fluctuations as in the pre-FIT period (Eichengreen *et al.*, 2020). An optimal policy rule with the ratio of weight on output gap to inflation gap higher than in the standard Taylor rule and a flexible inflation targeting framework turns out to be welfare maximising for India (Patra *et al.*, 2017).

(Contd...)

The novelty in the RBI's approach under FIT was a lower responsiveness than before to actual movements in inflation, suggesting forward-looking behaviour which enhanced policy credibility – smaller changes in the policy rate are now needed to signal the central bank's intent (Eichengreen, *op cit.*). This bore out the empirical finding that inflation expectations, especially those of professional forecasters[6], have become better anchored in India and inflation outcomes have become more stable, with lower volatility in the exchange rate and short-term interest rates. This has enhanced the ability of the RBI to respond to an exceptional shock like COVID-19 that is not of the authorities' own making. This led up to the view that inflation targeting and its institutional arrangements had a payoff in terms of policy credibility and room for manoeuvre.

Attention also turned to the institutional architecture as FIT matured in India. Justification has also been offered for decisions by an MPC (Dua, 2020). The growing prominence of the committee approach towards the conduct of monetary policy has several advantages, including confluence of specialised knowledge and expertise on the subject domain, bringing together different stakeholders and diverse opinions, improving representativeness and collective wisdom. The RBI's monetary policy communication seems to have improved significantly with the advent of inflation targeting (Mathur and Sengupta, 2020).

Comments on monetary policy in the media by some officials of the ministry of finance were seen as creating a public perception of lack of coordination. A government non-voting member could be a way to coordinate, but it was emphasised that the government needs to be cautious in not conveying the impression of interference or compromising the independence of the central bank (Patnaik and Pandey, 2020). In fact, this is important in a situation where two internal members of the MPC and all three external members are already appointed by the government. Publication of transcripts of monetary policy meeting with sufficient time lags were called for to improve transparency, with staggered terms for MPC members to guard against short-term political influences and to foster renewal of views.

This public discourse has come full circle more recently in response to the incisive question that is in a fundamental sense the DNA of the future of FIT in India: Does the focus on inflation targeting mean a neglect of other objectives such as growth and financial stability? (Rangarajan, 2020). Correctly, this influential view argues that when inflation goes beyond the comfort zone, the exclusive concern of monetary policy must be to bring it back to the target. When inflation is within the comfort zone, authorities can look to other objectives. This is the essence of FIT – the objective of control of inflation is not independent of the objective of growth, and this is enshrined in the amended RBI Act. That is why the inflation mandate must provide for a range and a time frame for adjustment. While monetary policy must act irrespective of what triggers inflation, supply side management in situation of supply shocks should be the responsibility of the government. FIT is not a rule but a framework (Bernanke and Mishkin, 1997). In terms of the operating procedure, central banks wielding the short term interest rate as the instrument to achieve the objectives of inflation and growth act on liquidity so that the proposed policy rate change 'sticks'. While the RBI must choose an appropriate measure of liquidity, this view held that the focus must also be on durable liquidity as reflected in reserve money (Rangarajan and Samantaraya, 2017). In terms of the inflation metric, it is better to deal with headline inflation with a range rather than excluding certain items (Rangarajan, 2020 *op cit.*).

Monetary policy is ultimately the art or science of the feasible (Patra, 2017). Decision making is always complex and testing. The endeavour of the MPC is to undertake a balanced assessment and set it out before the public so that monetary policy in India becomes transparent and predictable.

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6 By contrast, it was found that households' inflation expectations consistently exceed actual inflation and the deviations have not declined (Eichengreen, *et al., op cit.*).

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I.6 This chapter chronicles India's formative experience with FIT in order to set up the laboratory for a review of the monetary policy framework, which is the theme of this year's report. In what follows, an overview of the initial conditions and the impetus for change is set out in Section 2, followed in Section 3 by the experience of establishing the pre-conditions for ushering in FIT in India. The experience with *de jure* FIT since 2016 is assessed in Section 4. In these rites of passage, existential questions emerged, each of which forms the subject matter of dedicated chapters that follow. This chapter scheme is presented in Section 5, which concludes this chapter.

2. Initial Conditions

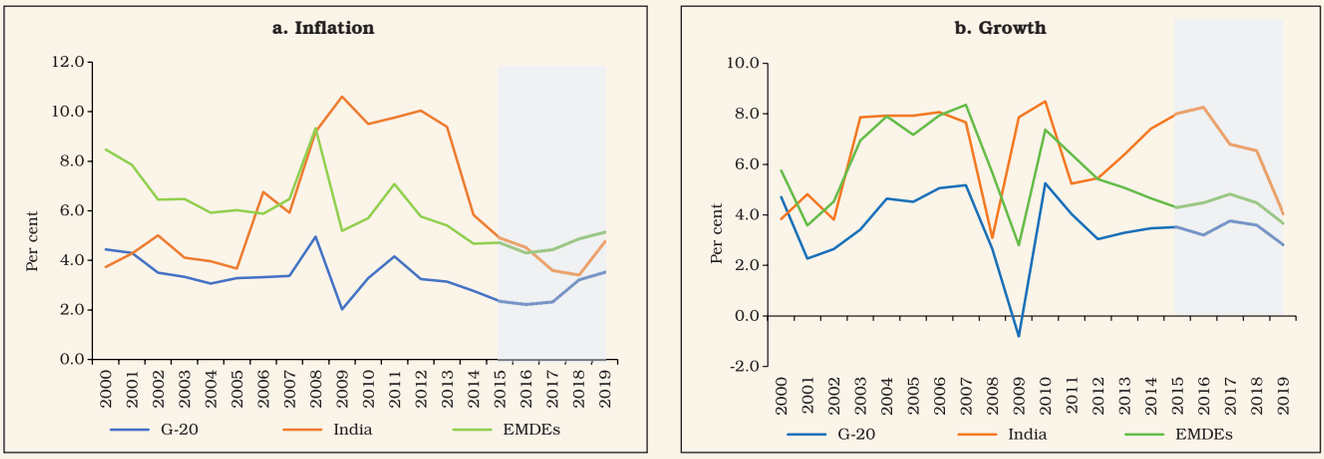
I.7 The story of the monetary policy regime change in India to FIT goes back to the turbulent days of the global financial crisis (GFC). Reminiscent of 2018-20 (pre-COVID), the economy was into a three-quarter cyclical downturn before the GFC struck. The tide of the Great Moderation had lifted all boats across the world at the turn of the century. In India, real GDP growth averaged 7.9 per cent during 2003-08, peaking at 8.1 per cent in 2006-07. From Q4:2007-08, however, signs of the imminent slowdown began to show, and in the first half of 2008-09, growth slid to 7.4 per cent (at 2004-05 base). On this slope, the Lehman Brothers moment arrived and the world was consumed by the GFC, which has drawn parallel with the Great Depression of the 1930s – in fact, it has been termed as the Great Recession (Verick and Islam, 2010). India became a bystander casualty – in the second half of 2008-09, the slowdown became more pronounced and growth collapsed to 3.1 per cent for the full year.

I.8 Cut to *Circa* 2009. India was among the first nations to bounce back from the GFC on the wings of a fiscal stimulus of 3.5 per cent of GDP[7], a cumulative policy rate reduction of 425 basis points[8] and assured liquidity of 10 per cent of GDP. The rebound took growth in 2009-10

7 The central government's fiscal deficit increased from 2.6 per cent of GDP in 2007-08 to 6.1 per cent of GDP in 2008-09.

8 With the operational policy rate switching from repo rate to reverse repo rate, the reduction in the effective policy rate was even higher at 575 basis points.

Chart I.3: Inflation and Growth - India *vs.* Global



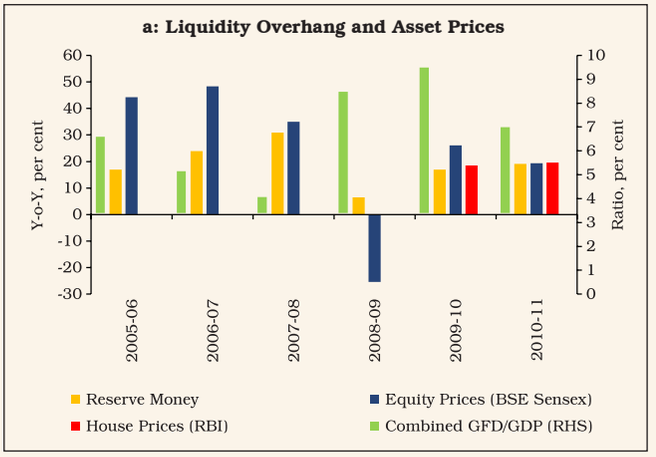
Source: NSO, GoI; WEO, IMF; and OECD. Data for India are on financial year basis.

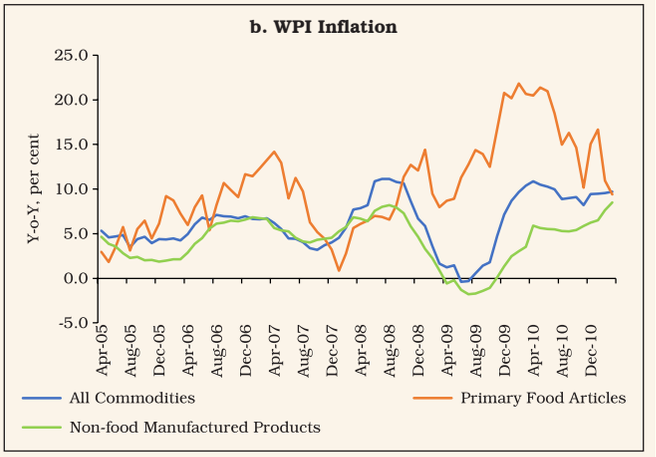
to a level (7.9 per cent), higher than in the pre-GFC year of 2007-08 (7.7 per cent) even as the global economy contracted in 2009 (Chart I.3b). The momentum provided by the unprecedented stimulus measures pushed growth even higher in 2010-11 (8.5 per cent). Aspirations of India's underlying potential seemed within reach, exemplified in official expectations of a growth rate of 9 per cent in 2011-12[9]. The 12th five-year plan envisaged average growth of 8 per cent for the period 2012-17 on the back of a massive push to build a world class infrastructure, with the banking sector intermediating its financial requirements.

I.9 History would, however, ordain otherwise – 2009-10 would turn out to be a fateful year in the recent history of the conduct of monetary policy in India. First, the large monetary stimulus was not unwound in a timely manner. The RBI's Annual Report for the year acknowledged that exit was debated in the light of the build-up of domestic inflationary pressures and inflation expectations. Clairvoyantly, it noted that the lag with which monetary policy operates pointed to a case for tightening sooner rather than later as the large overhang of liquidity could engender inflation expectations and an unsustainable asset price build-up, especially as capital inflows had resumed (RBI, 2010) (Chart I.4a). Eventually, however, arguments for deferring the unwinding won on the grounds of nurturing nascent growth impulses and also the facile view that inflationary pressures were driven by supply-side constraints, particularly food prices, which lie outside the remit of monetary policy (Chart I.4b). Exit did begin in October 2009, but it consisted of terminating some sector-specific liquidity facilities which were largely unutilised, restoring the statutory liquidity ratio (SLR) to its pre-crisis level [25 per cent of net demand and time liabilities (NDTL)], and restoring provisioning requirements for advances to the commercial real estate sector. Substantive liquidity withdrawal commenced from January 2010 when the cash reserve ratio (CRR) was raised by 75 basis points, but by then inflation was

9 Economic Survey, 2010-11.

Chart I.4: Liquidity, Asset Prices and Inflation





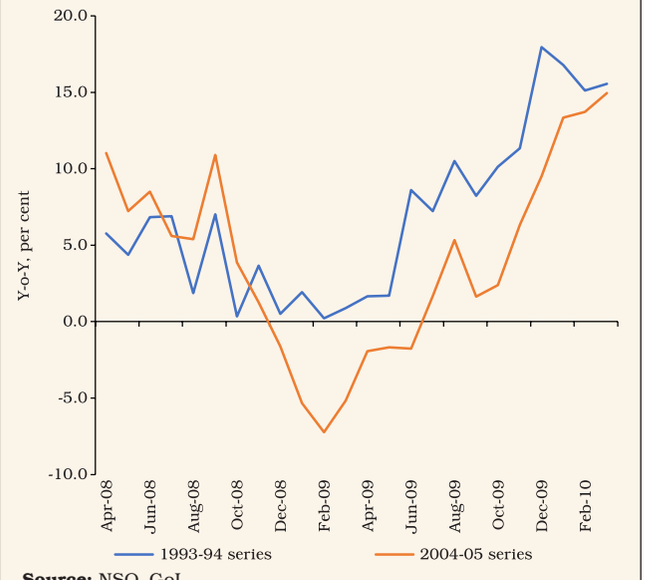
Source: DBIE, RBI and Office of Economic Adviser (OEA), GoI.

about to break out into double digits and race out of control.

I.10 Second, confronted with conflict among its multiple objectives, the RBI leaned towards supporting growth, even at the cost of accommodating inflation – "there were definitive indications of the economy reverting to the pre-GFC growth trajectory" (RBI, 2010). Growth projections were strongly influenced by high frequency indicators, notably the index of industrial production (IIP) based to 1993-94. In terms of this index, growth surged from Q2 and rapidly accelerated into double digits in the second half of the year. By contrast, the new IIP series rebased to 2004-05, which became available in November 2011, showed that a tenuous recovery from contraction in Q1:2009-10 occurred in Q2 and Q3, and it was not until Q4 that a strong expansion started (Chart I.5). In hindsight, the RBI was carried away by the nation-wide robust optimism about growth aspirations that characterised those halcyon days and refrained from acting counter-cyclically. This would prove to be a costly policy error in terms of the original sin of time inconsistency, as subsequent inflation developments would reveal.

I.11 Third, the amphitheatre shifts to inflation and several lessons emerge. Measured by the then RBI's metric – the wholesale price index (WPI) – prices emerged out of deflation in August 2009 but by December, it acquired elevation and persistence. The 2009 experience showed that it is crucial to carefully analyse the sources of inflation before making the judgment call on tolerating

Chart I.5. Growth in IIP: Old and Revised Series

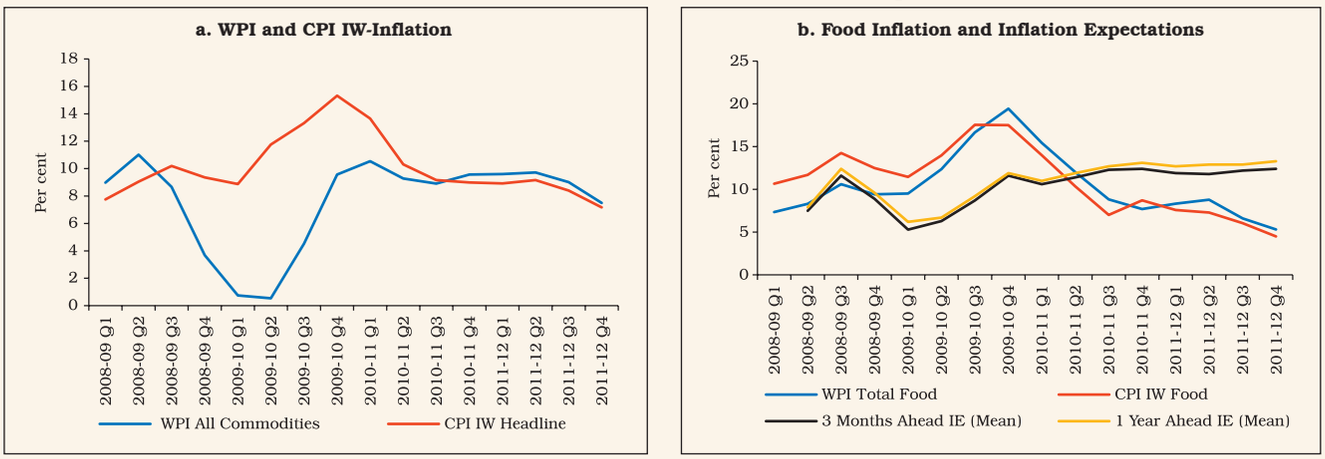


Source: NSO, GoI.

supply-side developments. Primary food prices had been ruling in double digits from as early as October 2008 and the failed monsoon of 2009 only stoked these pressures, taking food inflation to 20 per cent by December 2009. The signals being transmitted by food prices were set aside by design. In India, it is food (primary and manufactured combined) inflation which assumes properties of the true core when it persists, constituting 27 per cent of the old WPI index (1993-94=100) and a fourth of the 2004-05 based index which was released in September 2010. In the consumer price index (CPI) that is now the inflation metric, it's share is 45.9 per cent. In fact, a benign neglect of the warning signs flashing from the CPI proved to be monetary policy's costly error. In terms of the CPI for industrial workers (CPI-IW), food inflation had crossed into double digits by Q1:2008-09 itself and by Q3:2008-09 it had become generalised and spilled over into non-food components, taking headline inflation to 10.2 per cent in that quarter. Thus, although signals from both the WPI and the CPI were available to the RBI, they were looked through (Chart I.6a). Moreover, food inflation has a dominant influence on inflation expectations – in Q3:2009-10, households' median inflation expectations (IE) a year ahead rose by 500 basis points to 13.5 per cent (Chart I.6b). Food inflation also exhibits a closer association with underlying demand than other exclusion-based measures of the core. The 'official' measure of core – non-food manufactured products inflation – was in deflation between April 2009 and October 2009, but this mainly reflected the weakness in international crude prices rather than a deficiency of demand since real GDP growth had regained *mojo* by Q2:2009-10.

I.12 The spillover of food and fuel prices to non-food non-fuel inflation in WPI can be vividly illustrated by the historical decomposition of non-food non-fuel WPI inflation, which reveals the spillovers of elevated food inflation to non-food non-fuel inflation during 2009-10 (Chart I.7)[10]. This, in turn, led to generalised inflation during 2011-13. Thus, food price spillovers in an accommodative

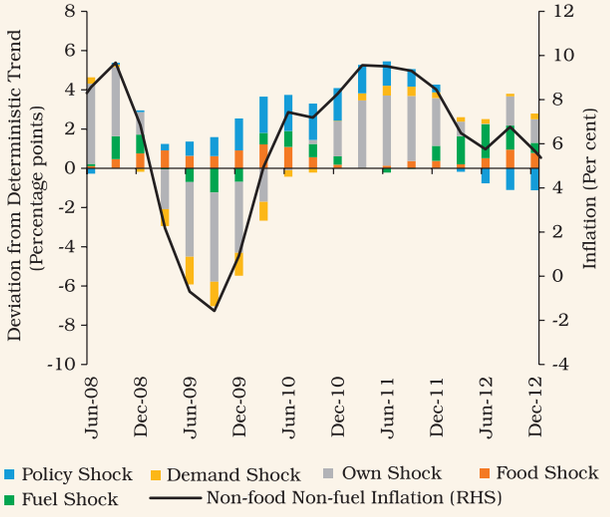
Chart I.6: WPI Inflation, CPI Inflation and Inflation Expectations



Source: RBI; and OEA and NSO, GoI.

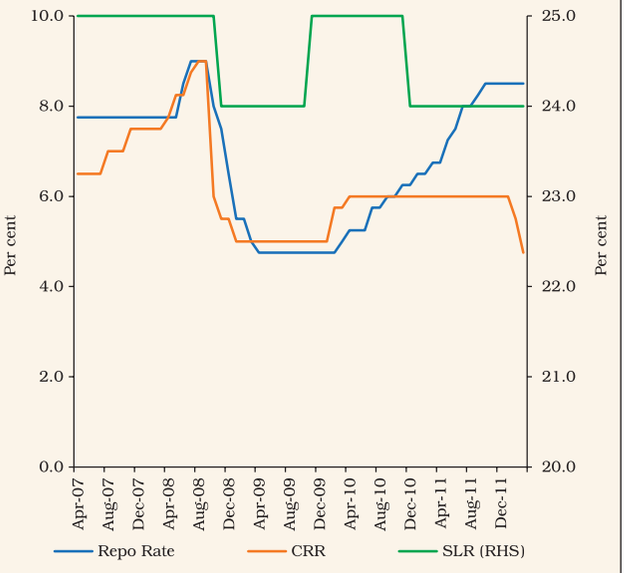
10 A vector auto regression (VAR) on quarterly data from 2001-02 to 2019-20 on the seasonally adjusted annualised rate (SAAR) of changes of fuel prices, food prices, non-food non-fuel prices, the output gap and the policy repo rate takes the form $Y_t = \Phi_0 + \Phi_1 Y_{t-1} + \ldots + \Phi_p Y_{t-p} + \varepsilon_t$, where Y_t is a vector of $\{\pi^{fuel}, \pi^{food}, \pi^{non\text{-}food,\ non\text{-}fuel}$, output gap, policy repo rate$\}$.

Chart I.7: Historical Decomposition of WPI Non-food Non-fuel Inflation



Source: OEA, GoI and Authors' calculations.

Chart I.8: Policy Rate, CRR and SLR



Source: RBI, Handbook of Statistics on Indian Economy.

low interest rate regime led to unanchoring of inflation expectations 'mutating like a multi-headed Hydra' (Patra, 2017 *op cit.*). Over the period 2010-13, WPI headline inflation averaged 8.6 per cent. The sectoral CPIs were flashing red way ahead of the WPI. In 2009-10, inflation measured by the CPI-IW had risen to 12.4 per cent and averaged 9.7 per cent during 2010-13.

I.13 Between March 2010 and October 2011, the RBI raised its policy rate by 375 basis points in 13 consecutive actions, backed up by another CRR increase in April 2010 and the unwinding of all the extraordinary GFC liquidity measures in 2010 (Chart I.8). But inflation had checked in and it was there to stay, 'all the king's men and all the king's horses'[11] notwithstanding. And now, a more sinister drama was about to unfold.

I.14 What if the RBI had behaved differently and the CPI inflation metric was used for policy? In order to assess this counterfactual, it is assumed that the RBI was operating in a rule-based policy environment with the objectives of attaining low and stable inflation and stabilising output. To simulate this scenario, a Taylor-type policy rule[12] is estimated on quarterly data from 2000-01 to 2010-11 under the following heroic assumptions: i) the inflation target is set at 5 per cent; ii) the RBI follows interest rate smoothing like other central banks to avoid delivering monetary policy shocks, and adjusts its policy rate at a pre-announced quarterly frequency in sync with quarterly policy meetings; and iii) the weighted average call money rate (WACR) is used as the effective policy rate as the RBI did not use a single monetary policy instrument during that period.

11 Adapted from Carroll, Lewis (1872), *Through the Looking Glass and What Alice Found There*. Philadelphia: Henry Altemus Company.

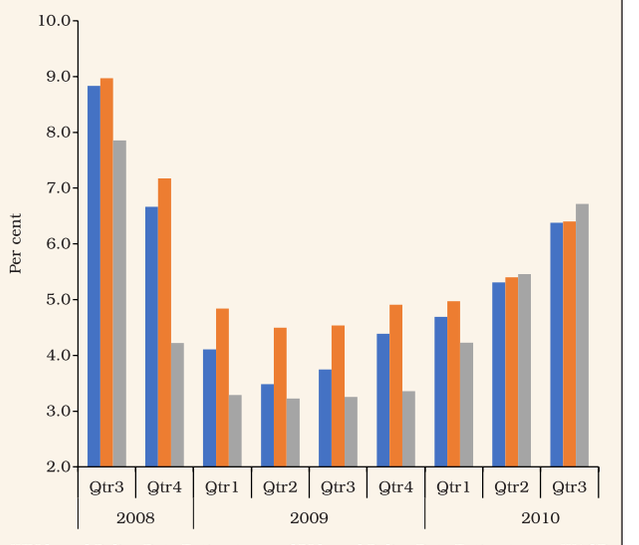
12 $i_t = \rho * i_{t-1} + (1-\rho) * (rr + \pi^T + a_1 * (\pi_t - \pi^T) + a_2 * OG_t + \varepsilon_t$; Where i_t is the WACR, π_t is the WPI inflation, OG_t is the output gap estimated using Hodrick-Prescott filter on logarithm of real GDP; ρ is the smoothing parameter; rr is the natural rate assumed to be 1.0 for the period 2001-2011; π^T is the inflation target assumed to be 5.0 per cent. The estimation is done using Non-Linear Least Squares (NLLS).

I.15 The inflation gap turns out to be statistically significant. The significance of the output gap coefficient and its larger size in comparison with the coefficient on inflation suggests that the RBI was more mindful of the growth objective relative to inflation[13] (Table I.1). In fact, the stated view was that growth, price stability and financial stability formed a hierarchy of policy objectives with one or the other ascending the hierarchy depending on the underlying macroeconomic and financial conditions (Reddy, 2005).

I.16 Given the large difference between WPI and CPI inflation during that period, a counterfactual analysis is conducted to assess whether the use of the CPI as the inflation metric would have evoked a different policy response. The Taylor-type rule suggests that if CPI-IW had been used as the primary inflation metric during 2009-2011, then it would have warranted a faster policy tightening after the GFC induced monetary policy accommodation (Chart I.9).

I.17 Looking back, the policy response was delayed. A timely response to a persisting supply shock is essential for a credible monetary policy. The more the delay, the costlier it will be for the economy. The importance of timely policy action can be shown with a policy experiment using the quarterly projection model (QPM)[14] that formed part of the Forecasting and Policy Analysis System (Benes *et al.*, 2016a) which has been developed as a precondition of the move to FIT in India. Defining steady state values of key macroeconomic parameters as a 5 per cent inflation target and 1.0 per cent as the real neutral rate (this is assumed based on the macroeconomic conditions prevailing during 2001-2011), the simulations show that there was a delay of four to six quarters in policy action, which kept the policy rate lower by up to 1 percentage point at its peak, *i.e.,* Q3:2009 (Chart I.9). This led to an

Chart I.9: Estimated Policy Rates (with WPI and CPI)



Source: OEA and Labour Bureau, GoI; and Authors'estimates.

Table I.1: Monetary Policy Reaction Function (2000-01 to 2010-11)

Smoothing Parameter	Inflation Gap[$]	Output Gap[^]
0.78***	0.41*	0.75**

[$] Deviation of WPI inflation from 5 per cent.
^ Estimated using Hodrick-Prescott (HP) filter.
***, ** and * represent significance at 1 per cent, 5 per cent and 10 per cent, respectively.
Source: Authors' estimates.

13 If IIP is used as a proxy for deriving the output gap, then its coefficient turns out to be insignificant. This suggests that policy was broadly guided by GDP as an indicator of overall economic activity, while IIP was only playing a role in terms of its lead information.

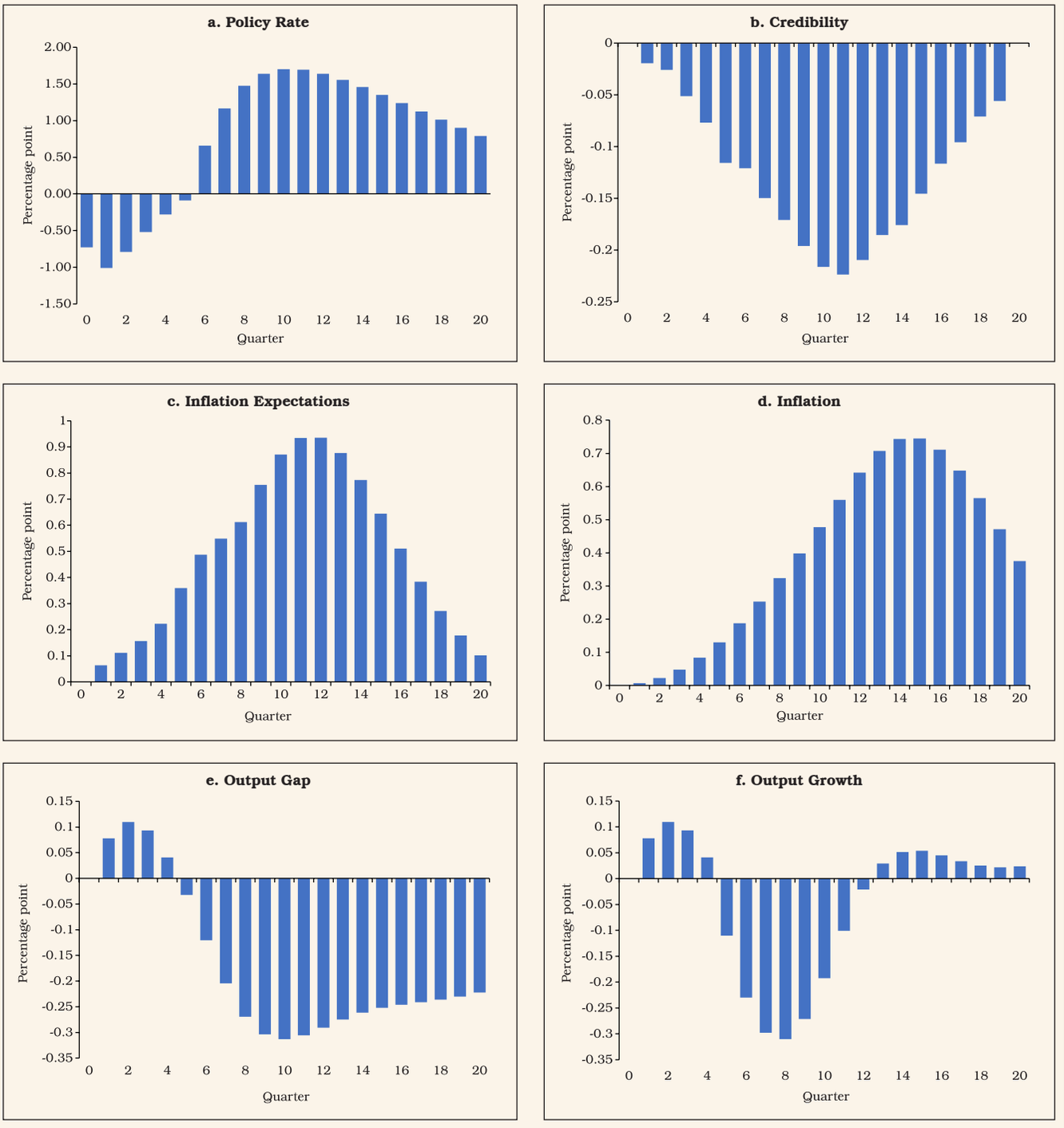
14 The QPM is a semi-structural, forward-looking, open economy, gap model in a New Keynesian framework, calibrated by incorporating India specific characteristics and provides an internally consistent analysis of various feedback mechanisms (Benes *et al.*, 2016a, b).

erosion of the central bank's credibility, leading to unhinging of inflation expectations. As a result, inflation rose by 0.8 percentage point more than it would have, had there been no delay. Eventually, the RBI was forced to increase the policy rate by 1.5 percentage points more than what would have been needed in the case of a timely response. Also, the delay forced the RBI to keep the policy rate elevated for a longer period of time than warranted in a no delay case. This higher and more persistent policy response caused by the delay led to the output losses being larger (Chart I.10). Thus, the initial gains in output due to a delay in the policy response were eroded by the higher than warranted policy reaction later on, eventually resulting in a substantial deterioration in the medium-term output-inflation trade-off.

I.18 Monetary policy is intrinsically a contract between the people and the sovereign. The people relinquish to the sovereign (or its agent, the central bank) the right over the value embodied in the goods and services they produce. In exchange, the sovereign undertakes to give to the people a money they can trust, a money that does not lose value over time in terms of the purchasing power it commands. Inflation is the metric by which this contract can be evaluated. Rising inflation erodes the purchasing power of money domestically, and externally as well by causing the exchange rate to depreciate against currencies of other countries that maintain a relatively lower rate of inflation. On the other hand, the inflation rate is also the rate of return on the production of goods and services. Too low a rate will disincentivise people from producing goods and services, thereby undermining the contract of trust. The challenge before the sovereign is to give to the people an appropriate inflation rate that balances these conflicting pulls and maximises social welfare. History has demonstrated that a break-down of this contract has severe repercussions, including the overthrow of sovereigns and the debasement of the currencies that circulate by their fiat. In India, a societal intolerance to inflation in high reaches and certainly at the double-digit threshold has manifested itself vividly – inflation measured by the GDP deflator and the WPI has averaged 6.4 per cent and 6.1 per cent, respectively, since 1951-52 (Chart I.11). Even short episodes of inflation beyond this social tolerance frontier are unacceptable, as election outcomes in India have repeatedly shown. In this fundamental sense, inflation is an index of governance (Patra, 2017 *op cit.*).

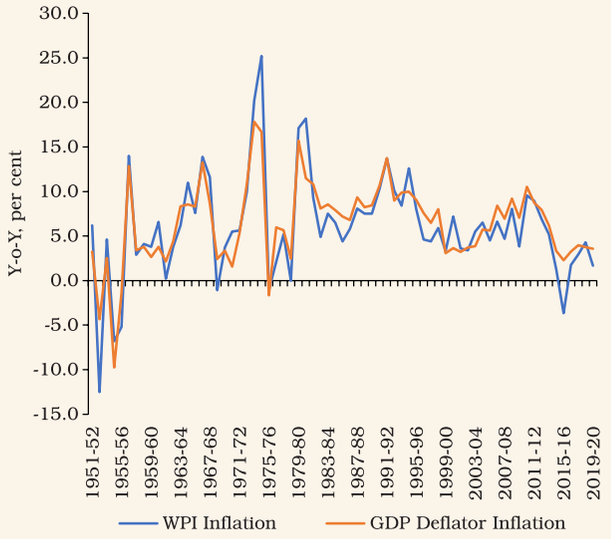
I.19 The inflation experience of the immediate post-GFC years left deep scars on the economy. When inflation surged from 3.8 per cent in 2009-10 to 9.6 per cent in 2010-11 and it was seen to be accommodated by monetary policy in the year before, the credibility of the social contract came under scrutiny. Rates of returns on bank deposits adjusted for inflation turned negative ((-) 1 per cent). Meanwhile, real rates of return on alternative assets such as housing (about 10 per cent), equity (about 10 per cent) and gold (12.5 per cent) looked lucrative and induced a portfolio shift from financial assets to physical assets (Chart I.12a). Households' financial saving declined from a recent peak of 10.9 per cent of GDP in 2009-10 to 7.4 per cent by 2011-12, with a corresponding increase in their physical assets from 14.0 per cent to 16.3 per cent (Chart I.12b). The rate of India's gross domestic saving in which households are the prime movers (accounting for over 60 per cent) was at 36.9 per cent of GDP in 2010-11, but it underwent a prolonged decline that took it down to 30.6 per cent by 2018-19, before showing an uptick in 2019-20.

Chart I.10: Implications of Delayed Policy Response (Difference between response with delay and without delay)



Source: Authors' estimates.

Chart I.11: WPI and GDP Deflator

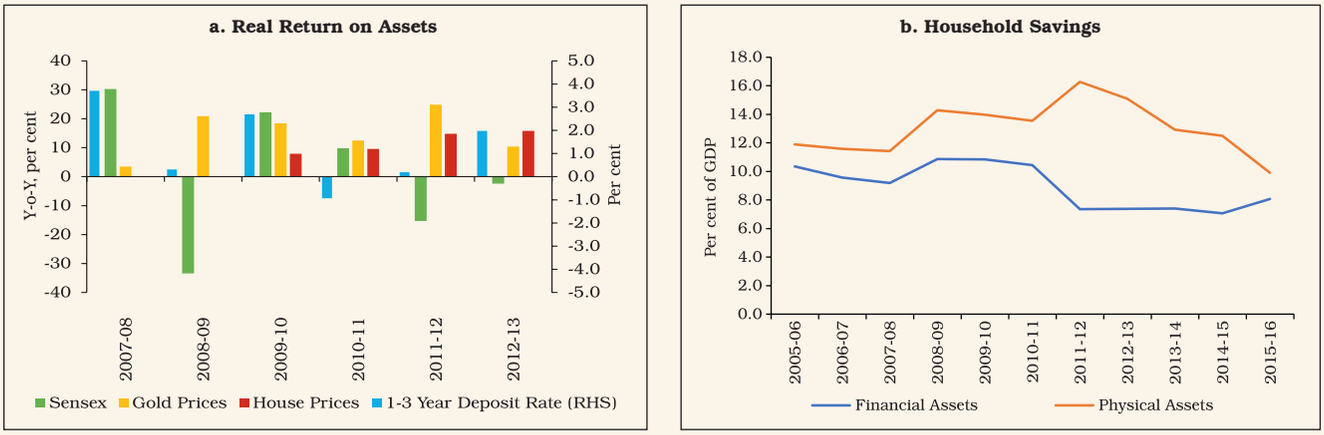


Source: OEA and NSO, GoI; and RBI, Handbook of Statistics on Indian Economy.

I.20 In an apparent contradiction of the Feldstein-Horioka puzzle which suggests close correlation between domestic saving and investment, India's gross domestic investment rate held up through these troubled times at around 39 per cent of GDP. With public investment declining from 9.0 per cent of GDP in 2008-09 to 7.2 per cent in 2012-13 as the GFC fiscal stimulus was unwound, the burden of sustaining the investment was entirely financed by foreign saving as reflected in the current account deficit (CAD) rising inexorably in those years from 0.1 per cent in Q4:2008-09 to a peak of 6.8 per cent of GDP in Q3:2012-13 (Chart I.13a). This was essentially reflecting a bad outcome. As people pulled out deposits from banks and bought gold, it reflected capital flight since India mines around one per cent of its gold consumption domestically. An annual level of gold imports of 750-850 tonnes surged to over 1000 tonnes in 2011-12 (Chart 13b). The RBI's warnings on the CAD (RBI, 2012) went unheeded in the flush of large capital inflows which financed the unsustainable levels of the external financing requirement.

I.21 The moment of reckoning overwhelmed India in the summer of 2013 with the taper tantrum[15]. As financial markets reeled under high turbulence and risk-off sentiment became

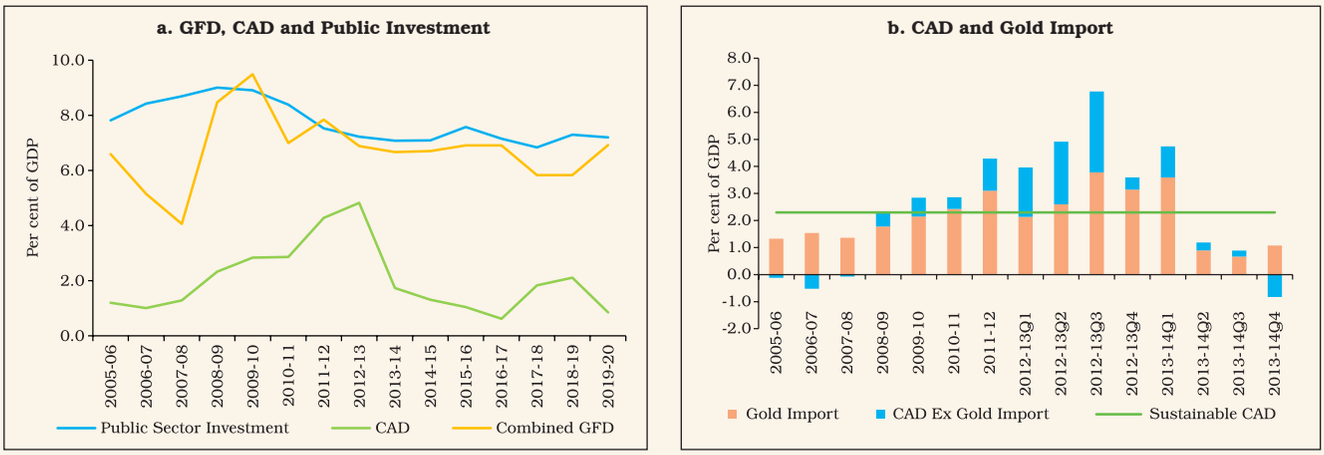
Chart I.12: Return on Assets and Household Savings



Note: Real returns are derived as nominal returns minus WPI inflation rates.
Source: RBI, Handbook of Statistics on Indian Economy and Authors' calculations.

15 The New York Times, June 17, 2013 first affixed the term to describe Mr. Bernanke's comments that the US economy was strong enough for the Fed to begin tapering its monthly purchases before the end of the year.

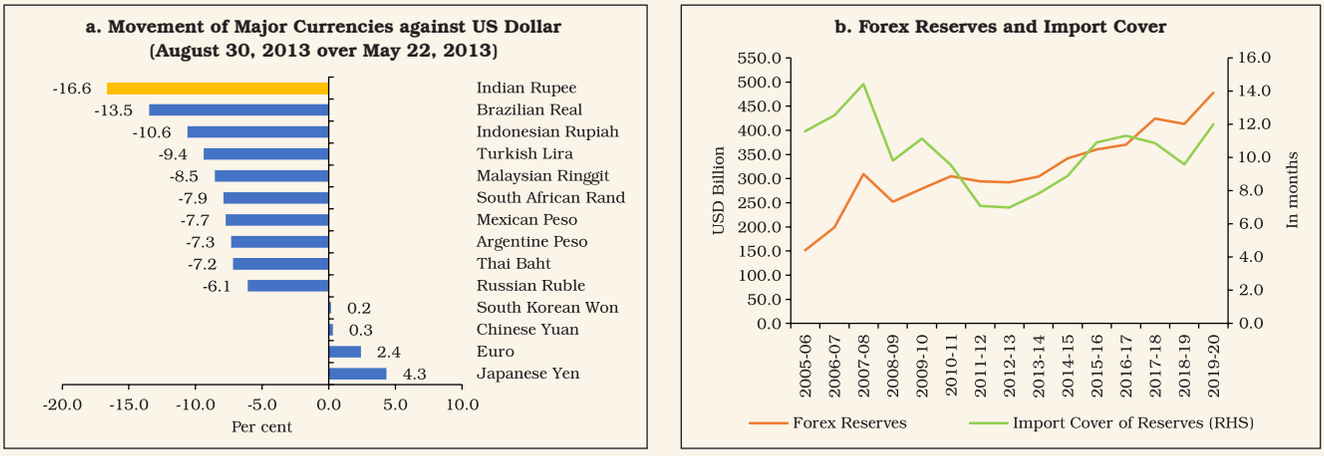
Chart I.13: GFD, Public Investment, CAD and Gold Import



Source: RBI, Handbook of Statistics on Indian Economy and Authors' calculations.

pervasive, capital flows stampeded for safe haven, exiting out of EMEs as an asset class. India was one of the worst hit, with the rupee depreciating the most among peers during May 22-August 30, 2013 (Chart I.14a). At that time, the foreign exchange reserves were close to US$ 300 billion, but markets discounted it completely (Chart I.14b). India joined Brazil, Indonesia, South Africa and Turkey in what was termed the 'fragile five'[16]. An unconventional crisis defence had to be mounted. Liquidity operations ensured that the money market rates were tightened; foreign exchange reserves were augmented by overseas borrowings and swaps; and gold imports were restricted through both tariffs, and end use constraints[17]. Although the crisis was seen off and

Chart I.14: Movement in Exchange Rate and Forex Reserves



Source: IMF, RBI, Thomson Reuters and Authors' calculations.

16 Morgan Stanley Research, Global EM Investor, August 5, 2013.

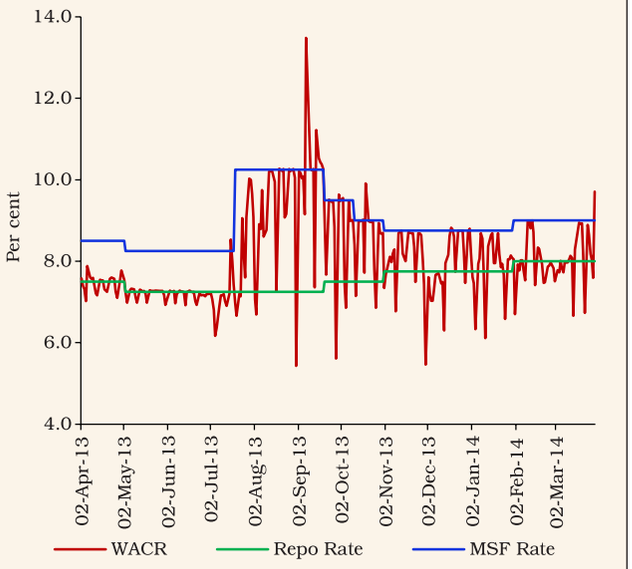
17 RBI, Annual Report 2013-14.

the situation stabilised thereafter, inflation had taken a heavy toll on macroeconomic conditions. With public credibility in monetary policy eroded, the time for regime overhaul was upon the RBI and India.

3. Preconditions

I.22 In July 2013, a rare data point was formed – monetary policy was employed in defence of the exchange rate for the second time in recent history, the first being in the GFC. Facing risks of currency turmoil due to the taper tantrum, the RBI judged that spillovers could endanger financial stability and growth and gave priority to stabilisation of the rupee in the conduct of monetary policy (RBI, 2014). The easing phase in the monetary policy stance that had commenced in April 2012 in response to the growth slowdown, after the delayed tightening during 2010-2011 to fight inflation, was interrupted. A 200 bps hike in the marginal standing facility (MSF) rate was effected and was backed up by capping individual bank's access to the liquidity adjustment facility (LAF) at 0.5 per cent of its NDTL, increasing the average daily CRR maintenance requirement (initially to 99 per cent from 70 per cent and thereafter to 95 per cent), and conducting open market sales to further tighten liquidity so that the MSF rate became the effective policy rate, 300 basis points above the *de jure* policy repo rate (Chart I.15). Although the exchange rate stabilised in ensuing months, inflation pressures persisted, warranting a more conventional monetary policy response in the form of policy rate increases in September and October 2013 even as the unconventional measures began to be wound down. Around this time, the RBI began setting the preconditions for a new monetary policy regime.

Chart I.15: Repo Rate, MSF Rate and WACR



Source: RBI, Handbook of Statistics on Indian Economy.

I.23 First, in September 2013, an expert committee was appointed to revise the monetary policy framework within a five-pillar approach comprising clarifying and strengthening the monetary policy framework, strengthening the banking structure, broadening and deepening financial markets, fostering financial inclusion, and improving the system's ability to deal with financial stress (RBI, 2014). The recommendations of this committee on the choice of a nominal anchor for monetary policy, decision making, instruments and operating procedure, transmission and open economy monetary policy provided the intellectual edifice for fashioning the new regime. This is detailed in Chapter 4.

I.24 Second, inflation was chosen as the nominal anchor for monetary policy in India in January 2014, drawing on the Committee's recommendations and the wider country experience. Well ahead of formal adoption, the RBI began sensitising the public about the choice

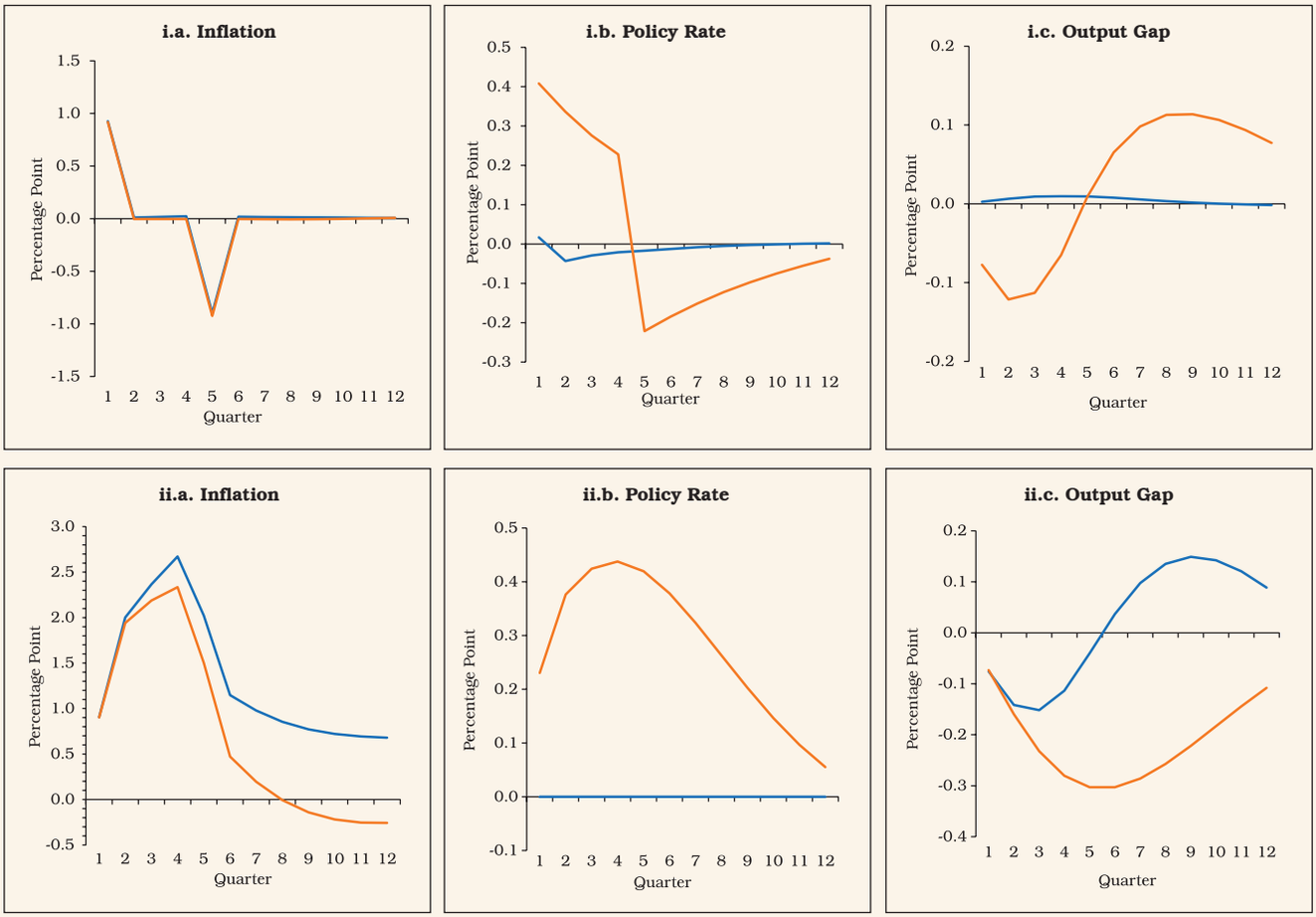
of metric for the nominal anchor as this would involve a shift from the WPI to the CPI[18]. From the October 2013 monetary policy review, retail inflation measured by the new CPI was analysed and projections in the form of fan charts were provided for the first time, effectively marking the beginning of the transition. Two challenges presented themselves. First, in the absence of any prior experience with CPI inflation, the RBI's policy reaction function was indeterminate. Second, 46 per cent of the new index comprised food and beverages – as against 24 per cent of the WPI based to 2004-05 – rendering the inflation process volatile and prone to supply shocks over which monetary policy had no control. On the other hand, the CPI is internationally used to express inflation; it is also easily communicated and understood, being a measure of prices at the retail level facing households and hence driving the formation of their expectations. In the context of changes in food and fuel prices, therefore, the commitment to the nominal anchor would need to be demonstrated by timely and even pre-emptive policy responses to risks from second round effects in order to anchor inflation expectations.

I.25 Understanding the nature and type of supply shocks is critical for calibrating monetary policy actions. Even though monetary policy cannot control these shocks, it can play an important role in avoiding the generalisation of inflationary pressures from the shock. Counterfactual experiments on food price shocks, *i.e.,* (i) transitory shocks from vegetables prices; and ii) persistent shocks due to monsoon vagaries can be carried out by employing QPM – the RBI's workhorse model (Chart I.16). In the case of a transitory food price shock, the initial price spike reverses, inflation falls, and monetary policy sees through the shock by not changing the policy rate [Chart I.16 (i.a, b, c)]. On the other hand, if monetary policy chooses to react to the transitory shock by increasing the policy rate, this will induce volatility in the output gap without having a discernible impact on the inflation path. A persistent food price shock warrants a monetary policy action to prevent un-anchoring of inflation expectations and spillover effects [Chart I.16 (ii.a, b, c)]. If monetary policy decides to see-through this shock, inflation expectations become unanchored, leading to a persistent upward drift in inflation, which does not fall back to the pre-shock level even after the initial shock has completely dissipated.

I.26 Third, inflation measured by the CPI had reached a peak of 11.5 per cent in November 2013. Bringing it down to a more tolerable level was a formidable task, given the cross-country evidence that the costs of disinflation are substantial. In a cross-country setting, each percentage point decline in trend inflation costs about 1.4 percentage points of a year's output (Ball, 1994), often termed the sacrifice ratio. Policy makers, therefore, often take a gradual approach as they fear that a deep recession could result from a 'cold turkey' approach or a sharp tightening of monetary policy. The RBI, too, avoided a 'big bang' and preferred a medium-term horizon of disinflation to minimise the associated output losses by spreading them over a multi-year time

18 From January 2012, the Central Statistics Office, Ministry of Statistics and Programme Implementation, released for the first time an all-India consumer price index (2010=100). The index was rebased to 2012 in January 2015. Up to 2011, consumer price indices were available on a sectoral basis *i.e.*, for industrial workers, agricultural labourers, rural labourers and urban non-manual employees, besides the all-India wholesale price index.

Chart I.16: Scenarios – Transitory and Persistent Food Price Shocks

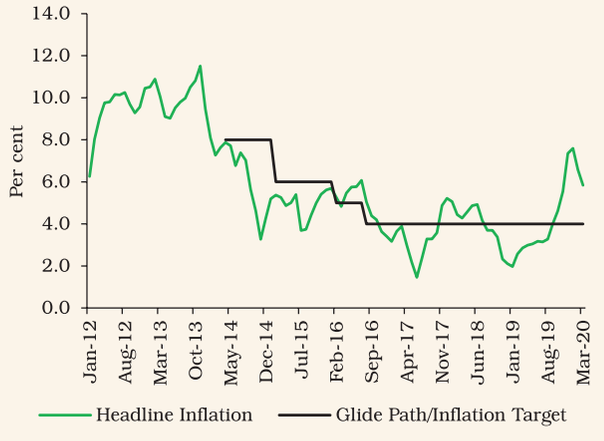


Note: Orange lines represent the impulse response functions (IRFs) with monetary policy action and blue lines represent the IRFs with unchanged monetary policy. The first row (charts i. a-c) represents the case of a transitory food price shock and the second row (charts ii. a-c) represents the case of a persistent food price shock.
Source: Authors' estimates.

frame. A glide path was set up that would bring down inflation to 8 per cent by January 2015 and 6 per cent by January 2016 (RBI, 2014). In the event, tailwinds from a collapse of commodity prices enabled measured CPI inflation to ease to 5.2 per cent in January 2015 and 5.7 per cent in January 2016 (Chart I.17).

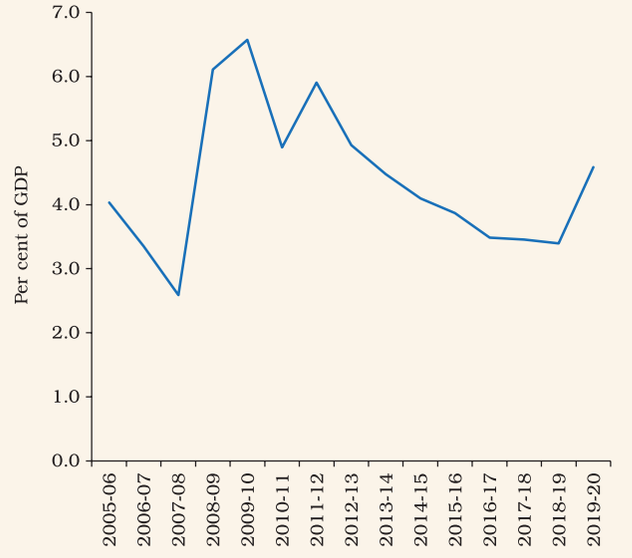
I.27 Fourth, after a hiatus of four years, the commitment to fiscal prudence was renewed. The union budget for 2012-13 set out a roadmap for fiscal consolidation by budgeting a reduction in the gross fiscal deficit (GFD) to GDP ratio beginning from 2012-13 and continuing the process through further corrections under rolling targets for the next two years. This was sought to be achieved through revenue enhancing (especially indirect tax measures and non-tax revenues through spectrum auction receipts) and expenditure control measures, *viz.*, restricting expenditure on subsidies to below 2 per cent of GDP. The widening of the services tax base and a partial rollback of crisis-related reductions in various indirect tax rates also contributed to the tax receipts of the central government.

Chart I.17: Headline Inflation *vis-a-vis* Glide Path/Inflation Target



Note: The glide path had suggested to bring inflation down to 5.0 per cent by end-2016, but before that government notified the inflation target of 4±2 per cent in August 2016.
Source: NSO and RBI.

Chart I.18: Central Government Gross Fiscal Deficit



Source: RBI, Handbook of Statistics on Indian Economy.

I.28 The amendment of the Fiscal Responsibility and Budget Management (FRBM) Act, 2003 in 2012 incorporated a medium-term expenditure framework statement (MEFS), which was a significant initiative towards fiscal consolidation. Under the amended FRBM Act, the government sought to eliminate the revenue deficit excluding grants for creation of capital assets by 2014-15, thereby targeting correction in respect of the structural component of the deficit in the revenue account. The MEFS set out three-year rolling targets for expenditure indicators as part of the strategy to improve the quality of public expenditure management. In response, the GFD of the centre declined from 6.6 per cent in 2009-10 to 4.1 per cent by 2014-15 (Chart I.18).

I.29 Fifth, the external sector regained resilience and strength. Supported by terms of trade gains from the plunge in international commodity prices, the current account deficit declined from its annual peak of 4.8 per cent of GDP in 2012-13 to 0.6 per cent in 2016-17. By the end of 2016-17, resurgence of capital flows and a modest external financing requirement enabled the level of reserves to rise to US$ 370 billion, equivalent to 11.3 months of imports. The ratio of reserves to external debt rose from 71.3 per cent at the end of March 2013 to 78.4 per cent by end 2016-17 and the ratio of the net international investment position to GDP fell from 17.8 per cent to 16.8 per cent.

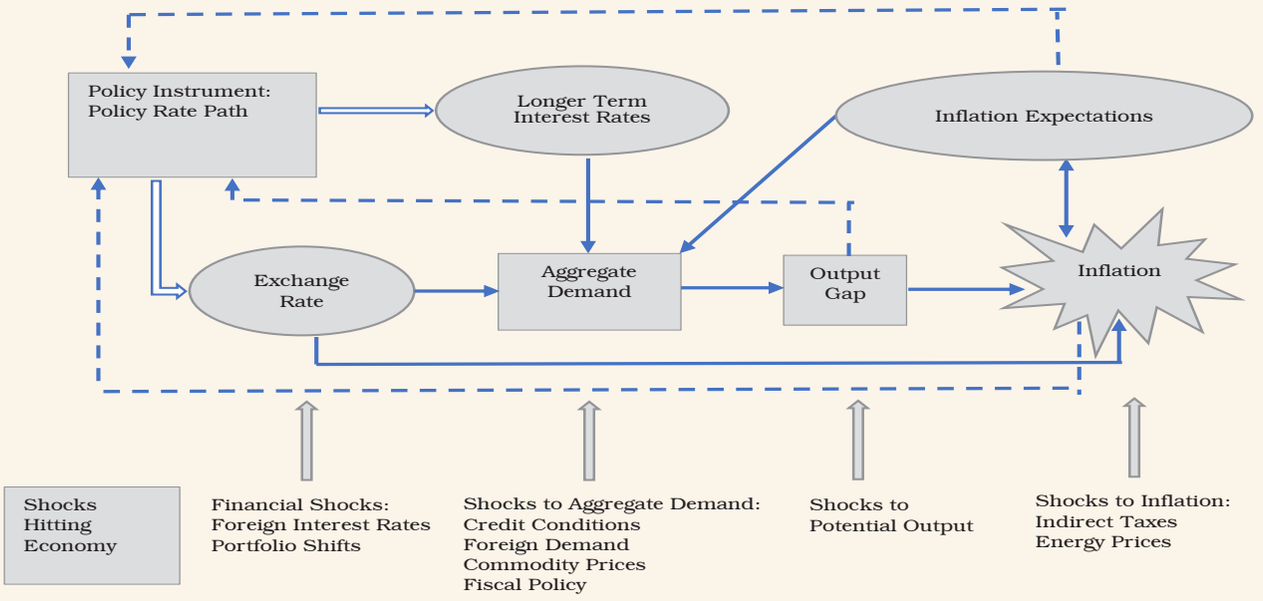
I.30 Sixth, the core of FIT is inflation forecast targeting. Consistent and reliable forecasts are prerequisites for the conduct of forward looking monetary policy under which the forecasts act as the intermediate target for monetary policy, *a la* monetary aggregates in the earlier regime. Hence, a theoretically consistent and empirically founded model, taking into account the specific characteristics of the Indian economy, was needed to be developed, especially in the context of external communication of inflation forecasts. In fact, Section 45ZM of the RBI Act mandates the RBI to publish a half-yearly Monetary Policy Report (MPR), including inflation forecasts for 6-18 months. It is in pursuance of this requirement that the RBI developed a macro economic model

– QPM – under the Forecasting and Policy Analysis System (FPAS) for generating medium term projections and policy analysis[19]. QPM is a forward looking open economy calibrated gap model broadly following a theoretical framework founded on New Keynesian principles in the widely adopted tradition among modern central banks and consistent with meeting the targets/mandate set under the FIT regime (Benes *et al.* 2016a, b). It provides the flexibility to incorporate empirical regularities (Chart I.19).

I.31 The QPM embeds key India-specific features like behaviour of different inflation components and their interlinkages, sluggishness in monetary policy transmission, the predominance of the bank lending channel, and credibility. It also incorporates monetary-fiscal linkages, fuel pricing, capital flow management and exchange rate dynamics. An innovative feature of India's QPM is the incorporation of the credit constraint on output *via* the bank lending channel, which resolves the issue of extracting valuable information from monetary and credit aggregates that canonical New Keynesian models are criticised for.

I.32 Fundamentally, the QPM is a framework designed to answer one question: what is the path of the policy rate, given the macroeconomic and financial conditions? The policy interest rate is endogenous and consistent with the inflation target. For any deviation of inflation from its target, however, there are many alternate interest rate paths that would bring inflation back to target over the medium term: for example, large early policy rate changes may get inflation to target quickly, but with a substantial adverse impact on output; more gradual policy actions will achieve the target slowly, but with less loss of output. Thus, this model can be calibrated to generate alternate interest rate paths, which are consistent with the inflation target, taking into consideration the policy makers' assessments of evolving macroeconomic conditions.

Chart I.19: QPM – Feedback Mechanism and Transmission



Source: Benes *et al.*, 2016b.

19 QPM was developed with the technical assistance (TA) of the IMF.

I.33 Against this backdrop of milestones set and crossed during 2013-15, formal FIT in its *de jure* format was ushered in during 2016-17. Amendments to the RBI Act came into force on June 27, 2016. For the first time in its history, the RBI was explicitly provided the legislative mandate to operate the monetary policy framework of the country. The primary objective of monetary policy was also defined explicitly for the first time – "to maintain price stability while keeping in mind the objective of growth." The amendments also provided for the constitution of an MPC that shall determine the policy rate required to achieve the inflation target, another landmark in India's monetary history. The composition of the MPC, terms of appointment, information flows and other procedural requirements such as implementation of and publication of its decisions, and failure to maintain the inflation target as well as remedial actions were specified and subsequently gazetted during May-August 2016. On August 5, 2016 the Government set out the inflation target as four per cent with upper and lower tolerance levels of six per cent and two per cent, respectively, for a period of five years up to March 31, 2021. On September 29, 2016 a press release of the Government of India informed of the appointment of external members of the MPC. One working day later, the MPC began its first ever meeting and issued its first unanimously voted resolution on October 4, 2016 (Table I.2). The specific dates and events around establishment of FIT in India suggest that the objective was to facilitate a smooth transition to minimise output losses.

4. Experience with FIT

I.34 With the formal institution of FIT in September 2016, India became the 36th country to adopt an inflation targeting monetary policy regime (Jahan, 2017) – the new kid on the block – and as stated in the foregoing, with many 'firsts' to its credit. The fortunes of FIT and India's first MPC were intertwined over a tumultuous period by any reckoning. The latter held 24 meetings in total, including two off-cycle.

I.35 Ahead of its first meeting, CPI inflation was on the decline from a recent peak, enabling the MPC to begin its innings with a unanimous rate reduction of 25 basis points and an accommodative stance. In its next meeting, however, FIT/the MPC had to deal with its first unforeseen shock that was domestic in character – demonetisation. Deflationary forces took hold, bringing headline inflation to an all-time low of 1.5 per cent in June 2017, below the lower tolerance level. Meanwhile real GDP growth moderated and slowed sequentially to 5.8 per cent in Q1:2017-18. Towards the close of the tenure of the MPC, *i.e.*, from March 2020, FIT was tested again by an unprecedented and equally unforeseen shock but of global proportions this time – COVID-19. Pre-emptively, the MPC met off-cycle and effected the biggest rate cuts in its lifetime – 115 basis points cumulatively during March-May – and nuanced its accommodative stance to incorporate the resolve to "mitigate the impact of COVID-19 on the economy" (RBI, 2020), in spite of inflation having breached the upper tolerance level during December 2019-February 2020.

Table I.2: Transition to FIT in India

Date	Event	Outcome
January 2014	RBI announced a disinflationary glide path for bringing down CPI inflation to 8 per cent by January 2015 and to 6 per cent by January 2016.	Inflation fell in line with the glide path to 5.2 per cent in January 2015 and 5.7 per cent in January 2016.
February 20, 2015	A Monetary Policy Framework Agreement (MPFA) was signed between the Government of India and the Reserve Bank.	FIT was formally adopted in India with RBI tasked to bring inflation to 6 per cent by January 2016 and target for 2016-17 and all subsequent years shall be 4 $\pm$ 2 per cent.
February 29, 2016	The Finance Minister announced in his Budget Speech for 2016-17 the Government's intention to amend the RBI Act, 1934 to provide for a statutory and institutionalised framework for a Monetary Policy Committee (MPC).	The RBI Act 1934 was amended to provide statutory basis for a Monetary Policy Framework and a Monetary Policy Committee through the Finance Bill 2016.
May 14, 2016	Amendment to the RBI Act was notified in the Gazette of India.	Statutory basis to the FIT framework.
June 27, 2016	The amended RBI Act came into force on June 27, 2016. Rules governing the procedure for selection of members of MPC and terms and conditions of their appointment and factors constituting failure to meet inflation target under the MPC Framework notified.	Sought to ensure independence and accountability, MPC vested with the responsibility of setting the policy rate.
August 5, 2016	Under section 45ZA of the RBI Act, 1934, the Central Government, in consultation with RBI, fixed the inflation target for the period from August 5, 2016 to March 31, 2021, as 4 per cent, with upper tolerance level of 6 per cent and lower tolerance level of 2 per cent.	Fixation of an inflation target while giving due emphasis to the objective of growth and challenges of an increasingly complex economy is an important monetary policy reform with necessary statutory back-up.
September 29, 2016	Constitution of the MPC under section 45ZB of the RBI Act, 1934 notified.	Government constituted the six member MPC for the first time with (a) the Governor of the Bank as Chairperson, *ex officio*; (b) Deputy Governor of the Bank, in charge of Monetary Policy - Member, *ex officio*; (c) One officer of the Bank to be nominated by the Central Board - Member, *ex officio*; and (d) three external members – Professor Chetan Ghate, Professor Pami Dua and Professor Ravindra H. Dholakia.
October 3-4, 2016	The MPC held its first meeting.	Unanimous decision to reduce policy rate by 25 bps, consistent with the accommodative policy stance.
October 5, 2020	Government constituted a new MPC on the expiry of the term of the first MPC with three external members: Dr. Shashanka Bhide; Dr. Ashima Goyal; and Prof. Jayanth R. Varma.	The 25th meeting of the MPC was held from October 7 to 9, 2020 and members voted unanimously to keep the policy rate unchanged at 4.0 per cent, while deciding to continue with the accommodative stance as long as necessary.

Source: RBI Annual Reports; PIB, Government of India; RBI Act, 1934 (amended).

I.36 Thus, the MPC/FIT had to deal with inflation variability of sizable amplitude and a unidirectional slowing down of growth in the downturn phase of the cycle. These subtle variations in situations and responses serve to underscore the 'F' of FIT, *i.e.*, flexibility in the context of acute policy trade-offs.

I.37 An abiding theme in the rapidly proliferating literature is to evaluate the performance of FIT against a variety of metrics (Ball and Sheridan, 2005; Fraga *et al.* 2003; Gonçalves and Salles, 2008; Mishkin and Schmidt-Hebbel, 2007). The main criteria for evaluating any policy regime are the specific objectives assigned to it.

Macroeconomic Performance[20]

I.38 First, over the period October 2016 to March 2020 – the principal metric set by the Act, *i.e.*, headline inflation averaged 3.9 per cent, even with the two life changing shocks alluded to earlier. Second, apart from aligning inflation with the target, the success of FIT lies in providing certainty to people about the course of future inflation by minimising its fluctuations. This is the crux of price stability. It is measured by the second moment about the mean, *i.e.*, inflation volatility, measured by its standard deviation, declined to 1.4 during October 2016-March 2020 from 2.4 in 2012-16 (Table I.3).

I.39 Third, people's expectations are also influenced by how inflation outcomes are distributed, which is the third moment about the mean. If they are more above the mean than below, there is a negative or left-tailed skew, which implies that most of the time, people are likely to face higher than average inflation. On the other hand, when the distribution of inflation is positively skewed or right-tailed, people would generally expect lower than average inflation. During the period of FIT and the first MPC, skewness was 0.9, indicating that over most of this period, inflation was lower than the average. Fourth, kurtosis, the fourth moment about the mean, describes the proportion of inflation outcomes that are far away from the average. In the case of FIT, it was 0.9, implying that there were very few instances of large deviations from the mean. During 2012-16, for instance, it was (-)1.5. Taken together, skewness and kurtosis of the inflation distribution during FIT suggest that most outcomes for headline inflation were concentrated around the mean of 3.9 per cent. This is in contrast to the bi-modal distribution observed during 2012-16 (Chart I.20.a).

I.40 During the FIT period, even the distribution of inflation across sub-groups was centred around the inflation target of 4 per cent as opposed to a wide range of outcomes in the pre-FIT period, as reflected in the long tails of the distribution during 2012-16 (Chart I.20.b).

Table I.3: Headline Inflation – Key Summary Statistics

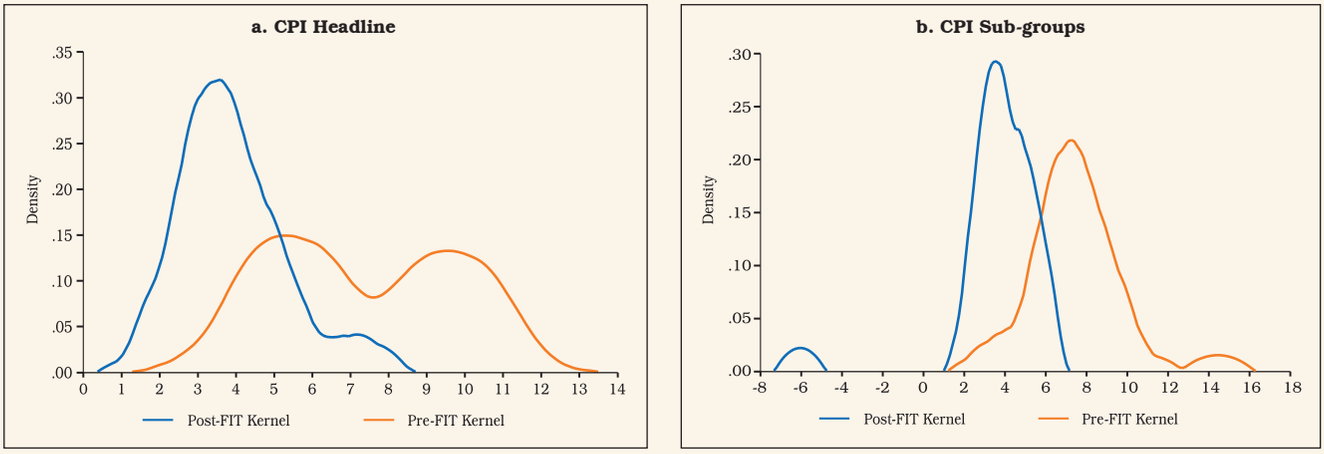
(Per cent)

	2012-13	2013-14	2014-15	2015-16	2012-16 (Apr-12 to Sep-16)	2016-17	2017-18	2018-19	2019-20	2016-20 (Oct-16 to Mar-20)
Mean	10.0	9.4	5.8	4.9	**7.3**	4.5	3.6	3.4	4.8	**3.9**
Standard Deviation	0.5	1.3	1.5	0.7	**2.4**	1.0	1.2	1.1	1.8	**1.4**
Skewness	0.2	-0.2	-0.1	-0.9	**0.1**	0.2	-0.2	0.1	0.5	**0.9**
Kurtosis	-0.2	-0.5	-1.0	-0.1	**-1.5**	-1.6	-1.0	-1.5	-1.4	**0.9**
Median	10.1	9.5	5.5	5.0	**7.1**	4.3	3.4	3.5	4.3	**3.6**
Maximum	10.9	11.5	7.9	5.7	**11.5**	6.1	5.2	4.9	7.6	**7.6**
Minimum	9.3	7.3	3.3	3.7	**3.3**	3.2	1.5	2.0	3.0	**1.5**

Note: Skewness and kurtosis are unit-free.
Source: NSO and Authors' calculations.

20 Assessment of macroeconomic performance is limited to the pre-COVID-19 period due to a break in the CPI inflation series on account of non-reporting of data in April-May 2020 (which were subsequently filled through imputation) and lack of representativeness, while GDP was impacted by lockdowns and social distancing norms.

Chart I.20: Kernel Density of CPI Headline and Sub-groups Inflation



Note: A kernel density estimation is a non-parametric way of estimating the probability density function of a random variable. Pre-FIT: January 2012 to September 2016; Post-FIT: October 2016 to March 2020.
Source: NSO and Authors' calculations.

Inflation Dynamics

I.41 Pinning down the underlying inflation dynamics – sources of inflation; relative price movements; inflation persistence; and inflation expectations – is important for evaluating the FIT experience. Understanding regional or spatial inflation dynamics is significant in this exercise.

(a) Sources of Inflation

I.42 Beginning with the sources of inflation, the disinflation ahead of FIT was broad-based, but driven mostly by the food group (Table I.4). During FIT, the enduring alignment of inflation with the target was enabled by a sharp fall in food inflation under the impact of record food grains and horticulture production. Reliance on food imports declined (except for palm oil and some pulses) and consequently, the correlation of global food inflation with domestic CPI food inflation fell in the four years leading up to FIT (Chart I.21.a). Improvements in road network, tele-density, market penetration and irrigation facilities helped reduce multi-stage mark-ups over the food supply chain in India (Bhoi, *et al.*, 2019).

I.43 Sustained moderation in the growth of agricultural and non-agricultural wages played a role in containing food price inflation during the FIT period, and lower inflation also contributed to lower wage growth (Chart I.21.b). Food inflation volatility remained high through the FIT period, however, suggesting persisting vulnerability to supply shocks such as the vagaries of the monsoon and idiosyncratic price shocks as in pre-monsoon upticks.

I.44 On the other hand, the volatility of core inflation – obtained by excluding food and fuel prices from the headline – more than halved during the FIT period. Positive spillovers from the sharp reduction in food inflation, a relatively stable exchange rate and the credibility bonus accruing to monetary policy on account of its focus on an inflation target contributed to this outcome. By contrast, the sharp reduction in international crude oil prices and their volatility did not fully pass through to domestic petroleum, oil and lubricants (POL) prices due to opportunistic fiscal revenue raising rather than consumption smoothing. In

Table I.4: CPI-C Inflation Components, Agricultural Growth and International Crude Oil Prices - Level and Volatility

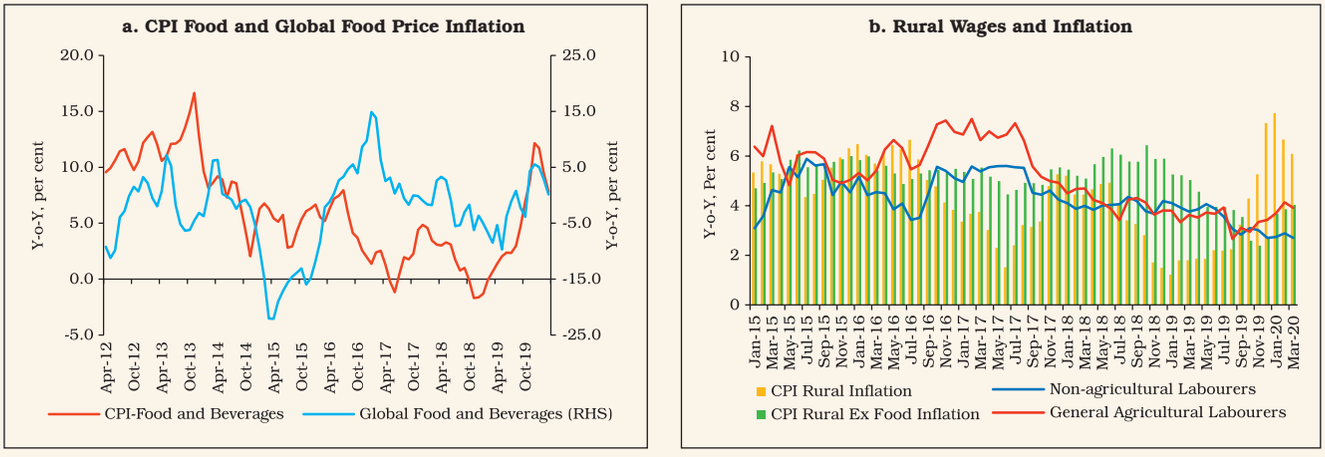
(Per cent)

	Average					Volatility				
	Food and Beverages (45.9)	Fuel and Light (6.8)	Ex-Food and Fuel (Core) (47.3)	Agricultural GVA Growth	International Crude Oil Prices (USD/Barrel)	Food and Beverages	Fuel and Light	Ex-Food and Fuel (Core)	Agricultural GVA Growth	International Crude Oil Prices (USD/Barrel)
Pre-FIT										
2012-13	11.2	9.7	9.0	1.5	103.2	1.2	1.0	0.4	0.4	5.7
2013-14	11.9	7.7	7.2	5.6	103.7	2.5	1.2	0.4	1.1	3.3
2014-15	6.5	4.2	5.4	-0.2	83.3	2.2	0.7	1.1	3.1	23.6
2015-16	5.1	5.3	4.6	0.6	46.1	1.2	0.7	0.3	2.2	11.1
Period average	**8.7**	**6.7**	**6.5**	**1.9**	**84.0**	**3.4**	**2.3**	**1.8**	**2.7**	**27.0**
FIT										
2016-17	4.4	3.3	4.8	6.8	47.9	2.4	0.8	0.2	1.4	4.3
2017-18	2.2	6.2	4.6	6.6	55.7	1.9	1.3	0.5	0.9	7.0
2018-19	0.7	5.7	5.8	2.6	67.3	1.8	2.7	0.4	1.0	7.6
2019-20	6.0	1.3	4.0	4.3	58.6	3.9	3.1	0.4	1.3	9.3
Period Average	**3.3**	**4.1**	**4.8**	**5.1**	**57.4**	**3.3**	**2.9**	**0.7**	**2.0**	**9.9**

Note: Volatility is measured by standard deviation of monthly y-o-y inflation of the CPI-C components, quarterly agricultural GVA growth and monthly average international crude oil prices. Petrol and diesel are part of transport and communication sub-group under core inflation. Figures in parentheses represent weights in per cent in CPI-C. Average volatility indicates standard deviation of the variable for the relevant full period.
Source: NSO, IMF Primary Commodity Prices database and Authors' calculations.

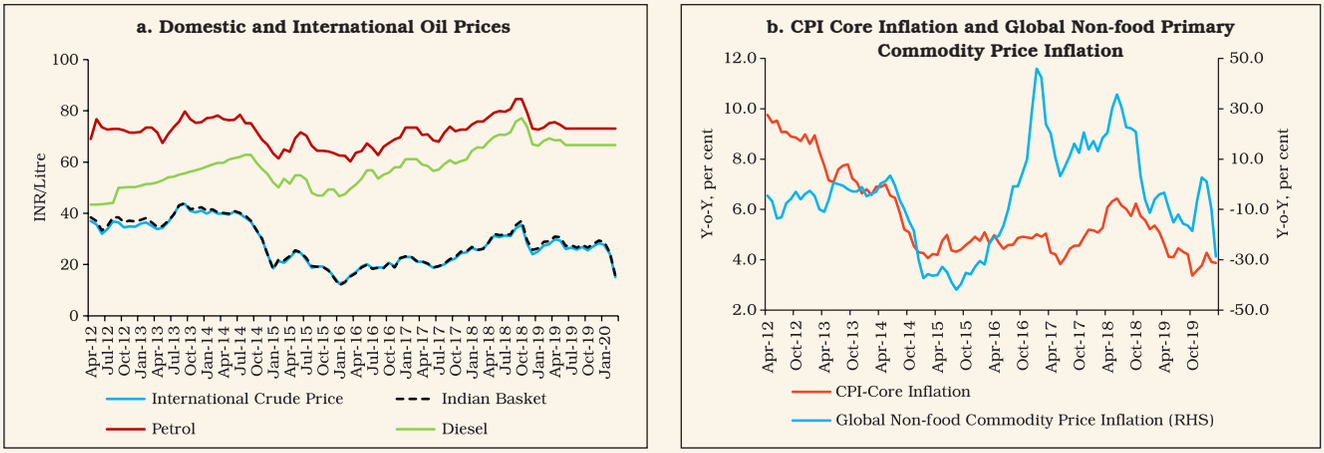
fact, global non-food primary commodity price inflation (consisting of fuel, metals, fertilisers and agricultural raw materials) exhibited high positive contemporaneous correlation with domestic CPI-core inflation during the pre-FIT and the FIT periods (Chart I.22).

Chart I.21: Domestic CPI and Global Commodity Price Inflation



Source: NSO, IMF Primary Commodity Prices database and Labour Bureau, Ministry of Labour and Employment, GoI.

Chart I.22: Domestic CPI Core and Global Non-food Commodity Price Inflation



Source: World Bank Pink Sheet Database, Indian Oil Corporation Ltd. (IOCL), Petroleum Planning and Analysis Cell (PPAC), NSO and IMF Primary Commodity Prices database.

I.45 An analysis of the relationship between core (excluding food, fuel, petrol and diesel) and non-core components of CPI suggests that non-core inflation converges to core inflation and the deviations from equilibrium gets corrected in around a year (Table I.5)[21]. The large residual volatility of non-core inflation (compared to core inflation) indicates the transitory nature of the non-core inflationary shocks. On the other hand, in the short-run, a positive relationship between non-core inflation and core inflation is found to be statistically significant, indicating that spillovers also happen from non-core inflation to core inflation through increased costs as well as unanchored inflation expectations.

Table I.5: Core and Non-Core Inflation Dynamics

	ΔNonCore	ΔCore
Error Correction Term	-0.069***	0.005
ΣΔCore	-0.637	0.231**
ΣΔNonCore	0.353***	0.075***
Residual SD$	0.607	0.164
Cointegration Test (F-Statistic)	4.073*	4.773*
Residual White Noise Test (p-value)	0.481	0.634

***, ** and * represent significance at 1 per cent, 5 per cent and 10 per cent, respectively.
$ The standard deviation (SD) corresponds to non-annualized m-o-m changes.
Note: In addition, a dummy variable to control for the increase in the housing inflation during January 2017 to June 2017 due to changes in sample process was used.
Source: Authors' estimates.

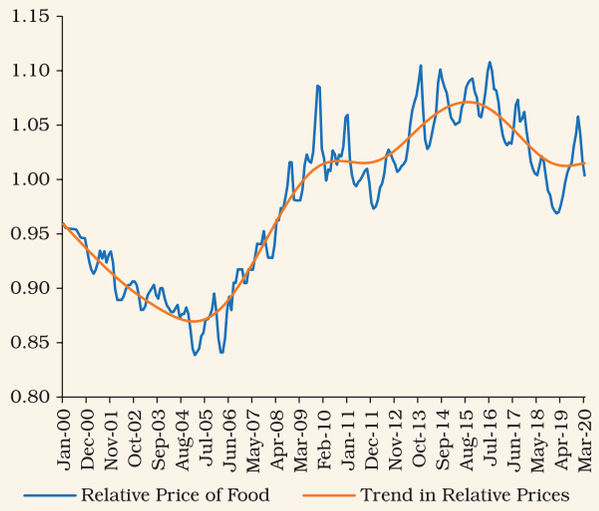
(b) Relative Price Movements

I.46 Monetary policy is concerned with the change in absolute level of prices as reflected in headline inflation; relative prices do not matter as they should be counterbalancing within the budget constraint. If relative prices are large, persistent and not offsetting, however, they impinge on the setting of monetary policy as they can influence inflation expectations lastingly through second-round effects.

I.47 Relative food price, *i.e.*, the ratio of food to non-food price indices, was trending up during the period from 2005 to 2014. With the

21 Estimates based on an autoregressive distributed lag (ARDL) framework (Pesaran *et al.*, 2001) with seasonally adjusted monthly data from January 2011 to March 2020 show that core and non-core components of the CPI inflation are cointegrated. The error correction term is negative and statistically significant for the non-core component, while it is not significant in case of core inflation.

Chart I.23: Relative Food Prices



Note: Relative food price is the ratio of the CPI food price index to CPI non-food price index. Trend is estimated by using an HP filter.
Source: NSO and Authors' calculations.

de facto notification of FIT from 2014, relative food prices started to show signs of moderation (Chart I.23). A combination of successive record harvests, improvements in supply management and moderate increases in MSPs contributed to disinflation under FIT. This underscores the need for close coordination between the central bank and supply management authorities to achieve FIT optimally.

(c) Inflation Expectations

I.48 Under FIT, forward-looking monetary policy endeavours to anchor inflation expectations of households and businesses to the target so that they can make spending and investment decisions with reasonable certainty. Accordingly, they incorporate the target level of inflation into their wage and price-setting behaviour which, in turn, reinforces the probability of achieving the target in the future and hence, the effectiveness of monetary policy. It is in this context that inflation expectations form an essential input in the central banks' policy framework (Shaw, 2019). In India, median inflation expectations of urban households over a one-year ahead horizon moderated to an average of 8.7 per cent during the FIT period from 12.5 per cent during the pre-FIT period. A host of other measures of inflation expectations in India such as those derived from surveys of consumer confidence, industrial outlook and professional forecasters reveal that inflation expectations of various economic agents are broadly aligned (please refer to Chapter 2 for details). Inflation expectations of private agents in the economy are, however, generally backward-looking*, i.e.*, they are likely to be influenced by prices of salient items of consumption – such as food and fuel – today or a month or two ago. Consequently, monetary policy has to be sensitive to such shocks to prices of households' consumption items so that they do not feed through into prices of other items and become generalised. The objective of monetary policy should, therefore, be to prevent inflation expectations developing inertia around high levels, underscoring the complementarity between aggregate demand and supply management policies.

(d) Inflation Persistence

I.49 Persistence can perhaps be likened to inertia in physics – the resistance of a body to changing its velocity unless acted upon by an external force (Fuhrer, 2010). A more formal definition of inflation persistence is "the tendency of inflation to converge slowly to its long-run value following a shock" (Altissimo *et al.*, 2006). Understanding the speed and manner in which inflation adjusts to shocks of varying nature, and measuring the patterns and determinants of inflation persistence, is critical for fashioning the monetary policy response to upsurges in inflation – reacting heavy-handedly to shortlived episodes can lead to overkills of economic activity; by

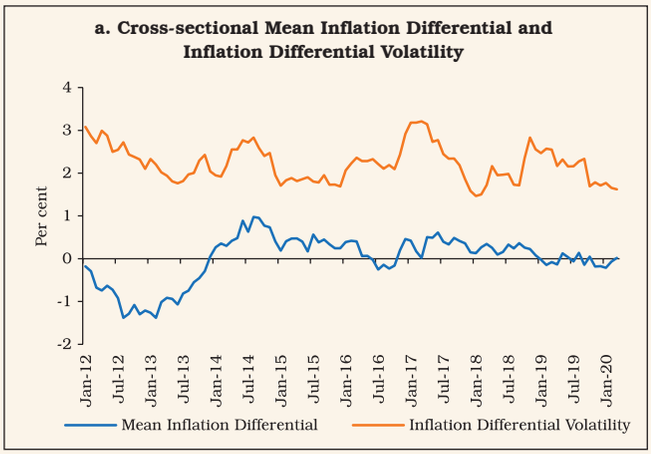
contrast, too delayed or too feeble a response to long-lasting inflation occurrences runs the risk of hardening inflation expectations and entrenching them at elevated levels with harmful effects that can even impair potential growth (IMF, 2011). While the size and timing of monetary policy reactions are eventually judgement calls, empirical measurement of inflation persistence can shine light on the judgement process. Furthermore, this has to be country-specific since the characteristics of the economy in question play a determining role in the dynamics of inflation (Patra *et al.*, 2014). In India, inflation persistence was found to be lower during the FIT period (please refer to Chapter 2 for details). Thus, the cost of correcting deviations of inflation from the target by monetary policy action diminishes going forward.

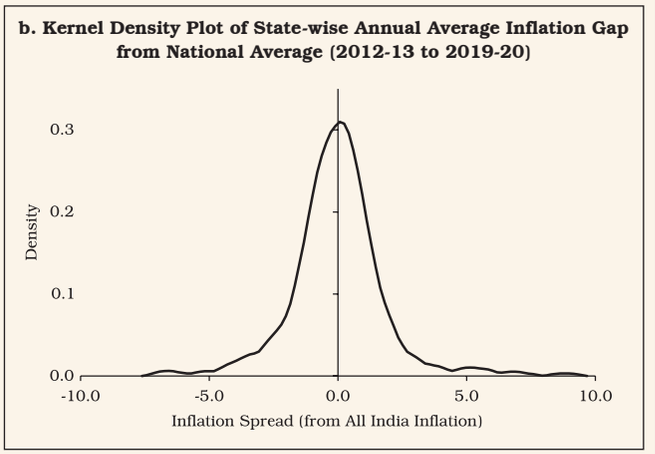
(e) Regional Inflation Dynamics

I.50 Although the inflation target in India is defined in terms of headline inflation, regional inflation dynamics cannot be overlooked, as that may constrain a nationally set monetary policy in adequately satisfying the needs of all regions (Beck and Weber, 2005; Weyerstrass *et al.,* 2011). While the data reveal wide dispersion in inflation across states driven largely by food prices, state level inflation tends to converge towards national inflation in India (Kundu *et.al.,* 2018) – the recent stability in both the mean inflation differential and inflation differential volatility validates this convergence (Chart I.24a). Furthermore, the estimated kernel density plot of deviations of state level inflation from national inflation during 2012-13 to 2019-20 is more or less symmetric, reinforcing the evidence on convergence (Chart I.24b)[22].

I.51 As India is characterised by sizable differences in income levels, agro-climatic conditions, population characteristics, and levels of industrialisation and urbanisation, it is also

Chart I.24: State-wise Inflation Differential and its Kernel Density Function

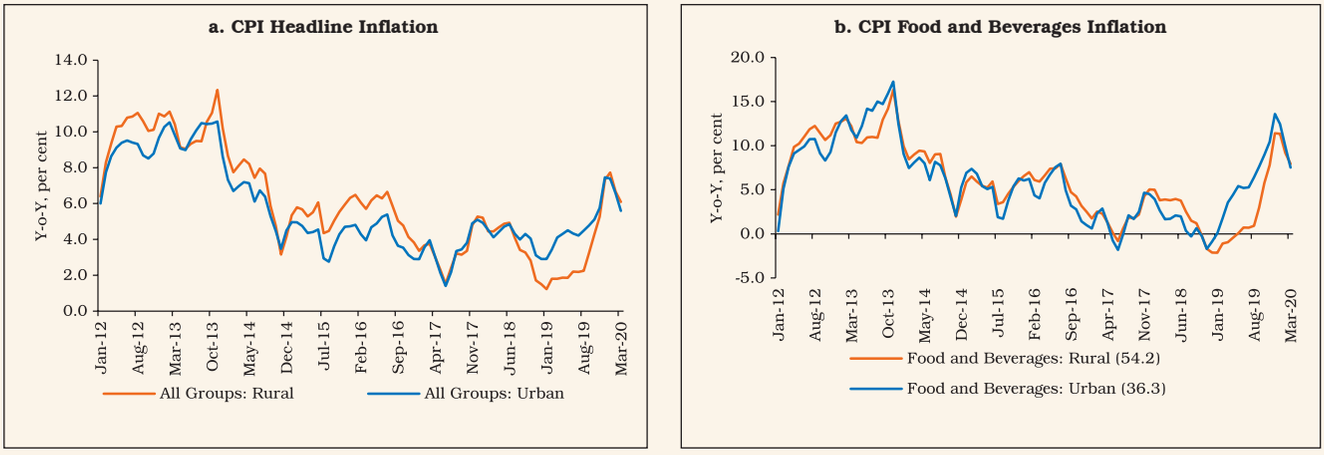




Source: NSO and Authors' calculations.

22 Inflation convergence is tested in a random effects panel regression model (Beck and Weber, 2005). Using data for 36 states and union territories for the period 2012-13 to 2019-20, a statistically significant negative value of the convergence parameter (β = -0.73) confirms inflation convergence.

Chart I.25: CPI Inflation: Rural *vs.* Urban



Note: Figures in parentheses are weights in respective CPIs.
Source: NSO and Authors' calculations.

important to test for the existence of a long-run equilibrium relationship between rural and urban inflation. It is observed that rural inflation eased till 2018-19 before picking up, while urban inflation moderated a year earlier and picked up thereafter (Chart I.25a). At a disaggregated level, the divergence between rural and urban inflation in recent years largely mirrors the divergence in the behaviour of food inflation, urban being higher than rural (Chart I.25.b). Empirical evidence suggests a long-run co-integrating relationship between urban and rural inflation with deviations adjusting to long-run equilibrium within 2-3 quarters[23].

I.52 In sum, these findings suggest that irrespective of short-run divergences, monetary policy could rely on the all-India level headline inflation (Bhoi *et al.*, 2020). This validates the choice of national level CPI (headline) inflation as the nominal anchor for monetary policy under the FIT regime in India.

Growth Dynamics

I.53 How has FIT measured up in terms of its secondary objective: "keeping in mind the objective of growth"? Average real GDP growth at 6.0 per cent during the FIT period (Q3:2016-17 to Q4:2019-20) was lower by 1.1 percentage points than in the pre-FIT period (Q1:2012-13 to Q2:2016-17). The pre-FIT period was characterised by one of the longest cyclical upswings in the post-independence era, with real GDP growth peaking at 9.7 per cent in Q2:2016-17. Robust growth in the industrial and services sectors was supported by a rebound in agriculture after two consecutive years of droughts. From 2017-18, a cyclical

23 An empirical exercise (Bhoi *et al.*, 2020) conducted using the Engle-Granger (1987) two-step approach in a fully modified ordinary least squares (FMOLS) framework (Phillips and Hansen, 1990) on monthly data from January 2012 to March 2020 confirms a co-integrating relationship (based on Engle-Granger tau-statistic and z-statistic) between rural (π^{rural}) and urban (π^{urban}) inflation at the all-India level, along with significant (at 5 per cent level) error correction (EC) terms in both short run equations:

$\Delta\pi^{urban}_{t} = - 0.01 - 0.13ECM_{t-1} + 0.74\Delta\pi^{rural}_{t} - 0.24\Delta\pi^{rural}_{t-1} + 0.30\Delta\pi^{urban}_{t-1} + \varepsilon^{1}_{t}$

$\Delta\pi^{rural}_{t} = 0.00 + 0.17ECM_{t-1} + 1.02\Delta\pi^{urban}_{t} - 0.11\Delta\pi^{urban}_{t-1} + 0.19\Delta\pi^{rural}_{t-1} - 0.22\Delta\pi^{urban}_{t-2} + 0.21\Delta\pi^{rural}_{t-2} + \varepsilon^{2}_{t}$

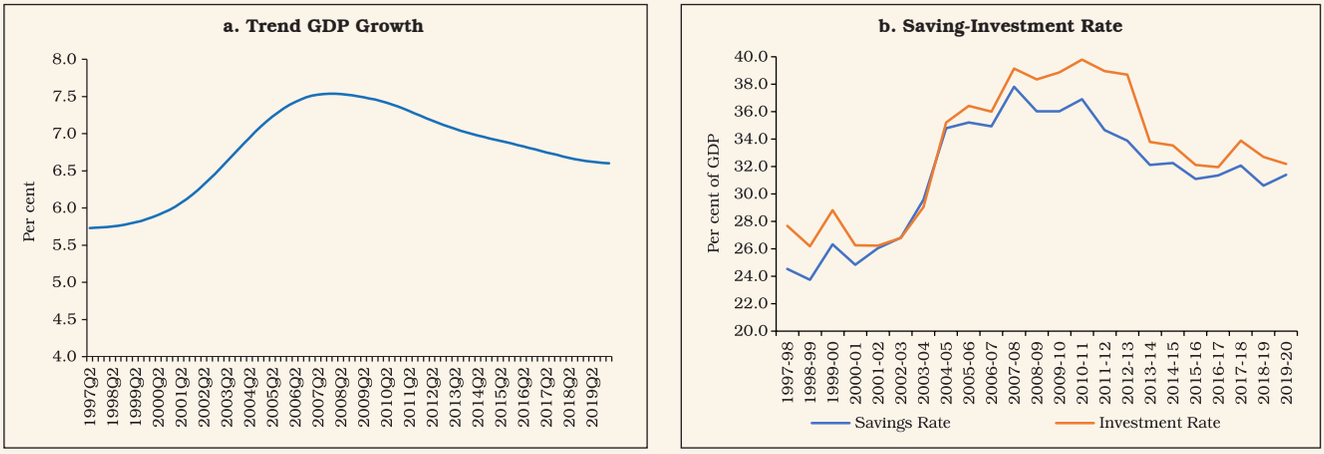
Diagnostics: Adj R^2=0.79; Breusch-Godfrey LM test for serial autocorrelation and Breusch-Pagan-Godfrey test for heteroskedasticity are satisfactory.

downturn set in, delayed in the second half of the year by favourable base effects. From the beginning of 2018-19, real GDP growth moderated sequentially for eight consecutive quarters in sync with the global slowdown. Increasingly, countries across the advanced and emerging worlds joined the synchronous global deceleration, the coupling accentuated by geopolitical developments, trade wars, and idiosyncratic factors like emission norms. Domestic factors like stress in the balance sheet of corporates and financial institutions, inventory overhang in the real estate sector, and unfavourable terms of trade sapped real GDP growth in India, taking it down to 3.1 per cent in Q4:2019-20 – the lowest in the 2011-12 series.

I.54 India's growth slowdown during the period of FIT was also associated with a weakening in the pace of trend growth[24] (Chart I.26 a). It co-moved with a downturn in saving and investment rates, a prolonged deceleration in manufacturing, a decline in openness and diminishing returns of the demographic dividend. All these factors were being reflected in a weakening of monetary and credit aggregates. Thus, the question of low and stable inflation in India during FIT not being associated with higher growth has to be addressed by investigating the structural changes underway in the Indian economy.

I.55 The deceleration in India's trend growth started in 2008-09 following the GFC, obscured by the massive (fiscal and monetary) policy stimulus holding up growth in saving and investment rates (Chart I.26 b). This was in contrast with the significant rise in domestic saving from 2003-04, which enabled an increase in the investment rate up to 2007-08. During this upswing, however, the behaviour of household savings was unusual – despite the strong pace in financial innovations,

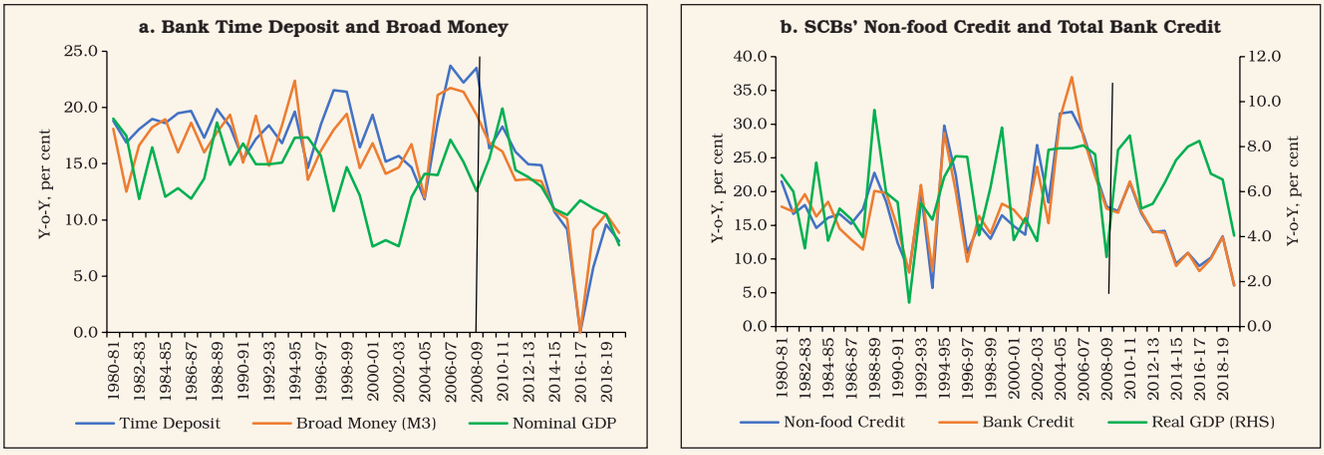
Chart I.26: Trend GDP Growth and Saving-Investment Rates



Note: Trend growth is obtained by first estimating the potential output using the quarterly data of seasonally adjusted real GDP from 1996-97 to 2019-20 using an HP filter and then calculating the year-on-year growth.
Source: NSO and Authors' calculations.

24 The trend level of output is estimated by using statistical filtering techniques, which could be different from the maximum possible growth at full employment.

Chart I.27: Growth in Bank Deposit, Money and Credit

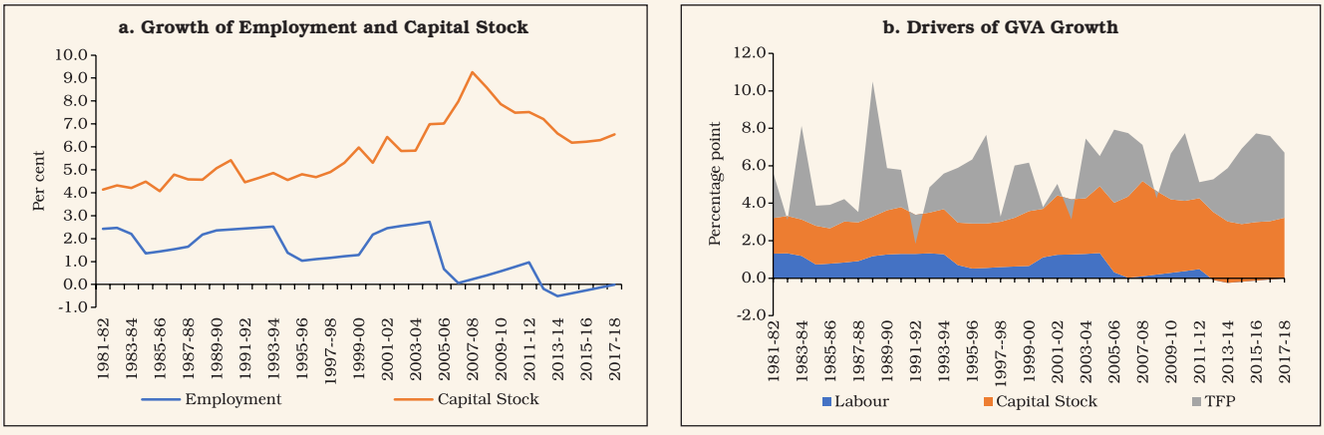


Source: NSO, RBI and Authors' calculations.

there was a continued preference for saving in physical assets, which prolonged until 2011-12. The consequent decline in the financial saving rate (especially in bank deposits) by households resulted in a deceleration in money growth, bank credit growth and GDP growth with a lag (Charts I.27a and b). Evidently, the behaviour of money and credit growth had lead information on the impending economic slowdown, justifying the need for close monitoring of key monetary and credit aggregates as is being practiced by the RBI.

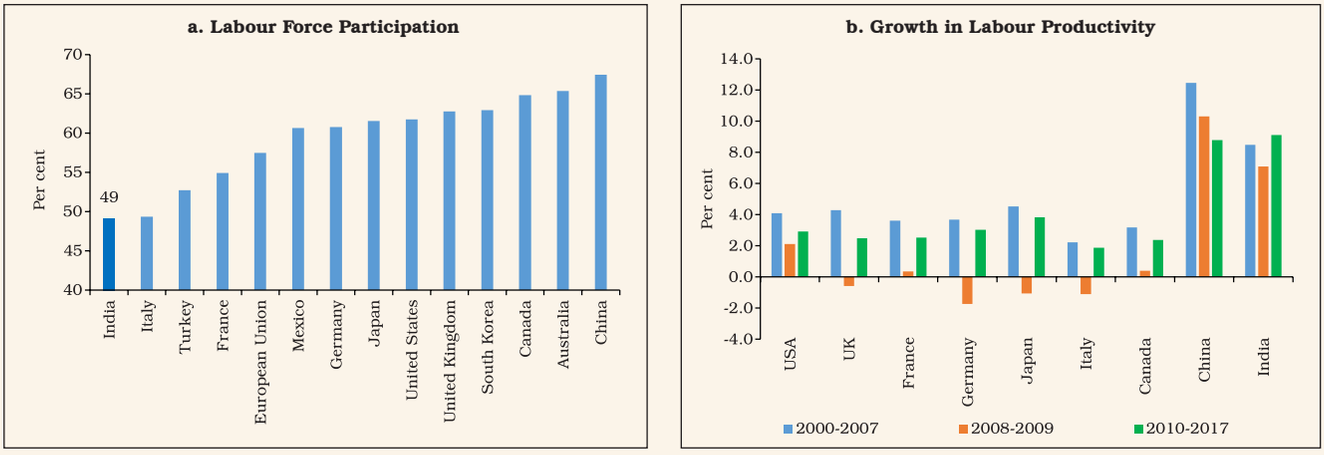
I.56 Eventually, as policy stimuli were wound down, investment began decelerating from 2010-11, weakening the momentum of growth of the economy. In fact, the accumulation of capital stock had started retreating even earlier from its peak in 2007-08 (Chart I.28a). Given the declining pace in the growth of employment from 2004-05, the deceleration in pace of capital accumulation impacted GDP growth. In the event, it was primarily productivity growth that sustained GDP growth (Chart I.28b).

Chart I.28: Employment and Capital Stock and their Contributions to GVA



Note: TFP: Total factor productivity.
Source: Authors' calculations based on India KLEMS data.

Chart I.29: Labour Force Participation and Labour Productivity in India



Note: GDP in purchasing power parity (international dollars) terms has been used for calculating labour productivity.
Source: Authors' calculations based on world KLEMS, India KLEMS, IMF and ILO data.

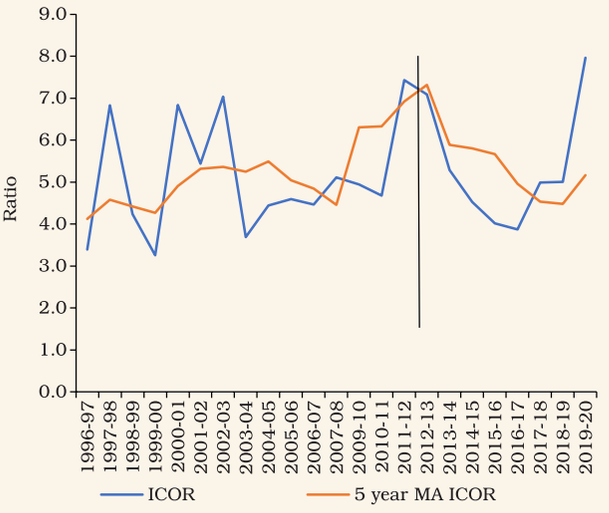
I.57 Reviving the economy over that period needed structural reforms in the factor and product markets, along with a strategy of promoting employment intensive manufacturing. In fact, India was experiencing significant improvements in labour productivity (output per unit of labour) – higher than in many advanced economies – though India's labour force participation rate was lower relative to G-20 countries (Charts I.29a and b).

I.58 Capital productivity, as measured by the incremental capital output ratio (ICOR) also fell up to 2012-13 (Chart I.30). Subsequently, improvements in the productivity of capital use could not compensate the observed slowdown in investment.

I.59 In this environment, the demographic dividend started showing signs of weakening as reflected in rising life expectancy at birth and reversal in the declining age dependency ratio (Charts I.31a and b). In fact, the declining phase of the year-on-year growth in age dependency reversed from 2015, raising concerns as to whether India would be able to reap the full benefits of the demographic dividend.

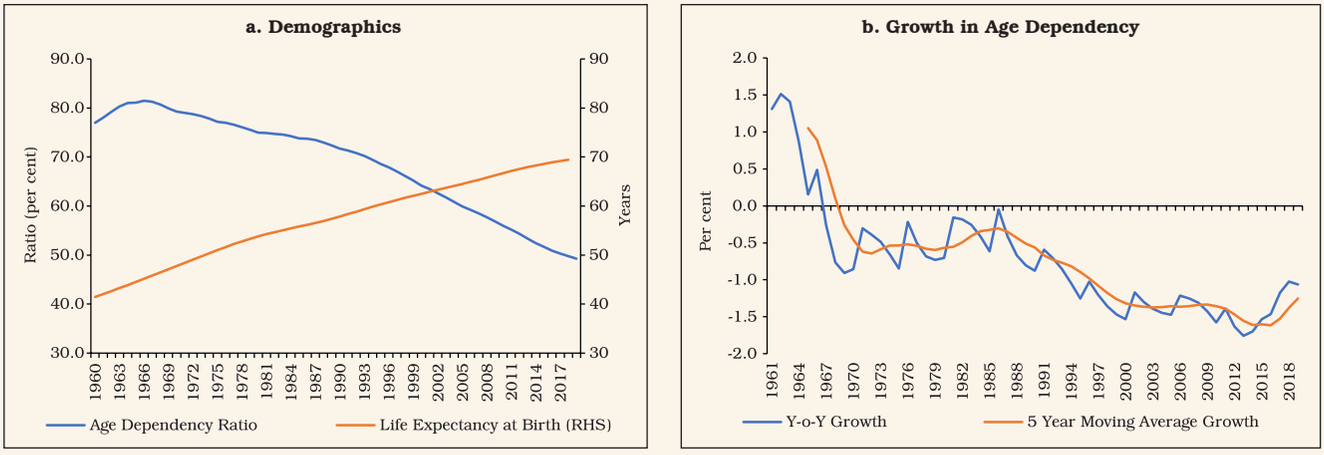
I.60 At the same time, the external environment also turned less favourable with various drags in operation, including rising trade protectionism, climate change compulsions and heightened geopolitical uncertainties. Consequently, India's

Chart I.30: Incremental Capital Output Ratio (ICOR)



Note: The GFC period of 2008-09 has been excluded for better representation.
Source: NSO and Authors'calculations.

Chart I.31: Demographic Developments



Source: World Bank.

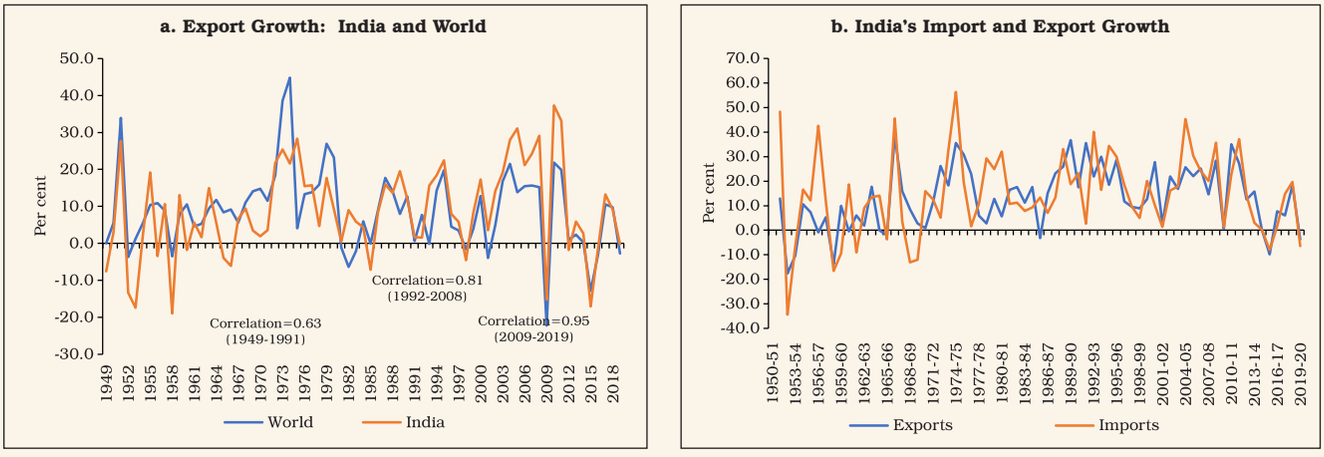
export performance closely mirrored global export conditions, which had been deteriorating since the GFC (Chart I.32a). India's imports also closely related with its exports due to a large share of intermediate and capital goods (Chart I.32b). With surges of capital inflows exceeding the absorptive capacity, India became a net exporter of capital during FIT.

I.61 Thus, macroeconomic performance under FIT was marked by an increase in the volatility of growth on account of a combination of domestic and global factors (Table I.6).

Appraisal of the Institutional Architecture

I.62 Besides the standard assessment in terms of macroeconomic outcomes, it is worthwhile to evaluate the institutional plumbing of the FIT architecture. Failure is defined as three consecutive quarters of average headline inflation overshooting/undershooting the upper and lower tolerance levels around the target. Since

Chart I.32: External Drag on Growth



Source: UNCTAD, RBI and Authors'calculations.

Table I.6: Key Macroeconomic Indicators under FIT - Level and Volatility

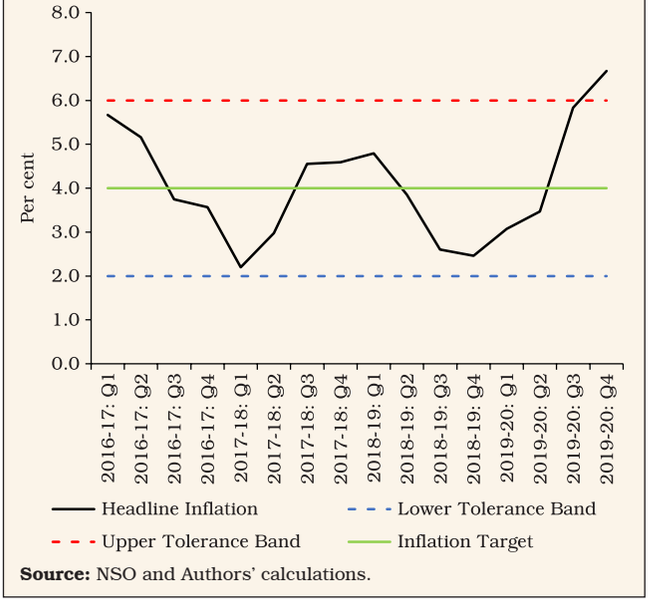
(Per cent)

	Level					Volatility				
	CPI-C Inflation	Real GDP Growth	Interest Rate (WACR)	App(+)/ Dep(-) of Exchange Rate (REER-36)	Combined GFD/GDP	CPI-C Inflation	Real GDP Growth	Interest Rate (WACR)	Exchange Rate (REER-36)	Fiscal Slippage (Deviation from Centre's Budgeted GFD/GDP)
Pre-FIT										
2012-13	10.0	5.5	8.1	-4.3	6.9	0.5	1.4	0.2	2.0	-0.2
2013-14	9.4	6.4	8.3	-2.2	6.7	1.3	0.8	0.9	2.2	-0.3
2014-15	5.8	7.4	8.0	5.5	6.7	1.5	1.2	0.2	0.9	0.0
2015-16	4.9	8.0	7.0	2.9	6.9	0.7	0.8	0.3	1.3	0.0
Average	**7.5**	**6.8**	**7.8**	**0.5**	**6.8**	**2.4**	**1.4**	**0.7**	**1.6**	**-0.1**
FIT										
2016-17	4.5	8.3	6.2	2.2	6.9	1.0	1.4	0.2	0.7	0.0
2017-18	3.6	6.8	5.9	4.5	5.8	1.2	1.1	0.1	1.3	0.3
2018-19	3.4	6.5	6.3	-4.8	5.8	1.1	0.7	0.2	1.9	0.1
2019-20	4.8	4.0	5.4	2.4	6.9	1.8	0.9	0.4	1.2	1.3
Average	**4.1**	**6.4**	**6.0**	**1.1**	**6.4**	**1.4**	**1.8**	**0.4**	**1.3**	**0.4**

Note: Volatility is measured by standard deviation of monthly y-o-y inflation, quarterly y-o-y GDP, monthly WACR and monthly appreciation/ depreciation of exchange rate. Fiscal slippage is defined as the deviation of the actual GFD/GDP ratio of the central government from the budgeted levels. Average volatility indicates standard deviation of the variable for the relevant full period.
Source: Handbook of Statistics on Indian Economy, RBI; GoI Budget Documents and Authors' calculations.

the adoption of FIT, until the pre-COVID period, there was only one occasion (*i.e.*, Q4: 2019-20) when inflation exceeded the upper tolerance level (Chart I.33)[25]. The breach was due to a sharp spike in food inflation (9.7 per cent in Q4:2019-20) on a combination of adverse developments, *i.e.*, the late withdrawal of the monsoon, unseasonal rains and associated supply disruptions (RBI, 2020).

Chart I.33: Movement in Headline Inflation



Source: NSO and Authors' calculations.

I.63 The committee approach to monetary policy decision making has been widely regarded as a means of overcoming time inconsistency by efficient pooling of information, collective wisdom and diversity of opinion that help to overcome the potential pitfalls of committee-based approaches, *i.e.*, the dangers of groupthink and free-riding

25 There has been only one instance of headline inflation undershooting the lower tolerance level when it went down to 1.5 per cent in June 2017; for that quarter as a whole, however, inflation averaged 2.2 per cent, *i.e.*, it remained within the tolerance band.

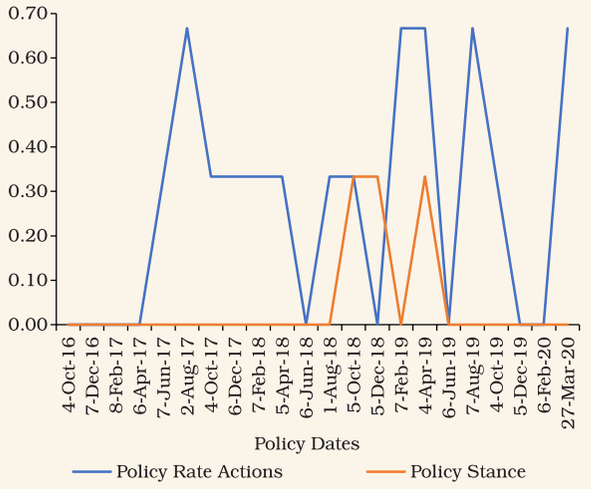
(Sibert, 2006). An analysis of the minutes of the MPC meetings reveals significant differences in the voting pattern, both on the policy rate, the stance and the individual member's assessment of the macroeconomic situation. In the universe of 22 meetings of the first MPC (during pre-COVID period), there has been less consensus on policy rate changes than on the monetary policy stance – only on nine occasions there was a consensus on policy rate changes (6-0), while on 19 occasions there was a consensus on the policy stance (6-0). The differences on the stance were largely on the timing of change in the policy stance. The differences with the 'majority view' was not limited to external MPC members; even internal members had differences on the size as well as direction of policy rate changes. This is in contrast with the view in the literature that only external members help avoid "groupthink" (Sibert, 2006, *op. cit*). Over its tenure, the MPC took more split decisions than unanimous calls, the minutes became more detailed, and even when members agreed, their arguments and rationales often differed (Duggal, 2020). In fact, the MPC has seen it all – hikes and cuts; unanimous calls and divided views; and emergency meetings (Chapter 3 delves into these experiences and draws lessons therefrom).

I.64 Independent assessment found that the length of monetary policy statements has dramatically declined, the linguistic complexity has improved, and the content is more focused on inflation topics since the regime change. In addition, there is a strong relationship between the length of statements and stock market volatility, highlighting the real impacts of effective communication (Mathur and Sengupta, 2020). Another interesting observation is that the discussions on inflation were dominant during the 2016-18 period, while discussions on growth have occupied more space in policy discussions from August 2019 (RBI, 2020).

I.65 In order to formally analyse the MPC's voting pattern, a Diversity Index (DI) is constructed on the basis of the voting by individual members on policy rate changes and policy stance. DI is calculated by the formula [1 - {(Number of MPC members supporting the decision *minus* number of MPC members opposing the decision) divided by the total size of the MPC (6 in this case)}]. The range of DI is from 0 to 1: 0 implying full agreement (6:0) and 1 implying equal division in voting (*i.e.*, 3:3). DI also confirms large disagreement on policy rate actions, but near unanimity on the policy stance (Chart I.34).

I.66 The implicit weights assigned by the MPC to inflation and output objectives can be evaluated by estimating a Taylor rule for the period from October 2016 to March 2020, *i.e.*, taking into account all the bi-monthly monetary policy statements (Taylor, 1993). Central banks prefer to respond cautiously to a shock by changing the

Chart I.34: Degree of Disagreement in MPC Voting Pattern



Note: Higher value indicates more disagreement. This chart covers MPC meetings during the pre-COVID period only (*i.e.*, up to March 2020).
Source: Authors' calculations.

policy rate gradually. Therefore, an interest rate smoothing term has been included in the Taylor rule (Woodford, 2003). Thus, the estimated Taylor rule has three parameters: the weight on interest rate smoothing; the weight on the inflation gap; and the weight on the output gap. Another popular approach is to modify Taylor's classic formulation by replacing current inflation numbers with forecasts (Taylor-type rule) (Clarida *et al.*, 2000; Orphanides, 2003). In FIT as stated earlier, the inflation forecast becomes the intermediate target for monetary policy, representing the consolidation of the entire information set available to the MPC at the time of its decision. Considering the lags in monetary policy transmission, a three-quarter ahead inflation forecast is used for measuring the inflation gap[26].

I.67 The estimated Taylor rule suggests that the MPC accorded greater importance to inflation consistent with its mandate. By and large, the approach of the MPC in aligning inflation with the target was gradualistic, reflecting its sensitivity to contingent output effects. This is reflected in the size of the smoothing parameter (Table I.7).

I.68 Another estimation carried out using realised inflation (at time t) instead of the inflation forecast (at time t+3) yields an insignificant coefficient on the inflation gap, indicating that the MPC was forward-looking and not driven by past readings of inflation (at time t) while deciding the policy rate[27]; however, the weakening of demand conditions played a more active role in policy rate determination in the recent past (Chart I.35).

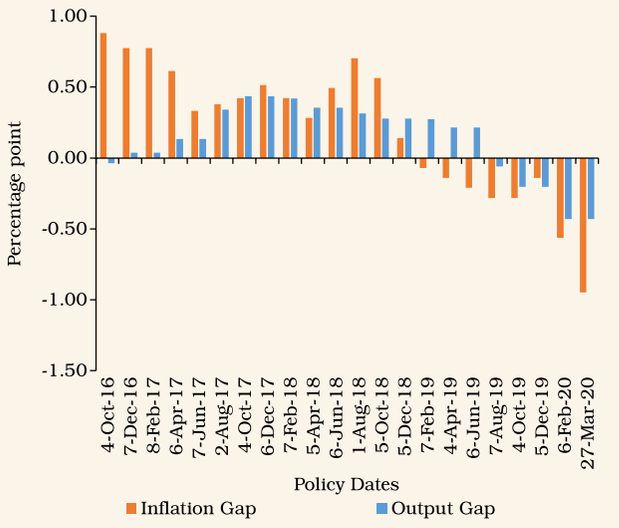
Table I.7: Monetary Policy Reaction Function (First MPC's Tenure)#

Smoothing Parameter	Inflation Forecast Gap (+3)	Output Gap
0.60***	0.70***	0.26**

*** and ** represent significance at 1 per cent and 5 per cent, respectively.
#: Covers meetings only for the pre-COVID period.
Source: Authors' estimates.

I.69 The disagreement on policy rate decisions can also be utilised to assess individual MPC members' contextual preferences for inflation and growth objectives. Accordingly, the Taylor rule

Chart I.35: Contribution of Inflation Gap and Output Gap to Policy Rate Deviations



Source: NSO and Authors' calculations.

26 The estimated interest rate smoothing Taylor-type rule is as follows: $PolicyRate = \rho * PolicyRate(-1) + (1-\rho) * (\pi^* + r^* + \alpha_1 * (inflationForecast(+3) - \pi^*) + \alpha_2 * OG) + \varepsilon$ ... (1)

Where ρ is the smoothing parameter, π^* is the inflation target (4 per cent) and r^* is natural rate of interest, OG is the output gap (deviation of actual output from potential output measured by using the HP filter on actual output. Considering the relatively short sample period of estimation, the coefficient r^* has been imposed instead of estimating it.

The equation (1) is estimated by non-linear least squares (NLLS) method using bi-monthly data from October 2016 to March 2020.

27 This explains the findings of Eichengreen, *et al., op. cit.* that the coefficient on realised inflation in the Taylor rule during the IT period in India has declined and that relationship is weaker following the adoption of IT.

is estimated separately for the policy rate path preferred by different MPC members as reflected in their voting patterns. The weights assigned by the MPC members on inflation and output objectives were found to be in the range of 0.63 to 0.74 and 0.24 to 0.31, respectively. The smoothing parameter also was different for different MPC members (varying in the range 0.58 to 0.68). With the same set of full information matrices available with all MPC members while casting their votes, the variation in the weighting pattern is reflective of the differences in the views and assessments of individual MPC members, indicative of individualistic behaviour rather than groupthink.

5. Conclusion

I.70 To sum up, this chapter chronicles India's formative experience with FIT in order to set up the laboratory for a review of the monetary policy framework. It provides an overview of the initial conditions that called for a change in the policy framework, followed by the setting of the pre-conditions for ushering in FIT in India and the experience with *de jure* FIT since 2016. In these rites of passage, existential questions emerged, each of which forms in a forward-looking manner the subject matter of dedicated chapters that follow.

I.71 Chapter 2 evaluates the inflation target and the appropriateness of +/- 2 per cent tolerance band taking into account the changes in the inflation process – inflation persistence; trend inflation; food and fuel shocks; threshold level of inflation; projection errors over different time horizons; and the degree of anchoring of inflation expectations. It also evaluates the growth objective under the FIT framework.

I.72 Chapter 3 drills into the monetary policy decision making process under the FIT in India, its statutory provisions, pre-policy procedures, rules and responsibilities for members individually and collectively as a Committee, communication, accountability and evaluation. The focus of the chapter is to identify what works and what needs to be fixed.

I.73 Chapter 4 is about the operating framework and monetary policy transmission. It delves into the liquidity management facility and the operating target, including the reaction to announcement effects of policy changes on the operating rate. Some stylised facts of the operating procedure and transmission to various segments of the financial markets are presented. The chapter draws on this analysis to make recommendations that should help to make transmission of monetary policy impulses to its ultimate goals full, complete and timely.

I.74 Chapter 5 deals with the challenges to monetary policy in an open economy framework, especially the trilemma that circumscribes its domestic orientation. Managing capital flows and exchange rate volatility are important considerations in this chapter as it looks beyond to an imminent larger role for India than before in the global economy.

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2 THE GOALS OF MONETARY POLICY

"… the primary objective of the monetary policy is to maintain price stability while keeping in mind the objective of growth."

[Excerpted from Preamble to the Reserve Bank of India (RBI) Act, 1934 (amended by the Finance Act, 2016)]

1. Introduction

II.1 Under FIT in India, monetary policy has to accord primacy to the goal of price stability, with due consideration to the objective of growth. The country experience yields several examples of inflation targeting frameworks with dual mandates. This performance record is replete with testing challenges and conflicting pulls inherent in the trade-offs between these objectives. There are also some central tendencies. Growth as an objective of monetary policy is found to have never been quantified, unlike the inflation target. It has also never been set as the primary goal in the mandate of monetary policy. Inflation targets and tolerance bands around them are, on the other hand, clearly defined in quantitative terms. The country experience also reveals another tendency that has evolved over time – targets/bands have mostly declined/narrowed over time[1], incentivised by the success achieved in stabilising headline inflation and inflation expectations, and the drive to catch up with the best in class.

II.2 In India, CPI-C inflation averaged 3.9 per cent during the period of FIT (October 2016 – March 2020)[2]. Over this period, GDP growth underwent a sustained deceleration from 8.3 per cent in 2016-17 to 4.0 per cent in 2019-20, including a 44-quarter low of 3.1 per cent during January-March 2020. In the context of these outcomes, attention has been drawn to the 'sacrifice ratio', *i.e.,* the sacrifice of output necessary for disinflating from some higher reaches of an inflation experience towards the numerical target that defines price stability. In India, the RBI has been criticised for unusually high real interest rates during the FIT period (Government of India, 2018; Bhalla, 2017); FIT being inimical to growth (Bhattacharya *et al.*, 2020); mindless monetary dogmatism, which could have been avoided if an explicit growth target was also mandated along with the inflation target (Jagannathan, 2019); and, imposing a potential constraint to achieving the medium-term goal of a US$ 5 trillion economy (Agarwala, 2020). Even around the time when an explicit inflation target was adopted, concerns were expressed about

This Chapter has been prepared by a team comprising Sitikantha Pattanaik, Harendra Behera, Atri Mukherjee, Satyananda Sahoo, Avdhesh Shukla, Supriya Majumdar, Pratik Mitra, Ipsita Padhi, Ranajoy Guha Neogi, Saurabh Sharma, Sarthak Gulati, Purnima Shaw, D. Suganthi, Bhanu Pratap, Himani Shekhar, Roshin Paul, Aditya Mishra, Abhilasha, Barkha Gupta, Sadhan Kumar Chattopadhayay, Dhanya V., Siddhartha Nath, Bichitrananda Seth, Rigzen Yangdol and Vimal Kishore.

1 As section II.2 will reveal, there have been only a few instances in the country experience of temporary widening of tolerance band by South Korea and Thailand and increase in the target by Philippines, Hungary and Brazil, which were reversed within a few years.

2 The choice of period has been explained in Chapter I and applies uniformly across the Report.

its relevance for a country with young population (Singh, 2014); that microeconomic foundations of CPI based inflation targeting were not empirically tested robustly before its adoption (Srinivasan, 2014); and that the target needed to be higher, particularly the lower band, given the structural nature of inflation in India (Panagariya, 2015). The actual experience with FIT in India has swung the pendulum more recently. It has been highlighted that neither did the RBI neglect changes in the output gap nor did monetary policy become hawkish after the adoption of FIT (Eichengreen *et al.,* 2020).

II.3 The next review of the inflation target, which is a core element of FIT, is due before March 31, 2021. Reassessing the inflation target and the tolerance band, is the most important motivation of this chapter. Under the Agreement on the Monetary Policy Framework signed by the RBI and the Government of India (GOI) on February 20, 2015, it was specified that: (a) the Reserve Bank will aim to bring inflation below 6 per cent by January 2016; and (b) that the inflation target for India for 2016-17 and all subsequent years shall be 4 per cent with a band of (+/-) 2 per cent. In the subsequent amendment of the RBI Act, this institutional framework was endorsed. Section 45ZA of the Act clearly specified that "The Central Government shall, in consultation with the Bank, determine the inflation target in terms of the Consumer Price Index, once in every five years. The Central Government shall, upon such determination, notify the inflation target in the Official Gazette." The provisions of the amended RBI Act were brought into force through a notification in the Gazette of India on June 27, 2016. The inflation target of 4 per cent and the lower and upper tolerance bands were set at 2 per cent and 6 per cent, respectively, in a Gazette notification on August 5, 2016 valid for the period beginning from the date of publication of the notification and ending on March 31, 2021. A review of the inflation target is, thus, embedded in this Gazette notification.

II.4 It is important to recognize that while setting a single target/tolerance band for the next five years, structural changes that may materialise or the type of shocks that may hit the economy are difficult to anticipate fully. Hence, flexibility must be built into the framework, without undermining the discipline of the inflation target, which has to be forward-looking to ensure that inflation expectations are firmly anchored over the medium term to facilitate decisions on investment, savings and consumption. It is important to revisit the target periodically, even when a review is not required by statute, because changing underlying structural characteristics of the economy and inflation dynamics can render the target sub-optimal.

II.5 Another motivation of this chapter stems from the deceleration of growth during FIT, which poses several intriguing empirical questions. In our view, clarity on them is essential if the suitability of the framework for the future has to be justified: (a) did FIT contribute to the slowdown in growth? (b) would a higher inflation target *ab initio* have been more appropriate for India's growth dynamics? and (c) is the current inflation target consistent with the goal of achieving a US$ 5 trillion economy?

II.6 This chapter is, accordingly, organised into seven sections. Section 2 reviews the experiences of IT countries and their strategies to keep monetary policy relevant in swiftly changing macro-financial conditions. Section 3 focuses on the determination of appropriate inflation target using the concept of trend inflation. Section 4 evaluates the tolerance band on the basis of three

conditioning aspects: (a) food and fuel shocks to the inflation path; (b) structural and statistical analysis of the inflation process; and (c) projection errors over different time horizons. Section 5 dwells on other features of the inflation process – persistence and expectations. The consistency of the inflation target with the growth objective is examined in Section 6. The concluding section sets out policy perspectives and recommends the inflation target, and the tolerance band for the next five years.

2. Country Experience

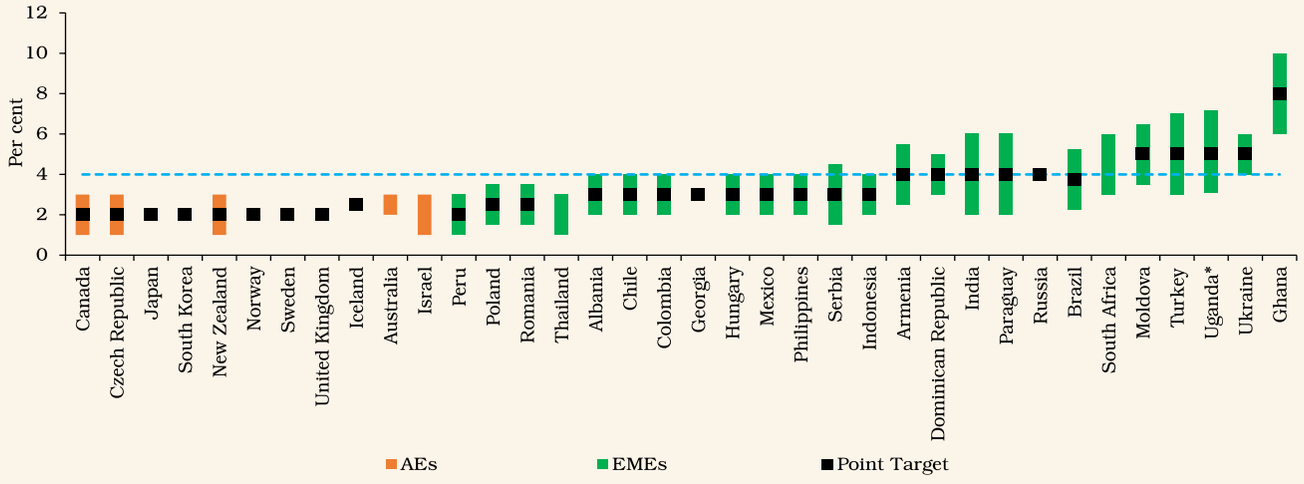
2.1 Inflation Target

II.7 IT in practice has undergone several transformations over the past three decades, often driven by periodic reviews, but more by 'learning by doing'. These changes have been reflected in amendments of the inflation targets and operating frameworks covering the range of policy instruments, their deployment under specific macro-financial conditions, and the decision-making process.

II.8 Country-specific inflation targets have evolved over time in response to the exigencies of localised circumstances and conditioned by the interaction with global macroeconomic developments. While AEs have generally established inflation targets in the range of 1-3 per cent, EMEs adopted higher targets, typically against the backdrop of higher inflation histories. EMEs too have gradually reduced their inflation targets over time, drawing upon the success achieved in stabilising headline inflation and expectations. Many EMEs have successfully married inflation targeting frameworks with foreign exchange interventions, thereby innovating within the IT tradition to seek out intermediate solutions to the impossible trinity.

II.9 Broadly, countries have adopted three kinds of targets, *viz.*, point targets; point targets with tolerance bands; and range targets (Chart II.1). Several central banks have also changed the type of target in response to changing inflation dynamics, and particularly so in response to the nature and size of shocks to the inflation

Chart II.1: Inflation Targets in IT Countries



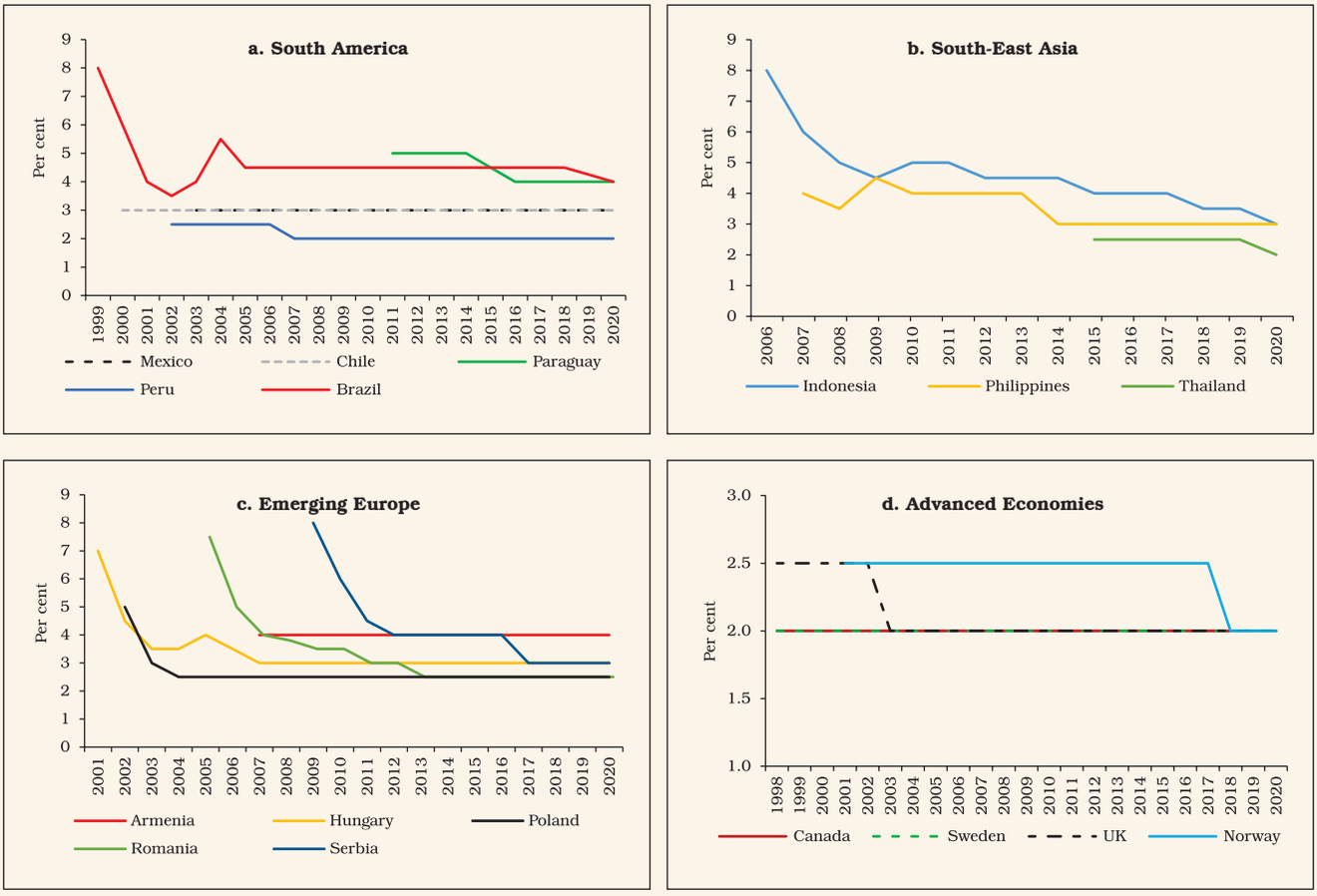
*: Targets core inflation.
Source: www.centralbanknews.info.

trajectory. The majority of IT-practicing EMEs have adopted point targets with tolerance bands, as opposed to most AEs that have preferred inflation targets of 2 per cent with narrow/no tolerance band.

II.10 As stated earlier, EMEs have gradually reduced their inflation targets to a range of 2-4 per cent in South America and South-East Asia (Chart II.2a and b). Only in Brazil, the inflation target was raised in 2003 in response to domestic unrest and the 9/11 shock to mitigate sharp exchange rate depreciation. This increase in target was short-lived and it was reduced again after 2004.

II.11 Eastern European countries have also progressively reduced their targets to converge to a range of 2.5-4.0 per cent (Chart II.2c). While inflation targets in AEs have remained relatively stable over the last two decades (Chart II.2d), Norway deliberately set its target above that of other major European economies in 2001, when it faced a period during which substantial oil revenues were to be phased into the economy. Norway reduced its inflation target in 2018 to 2.0 per cent from 2.5 per cent earlier, as the country's liberal spending from oil revenues was contained, dampening pressure on prices.

Chart II.2: Evolution of Inflation Targets



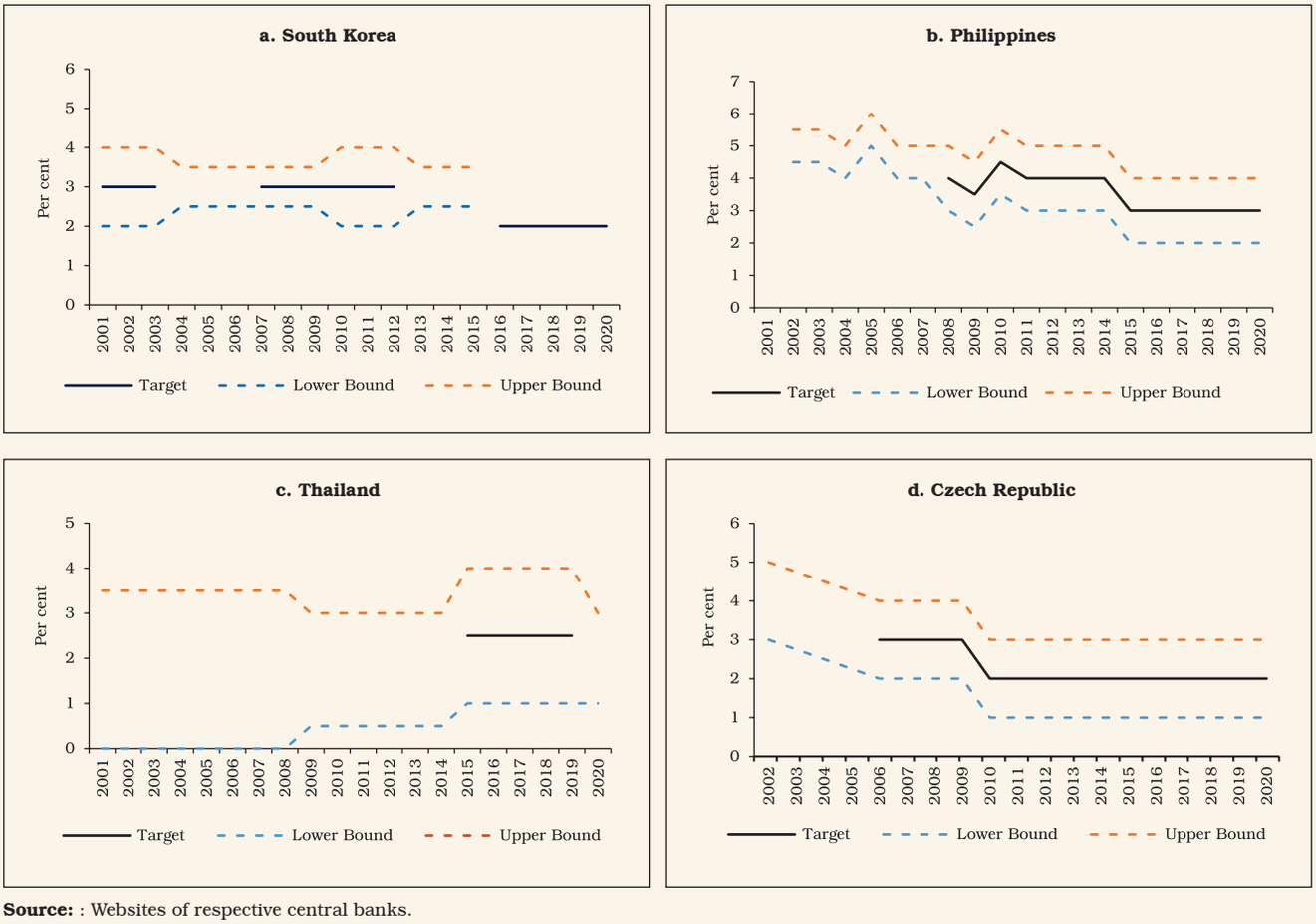
Note: Mid-points have been taken for countries with inflation target range.
Sources: CEIC Database; Websites of respective central banks.

II.12 Several countries have quite regularly reviewed and changed both levels of the target and the width of their tolerance bands. Illustratively, South Korea, which adopted IT in 1998, shifted from a point target with a tolerance band to a narrower range target in 2004 (Chart II.3a). In 2007, the Bank of Korea (BoK) moved away from targeting core inflation to headline inflation, and also adopted a point target with a fluctuation band (3.0 +/-0.5 percentage points). The tolerance band was widened to +/- 1 percentage point amidst high inflation volatility, while maintaining the 3.0 per cent target for the period 2010-12. Subsequently, it shifted back to a narrow target band and in 2016, it lowered the inflation target to 2.0 per cent without any tolerance band (Ciżkowicz-Pękała *et al.*, 2019).

II.13 Among South-East Asian countries, a broader target band aimed to provide flexibility in steering inflation. The Bangko Sentral ng Pilipinas (BSP) shifted from a range target to a point target with a tolerance interval of ±1 percentage point starting 2008 (Chart II.3b), which effectively widened the target band (BSP, 2019).

II.14 Thailand adopted IT in the year 2000 with core inflation as the target. Thailand narrowed the target range for core inflation in 2009 from 0-3.5 per cent to 0.5-3.0 per cent (Chart II.3c). The lower bound of the target range was adjusted upwards by 0.5 percentage points to reduce the

Chart II.3: Changes in Inflation Target and Tolerance Band



Source: : Websites of respective central banks.

likelihood of deflation. In 2015, the target was shifted from core to headline inflation of 2.5 per cent with a tolerance band of ± 1.5 per cent, which was subsequently changed to a range of 1.0-3.0 per cent for 2020, prompted by long periods of divergence of core inflation from headline inflation. The choice of the latter was also conditioned by the fact that it reflected changes in the cost of living better and was used as a reference for consumption and saving decisions by households, and for investment and price setting decisions by businesses. The switch from a range to a point target was intended to give a clearer signal to the public regarding the commitment of monetary policy towards maintaining price stability, which should help strengthen its effectiveness in anchoring the public's long-term inflation expectations. Re-adoption of range target in 2020 intended to provide more monetary policy flexibility amidst volatile and uncertain global economic conditions. The Czech Republic shifted from a range target to a point target, and also gradually reduced its target (Chart II.3d).

2.2 Tolerance Band

II.15 Most EMEs have a tolerance band around their mandated inflation targets, the motivation being to formally incorporate flexibility into their policy frameworks (Table II.1). Overwhelmingly, the preference is for symmetrical tolerance bands – deviations in both direction from the target are treated in the same way. On the width of the band, +/- 1 per cent dominates, although some countries also have wider bands. There are outliers too – while Georgia and Russia have point targets without any tolerance band, Jamaica, South Africa, Thailand and Uruguay have the band as the target.

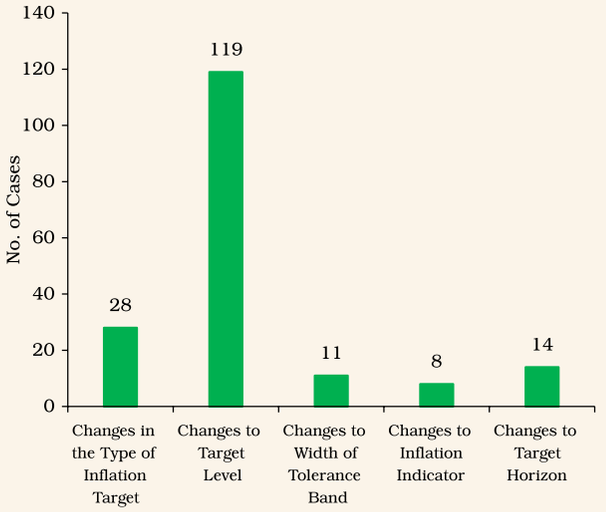
II.16 In many EMEs, food constitutes a sizeable component of CPI – around 32 per cent on average – as compared with the AE average of around 19 per cent (Table II.1). This renders the former prone to supply shocks. Their experience also suggests that a higher food share in the CPI is associated with relatively higher inflation targets and wider tolerance bands. It is not very common

Table II.1: Inflation Target and Tolerance Band for EMEs

EMEs with Higher Share of Food in CPI					EMEs with Lower Share of Food in CPI				
Sr. No	EME	Share of Food in CPI (per cent)	Inflation Target (per cent)	Tolerance Band (per cent)	Sr. No	EME	Share of Food in CPI (per cent)	Inflation Target (per cent)	Tolerance Band (per cent)
1	India	45.9	4.0	+/-2.0	13	Uganda	28.5	5.0	+/-2.0
2	Ukraine	45.0	5.0	+/- 1.0	14	Paraguay	26.9	4.0	+/-2.0
3	Ghana	43.9	8.0	+/-2.0	15	Uruguay	26.0	3.0 - 7.0	
4	Philippines	38.3	3.0	+/- 1.0	16	Mexico	25.8	3.0	+/- 1.0
5	Jamaica	37.5	4.0-6.0		17	Poland	25.2	2.5	+/- 1.0
6	Albania	37.3	3.0	+/- 1.0	18	Peru	25.1	2.0	+/- 1.0
7	Thailand	36.1	1.0 - 3.0		19	Indonesia	25.0	3.0	+/-1.0
8	Egypt	32.7	7.0	+/- 2.0	20	Dominican Republic	23.8	4.0	+/- 1.0
9	Serbia	31.2	3.0	+/- 1.5	21	Turkey	22.8	5.0	+/-2.0
10	Georgia	31.0	3.0		22	Hungary	21.5	3.0	+/- 1.0
11	Russia	31.0	4.0		23	Chile	19.3	3.0	+/- 1.0
12	Brazil	31.0	3.75	+/- 1.5	24	South Africa	17.2	3.0 - 6.0	
					25	Colombia	15.1	3.0	+/- 1.0

Sources: www.centralbanknews.info and IMF.

Chart II.4: Reformulation of Inflation Target



Source: Niedźwiedzińska (2018), Inflation Targeting - Institutional features of the strategy in practice, NBP working paper No. 299.

for countries to change or revise their tolerance band, unlike in the case of the inflation target (Chart II.4).

II.17 Currently, only two countries have escape clauses incorporated into their inflation targeting frameworks, *viz*., Czech Republic and Romania, in addition to a tolerance band. Incidentally, both countries have escape clauses included in their Fiscal Responsibility and Budget Management (FRBM) frameworks as well.

3. The Inflation Target

II.18 Trend inflation is the permanent or the underlying component of inflation to which actual inflation converges after a shock. Alternatively referred to as steady state inflation (Ascari and Sbordone, 2014), it is consistent with the potential level of output, the natural rate of unemployment and the natural rate of interest. Consequently, it provides a valuable guide for monetary policy authorities in assessing the appropriate level of the inflation target. A target fixed much below the trend could produce a deflationary bias in the economy while a target set above the trend level renders monetary policy too expansionary and prone to inflationary shocks (Behera and Patra, 2020). In fact, there is an influential view that setting the target above the trend could increase inflation and its volatility, undermining the confidence of firms and households to undertake and execute long-term plans, squandering the credibility of the central bank, destabilising inflation expectations and raising risk premiums in asset markets (Bernanke, 2010). As a result, the effects of shocks on macroeconomic variables could become more persistent (Ascari and Sbordone, 2014). The optimal approach is to set the inflation target in close alignment with the trend inflation (Tulasi *et al*., 2021).

II.19 Trend inflation, however, is unobservable and hence an empirical issue, warranting careful choice of methodology and sample period for estimation in order to secure precision if it has to serve as the metric for setting the inflation target, especially to avoid costly policy errors. These choices have to be sensitive to the regime changes and structural shifts that underlie the inflation process. First, the relationship between inflation and economic growth is non-linear (Phillips, 1958; Okun, 1962); hence, the use of any linear approach to measure trend inflation could produce imprecise estimates. Second, the incidence of sporadic supply shocks further complicates the measurement of trend inflation by producing noise. Estimating trend inflation involves filtering out the noise in inflation data, but there are multiple sources of noise and the nature of the noise can change over time. Thus, it embodies a signal extraction problem (Stock and Watson, 2016). Third, the time varying nature of the trend makes estimation even more challenging as it is difficult to distinguish sources

of inflation that are persistent from those that are transitory[3].

II.20 The most popular method of estimation of trend inflation is the unobserved components stochastic volatility (UCSV) model (Stock and Watson, 2007)[4]. Using different variants of unobserved components models on monthly data on headline CPI (y-o-y)[5], trend inflation estimates are obtained in the range of 3.8 – 4.3 per cent for the FIT period (Chart II.5 and Table II.2).

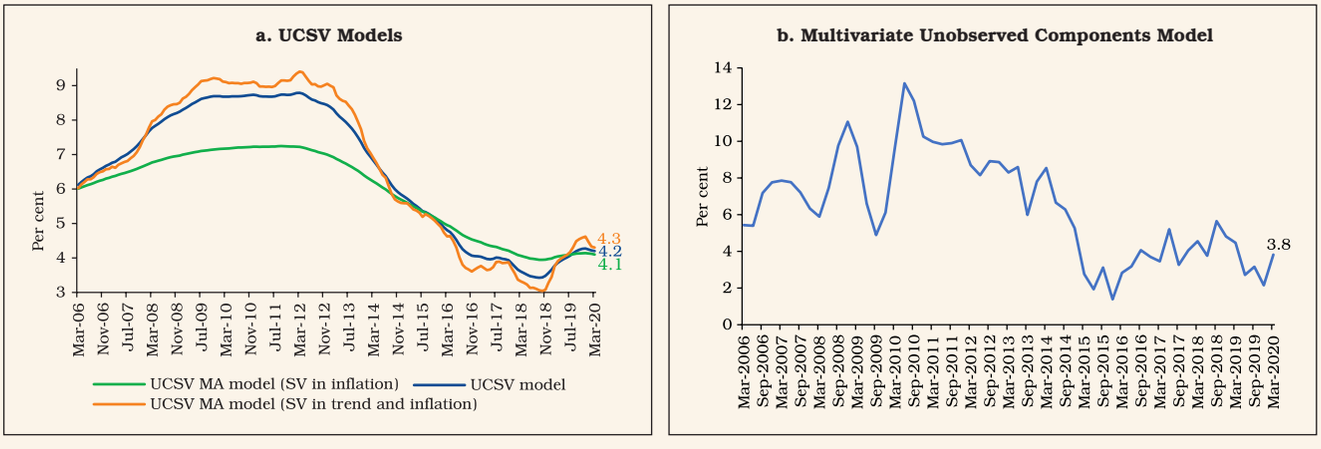
Table II.2: Trend Inflation Estimates of India

Models	Estimates for 2020:Q1
UCSV	4.2
UCSV-MA (Stochastic Volatility in Inflation)	4.1
UCSV-MA (Stochastic Volatility in Inflation and Trend)	4.3
Multivariate unobserved components model	3.8
Regime switching (with only inflation)	4.2
Regime switching (with NKPC)	4.1 – 4.3

Source: RBI staff estimates.

II.21 Trend inflation can also be estimated through multivariate approaches that combine cross sectional and time series properties of different inflation measures such as headline CPI inflation, WPI inflation and the GDP deflator in the Indian case but preserve the unique properties of the UCSV model. The underlying assumption is that inflation measured by different indicators converges to the same trend. The questions that multivariate approaches seek to address are: Will there be improvements by using different inflation measures? Do the implied weights evolve over

Chart II.5: Estimates of Trend Inflation



UCSV: Unobserved Components Stochastic Volatility
UCSV MA: Unobserved Components Stochastic Volatility Moving Average
Source: RBI staff estimates.

3 Several methods are being adopted to measure trend inflation in the literature, which can be grouped into four broad categories, such as: (a) approaches that define trend inflation as long-run forecasts of economic agents and estimate the trend using expectations drawn from surveys and financial asset prices; (b) univariate models, including non-linear or time-varying specifications (*e.g.*, UCSV); (c) multivariate models based on the relationship between inflation and other macroeconomic variables (*e.g.* TVP-VAR) and approaches taking various measures of inflation to extract the common component as trend *(e.g.*, Multivariate Unobserved Component Stochastic Volatility Models); and (d) models using Phillips curve. See Behera and Patra (2020) and Clark and Doh (2014) for a survey of various methods to estimate trend inflation.

4 UCSV models are the type of state space models that can simultaneously capture features such as time-varying mean, volatility clustering, higher moment autocorrelation, and heavy tailed densities.

5 Time series from March 1981 to March 2020.

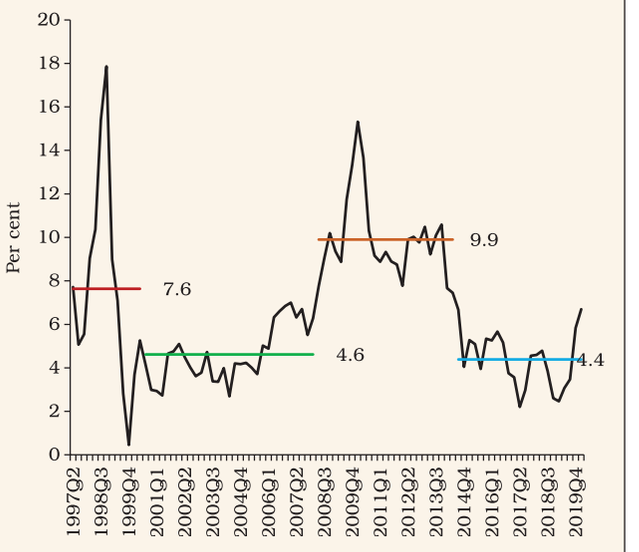
time, or are they stable? Do these trend inflation measures improve on the UCSV estimates? The multivariate unobserved components model estimated here allows for common persistent and transitory factors and time-varying factor loadings in the common and index specific components. The time-varying factor loadings allow for changes in the co-movements across measures, such as the reduction in energy price pass-through into other prices. A strength of the method is that the resulting estimates adjust for changes in persistence of the component series (Stock and Watson, 2016). The estimated average trend inflation obtained from this multivariate approach using data for the period 1981:Q2 through 2020:Q2 works out to 3.9 per cent during FIT period (Chart II.5).

II.22 The multivariate model improves upon the UCSV model by bringing information from various inflation measures. As noted in the literature, however, improvements in accuracy of estimation, especially in forecasting are small relative to the computation burden.

II.23 The Bai-Perron structural break test[6] identifies four structural breaks[7] in India's inflation series, with the last structural break point in 2014:Q3 coinciding with the *de facto* adoption of FIT in India (Chart II.6).

II.24 A recent strand in the empirical literature has sought to estimate trend inflation by modelling

Chart II.6: Structural Breaks in CPI Inflation



Source: RBI staff estimates.

it as influenced by extrinsic macroeconomic conditions embodied in the Phillips curve. Rather than a purely forward-looking NKPC advocated in the theoretical literature, a hybrid Phillips curve is preferred. In a recent effort, regime shifts in monetary policy are introduced into the Phillips curve through a Markov Chain Monte Carlo (MCMC) process (Behera and Patra, 2020). Estimates from this model yield trend inflation in India at 4.1-4.3 per cent (Box II.1).

II.25 Based on these alternative estimates, the observed decline in trend inflation since 2014 and a decline in inflation persistence as

6 The null hypothesis in the Bai-Perron test is no structural break versus multiple unknown number of break points.

7

Bai-Perron Structural Break Tests		
Period	**Intercept Coef.**	**t-Stat**
1997Q2 - 2000Q2	7.64***	12.11
2000Q3 - 2008Q1	4.62***	11.31
2008Q2 - 2014Q2	9.90***	21.77
2014Q3 - 2020Q1	4.39***	9.25
R^2	0.53	

***: Significant at less than 1 per cent level.

Box II.1
Trend Inflation in India

Trend inflation is regarded as a key building block of the New Keynesian model that is at the core of the monetary policy frameworks of modern central banks across the world. Measuring trend inflation is essentially an empirical issue, with attention being increasingly given to precision in modelling the time-varying dynamics of trend inflation including structural shifts therein. In the theoretical literature, the standard approach has been to assume zero trend inflation in the steady state. In the empirical literature, however, a non-zero trend inflation is preferred and a wide variety of models for estimating trend inflation from the data is available. Survey-based data on inflation expectations have been used but estimates of trend inflation therefrom suffer from various biases in the survey responses. Survey-based approaches also lack several positive features of a model such as ascertaining the determinants of trend inflation and obtaining a forecast when needed. Trend inflation has also been measured by the last period's inflation rate; as a random walk; a random walk subject to bounds; and as an exponentially smoothed trend. The workhorse model for estimating trend inflation, and arguably the most popular, has been the unobserved components with stochastic volatility (UCSV) model. The trend is defined as a random walk[8] process, while the inflation gap is governed by a separate process of stochastic volatility, *i.e.*, it has no persistence.

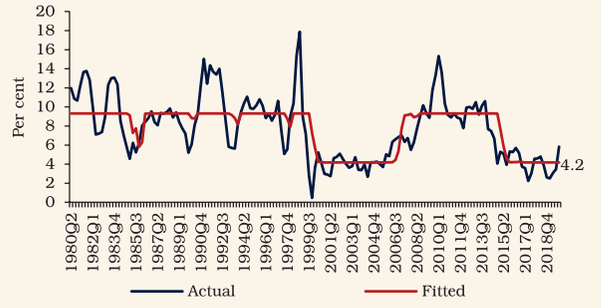
Extension of the UCSV model has involved a so-called 'multivariate' approach designated as the multivariate stochastic volatility model, which has been estimated for India in the foregoing.

For the purpose of measuring trend inflation in India in the presence of shifts in inflation dynamics, a hybrid New Keynesian Phillips curve (NKPC) is estimated on quarterly data for the period 1981:Q2 through 2020:Q1 in which current inflation depends on lagged inflation to capture the historical intrinsic behaviour of the inflation process, trend inflation to reflect persistence in inflation expectations and the contemporaneous output gap to represent the extrinsic macroeconomic conditions relevant for the setting of monetary policy. The hybrid NKPC is specified as follows:

$$\pi_t = \sum_{i=1}^{m} \alpha_i \pi_{t-i} + \left(1 - \sum_{i=1}^{m} \alpha_i\right) \mu_t + \beta_t x_t + \varepsilon_t$$

where $\varepsilon_t \sim N(0, \sigma_t^2)$; t = 1,2,…,T; π_t is the inflation rate; μ_t is trend inflation; x_t is the output gap; β_t is the coefficient on the output gap and represents the slope of the Phillips curve which is time-varying; and ε_t is the error term. The sum of all the coefficients on inflation terms $\sum_{i=1}^{m} \alpha_i \leq 1$, signifying the steady state in which the Phillips curve is vertical in the long run and the output gap is zero.

Chart 1: Markov Switching Estimates: Actual Inflation *vs.* Fitted Inflation

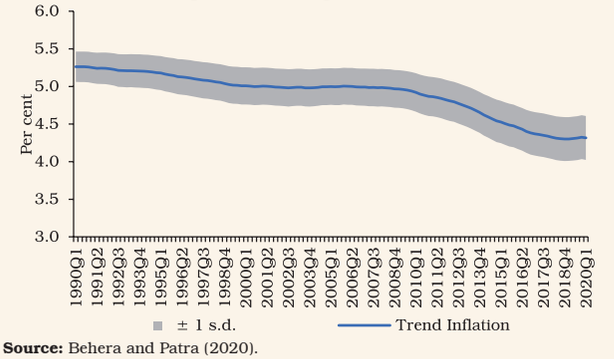


Source: Behera and Patra (2020).

Before estimating the NKPC model with pre-specification of regimes, a Markov switching regression with unknown regimes is estimated to understand the current regime of inflation. The results indicate two regimes in India's recent inflation history – a high inflation regime of 9.4 per cent during 2007-2014 and a low inflation regime of 4.0 per cent since 2015 (Chart 1). The probability weighted estimate of trend inflation in the current regime is 4.2 per cent.

The real time estimate of trend inflation is 4.1 per cent in Q1 of 2020. Smoothed probability weighted estimates of trend inflation eased steadily from 2009 to reach 4.3 per cent in Q1 of 2020 (Chart 2).

Chart 2: Regime Switching Smoothed Estimates



Source: Behera and Patra (2020).

(Contd...)

8 A random walk refers to any process in which there is no observable pattern or trend, *i.e.,* where the movements of an object, or the values taken by a certain variable, are completely random. The best example of a random walk is that of a drunk person walking home from a bar on a Saturday night.

Hence, the estimate of trend inflation for India is 4.1-4.3 per cent. The decline in trend inflation since 2014 is coincident with a flattening of the Phillips curve. Underlying this is (a) a decline in the inflation persistence, indicating that households and businesses in India are becoming more forward-looking than before as credibility associated with monetary policy increases; and (b) an increase in the sacrifice ratio – further disinflations will become costlier in terms of the output foregone. At the same time, the credibility bonus accruing to monetary policy warrants smaller policy actions to achieve the target. This points to maintaining the inflation target at 4 per cent into the medium-term.

Reference:

Behera, H.K. and Patra, M.D. (2020), "Measuring Trend Inflation in India", *RBI Working Paper Series*, No. 15, December.

shown in Section 5 indicate that households and businesses in India are becoming more forward-looking than before as credibility associated with monetary policy is increasing – it is appropriate to maintain the inflation target at 4 per cent into the medium-term.

4. The Tolerance Band

II.26 Having identified the appropriate level of the target for inflation, we now turn to the tolerance bands around the target within which actual inflation outcomes will be allowed to deviate from the target while minimising the losses of output. The need for defining a tolerance band is primarily based on three considerations. First, the band allows flexibility to the central bank to look through temporary fluctuations caused by supply shocks. Second, the band should accommodate the actual inflation within it for most of the time without undermining credibility of the central bank. Third, inflation forecasts act as the intermediate target in a FIT regime (Svensson, 1997). Consequently, the deviation of forecasts from realised inflation – forecast errors – is not just a factor in assessing the performance of inflation targeting but also informs the framework itself by affecting the tolerance band. The tolerance band can hence be considered as a "confidence interval"[9]. As a result, the width of the band should reflect a conscious and judicious balance between flexibility and credibility.

4.1 The Upper Tolerance Level

II.27 The relationship between inflation and economic growth is non-linear – up to some low level of inflation, it is positive, *i.e.*, some benign rate of price increase is beneficial for growth by greasing the wheels of production with reasonable returns. *Per contra*, at some higher rate of inflation, growth decelerates and can even turn negative if inflation rises further – large changes in prices create uncertainty that impedes consumption and investment decisions. Hence, even after setting the target in alignment with the steady state inflation, it is important to fix the upper bound up to which rising inflation is associated with smaller increases in growth till it reaches its maximum, beyond which inflation becomes growth retarding. This growth-inflation trade-off provides the motivation for locating the threshold, *i.e.*, the kink beyond which inflation is unambiguously inimical to growth. Precision in estimating the threshold is critical in order to numerically set the upper bound for deviations from the inflation target.

9 It is proportional to the unconditional standard deviation of inflation, the square root of the sum of the variance of the conditional expectation of inflation and the variance of the inflation forecast errors (Svensson, 1997).

II.28 Empirical estimates of threshold inflation for India that are available in the literature range between 4 and 7 per cent across different time periods (Annex II.1). Updated estimates of threshold inflation using alternative methodologies (Box II.2 and Annex II.2) found it to lie in the range of 4 – 5 per cent for the sample period 2002:Q2 to 2020:Q1, and 5 – 6 per cent for a longer sample

Box II.2
Estimates of Threshold Inflation for India

Drawing on the literature (Rangarajan, 1998; 2020), a number of approaches are used to work out threshold inflation for India. They also serve to provide robustness checks.

(a) Splining

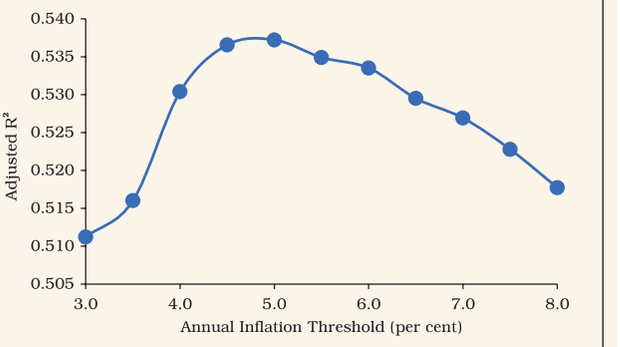
Among the methodologies employed to estimate threshold regression, splining involves a series of regression equations to identify the threshold value of inflation based on maximum R-squared or minimum Root Mean Square Error (RMSE) (Sarel, 1996).

Following Khan and Senhadji (2001), the following equation is estimated:

$$GDPg_t = \alpha_0 + \alpha_1 GDPg_{t-1} + \alpha_2 \Delta cred\_gdp_{t-1} + \alpha_3 \pi_{t-1} + \alpha_4 D * (\pi_{t-1} - \pi^*) + \varepsilon_t$$

where year-on-year growth in GDP ($GDPg_t$) is regressed on its lag, change in lagged credit to GDP ratio ($\Delta cred\_gdp_t$) to explain the impact of financial development on growth, lagged inflation level (π_t) and a dummy variable interacting with deviation of inflation from a pre-specified threshold level (π^*) as part of the search process. The dummy variable takes a value of 1 if the realised inflation is above the threshold level and 0 otherwise. The threshold value is pre-specified in the range of 3 – 8 per cent levels and the maximum adjusted R-squared for any threshold value is considered as the optimum. The results, based on data for the sample period Q2:2002 to Q1:2020 indicate a point of inflection at 5 per cent (Chart 1 and Table 1).

Chart 1: Threshold Level of CPI Inflation



Source: RBI staff estimates.

(b) Logistic Smooth Transition Regression (LSTR)

The Logistic Smooth Transition Regression (LSTR) model (Teräsvirta, 1994; Eitrheim and Teräsvirta, 1996) estimates the threshold level of inflation and also the speed of transition from one regime (low effect of inflation on growth) to another (high effect of inflation on growth). The basic difference from the spline model is that instead of using a dummy variable to differentiate the regimes, weights are assigned on the

Table 1: Parameter Estimates

Threshold Levels	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0
Constant	-0.18	0.28	-0.17	0.3	0.85	1.32	1.64*	1.96*	2.18**	2.37**	2.58**
$GDPg_{t-1}$	0.53***	0.52***	0.52***	0.53***	0.53***	0.53***	0.53***	0.53***	0.53***	0.53***	0.54***
$\Delta cred\_gdp_{t-1}$	0.14	0.14	0.13	0.14	0.15	0.15	0.15	0.15	0.15	0.16	0.16
CPI_INF(-1)	1.20	0.93	0.99	0.80**	0.62**	0.48**	0.39*	0.31*	0.25	0.19	0.14
Threshold	-1.21	-0.96	-1.07*	-0.92**	-0.77**	-0.67**	-0.62*	-0.56*	-0.53*	-0.49	-0.43
D2002Q3	-3.32***	-3.38***	-3.53***	-3.66***	-3.79***	-3.89***	-3.74***	-3.61***	-3.51***	-3.41***	-3.33***
D2003Q3	3.19***	3.13***	2.97***	2.83***	2.70***	2.71***	2.85***	2.96***	3.03***	3.08***	3.13***
D2009Q1	-3.97***	-3.94***	-3.84***	-3.74***	-3.67***	-3.63***	-3.60***	-3.59***	-3.56***	-3.54***	-3.57***
D2010Q1	5.70***	5.76***	5.89***	6.00***	6.07***	6.12***	6.18***	6.19***	6.21***	6.20***	6.14***
Adj. R^2	0.511	0.516	0.530	0.536	0.537	0.535	0.533	0.529	0.527	0.523	0.518

***, **, *: Significant at 1 per cent, 5 per cent and 10 per cent levels, respectively.
Different dummy variables are also used to incorporate outlier effects.
Source: RBI staff estimates.

(Contd...)

basis of a logistic function that allows the parameter to differ across regimes, enabling identification of the threshold. The functional form of the model can be specified as:

$$y_t = \alpha + \beta_1 \pi_{t-1} + \beta_2 \pi_{t-1} \varphi(s_t; \pi^*, \gamma) + \delta X_t + \varepsilon_t$$

where, $\varphi(s_t; \pi^*, \gamma) = [1 + \exp(-\gamma(s_t - \pi^*)]^{-1}$

s_t is the transition variable, which governs the regime switching; π^* is an unknown threshold parameter(s); and γ represents the slope parameter ($\gamma > 0$). The transition function $\varphi(s_t; \pi^*, \gamma)$ is a continuous function and depends on π^*. It is normalised to be bounded between 0 and 1, and these extreme values are associated with regression coefficients β_1 and (β_1+ β_2).

The results imply that there exists a nonlinear relationship between inflation and growth as the null hypothesis of linearity is rejected at 5 per cent significance level (Table 2). The nonlinearity in the growth-inflation relationship is also confirmed by the statistical significance of the slope parameter. The estimated threshold value of inflation from this regression works out to 5.0 per cent.

(c) Threshold VAR (TVAR)

In multivariate frameworks like threshold VAR (TVAR), threshold inflation is computed from the estimated nonlinear impulse responses which are derived as conditional forecasts at each period. Hence, it is possible to study time variance in responses to shocks not only across regimes, but also within regimes. Moreover, it is possible to test whether nonlinearities are statistically significant. Another advantage of the TVAR methodology is that the variable by which different regimes are defined can itself be an endogenous variable included in the VAR. Therefore, regime switches may occur after the shock to each variable.

The TVAR can be specified as:

$$Y_t = A_1 Y_t + B_1(L) Y_{t-1} + \left(A_2 Y_t + B_2(L) Y_{t-1}\right) I\left[s_{t-d} > \gamma\right] + \epsilon_t$$

where, Y_t represents a vector of macro variables (inflation; GDP growth; weighted average call money rate); s_t is the threshold variable; γ is the level of the threshold; and *I* refers to the indicator function, $I = 0$, when $s_{t-d} < \gamma$ and $I = 1$ otherwise and d is the delay parameter.

Using Bayesian methods and treating inflation as the threshold variable, the estimated threshold level works out to 4.5 per cent (Chart 2). An exogenous shock to inflation causes GDP growth to fall under the high inflation regime (*i.e.* when inflation is above 4.5 per cent). On the contrary, the growth impact is positive when inflation is below 4.5 per cent. The cumulative impact (over 12 quarters) of one percentage point rise in inflation on GDP growth is: (+)37 bps under the low inflation regime and (-)46 bps under the high inflation regime. While the positive impact is statistically insignificant, the negative effects are significant for most lags.

(d) Panel Threshold Regression

Considerable heterogeneity in the inflation and growth experiences of Indian states has encouraged estimation of the threshold inflation at the sub-national level (Mohaddes and Raissi, 2014). In a panel framework, using data on GSDP growth and CPI inflation across major Indian states for the period 2011-12 to 2018-19, the following equation is

Table 2: Estimated Parameters in LSTR Model

	Coefficient	t-statistic
Threshold: π^*	4.97***	2.75
Slope: γ	0.37*	1.80
Variable		
Inflation (π_{t-1}) (< threshold)	1.62**	2.63
Inflation (π_{t-1}) (> threshold)	-1.19**	-2.05
GDP growth (y_{t-1})	0.25*	1.68
GDP growth (y_{t-1})	0.55***	2.79
OECD GDP growth	-1.15***	-3.05
Dstructural	4.97***	2.75
R^2	0.54	
DW	1.77	
LM(4) P-val	0.30	
ARCH(4) P-val	0.25	

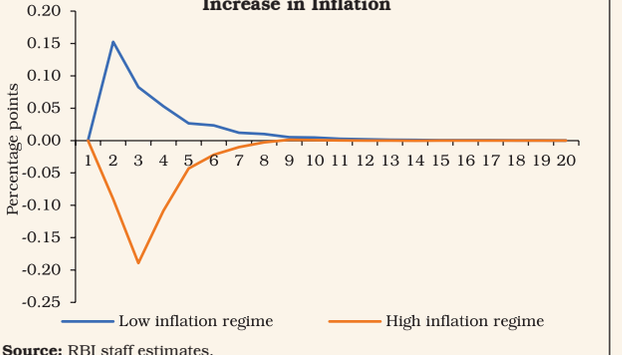
Test of Linearity and Non-linearity

	Test of Linearity (p-value)	Test of remaining Nonlinearity (p-value)
Terasvirta Sequential Tests	0.02	0.42
Escribano-Jorda Tests	0.05	0.13

H_0: $\beta_2 = 0$ or $\gamma = 0$

Source: RBI staff estimates.

Chart 2: Response of GDP Growth to 1 Percentage Point Increase in Inflation



Source: RBI staff estimates.

(Contd...)

estimated:

$$G_{it} = \beta_0 + \beta_1 \pi_{it} + \beta_2 D_{it}(\pi_{it} - \pi^*) + \beta_3 X_{it} + s_i + s_t + s_i s_t + \epsilon_{it}$$

where, G_{it} is the GDP growth of state *i* at time period *t*; π_{it} is the inflation rate of state *i* at time *t*; π^* is the threshold inflation rate; and X_{it} is a vector of control variables (state level fiscal deficit and weighted average call rate). State and time dummies are used to control for time invariant and state invariant unobservable factors, respectively. Interacting state and time dummies are also included to control for all other factors not explicitly included in the model. An interaction of a dummy variable D_{it} with "excess inflation $(\pi_{it} - \pi^*)$" is introduced in the growth equation (Sarel,1996). D_{it} takes the value 1 when inflation is greater than the threshold level and zero otherwise. When inflation is below the threshold ($D_{it} = 0$), inflation is expected to have a positive effect on growth ($\beta_1 > 0$). When inflation exceeds the threshold ($D_{it} = 1$), it is expected to affect growth adversely ($\beta_2 < 0$). This equation is estimated with different values of π^*. The value of π^* that gives the correctly signed and statistically significant coefficients ($\beta_1 > 0,\ \beta_2 < 0$) along with highest R^2 value is selected as the threshold inflation rate. This exercise yields threshold inflation closer to 4.0 per cent (Table 3).

Table 3: Panel Regression Estimates (Dependent Variable: GDP growth)

	(π*=3)	(π*=3.5)	(π*=4)	(π*=4.5)	(π*=5)	(π*=6)
π	2.295 (1.655)	1.876* (1.036)	1.428* (0.754)	1.069* (0.639)	0.676 (0.557)	0.277 (0.484)
D×(π- π*)	-2.628 (1.688)	-2.240** (1.085)	-1.818** (0.831)	-1.475* (0.758)	-1.103 (0.723)	-0.753 (0.771)
Constant	-0.593 (5.950)	-0.331 (4.455)	0.452 (3.699)	1.262 (3.383)	2.812 (3.136)	4.660 (2.974)
R^2 (Overall)	0.3009	0.3086	0.3115	0.3111	0.3036	0.2951
N	154	154	154	154	154	154

Standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$;
Sample: 2011-12 to 2018-19 for 22 states.
Source: RBI staff estimates.

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period 1997:Q2 to 2020:Q1. As the concept of threshold inflation applies to the long run and growth is unambiguously impaired when inflation crosses 6 per cent, it is recommended that 6 per cent be maintained as the appropriate upper tolerance limit for India's inflation target to remain credible (Table II.3).

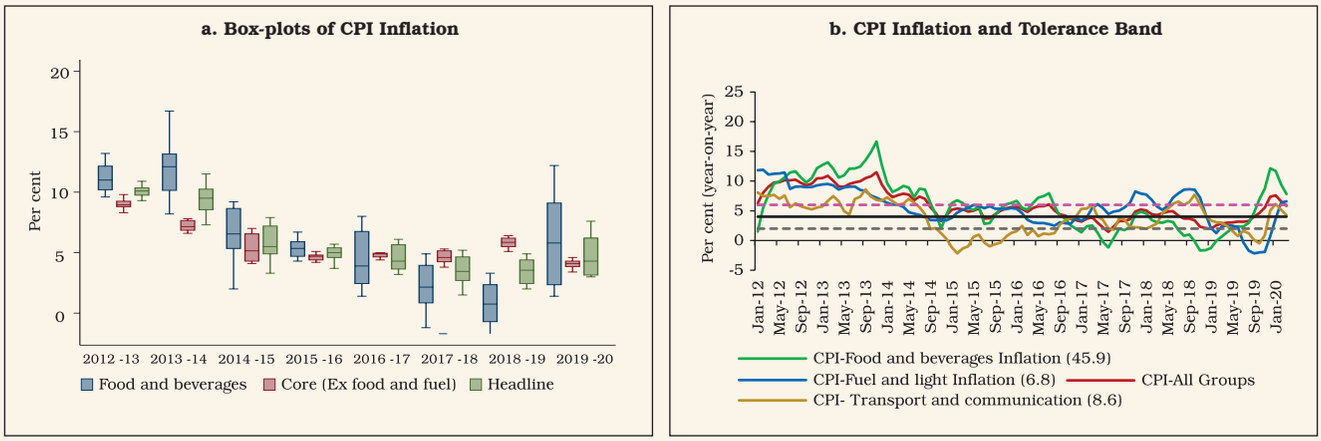
II.29 For India, model-based estimates of the upper tolerance level for inflation need to be conditioned by the vulnerability of the economy to recurring supply shocks such as weather adversities and/or volatility in international commodity prices. The agricultural sector is still heavily dependent on rainfall as merely 49 per cent of the gross cropped area is irrigated. Inefficiencies in the food supply chain – high and

Table II.3: Threshold Inflation Estimates of India

Method	Expert Committee Report		Current Estimates using CPI Inflation	
	WPI Inflation	CPI Inflation	Recent Period (2002:Q2 to 2020:Q1)	Full Sample (1997:Q2 to 2020:Q1)
LSTR	5.8	6.7	5.0	5.6
Threshold VAR	4.6	6.2	4.5	5.5
Spline Regression			5.0	6.0
Panel Threshold Model			4.0	5.0

Source: RBI staff estimates and Expert Committee report.

Chart II.7: Distribution of Major Components of CPI Inflation in India



Figures in parentheses indicate weights in CPI basket.
Source: National Statistical Office (NSO).

volatile retail mark ups on wholesale/farm gate prices and limited level of development of the food processing industry – also impact food inflation (Bhoi *et al.,* 2019; Dhanya *et al.,* 2020). With the highest share of food in the consumption basket in the world (45.9 per cent) and high volatility in food inflation – 3.2 as against 1.4 for headline inflation during the FIT period (Chart II.7) – there is a strong case for a wider tolerance band for India relative to the country experience.

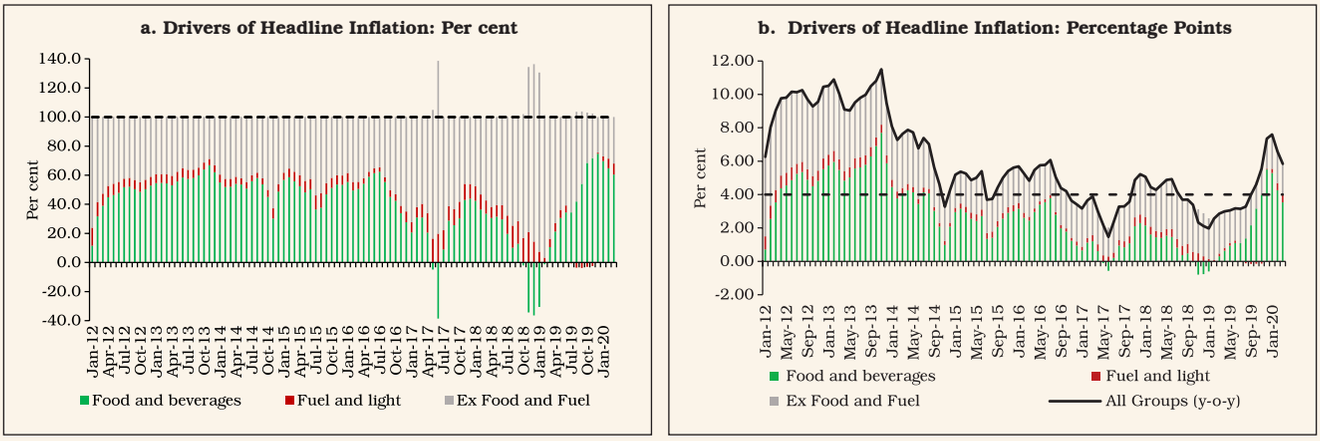
II.30 Food inflation remained within the tolerance band only about 43 per cent of the time in the FIT period – inflation in respect of pulses, vegetables and sugar remained within the tolerance band less than 20 per cent of the time. In fact, for vegetables and pulses price volatility has

Table II.4: Performance of Different Food Sub-Groups during Pre and Post - FIT

Item	Weight	Inflation above 6 per cent (in per cent of months)		Inflation below 2 per cent (in per cent of months)		Inflation within 2 to 6 per cent (in per cent of months)	
		Pre -FIT	Post-FIT	Pre -FIT	Post-FIT	Pre -FIT	Post-FIT
CPI All Groups	100	57.9	7.1	0.0	4.8	42.1	88.1
Food and Beverages	45.86	71.9	14.3	1.8	42.9	26.3	42.9
Cereals and products	9.67	45.6	0.0	10.5	26.2	43.9	73.8
Meat and fish	3.61	78.9	33.3	0.0	4.8	21.1	61.9
Egg	0.43	57.9	38.1	19.3	40.5	22.8	21.4
Milk and products	6.61	75.4	4.8	0.0	28.6	24.6	66.7
Oils and fats	3.56	33.3	7.1	19.3	50.0	47.4	42.9
Fruits	2.89	63.2	21.4	15.8	35.7	21.1	42.9
Vegetables	6.04	61.4	40.5	22.8	45.2	15.8	14.3
Pulses and products	2.38	71.9	21.4	7.0	71.4	21.1	7.1
Sugar and confectionery	1.36	31.6	35.7	56.1	50.0	12.3	14.3
Spices	2.50	73.7	14.3	15.8	47.6	10.5	38.1
Non-alcoholic beverages	1.26	47.4	0.0	0.0	26.2	52.6	73.8
Prepared meals, snacks, sweets *etc.*	5.55	89.5	2.4	0.0	2.4	10.5	95.2

Note: Pre-FIT period covers January 2012 - September 2016.
Sources: NSO; RBI staff estimates.

Chart II.8: Contribution to Headline Inflation



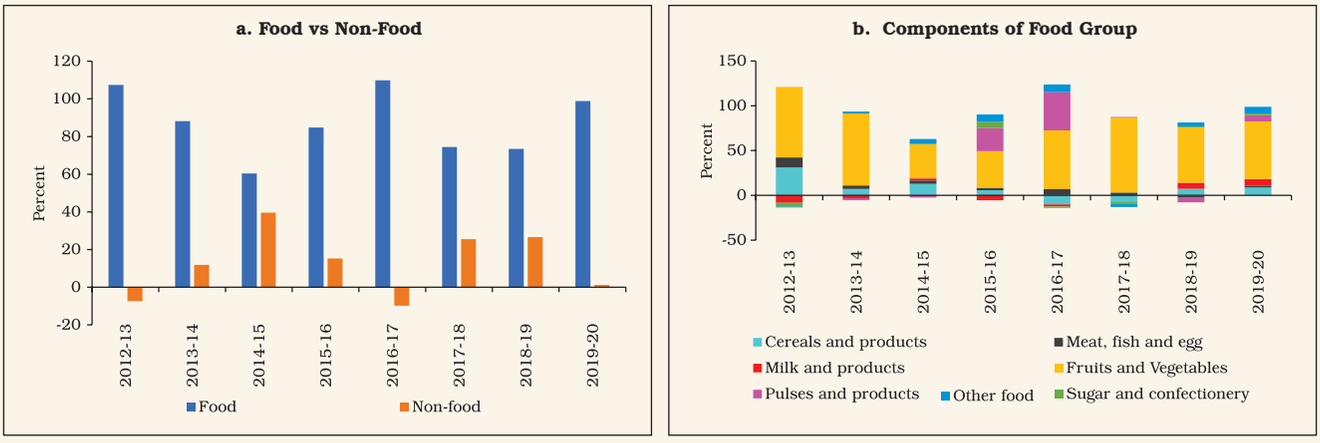
Sources: NSO; RBI staff estimates.

increased in the FIT period, mainly on account of an increase in extreme weather events (Table II.4 and Chart II.8).

II.31 The contribution of food, and particularly, vegetables, to volatility[10] in headline inflation[11] is significantly higher than non-food items, reflecting the perishable nature of the crop, short crop cycles, lack of adequate storage and poor pre- and post-harvest practices (Chart II.9). Even non-perishables such as pulses and cereals have exhibited considerable volatility.

II.32 Apart from food, another major source of supply shock to inflation in India is fuel prices, with more than 80 per cent of domestic oil consumption met through imports. Fluctuations in petroleum product prices in India reflect not only movements

Chart II.9: Contribution to Volatility in Headline Inflation

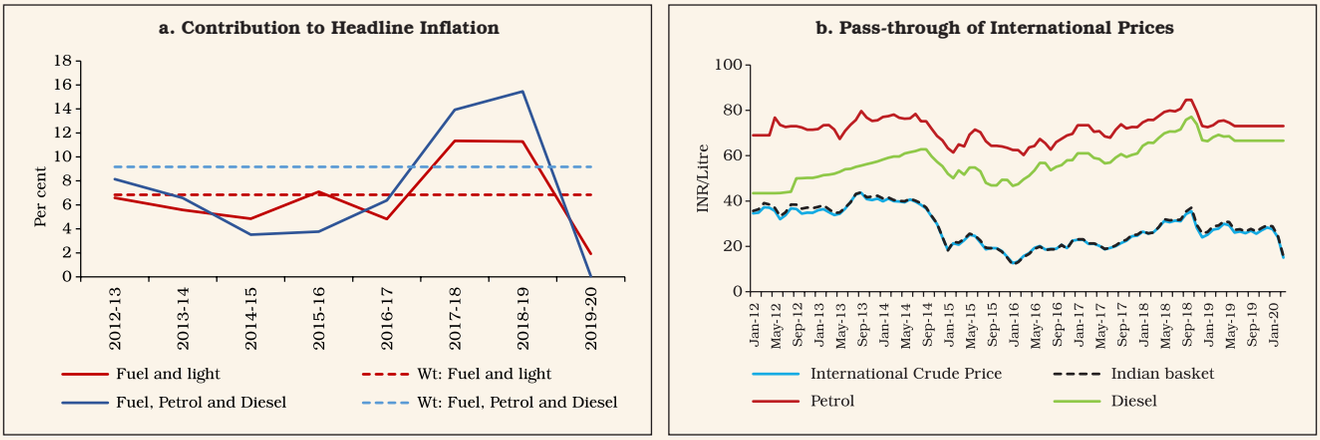


Sources: NSO; RBI staff estimates.

10 Annual Volatility is defined as variance of 12 months inflation in that year.

11 Contribution of subgroup (say, A) to variance in total (A+B+C) is calculated using the following formula:
Contribution (A)= W(A)W(A) Cov (A, A) + W(A)W(B) Cov (A, B) + W(A)W(C) Cov(A ,C), where W is the weight of the sub-group.

Chart II.10: High Volatility and Asymmetric Pass-through of Fuel Prices



Note: International crude price represents the average price of WTI, Brent and Dubai Fateh.
Sources: World Bank; Indian Oil Corporation Ltd.; Petroleum Planning and Analysis Cell.

in global crude prices, but also changes in excise duties and value added tax (VAT) as well as the exchange rate of the rupee. The fuel and light group has a weight of around 7 per cent in the CPI basket, which mainly comprises electricity, firewood and chips, LPG and kerosene (Chart II.10). It is the transport and communication subgroup in the CPI that is directly impacted by changes in the prices of petroleum products as it contains petrol and diesel.

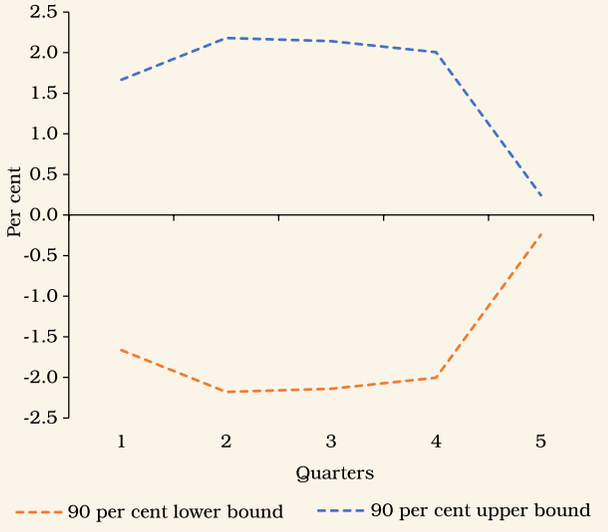
4.2 The Lower Tolerance Level

II.33 For the determination of the lower tolerance bound, it is necessary to investigate the statistical properties of the inflation process under the deflationary impact of structural shocks.

II.34 Adapting from the tradition of the seminal work on shocks and frictions in business cycles within the framework of a structural dynamic stochastic general equilibrium model (Smets and Wouters, 2007), the lower tolerance level for inflation in India can be estimated by assessing the impact of supply shocks on production costs and pricing. There appears to be a minimum level of inflation below which producers are unable to pass on changes in production costs to selling prices. Estimates for India for the period 1996:Q2 to 2019:Q2 indicate that the magnitude[12] of supply shocks varies from (+) 1.56 to (-) 1.56 per cent, where the former denotes the upper bound and the latter denotes the lower bound. The impulse response results imply that the impact of supply shocks on inflation mainly persists for four quarters, with a band of (+/-) 2.18 per cent around the target accommodating supply shocks 90 per cent of the time (Chart II.11). This is the level of inflation on account of supply-side factors (such as unexpected changes in oil prices, raw materials, imported intermediates and the like) which cannot be influenced by monetary policy. Any attempt to bring down inflation below this level using contractionary monetary policy would dis-incentivise production activity as firms would not be able to pass on increased costs to final consumers. A lower bound of above 2 per cent will lead to actual inflation frequently dipping

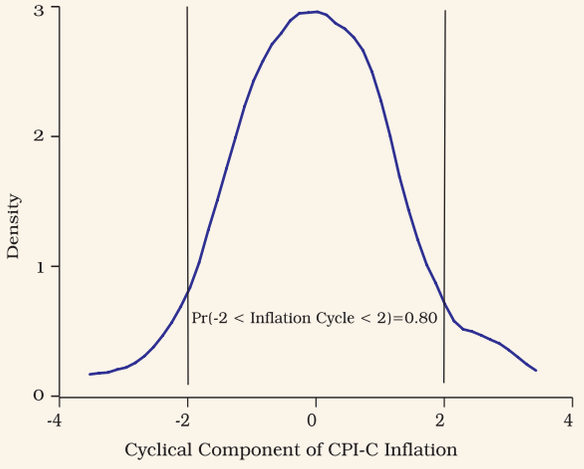
12 The upper and lower bound corresponds to the (+)1.645*0.95 and (-)1.645*0.95 respectively.

Chart II.11: Supply Shocks and their Impact on Inflation



Source: RBI staff estimates.

Chart II.12: Distribution of Cyclical Component of Inflation



kernel = epanechnikov, bandwidth = 0.4134

Source: RBI staff estimates.

below the tolerance band (as explained in the next section), while a lower bound below 2 per cent will hamper output/growth[13]. In the history of the CPI (base 2012=100), inflation has not fallen below 2 per cent in any quarter[14].

II.35 These estimates can be counterfactually corroborated by evaluating the symmetry or otherwise of the tolerance band. Drawing on monthly data through the history of the CPI series, it is observed that the distribution of the transitory component of inflation – estimated by taking the deviation of actual year-on-year inflation from its trend[15] – is found to be centred around zero with a probability value of 0.8 for inflation observations lying between -2 and +2 per cent (Chart II.12). The skewness and kurtosis tests for normality confirm that the distribution of cyclical components of inflation is symmetric around zero and normally distributed. This supports a symmetric tolerance band set at +/- 2 percentage points around the inflation target so that actual inflation will remain above the lower bound and below the upper bound 80 per cent of the time. These results also suggest that, given the estimate of trend inflation at 4 per cent, the model derived estimate of the upper tolerance level has a downside bias and needs to be revisited by juxtaposing it with actual outcomes.

II.36 Finally, the assessment of forecasting performance carried out in Chapter III can inform the choice of the width of the tolerance band, which is a function of forecast errors. The observed incidence of these errors leave little space for narrowing of the existing +/- 2 per cent tolerance band. The empirical assessment of accuracy and efficiency of inflation forecasts conducted

13 Details of the model are presented in Annex II.3.

14 CPI inflation was 1.5 per cent and 2.0 per cent in the months of June 2017 and January 2019, respectively.

15 Trend inflation is generated by using Hodrick-Prescott filter of the actual inflation series for 2011-12 to 2019-20.

Table II.5: Accuracy, Unbiasedness, Efficiency and Autocorrelation of Inflation Forecasts over Forecast Horizons

	Current Quarter	1Q Ahead	2Q Ahead	3Q Ahead
N	14	15	13	11
Negative errors (max, min)	(-0.75, -0.10)	(-2.23, -0.13)	(-2.34, -0.73)	(-2.24, -0.55)
Positive errors (min, max)	(0.07, 0.73)	(0.11, 2.33)	(0.05, 2.97)	(0.12, 2.97)
Accuracy				
ME	-0.10	-0.28	-0.21	-0.22
MAE	0.34	1.11	1.54	1.66
RMSE	0.41	1.36	1.79	1.88
Unbiasedness	$e_{t+q,t} = \alpha_q + u_{t+q,t}$			
Alpha	-0.10	-0.27	-0.21	-0.22
Unbiased	Y	Y	Y	Y
Efficiency	$e_{t+q,t} = \alpha_q + \beta_q \pi_{t-1} + u_{t+q,t}$			
Beta	-0.14	-0.49	-1.19***	-1.73***
Efficient	Y	Y	N	N
Autocorrelation	$e_{t+q,t} = \alpha_q + \beta_q e_{t+q,t-1} + u_{t+q,t}$			
Beta	0.37	0.68***	0.77***	0.82***
Errors are NOT Autocorrelated	Y	N	N	N

ME: Mean Errors; MAE: Mean Absolute Error; RMSE: Root Mean Square Error.
***: t-statistic is significant at 1 per cent level.
Source: RBI staff estimates.

during FIT shows that forecast errors up to 1.88 per cent are inherent in the projection processes, validating the adoption of +/- 2 per cent tolerance band (Table II.5).

5. Other Features of India's Inflation Process

II.37 The estimates of trend inflation and upper and lower thresholds help to define the primary mandate for FIT in India and to assess the success or otherwise in achieving it. In this regard, two other aspects of the inflation process merit consideration; first, the time taken for deviations of inflation from the target to correct or inflation persistence, and second, what beliefs/expectations do people hold about inflation and the ability of the central bank/ government in keeping it low and stable.

5.1 Inflation Persistence

II.38 Inflation persistence is determined by intrinsic factors (*i.e.*, past inflation behaviour) as well as extrinsic factors (the credibility of monetary policy in achieving the inflation target). In advanced economies, inflation persistence was reduced/ eliminated after the adoption of inflation targeting (Bratsiotis *et al.*, 2002). In emerging economies in the Asia pacific region, inflation targeting countries witnessed significant decline in inflation persistence, unlike countries that did not adopt inflation targeting (Gerlach and Tillmann, 2011). Understanding the nature of inflation persistence, therefore, is important to evaluate the role of FIT in India.

II.39 In technical terms, inflation persistence emanates from four sources. First, there is backward-lookingness in wage and price setting – wage negotiations typically take into account inflation of the recent past; firms revise their prices infrequently in response to recent sizeable changes in prices. This is termed as "intrinsic" persistence. Second, extrinsic inflation persistence relates

to the mark-up over costs. Third, "expectations-based" persistence is due to private agents in the economy perceiving inflation to be different from the central bank's target. Fourth, persistence can arise due to supply shocks (Angeloni *et al*., 2006). Another dimension of persistence may arise from monetary policy itself through interest rate smoothing or small and gradual interest rate changes in one direction to reinforce the intent of monetary policy (Patra *et al*., 2014)[16].

II.40 Empirical results suggest that in India[17], intrinsic persistence declined when the FIT period is added to the pre-FIT sample period, whereas the role of expectations has risen[18] (Table II.6). The lower value of the interest rate smoothing parameter appears to have contributed to the observed stabilisation of inflation expectations and thereby to the credibility of the FIT regime.

II.41 In view of the short period covered under FIT restricting degrees of freedom, estimates of trend inflation within the UCSV tradition can be generated from an augmented Phillips curve in a time-varying parameter regression framework with stochastic volatility (TVP-SV)[19] (Stock and Watson, 2007; Cogley, Primiceri and Sargent, 2010). Estimates show that the intrinsic persistence has declined contributing to the moderation in trend inflation (Chart II.13a).

Table II.6: Estimates of Inflation Persistence

$$\pi_t = \alpha + \beta\pi_{t-1} + \gamma\pi^e_{t+1} + \omega y_t^{gap} + \varepsilon_t$$

	Pre-FIT Period (Q1:1996-97 to Q2:2016-17)		Including FIT Period (Q1:1996-97 to Q4:2019-20)	
	Coefficient	t-statistic	Coefficient	t-statistic
Constant	0.74***	3.48	0.33*	1.64
π_{t-1} (Intrinsic)	0.68***	12.89	0.64***	16.59
π^e_{t+1} (Expectations)	0.19**	2.26	0.28***	4.31
y_t^{gap} (Extrinsic)	0.08**	2.32	0.06*	1.64
Interest rate smoothing	0.86		0.75	
Wald Test χ^2 H_0: $\beta + \gamma = 1$	16.62***	0.00	1021.53***	0.00

***, **,*: Significant at 1 per cent, 5 per cent and 10 per cent level, respectively.
Source: RBI staff estimates.

II.42 The decline in extrinsic persistence points to a softening of nominal rigidities in price setting (Chart II.13b). Stochastic volatility in inflation had started to decline much before FIT (Chart II.13c) because of fewer instances of unfavourable supply shocks in the recent past.

5.2 Inflation Expectations

II.43 Households, firms and financial market players incorporate their inflation expectations into their decisions to consume, invest and

16 The first four factors of inflation persistence can be estimated using an augmented Phillips curve, while the fifth factor – "policy-driven" persistence – can be inferred from the movement of the four factors over the time horizon, and estimated from a Taylor type rule.

17 The results are obtained using methodology proposed in Patra *et al*. (2014) and covering data from Q1:1996-97 to Q4:2019-20.

18 Inflation expectations are said to be anchored when households and firms are relatively insensitive to supply shocks or incoming data (rather more adhesive to their long-term expectations). The expectations are anchored fully when the coefficient of inflation expectations in the Phillips curve is close to one and a rise in the value of the coefficient implies better anchoring of inflation expectations.

19 Inflation: $\pi_t = \rho_t + (1-\rho_t) * \pi_t^T + \alpha_t * ygap_t + \varepsilon_t^{\pi}$

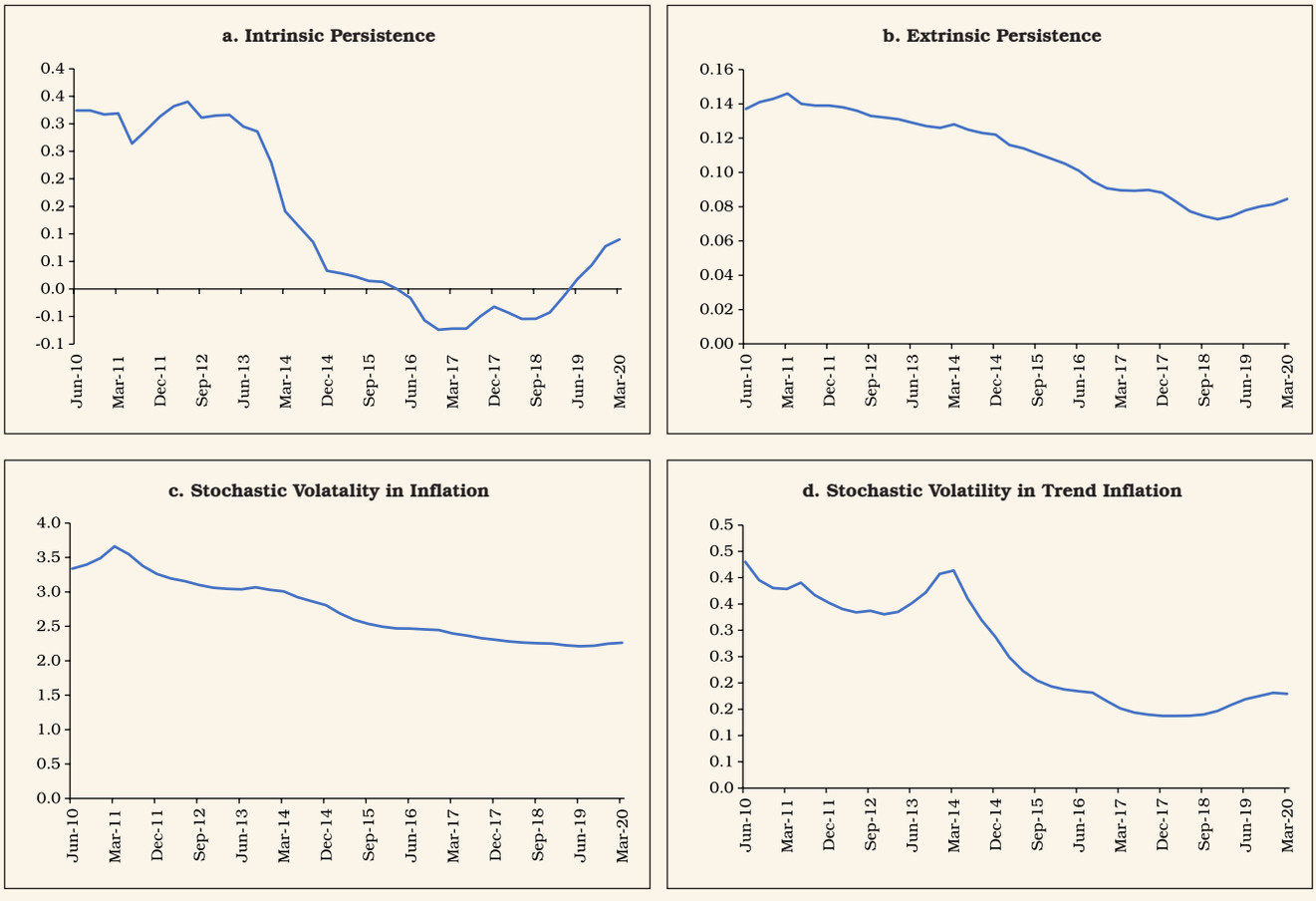
Inflation Trend: $\pi_t^T = \pi_{t-1}^T + \varepsilon_t^{\pi^T}$

Stochastic Volatilities; $\varepsilon_t^{\pi} \sim N(0, \sigma_t^{\pi})$; $\varepsilon_t^{\pi^T} \sim N(0, \sigma_t^{\pi^T})$

$ygap$: is the output Gap.

The time varying parameters are estimated using Bayesian Markov Chain Monte Carlo (MCMC) method using the codes of Nakajima (2011).

Chart II.13: Inflation Trend, Persistence and Volatility



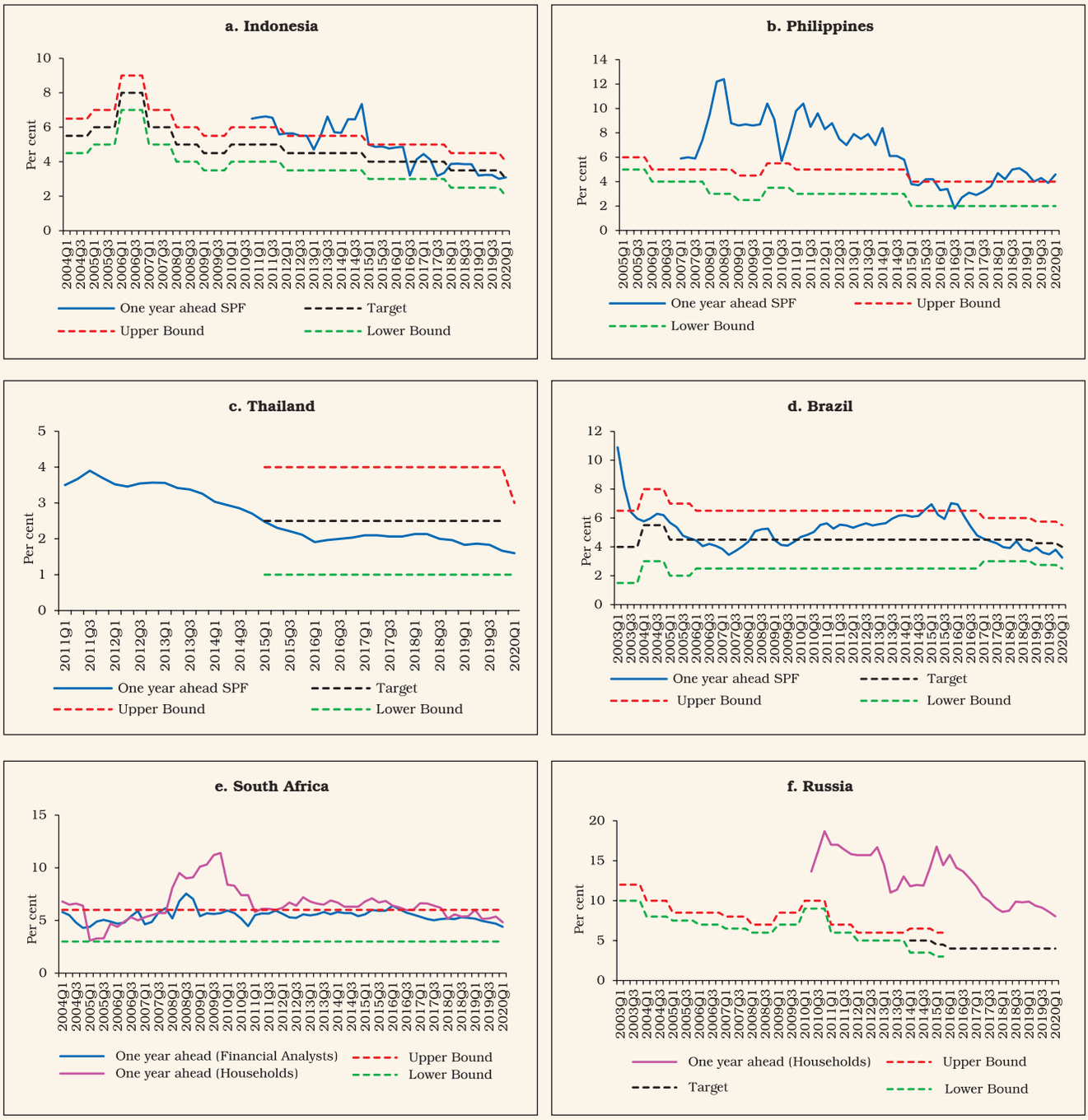
Source: RBI staff estimates.

change financial market positions. FIT focuses on anchoring inflation expectations of the public through a credible commitment to a publicly announced inflation target. This increases the probability of maintaining price stability on a durable basis. Several benefits can accrue: wage-price spirals can be averted; idiosyncratic supply shocks can be accommodated, and as a result the risk of growth sacrifices for achieving price stability can be minimised; and stability of financial markets can be engendered, facilitating efficient allocation of resources in the economy (Miyajima and Yetman, 2018).

Cross-country Experience

II.44 Both advanced and emerging economies show somewhat similar performance in anchoring of inflation expectations, before and after the adoption of an inflation targeting framework. Expectations of professional forecasters generally stabilise around the inflation target relatively quickly while expectations of households generally exceed the inflation target/ upper tolerance band, often taking several years to moderate after formal adoption of inflation targeting (Charts II.14 and II.15). Among AEs, it is only in New Zealand that

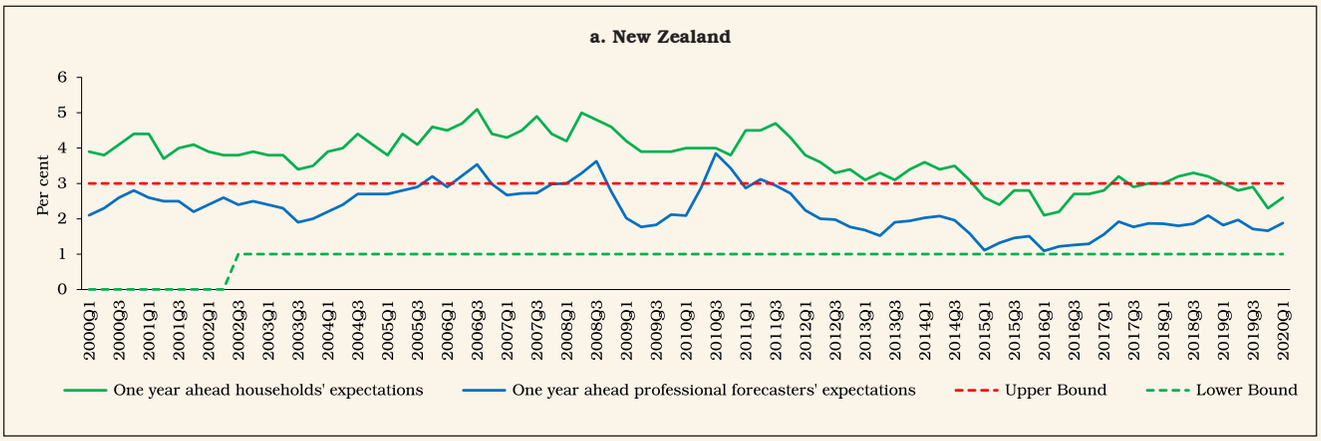
Chart II.14: Inflation Expectations in select Emerging Market Economies (EMEs)

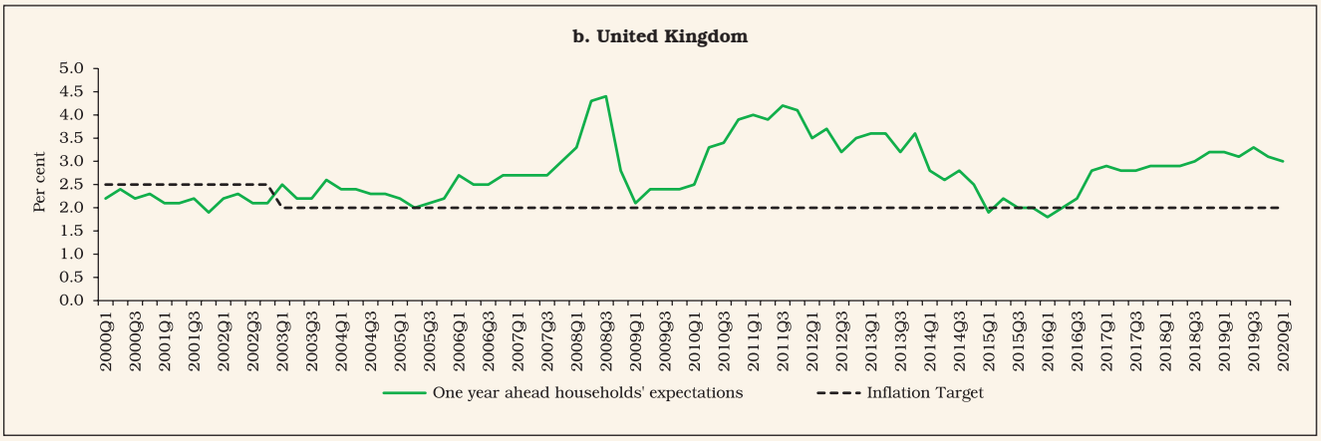


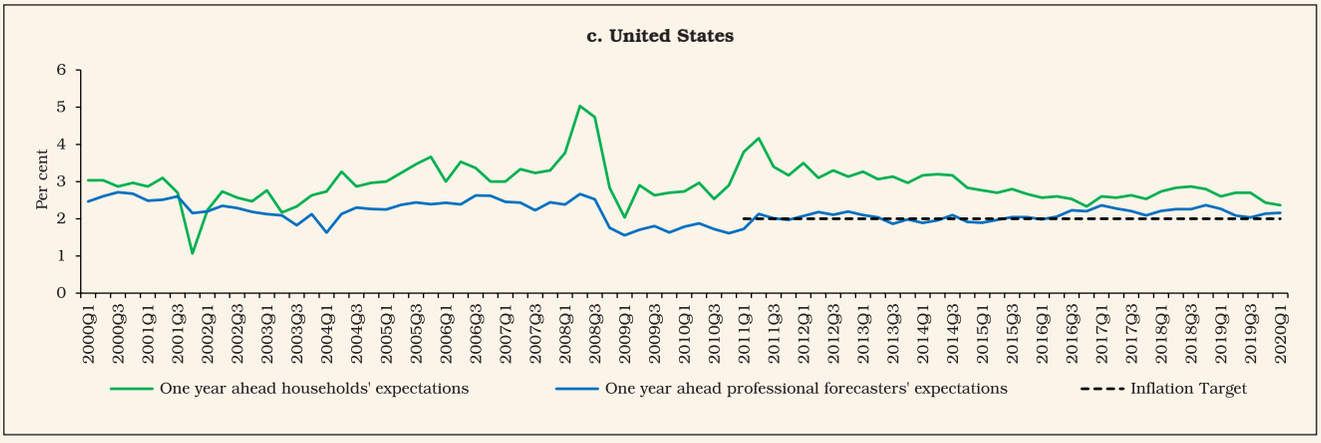
Source: CEIC database.

households' inflation expectations have eased to levels within the target band in recent years. A similar pattern is observed in South Africa while in Russia, households' expectations continue to hover above the inflation target. In some countries, inflation expectations have most often tended to stay higher than both actual inflation and the inflation target.

Chart II.15: Inflation Expectations in select Advanced Economies (AEs)







Source: CEIC database

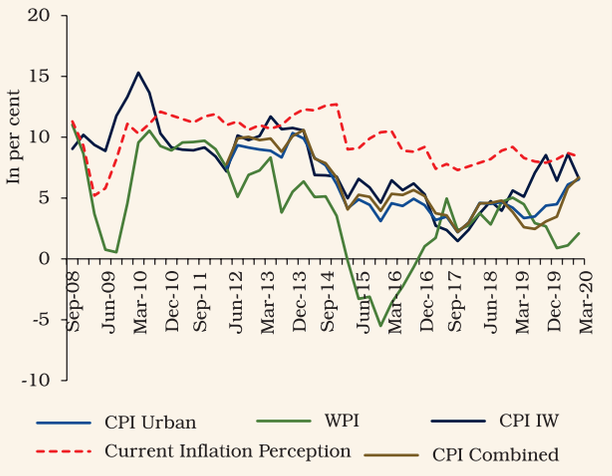
II.45 Overall, it is observed that across AEs and EMEs, households have a higher bias and lower degree of anchoring relative to professional forecasters and financial analysts.

Inflation Expectations in India during FIT

II.46 The Reserve Bank conducts bi-monthly surveys to collect information on inflation expectations of households (IESH) and professional

forecasters (SPF)[20]. During the FIT period, current inflation perception of households has persistently remained above all official measures of inflation, imparting an upside to inflation expectations (*i.e.,* inflation expectations for three months ahead and one year ahead are formed on the basis of current perceptions rather than actual inflation experienced as per official inflation data) (Chart II.16). On the other hand, expectations of professional forecasters have hovered around the actual inflation trajectory (Chart II.17). Households' and professional forecasters' sentiments on one year ahead inflation are strongly related, with a high and significant correlation of 0.79.

Chart II.16: Inflation Perception of Households *vs.* Actual Inflation

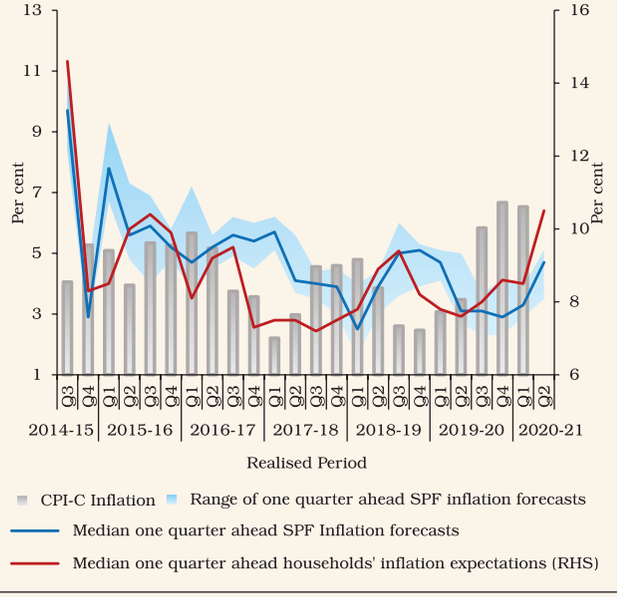


Sources: RBI; NSO; Labour Bureau; and the Office of Economic Adviser Ministry of Commerce and Industry.

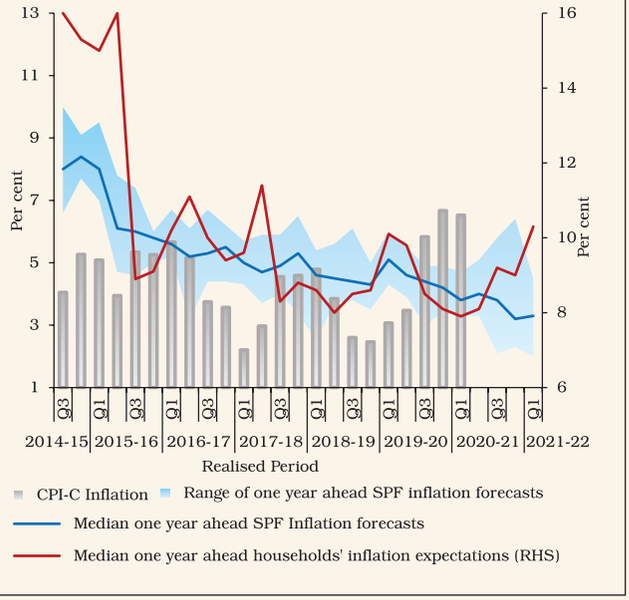
II.47 Since 2014, a decline in inflation expectations has trailed the fall in headline inflation (Chart II.18 and Table II.7). Statistically, inflation perception and inflation expectations

Chart II.17: Inflation Expectations: Households *vis-à-vis* Other Agents

a. One Quarter ahead Inflation Expectations: Households *vis-à-vis* Three Months Lagged Expectations of Professional Forecasters (Correlation = 0.68)



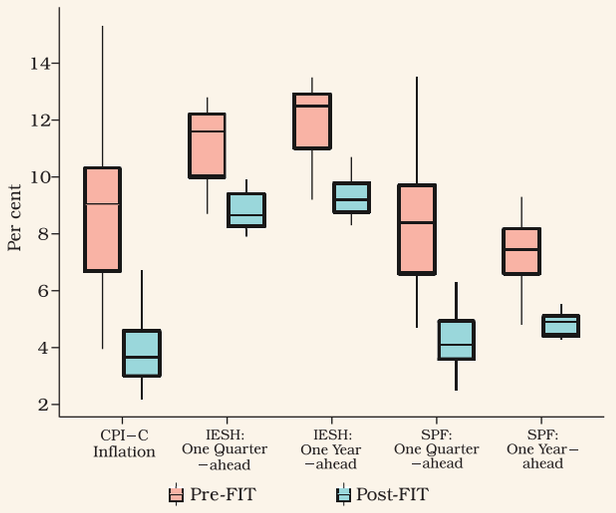
b. One Year ahead Inflation Expectations: Households *vis-à-vis* Professional Forecasters (Correlation = 0.79)



Sources: RBI; NSO; Labour Bureau; and Ministry of Commerce and Industry.

20 Survey of Professional Forecasters (SPF) is being conducted since September 2007 on a bi-monthly basis. A panel of market analysts and professional forecasters are surveyed under the SPF. Panellists submit forecasts for, *inter alia*, headline CPI, core CPI, headline WPI and WPI non-food manufactured products for three months to one year ahead horizon.

Chart II.18: CPI Inflation and Inflation Expectations during pre- and post-FIT Period



Source: RBI staff estimates.

exhibit a high degree of correlation with CPI-C headline inflation (Table II.7).

Table II.7: Correlation between Inflation Expectations (IE) and Actual Inflation

Correlation	CPI-C Headline	CPI-C Food	CPI-C Fuel	CPI-C Core	CPI-IW	WPI
IESH Current Perception	0.83	0.77	0.47	0.68	0.44	0.47
IESH one quarter ahead IE	0.87	0.78	0.53	0.75	0.45	0.50
IESH one year ahead IE	0.90	0.83	0.57	0.75	0.43	0.51
SPF one quarter ahead IE	0.78	0.59	0.27	*	*	0.91
SPF one year ahead IE	0.26	0.29	0.01	*	*	0.42

* In SPF, forecast of CPI-IW was included till December 2013. Subsequently, in place of CPI-IW, forecast of CPI-C headline and CPI-C core were requested for.

Sources: RBI; NSO; Labour Bureau and the Office of Economic Adviser in the Ministry of Commerce and Industry.

II.48 The anchoring of one year ahead inflation expectations across professional forecasters and households during the FIT period has enhanced the efficacy of monetary policy (Box II.3).

Box II.3
Stabilisation of Inflation Expectations during FIT in India

To assess whether FIT has helped in stabilising inflation expectations, the following regression specification is used:

$$\pi^{e}_{t+h|t} = c + \alpha \cdot \pi^{e}_{t+h|t-1} + \beta \cdot \pi_{t-1} + \in_t$$

Considering that regime changes are often gradual, the above equation is estimated allowing for model parameters to vary over time. The model is estimated for both one quarter ahead and one year ahead inflation expectations of households and professional forecasters. The time-varying parameter estimates show that the beta (β) parameter – signifying the influence of actual inflation on inflation expectations (IE) – has dropped significantly from peak levels of 2010-2014, for one year ahead inflation expectations of both households and professional forecasters (Chart 1c and d). From mid-2014, the beta (β) parameter has gradually declined and remained statistically significant up to mid-2017. Hence, the adoption of FIT has led to an enhancement in monetary policy transparency which is associated with an improved degree of anchoring of inflation expectations in India (Samanta and Kumari, 2021).

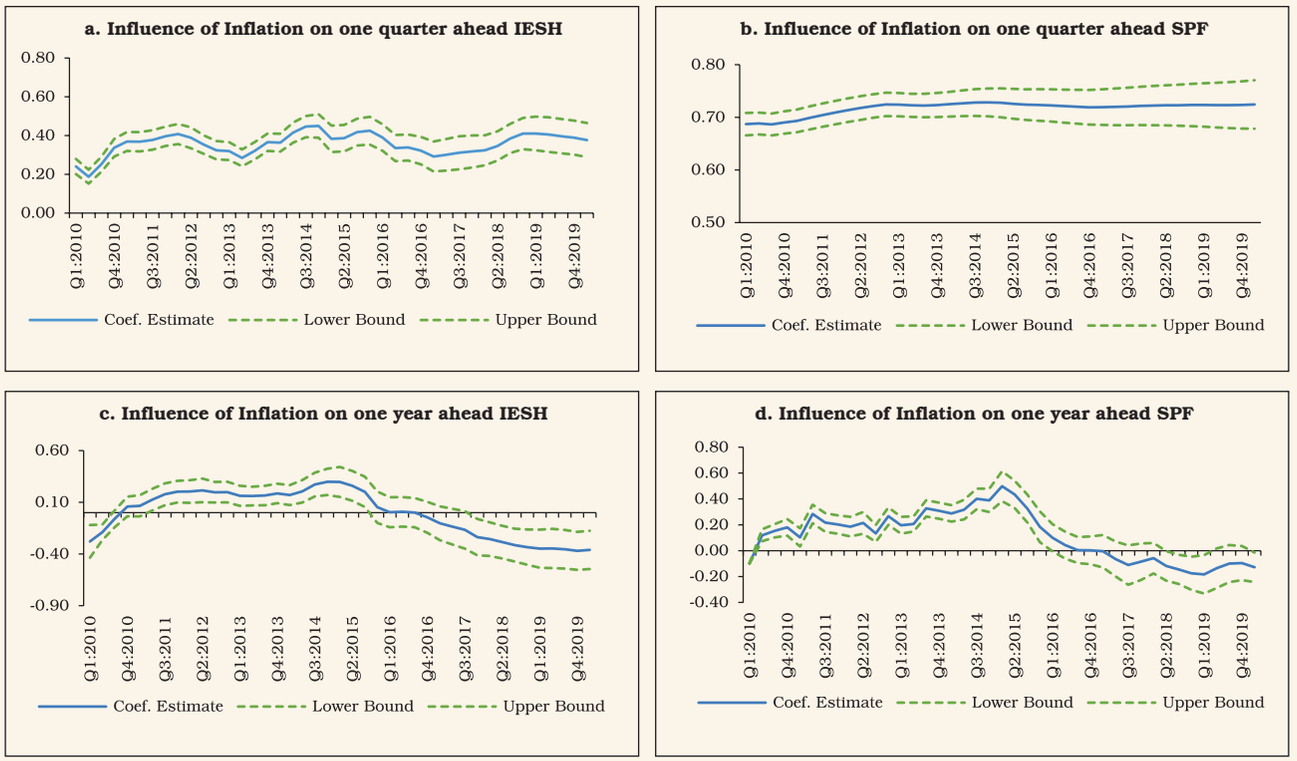
In order to explore the level of inflation expectations around which one year ahead expectations have stabilized post-FIT, the following model is used:

$$\pi^{e}_{t} = \alpha_t + \beta_t \cdot (\pi_t) + \varepsilon_t$$

where α_t depicts the time-varying trend level of expectations. This slow-moving trend indicates the long-term level around which expectations have been stabilized. The resulting time-varying estimates for alpha (α) parameter confirms stabilisation of IE around the range of 9-10 per cent for

(Contd...)

Chart 1: Sensitivity of Inflation Expectations to Past Inflation

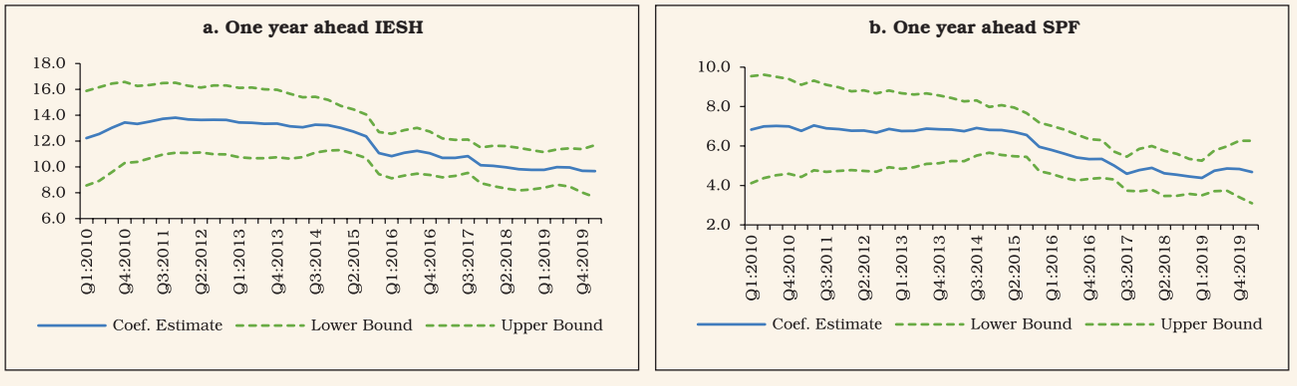


Note: Above estimates are computed using state-space model framework and kalman-filtering approach; Data Sample – 2008:Q3-2020:Q1; Actual inflation is based on CPI-Combined Index; Similar results are obtained when contemporaneous inflation is used in place of lagged inflation;
Source: RBI staff estimates.

households and 4-5 per cent for professional forecasters (Chart 2).

Lastly, anchored inflation expectations can be both 'shock anchored' and 'level anchored' (Ball and Mazumder,

Chart 2: Time Varying Trend of Inflation Expectations



(Contd...)

Table 1a: Test for 'Shock Anchored' Inflation Expectations of Households

$$IE1YH = c + \beta_1 CPIIWEX + \beta_2 CPIIWF + \beta_3 CPIIWT + \varepsilon_t$$

Period	c	CPIIWEX	CPIIWF	CPIIWT	Adj. R^2
Q2:2009-10 to Q2:2016-17	**10.357** [0.000]	-0.179 [0.377]	0.123 [0.147]	**0.363** [0.003]	0.417
Q3:2016-17 to Q4:2019-20	**7.601** [0.000]	-0.055 [0.536]	0.192 [0.092]	**0.224** [0.044]	0.213

IE1YH : One year ahead mean inflation expectations of households
CPIIWEX : Four quarter lagged CPI-IW inflation-excluding 'food', 'fuel and light' and 'transport and communication'
CPIIWF : CPI-IW inflation of subgroup 'food' for the previous month
CPIIWT : CPI-IW inflation of subgroup 'transport and communication' for the previous month

Figures in brackets are p-values.
Source: RBI staff estimates.

2011; Chen, 2019). Testing this hypothesis, the inflation outlook of professional forecasters is found to be both shock and level anchored, while households' expectations were susceptible to fuel price shocks, based on recent experiences (Table 1a and b).

Table 1b: Test for 'Shock Anchored' Inflation Expectations of Professional Forecasters

$$IE1YS = c + \beta_1 CPIIWEX + \beta_2 CPIIWF + \beta_3 CPIIWT + \beta_4 CPIIWFl + \varepsilon_t$$

Period	c	CPIIWEX	CPIIWF	CPIIWT	CPIIWFl	Adj. R^2
Q2:2009-10 to Q2:2016-17	**3.471** [0.000]	-0.059 [0.295]	**0.223** [0.000]	-0.000 [0.993]	**0.233** [0.000]	0.810
Q3:2016-17 to Q4:2019-20	**5.000** [0.000]	**-0.125** [0.001]	0.101 [0.083]	0.023 [0.696]	-0.043 [0.316]	0.693

IE1YS : One year ahead mean inflation expectations of professional forecasters
IE1YS : Two quarter lagged value of CPI-IW inflation of subgroup 'food'
CPIIWT : Two quarter lagged value of CPI-IW inflation of subgroup 'transport and communication'
CPIIWFl : Two quarter lagged value of CPI-IW inflation of subgroup 'fuel and light'

Figures in brackets are p-values.
Source: RBI staff estimates.

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6. The Objective of Growth

II.49 Given the dual mandate of FIT, there has been considerable debate as to whether primacy assigned to price stability contributed to the growth slowdown. The absence of a quantitative target for growth, unlike for inflation, impedes an objective assessment of the debate. Hence, this section turns to a review of the experiences of inflation targeting countries to explore the possibility of drawing lessons therefrom in order to evaluate the central issue of the debate referred to above.

6.1 Country Experience

II.50 In several inflation targeting countries, growth is not explicitly stated as an objective of monetary policy. In some others, their objectives include growth explicitly (Annex II.4). Whether stated explicitly or implicitly, however, it has never been quantified or set as a numerical target, unlike the inflation target. Furthermore, growth is never reported as the primary objective of monetary policy. In policy communication, most central banks are emphatic that by keeping inflation low, stable and predictable, monetary policy can create an appropriate environment to stimulate investment and achieve long-term sustainable economic growth.

II.51 In Australia, the objective of monetary policy is to set interest rate in a way that best contributes to the stability of the currency (price stability), full employment, and the economic prosperity and welfare of the people of Australia. In New Zealand, besides price stability, monetary policy is mandated to support maximum sustainable employment. Under operational objectives, it explicitly requires the MPC to consider a broad range of labour market indicators with the realisation that the maximum sustainable employment is not directly measurable. The explicit goals of monetary policy of the US Federal Reserve are to promote maximum employment, stable prices and moderate long-term interest rates. In the UK, the main aim of monetary policy is to maintain low and stable inflation to support the government's main objective to achieve strong, sustainable and balanced growth. In the post-GFC low inflation environment, policy attention has turned increasingly to growth in advanced and emerging economies alike, justifying the use of ultra-accommodative monetary policy. Even so, neither has growth been set as the primary objective of monetary policy nor has the growth objective been quantified.

II.52 There is an overwhelming consensus that monetary policy cannot raise long-term (or potential) growth (Papademos, 2003). It can only reduce the variability of output around the potential (Meyer, 2001). The best contribution of monetary policy to growth is through low and stable inflation (Lacker, 2014). There is also an alternative view that a temporary shortfall in demand, unless stabilised in a timely manner, can lead to a permanent loss of output through hysteresis effects[21] (Garga and Singh, 2021). Monetary policy shocks can trigger long-run effects on total factor productivity, capital accumulation and overall productive capacity of an economy (Jorda *et al*., 2020). Monetary policy under FIT tends to be asymmetric – too tight during recessions and not so loose during expansions – generating a downward impulse to aggregate demand and the resultant negative real effects on output growth (Libanio, 2010).

II.53 In India, sustained deceleration in GDP growth during the FIT period requires empirical examination of the role of monetary policy. A specific indicator that could help in this assessment is the level of the real policy interest rate during and before FIT.

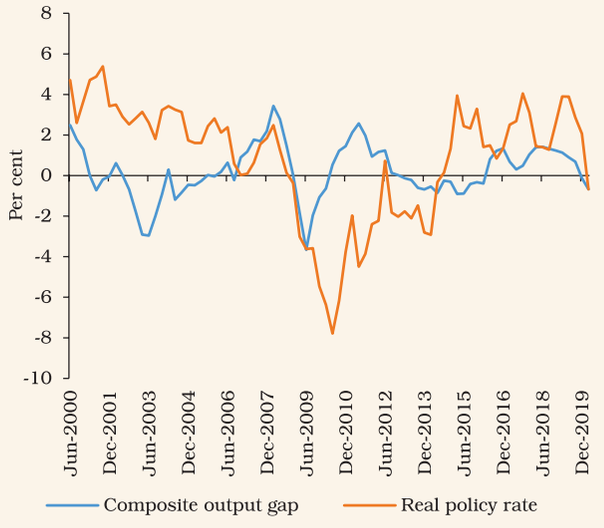
6.2 Real Policy Interest Rate

II.54 The real policy rate remained persistently positive during the FIT period (excluding last two quarters), whereas in the pre-FIT period, the real policy rate was negative for a long period (Chart II.19)[22]. Is lower investment and GDP

21 Hysteresis refers to the impact of an event in the economy persisting into the future even after the original shock fully dissipates.

22 Contemporaneous quarterly CPI-C average inflation has been used as the deflator for arriving at average real policy repo rate. For empirical assessment later in this section, inflation expectations (backward looking) are used to derive real policy rate. The output gap is an average of gaps obtained from different estimated models.

Chart II.19: Output-gap and Real Policy Rate



Source: RBI staff estimates.

growth during FIT attributable to the positive real policy rate?

II.55 Empirical estimates suggest that for a one percentage point reduction in the real policy interest rate, the investment rate could increase by about 9 bps in the short-run and 109 bps in the long-run[23]. Reducing the real policy rate involves, however, tolerance of inflation up to 1 percentage point above target that can dampen investment by about 6 bps in the short-run and 69 bps in the long-run. A one percentage point reduction in the real policy rate enhances growth by 40 bps in the short-run and 52 bps in the long-run[24]. Tolerating higher inflation, however, involves sacrifice of growth by about 30 bps in the short-run and 40 bps in the long-run. On a net basis (using two comparable standardised parameters), GDP growth could increase by about 12 bps in the long-run, but this does not take into account the feedback from inflation to inflation expectations, and then to investment and growth.

23 The following regression equation is estimated:

$$\mathrm{Inv}_t = \alpha + \beta \mathrm{Int}_t + \gamma \mathrm{X}_t + \varepsilon_t$$

where **Inv** refers to the investment rate, **Int** is the real policy interest rate (defined as the difference between effective policy rate and expected inflation measured by taking one quarter lagged year-on-year inflation) and **X** captures the impact of other variables relevant for investment decisions. As investors are largely driven by the future growth outlook, the long-term growth forecast derived from a Beveridge-Nelson decomposition of trend output is used to capture the acceleration principle driving the investment behaviour. Similarly, greater financial development can increase the scope of investments which is proxied by the credit to GDP ratio. A dummy variable (*Dstruct*), taking value 1 for the period since 2018:Q3 through 2020:Q1 and zero for the rest of the period is used to account for the slowdown.

GMM estimates of determinants of investment rate are given below:

$$\underset{}{Inv_t} = \underset{(8.73)^{***}}{1.69} + \underset{(123.44)^{***}}{0.92 Inv_{t-1}} + \underset{(8.73)^{***}}{0.14 trend g_t} - \underset{(-7.40)^{***}}{0.09 Int_{t-1}} + \underset{(5.20)^{***}}{0.09 \Delta NFCGDP_{t-2}} - \underset{(-3.40)^{***}}{0.06 \pi_{t-1}^{TH4}} - \underset{(-1.78)^{*}}{1.16 Dstruct}$$

Long-run estimates:

$$\underset{}{20.23} \qquad \underset{}{1.66} \qquad \underset{}{-1.09} \qquad \underset{}{0.37} \qquad \underset{}{-0.69}$$

R^2 =0.96; Cragg-Donald F-stat =0.72; Stock-Yogo TSLS 5 per cent critical value (relative bias): 21.0.

***; *: significant at 1 per cent and 10 per cent levels, respectively.

H_0: Instruments are weak (for testing weak instruments in Crag-Donald test).

24 GDP growth (y-o-y) is regressed on a constant, one period lagged growth, inflation exceeding the 4 per cent target level (π_t^{TH4}), world GDP growth (*WGDPg*) and real policy interest rate in order to examine the impact of a lower real policy rate directly on GDP growth (*GDPg*).

GMM estimates on drivers of GDP growth are given below:

$$\underset{}{GDPg_t} = \underset{(6.15)^{***}}{3.40} + \underset{(2.69)^{***}}{0.24 GDPg_{t-1}} - \underset{(-3.79)^{***}}{0.40 Int_{t-1}} + \underset{(6.16)^{***}}{0.82 WGDP_t} - \underset{(-3.14)^{***}}{0.30 \pi_{t-2}^{TH4}} - \underset{(-2.44)^{**}}{0.01 \Delta EPU_{t-1}}$$

Long-run estimates:

$$\underset{}{4.50} \qquad \underset{}{-0.52} \qquad \underset{}{1.08} \qquad \underset{}{-0.40} \qquad \underset{}{-0.01}$$

R^2 =0.67; Cragg-Donald F-stat =9.96; Stock-Yogo TSLS 5 per cent critical value (relative bias): 20.9.

***; **: significant at 1 per cent and 5 per cent levels, respectively.

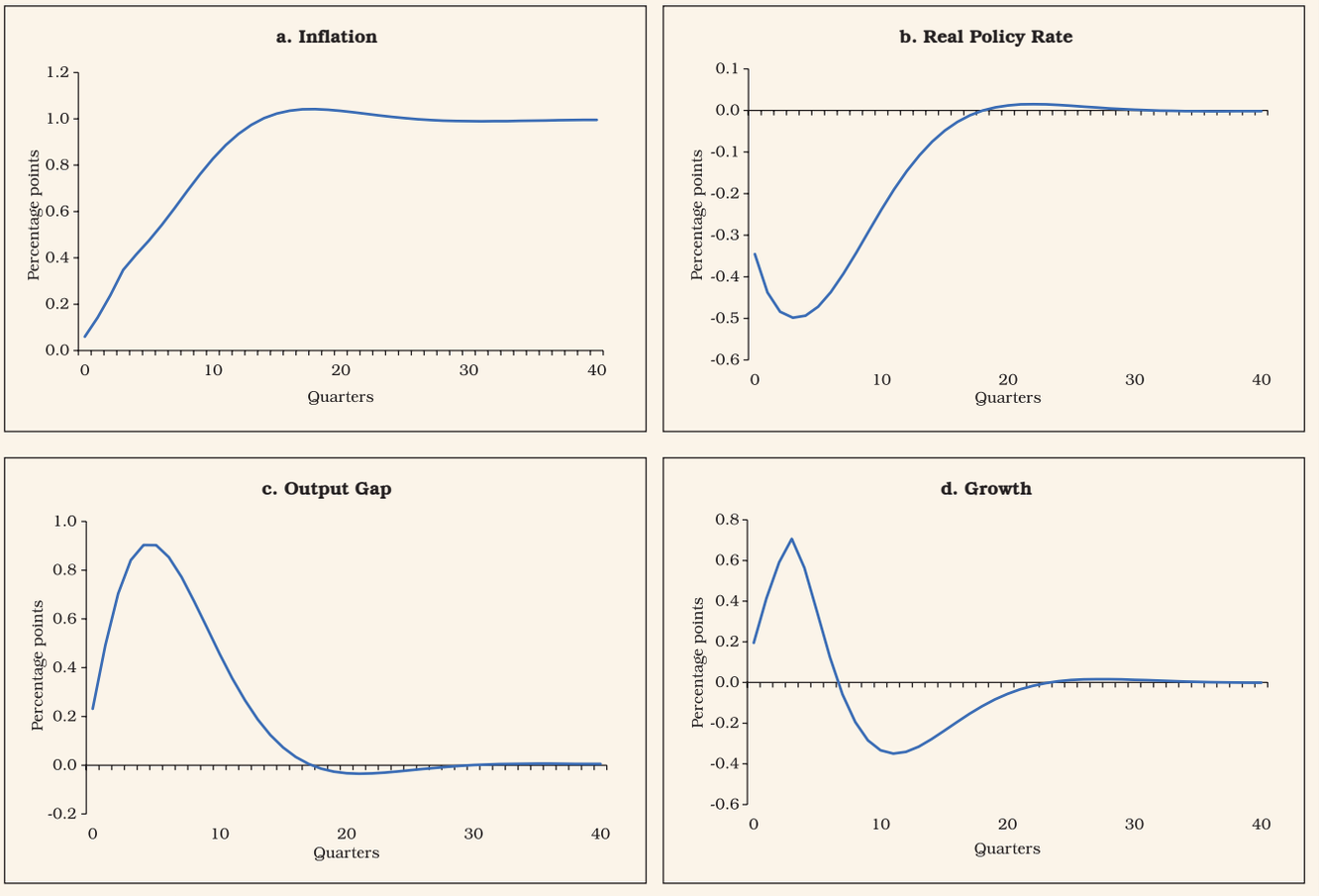
H_0: Instruments are weak (for testing weak instruments in Crag-Donald test).

These results are consistent with recent findings of empirical research for India (Pattanaik *et al*., 2020).

II.56 In order to incorporate this feedback loop, the QPM is employed[25]. The results show that a passive tolerance of higher inflation by one percentage point leads to unhinging of inflation expectations by a similar magnitude. This leads to decline in the real interest rate in the short-run, opening up a positive output gap. Inflation expectations settle at an elevated level over time, thereby, pushing up all the nominal variables, including the policy interest rate. This increase in the policy rate leads to an increase in the real interest rate later. The output gap closes to zero and real output returns to equilibrium leading to no long-term stimulating impact of higher inflation tolerance on GDP growth (Chart II.20).

II.57 Trend GDP growth during the FIT period (pre-COVID) works out to 6.5 per cent[26] when CPI headline inflation averaged 3.9 per cent. While presenting the Union Budget for 2019-20 in July 2019, the Honourable Union Finance Minister emphasised the need for directing policy priority

Chart II.20: Passive Tolerance of Inflation (Shock: One Percentage Point)



Source: Benes *et al.*, 2016.

25 Benes *et al. (*2016), "Quarterly Projection Model for India: Key Elements and Properties", RBI Working Paper Series No. 08.

26 The estimated parameters and average values of the variables (determinants of GDP growth in the equation) during the FIT period are used for estimating the realizable GDP growth consistent with 4 per cent inflation target.

for achieving the Honourable Prime Minister's vision of a US$ 5 trillion size economy by 2024-25. Achieving this vision is feasible, as India has demonstrated in the past its capacity to deliver real GDP growth of 7.4 per cent during 2003-04 to 2010-11 and 2014-15 to 2018-19 (Table II.8). This would, however, require raising the investment rate in the economy so that it contributes 60 per cent of average GDP growth, supported by robust growth in capital formation (10.6 per cent per annum) and boosting exports (22 per cent growth per annum), as was the case during 2003-04 to 2010-11. Total factor productivity has to contribute about 50 per cent to growth, on par with the 2014-15 to 2018-19 experience, supported by structural reforms (Annex II.5).

Table II.8: Average GDP Growth and Related Indicators

	2003-04 to 2010-11 (per cent)	2014-15 to 2018-19 (per cent)
Real GDP growth	7.4	7.4
Contribution from:		
Labour	*7.2*	*-1.3*
Capital	*60.1*	*43.5*
Labour quality	*4.6*	*2.0*
Capital quality	*4.0*	*5.0*
Total factor productivity	*24.2*	*50.9*
Nominal GDP growth	15.0	11.0
US$ denominated GDP growth	15.9	7.9
Share of gross capital formation in GDP	36.6	32.8
Growth in gross fixed capital formation in GDP	10.6	7.1
Growth of exports of goods and services	22.3	6.0
Bank credit growth	25.0	7.4
Share of NPAs (as proportion of advances)	3.5	8.4
GDP deflator inflation#	7.2	3.3
WPI inflation	6.2	1.3
CPI-C inflation*	7.1	4.5

#: Compound annual growth rate for the entire period.
*CPI-IW for 2003-11 period.
Sources: KLEMS, RBI and NSO.

7. Conclusion

II.58 The international experience suggests that inflation targeting EMEs have either lowered their inflation targets or kept their targets unchanged over time. In India, however, the repetitive incidence of supply shocks, still elevated inflation expectations and projection errors necessitate persevering with the current numerical framework for the target and tolerance band for inflation for the next five years.

II.59 The experience of advanced economies has shown that the zero lower bound is not particularly binding and the consequent loss of the interest rate as an instrument of monetary policy has led to a preponderant reliance of central banks on balance sheet policies which tend to inflate financial asset prices without any perceptible impact on the real economy. Meanwhile, structural changes in the economy, in particular demography, income distribution and falling trend growth are challenging the relevance of monetary policy as an instrument of stabilisation even as rising protectionism, digitisation, and climate change pose new risks. The pandemic is expected to leave permanent scars on the global economy, amplifying the effects of underlying structural changes and posing the risk of short-run disequilibria in the form of surges of inflation and increase in inequality. It is in this context that several central banks around the world are undertaking introspective reviews of their monetary policy frameworks and India cannot be immune to these tectonic shifts. Monetary policy has entered a twilight zone and until clarity emerges on the shape of the future, it is important to entrench its nominal anchor so that it can continue to perform its stabilising role.

II.60 On the lower tolerance limit for the inflation target, measurement errors warrant caution. Since inflation targets in AEs remain unchanged at about 2 per cent, notwithstanding persistent deflationary conditions, the lower tolerance band in India should not be less than 2 per cent. This is also consistent with estimates of supply shocks presented in the chapter. On the upper tolerance limit, international experience suggests that countries with a large share of food in the CPI basket tend to have higher inflation targets and wider tolerance bands. Threshold estimates over a longer sample period work out to 6 per cent, beyond which tolerance of inflation can be harmful to growth. Hence, the current tolerance band of +/-2 per cent may be retained notwithstanding the central tendency emerging from the country experience of lowering targets and narrowing bands over time.

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Annex II.1: Threshold Inflation Estimates for India in Empirical Literature

Study	Period	Inflation Threshold (per cent)
Chakravarty Committee Report (1985)		4
Rangarajan (1998)		6
Kannan and Joshi (1998)	1981-1995	6
Vasudevan, Bhoi and Dhal (1998)	1961-1998	5-7
Samantaraya and Prasad (2001)	1970-1999	6.5
Report on Currency and Finance (2002)	1971-2000	5
Singh and Kalirajan (2003)	1971-1998	No Threshold (negative relation between growth and inflation)
Bhanumurthy and Alex (2010)	1976-2004/1997Q1-2005Q4/ Jan2000-Apr2007	4-4.5
Singh (2010)	1970-2009	6
RBI Annual Report 2010-11		4-6
Pattanaik and Nadhanael (2013)	1972-2011	6
Mohanty *et al.* (2011)	1996-2011	4-5.5
IMF(2013)	1996-2011 (Quarterly)	5-6
RBI (2014)	1997-2013	6.2-6.7 (CPI-C) 4.6-5.8 (WPI)
Mohaddes and Raissi (2014)	1989-2013	5.5
Behera and Mishra (2017)	1990-2013	4
Mallick and Sethi (2018)	April 2006 to May 2015	4.8
Dholakia (2020)	1995-96 to 2018-19	5.4 - 6
Rangarajan (2020)	1982-2009 / 1992-2018	6-7

Annex II.2: Optimal Inflation in a Macroeconomic Framework

In order to assess the optimal level of inflation of India using macro theoretic approach, a new class of "agent-based model (ABM)" is used where the interactions of heterogenous economic agents (*e.g.,* households, firms, central bank and government) give rise to various macroeconomic outcomes and their decisions are not governed completely by rationality. ABMs can incorporate supply-demand mismatches and hence can be used to study adjustment mechanisms towards equilibrium. In the model (Gualdi *et al*., 2017), households' consumption expenditure, which depends on their accumulated earnings and prices of consumable products, conditions the demand side of the economy. On the supply side, firms make adjustment to their production, price (of the product) and wage (offered to the labour) based on a host of factors which include profit, demand, credit and labour market conditions. The financial side of the economy is captured through commercial banks and their role in intermediation between savers (households) and borrowers (firms). The central bank sets the policy rate as per a Taylor-type rule to steer the inflation towards the target. The inflation target influences inflation expectations, which in turn affect the nominal prices and wages, real cost of credit faced by firms, and return on household savings, *etc.* The extent to which inflation target affects inflation expectations of the economic agents is governed by the credibility of the central bank.

To determine the optimal level of inflation, the model is run multiple times with different values of inflation target ranging from zero to eight per cent. Each level of inflation target is associated with some benefits and costs, summarised in the form of output loss and price dispersion (Chart 1). The results imply an increase in output loss for inflation below 3.5 per cent and above 4.5 per cent and the loss is significantly high for inflation below 3 per cent. The price dispersion is found to increase with levels of inflation, and the increase is sharp for inflation above 5 per cent.

The inflation reaches its optimal level when both output loss and price dispersion are at the lowest level. Therefore, a weighted measure of net cost/ benefit, combining both output loss and price dispersion is estimated through a loss function where equal weights are assigned for output variability and price dispersion. Optimal inflation is the level of inflation at which this loss function is minimised. The results show the loss is at its minimum level when the inflation is around 5 per

Chart 1: Costs and Benefits of Inflation Target

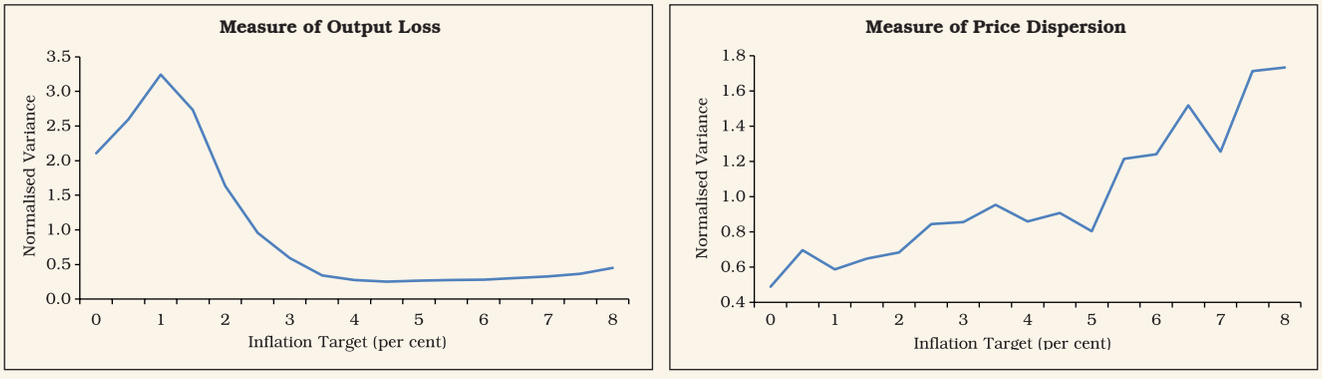

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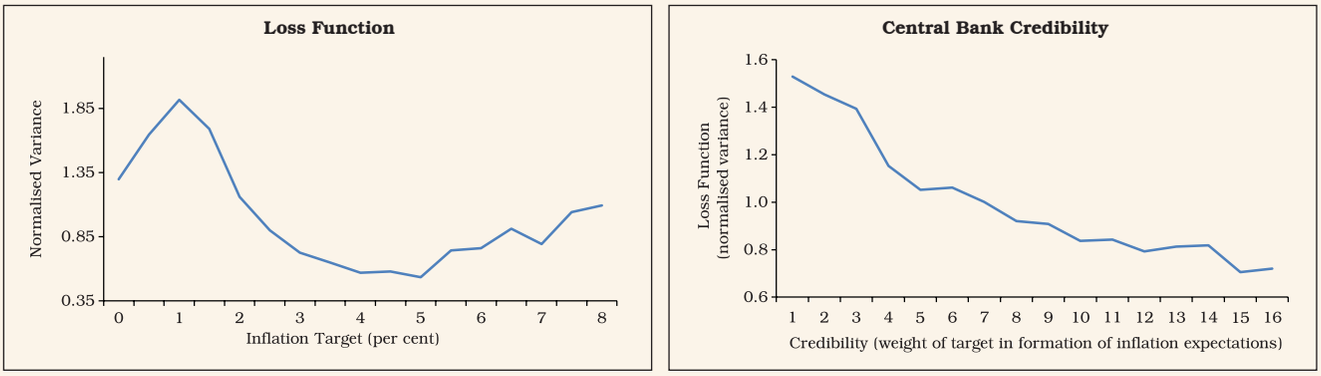
Chart 2: Welfare Loss and Central Bank Credibility



cent (Chart 2). Further, the response of the loss function at a particular target level to varying degree of central bank credibility is assessed. The broad idea is that agents in the economy form inflation expectations based on actual inflation and the target. If the central bank is more credible, agents place more weight on the target and *vice-versa*. The results imply that improvement in the credibility of the central bank lowers the loss associated with a given level of the target.

Reference

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Annex II.3: Supply Shocks and the Lower Tolerance Band

A standard medium-scale DSGE model (Smets and Wouters, 2007) is used to assess the impact of supply shocks on inflation. The model has three major blocks: households, firms and the government. The government block includes the fiscal and monetary authorities.

The households are inter-temporal utility maximisers. They supply labour and capital to the firm sector in return of wage and rental earnings. They can save either in risk-free one period government bond or in capital. They also choose how intensively capital is used in the production process. Their decision about how much to save in capital determines the investment level in the economy.

The firm sector includes two types of firm, *viz*. a final-goods producing firm and a continuum of intermediate goods producing firms. The production function of intermediate-goods producing firms combine labour and capital according to the constant returns to scale (CRS) technology. The final-goods firm combines the produce of intermediate-firms according to standard Dixit-Stiglitz aggregation, which is then sold to the households.

The fiscal authority issues bonds and raises lump-sum taxes to meet the expenditure on goods and services. The monetary authority sets the nominal interest rate following a Taylor-type rule. The interest rate affects the economy by influencing the behaviour of optimising households broadly in two ways: first, it affects inter-temporal substitution between consumption and savings and, second, it also influences the intra-temporal substitution between bond and capital investment.

Identification of supply shocks

The intermediate firms operate in a monopolistically competitive environment and hence possess pricing power. However, they are assumed to face Calvo (1983) type price rigidity, which results in to the following New Keynesian hybrid Phillips curve specification,

$$\pi_t = a.\pi_{t-1} + b.E_t\pi_{t+1} + c.mc_t + shock_t$$

Here a, b and c are the appropriate reduced form coefficients capturing the impact of lagged inflation, forward-looking inflation expectations and real marginal cost, respectively, on actual inflation. The shock term captures the residual impact on inflation excluding the demand side effects originating from households and the government. This acts as a reduced-form proxy capturing the effect of supply-side shocks on inflation.

References:

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Annex II.4: Objectives of Monetary Policy for the Inflation Targeting Countries

Sr. No.	Country	Year of Adoption of IT	Key Monetary Policy Objective
Countries with single mandate of Inflation targeting			
1	Brazil	1999	"Keeping inflation around the target is a fundamental objective of the Banco Central do Brasil (BCB)."
2	Japan	2013	The Bank of Japan Act states that the Bank's monetary policy should be "aimed at achieving price stability."
3	Switzerland	2000	"…ensure price stability."
4	Chile	1999	"…the primary objective of monetary policy is price stability."
5	Czech Republic	1997	"… primary purpose is to maintain price stability."
6	Sweden	1993	"... maintain price stability."
7	Mexico	2001	"...its primary objective shall be to seek the stability of the purchasing power of said currency."
8	Russia	2015	"The objective of monetary policy is "to ensure price stability, that is, sustainably low inflation."
9	Egypt	2005	"...price stability being the primary and overriding objective."
10	Iceland	2001	"The principal objective of the Central Bank of Iceland is to promote price stability."
11	Armenia	2006	"The primary goal of the CBA is prices stability."
12	Canada	1991	"to preserve the value of money by keeping inflation low, stable and predictable."
13	Poland	1998	"The basic objective of the activity of NBP shall be to maintain price stability, while supporting the economic policy of the Government, insofar as this does not constrain the pursuit of the basic objective of NBP."
14	Kazakhstan	2015	"... ensuring price stability in the Republic of Kazakhstan."

(Contd...)

Sr. No.	Country	Year of Adoption of IT	Key Monetary Policy Objective
Countries with Dual/multiple mandates			
1	Australia	1993	"…the Reserve Bank Board will best contribute to the stability of the currency of Australia, the **maintenance of full employment**, and the economic prosperity and welfare of the people of Australia."
2	New Zealand	1990	"The objective of monetary policy is to achieve "the economic objectives of price stability" and support "**maximum sustainable employment."**
3	USA	2012	"…so as to **promote effectively the goals of maximum employment**, stable prices, and moderate long-term interest rates."
4	UK	1992	"to maintain price stability and subject to that, to support the economic policy of Her Majesty's Government, including its objectives for **growth and employment**."
5	Turkey	2006	"The Bank shall, provided that it shall not conflict with the objective of achieving and maintaining price stability, support the **growth and employment policies** of the Government."
6	Colombia	1999	"The objective of monetary policy in Colombia "is to keep inflation low and stable and to achieve the **highest sustainable level of output and employment**."
7	Israel	1997	"…to maintain price stability as its central goal." "…to support other **objectives of the Government's economic policy, especially growth, employment and reducing social gaps**… this support shall not prejudice the attainment of Price Stability over the Course of Time."
8	Thailand	2000	"conducts monetary policy under a flexible inflation targeting framework, putting emphasis on achieving price stability alongside **preserving economic growth and financial stability**."
9	South Korea	2001	"…by pursuing price stability through the formulation and implementation of efficient monetary and credit policies." "…the Bank of Korea shall pay attention to **financial stability** in carrying out its monetary and credit policies."
10	Indonesia	2005	**"Exchange rate stability** along with price stability"

(Contd...)

Sr. No.	Country	Year of Adoption of IT	Key Monetary Policy Objective
11	ECB	2003	"To maintain price stability is the primary objective of the Eurosystem." "Without prejudice to the objective of price stability... achievement of the objectives of the Union. These include inter alia "**full employment**" and "**balanced economic growth**."
12	Norway	2001	"the primary objective of monetary policy is low and stable inflation." "Inflation targeting shall be forward-looking and flexible so that it can contribute to **high and stable output and employment, and to counteracting financial imbalances**."
13	Ghana	2007	" In addition to price stability, the Bank is enjoined to support the general **economic policy of Government, promote economic growth and development**, and ensure effective and efficient operation of the **banking and credit system**; and contribute to the promotion and maintenance of **financial stability**."
14	Philippines	2002	"The primary objective of the BSP's monetary policy is to promote a low and stable inflation conducive to a **balanced and sustainable economic growth**. It shall also promote and **maintain monetary stability and the convertibility of the peso**."
15	Ukraine	2016	The Law of Ukraine On the National Bank of Ukraine identifies a priority list of objectives for the NBU in the following order: 1. "...the primary objective of the NBU is to ensure stability of the monetary unit of Ukraine." 2. "...achievement and maintenance of price stability." 3. "...shall promote... **financial stability**, including stability of the banking system, without prejudice of the objective set forth in the second part." 4. "…shall also **promote sustainability of the economic growth and support the economic policy of the Cabinet of Ministers** of Ukraine provided that it does not prevent the NBU from attainment of the aims determined in the second and third parts of this Article."

Annex II.5: Structural Reforms during Inflation Targeting Regime

Reform Measures	Actual/Likely Outcome
Insolvency and Bankruptcy Code (IBC), 2016	Time-bound resolution of stressed assets. According to the World Bank Doing Business Report, 2020, the time taken to resolve stressed loans declined from 4.3 years to 1.6 years, while recovery rate improved from 26 per cent to 72 per cent, four years into IBC.
Goods and Services Tax Act, 2017	To simplify the indirect tax regime, create a common national market by subsuming a myriad of Central and State taxes, and reducing the incidence of tax-on-tax. India witnessed a fall in the weighted average effective GST rate from 14.4 per cent to 11.6 per cent in 2019.
Real Estate (Regulation and Development) Act, 2016	Imparted transparency and boosted home buyers' sentiment.
Labour Reforms	Rationalisation of labour laws to enhance ease of doing business and improve employment opportunities by promoting a flexible labour market along with widening access to social security.
MSMEs: Turnover as an additional criterion	Increased compatibility of new definition with GST data will help streamline access to information for lenders.
Commercial Mining of Coal open to private sector participation.	Aims at reducing import of coal and increase self-reliance in coal production.
Privatisation of Public Sector Enterprise	Aims to privatise PSEs, except the ones functioning in certain strategic sectors which has been notified by the government. In strategic sectors, bare minimum PSEs will remain, but private sector will also be allowed.
Model Agriculture and Land Leasing Act 2016	Increased land use efficiency and income for landless farmers.
Essential Commodities Act, 1955 amendment (June 2020)	To attract fresh investments and create a seamless market and better value for farm produce.
Farmers (Empowerment and Protection) Agreement on Price Assurance and Farm Services Act, 2020	Create assured markets for farmers and quality raw materials for industry.
The Farmers' Produce Trade and Commerce (Promotion and Facilitation) Ordinance 2020	Opportunity for private sector to set up private markets, alternative marketing channels and online market platforms.
Early Recognition, Adequate Provisioning and timely resolution of stressed assets	Asset quality review (AQR) ensured realistic assessment of asset quality of SCBs. Provision coverage ratio of banks (without write-off adjusted) rose from 41.7 per cent at end-March 2015 to 66.2 per cent at end-March 2020. RBI circular of June 7, 2019 - strong disincentives *via* additional provisions for delay in initiating resolution process.

(Contd...)

Reform Measures	Actual/Likely Outcome
Mergers and privatisation of banks and insurance companies	Merger of public sector banks (PSBs) to create next generation banks that have strong local as well as global presence. In June 2020, there were 12 PSBs as against 27 PSBs at end March 2019. Privatisation of two PSBs and one general insurance company in 2021-22 has been proposed in the Union Budget.
Banking Governance Reforms	Bank Board Bureau formed; guidelines on incentive structure of top management in private sector banks issued.
Taxation Laws (Amendment) Act, 2019	Effective tax rate for domestic corporates, inclusive of surcharges, to decline from 34.94 per cent to 25.17 per cent if other tax sops are not availed. For new manufacturing firms set up after October 1, 2019 and commencing operations by March 31, 2023, the effective tax rate will fall from 29.1per cent to 17per cent. Measures introduced to boost investments and increase the productive capacity of the economy.
Production Linked Incentive (PLI) Scheme	Scheme worth ₹1.97 lakh crore for 13 key sectors with the objective to create manufacturing global champions. This initiative will help bring scale and size in key sectors, create and nurture global champions and provide jobs to our youth.
Survey of Villages Abadi and Mapping with Improvised Technology in Village Areas (SVAMITVA) scheme	Aims to reduce property litigations and transaction costs and improve the ease of doing business by bringing clarity in land ownership.
National Monetisation Pipeline	Monetising operating public infrastructure assets is a very important financing option for new infrastructure construction. A dedicated dashboard will create visibility among investors.

3 MONETARY POLICY DECISION MAKING PROCESS

"The procedure, conduct, code of confidentiality and any other incidental matter for the functioning of the Monetary Policy Committee shall be such as may be specified by the regulations made by the Central Board."

[Section 45ZI (12) of the Reserve Bank of India (RBI) Act, 1934 (amended by the Finance Act, 2016)]

1. Introduction

III.1 The monetary policy decision making process in India has undergone a transformation with the adoption of flexible inflation targeting (FIT) in 2016. From a Governor-centric decision making to the vesting of this responsibility with a collegial Monetary Policy Committee (MPC), India has made a transition that is engaging a growing list of countries since the late 1990s.[1] India's MPC consists of three internal members – the Governor as the Chairperson, *ex officio*; the Deputy Governor in charge of monetary policy as Member, *ex officio*; and one officer of the Bank to be nominated by the Central Board as Member *ex-officio* – and three external experts appointed by the Central Government.[2]

III.2 *De jure* specifications of this process were set out in the RBI Act amended in 2016 and in the MPC and Monetary Policy Process Regulations, 2016 (Annex III.1). Its key features are as follows:

- The MPC is entrusted with the decision on the policy repo rate required to achieve the inflation target.
- Currently, the MPC meets six times in a financial year, *i.e.*, every two months; the schedule of meetings for the entire financial year is announced in advance.[3]
- The decisions by the MPC are decided by a majority of votes by the members present and voting, and in the event of an equality of votes, the Governor has a second or casting vote.
- After the conclusion of every MPC meeting, the RBI publishes the resolution adopted by the Committee, which includes a macroeconomic assessment and outlook and the decision on the policy repo rate.
- The minutes of every MPC meeting are published on the 14th day after the MPC meeting, comprising: (a) the resolution adopted

This Chapter has been prepared by Praggya Das, Asish Thomas George, Aastha, Deepak Kumar, Dirghau K. Raut and Priyanka Bajaj. Authors gratefully acknowledge Dr. Rajiv Ranjan for his encouragement and Shri Muneesh Kapur for his valuable suggestions and comments on earlier drafts. Authors express their gratitude to Shri C.V. Joshi for his comments on statutory aspects and Dr. Jugnu Ansari and Shri Kashyap Gupta for their technical inputs.

1 Chapter I lists the countries that are formally recognised as practicing inflation targeting under their monetary policy framework.

2 The Central Government appoints external members (under clause (d) of section 45ZB (2) of the RBI Act) based on the recommendations made by a search-cum-selection committee "from amongst persons of ability, integrity and standing, having knowledge and experience in the field of economics or banking or finance or monetary policy". These members are required to be less than 70 years of age at the time of appointment. The external members hold office for a period of four years and are not eligible for re-appointment.

3 As per Section 45ZI of the amended RBI Act, the RBI shall organise at least four meetings of the Monetary Policy Committee in a year presided by the Governor, and in his absence by the Deputy Governor who is a member of the Monetary Policy Committee. Clause 3(b) of Section 45ZI of the RBI Act and Regulation 5(i)(b) of the RBI MPC and Monetary Policy Process Regulations, 2016, have provisions to reschedule a meeting or arrange an emergency meeting at 24 hours' notice. With technology enabled arrangements in place, meetings may be convened at even shorter notice period.

by the MPC; (b) the vote of each member; and (c) the statement of each member.

- The RBI is required to publish, once in every six months, a Monetary Policy Report (MPR) which contains (a) an explanation of inflation dynamics in the last six months and the near term inflation outlook; (b) projections of inflation and growth (for the period between six to eighteen months from the date of publication of the document) and the balance of risks; (c) an assessment of the state of the economy, covering the real economy, financial markets and stability, fiscal situation, and the external sector, which may entail a bearing on monetary policy decisions; (d) an updated review of the operating procedure of monetary policy; and (e) an assessment of projection performance.
- A silent or blackout period is followed by the MPC members starting seven days before the voting/decision day and ending seven days after the day policy is announced during which the MPC members avoid public comment on issues related to monetary policy other than through the MPC resolution and the Governor's press statement, after the conclusion of every meeting.

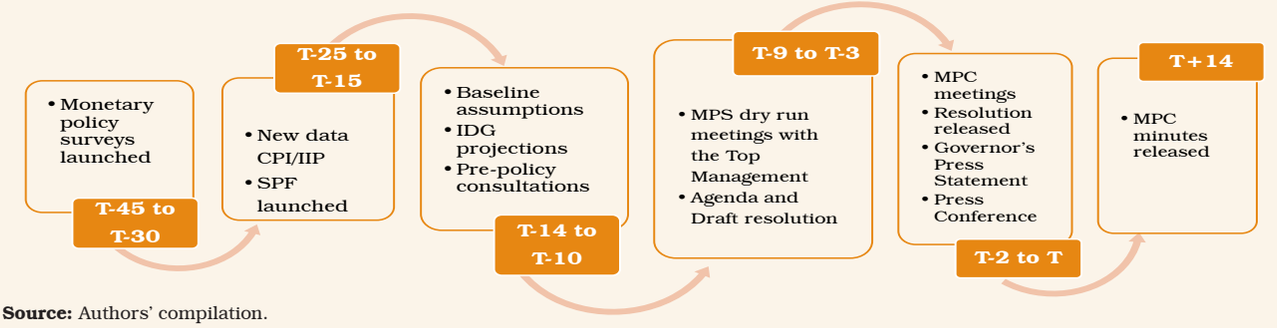
III.3 The preparation for the MPC's bi-monthly meetings starts more than a month before the MPC meets, with the RBI setting in motion the launch of the monetary policy surveys, followed

Box III.1
Monetary Policy Process of the Monetary Policy Committee

The preparations for the MPC's meeting up to the monetary policy announcement (day T), adopt the following broad timelines (Chart 1):

- T-45 to T-30 days before the policy announcement: launch of the key monetary policy surveys which include the industrial outlook survey, services and infrastructure outlook survey, order books and capacity utilisation survey, bank lending survey, survey of inflation expectations of households and the consumer confidence survey.[4]
- T-25 to T-15 days before policy announcement: following the monthly release of the index of industrial production (IIP) and the consumer price index (CPI) by the National Statistics Office (NSO), an Inter-Department Group (IDG) on inflation and growth starts preparing a detailed analysis of the recent developments in inflation and growth. The survey of professional forecasters (SPF) is also launched.
- T-14 to T-10 days before the policy announcement: the MPC Secretariat arrives at a common set of assumptions for projections of inflation and growth. Based on these baseline assumptions, the IDG makes the first round of inflation and growth projections. Scenario analysis based on the risks to the baseline projections are also prepared. Pre-policy consultations, which include meetings with economists, trade bodies, and financial

Chart 1: Monetary Policy Process of the MPC



Source: Authors' compilation.

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4 The quarterly enterprise surveys are at times launched even earlier, keeping policy synchronisation under consideration.

market participants are held under the chairpersonship of the Governor.

- T-9 to T-3 days before the policy announcement: monetary policy strategy (MPS) meeting dry run presentations to the top management are made on the results of the forward-looking surveys and the deep-dives on inflation and growth.
- T-2 to T: meetings of the MPC commence, starting with the presentations on monetary policy surveys, inflation and growth deep-dives which includes the inflation and growth assessment, outlook and scenario analysis. After the presentations, the MPC members have closed door deliberations to arrive at the monetary policy decision and to finalise the MPC resolution.
- The day of policy announcement (T): Governor makes Statement to the press; the MPC resolution is released followed by a press conference.
- T+14: release of the minutes of the MPC meeting.

by the start of the inflation and growth projection process, consultations with key stakeholders, and preparation of the draft MPC resolution (Box III.1).

III.4 The process of preparing projections by the RBI staff is structured into nowcasting, short-term, and medium-term projections (Box III.2).

Box III.2
Inflation and Growth Projection Process

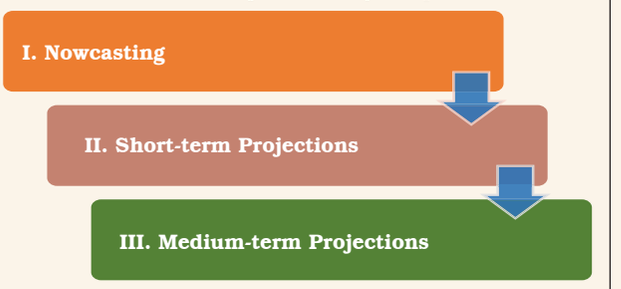
The forecasting process under FIT accompanying each bi-monthly MPC policy meeting has three broad components, based on forecast horizon and methods employed (Raj *et al.* 2019). The first component, the nowcasting[5] of key macroeconomic variables by the IDG[6], uses high-frequency indicators that become available ahead of the official data releases on inflation and growth for the current quarter/ month and informed judgement based on extensive discussions with subject area experts, forward-looking surveys and market intelligence.

The second component comprises of short-term forecasts for up to three quarters ahead by the IDG, based on a common set of key assumptions. The short-term forecasts follow a bottom up approach to arrive at the headline CPI inflation and GDP growth projections using full information projection system that employs competing models (structural time-series analysis; multivariate regression analysis; forward looking surveys and lead indicators) (Chart 1).

Individual projections are combined by using standard methodologies, by weighting with the relative accuracy of past individual forecasts. Combination forecasts are generally found to outperform individual forecasts (John, Singh, and Kapur, 2020).

The third component involves generating medium-term forecasts and risk scenarios using the quarterly projection model (QPM), which as stated in Chapter I, is a calibrated new-Keynesian gap model within a Forecasting and Policy Analysis System (FPAS) (Benes *et al.* 2016).

Chart 1: CPI Projections - Key Components



Source: Adapted from Raj *et al.* (2019).

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Raj, *et al.* (2019), "Inflation Forecasts: Recent Experience in India and a Cross-Country Assessment", Reserve Bank of India, Mint Street Memo No. 19.

5 Since data releases often take place with a lag, the current quarter and sometimes even the previous quarter actual numbers are not available to the policy makers at the time of decision making. Hence, they have to rely on 'nowcasts' – the estimates of current quarter based on a set of coincident indicators.

6 Inter-Departmental Group (IDG) comprises of three central office departments of RBI, *viz.,* Department of Economic and Policy Research (DEPR), Department of Statistics and Information Management (DSIM) and Monetary Policy Department (MPD).

III.5 In the rest of the chapter, Section 2 sets out an analytical documentation of the MPC voting patterns, individual statements, diversity in the MPC deliberations and on the weights assigned by the MPC members to the monetary policy objectives of inflation and growth while arriving at their monetary policy decisions. Section 3 presents an evaluation of the growth and inflation projection processes along with an impact assessment of the MPC under the FIT on communication and transparency. Sections 4 and 5 present an evaluation of the MPC's structure and processes, drawing on the experiences so far and from a cross-country perspective, centred on those aspects that have worked well and on those which can be reviewed for further refinement of the MPC processes. Section 6 concludes the chapter.

2. Experience with the MPC: Voting Patterns (2016-2020)

III.6 Of the 22 meetings of the MPC during the period since its first meeting in October 2016 and until March 2020, all meetings barring the March 2020 meeting were held as per pre-announced bi-monthly schedules and all meetings were held with full attendance.[7]

III.7 The MPC has seen 11 different members over this period. While the three external members were constant, the internal members who were the MPC members *ex officio*, changed due to change in the persons holding the office. There were in all eight internal members.[8] Government nominated Dr. Chetan Ghate, Professor, Indian Statistical Institute, Professor Pami Dua, Director,

Table III.1: Voting Records of the MPC Members on the Policy Rate

Voting on the Policy Repo Rate													
Announcement/Voting Pattern				Members as on March 2020						Past Members			
Date of Announcement	Repo Rate (per cent)	Voting Decision (bps)	Voting Pattern	Shri Shaktikanta Das	Dr. Michael Debabrata Patra	Dr. Janak Raj	Prof. Chetan Ghate	Prof. Pami Dua	Prof. Ravindra H. Dholakia	Sh Bibhu Prasad Kanungo	Dr. Viral V. Acharya	Dr. Urjit R. Patel	Shri R. Gandhi
	6.50												
4-Oct-16	6.25	(-)25	6:0		(-)25		(-)25	(-)25	(-)25			(-)25	(-)25
7-Dec-16	6.25	No change	6:0		No change		No change	No change	No change			No change	No change
8-Feb-17	6.25	No change	6:0		No change		No change	No change	No change		No change	No change	
6-Apr-17	6.25	No change	6:0		No change		No change	No change	No change		No change	No change	
7-Jun-17	6.25	No change	5:1		No change		No change	No change	(-)50		No change	No change	
2-Aug-17	6.00	(-)25	4:2		No change		(-)25	(-)25	(-)50		(-)25	(-)25	
4-Oct-17	6.00	No change	5:1		No change		No change	No change	(-)25		No change	No change	
6-Dec-17	6.00	No change	5:1		No change		No change	No change	(-)25		No change	No change	
7-Feb-18	6.00	No change	5:1		(+)25		No change	No change	No change		No change	No change	
5-Apr-18	6.00	No change	5:1		(+)25		No change	No change	No change		No change	No change	
6-Jun-18	6.25	(+)25	6:0		(+)25		(+)25	(+)25	(+)25		(+)25	(+)25	
1-Aug-18	6.50	(+)25	5:1		(+)25		(+)25	(+)25	No change		(+)25	(+)25	
5-Oct-18	6.50	No change	5:1		No change		(+)25	No change	No change		No change	No change	
5-Dec-18	6.50	No change	6:0		No change		No change	No change	No change		No change	No change	
7-Feb-19	6.25	(-)25	4:2	(-)25	(-)25		No change	(-)25	(-)25		No change		
4-Apr-19	6.00	(-)25	4:2	(-)25	(-)25		No change	(-)25	(-)25		No change		
6-Jun-19	5.75	(-)25	6:0	(-)25	(-)25		(-)25	(-)25	(-)25		(-)25		
7-Aug-19	5.40	(-)35	6:0*	(-)35	(-)35		(-)25	(-)25	(-)35	(-)35			
4-Oct-19	5.15	(-)25	6:0*	(-)25	(-)25		(-)25	(-)25	(-)40	(-)25			
5-Dec-19	5.15	No change	6:0	No change	No change		No change	No change	No change	No change			
6-Feb-20	5.15	No change	6:0	No change	No change	No change	No change	No change	No change				
27-Mar-20	4.40	(-)75	6:0*	(-)75	(-)75	(-)75	(-)50	(-)50	(-)75				

* Meeting with consensus regarding direction of rate change but difference in magnitude of rate change.
Sources: Monetary Policy Statements, RBI and Authors' compilation.

7 As indicated in Chapter I, the universe is restricted to twenty-two meetings of the first MPC.

8 Dr. Michael Debabrata Patra served in two capacities on the MPC (i) as 'an officer nominated by the Central Board' under Section 45ZB(2) (c) of the RBI Act from October 2016 to December 2019, and (ii) as 'Deputy Governor in charge of monetary policy' under Section 45ZB(2) (b) thereafter.

Table III.2: Voting Records of the MPC members on the Monetary Policy Stance

Voting on the Policy Stance												
Announcement/Voting Pattern			Members as on March 2020						Past Members			
Date of Announcement	Voting Decision	Voting Pattern	Shri Shaktikanta Das	Dr. Michael Debabrata Patra	Dr. Janak Raj	Prof. Chetan Ghate	Prof. Pami Dua	Prof. Ravindra H. Dholakia	Sh Bibhu Prasad Kanungo	Dr. Viral V. Acharya	Dr. Urjit R. Patel	Shri R. Gandhi
4-Oct-16	Accommodative	6:0		A		A	A	A			A	A
7-Dec-16	Accommodative	6:0		A		A	A	A			A	A
8-Feb-17	Neutral	6:0		N		N	N	N		N	N	
6-Apr-17	Neutral	6:0		N		N	N	N		N	N	
7-Jun-17	Neutral	6:0		N		N	N	N		N	N	
2-Aug-17	Neutral	6:0		N		N	N	N		N	N	
4-Oct-17	Neutral	6:0		N		N	N	N		N	N	
6-Dec-17	Neutral	6:0		N		N	N	N		N	N	
7-Feb-18	Neutral	6:0		N		N	N	N		N	N	
5-Apr-18	Neutral	6:0		N		N	N	N		N	N	
6-Jun-18	Neutral	6:0		N		N	N	N		N	N	
1-Aug-18	Neutral	6:0		N		N	N	N		N	N	
5-Oct-18	Calibrated tigntening	5:1		CT		CT	CT	N		CT	CT	
5-Dec-18	Calibrated tigntening	5:1		CT		CT	CT	N		CT	CT	
7-Feb-19	Neutral	6:0	N	N		N	N	N		N		
4-Apr-19	Neutral	5:1	N	N		N	N	A		N		
6-Jun-19	Accommodative	6:0	A	A		A	A	A		A		
7-Aug-19	Accommodative	6:0	A	A		A	A	A	A			
4-Oct-19	Accommodative	6:0	A	A		A	A	A	A			
5-Dec-19	Accommodative	6:0	A	A		A	A	A	A			
6-Feb-20	Accommodative	6:0	A	A	A	A	A	A				
27-Mar-20	Accommodative	6:0	A	A	A	A	A	A				

Abbreviation : A: Accommodative; N: Neutral; CT: Calibrated tightening.
Source: Monetary Policy Statements, RBI and Authors' compilation.

Delhi School of Economics, and Dr. Ravindra H. Dholakia, Professor, Indian Institute of Management, Ahmedabad as the three external members on September 29, 2016 for a four year period.

III.8 Voting records of individual members on the policy rate exhibited diversity. However, this typically pertained to the change in the policy rate rather than contesting the overarching policy stance (Patra, 2017). Divergence in voting was seen both for internal and external members with internal members being relatively more cohesive in their voting pattern than their external counterparts on both rate and stance decisions (Tables III.1 and III.2).

III.9 Twelve of the 22 decisions of the MPC on the repo rate have been unanimous with respect to the direction of policy rate change. Within these 12 decisions, however, there were three decisions where the MPC differed over the quantum of the interest rate cut (Table III.3 and Annex III.2).

Table III.3: The MPC Voting Summary (October 2016 to March 2020)

Total Meetings	Meetings with decision to:			Meetings with consensus regarding direction of change/status quo
	Raise rate	Decrease rate	Maintain rate	
22	Jun-18	Oct-16	Dec-16	Oct-16
	Aug-18	Aug-17	Feb-17	Dec-16
		Feb-19	Apr-17	Feb-17
		Apr-19	Jun-17	Apr-17
		Jun-19	Oct-17	Jun-18
		Aug-19*	Dec-17	Dec-18
		Oct-19*	Feb-18	Jun-19
		Mar-20*	Apr-18	Aug-19*
			Oct-18	Oct-19*
			Dec-18	Dec-19
			Dec-19	Feb-20
			Feb-20	Mar-20*
	2	8	12	12

* The meetings without consensus on magnitude of rate change.
Sources: Dua (2020) and Annual Report (2019-20), RBI.

III.10 The MPC has never seen a tie in monetary policy decisions and hence there was no recourse to a casting vote by the Governor as the Chairman of the MPC.

The MPC Statements: Word Count and Text Mining Analysis

III.11 In a FIT framework, it is the relative emphasis given to growth and inflation over various points of time by each MPC member which eventually determines the overall monetary policy stance and the decisions on the direction of key policy rate. As noted in Chapter I, the MPC since its inception in October 2016 had to grapple with several formidable challenges – demonetisation; shocks to inflation from volatile food and crude oil prices; growth slowdown; recurrent external shocks; and the COVID-19 pandemic. An analysis of the MPC minutes on the basis of a word count of inflation and growth in the MPC members' statement, supported by text mining – with its results presented in the form of a word cloud – reflects the relative importance of the key words and phrases that dominated the MPC statements.

Word Count Analysis

III.12 During the period of initial accommodative stance from October to December 2016, inflation occupied more than 60 per cent of the growth-inflation discussions. By February 2017, however, inflation assumed centre stage in the MPC minutes, with the discussions on inflation accounting for 80 per cent of the total growth-inflation deliberations and coinciding with the change in stance of the monetary policy from accommodative to neutral. Thereafter, during June and October 2017, the relative emphasis on growth increased in the MPC statements and accounted for more than 50 per cent of the discussion space by October 2017. From December 2017, inflation discussions started getting higher emphasis in the MPC statements. During August to October 2018, more than 75 per cent of the MPC members' discussion space was occupied by inflation concerns and mirrored the change in stance to calibrated tightening.

III.13 With inflation registering sharp moderation since February 2019 and growth impulses weakening, the emphasis on inflation in the MPC members' statements ebbed and the weight attached to growth rose. With the subsequent shift of monetary policy stance from neutral to accommodative and continuation of policy rate cuts, growth discussion predominately featured in monetary policy statements of members, occupying more than 50 per cent of discussion space until February 2020. The COVID-19 pandemic led the MPC to vote for a sharp reduction in the policy rate – by 75 basis points in March 2020 – and growth concerns were the focal point, occupying nearly 75 per cent of the discussions (Chart III.1).

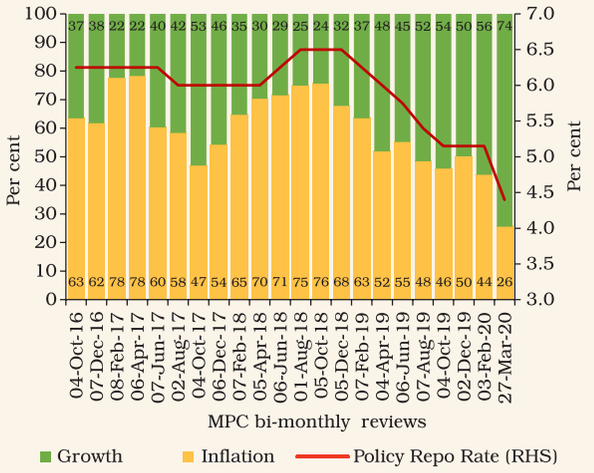
Text Mining and Word Cloud

III.14 Text mining techniques involve computational tools and statistical techniques to quantify text to uncover the implicit focal variables. While the technique of text mining is widely applied in fields such as political science and marketing, its use in economics, particularly in central bank research, is relatively nascent (David Bholat, 2015; Paul Hubert *et al.*, 2018; Bailliu *et al.,* 2021).

III.15 For the purpose of text mining analysis, the statements by the MPC members were pooled and processed[9] across three distinct stances – neutral;

9 This involves removing spaces, punctuation marks and other special notations, numbers, and uninformative words from the pooled document of the MPC statements.

Chart III.1: Share of Inflation and Growth Discussions in the MPC Members' Statements



Note: The distribution above is the share of total word count relating to growth and inflation in the MPC Members' statements.
Sources: Monetary Policy Statements, RBI and Authors' estimates.

calibrated tightening; and accommodative. Such a grouping of the MPC members' statements shows that during the accommodative and calibrated tightening phases, the discussion space occupied by the words 'inflation' and 'growth' clearly justified the MPC's stances. During the accommodative phases, the frequency of words related to growth was higher whereas the calibrated tightening stance period saw a clear shift, with discussion on inflation eclipsing that on growth. In the neutral stance phase, discussions gave primacy to inflation concerns, though growth was also in focus – more than what it was in the period of calibrated tightening (Chart III.2).

III.16 Box plots of word counts help to bring out the extent of cohesion and diversity among the MPC members. Each data point in the box plot depicts the relative importance given to growth and inflation (number of words spent on these discussions) by each MPC member across the 22 bi-monthly statements, grouped according to the policy stance. During the calibrated tightening stance, the median value of the word count on inflation was the highest along with the lowest inter-quartile range. Similarly, during the accommodative phase, word count on growth recorded a higher median value *vis-à-vis* inflation. However, the relatively wider inter-quartile range around growth during this phase also points to considerable divergence among the MPC members on the weightage assigned to growth. In the neutral stance phase, the relative importance given to growth and inflation by the MPC members varied widely as is seen from the high positive

Chart III.2: Word Clouds across Monetary Policy Stances, October 2016 - March 2020

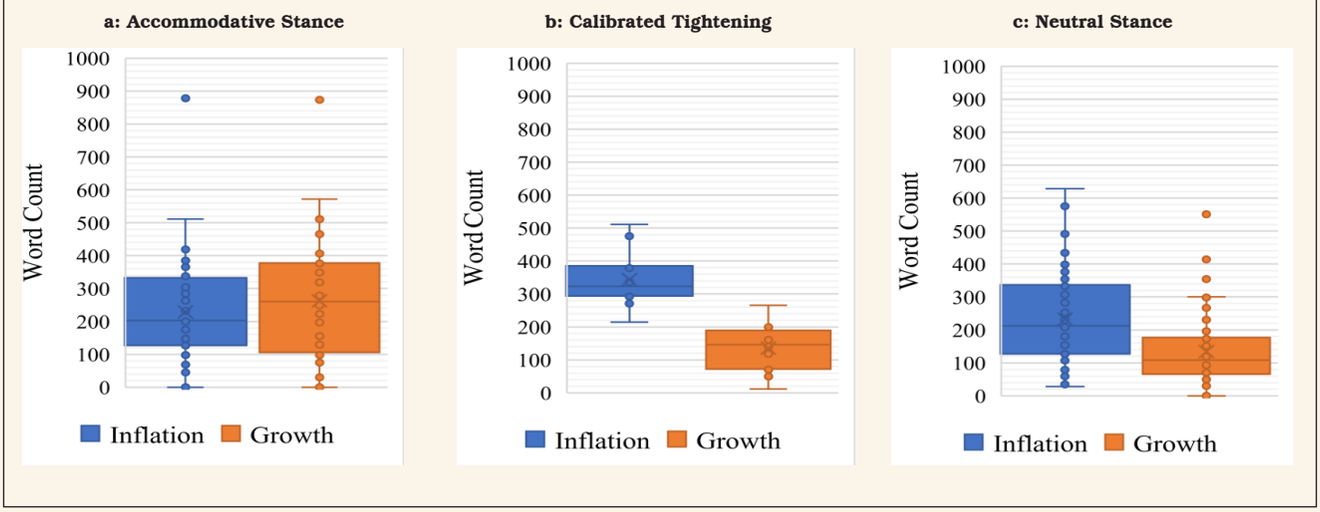
a: Accommodative Phase

b: Calibrated Tightening Phase

c: Neutral Phase

Sources: Monetary Policy Statements, RBI and Authors' estimates.

Chart III.3: Distribution of Inflation and Growth Word Count across the MPC Policy Stances



Sources: Monetary Policy Statements, RBI and Authors' estimates.

skew in the box plots of growth and inflation word counts. This ultimately showed up in their voting preference (Chart III.3).

Diversity and Dissent

III.17 Heterogeneity in the MPC structures globally has reflected preferences, views of members and differences in skills and backgrounds all of which has imparted diversity in voting. This drives the Committee to adopt an eclectic approach which serves to limit the risk that a single viewpoint or analytical framework might become unduly dominant (Bernanke, 2007). These voting records also provide valuable information about agreement and dissent (Horváth, Smidková and Zápal, 2010).

III.18 The neutral stance period of February 2017 to August 2018 witnessed the largest number of dissent votes, on account of the fast-changing growth inflation dynamics. The first dissent vote in June 2017 was by an external MPC member for easing of policy rates, when the MPC majority decision was to pause. In August 2017, dissent came from both internal and external members. The external member voted for larger policy rate reduction, while an internal member dissented in favour of maintaining *status quo* when the MPC majority reduced the policy rate. This was the only time in the 22-meeting voting history of the MPC that dissent votes were registered for two different policy options than the MPC majority decision. Further, in the October and December 2017 policies, an external member was in favour of a reduction in policy rate against *status quo* decision of the MPC. Contrastingly, in the next two policies in February and April 2018, when the MPC kept rates on hold, an internal member dissented and voted for an increase in policy rates. Thereafter in August 2018, when the MPC raised rates for the second time, one external member voted for *status quo*.

III.19 During the calibrated tightening phase (October to December 2018), there was one dissent vote by an external member in the October

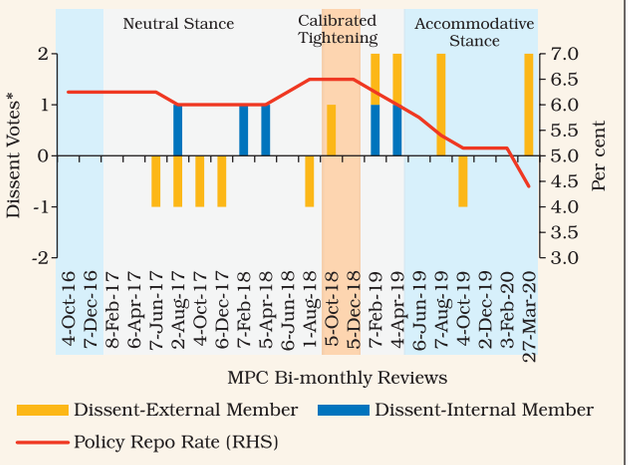
policy for a rate increase against the MPC decision to keep rates on hold. The calibrated tightening phase also saw a dissent on the stance of monetary policy – an external member voted for a neutral stance in both these meetings.

III.20 The second neutral stance phase that lasted for just two MPC meetings – February and April 2019 – witnessed considerable dissent, both on the policy rate action and on the policy stance. The MPC reduced rates amidst dissent from both internal and external members who favoured maintenance of *status quo*. In the April 2019 policy, an external MPC member had a divergent view on continuing with the neutral stance and voted to change it to accommodative.

III.21 In the accommodative phase (June 2019 to March 2020) there were three instances of dissent – all by the external members. In August 2019, when the policy rate was reduced by 35 bps, two external members, while agreeing with the direction of rate change favoured a lower reduction of 25 bps. In October 2019 an external member voted for a larger reduction in the policy rate by 40 bps against the MPC consensus of 25 bps. In the March 2020 off-cycle policy, the MPC delivered a steep cut of 75 basis points, with two external members favouring a reduction of 50 bps.

III.22 Over the 22 meetings, all the external MPC members expressed dissent at some meeting, with each member dissenting in the range of two to six occasions. Two internal members also diverged from the majority view, each on two occasions. Dissent votes in the case of the policy stance in three meetings were only by external members (Chart III.4, Table III.2 and Annex III.2).

Chart III.4: Policy Meetings and the MPC Dissent Votes



* A positive dissent vote denotes cases where the MPC member voted for a higher policy rate or less deeper cuts than the MPC majority vote. A negative dissent vote denotes cases where the MPC member voted for a lower policy rate than the MPC majority vote.

Sources: Monetary Policy Statements, RBI and Authors' estimates.

III.23 Overall, the diversity index in Chapter I and internal-external member differences presented above showed considerable independence and confirms the absence of group think in the RBI's MPC.

3. Evaluation of the Projection Performance, Communication and Transparency

III.24 In a FIT framework, reliability of projections, effectiveness of communication and transparency of processes play a key role in its successful implementation. The following discussions quantify the MPC performance on these aspects.

Evaluation of the Projection Performance

III.25 Inflation and growth projection performance is reviewed on a regular basis at the RBI and its results are put in the public domain through publications. The bi-annual Monetary Policy Report (MPR), as mandated by the Statutes,

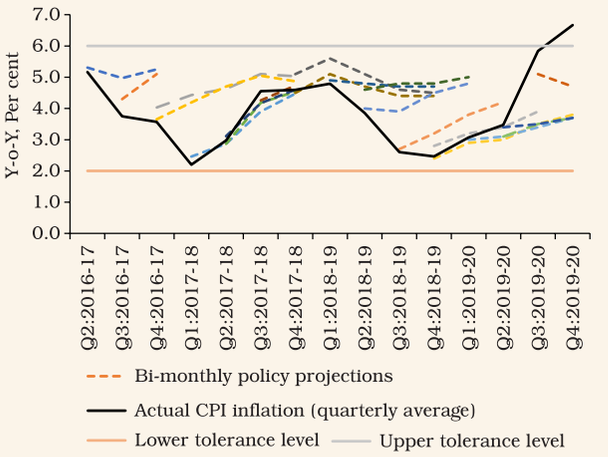
presents the size of forecast errors and the factors that contribute to such errors. A detailed analysis of forecast errors is presented to the MPC in each of its bi-monthly meetings.

III.26 Forecast performance can be evaluated on the basis of accuracy, unbiasedness, efficiency, and auto-correlation (Raj *et al.*, 2019). Accuracy is measured as deviation of forecasts from realised values, measured as mean error, mean absolute error, and the root mean squared error (RMSE).[10] Accuracy is formally verified by tests of unbiasedness which checks for any systematic under or overestimation, by regressing forecast errors on a constant term (Holden and Peel, 1990). Forecast efficiency is an evaluation of whether all information available at the time of forecasting is used. It is tested by regressing forecast errors on the most recently observed value of the forecasted variable.[11] Significant levels of autocorrelation in forecast errors would indicate inefficient use of information on previous forecasting errors in the current forecast. This analysis is carried out for inflation and growth separately for different time horizons of forecasts, *i.e.*, nowcasts and forecasts for one quarter, two quarters, and three quarters ahead.

Inflation

III.27 During the FIT regime, there have been episodes of both overestimation and underestimation of inflation. Inflation was occasionally overestimated during Q2:2016-17 to Q2:2019-20 (for three-quarters ahead inflation) and it was only in the subsequent quarters that there was some underestimation. In spite of sizeable forecast errors, the projected path of inflation remained within the tolerance band of 2 to 6 per cent (Chart III.5).

Chart III.5: Actual *versus* Projected Inflation during FIT



Note: The black line represents the actual headline CPI inflation. The coloured dotted lines represent the bi-monthly inflation projections. The bands represent the inflation tolerance band with (a lower bound of 2 per cent and an upper bound of 6 per cent).
Source: Authors' estimates.

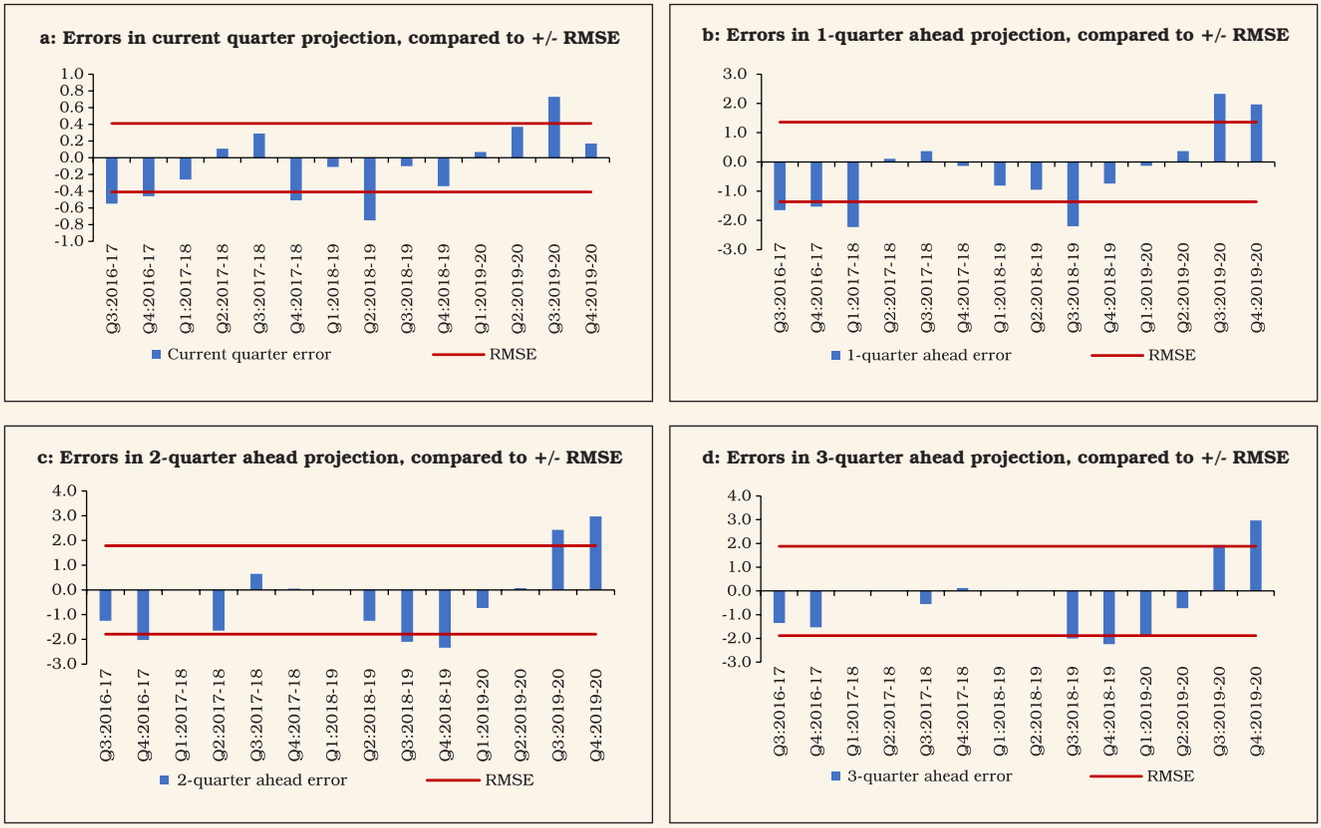
III.28 Initially narrow RMSE bands for nowcasts widened as the horizon increased up to three quarters (Chart III.6).

III.29 Formal statistical tests indicate no systematic bias in inflation forecasts across all forecast horizons. The test for efficiency of forecasts shows that nowcasts and one-quarter ahead forecasts are efficient, *i.e.*, all available information at the time of forecasting is used. However, the second and third quarter ahead forecasts are found to be statistically inefficient. While nowcast errors are not auto correlated, errors for longer forecast horizons are found to be auto-correlated.

10 These measures are widely used in the literature to estimate accuracy (Öller and Barot, 2000; Pons, 2000; Reid, 2016).

11 For variations of the same technique, see Holden and Peel (1990), Barrionuevo (1993), and Fildes & Stekler (2002).

Chart III.6: Inflation Projection Errors during FIT across Projection Horizons



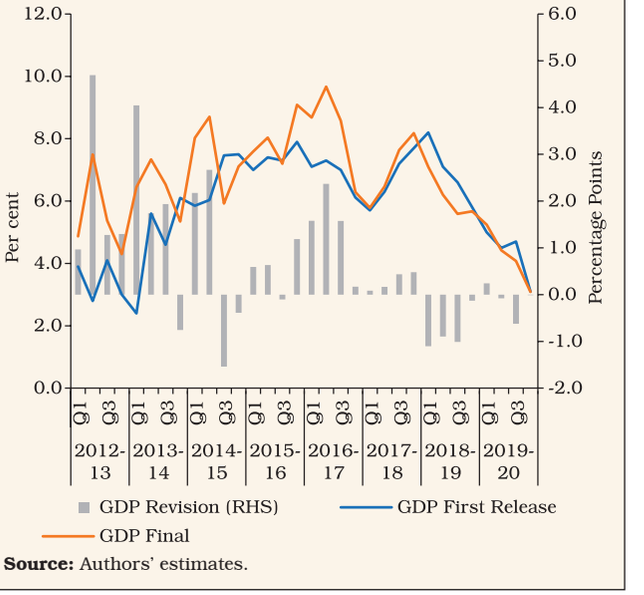
Note: The RMSEs are based on latest forecast available for corresponding quarters.
Source: Authors' estimates.

GDP Growth

III.30 India's experience shows that GDP data are often revised and the direction and magnitude of revision changes over time (Chart III.7). It is also found that there is a tendency for revisions to be more on the upside at a time when the economy is registering an acceleration, while revisions are more on downside when the economy is undergoing a moderation (Prakash *et.al*, 2018).

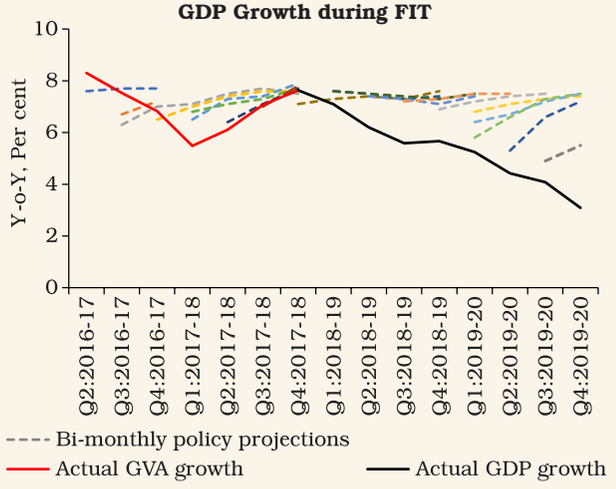
III.31 The RBI's GDP growth projection performance during the FIT period shows persistent overestimation of GDP growth since Q4:2017-18 (Chart III.8) for all forecast horizons under consideration.

Chart III.7: Revision in GDP Growth



Source: Authors' estimates.

Chart III.8: Actual *versus* Projected GDP Growth during FIT



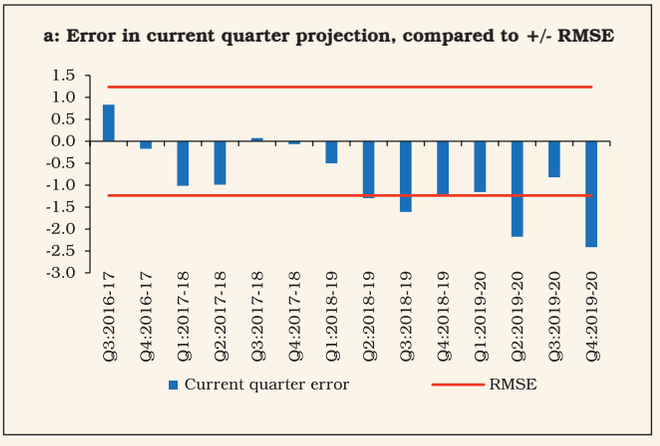
Note: Growth projections pertain to GVA up to Q4:2017-18 and GDP thereafter. The coloured dotted lines represent the bi-monthly growth projections.
Source: Authors' estimates.

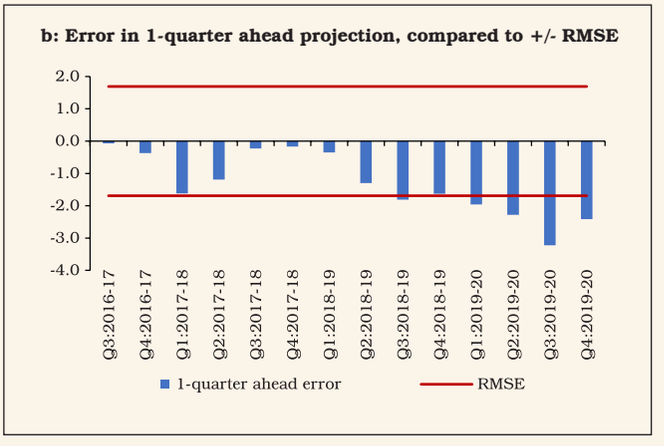
III.32 The degree of overestimation in terms of the RMSE band has been high in the recent period (Chart III.9).

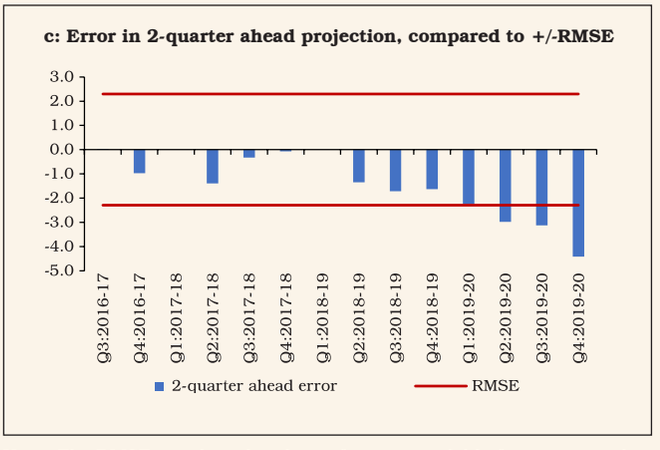
Gauging Process Transparency

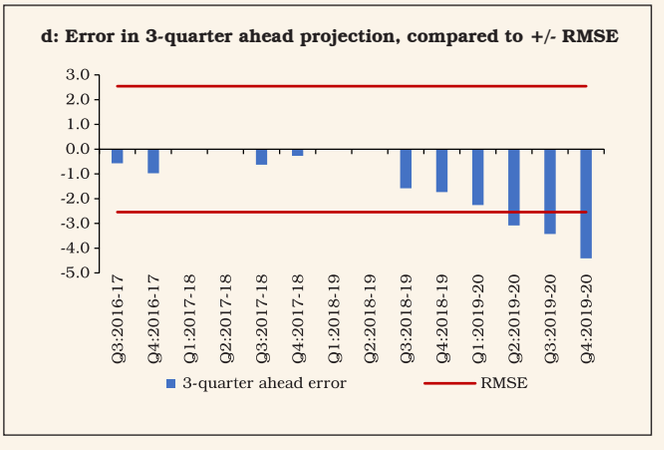
III.33 Greater transparency in monetary policy making is one of the most notable features differentiating central banking of today from the past (Eijffinger and Geraats, 2006; Dincer and Eichengreen, 2007; 2014; and Geraats, 2006). Transparency is seen as a key element of accountability in an era of central bank independence. Central bank transparency is also seen as a way of enabling markets to respond more smoothly to policy decisions. The Eijffinger

Chart III.9: GDP Growth Projection Errors across Projection Horizons









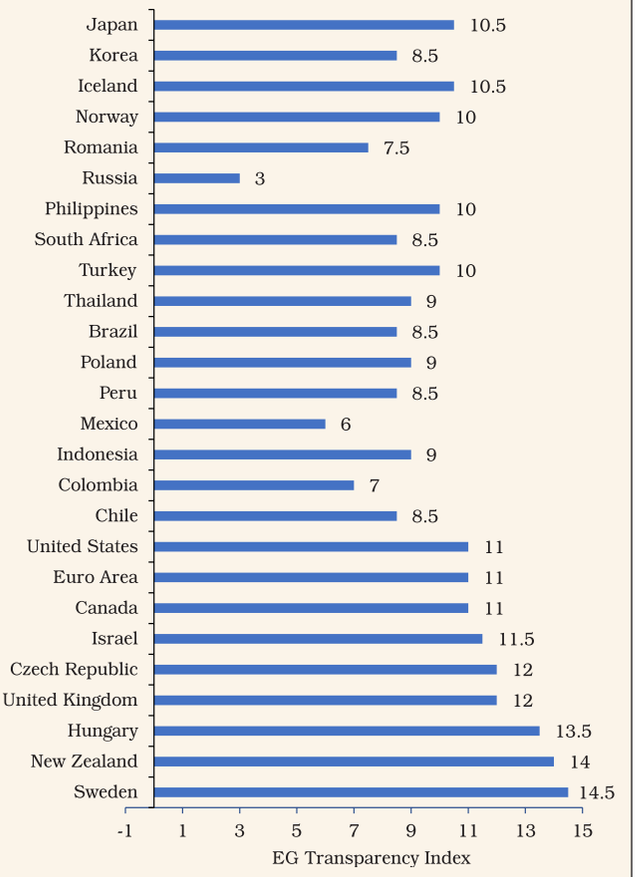
Note: The RMSEs are based on latest forecast available for corresponding quarters.
Source: Authors' estimates.

and Geraats index or EG index distinguishes five aspects of monetary policy transparency (Eijffinger and Geraats, 2006):

- *Political transparency*: this refers to openness about objectives for monetary policy, comprising a formal statement of objectives, including an explicit prioritization in case of multiple goals, a quantification of the primary objective(s), and explicit institutional arrangements.
- *Economic transparency*: transparency regarding the economic information used for monetary policy, *i.e.*, public availability of economic data, the models used in policy analysis, and the internal forecasts (model based or judgmental) that a central bank relies on.
- *Procedural transparency*: transparency regarding the way monetary policy decisions are made – existence of an explicit monetary policy rule, an account of policy deliberations, and how the policy decisions are reached.
- *Policy transparency*: transparency regarding announcement of policy; explanation of decisions; and indication on future policy actions.
- *Operational transparency*: transparency on achieving operating targets; impediments to the transmission of monetary policy; and the evaluation of the macroeconomic outcomes of monetary policy considering its objectives (Annex III.3).

III.34 As per Dincer and Eichengreen (2014), the Riksbank, Sweden, the Reserve Bank of New Zealand, the Central Bank of Hungary, the Bank of England and the Czech National Bank were the five central banks with the highest scores for transparent monetary policy (Chart III.10).

Chart III.10: EG Transparency Index of Central Banks



Source: Dincer and Eichengreen (2014).

III.35 An EG transparency index for India shows that there was a notable enhancement in transparency of the monetary policy process with FIT. The EG index rose from 6 to 12, a level close to that of the advanced economies (Table III.4).

III.36 Separate estimates for monetary policy transparency in India also show notable improvement post adoption of FIT (Samanta and Kumari, 2020). In these estimates, the EG transparency index moved from a low of 6 to 8.5 during October-December 2013 to reach 12 to 13 in October-December 2019.

Table III.4: EG index for RBI Pre-FIT and FIT

Measure of Transparency	Pre-FIT	FIT
Political	0.5	2.5
Economic	1	2
Procedural	1	2
Policy	2	3
Operational	1.5	2.5
Total Score	**6**	**12**

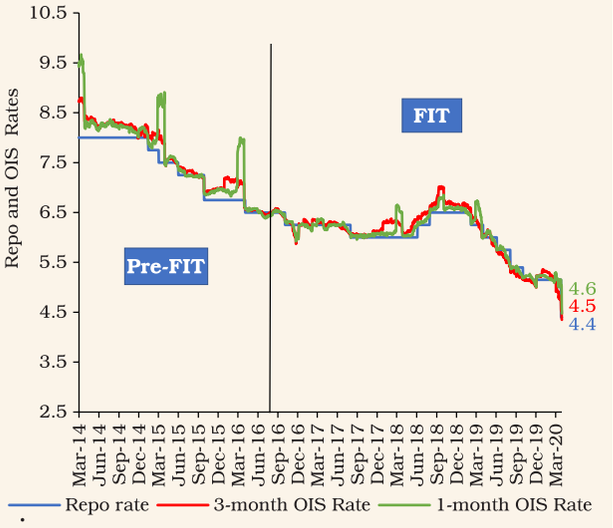
Source: Authors' estimates.

Communication by RBI's MPC: Has It been Effective?

III.37 Communication is an important element in a central bank's monetary policy tool kit. The rationale for transparency in communication lies in helping economic agents gauge the current and future economic outlook of the MPC so that they can form their own expectations. The interest rates on financial market instruments are closely related to the current level and future expectations of the RBI's repo rate. One measure of monetary policy expectations is the overnight indexed swap (OIS) rate. One to 24-month US, euro-zone and Japanese OIS rates and one to 18-month UK OIS rates tend to accurately measure expectations of future short-term interest rates (Lloyd, 2018). In the case of India, the 1-month and 3-month OIS rate shows that interest rate expectations are better anchored during FIT than in the pre-FIT period(Chart III.11).[12]

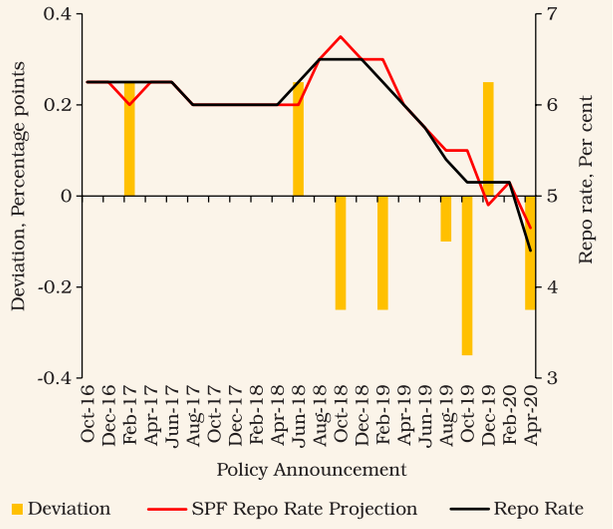
III.38 The RBI's Survey of Professional Forecasters (SPF) on macroeconomic indicators also cover expectations on changes in the policy rate. By and large, it projected the policy direction correctly, although there were more downward surprises than upward surprises during the 22 policy meetings (Chart III.12).

Chart III.11: 1-Month and 3-Month OIS Rate: Pre-FIT and FIT



Sources: Bloomberg and Authors' estimates.

Chart III.12: Repo Rate: SPF Projections *versus* Actuals



Sources: Survey of Professional Forecasters on Macroeconomic Indicator, RBI and Authors' estimates.

12 The root mean square deviation of 1-month and 3-month OIS from repo rate declined to 0.13 and 0.16 percentage points respectively after inflation targeting was formally adopted, from 0.46 and 0.34 percentage points before the FIT regime, respectively.

III.39 An analysis of historical newsfeed from media on the RBI's policy repo rate by Giddi and Kumari (2020), to capture media expectations one day prior to the policy announcement reveals that for most of the period under consideration, media sentiments were directionally in line with the actual policy rate decisions (Chart III.13).

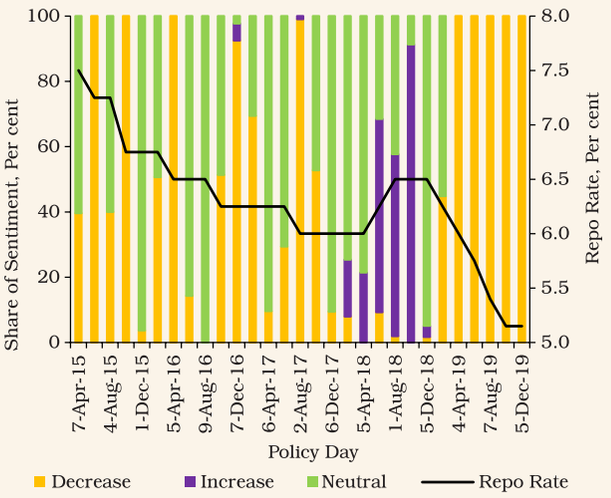
4. What Works for India's MPC

III.40 The practical experience of working with the MPC reveals several features which have stood the test of time and need to be persevered with.

The Institutional Architecture

III.41 Setting up a monetary policy committee for monetary policy decision making in India is in line with the global consensus. Since the late 1990s, there has been a decisive preference for a committee structure, with the MPC being the norm with all countries that adopted FIT during this period. Several committees in the past have also recommended an MPC for monetary policy decision making in India (RBI, 2014).

Chart III.13: Media Sentiment One Day Prior to Policy Day



Source: Giddi and Kumari (2020), Policy Rate Expectations in Media, RBI Bulletin, August 2020.

III.42 Data on MPCs in over 30 countries from 1960 to 2006 reveal a U-shaped relationship between the MPC size (both *de jure* and *de facto*) and inflation, with very small or very large groups leading to higher than necessary rates of inflation and inflation variability. Medium sized MPCs with about five to nine members were estimated as optimal (Berger and Nitsch, 2011 and Maier, 2007). The largest MPC is that of the National Bank of Poland with 10 members. The smallest MPC is a five-member committee in Chile, Iceland, and Norway. For all countries under study, the modal committee size is of seven members. In terms of composition mix between internal and external members, on an average, 48 per cent of the members were external with the number of external members ranging from zero to nine (Table III.5). From the above cross-country perspective, the committee size and composition of the MPC in India appears to be in line with the global best practices.

The Decision Making Process

III.43 Globally, the striking difference among the MPCs is in terms of their decision making process *i.e.* either by voting or by consensus. The design of decision making processes in a committee structure ranges from an 'individualistic MPC' model – where each member express opinion freely and decisions are made based on majority voting – to a fully 'consensus-based MPCs' where decisions are ultimately ascribed to the group as a whole and is owned up by each MPC member, even though members may argue behind closed doors for their respective points of view. Another variant of consensus based MPC could be the autocratically-collegial' MPC where the chairman

Table III.5: Structure of Monetary Policy Decision Making Committees

Country	MPC/ Central Bank Board	Year Adopted Board/ MPC	Number of members	External members
Australia	Board	1959	9	6
Canada	Board	1934	6	0
Chile	Board	1925	5	0
Colombia	Board	1922	7	1
Czech Republic	Board	1992	7	0
ECB	Board	1998	25	0
Hungary	Board	1924	5-9	4-6
Indonesia	Board	1999	6-9	0
Mexico	Board	2001	5	0
Peru	Board	1992	7	0
Philippines	Board	1993	7	6
Russian Federation	Board	1991	15	0
Romania	Board	2007	9	5
Sweden	Board	1897	6	0
South Korea	Board	1950	7	5
Japan	Board	1942	9	6
United States	FOMC	1933	12	0
Brazil	COPOM	1996	9	0
United Kingdom	MPC	1997	9	4
Iceland	MPC	2009	5	2
Israel	MPC	2010	6	3
India	**MPC**	**2016**	**6**	**3**
New Zealand	MPC	2019	7	3
Norway	MPC	1999	8	5
Poland	MPC	2011	10	9
South Africa	MPC	1999	7	0
Thailand	MPC	2008	7	4
Turkey	MPC	2006	7	1

Note: Countries in red font denote central banks having Committee structure.
Sources: Central banks' websites, Hammond (2012) and Ciżkowicz-Pękała *et al.*(2019).

more or less dictates the group 'consensus' and the group's decision is essentially the chairman's decision, informed by the views of the other committee members (Blinder and Wyplosz, 2004). An analysis of 28 central banks suggests voting is the overwhelming preference, with 24 central banks following a voting based monetary policy decision making process. The MPC in India also falls into the category that takes decision by voting (Table III.6).

Table III.6: MPC Decision Making Process

Country	MPC/Central Bank Board	Decision making process
Australia	Board	Vote
Canada	Board	Consensus
Chile	Board	Vote
Colombia	Board	Vote
Czech Republic	Board	Vote
ECB	Board	Consensus
Hungary	Board	Vote
Indonesia	Board	Consensus
Mexico	Board	Vote
Peru	Board	Vote
Philippines	Board	Vote
Russian Federation	Board	Vote
Romania	Board	Vote
Sweden	Board	Vote
South Korea	Board	Vote
Japan	Board	Vote
United States	FOMC	Vote
Brazil	COPOM	Vote
United Kingdom	MPC	Vote
Iceland	MPC	Vote
Israel	MPC	Vote
India	**MPC**	**Vote**
New Zealand	MPC	Consensus
Norway	MPC	Vote
Poland	MPC	Vote
South Africa	MPC	Vote
Thailand	MPC	Vote
Turkey	MPC	Vote

Note: Countries in red font denote central banks having Committee structure.
Sources: Central banks' websites, Hammond (2012) and Ciżkowicz-Pękała *et al.* (2019).

Communication

III.44 The monetary policy communication practices in India mirror global experiences wherein most central banks publish their analysis of economic conditions, including outlooks for growth and inflation with central banks explaining the reasons for their policy decision through press conferences. The release of the MPC minutes two weeks after the policy by the RBI is also in line with international best practices (Table III.7), although, under India specific conditions, there is

Table III.7: Monetary Policy Transparency and Communication across Central Banks

Country	Press Conferences around forecasts and monetary policy decisions	Forecasts			Minutes		
		GDP Fan chart	Inflation Fan chart	How often (usually quarterly)	Publish	Publication Lag	Identify votes
Australia	No	Yes#	Yes#	4x year	Yes	Two weeks	No
Canada	Yes	Yes	Yes	4x year	No	-	No
Chile	Yes	Yes#	Yes#	4x year	Yes	Two weeks	Yes
Czech Republic	Yes	Yes	Yes	4x year	Yes	Eight days	Yes
ECB	Yes	Yes	Yes	4x year	Yes	Four weeks	No
Hungary	Yes	Yes	Yes	4x year	Yes	Two weeks	Yes
Indonesia	No	Yes	Yes	4x year	No	-	No
Peru	Yes	Yes	Yes	4x year	No	-	No
Philippines	Yes	No	Yes	4x year	Yes	Four weeks	No
Sweden	Yes	Yes	Yes	6x year	Yes	Two weeks	Yes
South Korea	Yes	Yes#	Yes#	4x year	Yes	Two weeks	Yes
United States	Yes	Yes	Yes	4x year	Yes	Three weeks	Yes
Brazil	Yes	Yes	Yes	4x year	Yes	Six days	Yes
United Kingdom	Yes	Yes	Yes	4x year	Yes	One day	Yes
Iceland	Yes	Yes	Yes	4x year	Yes	Two weeks	Yes
India	**Yes**	**Yes**	**Yes**	**6x year**	**Yes**	**Two weeks**	**Yes**
Israel	Yes	Yes#	Yes#	4x year	Yes	Two weeks	No
New Zealand	Yes	Yes	Yes	4x year	No	-	No
Norway	Yes	Yes*	Yes	4x year	No	-	No
South Africa	Yes	Yes	Yes	2x year	No	-	No
Thailand	Yes	Yes	Yes	4x year	Yes	Two weeks	No
Turkey	Yes	Yes*	Yes	4x year	Yes	One week	No

***** Output Gap, # Point forecast
Note: Countries in red font denote central banks having Committee structure.
Sources: Central banks' websites, Hammond (2012), Ciżkowicz-Pękała *et al.* (2019), and BIS (2019).

a risk of public perception of new data releases post the MPC's meeting influencing these minutes. Accordingly, the requirement of the Act to release the minutes "… *at 5 pm on the 14th day from the date of the policy day* …" could be reformulated to "… *at 5 pm within seven days from the date of the policy* ….". This would require amendment to the RBI Act.

Accountability of the MPC

III.45 Section 45ZN of the RBI Act enables the Central Government to set out the definition of failure to meet inflation target as well as accountability measures in case of failure. As per sub-sections (a), (b) and (c) of Section 45ZN of the RBI Act, when the Bank fails to meet the inflation target, it is required to set out in a report to the Central Government – (a) the reasons for failure to achieve the inflation target; (b) remedial actions proposed to be taken by the Bank; and (c) an estimate of the time-period within which the inflation target shall be achieved pursuant to timely implementation of proposed remedial actions. In the event of failure of the RBI to meet the inflation target, in accordance with the Regulation 7 of the RBI MPC and Monetary Policy

Process Regulations, 2016, a separate meeting is required to be scheduled by the Secretary to the Committee, as part of the normal policy process to discuss and draft the report to be sent to the Central Government. The Report is required to be sent to the Central Government within one month from the date on which the Bank failed to meet the inflation target.

III.46 Globally, as in the case of India, accountability mechanisms for monetary policy are usually enshrined in central bank Acts. They take the form of (a) 'parliamentary hearings' in a structured reporting to the Parliament on monetary policy; or (b) 'open letters' addressed by the Governor/Bank/MPC to the Government. The open letter, which explains the reasons for monetary policy failing to meet the inflation target, the remedial actions proposed and a time-frame to reach back to the target, are seen as part of the communication and accountability process, and not a 'censure' on the central bank (Hammond, 2012). As per the RBI Act, in the case of failure to meet the target, the RBI is mandated to write a report to the Central Government. Among the countries surveyed, open letters are more prevalent in central banks with MPC structures. In addition to open letters, some central banks also have parliamentary hearings (Table III.8). In India, the RBI reports to the Central Government, therefore, the accountability for failure through a report to the Central Government is the appropriate procedure.

Table III.8: Accountability Mechanism

Country	Accountability Measures
Australia	Parliament hearing
Canada	Parliament hearing
Chile	Parliament hearing
Czech Republic	Parliament hearing
Hungary	Parliament hearing
Indonesia	Open letter and Parliament hearing
Peru	Parliament hearing
Philippines	Open letter and Parliament hearing
Sweden	Parliament hearing
South Korea	Open letter and Parliament hearing
Brazil	Open letter and Parliament hearing
United Kingdom	Open letter and Parliament hearing
Iceland	Open letter and Public report to the Government and Parliament hearing
India	**Report to Central Government**
Israel	Parliament hearing
New Zealand	Open letter and Parliament hearing
Norway	Open letter and Parliament hearing
South Africa	Parliament hearing
Thailand	Open letter and Parliament hearing
Turkey	Open letter and Parliament hearing

Note: Countries in red font denote central banks having Committee structure.
Sources: Central banks' websites, Hammond (2012) and Ciżkowicz-Pękała *et al.* (2019).

Code of Conduct of the MPC Members

III.47 The Regulation 5(ii) of the RBI MPC and Monetary Policy Process Regulations provides broad guidance to members of the MPC on their ethical conduct to help enhance public trust and confidence in the RBI and its policies. The Members, *inter alia,* are expected to be guided by the objectives of monetary policy set out in the Act and the inflation target set by the Central Government; and independently and candidly express their views in the MPC meetings before voting. Members are also expected to take adequate precautions to ensure utmost confidentiality of the MPC's policy decision before it is made public, preserve confidentiality about the decision-making process and maintain the highest standards of probity consistent with public office. While interacting with profit-making organizations or making personal financial decisions, they shall weigh carefully any scope for conflict between personal interest and public interest.

III.48 International central bank policies show that to avoid conflict of interest and retain independence, external members in a monetary policy committee are restricted from certain activities or affiliations outside the central bank. Generally, they include restrictions on involvement in financial institutions, political activity, and government service (Patra and Samantaraya, 2007).

III.49 As per the RBI Act, external member on the MPC cannot be a public servant, or Member of Parliament or any State Legislature. The Central Government can remove an MPC member from office on certain conditions, *e.g*. if the member is adjudged as an insolvent; is physically and mentally incapable; fails to adequately disclose any material conflict of interest at time of appointment; is not able to attend three consecutive meetings of the MPC; is convicted of an offence which, in the opinion of the Central Government, involves moral turpitude; or has such financial or other interest as is likely to affect prejudicially his functions as a Member. These guidelines on code of conduct for the MPC members are in line with the ethical standards set out by other countries for the MPC.

5. What Needs to Change

III.50 Based on the experience in India so far and cross-country best practices, there is scope for some refinements to the MPC's decision making process for improvement in transparency, accountability and operational efficiency.

Shut Period

III.51 Members of the RBI's MPC observe a silent or blackout period, starting seven days before the voting/decision day, and ending seven days after the day policy is announced. During this period, the MPC members avoid public comments on issues related to monetary policy, other than through the MPC's communication framework to avoid market volatility and weakening of transmission of policy signals.

III.52 Among the central banks surveyed, there is a shut period for all the members of the Board/ MPC of around a week to 10 days before the date of monetary policy decision. In the case of Bank of Japan, the shut period is only for two days before the meeting. In most cases the shut period ends after the announcement of the monetary policy decision (Table III.9).

III.53 The current practice in India of a 7-day shut period after the release of the MPC resolution is not aligned to the global best practice. Hence, a more flexible approach, with the shut period for the MPC starting seven days before policy announcement and ending three days after the policy is announced may be considered. Maintaining a shut period for three days after the policy announcement would felicitate clear and effective communication of the monetary policy decisions by the Governor.

Staggered Onboarding of Members

III.54 As per the extant statutory design, the 6-member MPC of the RBI undergoes a major change every four years as three external members, who are appointed for a fixed period of four years, are not eligible for reappointment after completing their term.

III.55 Cross-country experience suggests that a committee structure with staggered terms of office creates checks and balances that moderate political influences on monetary policy (Blinder 2006). Staggering the terms of committee members also helps to achieve greater credibility (Vandenbussche, 2006).

Table III.9: Shut Period Practices: Major Central Banks

Country	Shut period before the meeting (days)	Shut period after the meeting (days)	Applicable to
ECB	7	-	All Members of the Governing Council
Sweden	1 week	Ends after the policy is announced	All Members of the Executive Board, including Governor
Japan	2 days before the first day of the policy meeting	End of day after policy or after the outlook report (if due) is released	All Members of Policy Board
United States	10	1	All Members of FOMC; However, FED Chairs holds press meet after FOMC meeting
Brazil	6	6	All Members of COPOM
United Kingdom	8 to 9	Only till the decision has been published	All Members of MPC
India	**7**	**7**	**All Members of MPC**

Note: Countries in red font denote central banks having Committee structure.
Source: Central banks' websites.

III.56 Of the 28 countries surveyed, most of the central banks, with either an MPC or a Board structure, follow staggered onboarding of members (Table III.10). This is usually achieved by instituting different tenures at the start of the staggered onboarding process. ECB in its appointment for the first Board in 1998, onboarded members with varying tenures. One of the central bank that recently staggered appointment of external members is South Korea. Though the term of the external members in the monetary policy board is four years, to bring about staggering, of the four members appointed in April 2020, two were appointed for three years and another two for a four-year term. In the case of New Zealand, in the first MPC constituted in 2019, the three external members were onboarded for varying tenures. Two members were appointed for a three-year term and one member for a four-year term.

Table III.10: Tenure of Committees for Monetary Policy Decision Making

Country	MPC/ Central Bank Board	Tenure of Board Members/ External members (in years)	Staggered appointment
Australia	Board	up to 5	Yes
Canada	Board	7	Yes
Chile	Board	10	Yes
Colombia	Board	4	Yes
Czech Republic	Board	6	Yes
ECB	Board	8	Yes
Hungary	Board	6	Yes
Indonesia	Board	5	Yes
Mexico	Board	6-8	Yes
Peru	Board	5	Yes
Philippines	Board	6	Yes
Russian Federation	Board	5	Yes
Romania	Board	5	No
Sweden	Board	5-6	Yes
South Korea	Board	3-4	Yes
Japan	Board	5	Yes
United States	FOMC	Rotation basis	Yes
Brazil	COPOM	8	No fixed term of appointment
United Kingdom	MPC	3	Yes
Iceland	MPC	5	No
Israel	MPC	5	Yes
India	**MPC**	**4**	**No**
New Zealand	MPC	3-4	Yes
Norway	MPC	2-4	Yes
Poland	MPC	6	Yes
South Africa	MPC	5	Yes
Thailand	MPC	3	Yes
Turkey	MPC	5	No

Note: Countries in red font denote central banks having Committee structure.
Sources: Central banks' websites, Hammond (2012) and Ciżkowicz-Pękała *et al.* (2019).

III.57 While the appointment of new external members on the RBI's MPC in 2020 has not posed any disruptions to the decision making process, the global practice univocally suggests staggering for the MPC members with external members appointed for different tenures at the first instance of the start of the staggered onboarding process. This would require an amendment to the RBI Act.

Transcripts of the MPC meetings

III.58 As per the RBI Act, the proceedings of the MPC meeting will be confidential. During the MPC meetings, no transcripts of the meeting are recorded as per the extant practice.

III.59 The global practice suggests that several central banks record transcripts of the deliberations in the monetary policy meetings. There are different practices, however, on release of these transcripts. The Bank of England releases minutes on the day after the meetings but withholds transcripts for 7-8 years. The US Federal Reserve releases minutes and transcripts of the Federal Open Market Committee (FOMC) meetings after a 3-week and 5-year lag, respectively. With a view to enhancing accountability and credibility, and for historical analysis, transcripts of the MPC meetings may be recorded at a future date as the MPC process and structure matures over time. These transcripts may be released in the public domain with a lag of 5-7 years.

The MPC Communication Policy Document

III.60 Inflation targeting has been viewed as a framework for making and communicating decisions (King, 2005). Any decision taken by the central bank has to be backed by communication (Das, 2019). The focus of the RBI's monetary policy communication has been to give greater clarity on what informs monetary policy decisions and to be as transparent as possible. Under the inflation targeting framework, the primary means of monetary policy communication is the monetary policy resolution of the MPC that is released shortly after the conclusion of the MPC meeting and the minutes of the MPC released on the 14th day after the meeting.

III.61 Apart from the above forms of written communication, the Governor's press statements; interactions with media, researchers, and analysts; and speeches are also forms of formal communication.

III.62 While there are structured forms of communication by the MPC, there is no formal communication policy document that lays out the communication policy for the MPC. Globally, most of the leading central banks publish an MPC communication policy document (Table III.11).

III.63 Drawing from the global best practices, a model communication policy document for the MPC has been prepared, which lays out the do's and dont's of communication policy for the

Table III.11: Contents of the Communication Policy Document

The document covers policy on	Bank of England	Reserve Bank of New Zealand	Risksbank
1. Statements by Governor	Yes	Yes	---
2. Speeches and other Media communication by MPC members	Yes	---	Yes
3. Shut Period for MPC members.	Yes	---	Yes
4. Comments by MPC members on inflation target and fiscal policy	Yes	---	---
5. Secrecy of confidential data of the bank.	Yes	---	Yes
6. Communication through Public Lectures and Economic Journals	Yes	Yes	Yes

Source: Central banks' websites.

MPC and includes, *inter alia*, the written forms of communication and broad guidance on other forms of communication by the MPC (Annex III.4). Based on similar lines, a communication policy document for RBI's MPC may be considered.

Timing of Release of the MPC Resolution

III.64 The monetary policy announcements by most FIT countries are made at a pre-announced calendar that includes the date and time of policy announcement and press conference (Table III.12). In the case of India, under the FIT regime, the annual calendar is announced before the first meeting of the financial year, while the time for release of the policy resolution and press conference over the years varied – from 10 am to 2:30 pm. To provide certainty to markets, the announcement of the policy can be at a time that is fixed (barring exceptional circumstances) and pre-announced.

Publication of Interest Rate Path

III.65 As part of the monetary policy communication strategy and transparency measures, the inflation and growth projections, usually in the form of fan charts, are published by all major FIT central banks. In addition, a growing number of FIT central banks are publishing forward guidance and projections of the interest rate path. One of the key considerations in publishing a conditional interest rate path comes from the central role played by interest rate expectations in reinforcing monetary policy transmission. This would be beneficial to preserve monetary policy credibility in episodes of large supply shocks to show that maintenance of the inflation target over the medium term does not require abrupt changes in interest rates. The interest rate guidance could be descriptive in nature or in the form of a fan chart of interest rate path. Such interest rate guidance are conditional interest rate paths *i.e.,* conditional on information available at the time of the policy review and would change as new information is made available. Among the major central banks surveyed, four central banks provide explicit interest rate paths in the form of fan charts and six central banks provide descriptive interest rate path outlooks (Table III.13). In most central banks, publication of interest rate path has come about after FIT has been well established.

Table III.12: Timing of Policy Announcement

Country	Timing of Release of Resolution
Australia	Immediate announcement of policy decision at 11:30 hours with media and press release at 14:30 hours
Canada	Immediate announcement of policy decision at 10:00 hours with press release
Czech Republic	Immediate announcement of policy decision at 14:30 hours with press conference (15:45 hours) and press release
Hungary	Immediate announcement of policy decision with press conference and press release (14:00 Hrs)
Sweden	Press release is published the day after each monetary policy meeting.at 9:30 hours
United States	Press release at 11:30 am and press conference at 2:00 pm
Brazil	Immediate announcement of decision and press release at 18:00 hours after publication of Inflation Report
United Kingdom	Announcement of policy decision and Minutes of the meeting on the day after the meeting, at 12:00 hours
India	**Policy Resolution is released on the same day of policy announcement**
New Zealand	Immediate announcement of policy decision with press notice and press conference at 14:00 hours for Inflation report (four times a year)

Note: Countries in red font denote central banks having Committee structure.
Sources: Central banks' websites, Hammond (2012), Ciżkowicz-Pękała *et al.* (2019), and BIS (2019).

Table III.13: Central Banks Providing Guidance on Policy Rate Path

Country	MPC/Central Bank Board	Fan Chart	Descriptive Guidance on Interest Rate
Australia	Board	No	Yes
Canada	Board	No	Yes
Colombia	Board	No	Yes
Czech Republic	Board	Yes	No
ECB	Board	No	Yes
Sweden	Board	Yes	No
United Kingdom	MPC	No	Yes
Israel	MPC	Yes	No
India	**MPC**	**No**	**No***
Norway	MPC	Yes	No
South Africa	MPC	No	Yes

Note: Countries in red font denote central banks having Committee structure. The countries which do not publish a fan chart on policy rate path provide descriptive guidance on policy rate.
* Since October 2020, MPC has started providing time contingent forward guidance on the monetary policy stance.
Source: Central banks' websites.

III.66 The RBI's MPC may consider providing a more explicit forward guidance on the interest rate path at a future date, as the projection process is strengthened further over time.

Definition of Failure of the MPC

III.67 Failure of the MPC in meeting its objective, as part of accountability measures, is generally defined as when inflation deviates from the target rate or a tolerance band for a specified period. Cross country experience shows failure is usually defined in terms of deviations of the inflation rate from the target rate or tolerance threshold. However, in many central banks, especially in EMEs, which often face food and fuel price spikes and have a high share of food and fuel in the CPI basket, failure is also conditional on inflation exceeding the tolerance threshold over a specified duration of time rather than immediately (Table III.14).

Table III.14: Definition of Failure

Country	Inflation Target / Range	Definition of Failure
Australia	2-3%	Average inflation should be within target range over time
Canada	2%: midpoint target range of 1-3%	Deviation of inflation from target range
Chile	3 +/- 1%	Deviation of inflation from tolerance band
Czech Republic	2 ± 1%	Deviation of inflation from target range
Hungary	3 +/- 1%	Deviation of inflation from target range
Indonesia	3.5 +/- 1%	Deviation of inflation from inflation target band in any given year
Peru	2 +/- 1%	Deviation of inflation from inflation tolerance band
Philippines	3 +/- 1%	Deviation of inflation from inflation target
Sweden	2%	Deviation of inflation from target
South Korea	2%	Deviation from the target by more than 0.5 percentage points in either direction for six consecutive months
Brazil	4 +/- 1.5%	Deviation of inflation from the upper and lower tolerance level
United Kingdom	2%	Deviation from inflation target by 1 percentage point in either direction
Iceland	2.5%	Deviation of 1.5 per cent from target in either direction
Israel	1-3%	If inflation target is missed over more than six months
India	**4 +/- 2%**	**The average inflation is more (less) than the upper (lower) tolerance level for three consecutive quarters**
New Zealand	1-3%	Deviation of inflation from target range
Norway	2%	Deviation of inflation from target
South Africa	3-6%	Deviation of inflation from target rate
Thailand	1-3%	Average headline inflation in past 12 months or forecast of average inflation over the next 12 months exceeds the target range
Turkey	5 +/- 2%	Deviation of inflation from target range

Note: Countries in red font denote central banks having Committee structure.
Sources: Central banks' websites, Hammond (2012) and Ciżkowicz-Pękała *et al.* (2019).

III.68 In India, as per the RBI Act, the Central Government has notified the definition of failure as average headline CPI inflation more than the upper tolerance level or less than the lower tolerance level for three consecutive quarters. Since the adoption of FIT, between October 2016 and March 2020 there has been no failure by the MPC as per this definition. However, frequent occurrence of supply side shocks engendering sharp volatility in food inflation had been a recurring refrain during the FIT period so far and has been identified as a major reason for headline CPI inflation projection errors (Raj *et al.* 2019). In respect of several food items, inflation has deviated from the upper tolerance band (6 per cent) for more than three consecutive quarters (Table III.15). Often the occurrence of a series of transitory food price shocks in a sequential manner caused food price spikes to take time to revert. For example, in the case of vegetables prices, it took exactly nine months (October 2017 to June 2018) for inflation to return to the tolerance band.

III.69 On the other hand, many food items have had frequent price crashes in the FIT period which took several months to get back to precincts of the target, especially in cereals, pulses and sugar. Pulses and sugar inflation remained below 2 per cent consecutively for 30 months and 21 months, respectively. This along with downward pull from other subgroups such as vegetables and fruits resulted in food inflation dipping below 2 per cent for 10 consecutive months between July 2018 and April 2019 (Table III.16).

Table III.15: Episodes of High Food Price Inflation

Commodity	High inflation episodes (>6%)	Peak inflation rate (%)	Number of consecutive months when inflation remained above 6%
All Food Group	Oct 2019-Mar 2020	12.2	6
Meat and fish	Mar 2019-Mar 2020	10.6	13
Egg	Oct 2016-Dec 2016	9.5	3
	Nov 2017-Apr 2018	9.3	6
	Jul 2018-Aug 2018	7.4	2
	Oct 2019-Feb 2020	10.5	5
Milk and products	Feb 2020-Mar 2020	6.5	2
Oils and Fats	Jan 2020-Mar 2020	7.7	3
Fruits	Feb 2017-Mar 2017	9.6	2
	Nov 2017-Jan 2018	6.6	3
	Apr 2018-Jul 2018	12.1	4
Vegetables	Oct 2017-Jun 2018	29.1	9
	Aug 2019-Mar 2020	60.5	8
Pulses	Jul 2019-Mar 2020	16.7	9
Sugar and confectionery	Oct 2016-Dec 2017	23.6	15
Spices	Oct 2016-Dec 2016	7.4	3
	Jan 2020-Mar 2020	9.8	3
Prepared meals, snacks, sweets, *etc.*	Oct 2016	6.1	1

Sources: NSO; and Authors' estimates.

Table III.16: Episodes of Low Food Price Inflation

Commodity	Low inflation episodes (<2%)	Lowest inflation rate (%)	Number of consecutive months when inflation remained below 2%
All Food Group	Dec 2016-Jan 2017	1.4	2
	Apr 2017-Sep 2017	-1.2	6
	Jul 2018-Apr 2019	-1.7	10
Cereals and products	Nov 2018-Sep 2019	0.8	11
Meat and fish	Apr 2017-May 2017	1.8	2
Egg	Feb 2017	0.5	1
	May 2017-Oct 2017	-2.0	6
	Nov 2018-Aug 2019	-4.4	10
Milk and products	Oct 2018-Sep 2019	0.3	12
Oils and fats	Jul 2017-Mar 2018	1.0	9
	Nov 2018-Oct 2019	0.6	12
Fruits	May 2017-Jun 2017	1.4	2
	Sep 2018-Sep 2019	-5.9	13
Vegetables	Oct 2016-Jul 2017	-16.5	10
	Jul 2018-Mar 2019	-16.4	9
Pulses	Nov 2016-Apr 2019	-24.7	30
Sugar and confectionery	Feb 2018-Oct 2019	-9.2	21
Spices	Apr 2017-May 2018	-2.3	14
	Jan 2019-Jun 2019	0.8	6
Non-alcoholic beverages	Dec 2017-May 2018	1.3	6
	Jul 2018-Sep 2018	1.4	3
	Nov 2019-Dec 2019	1.3	2
Prepared meals, snacks, sweets, *etc.*	Nov 2019	1.9	1

Sources: NSO; and Authors' estimates.

III.70 The volatility observed in food inflation due to transitory factors had limited spillovers to core inflation (Box III.3). However, persistent and permanent food and fuel price shocks necessitate timely monetary policy response to mitigate risks from second round effects and inflation expectations. All this requires greater flexibility to monetary policy and the MPC to see through sharp movements in food prices brought about by transient factors while, at the same time, be cognizant of relative price shocks that have a bearing on core inflation trajectory. A definition of failure that balances these two objectives would help prevent volatility in output growth brought about by policy responses to frequent food price spikes. This is also important considering the fact that even if monetary policy reacts promptly to non-transitory supply shocks to bring inflation back into the tolerance band, it takes up to 10 quarters for full transmission of policy impulses to inflation outcomes (see Chapter IV for further details).

III.71 Given these India-specific experiences and concerns, it may be appropriate to revise the definition of failure from the current three-quarter horizon. Failure may be redefined as inflation overshooting/undershooting the upper and lower tolerance bands around the target for four consecutive quarters.

Box III.3
Transmission of Food and Fuel Shocks to Core Inflation

While food and energy prices are often viewed as sources of transitory supply shocks, it is important to assess the risk of transmission of food and fuel price shocks to core inflation, and the resultant generalisation of inflation.

The dynamic interaction between headline and core inflation is examined through an 'inflation-gap' model to assess the risk of second-round effects of food and fuel shocks on headline and core inflation using the following regression specifications:

$$\pi_t - \pi_{t-h} = a_1 + b_1(\pi_{t-h} - \pi_{t-h}^{core}) + \epsilon_{1t} \quad \ldots\ldots (1)$$

$$\pi_t^{core} - \pi_{t-h}^{core} = a_2 + b_2(\pi_{t-h} - \pi_{t-h}^{core}) + \epsilon_{2t} \quad \ldots\ldots (2)$$

The first equation shows how the gap between headline and core in any period affects the change in headline inflation h-periods ahead. A negative coefficient (b_1) indicates that when headline is above core, headline inflation comes down, *i.e.*, headline converges to core inflation and any deviation of headline from core is transitory. The second equation relates changes in core inflation to the gap between headline and core inflation. A positive coefficient (b_2) implies that

(Contd...)

Table 1: Core excluding food and fuel inflation

	b_1	b_2
h=3	-0.31***	0.02
h=6	-0.54***	0.00
h=9	-0.76***	-0.06
h=12	-1.21***	-0.19**

Note: * p < 0.10, ** p < 0.05, *** p < 0.01

Table 2: Core excluding food, fuel, petrol, diesel inflation

	b_1	b_2
h=3	-0.22	0.09*
h=6	-0.72***	0.14*
h=9	-1.07***	0.14
h=12	-1.68***	0.10

Note: * p < 0.10, ** p < 0.05, *** p < 0.01

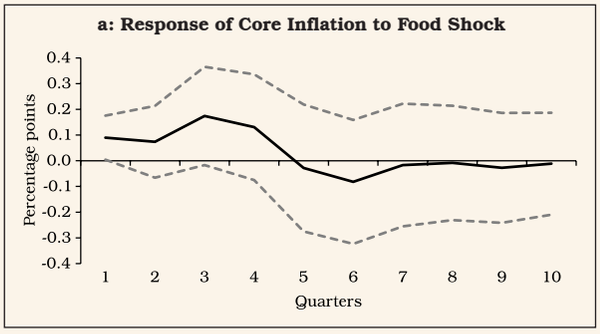
whenever headline is above core, core inflation increases subsequently, *i.e.,* core inflation converges to headline implying that inflation pressures in the non-core component of headline inflation spill over to core inflation, leading to the convergence of core to headline inflation.

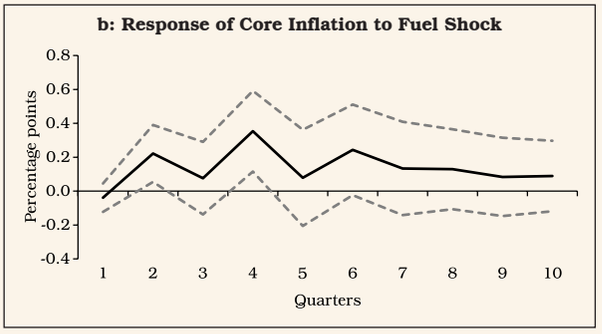
The convergence analysis uses data from January 2012 to March 2020 for h=3, 6, 9 and 12. When core inflation is defined as headline excluding food and fuel, there is evidence of headline inflation converging to core inflation and no evidence for convergence of core to headline (Table 1.1). This suggests that food and fuel inflation shocks lead to transitory deviations of headline inflation from core inflation, which could be viewed as evidence of no generalisation risk.

However, when core inflation is measured by excluding food, fuel, petrol and diesel, the convergence analysis provides some evidence that core may also revert to headline, which could be viewed as evidence of generalisation (Table 1.2).

The relationship between headline and core is investigated further by using a structural VAR framework covering data from Q3:2009 to Q1:2020. Inflation excluding food and fuel, inflation expectations and the output gap are included as endogenous variables, while food and fuel inflation are treated as exogenous shocks.[13] The empirical findings suggest that upside surprises to food and fuel inflation trajectories in the pre-COVID period have been mostly transitory in nature (Chart 1).

Chart 1: Impulse Response Functions (one-standard-deviation shock)





Source: Authors' estimates.

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13 Q-o-q changes have been considered in all variables.

6. Conclusion

III.72 Being a late entrant to the club of countries that have been practicing monetary policy making in an FIT framework since the 1990s, India adopted the best practices and procedures for the decision-making process.

III.73 The endeavour of the individualistic MPC of the RBI (where decisions are based on majority voting), over its first 22 meetings since October 2016, has been to enrich policy making by bringing in intellectual depth and individual expertise tempered by reasoning and deliberations on diverse and sometimes contrary views. Since October 2016, the MPC has seen it all – transitioning through various stances – from neutral to accommodative to calibrated tightening; shifting from rate hikes to cuts and pauses; moving from unanimous decisions to divided views; and dissenting from the consensus view by both external and internal members. However, the need for casting vote by the Governor was never required to be exercised. By all metrics, there has been an absence of group think and there were no free riders. With the change in the institutional architecture for conduct of monetary policy after the amendment of the RBI Act, there has been significant enhancement in transparency of the monetary policy process.

III.74 Based on the learning from the first four years of FIT and a review of the global practices, this chapter has recommended refinements in the framework to make it more relevant and operationally efficient. They include limiting the shut period for the MPC to start seven days before policy announcement and end three days after the day policy is announced; staggering onboarding of external members on the MPC; having an official communication policy document for the MPC; releasing minutes within a week after the policy announcement; releasing policy at a pre-fixed and pre-announced time; maintaining the transcripts of the MPC meetings and its release with a lag of 5-7 years at a future date; providing a more explicit forward guidance on the interest rate path at a future date, as the projection process is strengthened further over time; and modifying the definition of failure from the current three consecutive quarters norm of inflation remaining outside the tolerance band to four consecutive quarters.

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Annex III.1: Monetary Policy Committee – Statutory Provisions on Processes

The key features of the Monetary Policy Committee (MPC) processes as envisaged by the amended RBI Act, 1934 and the MPC and Monetary Policy Process Regulations, 2016 are as follows:

The Regulatory Framework

The Institutional Architecture

Composition and size of the MPC

The Central Government constitutes a six-member MPC with the Governor as the Chairperson, *ex officio*; the Deputy Governor in charge of monetary policy as Member, *ex officio*; one officer of the Bank to be nominated by the Central Board, Member *ex officio*; and three persons appointed by the Central Government as Members. The Central Government appoints external members based on the recommendations made by a search-cum-selection committee "from amongst persons of ability, integrity and standing, having knowledge and experience in the field of economics or banking or finance or monetary policy". These members are required to be less than 70 years of age at the time of appointment. The external members hold office for a period of four years and are not eligible for re-appointment.

[Section 45ZB and clause (d) of section 45ZB (2)]

Secretary to the MPC

The RBI Act, 1934, provides for the Bank to appoint a Secretary to the MPC for providing secretariat support to the MPC. The head of the Monetary Policy Department (MPD) is appointed as the Secretary to the committee. In his/her absence, the representative nominated by him/her not below the rank of senior officer in MPD functions as the Secretary. MPD assists the MPC with analytical and data requirements for meetings; prepares the resolution and statements by the MPC members.

[Section 45ZG and Regulation 4(i)]

Function of the MPC

The RBI Act states that the Monetary Policy Committee shall determine the Policy Rate required to achieve the inflation target and decision of the Monetary Policy Committee shall be binding on the Bank.

[Clause 3 and 4 of Section 45ZB]

The Decision-Making Process of the MPC

Planning Meetings

Scheduled meetings: The Bank shall organise at least four meetings of the Monetary Policy Committee in a year. To help the MPC members plan for the meetings and for information of the markets, the schedule of monetary policy voting/ decision meetings for the entire fiscal year is announced in advance.

[Section 45ZI and Regulation 5(i)(a)]

Emergency meetings: Ordinarily not less than fifteen days' notice shall be given to the members for meetings of the Committee. However, in the case of exigency, there are provisions to arrange an emergency meeting at 24 hours' notice to enable every member to attend. With technology enabled arrangements in place, meetings can be convened at even shorter notice period

[Clause 3(b) of Section 45ZI and Regulation 5(i)(b)]

Frequency of meetings: The MPC must hold at least four meetings in a year. In practice, the MPC conducts six meeting a year at bi-monthly frequency.

[Section 45ZI (1)]

Meeting Structure

Quorum and Presider: The quorum for having a meeting of the MPC is of four members, at least one of whom is the Governor and, in his absence, the Deputy Governor who is the Member of the Monetary Policy Committee. The meetings of the Monetary Policy Committee would be presided by the Governor, and in his absence by the Deputy Governor who is a Member of the Monetary Policy Committee.

[Clause 5 and 6 of the Section 45ZI]

Voting: All questions which come up before any meeting of the MPC to be decided by a majority of votes by the Members present and voting, and in the event of an equality of votes, the Governor has a second or casting vote.

[Clause 8 of the Section 45ZI]

The MPC Communications

Publication of Decision: After the conclusion of every MPC meeting, the Bank publishes the resolution adopted by the said Committee. The resolution includes the macroeconomic assessment and outlook of the MPC and its decision on the policy repo rate.

[Section 45ZK]

Minutes of the MPC: The minutes of every MPC meeting are published on the 14th day after the MPC meeting. The minutes of the proceedings of the meeting must include: (a) the resolution adopted by the MPC; (b) the vote of each member of the Monetary Policy Committee, ascribed to such member, on resolutions adopted in the said meeting; and (c) the statement of each member of the Monetary Policy Committee on the resolutions adopted in the said meeting.

[Section 45ZL and Subsection 11 of Section 45ZI]

Monetary Policy Report: The Reserve Bank is required to publish, once in every six-months, a document titled Monetary Policy Report (MPR) explaining the sources of inflation and the forecasts of inflation for the period between six to eighteen months from the date of publication of the document. The MPR shall contain (a) The explanation of inflation dynamics in the last six months and the near term inflation outlook; (b) Projections of inflation and growth and the balance of risks; (c) An assessment of the state of the economy, covering the real economy, financial markets and stability, fiscal situation, and the external sector, which may entail a bearing on monetary policy decisions; (d) An updated review of the operating procedure of monetary policy; and (e) An assessment of projection performance. The MPR is released on the Bank website within 24 hours of the release of the relevant policy statement.

[Section 45ZM and Regulation 6(ii)]

Silent Period: The external communication policy for the MPC mandates a silent or blackout period for the MPC members, starting seven days before the voting/decision day, and ending seven days after the day policy is announced. During this period, the MPC members are required to avoid public comment on issues related to monetary policy, other than through the MPC's communication framework.

[Regulation 5(i)]

Accountability of the MPC

The RBI Act enable the Central Government to set out the definition of failure to meet inflation target as well as accountability measures in case of failure. As per the RBI Act, when the Bank fails to meet the inflation target, it is required to set out in a report to the Central Government – (a) the reasons for failure to achieve the inflation

target; (b) remedial actions proposed to be taken by the Bank; and (c) an estimate of the time-period within which the inflation target shall be achieved pursuant to timely implementation of proposed remedial actions. In the event of failure of the Reserve Bank to meet the inflation target, a separate meeting is required to be scheduled by the Secretary to the Committee, as part of the normal policy process to discuss and draft the report to be sent to the Central Government under the provisions of the Act. The Report is required to be sent to the Central Government within one month from the date on which the Bank failed to meet the inflation target.

[Sub-sections (a), (b) and (c) of Section 45ZN and Regulation 7]

Code of conduct of the MPC Members: The Regulation provides broad guidance to members of the MPC on their ethical conduct to help enhance public trust and confidence in the Bank and its policies. The Members, *inter alia,* are expected to be guided by the objectives of monetary policy set out in the Act and the inflation target set by the Central Government, and independently and candidly express their views in the MPC meetings before voting. The RBI Act places responsibility for removing the MPC members. The current MPC Framework provides guidance to the members of MPC on their ethical conduct to build trust and confidence in the bank policies. Members are also expected to take adequate precautions to ensure utmost confidentiality of the MPC's policy decision before it is made public, preserve confidentiality about the decision-making process and maintain the highest standards of probity consistent with public office. While interacting with profit-making organizations or making personal financial decisions, they shall weigh carefully, any scope for conflict between personal interest and public interest

[Section 45 ZE and Regulation 5(ii)]

Annex III.2: The MPC Voting Patterns (October 2016-March 2020)

Meeting No.	Meeting Date	Repo Rate (per cent)	Stance	Voting Pattern		Change in Policy Rate (in bps)	
				Policy Rate	Stance	Policy	Difference (bps/no.)
1	Oct-16	6.25	Accommodative	6-0	6-0	-25	
2	Dec-16	6.25	Accommodative	6-0	6-0	0	
3	Feb-17	6.25	Neutral	6-0	6-0	0	
4	Apr-17	6.25	Neutral	6-0	6-0	0	
5	Jun-17	6.25	Neutral	5-1	6-0	0	-50:1
6	Aug-17	6.00	Neutral	4-2	6-0	-25	0:1; -50:1
7	Oct-17	6.00	Neutral	5-1	6-0	0	-25:1
8	Dec-17	6.00	Neutral	5-1	6-0	0	-25:1
9	Feb-18	6.00	Neutral	5-1	6-0	0	25:1
10	Apr-18	6.00	Neutral	5-1	6-0	0	25:1
11	Jun-18	6.25	Neutral	6-0	6-0	25	
12	Aug-18	6.50	Neutral	5-1	6-0	25	0:1
13	Oct-18	6.50	Calibrated tightening	5-1	5-1 (Neutral:1)	0	25:1
14	Dec-18	6.50	Calibrated tightening	6-0	5-1 (Neutral:1)	0	
15	Feb-19	6.25	Neutral	4-2	6-0	-25	0:2
16	Apr-19	6.00	Neutral	4-2	5-1 (Accommodative:1)	-25	0:2
17	Jun-19	5.75	Accommodative	6-0	6-0	-25	
18	Aug-19	5.40	Accommodative	4-2	6-0	-35	-25:2
19	Oct-19	5.15	Accommodative	5-1	6-0	-25	-40:1
20	Dec-19	5.15	Accommodative	6-0	6-0	0	
21	Feb-20	5.15	Accommodative	6-0	6-0	0	
22	Mar-20	4.40	Accommodative	4-2	6-0	-75	-50:2

Sources: Monetary Policy Statements, RBI and Authors' compilation.

Annex III.3: Central Bank Transparency Index

Sr	Attribute	Criteria
1	**Political transparency**	
a	Is there a formal statement of the objective(s) of monetary policy, with an explicit prioritization in case of multiple objectives?	No formal objective(s)=0.
		Multiple objectives without prioritization=1/2.
		One primary objective, or multiple objectives with explicit priority=1.
b	Is there a quantification of the primary objective(s)?	No=0.
		Yes = 1.
c	Are there explicit institutional arrangements or contracts between the monetary authorities and the government?	No central bank, contracts or other institutional arrangements=0.
		Central bank without explicit instrument independence or contract=1/2.
		Central bank with explicit instrument independence or central bank contract (although possibly subject to an explicit override procedure)=1.
2	**Economic transparency**	
a	Is the basic economic data relevant for the conduct of monetary policy publicly available? The focus is on the release of data for the following five variables: money supply, inflation, GDP, unemployment rate and capacity utilization.	Quarterly time series for at most two out of the five variables=0.
		Quarterly time series for three or four out of the five variables=1/2.
		Quarterly time series for all five variables=1.
b	Does the central bank disclose the formal macroeconomic model(s) it uses for policy analysis?	No=0.
		Yes = 1.
c	Does the central bank regularly publish its own macroeconomic forecasts?	No numerical central bank forecasts for inflation and output=0.
		Numerical central bank forecasts for inflation and/or output published at less than quarterly frequency=1/2.
		Quarterly numerical central bank forecasts for inflation and output for the medium term (one to two years ahead), specifying the assumptions about the policy instrument (conditional or unconditional forecasts)=1.
3	**Procedural transparency**	
a	Does the central bank provide an explicit policy rule or strategy that describes its developments (at least quarterly)=1 /2?	No=0.
		Yes = 1.

(Contd.)

Sr	Attribute	Criteria
b	Does the central bank give a comprehensive account of policy deliberations (or explanations in case of a single central banker) within a reasonable amount of time?	No, or only after a substantial lag (more than 8 weeks)=0.
		Yes, comprehensive minutes (although not necessarily verbatim or attributed) or explanations (in case of a single central banker), including a discussion of backward and forward-looking arguments=1.
c	Does the central bank disclose how each decision on the level of its main operating instrument or target was reached?	No voting records, or only after substantial lag (more than eight weeks)=0.
		Non-attributed voting records=1/2.
		Individual voting records, or decision by single central banker=1.
4	**Policy transparency**	
a	Are decisions about adjustments to the main operating instrument or target promptly announced?	No, or after a significant lag=0.
		Yes, at the latest on the day of implementation=1.
b	Does the central bank provide an explanation when it announces policy decisions?	No=0.
		Yes, when policy decisions change, or only superficially=1/2.
		Yes, always and including forwarding-looking assessments=1.
c	Does the central bank disclose an explicit policy inclination after every policy meeting or an explicit indication of likely future policy actions (at least quarterly)?	No=0.
		Yes = 1.
5	**Operational transparency**	
a	Does the central bank regularly evaluate to what extent its main policy operating targets (if any) have been achieved?	No, or not very often (at less than annual frequency)=0.
		Yes, but without providing explanations for significant deviations=1/2.
		Yes, accounting for significant deviations from target (if any); or, (nearly) perfect control over main operating instrument/target=1.
b	Does the central bank regularly provide information on (unanticipated) macroeconomic disturbances that affect the policy transmission process?	No, or not very often=0.
		Yes, but only through short-term forecasts or analysis of current macroeconomic developments (at least quarterly)=1 /2.
		Yes, including a discussion of past forecast errors (at least annually)=1.
c	Does the central bank regularly provide an evaluation of the policy outcome in light of its macroeconomic objectives?	No, or not very often (at less than annual frequency)=0.
		Yes, but superficially=1/2.
		Yes, with an explicit account of the contribution of monetary policy in meeting the objectives=1.

Source: Eijffinger and Geraats (2006)

Annex III.4: Model MPC Communication Document

Section 45ZB of the RBI Act, 1934 provides for an empowered six-member monetary policy committee (MPC) to be constituted by the Central Government by notification in the Official Gazette. The MPC is guided by the objectives of monetary policy set out in the Act and the inflation target set by the Central Government.

Apart from rigorous analysis and intense deliberations that precede every monetary policy decision, the success in arriving at the desired outcome of monetary policy also depends on the effectiveness of communication. Communication is an important tool in the conduct of monetary policy. Accordingly, this document lays out communication guidance for the MPC members.

Guidance on Written communication

The MPC resolution is published on the final day of the policy meeting. It conveys the MPC's collective assessment of macroeconomic developments; the MPC's projections of growth and inflation for a year ahead along with balance of risks; and votes of each member ascribed to such members. The minutes of the MPC that are released on the fourteenth day after the resolution is published, include in addition to the resolution, the statement of each member of the MPC on the resolution adopted in the meeting. The MPC members shall independently and candidly express their views in the meetings before voting. Members shall take adequate precaution to ensure utmost confidentiality of the MPC's policy decision before it is made public and preserve confidentiality about the decision-making process.

Guidance on Speeches and other Communication

Since monetary policy communication is market sensitive, to ensure that the rationale behind monetary policy actions is understood correctly, the Governor, Chairperson of the MPC, will give a press statement after conclusion of every meeting. He will also address the media and researchers and analysts to address their queries and to clarify the stance and intent of policy so that misconceptions and confusion are eschewed, and a common set of expectations is shared by all. This can greatly enhance the efficiency and credibility of monetary policy.

Other members of the MPC shall ensure that personal views expressed through speeches and other forms of communications are attributable only to themselves. They may also be sensitive of the MPC's collective decision and act in a manner consistent with the integrity, dignity and reputation of their office and of the Reserve Bank of India while discussing about monetary policy in public forums. The MPC members must also keep the Reserve Bank informed about their public lectures and research publications on matters related to monetary policy.

Guidance on Communication during Emergency Meetings

Should there be a need of conducting monetary policy meetings outside the regular/scheduled policy meetings, communication of monetary policy decisions in such emergency meetings will be made only by the Governor, as chairperson of the MPC.

Silent Period

Members shall observe a silent or blackout period relating to monetary policy issues, starting seven days before the voting/decision day, and ending seven days after the monetary policy is announced. During this period, the members must refrain from making public statements on matters relating to monetary policy, other than through the MPC's

communication framework. Members may avoid private interactions with media or other groups to eschew speculation.

The silent period after the policy is announced will not be applicable in the case of the Governor, as Chairperson of the MPC. The Governor has to interact with various stakeholders in the monetary policy discussions to help enhance the efficacy of monetary policy.

For any public communication during the silent period after the policy is announced, the members of the MPC, other than the Chairperson of the MPC, will consult and inform the MPC Secretary in advance.

4 OPERATING PROCEDURE OF MONETARY POLICY

"The Bank shall publish a document explaining the steps to be taken by it to implement the decisions of the Monetary Policy Committee, including any changes thereto"

[Section 45ZJ(1) of the Reserve Bank of India Act, 1934]

1. Introduction

IV.1 The operating procedure of monetary policy[1] revolves around the implementation of monetary policy decisions – "the plumbing in its architecture" (Patra *et al*., 2016). As enjoined by the RBI Act, the decision of the MPC on the policy rate has to be operationalised by the RBI so that it alters the spending behaviour of economic agents and, in turn, achieves the RBI's mandate on inflation and growth. Since monetary policy is characterised by "inside" and "outside" lags in policy formulation and implementation,[2] the challenge for an efficient operating procedure is to (i) minimise the transmission lag from changes in the policy rate to the operating target – a variable that can be controlled by monetary policy actions – rapidly and efficiently; and (ii) ensure that changes in the operating target are transmitted as fully as feasible across the interest rate term structure in the economy. In pursuit of the legislative mandate, details of the changes in operating procedure and their rationale are presented in the bi-annual Monetary Policy Reports.

IV.2 The weighted average call rate (WACR) – which represents the unsecured segment of the overnight money market and is best reflective of systemic liquidity mismatches at the margin – was explicitly chosen as the operating target of monetary policy in India. An interest rate corridor – the liquidity adjustment facility (LAF) – has been defined since May 2011 by the interest rate on the marginal standing facility (MSF) as the upper bound (ceiling), the fixed overnight reverse repo rate as the lower bound (floor) and the policy repo rate in between (RBI, 2011).[3]

IV.3 The LAF corridor effectively defines the operating procedure of monetary policy. Once the policy repo rate is announced, liquidity operations are conducted to keep the WACR closely aligned to the repo rate. While the operating target and the LAF corridor framework have remained unchanged during the FIT period, several refinements have been introduced regarding (i) the width of the corridor; (ii) the choice of liquidity management instruments; and (iii) fine-tuning regular/durable market operations, all

This chapter has been prepared by a team comprising Arghya Kusum Mitra, Indranil Bhattacharyya, Edwin A. Prabhu, Rajesh B. Kavediya, Bhimappa A. Talwar, K.M. Kushawaha and Avnish Kumar. The authors are thankful to Dr Rajiv Ranjan and Shri Muneesh Kapur for encouragement and suggestions. Data support provided by Akshay S. Gorwadkar and Nilesh P. Dalal is gratefully acknowledged.

1 In central banking parlance, the implementation of monetary policy on a day-to-day basis in pursuit of the ultimate objectives of price stability and growth is known as the operating procedure (Walsh, 2011).

2 Inside lags include (a) recognition of the problem, (b) policy decision to address the problem, and (c) implementation of the decision while outside lags include (a) immediate impact of the policy decision, and (b) the final outcome (Perryman, 2012).

3 While the MSF provides market participants access to central bank liquidity at a premium above the policy rate, the fixed rate overnight reverse repo window allows surplus liquidity to be parked with the Reserve Bank at the end of the day at a discount below the policy rate.

intended to anchor the term structure of interest rates to the policy repo rate in order to strengthen transmission.

IV.4 Monetary policy transmission constitutes a 'black box' (Bernanke and Gertler, 1995). Several channels of transmission have been identified in the literature and the cross-country experience: (i) the interest rate channel described in the foregoing; (ii) the credit or bank lending channel, which assumes importance in a bank-dominated financial system such as India's; (iii) the exchange rate channel operating through relative prices of tradables and non-tradables; (iv) the asset price channel impacting wealth/income accruing from holdings of financial assets; and (v) the expectations channel encapsulating the perceptions of households and businesses on the state of the economy and its outlook. These conduits of transmission intertwine and operate in conjunction and are difficult to disentangle. There is a loose consensus, however, in great measure associated with the development and growing sophistication of financial markets, that the interest rate channel is dominant (Bernanke and Blinder, 1992). Since the 2000s, this has provided the rationale for the choice of the operating procedure in India. During FIT, this operating procedure has been reinforced by practitioner innovations and communication strategies. In the process, trade-offs have surfaced, which warrant careful evaluation in order to draw lessons for the operationalisation of FIT in India, going forward.

IV.5 Given this motivation, this chapter sets out to review the performance of the extant operating framework and its efficacy. The rest of the Chapter is structured in the following manner: Section 2 presents the stylised facts of the operating procedure and the transmission mechanism juxtaposed against the cross-country experience. Section 3 addresses specific tensions stemming from the operating procedure and the monetary transmission mechanism, some aspects of which engaged public discourse over the past four years. This section also recommends steps needed to fine-tune the operating procedure and facilitate better transmission. Finally, Section 4 concludes by laying out the challenges lying ahead.

2. Some Stylised Facts

IV.6 Refinements in the operating framework have been undertaken in response to the changing macroeconomic and financial environment to sharpen the role of the repo rate as the single policy rate, to establish the 14-day term repo as the main instrument for providing liquidity over the reserve maintenance period and to enable a flexible framework that could shift seamlessly from a deficit mode in consonance with a tightening stance to a surplus mode in support of an accommodative stance (Table IV.1).

IV.7 In February 2020, the culmination of these reforms was placed in the public domain with a view to clearly communicating the objectives and the toolkit for liquidity management (Box IV.1).

IV.8 During the period of FIT,[4] liquidity management operations underwent severe stress on two occasions. The first test came with the surplus liquidity glut post-demonetisation, which prompted the RBI to impose an unprecedented incremental cash reserve ratio (CRR) of 100 per cent for one fortnight (RBI, 2017). The second shock is the outbreak of COVID-19 when market

4 As mentioned in Chapter I, the FIT period spans October 2016 to March 2020.

Table IV.1: Reforms in the Operating Framework

The New Operating Framework of Monetary Policy (May 2011)	Revised Liquidity Management Framework (September 2014)	Modified Liquidity Framework (April 2016)
• Repo Rate - Single policy rate. • Weighted average overnight call money rate (WACR) is the operating target. • Corridor of +/- 100 bps around the Repo Rate. • 100 bps above the repo rate for the Marginal Standing Facility (MSF) and 100 bps below the repo rate for the reverse repo rate. • Full accommodation of liquidity demand at the fixed repo rate, *albeit* with an indicative comfort zone of +/-1 per cent of net demand and time liabilities (NDTL) of the banking system. • Transmission of the changes in Repo Rate through the WACR to the term structure of interest rates.	• Access to assured liquidity of about 1 per cent of NDTL on an average • Bank-wise overnight fixed rate repos of 0.25 per cent of NDTL, and the balance through 14-day variable rate term repos. • More frequent auctions of 14-day term repos during a fortnight (every Tuesday and Friday of a week). • Introduction of variable rate fine-tuning repo/reverse repo auctions.	• The corridor around the Repo rate narrowed from +/- 100 bps to +/- 50 bps. • Commitment to progressively lower the *ex-ante* system level liquidity deficit to a position closer to neutrality in the medium run. • Reducing the minimum daily maintenance of the CRR from 95 per cent of the requirement to 90 per cent.

seizure caused a collapse in trading activity, warranting the use of extraordinary system-wide as well as targeted liquidity measures to restore normalcy (RBI, 2020).

Box IV.1
Liquidity Management Framework

The salient features of the *extant* framework operationalised on February 14, 2020 are[5]:

- The liquidity management corridor is retained and the weighted average call rate (WACR) remains the operating target.
- The width of the corridor was retained at 50 basis points (bps)[6]
- A 14-day term repo/reverse repo operation at a variable rate and conducted to coincide with the cash reserve ratio (CRR) maintenance cycle is the main liquidity management tool for managing frictional liquidity requirements; the daily fixed rate repo and four 14-day term repos conducted every fortnight earlier stand withdrawn.
- The main liquidity operation is supported by fine-tuning operations, overnight and/or longer tenor, to tide over any unanticipated liquidity changes during the reserve maintenance period; if required, the RBI will conduct variable rate repo/reverse repo operations of more than 14 days tenor.
- Liquidity management instruments include fixed and variable rate repo/reverse repo auctions, outright open market operations (OMOs), forex swaps and other instruments.
- The daily minimum CRR maintenance requirement is retained at 90 per cent[7]
- Standalone Primary Dealers (SPDs) are allowed to participate directly in all overnight liquidity management operations.
- Transparency in communication is enhanced through (a) dissemination of both flow and stock impact of liquidity operations; and (b) publication of a quantitative assessment of durable liquidity conditions of the banking system with a fortnightly lag.

5 Statement on Developmental and Regulatory Policies, February 6, 2020, RBI.

6 Following the outbreak of the pandemic, the corridor was asymmetrically widened to 65 bps in March and further to 90 bps in April 2020; at present, the reverse repo rate is 65 bps below the repo rate while the MSF rate is 25 bps above the repo rate.

7 The daily CRR maintenance requirement was reduced to 80 per cent in March 2020 in view of the Covid-19 induced financial market dislocations.

Operating Framework and Market Microstructure

IV.9 The choice of the operating framework and the liquidity management strategy of a central bank is premised on an efficient inter-bank money market which ensures smooth transfer of funds from lenders to borrowers and, in that process, determines the overnight rate (Bindseil, 2014). Reforms to develop the money market in India over the years in the context of the first leg of monetary policy transmission have expanded participation and instruments. There has been a steady migration of market activity to collateralised segments (Table IV.2), in conformity with some advanced economy (AE) experiences *viz.*, the US, the UK, the Euro area and Japan.

IV.10 In the uncollateralised segment, the reduced turnover is highly concentrated in the opening and the closing hours of trading, which tends to accentuate volatility in the WACR (Bhattacharyya *et al.*, 2019). The collateralised segments are dominated by non-bank participants such as mutual funds (MFs). Consequently, extraneous developments such as large redemption pressures in the stock market spill over and bring episodes of tightness to overnight market conditions. Likewise, regulatory changes that mandate or incentivise collateralised instruments for investment by these entities – as in September 2019[8] – can ease market conditions unexpectedly. Other aspects of the market microstructure can also influence the WACR. Specifically, special repos – repo transactions in which funds are lent in order to acquire a specific security for meeting obligations in the short sale[9] market – often drive market repo rates to unduly low levels, dragging down money market rates out of sync with the Reserve Bank's operating corridor. Furthermore, a higher proportion of 'reported deals' – which are traded over-the-counter (OTC) and reported on the negotiated dealing system (NDS)-Call platform after the deals are completed – exerts a disproportionate influence on the WACR.[10]

Table IV.2: Share in Overnight Money Market Volume

(Per cent)

Financial Year		Uncollateralised	Collateralised	
		Call Money	CBLO/ Tri-party Repo	Market Repo
Pre-FIT	2011-12	21.2	58.9	19.9
	2012-13	21.1	54.5	24.5
	2013-14	15.2	60.1	24.8
	2014-15	13.0	59.2	27.8
	2015-16	12.4	59.1	28.6
	2016-17 (April - September)	11.5	56.2	32.3
Average (Pre-FIT)		**15.4**	**58.2**	**26.4**
FIT	2016-17 (October – March)	9.8	61.4	28.8
	2017-18	8.4	63.2	28.5
	2018-19	9.6	63.8	26.6
	2019-20	6.9	68.0	25.1
Average (FIT)		**8.4**	**64.8**	**26.8**

Note: Tri-party repo replaced collateralized borrowing and lending obligations (CBLO) effective November 5, 2018; Pre-FIT (April 2011- September 2016).
Source: Reserve Bank of India (RBI).

8 The cut-off timing for computing net asset value (NAV) was advanced from 2:00 PM to 1:30 PM by the Securities and Exchange Board of India (SEBI) on September 20, 2019.

9 Sale of a security that the seller does not own at the time of transaction but which requires delivery on the settlement date.

10 Most of reported deals involve cooperative banks as lenders and private banks as borrowers. The rates on reported deals are generally lower; consequently, a higher share of reported deals *vis-a-vis* traded deals exerts downward pressure on the WACR.

Policy Corridor

IV.11 During FIT, liquidity management operations kept the WACR within the policy corridor on 97 per cent of the time (Table IV.3), although it predominantly traded below the repo rate (91 per cent of the time).

IV.12 The country experience with regard to a corridor system indicates that the operating target generally lies in the middle, *i.e.*, equidistant from the ceiling and the floor, suggesting efficient liquidity management based on prescient forecasting of systemic liquidity requirements (Sveriges Riksbank, 2014). In India, the WACR was centred in the LAF corridor and aligned tightly with the policy rate ahead of the institution of FIT and through its early months, reflecting monetary marksmanship on the back of a narrowing of the corridor from 200 bps in April 2015 to 50 bps by April 2017. This was honed by active liquidity management – 14-day repo auctions were used in the place of fixed rate repo. From the latter part of 2016-17 and in the first half of 2017-18, the demonetisation-induced liquidity overhang imparted a softening bias to overnight rates, reflected in a negative spread (over the repo rate) of 19 bps over a year. In the wake of the slowdown in economic activity thereafter, the RBI adopted an accommodative stance of monetary policy and allowed systemic liquidity (net LAF) to transit from deficit to surplus from June 2019 and into large liquidity absorption with the onset of the pandemic (Chart IV.1a). Overall, the WACR traded 11 bps below the repo rate under FIT on average, as against 19 bps above the repo rate pre-FIT (Chart IV.1b).

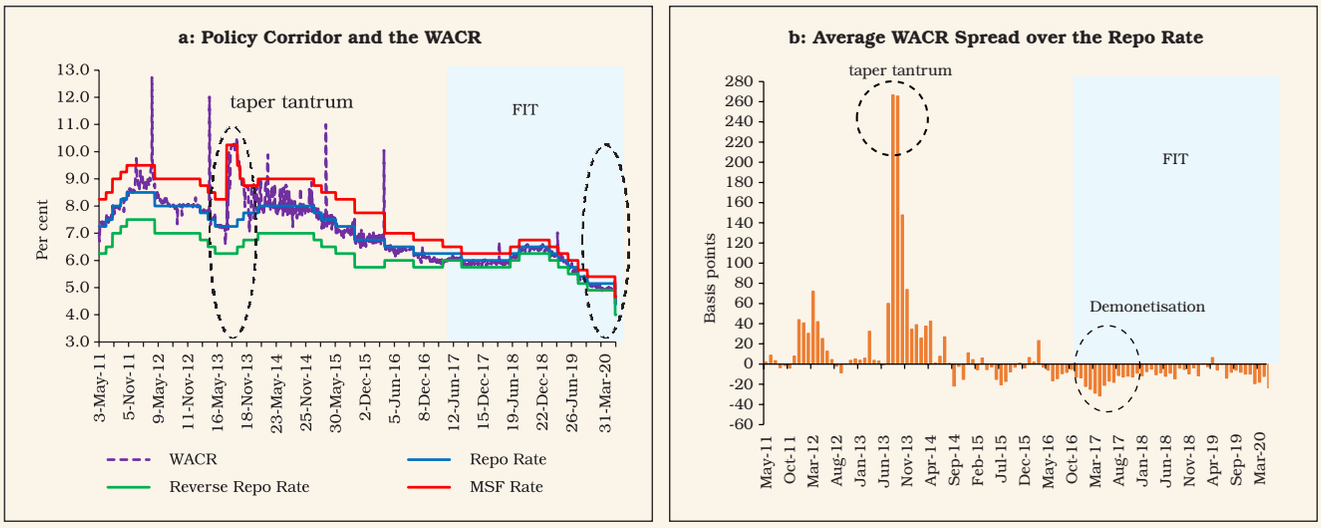
Table IV.3: Operating Target and Monetary Marksmanship

(Days)

Regime	Outside Corridor		Within Corridor			Total
	> MSF	< Reverse Repo	< Repo	= Repo	> Repo	
Pre-FIT	31	0	556	7	710	1,304
FIT	4	23	742	2	74	845
Overall	**35**	**23**	**1,298**	**9**	**784**	**2,149**

Note: Pre-FIT: (May 2011 to September 2016); FIT: (October 2016 to March 2020).
Source: RBI.

Chart IV.1: Corridor Marksmanship

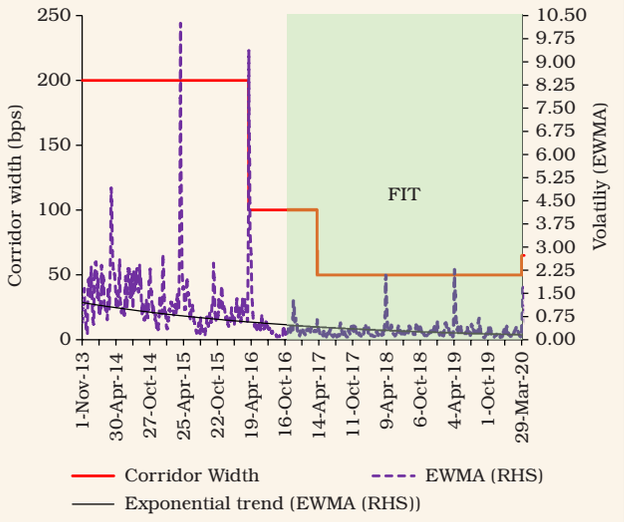


Source: RBI.

IV.13 The country experience suggests that the corridor width usually ranges between 25-200 bps around the policy rate/target (Annex IV.1). The optimal width of the corridor and its impact on liquidity management has been extensively deliberated in the literature. A wider corridor is synonymous with costlier central bank standing facilities and is associated with (i) greater inter-bank turnover; (ii) leaner balance sheet of the central bank; and (iii) greater short-term interest rate volatility (Bindseil and Jablecki, 2011). In contrast, a narrow corridor is associated with (i) shrinking inter-bank market activity; (ii) higher recourse to standing facilities, leading to a sharp increase in the size of the central bank's balance sheet; and (iii) stable short-term rates in the inter-bank market. In India, the width of the corridor was progressively narrowed in a symmetric manner, which helped in moderating volatility – measured by the exponential weighted moving average (EWMA)[11] of the WACR – corroborating the cross-country experience (Chart IV.2).

IV.14 An asymmetric corridor has also been proposed in the context of a weak economy and a fragile financial sector (Goodhart, 2010); in practice, it has gained wide acceptability among some AEs after the GFC. In India too, the RBI asymmetrically widened the corridor to 400 bps in mid-July 2013 in response to the taper tantrum. With the return of normalcy, the corridor width was gradually restored to its pre-crisis level of 200 bps by end-October 2013 (Chart IV.3). After the COVID-19 pandemic, the Reserve Bank once again asymmetrically widened the corridor during March-April 2020, operating a *de facto* floor system as various conventional and unconventional measures flooded liquidity into the system and kept financial conditions ultra-easy to counter the pandemic.

Chart IV.2: Corridor Width and WACR Volatility



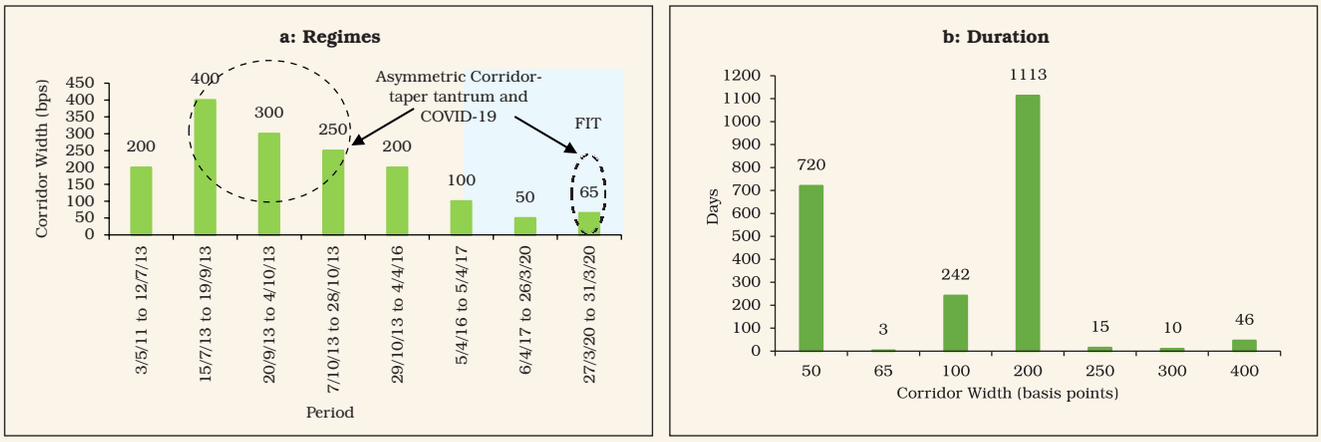
Note: EWMA - Exponential Weighted Moving Average.
Source: RBI Staff Estimates.

Reserve Maintenance and Averaging

IV.15 Although the efficacy of the CRR as a policy instrument is limited in a modern financial system, it is a potent tool for stabilising overnight interest rates by creating the demand for reserves. Banks may frontload (backload) their maintenance at the beginning (end) of the reserve maintenance period, depending on the prevailing market interest rate and expectations of future rates. Accordingly, the overwhelming preference across jurisdictions is to stipulate reserve maintenance on an average basis: maintenance periods vary from two weeks (India) to six-eight weeks coinciding with monetary policy meetings (Euro area). The number of central banks stipulating daily minimum reserve maintenance is limited (Annex IV.1).

11 As a volatility measure, the EWMA is an improvement over simple variance as it assigns greater weight to more recent observations. EWMA expresses volatility as a weighted average of past volatility where the weights are higher for more recent observations.

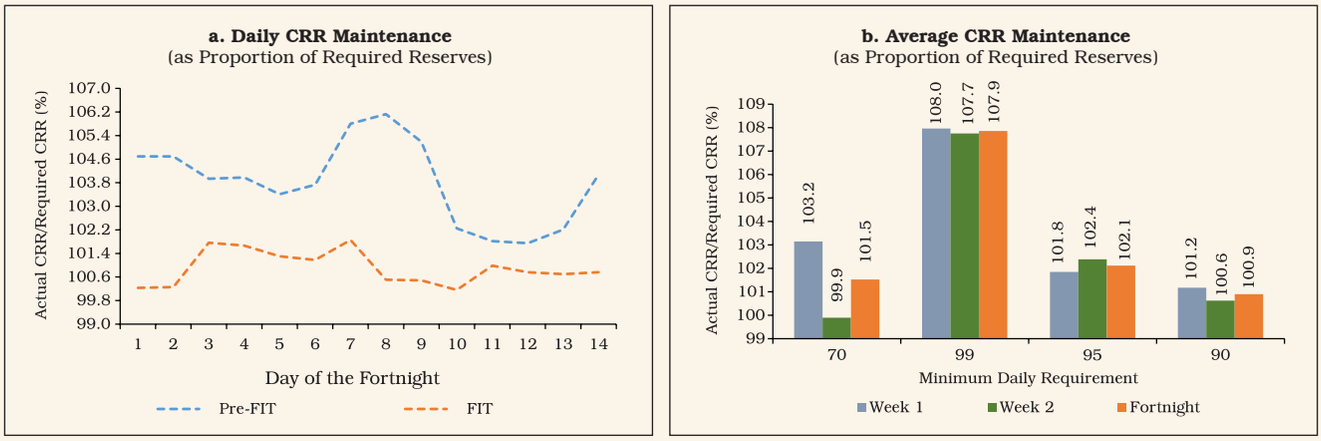
Chart IV.3: Evolution of Corridor Width



Source: RBI.

IV.16 Under Section 42(2) of the RBI Act, 1934, banks are required to maintain a specified proportion of their net demand and time liabilities (NDTL) as CRR balances with the RBI on an average daily basis over a reporting fortnight, with a minimum daily maintenance (stipulated as a proportion of actual requirements) during the fortnight. The daily minimum reserve requirement provides banks with flexibility in optimising their reserve holdings, depending upon intra-fortnight cash flows. Within the reporting fortnight, banks choose their daily maintenance levels – based on a cost-benefit analysis of interest rate expectations *vis-à-vis* the rates on standing facilities. Significant improvement in liquidity planning and reserve maintenance by banks has been observed in the FIT period (Chart IV.4a). The daily minimum reserve requirement was enhanced from 70 per cent of required CRR (effective since December 2002) to 99 per cent in July 2013 but subsequently reduced to 95 per cent in September 2013 and further to 90 per cent in April 2016. Post the

Chart IV.4: Reserve Maintenance



Source: RBI

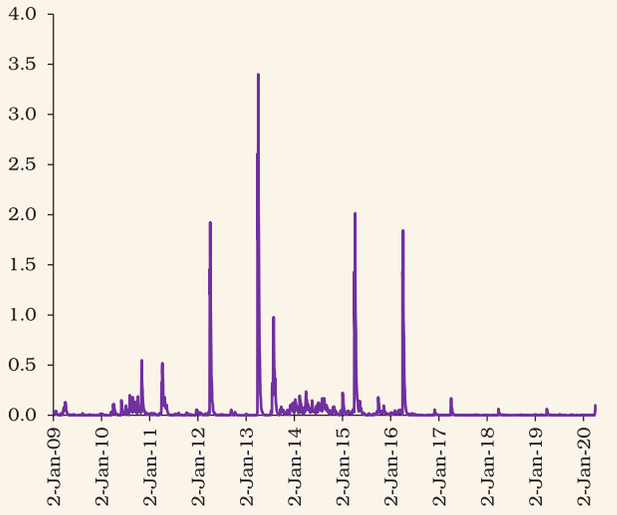
outbreak of COVID-19, the minimum requirement was further reduced to 80 per cent in March 2020. The intra-fortnight variation (across weeks) in reserve maintenance was negligible when the daily minimum was prescribed at 99 per cent after the taper tantrum; in contrast, there has been significant frontloading in the first *vis-à-vis* the second week when the daily minimum balance was set at 70 per cent (Chart IV.4b).

Volatility of WACR

IV.17 The efficacy of monetary policy transmission is contingent upon minimising volatility in the operating target so that policy signals are not blurred. Lower volatility in the overnight inter-bank rate lessens uncertainty about funding costs (Kavediya and Pattanaik, 2016). In fact, longer term rates can be higher than the policy preference due to increased volatility in the operating target (Carpenter *et al*., 2016); hence, stable and predictable short-term rates can help to improve transmission (Mæhle, 2020). Minimising operating target volatility has accordingly acquired priority in liquidity management objectives of central banks. It is in this context that most central banks resort to fine-tuning operations and provide forward guidance to align the operating target with the policy rate (USA; Euro area; UK, Sweden, Canada, Norway, Australia). Volatility is also minimised by (i) synchronising main refinancing operations with the reserve maintenance periods (ECB); (ii) indexing the overnight rate to the policy rate (UK); and (iii) undertaking discretionary operations alongside regular operations.

IV.18 In India, the conditional volatility of the WACR has been found to positively affect the bid-ask spread in the overnight inter-bank market

Chart IV.5: Estimated Volatility (IGARCH) of WACR



Source: RBI Staff Estimates.

(Ghosh and Bhattacharyya, 2009). The conditional volatility of WACR has generally been subdued especially after the introduction of FIT, but for the usual year-end effects associated with balance sheet adjustment by banks (Chart IV.5).

IV.19 An assessment of the key determinants of volatility suggests that calendar effects (annual closing) and reserve maintenance behaviour have had lesser impact under FIT than before, indicating improved liquidity management during this period (Box IV.2).

Instruments and Collateral

IV.20 In the aftermath of the GFC, discretionary and emergency liquidity facilities have been active across central banks or relevant legislations are in place for their future usage, if required. Besides open market operations (OMOs), other discretionary operations include forex swaps (Australia); term deposits (Australia); compulsory deposits (Mexico); additional loans and deposits (Sweden); and funding for lending (UK).

Box IV.2
Volatility of WACR – Key Determinants

Based on daily data from January 2009 to March 2020, the estimated volatility of daily changes in WACR, on an average, is found to be lower during the FIT period (Table 1). Moreover, skewness and kurtosis of estimated volatility has also declined during the FIT period, which is partly reflected in the moderation of spikes in WACR around end-March during this period.

High frequency variables such as the WACR exhibit volatility clustering – bouts of intense volatility followed by periods of calm. This warrants the use of generalised autoregressive conditional heteroscedasticity (GARCH) [1,1] models or variants, where the sum of the estimated parameters is close to unity. Considering the persistence of volatility in the WACR, the integrated-GARCH (I-GRACH) model is used to model volatility (Engle and Bollerslev, 1986) with the following specification:

Mean equation:

$$\Delta r_t = c + \rho\,(r-o)_{t-1} + \sum_i \beta_i\,\Delta r_{t-i} + \sum_j \gamma_{t-j}\Delta o_{t-j} + \theta liq_t + \omega DX_t + \varepsilon_t \quad \text{... (1)}$$

Variance equation:

$$\sigma_t^2 = \mu + \alpha\,\varepsilon_{t-1}^2 + \delta\sigma_{t-1}^2 + \tau DX_t$$

$$\alpha > 0\ ,\ \delta > 0 \text{ and } \alpha + \delta = 1 \quad \text{....(2)}$$

where r_t denotes daily WACR, o_t is the policy repo rate, liq_t is the daily net LAF position reflecting the liquidity mismatch and Δ represents daily change in respective variables. The error correction term measured through the lagged spread between WACR and the policy repo rate is also included in the mean equation. The impact of specific events such as the taper tantrum, demonetisation, year-end liquidity effects, and fortnightly reserve maintenance patterns of banks is controlled by using dummy variables represented by DX_t. The coefficients from the variance equation can be interpreted as the autocorrelation factor (α) and the volatility persistence ($\alpha + \delta$) factor. Diagnostic tests of residuals suggest that (i) the model is specified correctly and (ii) free from autocorrelation (Table 2).

Table 1: Estimated Conditional Volatility of Daily Changes in WACR

Summary Statistics	Pre-FIT$	FIT@
Mean	0.050	0.003
Median	0.012	0.003
Maximum	2.028	0.004
Minimum	0.000	0.002
Std. Dev.	0.146	0.000
Skewness	7.308	0.676
Kurtosis	69.882	2.669

$: January 2009 to September 2016;
@: October 2016 to March 2020

Table 2: Volatility of WACR

Dependent Variable: ΔWACR		
Variables	**Pre-FIT**	**FIT**
Mean Equation		
Constant	-0.01***	-0.02***
∑ΔWACR	-0.12***	-0.13***
∑ΔRepo Rate	0.78***	0.49***
Net Liquidity	-0.00**	-0.01***
ECM	-0.04***	-0.22***
dum_March	3.12***	0.04
Dum_April	-3.08***	-0.60***
Dum_Taper	0.11***	
D3	0.05***	
D4	0.01***	
D5	0.01***	
D6	0.00**	
D7	0.01***	
D10	0.01***	
D12	0.01***	
Volatility Equation		
RESID(-1)^2	0.23***	0.00*
GARCH(-1)^2	0.77***	0.99***
DUM_MARCH	0.21***	0.00
Diagnostics (*p*-values)		
T-DIST. DOF	0.00	0.00
Q(10)	0.57	0.31
Q(20)	0.51	0.69
ARCH LM (5)	0.86	0.16

Note: *, ** and *** denote significance at 10%, 5% and 1% level, respectively. Demonetisation dummy turned out to be insignificant in both mean and variance equation for FIT period.

A one percentage point increase in the policy repo rate led to an instantaneous increase of 0.8 percentage points in WACR in the pre-FIT period as compared with 0.5 percentage points during FIT. The error correction term, indicating the speed of adjustment for any departure of the WACR from its long-term relationship with the policy repo rate, is about five times higher for the FIT period, reflecting improvement in transmission. Calendar effects are statistically significant during both the periods; however, their impact is much lower during FIT, with the end-March effect turning insignificant. Dummy variables capturing the impact of reserve maintenance behaviour of banks turned out to be statistically significant in the pre-FIT period; however, their impact became insignificant during FIT.

Reference:

Engle, R.F. and T. Bollerslev, (1986), "Modelling the Persistence of Conditional Variance", *Econometric Reviews, 5, 1-50*.

IV.21 For liquidity management purposes, OMOs – more purchases than sales – have been the favoured instrument in India under FIT (Table IV.4).[12] USD/INR swaps have also been used since March 2019 to inject/withdraw durable liquidity. In the wake of the pandemic, unconventional monetary policy (UMP) instruments such as long-term repo operations (LTRO) and targeted long-term repo operations (TLTRO) were introduced to reach out to specific sectors, institutions and instruments, which helped in easing market stress and softening financing conditions (RBI, 2020). As a COVID-related exceptional response, refinance / line of credit was provided to All India Financial Institutions[13] [*viz*., National Bank for Agriculture and Rural Development (NABARD); Small Industries Development Bank of India (SIDBI); National Housing Bank (NHB); and Exim Bank of India] to alleviate sector-specific liquidity constraints.[14]

IV.22 Fine-tuning operations through variable rate auctions of varying maturities geared at meeting unanticipated liquidity shocks commenced from 2014-15. During FIT, these operations have increased, both in terms of volume and number of operations conducted (Table IV.5). Although the bulk of such transactions were concentrated in smaller maturities (1-3 days), reverse repo transactions of longer maturity picked up during FIT relative to before, due to phases of prolonged surplus liquidity. As a pre-emptive measure to tide over frictional liquidity requirements caused by dislocations due to COVID-19, longer tenor (16-day maturity) fine-tuning variable rate repo auctions were conducted in March 2020, notwithstanding large surplus liquidity.

Table IV.4: Liquidity Management Instruments

(₹ Crore)

Financial Year		Net OMOs Purchases (+) / Sales (-)			Export Credit Refinance	LTROs / TLTROs	USD/INR Swap Auction	
		Auction	NDS-OM	Total			Sell/ Buy	Buy/ Sell
Pre-FIT	2011-12	1,24,724	9,361	1,34,085	23,640			
	2012-13	1,31,708	22,892	1,54,599	18,200			
	2013-14	52,003	0	52,002	28,500			
	2014-15	-29,268	-34,150	-63,418	-9,100			
	2015-16	63,139	-10,815	52,324	-			
	2016-17 (up to Sept. 30, 2016)	1,00,014	490	1,00,504	-			
FIT	2016-17 (Oct. 01, 2016 onwards)	10,000	-10	9,990	-			
	2017-18	-90,000	1,225	-88,775	-			
	2018-19	2,98,502	730	2,99,232	-		34,561	
	2019-20	1,04,224	9,345	1,13,569	-	1,50,126	34,874	- 20,232

Source: RBI.

12 In addition to liquidity measures, policy rate adjustments, which are discussed in Table IV.7 subsequently have also been effected.

13 Initially amounting to ₹50,000 crore in April 2020, subsequently increased to ₹65,000 crore in May and further to ₹75,000 crore in August 2020.

14 Since sector-specific refinance facilities provide access to assured liquidity at rates not determined by market forces, they tend to impede the monetary transmission process. Consequently, export credit refinance (ECR) was withdrawn in February 2015, based on the recommendations of the Expert Committee to Revise and Strengthen the Monetary Policy Framework (RBI, 2014).

Table IV.5: Fine-Tuning Operations

Year	Tenor (Days)	Average Volume (₹ Crore)	
		Repo	Reverse Repo
Pre-FIT			
2014-15	01-03	15,399 (50)	13,485 (56)
	04-12	12,143 (8)	11,144 (8)
	13-27	-	-
	28 and above	9,125 (1)	-
2015-16	01-03	13,051 (57)	11,449 (104)
	04-12	14,915 (44)	13,418 (42)
	13-27	21,570 (6)	4,995 (6)
	28 and above	19,803 (8)	-
2016-17 (up to Sept. 30, 2016)	01-03	9,247 (8)	15,341(47)
	04-12	11,438 (11)	11,969 (49)
	13-27	15,064 (2)	4489 (10)
	28 and above	20,004 (1)	560 (3)
FIT			
2016-17 (since Oct.1, 2016)	01-03	51,912 (15)	40,145 (164)
	04-12	6,850 (1)	21,469 (68)
	13-27	-	17,989 (53)
	28 and above	-	10,626 (22)
2017-18	01-03	14,270 (6)	20,565 (37)
	04-12	21,016 (7)	15,603 (226)
	13-27	25,005 (1)	11,775 (180)
	28 and above	23,631 (4)	3,141 (139)
2018-19	01-03	19,988 (11)	38,945 (65)
	04-12	22,441 (6)	14,092 (120)
	13-27	22,594 (4)	4,272 (14)
	28 and above	24,377 (8)	-
2019-20	01-03	15,709 (3)	1,22,451 (222)
	04-12	11,772 (1)	26,747 (39)
	13-27	38,873 (2)	9,824 (3)
	28 and above	-	16,482 (11)

Note: Figures in parentheses represent number of operations.
Source: RBI.

IV.23 All major central banks consider public sector securities as eligible collateral. Since the GFC, the list of eligible collaterals has expanded in several countries covering (i) financial entity debt (Japan, Mexico, Sweden and UK); (ii) covered bonds (Australia and UK); (iii) other asset backed securities (Australia, Canada, Mexico and UK); (iv) corporate debt and loans and other credit claims (Canada and UK); and (v) cross-border collateral (Australia, Japan, and Mexico). Accordingly, countries follow different practices relating to pricing, margins and haircuts for collateral.

IV.24 As per the RBI Act, only government securities are eligible as collateral in India for counterparties availing standing facilities and participating in liquidity operations of the RBI. Consequently, funds under the MSF and the repo facility are availed against pledging of central and state government securities.

Drivers and Management of Liquidity[15]

IV.25 A close examination suggests that although the key drivers of autonomous liquidity have remained unchanged in the FIT period relative to preceding years, their average dimensions have changed (Table IV.6). Liquidity leakage from the banking system through currency in circulation (CiC), on an average, has increased sizably in the FIT period. The size of market intervention by the RBI has been stepped up during FIT, reflecting pressures from surges in capital inflows. Among discretionary measures, the quantum of OMOs has increased, reflecting the preference towards market-based instruments under FIT. USD/INR forex swaps and UMP measures introduced after the outbreak of the pandemic have provided additional leeway in modulating systemic liquidity.

15 Liquidity conditions could alter due to both autonomous factors reflecting actions of different agents in the economy as well as discretionary market operations of a central bank; typically, discretionary measures are undertaken to offset autonomous factors (Bhattacharyya and Sahoo, 2011).

Table IV.6: Key Liquidity Indicators
(period averages)

(₹ Crore)

	Pre-FIT	FIT
A. Drivers of Liquidity		
1. Net Purchases from Authorised Dealers (ADs)	75,764	1,23,818
2. Currency in Circulation (- leakage)	-1,47,465	-2,05,553
3. Government of India Cash Balances (+ decrease/- increase)	-7,307	-2,460
4. Excess CRR maintained by banks (+ drawdown/- build-up)	12,055	-23,831
B. Management of Liquidity		
5. Net Liquidity Adjustment Facility (LAF)	-34,326	-50,322
6. Open Market Purchases	61,768	95,211
7. UMPs (LTROs and TLTROs)	0	68,005
8. Net Forex Swaps	0	14,058

Note: Pre-FIT (April 2011 – September 2016); FIT: (October 2016 – March 2020).
Source: RBI

Monetary Policy Transmission

IV.26 Monetary policy impulses transmitted to the money market work their way through financial markets to the real economy *i.e.*, the second leg of the operating procedure. Since financial markets are typically characterised by asymmetric information, policy signalling is an effective mechanism of bridging the asymmetry and conveying the central banks' policy stance to the economy (Amato *et al.*, 2002).

Transmission of Policy Rate to WACR

IV.27 In the pre-FIT period, the policy repo rate was increased (reduced) on eight (nine) occasions, while it remained unchanged on as many as twenty-three instances (Table IV.7). In contrast, it has been increased only twice, reduced on eight occasions and kept unchanged on twelve instances under FIT. While the CRR was not hiked during 2011-20, it was reduced on five occasions in the pre-FIT period. Under FIT, the sole reduction (100 bps) was in March 2020, aimed at easing liquidity constraints in response to COVID-19.

IV.28 Empirical findings suggest that the market's reactions to policy innovations are stronger and faster than the responsiveness of actual cost of funds to system liquidity shifts (Box IV.3).

Table IV.7: Policy Rate Changes

(number of changes)

Financial Year		Repo Rate				Cash Reserve Ratio			
		↑	↓	—	**Quantum** (in bps)	↑	↓	**Quantum** (in bps)	**Primary Liquidity Injected (₹ crore)**
Pre-FIT	2011-12	5	-	3	175	-	2	-125	80,000
	2012-13	-	3	5	-100	-	3	-75	52,500
	2013-14	3	1	3	50	-	-	-	-
	2014-15		2	6	-50	-	-	-	-
	2015-16	-	2	4	-75	-	-	-	-
	2016-17 (up to Sept. 30, 2016)	-	1	2	-25	-	-	-	-
FIT	2016-17 (Oct. 01 to Mar 31, 2017)	-	1	2	-25	-	-	-	-
	2017-18	-	1	5	-25	-	-	-	-
	2018-19	2	1	3	25	-	-	-	-
	2019-20	-	5	2	-185	-	1	-100	1,37,000

Note: ↑: Increased; ↓: Decreased; —: Unchanged.
Source: RBI.

Box IV.3
Policy Transmission to the Operating Target

Based on daily data spanning May 2011 to March 2020, the WACR and the policy rate (PR) are found to be non-stationary at levels but stationary in first differences (Table 1).

Table 1: ADF Unit Root Test

Variable	Level	Difference
WACR	-2.018	-22.991*
Policy Rate	0.986	-46.729*

Note: *denote significance at 1%. The optimal lag order is selected based on SIC in the ADF test equation.

The Bound test suggests that the two series are co-integrated in a long run relationship (Table 2).

Table 2: Cointegration of PR and WACR

Bound test	F = 28.188
Critical values at 5 per cent	[3.62 4.16]
Inference	Cointegrated

This supports the application of the autoregressive distributed lag (ARDL) model (Pesaran *et al.*, 2001) for examining the long-run relationship between the two series, as specified below:

$$WACR_t = \alpha_0 + \theta * Policy_t + \eta_t \quad ...(1)$$

The short run dynamics, which represent the deviation of the WACR from its long-run relationship with PR, are modelled using the GARCH (1, 1) framework (Bollerslev, 1986), with the mean and variance equation, as below:

$$\Delta WACR_t = \alpha_0 + \sum_{i=1}^{n} \beta_i \, \Delta WACR_{t-i} + \sum_{i=0}^{n} \delta_i \, \Delta Policy_{t-i} + \theta_1 ECT_{t-1} + \theta_2 Liquidity_t + \theta_3 Excess\ CRR_t + \theta_4 DTT_t + \theta_5 DQuarter_t + \theta_6 DDemo_t + \varepsilon_t \quad ...(2)$$

$$\sigma_t^2 = \omega_0 + \omega_1 * \varepsilon_{t-1}^2 + \phi * \sigma_{t-1}^2 \quad ...(3),$$

where the error correction term (ECT) estimated from equation (1) reflects the deviation from the long-term relationship. The short run dynamics also take into account the impact on WACR due to (i) variability in banking system liquidity (net LAF position); (ii) excess CRR maintenance by banks; (iii) a dummy variable capturing the impact of the taper tantrum; (iv) dummies capturing behavioural patterns, *viz.*, banks reducing their lending exposure in the unsecured call market at the end of each quarter; and (v) a dummy variable to capture the impact of demonetisation.

The long-run coefficient of the policy repo rate indicates complete pass-through of policy rate impulses to the WACR across the full sample as well as the two sub-periods. The estimated coefficient of liquidity operations (measured by net liquidity injection as proportion of NDTL) indicates the expected inverse relationship between liquidity conditions and the WACR. The high value of the quarter-end dummy coefficient (positive and statistically significant) is indicative of significant pressure on the WACR at quarter ends, although the impact is considerably moderated during the FIT period; similarly, the coefficient of excess CRR is much smaller during FIT *vis-à-vis* pre-FIT. Both these findings essentially reflect more efficient liquidity management by banks during FIT. Furthermore, the ECT suggests speedier correction of any deviation of the WACR during the FIT period, indicating efficiency gains from higher speed of adjustment in the market clearing mechanism. Finally, high GARCH coefficients from the estimated volatility equation suggests that volatility is persistent during both the periods (Table 3).[16]

The above equations are re-estimated separately under the tightening and easing phase, for both the pre-FIT and the FIT period. The long run estimates suggest that policy transmission from rate cuts (*vis-à-vis* rate hikes) is higher during FIT in comparison to the pre-FIT period (Table 3).

Similarly, transmission under surplus and deficit liquidity conditions are analysed separately by re-estimating the above equations for the full sample as well as the two sub-periods. The long-run estimates suggest that policy transmission is higher under deficit *vis-à-vis* surplus liquidity conditions for the full sample (Table 4). While transmission is greater under deficit liquidity conditions in the pre-FIT period, it is stronger in surplus mode during FIT.

The dynamics of adjustments are distinctly different for the FIT period and the years preceding it, with the ECT indicating more than three-fold faster rate of convergence in the FIT period under deficit liquidity conditions than under the pre-FIT period. For the full sample as well as the truncated sample periods, excess CRR has a significant effect on

(Contd.)

16 Sum of ARCH and GARCH coefficients being less than unity indicate stability of the variance process.

Table 3: Policy Transmission to WACR

Variables	Policy Rate Changes			Rate Hike *vis-à-vis* Rate Cut			
	Full Sample	Pre-FIT	FIT	Pre-FIT		FIT	
				Rate ↑	Rate ↓	Rate ↑	Rate ↓
Long run Coefficients							
PR	**1.17*** **	**1.08*** **	**1.05*** **	**1.03*** **	**0.99*** **	**1.03*** **	**1.06*** **
Short run coefficients							
ECT (-1)	-0.17***	-0.19***	-0.29***	-0.10***	-0.73***	-0.43***	-0.22***
$\sum_{i=1}^{n} \Delta \mathrm{WACR}_{t-i}$	-1.09***	-0.66***	-0.33***	-0.86***	-0.68***	-0.43	-0.11***
Δ PR	0.37***	0.25*	0.20***	-0.46	0.99	0.03	0.22***
Δ PR (-1)	0.40***	0.38*	0.35***	-0.26	1.52***	0.22	0.39***
Liquidity	-0.02***	-0.07***	-0.01***	-0.07***	-0.12***	-0.01**	-0.00*
Excess CRR	0.27***	0.39***	0.07***	0.22***	0.45***	0.09***	0.07***
Dummy TT	0.39***	0.38***		0.11***			
Dummy Quarter	0.33***	0.64***	0.31***	0.41***	1.28***	0.02***	0.16***
Dummy Demo	0.01		-0.02***				
Variance Equation							
RESID(-1)^2	0.12***	0.11***	0.15***	0.12***	0.13***	0.15***	0.15***
GARCH(-1)	0.57***	0.56***	0.60***	0.57***	0.56***	0.60***	0.60***
Diagnostics (*p* - value)							
ARCH–LM	0.9477	0.9911	0.7764	0.8687	0.1371	0.9397	0.9034

Note: *, ** and *** denote significance at 10%, 5% and 1% level, respectively.

Table 4: Transmission under Alternate Liquidity Conditions

Variables	Full Sample		Pre-FIT		FIT	
	Deficit	Surplus	Deficit	Surplus	Deficit	Surplus
Long run Coefficients						
PR	**1.13*** **	**1.01*** **	**1.03*** **	**0.97*** **	**0.86*** **	**0.95*** **
Short run coefficients						
ECT (-1)	-0.25***	-0.29***	-0.21***	-0.42***	-0.63***	-0.36***
$\sum_{i=1}^{n} \Delta \mathrm{WACR}_{t-i}$	-0.08**	-0.41***	-0.95***	-0.36***	-0.48***	-0.54***
Δ PR	0.52**	0.58***	0.28	0.82***	0.51***	0.48***
Δ PR (-1)	0.28	0.33***	0.30	0.14	-0.18	0.27***
Liquidity	-0.10***	-0.01***	-0.13***	-0.06***	-0.10***	-0.01***
Excess CRR	0.34***	0.005	0.34***	-0.41	0.14***	0.05***
Dummy TT	0.58***		0.37***			
Dummy Quarter	0.39***	0.05***	0.60***	0.06	0.54***	-0.09***
Dummy Demo	0.05	-0.02**			-0.01	-0.02***
Variance Equation						
RESID(-1)^2	0.12***	0.14***	0.11***	0.24***	0.15***	0.15***
GARCH(-1)	0.57***	0.59***	0.56***	0.42***	0.60***	0.60***
Diagnostics (*p* - value)						
ARCH–LM	0.9342	0.7905	0.9893	0.5309	0.5065	0.2460

Note: *, ** and *** denote significance at 10%, 5% and 1% level, respectively.

the WACR under deficit conditions. Even under surplus liquidity, excess CRR's impact on the WACR turns out to be significant, with the appropriate sign during FIT. Finally, the impact of quarter-end phenomenon causing spikes in the WACR was stronger under deficit liquidity conditions, both for the full sample and the truncated periods.

The above findings underscore the need for more proactive liquidity management to achieve monetary marksmanship during the FIT period, considering the institutional features, calendar effects, and market dynamics. Nevertheless, the greater impact of policy announcements on the operating target *vis-a-vis* shifts in systemic liquidity conditions merits closer scrutiny of market microstructure issues.

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Transmission to Broader Market Segments

IV.29 During the FIT period prior to COVID-19 outbreak (October 2016 to March 10, 2020), monetary transmission has been full and reasonably swift across the money market, the private corporate bond market and the government securities market. In the money market, interest rates on 3-month certificates of deposit (CDs), 3-month commercial papers (CPs) and 91-day Treasury bills (T-Bills) moved in sync with the policy rate, lowering funding and working capital costs. As against the cumulative reduction of 135 bps in the policy rate during FIT, the yield on 3-month T-Bills declined by 165 bps, while the yield on 3-month CPs issued by non-banking finance companies (NBFCs) declined by 117 bps (Table IV.8). Transmission to the government securities market and the corporate bond market, however, was less than complete. Since February 2019,

Table IV.8: Policy Transmission to Financial Market Segments

	FIT (Per cent)				Variation during FIT (bps)
	03-Oct 2016	06-Jun 2018	06-Feb 2019	10-Mar 2020	
I. Policy Repo Rate	6.50	6.25	6.50	5.15	-135
II. Money Market					
(i) WACR	6.39	5.88	6.42	4.96	-143
(ii) Tri-party Repo	6.19	5.71	6.34	4.86	-133
(iii) Market Repo	6.38	5.78	6.33	4.86	-152
(iv) 3-month T-bill	6.45	6.51	6.56	4.80	-165
(v) 3-month CD	6.61	7.54	7.17	5.23	-138
(vi) 3-month CP (NBFCs)	7.00	8.18	7.78	5.83	-117
III. Corporate Bond Market					
(i) AAA -5-year	7.52	8.70	8.55	6.53	-99
(ii) AAA-10-year	7.62	8.74	8.67	7.13	-49
IV. G-sec Market					
(i) 5-year G-sec	6.77	8.02	7.32	5.93	-84
(ii) 10-year G-sec	6.77	7.92	7.36	6.07	-70

Source: RBI; Bloomberg.

improved transmission was facilitated by several liquidity augmenting measures (both conventional and unconventional) announced by the RBI.

IV.30 Empirical evidence suggests differential impact of monetary policy announcements on various market segments (Box IV.4).

Credit Market Transmission

IV.31 Following the deregulation of lending rates of scheduled commercial banks (SCBs) in October 1994, the Reserve Bank mandated the benchmarking of rupee loans pricing by banks, beginning with the prime lending rate (PLR) regime. The PLR regime (October 1994 to March 2003) was followed by the benchmark PLR (BPLR) regime (April 2003 to June 2010) and the base rate regime (July 2010 to March 2016).[17] These benchmarks – based on internal parameters of balance sheets such as the cost of

Box IV.4
Transmission to Other Markets

Based on daily data spanning October 2016-March 2020, monetary policy surprises are calculated as the change in the one-month overnight indexed swap (OIS) on the monetary policy announcement days (Kamber and Mohanty 2018, Mathur and Sengupta 2019). The OIS instruments are forward looking and take into account all the anticipated monetary policy changes until the policy announcement date. Any change in the one-month OIS rate on the monetary policy announcement day reflects the unanticipated component or surprise element of monetary policy.[18]

The transmission of monetary policy surprises and its impact on various markets (10-year G-sec yield, 5-year AAA corporate bond yield, INRUSD exchange rate and Nifty) is examined through the local projection method (Jorda, 2005), which measures the magnitude of monetary policy surprises on financial markets through the following equation

$$\Delta y_{t+h} = \alpha + \beta_h s_t + \sum_{j=1}^{2} \gamma_{j,h} \Delta y_{t-j} + \xi_t \quad \ldots 1$$

where h = 1, …, 12 days. The coefficient β_h represents the average impact of a monetary policy surprise on the variable of interest h days after the shock. Δy_{t+h} is the change in the dependent variable (10-year G-sec yield, 5-year AAA yield, INRUSD exchange rate return and Nifty return) measured over a one-day window at different horizons of h. Equation 1 is estimated separately for each of the markets as the dependent variable and the coefficients of monetary policy surprises are reported as the results of the cumulative impulse response function with 90 per cent confidence interval. A robustness check of the results undertaken through statistical identification methods (Rigobon, 2003) corroborate the findings.

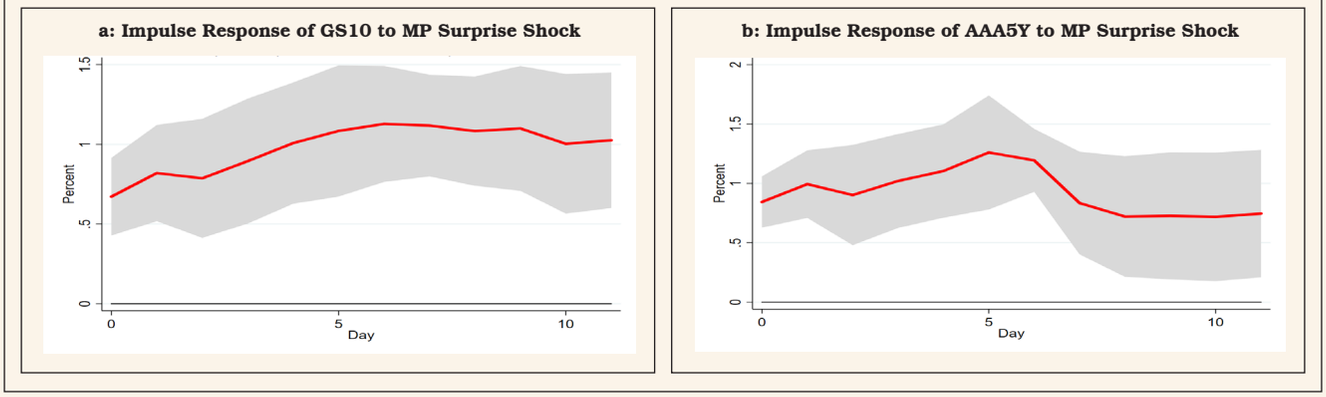
The monetary policy surprise is immediately transmitted to G-sec and corporate bond yields with persistent impact. The

(Contd.)

17 See RBI (2017), "Report of the Internal Study Group to Review the Working of the Marginal Cost of Funds Based Lending Rate System" for discussion on various lending rate regimes.

18 On the monetary policy announcement date, the predominant news impacting the market is news on monetary policy; hence, the changes in the one-month OIS rate on announcement dates are attributed to the surprise elements of monetary policy changes.

Chart 1: Impact of Monetary Policy Shock on Financial Markets



cumulative impulse response function implies that a one per cent monetary policy surprise (increase) on announcement day hardens 10-year G- sec and AAA 5-year corporate bond yields, cumulatively on average, by about 0.98 per cent and 0.9 per cent, respectively, over the next 12 days (Chart 1). The impact on the forex and stock market, however, is not significant.[19]

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funds and operating costs – were bank-specific. Although the Reserve Bank had introduced external benchmark-based lending in 2000 to run in parallel, banks almost invariably offered loans based on the internal benchmark, arguing that external benchmarks do not reflect cost of funds (RBI, 2018a). The introduction of the marginal cost of funds-based lending rate (MCLR) regime – the latest internal benchmark introduced by the RBI in April 2016 – almost coincided with the adoption of FIT (Table IV.9). In case of the internal benchmark-based pricing of loans, transmission from the policy rate to bank lending rates is indirect, since lending rates are determined on a cost-plus basis. This creates a wedge in the pricing of bank credit, unlike in the determination of money market rates and bond market yields where transmission is direct (Kavediya and Pattanaik, 2016). In recognition of this asymmetry, the RBI mandated the introduction of an external benchmark system of lending rates for select sectors three years into the FIT regime in October 2019.[20]

19 These results are consistent with recent findings (Prabu and Ray, 2019).

20 Effective October 1, 2019, the interest rates charged on new floating rate loans to personal/retail (housing, vehicle, education, *etc.*) sectors and to MSEs extended by banks were mandated to be linked to an external benchmark, *viz.*, the policy repo rate, 3-month and 6-month T-bill rates or any other benchmark published by Financial Benchmarks India Pvt. Ltd. (FBIL). Effective April 1, 2020, loans to medium enterprises were also linked to any of the above external benchmarks. The interest rates on outstanding loans to these sectors would be reset once in three months. The spread can be changed only once every three years (except for material credit event).

Table IV.9: Transmission from Repo Rate to Banks' Deposit and Lending Interest Rates

(Basis points)

		Repo rate	Median Term Deposit Rate	WADTDR	WALR - Outstanding Rupee Loans	WALR - Fresh Rupee Loans
Pre- FIT	Apr 2004 – Sep 2008	300	229	253	-23	-
	Oct 2008 – Feb 2010	-425	-227	-174	-181	-
	Mar 2010 -June 2010	50	0	-	-	-
	July 2010 - Mar 2012	325	226	222	203	-
	Apr 2012 – June 2013	-125	-4	-46	-44	-
	July 2013 - Dec 2014	75	7	-9	-28	5
	Jan 2015 – Sep 2016	-150	-96	-123	-67	-110
FIT	Oct 2016- May 2018	-50	-62	-70	-92	-95
	June 2018 – Jan 2019	50	16	20	2	57
	Feb 2019 – Mar 2020	-135*	-48	-53	-27	-115

*: The 75-bps policy rate cut on March 27, 2020 is not included.
WALR: Weighted Average Lending Rate; WADTDR: Weighted Average Domestic Term Deposit Rate.
Source: RBI.

Transmission under FIT

IV.32 The MCLR system introduced in April 2016 endured only for a brief eight-month period of tight monetary policy (June 2018-January 2019), preceded and followed by easing cycles. Transmission to deposit and lending interest rates remained muted during the initial months of FIT, but it gained traction post-demonetisation (November 2016 to November 2017), resulting from an unprecedented influx of low cost current account and savings account (CASA) deposits into the banking system which, in turn, encouraged banks to lower their term deposit rates.[21] The introduction of external benchmarking of lending rates for retail and micro and small enterprises (MSEs) loans in October 2019 and syncing of liquidity in the financial system with the stance of monetary policy were noteworthy reform measures in support of transmission during the FIT period.

IV.33 It is estimated that a policy rate change impacts the weighted average lending rate (WALR) on fresh rupee loans sanctioned by commercial banks with a lag of 2 months and the impact peaks in 3 months - the impact used to peak in 4 months in the pre-FIT period.[22]

IV.34 The pass through to WALR on fresh rupee loans improved in the FIT period *vis-à-vis* pre-FIT in response to the policy rate tightening (Table IV.9). A reduction in the policy repo rate, however, had noticeable impact on lending rates during both regimes.[23]

21 The share of CASA in aggregate deposits increased from 35.2 per cent in October 2016 to 40.6 per cent in March 2017 before declining to 39.0 per cent in November 2017. The median domestic rupee term deposit rate (card rates) on fresh deposits declined by 60 bps over the same period. Consequently, the median MCLR declined from 9.28 per cent to 8.30 per cent during this period. This led to the reduction in WALR of fresh rupee loans and outstanding rupee loans by 79 bps and 76 bps, respectively.

22 In order to explore the impact of the policy rate change on lending interest rates of commercial banks during pre-FIT and FIT periods, a structural VAR (SVAR) analysis using a set of five endogenous variables – Index of Industrial Production (IIP) growth; CPI inflation; weighted average call rate (WACR); median domestic rupee term deposit rate and WALR on fresh rupee loans sanctioned by banks – was considered.

23 In response to the repo rate cut of 150 bps during pre-FIT (January 2015 to September 2016), WALR on fresh rupee loans declined by 110 bps. In response to the135 bps repo rate cut during FIT period (February 2019-March 2020), WALR on fresh rupee loans declined by 115 bps.

IV.35 There is evidence of asymmetry in pass-through of policy repo rate changes to banks' lending and term deposit rates. Transmission is uneven across bank groups as well as across monetary policy cycles (Singh, 2011; Das, 2015; Khundrakpam, 2017), and usually higher for weighted average outstanding domestic term deposit rates (DR) and weighted average lending rates (WALRs) on fresh rupee loans (LR-F) *vis-à-vis* WALRs on outstanding rupee loans (LR-O) over different policy cycles (Table IV.10).

Sensitivity of Output and Inflation to Monetary Policy

IV.36 Since monetary transmission is subject to long, variable and uncertain lags, most IT central banks have adopted a period in the range of 12-24 months as their policy horizon (Bank of England, 1999; European Central Bank, 2010). An analysis of empirical work reported in the literature suggests that the average transmission lag is 29 months, and the maximum reduction in prices is, on average, 0.9 per cent following a one percentage point hike in the policy rate (Havranek and Rusnak, 2013).[24] Transmission lags are longer in developed economies (26 to 51 months) than in post-transition economies (11 to 20 months). The difference in the speed of adjustment between developed and post-transition economies has been attributed to the degree of financial development: greater financial development is associated with slower transmission, as developed financial institutions have more opportunities to hedge against surprises in monetary policy actions. In developing countries, however, an underdeveloped financial market impedes transmission (Mishra *et al.*, 2012). It appears that it is not the stage of development of financial markets *per se*, but it is the choice of an appropriate monetary regime that is more important in determining the strength of monetary transmission (Marques *et al.*, 2020).

IV.37 A survey of the empirical literature across countries shows that monetary policy impacts output with a lag of up to 12 months and inflation with a lag of up to 39 months and monetary policy impulses persist up to 60 months and even beyond for some countries. The lagged impact is sensitive to sample period, assumptions and methodology adopted for empirical analysis (Annex IV.2).

IV.38 For India, empirical results from estimating New Keynesian models with inflation measured by the WPI indicate that in response to policy tightening, output starts contracting after three

Table IV.10: Transmission across Bank Groups – Tightening and Easing Policy Cycles

(Basis points)

Policy Cycle	Repo Rate	Public Sector Banks			Private Sector Banks			Foreign Banks			SCBs		
		DR	LR-O	LR-F	DR	LR-O	LR-F	DR	LR-O	LR-F	DR	LR-O	LR-F
Oct 16 - May 18	-50	-77	-95	-107	-54	-91	-108	-58	-74	-59	-70	-92	-95
June 18 – Jan 19	50	13	-32	37	29	53	78	60	35	75	20	2	57
Feb 19 – Mar 20	-135	-42	-35	-83	-70	-11	-140	-139	-89	-135	-53	-27	-115

DR: Weighted average domestic rupee term deposit rate; LR-O: Weighted average lending rate on outstanding rupee loans; LR-F: Weighted average lending rate on fresh rupee loans sanctioned by banks.
Source: RBI.

24 Havranek and Rusnak's (2013) meta-analysis included 67 studies covering 30 countries.

quarters and reaches its trough after one more quarter before gradually returning to its baseline. Inflation responds after seven quarters of the shock and the maximum impact is felt after 10 quarters (Patra and Kapur, 2012).[25] When data on CPI are used, the transmission of a policy rate increase to headline CPI inflation peaks after 4 years (Kapur, 2018). In the QPM, the peak impact of monetary policy tightening on CPI inflation occurs after 10 quarters (Benes *et al.*, 2016). There is a consensus that the interest rate channel is the strongest conduit of transmission, followed by the credit channel.[26]

3. Fine-tuning the Operating Procedure and Transmission Channels

IV.39 The lessons from the implementation of monetary policy under FIT juxtaposed with the contemporaneous country experience points to the scope for several refinements in the operating framework and market infrastructure which can potentially improve the efficiency of monetary policy in the transmission of signals across the term structure of interest rates and the spectrum of markets in the economy. It is important to delineate, however, what works and, therefore, need not be fixed.

Uncollateralised vis-à-vis collateralised rate as the operating target

IV.40 The WACR should continue as the operating target of monetary policy. The gradual shrinkage in the share of the call money market in total money market turnover is mirrored in the experiences of countries across the world and this has not been deemed inimical to the integrity of the call money rate as an operating target by the majority of central banks, although a few *viz*., Brazil, Canada, Mexico, Switzerland choose the collateralised rate as the operating target (Annex IV.1). Moreover, collateralised segments of the money market are also populated by non-bank and unregulated participants whose actions may not be consistent with the monetary policy stance or amenable to the central bank's regulatory control. Technically, the Reserve Bank can exert countervailing influence over them by its power to create reserves, but this may prove to be inefficient and costly in terms of the volumes of liquidity that has to be injected or withdrawn and the frictions encountered in the interface with the Reserve Bank's collateral policy.

Corridor Play, Marksmanship and MPC's Mandate

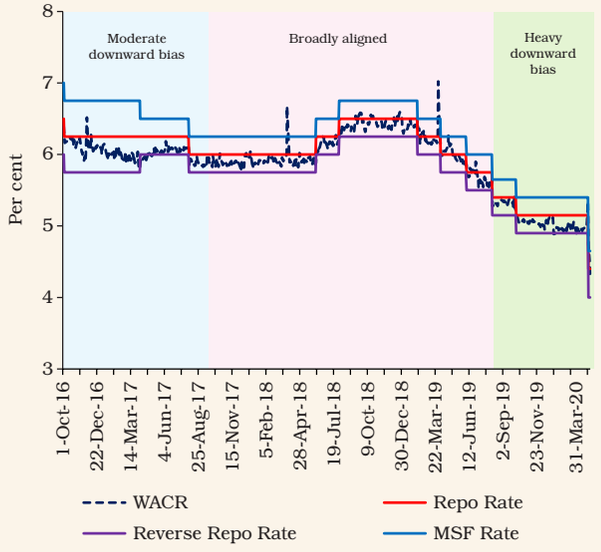
IV.41 As stated earlier, the FIT period was marked by the WACR trading with a pronounced downward bias *vis-à-vis* the policy repo rate. Moreover, the corridor was made asymmetric on March 27, 2020 by reducing the reverse repo rate by an additional 15 bps over and above the 75 bps reduction in the repo and the MSF rate.[27] Cumulatively, these two factors have resulted in the WACR getting closely aligned with the reverse

25 While VAR approach has been used commonly (RBI, 2005; Pandit *et al*., 2006; Aleem, 2010; Bhattacharya *et al*., 2011; Khundrakpam, 2011; Jain and Khundrakpam, 2012; Mohanty, 2012; Sengupta, 2014; Mishra *et al*., 2016; Bhoi *et al*., 2017), a few studies (Patra and Kapur, 2012; Kapur and Behera, 2012) applied New Keynesian models.

26 Aleem, 2010; Bhattacharya *et al.*, 2011; Khundrakpam and Jain, 2012; Sengupta, 2014; Bhoi *et al*., 2017 have examined the relative importance of various channels of monetary transmission mechanism. An exception was Bhattacharya *et al.* (2011), which concluded that exchange rate channel has the strongest impact on output and inflation while interest rate channel is weak.

27 Subsequently, the reverse repo rate was unilaterally pared by 25 bps without concomitant changes in the repo and the MSF rate on April 17, 2020 which further widened the corridor.

Chart IV.6: WACR *vis-a-vis* the Policy Corridor



Source: RBI.

repo rate (Chart IV.6). In this context, it has been argued in some section of the media and by a few analysts that by undertaking unilateral reductions in the reverse repo rate not in proportion to the repo rate, the Reserve Bank has solely appropriated for itself the task of monetary policy decision making.

IV.42 The amended RBI Act entails that the MPC shall determine the policy rate required to achieve the inflation target. It also defines the policy rate as the repo rate under the LAF. The operating procedure of monetary policy is guided by the objective of aligning the operating target of monetary policy – the WACR – to the repo rate through active liquidity management, consistent with the stance of monetary policy (RBI, 2015). Day to day liquidity management function is solely in the domain of the Reserve Bank. During normal times, the reverse repo rate and the MSF rate move in sync with repo rate changes as they are pegged to the repo rate in an equidistant manner under a symmetric corridor. In exceptional times, however, the corridor itself becomes an instrument for managing liquidity conditions. As the marginal standing facility and the fixed rate reverse repo windows are essentially instruments of liquidity management, they are in the remit of the Reserve Bank. In its endeavour to achieve the policy rate voted upon by the MPC, decisions involving a change in the reverse repo rate and the MSF rate and announcements thereof may be shifted out of the MPC resolution to the Reserve Bank's Statement on Developmental and Regulatory Policies. The RBI may also clarify for the purpose of anchoring expectations that in normal times it will work with a symmetrical corridor with the MSF rate and the fixed rate reverse repo rate at pre-specified alignment with the policy repo rate and that it reserves the option of operating with an asymmetric LAF corridor in exceptional times.

IV.43 When the MPC decided to adopt an accommodative stance of policy in June 2019, the Reserve Bank, in pursuance, ensured that systemic liquidity migrated from deficit to surplus by injecting large amounts of durable liquidity into the banking system through forex operations and OMO purchases and later through LTROs and TLTROs. In the absence of adequate opportunities for productive deployment of funds, surplus liquidity was parked by banks with the RBI under the reverse repo window. In this *milieu,* the reduction in the reverse repo rate was aimed at discouraging banks from passively parking surplus liquidity and explore lending opportunities amidst the nation-wide lockdown. The downside risk that emerged was that collateralised money markets traded, on average, 49-58 bps lower than the reverse repo rate. Term premia on instruments such as treasury bills, CPs and CDs moderated sharply – their interest rates trading below the overnight fixed rate reverse repo – posing threats to financial stability. Given this backdrop, it needs

to be recognised that the asymmetric corridor is a temporary measure which will be reversed once normalcy is restored and that it would be misleading to interpret a crisis-induced measure as an attempt to weaken the MPC.

IV.44 In view of the above, clarity of roles and responsibilities is clearly warranted to preserve the public's credibility in monetary policy procedures so that expectations are anchored to this goal and intent. Consistency of actions with the publicly communicated stance would preserve and enhance transparency under the FIT framework.

Narrow versus Wide Corridor

IV.45 At the start of FIT in India, the Reserve Bank indicated a preference for narrowing the LAF corridor in keeping with peer country experiences with a view to honing monetary marksmanship in aligning the WACR closely with the policy repo rate (Patra et. al, 2016; RBI, 2016). While a narrow corridor lowers volatility in the operating target, it dis-incentivises the inter-bank market, resulting in the central bank emerging as the sole counterparty. In contrast, a wide corridor entails costlier central bank liquidity facilities but encourages active inter-bank trading and the development of the market segments, participants and products that continuously price and transfer various kinds of risks, but at the cost of tolerating higher volatility (Bindseil and Jablecki, 2011), which can amplify to a point at which it impedes monetary transmission. Therefore, the trade-off between low volatility and market buoyancy has to be keenly weighed before deciding on the appropriate width of the corridor. It is pertinent to note that ultra-low volatility (a very stable rate) is not particularly helpful for market making as contrasting views are necessary to spur market activity. As the pandemic recedes, exceptional measures are wound down and normalcy is restored, it is envisaged that the pre-pandemic LAF corridor of +/-25 bps may be gradually reinstated. At that stage, it may be appropriate to fully resume the revised liquidity framework laid out in February 2020[28] (Box IV.1) with 14-day repo/ reverse repo auctions as the main liquidity operation with cut-offs finely aligned with the policy rate to secure marksmanship.

Capital flows and Liquidity Management

IV.46 Large swings in capital flows can undermine the stance of monetary policy and pose challenges for liquidity management, as Chapter V dwells upon in detail. Forex market intervention by the Reserve Bank is aimed at curbing excessive volatility and discourage disruptive speculative activities in the foreign exchange market: large-scale capital outflows necessitate forex sales to avoid high volatility of the domestic currency on the downside, while a deluge of inflows warrants forex purchases to prevent volatility on the upside. More pressing are the resulting liquidity consequences of these interventions (Raj *et al.*, 2018). Forward interventions may be liquidity neutral but by imparting pressure on the short-term interest rates, they can produce a similar outcome of contravening the policy stance. Forex purchases, by expanding domestic liquidity, exert downward pressure on money market rates which may be at variance with

28 In view of the outbreak of COVID-19, the revised liquidity management framework was temporarily suspended and the window for fixed rate reverse repo and MSF operations were made available throughout the day. On a review of evolving liquidity and financial conditions, it was decided on January 8, 2021 to restore normal liquidity management operations in a phased manner.

the stated policy stance. Moreover, in situations of exceptional liquidity glut, the traditional instrument *viz.,* OMO sales have limitations in terms of the availability of adequate securities in the Reserve Bank's portfolio. Furthermore, the reverse repo window, being a short-term instrument whose impact gets quickly reversed, cannot be an effective sterilisation tool for durable liquidity flows. In times of extreme liquidity tightness, an analogous constraint emerges in the form of the finite stock of excess statutory liquidity ratio (SLR) securities held by banks, which can be used as collateral under the LAF. With the MSF acting as a safety valve on the injection side, it is necessary to impart symmetry to the LAF by providing for a special facility on the absorption side.

IV.47 In this context, the standing deposit facility (SDF) announced in the Union Budget 2018-19 and notified in April 2018, which is unencumbered and unconstrained regarding availability of securities, can be activated. The design of the SDF in terms of the appropriate interest rate and the conditions under which it is triggered, however, merits closer scrutiny since it would act as an additional floor to interest rates, beside the existing reverse repo rate. If the reverse repo facility has to be kept active or a potent tool of liquidity management, the interest rate on SDF must be lower than the reverse repo rate. Thus, the SDF will ensure that tail events such as a deluge of capital inflows do not threaten financial stability without the need to take recourse to instruments outside the Reserve Bank's toolkit (*eg.*, MSS). In that sense, the SDF needs to be regarded as a tool for ensuring financial stability in addition to its role in liquidity management (RBI, 2018b).

Improving Liquidity Assessment and Communication

IV.48 With the introduction of the 14-day variable rate repo as the main liquidity management tool synchronised with the reserve maintenance period, a more accurate assessment of liquidity is critical for both the Reserve Bank and the commercial banks, combining top-down methodologies and bottom-up approaches. From the Reserve Bank's standpoint, resources have to be invested into availability of information on a more concurrent basis and more precise forecasts of autonomous factors such as currency demand, government cash balances and forex flows for a systematic liquidity assessment over the reserve maintenance fortnight. Illustratively, government cash balances are available to the liquidity forecaster with a lag of one day and currency in circulation with a lag of one week whereas they should be available on the same day and even intra-day for frictional liquidity management operations. As committed to in the revised liquidity management framework announced in February 2020, the Reserve Bank's assessment of autonomous liquidity in an aggregated manner could be made available in the public domain on an *ex ante* daily / fortnightly basis as an incentive mechanism for improving the quality of forecasts.

IV.49 For commercial banks, refining intra-fortnight cash flow projections remains a major challenge. The incentive structure for commercial banks to improve the quality and precision of bottom-up forecast could take the form of a reporting requirement on a pre-set frequency which the Reserve Bank, in turn, can aggregate and release in public domain along with its own assessment / forecasts.

IV.50 Active liquidity management also presages the need for operations as needed in the form of two-way OMOs (both purchases and sales), forex operations (both spot and forward) and repo/ reverse repo of various tenors so that quantity modulation occurs seamlessly and persisting liquidity gaps / overhangs, as under the FIT, are avoided. Such gaps / overhangs often lead to large deviation of the operating target from the policy rate necessitating increased intervention by the central bank in the money market thereby hindering efficient price discovery and market development. Alongside, the frequency of fine-tuning operations should be minimised and confined to short tenors which are easily reversible so as not to overwhelm durable liquidity operations. Overall, the success of liquidity management in terms of its objectives hinges around clear and transparent communication of the central bank's intentions followed up by credible actions resulting in desirable outcomes that are consistent with the publicly communicated stance.

Synchronising Market Timings

IV.51 Synchronicity in market timings across all products and funding markets is necessary to ensure that they complement each other by avoiding unanticipated frictions. Asynchronous market closure timings across different money market segments, high trading intensity in early hours and market timings not in sync with settlement timings often impact WACR trading disproportionately towards the end of the day. Specifically, the first hour of trading in the call money market usually accounts for bulk of the day's volume as most of the market participants are unable to assess their cash-flow position for the day in the absence of a robust liquidity forecasting framework. As a result, late hour demand supply mismatches reflect in volatile call rates. Moreover, the absence of uniform market hours across all money market segments (Table IV.11), which are not in sync with real time gross settlement (RTGS) timings often have a destabilising impact on the WACR towards the market's closure as cooperative banks enter

Table IV.11: Market Timings

Market	Trading System	Settlement type	Entities	Market Timings	
				Open	Close
Call Money market	NDS-Call	T+0 T+1 (Notice/ Term)	All Entities	9.00 AM	5.00 PM
Tri-party Repo in Government securities	TREPS	T+0	Entities settling funds at RBI	9.00 AM	3.00 PM
			Entities settling funds at Settlement Bank	9.00 AM	2.30 PM
Tri-party Repo in Government securities	TREPS	T+1	Entities settling funds at RBI	9.00 AM	5.00 PM
		T+1	Entities settling funds at Settlement Bank	9.00 AM	5.00 PM
Market Repo in Government Securities	CROMS	T+0	All Entities	9.00 AM	2.30 PM
Market Repo in Government Securities	CROMS	T+1	All Entities	9.00 AM	5.00 PM
Repo in Corporate Bond (reporting)	F-TRAC	T+0	All Entities	9.00 AM	6.00 PM
Repo in Corporate Bond (reporting)	F-TRAC	T+1	All Entities	9.00 AM	6.00 PM
Government Securities (Central Government Securities, State Development Loans and Treasury Bills)	NDS-OM	T+0	All Entities	9.00 AM	2:30 PM
Government Securities (Central Government Securities, State Development Loans and Treasury Bills)	NDS-OM	T+1	All Entities	9.00 AM	5.00 PM

Note: In order to minimise the risks of contagion from COVID-19 and to ensure safety of personnel, trading hours for various markets were curtailed effective April 7, 2020.

Source: RBI.

the market to lend at cheaper rates. Therefore, standardising operational timings across market segments would reinforce the sanctity of the WACR as the operating target.

IV.52 Among Asian economies, interbank money markets are open till about 4-6:30 pm (local time) in Indonesia, Malaysia, South Korea and Hong Kong. The cut-off timings of payment systems relating to customer transactions is before closure of money markets in many of these jurisdictions; however, retail payment systems remain open post closure of money markets in China, Thailand and Vietnam.

IV.53 Synchronous operational timings in the money market is vital so that participants have access to collateralised / uncollateralised funding as per their requirements. It also alleviates pressure on any segment that remains operational after the closure of other segments, as is the case in funding markets. Different settlement mechanisms for collateralised (market repo and TREPS) segments and uncollateralised (call) segment, however, pose challenges in aligning timings. The settlement of transactions in market repo and TREPS takes place along with secondary market transactions in securities segment. Multilateral netting of funds and securities results in high degree of netting benefits for market participants in terms of liquidity requirement. Furthermore, sufficient time is also required to facilitate repayment of intra-day credit lines availed by market participants from banks after completion of securities settlement. Availability of large value payment systems, such as RTGS, facilitates efficient functioning of the collateralised funding markets.

IV.54 Finally, synchronised timing is also necessary from the viewpoint of meeting intra-day liquidity challenges due to sequencing of settlements. For instance, primary auctions and OMOs settle at about mid-day while settlement of securities are towards the end of the day. This sequencing of settlements may increase the intraday liquidity needs of the system as some market participants may have payable position in one settlement and receivable in another. Hence, primary auction/OMO settlement may be conducted later in the day. This would not only improve the netting efficiency but also help in reducing the overall liquidity requirement (RBI, 2019).

Impediments to Transmission

IV.55 Monetary transmission in India is delayed and incomplete. Several factors impeded policy transmission to deposit and lending interest rates of banks during the FIT regime (Box IV.5).

Policy Measures Undertaken to Improve Transmission in Credit Market

IV.56 Keeping in view the drags on transmission, a few initiatives were taken to facilitate transmission in the FIT period. As the experience with the introduction of MCLR regime coinciding with FIT framework did not prove to be satisfactory, the Reserve Bank mandated introduction of external benchmark linked loans for retail and MSE sectors in October 2019; and for medium enterprises, effective April 1, 2020.

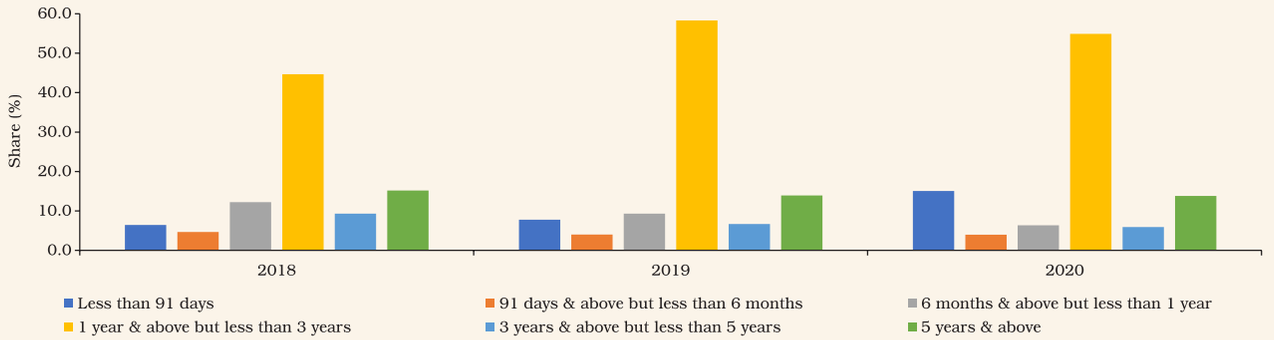
IV.57 Notably, a cross country survey of interest rate benchmarks adopted by banks reveals that

Box IV.5
Impediments to Monetary Policy Transmission during FIT

Since the deregulation of interest rates in the early 1990s, the Reserve Bank has made concerted efforts to improve the effectiveness of monetary transmission by refining the process of interest rates setting by banks. Several specific factors, however, continue to impede monetary transmission in the credit market during FIT regime. These include: internal benchmarks for pricing of loans by banks[29]; distortive interest rate subventions; mismatches in the maturity profile of banks' assets and liabilities; funding of assets dependent on longer maturity fixed rate retail deposits; loans mostly contracted at floating rates but long maturity profile of deposits at fixed interest rates; rigidity in interest rates on banks' saving deposits; higher interest rates offered by competing saving instruments such as small saving schemes and debt mutual fund schemes; and deterioration in the asset quality of commercial banks. The lack of transparency in the pricing of loans by NBFCs makes it difficult to assess transmission, let alone address the impediments.

1. The pricing of loans during the post-deregulation period is primarily based on internal – and hence, bank specific – benchmarks that are not conducive to customer awareness and protection. The adoption of FIT in India broadly coincided with the introduction of marginal cost of funds-based lending rate (MCLR) system in April 2016. Banks arbitrarily adjusted their MCLRs and the spread, which impeded transmission of policy rate cuts to borrowers. In this regard, the key findings of the Internal Study Group to review the Working of the MCLR system (Chairman: Dr. Janak Raj) were: (i) large reduction in MCLR was partly offset by some banks by a simultaneous increase in the spread in the form of business strategy premium that lowers the pass-through to lending rates; (ii) some banks did not have any methodology for computing the spread, which was merely treated as a residual arrived at by deducting the MCLR from the actual prevailing lending rate; and (iii) the credit risk element was not applied based on the credit rating of the borrower concerned, but on the historically observed probability of default (PD) and loss given default (LGD) of the credit portfolio/sector concerned. Besides, in the absence of any sunset clause on the base rate, banks were slow in migrating their existing customers to the MCLR regime. It took around four years for the share of loans linked to the base rate to decline to single digit.
2. A major factor that prevents banks from passing the benefits of transmission has been the relatively long maturity profile of term deposits contracted at fixed rates (Chart 1), while loans – though skewed towards the longer-term – are contracted mostly at floating interest rates (72.8 per cent in end-June 2020), resulting in the duration mismatch of banks' assets and liabilities (Chart 2).
3. Another cause of weak transmission is the rigidity in interest rates on banks' saving deposits which constitute nearly one-third (around 32 per cent since

Chart 1: Maturity Patten of Term Deposits of SCBs - Contractual maturity

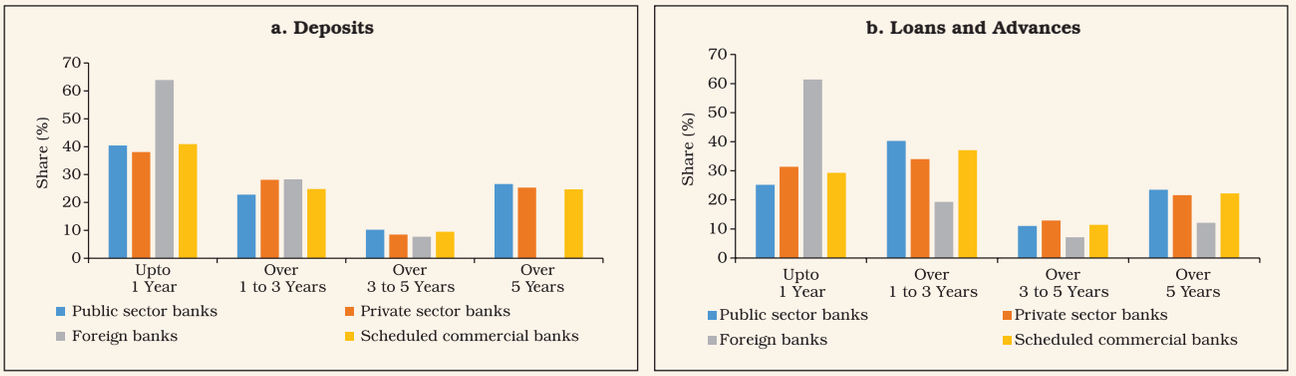


Source: RBI.

(Contd.)

29 External benchmark linked floating rate loans was recently mandated for select sectors that usually account for less than 30 per cent of new loans (around 10 per cent of outstanding loans as at end-March 2020).

Chart 2: Maturity Profiles of Deposits and Loans: March 2020

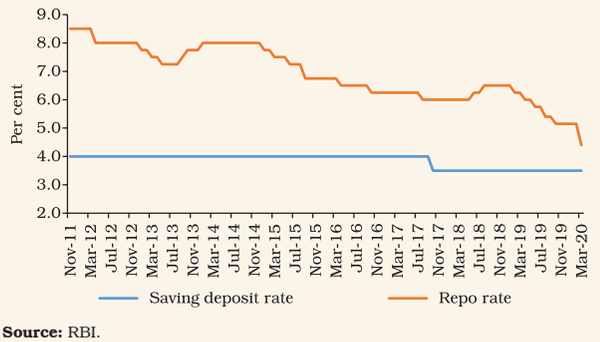


Source: RBI.

demonetisation) of aggregate deposits. The median saving deposit rate remained constant for almost six years since its deregulation in October 2011 although the policy cycle moved in either direction (RBI, 2017). It was only after large influx of current account and savings account (CASA) deposits in the banking system on account of demonetisation – entirely unrelated to monetary policy – that major public sector banks, led by the State Bank of India, lowered the interest rate on saving deposits on July 31, 2017 (Chart 3).[30] The mandatory introduction of external benchmark linked loans for select sectors has broken the jinx, as it were, in bringing about an end to rigidity in saving deposit rates.

4. The interest rates on small saving schemes are administered by the central government and are linked to the secondary market yields on G-secs of comparable maturities. Although it was decided to set these interest rates on a quarterly basis (with a 4-month lag)[31] since April 2016, broadly coinciding with the introduction of the FIT regime, the implementation was half hearted, particularly during the easing cycle. Thus, the actual rates of interest of various small saving instruments were higher than the formula-based rates during Q2:2017-18 to Q4:2017-18 and Q1:2019-20 to Q4:2019-20. For *e.g.,* the administered interest rates on small saving schemes were higher by 81-160 bps as compared with the formula-based rates in Q4: 2019-20 as the government left small saving interest rates unchanged for Q3 and Q4:2019-20, notwithstanding the decline in G-sec yields during the reference period, with implications for monetary transmission. Higher interest rates offered by competing saving instruments such as small saving schemes and debt mutual fund schemes have impeded transmission especially during the easing cycle, although bank deposits have some distinct advantages in the form of stable returns (*vis-à-vis* mutual fund schemes) and liquidity (*vis-à-vis* small saving schemes). Besides, small savings are liabilities of the sovereign and are free from credit risk. Banks, therefore, often appeared to be reluctant in the past to reduce interest rates on term deposits in line with the reduction in the policy rate by the Reserve Bank.[32] These factors imparted rigidity to the liability side of banks' balance sheets.

Chart 3: Median Saving Deposit Rates and Repo Rate - Domestic Banks



Source: RBI.

(Contd.)

30 For deposits up to ₹ 1 lakh.

31 For *e.g.,* the interest rates for the quarter July to September 2019 are based on the month-end G-sec yields for March to May 2019.

32 Nevertheless, after maintaining the saving deposit rate at the same level as postal saving deposit rate (4 per cent) for six years (2011-17), the median saving deposit rate of domestic banks has declined to 3 per cent in September 2020 even as there has been no change in the interest rate on postal saving deposits.

5. The deterioration in the health of the banking sector and the expected loan losses in credit portfolios impacted monetary transmission (John *et al.,* 2018). An increase in credit risk [proxied separately by the gross non-performing assets (NPA) ratio and the stressed assets ratio (NPA plus restructured assets)] impeded monetary transmission through the interest rate channel. Transmission was also hindered through the bank lending channel during the more recent period as credit growth decelerated in response to a sharp deterioration in asset quality (Raj *et al*., 2020).
6. The relative significance of NBFCs in the financial system has been growing. The share of NBFCs in credit extended by banks and NBFCs increased from 9.5 per cent in March 2008 to 18.6 per cent in March 2020. NBFCs, however, do not follow a uniform methodology in the pricing of loans. While some NBFCs use their own prime lending rates as interest rate benchmarks, others use base rates/MCLRs of banks as external benchmark; a few do not have any interest rate benchmark for their loan pricing. The lack of transparency has resulted in weak transmission of monetary policy in this segment of financial market.
7. Fiscal dominance in policy making has continued to impinge on the efficacy of monetary policy in India (Mitra *et al.,* 2017). Open market operations are employed in the context of large government borrowings crowding out non-food credit extended by banks. The SLR prescription provides a captive market for government securities and helps to artificially suppress the cost of borrowing for the Government, dampening the transmission of interest rate changes across the term structure. Though the SLR regulatory floor has been reduced to 18 per cent of NDTL, banks maintain higher SLR than the prescribed limit (26.4 per cent as at end-March 2020). The excess SLR is LAF eligible, which incentivises banks to maintain excess SLR. In addition, weak demand for credit and risk aversion among banks (including '*lazy banking*') appear to motivate banks to invest in government securities more than their statutory requirements. In case of weaker banks, particularly those under prompt corrective action (PCA) framework of the RBI, inadequate capital could also constrain lending operations of banks. The Government also influences the monetary policy transmission channel through moral suasion and at times, directives, to banks. The central and state governments offer interest rate subvention to certain sectors, which distorts setting of competitive prices for loans in free market.
8. There is significant presence of informal/semi-formal lending system in India, particularly in rural areas. The cost of borrowing from informal sources is significantly higher than that of borrowing from banks. Thus, the significant presence of informal finance as well as its costs of intermediation can impede the impact of monetary policy on aggregate demand.

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Raj, J., D.P. Rath, P. Mitra & J. John (2020), "Asset Quality and Credit Channel of Monetary Policy Transmission in India: Some Evidence from Bank-level Data", Reserve Bank of India Working Paper No. 14/2020.

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loans linked to external benchmarks constitute a significant share of balance sheets of banks in many countries (Table IV.12).

IV.58 An overview of country practices[33] on setting of lending and deposit rates suggests that developed economies have typically two benchmark rates – one for retail loans and another for corporate loans. For instance, in the US, the prime rate – normally 3 percentage points higher than the federal funds rate – is usually the benchmark rate for consumer and retail loans; and London Inter-Bank Offered Rate (LIBOR) is the reference rate for corporate loans (and also for longer maturity floating rate mortgages). Similarly, in the UK, the Bank of England's base rate is a key benchmark rate for consumer and retail loans,

33 See Annex IV.3.

Table IV.12: Proportion of Loans linked to Internal and External Benchmarks

(Per cent)

Country	Internal	External	Total
Thailand	95	5	100
Indonesia	90	10	100
Switzerland	80	20	100
Turkey	55	45	100
Malaysia	45	55	100
United Kingdom	45	55	100
Taiwan	40	60	100
Singapore	30	70	100
South Korea	10	90	100
China	0	100	100

Source: Credit Suisse Research, HDFC Bank (Acharya, 2020).

while LIBOR is the benchmark for commercial loans. In case of countries such as the US and the UK, the external benchmark rates have evolved out of market practices. In case of China, however, the Chinese central bank *i.e.*, the People's Bank of China (PBC) appears to goad commercial banks to link their benchmark rate, *viz.*, lending prime rate (LPR) – a reference rate monthly reset by 18 banks – to the interest rate of one of its main tools for managing longer-term liquidity in the banking system, which serves as a guide for the LPR (Reuters, 2020).

IV.59 The shift to external benchmark for select sectors has ushered in transparency in interest rate setting by banks for those sectors; facilitated product comparison (say, lending rate on housing loans) across banks; ensured customer protection; and greatly facilitated transmission. The transmission from the policy rate to the lending rate is more direct than under internal benchmarks (with most banks having adopted the policy repo rate as the desired benchmark). Banks would need to reset the lending rate at least once in three months for existing borrowers to reflect the change in the benchmark rate on a 1-1 basis, speeding up transmission from the MCLR regime, where loans are typically reset on an annual frequency (Mitra and Chattopadhyay, 2020).[34] Besides, the spread would not be frequently/ arbitrarily revised from time to time defeating the purpose of having a benchmark; instead, it will be subject to review once in 3 years (unless there is a credit event).

IV.60 Is the mandatory prescription of an external benchmark by the RBI tantamount to re-regulation through the back door? The element of regulation is, in fact, only to the extent of prescription of an external benchmark in respect of floating rate loans, as opposed to an internal benchmark or having no benchmark at all. Prescribing external benchmark was necessitated by the fact that internal benchmarks lacked transparency and were open to manipulation by banks (RBI, 2017). Besides, under the internal benchmarking regime, both the benchmark rate as also its quantum of change differ from one bank to another, making it difficult for the prospective borrower to compare the interest rate of a loan product across banks and over time.[35] Second, even while recommending an external benchmark, banks were given the choice of selection among any one of the benchmarks published by FBIL and the policy repo rate, even though most banks, of their own volition, have preferred to opt for the latter. Third and most importantly, banks are completely free to determine

34 73.1 per cent of floating rate loans of commercial banks linked to MCLR were reset on an annual frequency in May 2019.

35 It is possible that the MCLR of bank A is greater than that of bank B at time t; however, at time t+1, the reverse can be the case. This is not possible under external benchmarking regime in respect of loans linked to the same benchmark since any change in the benchmark rate will be reflected in lending rates of all banks on a 1-1 basis.

the spread over the external benchmark at the time of loan sanction, based on their commercial judgement; and hence, the lending rate is freely determined by the operation of market forces.[36] Banks also have the freedom to load extra cost of funding or any other costs such as operating costs in the spread at the time of sanctioning of the loans. Having once fixed the spread (and hence, the lending rate), banks are permitted to revise the spread only once in three years except for a major credit event. If the spread remained variable just as the benchmark, the purpose of benchmarking would have got defeated, which is that lending rate ought to change only when the benchmark changes. This stipulation is aimed at safeguarding the interests of the borrowers through the entire loan repayment period since the experience with the internal benchmark regimes has been that banks do not always pass on the entire benefits of the lower benchmark rate to their old borrowers even while passing on the entire benefit of lower interest rate environment to the prospective customers to gain market share. The external benchmark regime thus aims at balancing the interests of the lender with that of the borrower.

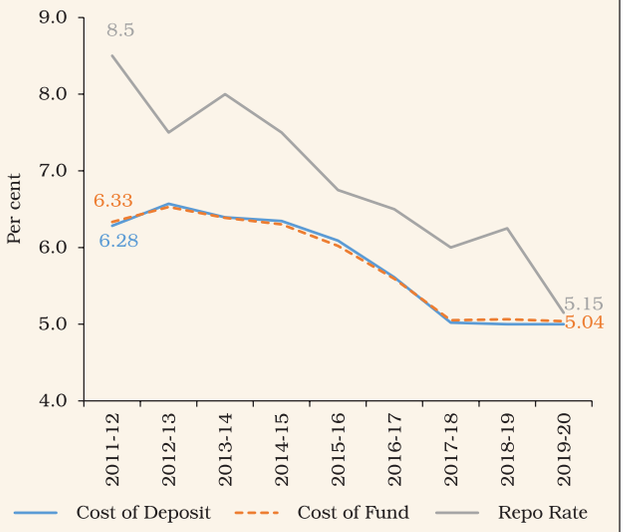
IV.61 The hallmark of FIT regime is transparency, which is also applicable to the external benchmarking regime. Undoubtedly, it would have been ideal had an external benchmark emerged automatically in a market driven process. This, however, was unlikely given the limited depth of money markets, thereby requiring handholding from the Reserve Bank to facilitate emergence of the benchmark as was envisaged by the Expert Committee to Revise and Strengthen the Monetary Policy Framework (RBI, 2014) and the Internal Study Group to Review the Working of the MCLR System (RBI, 2017); this is also consistent with the developmental role played by central banks, including from advanced economies, particularly following the LIBOR episode.

IV.62 Introduction of external benchmark for the pricing of loans did not inconvenience banks as the cost of funds is now more closely aligned to the policy rate with the spread over repo rate declining from 217 bps in March 2012 to 11 bps in March 2020 (Chart IV.7).[37]

Improving Transmission in the Credit Market

IV.63 Efficient monetary transmission in a bank-dominated financial system implies that deposit

Chart IV.7: Cost of Deposit/Funds and Policy Repo Rate*



*: Latest data on policy repo rate is as on March 26, 2020.
Source: RBI.

36 This is at complete variance from the regulated regime where the regulator prescribes the lending rate, or at the least, subjects it to a ceiling. While banks are free to determine lending rates, it is expected that banks would not charge exceptionally high rates due to competition from other banks and other players in the market, such as NBFCs and HFCs; or other instruments, such as CPs and corporate bonds. Ultimately, competitive market forces, rather than regulation, are expected to bring about a convergence of interest rates for same loan category, maturity and risk profile.

37 With the introduction of external benchmark system since October 2019, the WADTDR declined by 48 bps (till March 2020) in response to 25 bps repo rate cut. The 75 bps policy repo rate cut on March 27, 2020 is not included.

and lending rates change in quick time in line with the policy rate to meet the monetary policy objective as laid down in the RBI Act. Addressing the impediments to transmission would facilitate adherence to the inflation targeting framework.

IV.64 If interest rates in the banking system – unlike the money and bond market rates – do not change in line with the policy rate, the monetary authority of a bank-dominated financial system has to either persist with the policy rate for longer to steer growth towards its potential and inflation towards its target; or change the policy rate by much more than would have been the case if interest rates in the credit market moved in tandem with the policy rate. When there is a wide divergence in the movement between money and bond market interest rates on the one hand and credit market on the other, suboptimal allocation of resources may result from imperfect price signals, impacting growth and price stability. If the external benchmarking regime is made applicable to the entire commercial banking sector, not only will it improve monetary transmission, but also indirectly contribute to monetary and financial stability (Acharya, 2020).

Broadening and Deepening Interest Rate Derivatives Market

IV.65 Globally, one of the major tools of managing the duration mismatches between assets and liabilities of banks is through recourse to interest rate derivatives. In India, interest rate derivative markets have grown but have remained limited to one product – the overnight indexed swap (OIS) – and to a small set of market participants (Das, 2020a). In India, there appears to be a chicken and egg problem between the demand and supply sides that restrict participation and limit transactions. A necessary push from the Reserve Bank can break this logjam: the progressive linking of loans to all sectors to one of the external benchmarks currently prescribed for personal and MSME loans for pricing of loans would likely provide a fillip to the development of the derivatives market from the demand side. This, in turn, is expected to provide the necessary impetus to the supply of derivatives products, resulting in an optimal distribution of risk among those who are willing and able to manage without adding to the risks to the financial system as a whole.

Linking Deposits to External Benchmarks

IV.66 Recourse to derivatives products apart, banks can voluntarily link their liabilities (deposits) to external benchmark rates. To begin with, the interest rates on bulk deposits of high net-worth individuals (HNIs) and corporates who are better equipped to handle interest rate risk than retail depositors, could be linked to external benchmark. This will further facilitate the alignment of banks' cost of funds with market rates.

Migrating Old Loans to External Benchmarks

IV.67 The success of the new regime in interest rate setting by banks for better monetary transmission would depend on how quickly and efficiently banks migrate their existing borrowers from the old regime to the new one. Wider publicity may be accorded among borrowers, particularly retail borrowers, about the merits of external benchmarking system through various channels, including in the form of FAQs in layperson language.

Improving Disclosure Practices of Banks

IV.68 The disclosure practices of banks on lending rates charged by them have room for improvement. In the lines of the recommendations of the Internal Study Group to review the working

of the MCLR (RBI, 2017), banks may display prominently in their websites the base rate/MCLR (tenor-wise), the benchmark chosen for external benchmark and the minimum and the maximum spread on loans for each sector separately for loans linked to the base rate, the MCLR and the external benchmark. Information on the spread charged to various categories of borrowers including the credit risk premia and the criteria for levying credit risk premia should be made available on request to the borrowers, including the prospective borrowers. The Indian Banks' Association (IBA) could disseminate consolidated bank-wise information on its website to enable customers to easily compare the lending rates across banks for various sectors.

Aligning Interest Rate Setting Processes of Banks with NBFCs

IV.69 For effective monetary policy transmission to the financial intermediaries and ultimately to the real economy, it is necessary that the interest rate setting processes of NBFCs are aligned with those of banks (Acharya, 2020). The external benchmark system could be mandatory for NBFCs as well as housing finance companies (HFCs) for pricing their loans. The harmonisation of lending rates across banks and NBFCs in terms of benchmarks, fixation of spread and the periodicity of interest rate reset would facilitate effective transmission of monetary policy across the entire spectrum of financial intermediaries.

Revising Interest Rates on Small Savings at Quarterly Intervals

IV.70 To facilitate better transmission, the government should revise interest rates on the various small savings schemes every quarter in line with the well-defined formula as announced by the government in its Press Release dated February 16, 2016.

Harnessing FinTechs for Improving Transmission

IV.71 The new financial technologies (FinTech) are bringing about an unprecedented change in the financial sector globally; India is no exception. Electronic money (including central bank digital currency), peer to peer lending, crowd funding platform and distributed ledger technology have the potential to transform the financial landscape in the near future (Leong and Sung, 2018). FinTechs would reduce transaction costs among counterparties; provide transparency with simpler products; and increase efficiency (Curran, 2016). FinTechs would be the vehicle to reach customers who are outside the pale of the financial system thereby promoting financial inclusion. In India, FinTechs could function as the fourth segment of the Indian financial system, alongside large banks; mid-sized banks including niche banks; and small finance banks, regional rural banks and cooperative banks (Das, 2020b).

IV.72 The role of FinTechs in improving monetary transmission is well recognised in the literature (Bernoth *et al*., 2017). A light touch regulation for FinTechs can result in regulatory arbitrage *vis-à-vis* banks, enabling FinTechs to better transmit monetary policy signals than capital constrained banks through the bank capital channel.[38] Given their nature of operations, FinTechs are more likely to pass on the rate hikes to their customers, facilitating transmission through the lending channel (Bolton *et al*., 2016). Further, there is an overall strengthening effect of non-bank finance on

38 See Van den Heuvel (2002) for bank capital channel.

monetary policy transmission, particularly through the risk-taking channel (IMF, 2016).

IV.73 In India, literature on the role played by FinTechs in monetary transmission is scanty. FinTech firms issue loans to SMEs. The rate of interest charged to small businesses ranges between 16 to 27 per cent (Faridi, 2020). This reflects the high cost of borrowing by FinTechs from banks and high-risk premia assigned by FinTechs. Going forward, FinTechs may be required to better manage the risk through use of derivatives and reduce their cost of borrowings for on-lending to retail borrowers at lower rates of interest.

IV.74 The push from FinTechs would likely prompt banks and NBFCs in India to adopt financial technology, which, by reducing the cost of intermediation, can bring the hitherto unbanked households and firms within the ambit of formal finance, while facilitating economy-wide monetary transmission. FinTech's growth will potentially intensify financial sector competition and cause the market to become more sensitive in its response to policy rate changes, which would improve monetary policy transmission.

Opportunities and Challenges with CBDC

IV.75 Several countries have been toying with the idea of launching central bank digital currency (CBDC) in some form or the other.[39] The attractiveness of CBDC stems from its digital feature as well as from being a sovereign liability. CBDC can be designed to promote non-anonymity at the individual level, monitor transactions, promote financial inclusion by direct benefit fiscal transfer, pumping central bank 'helicopter money' and even direct public consumption to a select basket of goods and services to increase aggregate demand and social welfare, thereby acting as a direct instrument of monetary transmission. Besides, an interest-bearing CBDC can increase the economy's response to changes in the policy rate. In advanced economies with low growth and inflation and facing the constraint of "zero lower bound", CBDC can help countries overcome the constraint with the monetary authority offering negative nominal interest rates to its holders.

IV.76 In emerging markets facing large scale capital inflows, CBDC can act as an instrument of sterilisation, alleviating the constraint that a finite stock of government securities in central bank balance sheet poses. A standing deposit facility (SDF) can also play a similar role, but CBDC, if designed to cater to not only wholesale institutions, but also retail individuals, can directly improve and fasten transmission.

IV.77 CBDC is, however, not an unmixed blessing – it poses a risk of disintermediation of the banking system, more so if the commercial banking system is perceived to be fragile. The public can convert their CASA deposits with banks into CBDC, thereby raising the cost of bank-based financial intermediation with implications for growth and financial stability. In countries with significant credit markets, commercial banks may lose their primacy as the major conduit of monetary policy transmission. One recently proposed solution to limit disintermediation is the introduction of a 2-tier remuneration system for CBDCs, whereby

39 The announcement by Facebook of its Libra initiative as well as reports of a possible launch of CBDC by the People's Bank of China has provided the stimulus to do research and create the technological infrastructure for launching of CBDCs. See Adrian, T. and T.M. Griffoli (2019).

transaction balances held by an individual remain interest free and is subject to a ceiling; while CBDC balances of the individual over and above the ceiling are subject to a penal negative interest rate (Bindseil and Pannetta, 2020). CBDCs providing anonymity may also have implications for cross border payments in violation of extant acts; appropriate safeguards against AML/CFT would need to be laid down.

4. Conclusion

IV.78 The operating procedure of monetary policy has undergone significant transformation over the last decade. This process gained further momentum during FIT with the transition to a more market-based monetary policy framework. The increase in market turnover, proliferation of instruments and players, refinements in payments and settlements infrastructures and rationalisation of market regulations have facilitated smoother and speedier transmission of policy impulses, particularly at the short end of the maturity spectrum. Enhanced transparency in the conduct of monetary policy – a prerequisite for the success of FIT – has also facilitated policy transmission and achieved desirable outcomes while augmenting policy credibility. Of more recent vintage, forward guidance has been an effective tool in managing market sentiments and ensuring cooperative solutions consistent with the monetary policy stance (RBI, 2020). All these factors have contributed in improving the daily cash flow assessment of commercial banks.

IV.79 Notwithstanding the above gains, several daunting challenges remain in further fine-tuning the liquidity management framework. These are: (i) the rapidly shrinking size of the uncollateralised segment of the money market; (ii) improving the liquidity forecasting framework; (iii) choice of the suitable operating framework – corridor *vis-à-vis* floor; (iv) the appropriate width of the corridor; (v) consistency of monetary and liquidity operations with the publicly communicated stance; (vi) managing capital flows through the right choice of instruments; and (vii) the harmonisation of operational timings across market segments. Effective resolution on these issues would remove the impediments to seamless transmission of policy signals and its propagation across the term structure of interest rates. For this purpose, an improved understanding of market microstructure issues and the challenges posed therein would enable informed policy making while retaining credibility.

IV.80 With the adoption of the 14-day variable rate term repo/reverse repo as the principal liquidity management tool, the development of a term money market is an absolute imperative for establishing market-based benchmarks, which in turn would help improve transmission, particularly if bank deposits and loans are priced off these benchmarks. Since a FIT framework can effectively anchor inflation expectations, it encourages market participants to develop an interest rate outlook beyond the immediate short term – conducive for developing a term money market.

IV.81 There has been an improvement in transmission to the deposit and lending interest rates of banks during the FIT regime. Mandating external benchmarks for pricing of loans to select sectors, the quarterly resetting of interest rates on outstanding external benchmark linked loans and quarterly setting of interest rates on small savings schemes have turned out to be game changers. These initial positives have provided the impetus for a wider adoption of external benchmarks, including in various market segments. The imminent transition from LIBOR will spur heightened activity in these directions

as deadlines draw near. In this regard, Financial Benchmarks India Pvt. Ltd. (FBIL) is engaged in developing an interest rate benchmark that would replace FBIL MIFOR curve (which is an implied rupee interest rate curve derived from the FBIL forward premia curve and the USD LIBOR curve) after the cessation of LIBOR. Greater recourse to money and bond market instruments by top rated large corporates to meet their funding requirements could speed up overall transmission across the financial markets.

IV.82 FinTech is expected to challenge the banking sector with innovations and exponential growth, especially in providing last mile connectivity in areas where banks fear to tread. This could potentially revolutionise financial intermediation while improving transmission.

IV.83 CBDC, once introduced, can bring about a sea change in payment transactions, quickening transmission. This could be of greater relevance with the eventual decline in the usage of (physical) currency gaining traction. It is imperative for the Reserve Bank to monitor global developments, explore the possibility of the need for introduction of CBDC and remain in readiness to operationalise CBDC, as and when necessary.

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Annex IV.1: Monetary Policy Operating Frameworks – Key Features

Country	Key Policy Rate (Maturity in Days)	Operating Target (Maturity in Days)	Standing Facilities	Corridor Width (Basis points)	Reserve Requirements (Maintenance Period)	Main Operation	
						Maturity (in days)	Frequency
Australia	Target Cash Rate (1)	Unsecured inter-bank cash rate (1)	Lending, deposit	50	Yes (Daily)	1-365	1 per day
Brazil	Target Cash Rate (1)	Collateralised overnight transactions (1)	Lending, deposit	160	Yes (Two weeks)	1-180	As required
Canada	Target Overnight Rate (1)	Collateralised overnight transactions (1)	Lending, deposit	50	Zero (Not applicable)	1	As required
China	Benchmark interest rates	Excess Reserve and short-term interest rate	Lending	Not applicable	Yes (Ten days)	Generally, 7, other maturity ≤ 1 year	Daily
Eurosystem	Interest rate on main refinancing operations (7)	Short term interest rates (not explicit)	Lending, deposit	65	Yes (Around 6-7 weeks)	7	1 per week
Indonesia	BI 7-day Repo Rate (BI 7DRR)	Inter-bank overnight (O/N) Rate	Lending, deposit	200	Yes	1-day to 12 months	Not fixed
Japan	(i) Interest rate applied to the policy-rate balances in current accounts; (ii) Japan Government Bond yield (10 years)	i) Interest rate applied to the policy-rate balances in current accounts; (ii) Japan Government Bond yield (10 years)	Lending, deposit	40	Yes (1 month)	1-365	1-3 per day
Korea	Base Rate – reversed purchase (RP) and Reverse RP rate (7)	Overnight call rate (1)	Lending, deposit	200	Yes (1 month)	(i) MSBs (14 day – 2 years); (ii) RRPs (1-91); (iii) MSAs (1-91)	(i) 2 per week; (ii) 1 per week; (iii) 1 per week
Malaysia	Overnight Policy Rate (1)	Average overnight inter-bank rate (1)	Lending, deposit	50	Yes	1-180	Daily
Mexico	Monetary Policy Rate (1)	Collateralised overnight inter-bank rate (1)	Lending, deposit	Variable (Deposit: MPR 0%; Lending: MPR + 2)	No (Not applicable)	≤ 25	Daily (greater than 1 per day)

Country	Key Policy Rate (Maturity in Days)	Operating Target (Maturity in Days)	Standing Facilities	Corridor Width (Basis points)	Reserve Requirements (Maintenance Period)	Main Operation	
						Maturity (in days)	Frequency
New Zealand	Official Cash Rate	Overnight Rates	Overnight Reverse Repo facility (ORRF); Bond Lending Facility (BLF)	50	Yes	Overnight	Daily
Norway	Sight Deposit Rate (1)	Short term money market rate	Lending, deposit	200	No	Overnight/ intra-day	Daily
Philippines	Overnight reverse repurchase (RRP) rate (1)	Short-term market rates	Lending, deposit	100	Yes	1-day	Daily
Russia	Bank of Russia Key Rate	Money market rates	Overnight loans; FX swaps; Lombard loans; REPOs; loans secured by non-marketable assets; deposit operations	200	Yes	One week	Weekly
South Africa	Repo Rate (7)	No specific rate	SF repo rate, SF reverse repo rate	200	Yes	7-day	Weekly
Sweden	Repo Rate (7)	No formal target	Lending, deposit	150	No (Not applicable)	7	Weekly (Tuesdays)
Switzerland	SNB policy rate (Out to next MPA)	Short-term Swiss franc money market rates (1)	Liquidity – shortage financing facility	Not applicable	Yes (1 month)	Not applicable	Not applicable
Thailand	Bilateral repurchase rate (1)	Short-term money market rates	Lending, deposit	100	Yes (Fortnightly)	1-day to 6-months	Daily
UK	Bank Rate (1)	Short-term money market rates	Collateralised lending, unsecured deposit	50	No (6-8 weeks)	Not applicable	Not applicable
US	Target Range for Federal Funds Rate	Federal Funds Rate	Lending, deposit		Yes (2 weeks)	1-day to 90-day	Daily

Source: Central Bank websites and Bank for International Settlements (BIS).

Annex IV.2: Lags in Transmission to Output and Prices: A Cross-country Evidence

(In months)

Country	Output			Inflation			Source
	Lagged impact	Peak Impact	Persistence	Lagged impact	Peak Impact	Persistence	
Australia (1985-2003)	12	21		36	42		Arin and Jolly (2005)
Brazil	3			6-9			Banco Central do Brasil (2007)
Czech Republic (1997-2002)	4	12	18-19	5	16	23-24	Anzuini *and Levy* (2007)
EDMEs[40] (1995-2007)		7-10		11			Marques *et al.* (2020)
Euro Area (1970-98)	9	15	>60	39	60	>60	Angeloni *et al.* (2003)
Finland (1970-98)	9	15	36	13	54		Angeloni *et al.* (2003)
France (1970-98)	3	9-15	>60	21-24	No peak		Angeloni *et al.* (2003)
Germany (1970-98)	3	9-12		21	48	>60	Angeloni *et al.* (2003)
Hungary (1993-2003)	2-3	10	18	5	12-13	42	Anzuini *and Levy* (2007)
India	9	12		21	30-48		Patra and Kapur (2012); Kapur (2018)
Ireland (1970-98)	Insignificant impact			13	3-6		Angeloni *et al.* (2003)
Italy (1970-98)	6	9-12	48	18	No peak		Angeloni *et al.* (2003)
Japan (1977-95)	3-4	12	28	24	42		Shioji (1997)

40 Output declines after a contractionary monetary policy shock. The response of output to monetary policy shock is statistically significant at the 1 per cent significance level, peaks after about 7 months when the exchange-rate channel is active, and at 10 months when it is not. A 100-basis point rise in interest rates lowers output by 1.15 per cent when considering the contemporaneous effect of the exchange rate and 1.05 per cent when not. The effect of monetary policy shock on prices is significant at 10 per cent level when exchange rate channel is considered. The decline in prices reaches its peak in 11 months. A 100-basis point rise in interest rates lowers prices by 0.33 per cent (Marques *et al.*, 2020).

Country	Output			Inflation			Source
	Lagged impact	Peak Impact	Persistence	Lagged impact	Peak Impact	Persistence	
New Zealand (1985-2003)	1	3-4		6	12		Arin and Jolly (2005)
Philippines (1984-2003)		12			36		Dakila *et al.* (2005)
Poland (1993-2002)	3	8	20	3	14	40	Anzuini *and Levy* (2007)
Spain (1970-1998)	3	12	33-36	36	48	>60	Angeloni *et al.* (2003)
Sweden (2000-2012)	3	18		6	18		Bardsen *et al.* (2011)
Thailand (2000-2006)	4	6		12	39		Kubo (2007)
UK (1975-2007)		30			36		Cloyne and Hürtgen (2015)
US (1965-95)	5	21	31	20	48	>50	Ramey (2016)

Note: IIP is used as an indicator of economic activity for Philippines, Thailand, UK and US.

Annex IV.3: Benchmark for Interest Rates on Loans

Country	Benchmark Rate	Remarks
Australia	Bank bill swap (BBSW) rates	• In Australia, major banks' wholesale debt and deposit costs are linked (either directly or *via* hedging) to bank bill swap (BBSW) rates.
Canada	Canadian Dollar Offered Rate (CDOR)	• CDOR is the recognized financial benchmark in Canada for bankers' acceptances (BAs) with a term of maturity of 1 year or less. It is the rate at which banks are willing to lend to companies.
China	Loan Prime Rate	• The loan prime rate (LPR) – set by 18 commercial banks – serves as the benchmark lending rate for corporate and housing loans. • The PBOC revamped the mechanism to price LPR in August 2019, loosely pegging it to the 1-year medium-term lending facility (MLF) rate at which PBoC lends.
Europe	EURIBOR	• The 3-month EURIBOR is the rate applied to most of the floating rate bank loans. • Bulk deposits from corporate clients are generally linked to EURIBOR.
Japan	Prime Lending Rate, TIBOR	• For term loans, 3-6 month Tokyo Inter-bank Offered Rate (TIBOR) is used. • Short-term prime lending rate is adopted by the largest number of the city banks.
New Zealand		• Bank Bill Rate Benchmark (BKBM) is used in New Zealand. BKBM is based on actual transactions.
Singapore	Singapore Inter-bank Offered Rate (SIBOR)/Swap Offer Rate (SOR).	• Loans are generally on a floating rate basis linked to Singapore Inter-bank Offered Rate (SIBOR)/Swap Offer Rate (SOR).
South Africa	Johannesburg Interbank Average Rate (JIBAR)	• The Johannesburg Interbank Average Rate (JIBAR) is the benchmark for inter-bank short-term interest rates in South Africa. • PLR is determined as an average of the borrowing and lending rates indicated by several local and international banks. Derived from the bid and offer rates from eight major banks, JIBAR comes in terms ranging from one to 12 months, with the three-month rate the most commonly used reference. • JIBAR rates (typically, of 3-month maturity) are used in setting bank certificate of deposit rates, loan rates, and futures contract rates.
UK	Base Rate, LIBOR	• In UK, the Bank of England's base rate is a key benchmark rate for consumer and retail loans. • LIBOR is the benchmark for commercial loans, student loans and credit cards. • Bulk corporate term deposits are generally linked to LIBOR.

(Contd.)

Country	Benchmark Rate	Remarks
US	US Prime Rate, LIBOR	• The prime rate is often used as a reference rate (also called the base rate) for many types of loans, including loans to small businesses and credit card loans. The prime rate is what banks charge their most creditworthy customers, and it is the base rate on corporate loans posted by a majority of the nation's 25 largest banks, which is normally 3 percentage points higher than the Federal Funds Rate and is the benchmark rate for consumer and retail loans. • London Inter-Bank Offered Rate (LIBOR) is typically the reference rate for corporate loans. • Some banks link the interest rates on their certificates of deposits (CDs) to the US Prime Rate.

Source: Central bank websites.

5 OPEN ECONOMY FLEXIBLE INFLATION TARGETING

"… WHEREAS it is essential to have a modern monetary policy framework to meet the challenge of an increasingly complex economy."

[Excerpted from Preamble to the Reserve Bank of India (RBI) Act, 1934 (amended by the Finance Act, 2016)]

1. Introduction

V.1 As India's experience in the lead-up to the institution of flexible inflation targeting (FIT) vividly showed, persistently high inflation can carry the seeds of external vulnerabilities, which surged to a crescendo during the taper tantrum in the summer of 2013. High inflation morphed into a balance of payments crisis, posing a severe challenge to monetary policy credibility (Patra, 2017). For an open emerging market economy, surges, sudden stops and reversals in capital flows and related volatile exchange rate movements complicate the conduct of monetary policy in the short run. By influencing domestic liquidity and monetary conditions, they feed into domestic inflation, depending on the degree of exchange rate pass-through (ERPT) to domestic prices and the effectiveness of sterilisation operations. Over the longer run, persistently high levels of inflation tend to erode export competitiveness and along with imported inflation can worsen the terms of trade and the current account balance.

V.2 In an open economy setting, therefore, policy authorities are confronted with 'impossible' trade-offs, requiring them to sacrifice one of three policy choices: monetary policy independence; exchange rate stability; and an open capital account (Mundell, 1963; Fleming, 1962). The rapid globalisation of economies and the cross-border integration of domestic financial markets have amplified these challenges. In fact, irrespective of the exchange rate regime, financial openness has posed complications for independent conduct of monetary policy, morphing the trilemma into a dilemma, a choice between capital mobility and independent monetary policy (Rey, 2013). In the aftermath of the global financial crisis (GFC), global spillovers of unconventional monetary policies (UMPs) of systemically important central banks added a new dimension to the open economy policy trade-offs, *i.e.*, domestic financial conditions became heavily influenced by interest rate settings in advanced economies (AEs) and the slosh of global liquidity which impacted credit spreads, risk premia, credit flows and leverage, rendering the pursuit of domestic monetary policy objectives even more challenging. Countries with fixed/managed exchange rate regimes found that they are more likely to experience financial vulnerabilities – faster domestic credit and housing price growth, and increases in bank leverage – than those with relatively flexible regimes (Obstfeld *et al.*, 2017). In this complex international environment, emerging market economies (EMEs) have brought to bear several innovations in the conduct of open economy monetary policy. They have resisted depreciation with a combination of foreign exchange interventions and interest rate defences;

This Chapter has been prepared by a team comprising Rajeev Jain, Amarendra Acharya, Soumasree Tewari, Manu Sharma, Sujata Kundu, Silu Muduli, Shobhit Goel and Rohan Bansal.

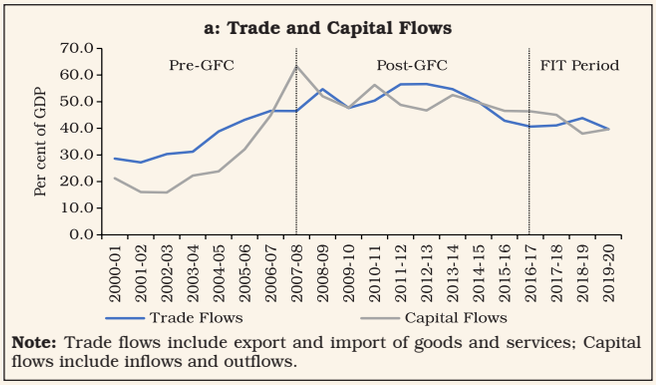
they have learnt over time to manage appreciation pressures better, using a combination of sterilised interventions, capital flow management measures (CFMs) and macro-prudential policies. As a result, EMEs have transformed the dilemma in practice to an asymmetric 2.5 lemma (Cheng and Rajan, 2019). The most important innovation brought in by EMEs has been the happy marriage between FIT and foreign exchange intervention. This can be characterised as an intermediate approach between the two 'impossible' corner solutions – fixed exchange rate *versus* fully open capital account – in the conduct of monetary policy. As a result, the practice of monetary policy in EMEs has moved ahead of theory (BIS, 2019). The global narrative today is all about developing a consensus on an integrated policy framework (IMF, 2019; Adrian and Gopinath, 2020).

V.3 Since the adoption of FIT in India in June 2016, India has also used its own intermediate approach to deal with global spillovers, absent any multilateral consensus on an ideal framework. This chapter covers India-specific issues relating to managing open economy challenges and trade-offs under FIT. Section 2 provides stylised facts on India's openness, comparing the FIT experience with that of the pre-FIT period. Section 3 drills down into underlying exchange rate dynamics, including the effectiveness of sterilised interventions in enhancing flexibility in the conduct of monetary policy in India, and nuances of exchange rate pass-through to domestic inflation. Section 4 summarises policy responses with the help of an open economy Taylor type rule to guide the setting of monetary policy amidst UMPs and global spillovers, taking into account implications for current account sustainability and competitiveness. Section 5 summarises the findings and ends with key takeaways and policy inferences.

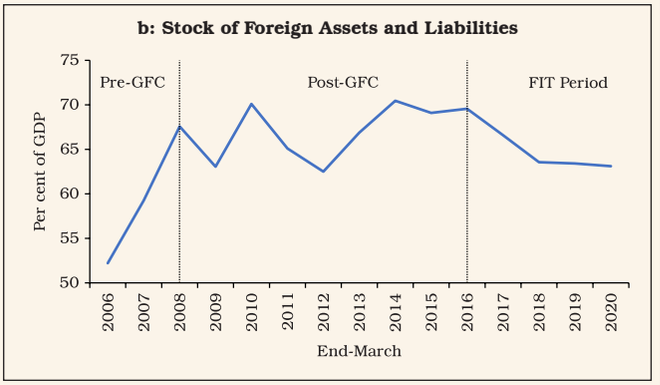
2. Openness: Some Stylised Facts

V.4 Despite various *de jure* policies that have sustained the progressive liberalisation of the capital account in India, cross-border capital flows as a ratio to GDP have moderated during the FIT period (Chart V.1). This reflects a global pattern among EMEs (Chart V.2). At the global level, growing trade protectionism and the retrenchment of banking sector flows largely explain the moderate levels of trade related and capital flows in the post-GFC period. In the case of India, deceleration in the rate of domestic capital formation has also constrained productive absorption of foreign capital.

Chart V.1: India's Openness Indicators

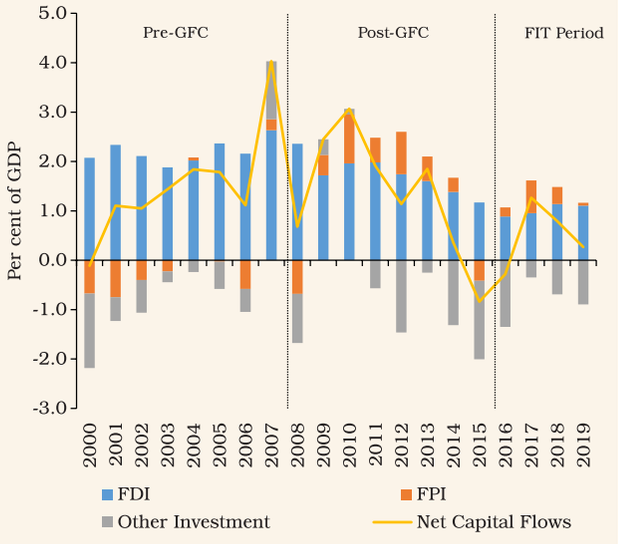


Note: Trade flows include export and import of goods and services; Capital flows include inflows and outflows.



Source: RBI.

Chart V.2: Net Capital Flows to EMEs



Source: IMF.

V.5 On the other hand, India's external vulnerability indicators have improved dramatically, allowing for greater independence of monetary policy from global developments (Table V.1). In particular, the current account balance, the bellwether indicator of India's external viability in view of the historical predominance of trade and remittances in the country's external interface, has strengthened, benefitting from low oil prices during the FIT period and net terms of trade (ToT) turning favourable in 2019-20 (Chart V.3).

Table V.1: India's External Vulnerability Indicators

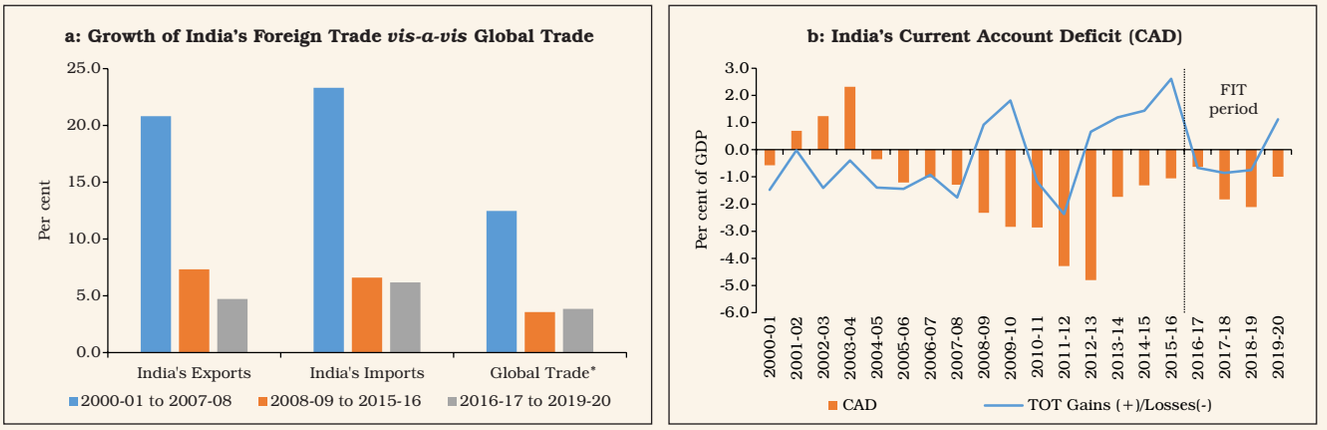
(Per cent, unless indicated otherwise)

Indicator	End-March 2013	End-September 2016	End-March 2020
1. Current Account Balance to GDP ratio*	-4.8	-0.5	-0.9
2. External Debt to GDP ratio	22.4	22.2	20.6
3. Short-term Debt (residual maturity) to Reserves ratio	59.0	54.7	49.6
4. Short-term Debt (original maturity) to Reserves ratio	33.1	21.9	22.4
5. Reserves to Total External Debt ratio	71.3	76.8	85.6
6. Reserve Cover of Imports (in months)	7.0	12.0	12.0
7. Debt Service ratio (debt service to current receipts)	5.9	8.2	6.5
8. Net International Investment Position to GDP ratio	-17.8	-16.9	-13.9

*Average of four quarters.
Source: RBI.

V.6 Net capital inflows exceeded CAD funding requirements during the FIT period. The Indian economy, thus, experienced the problem of poor absorption of saving from abroad that could have complemented domestic savings and worked as a lever for stepping up the pace of growth in a time of abundant global liquidity and ultra-low interest

Chart V.3: India's Foreign Trade during FIT



Note: *Excludes 2009-10 as the world trade declined sharply after the global financial crisis.
Source: RBI and IMF.

Table V.2: Episodes of Excess Capital Inflows

Period	Net Capital Flows		Excess Capital Flows (BoP Basis)	
	> CAD	< CAD		
	No. of Quarters		(US$ billion)	Per cent of GDP
Pre-GFC (2000-01 to 2007-08)	28	4	236.0	4.1
Post-GFC (2008-09 to 2015-16)	21	11	92.2	0.7
FIT period (2016-17 to 2019-20)	12	4	121.3	1.1

Source: RBI.

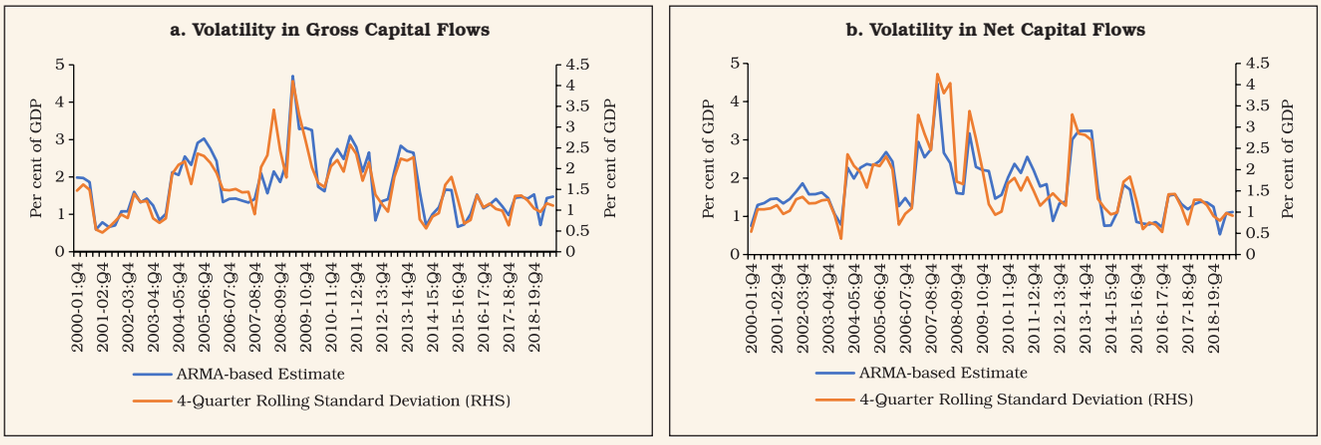
rates. The result was overall balance of payments surpluses and an unprecedented accumulation of India's official reserves (Table V.2). This assumes relevance in comparison with the pre-GFC period when capital inflows averaged about 4.1 per cent of GDP per annum during 2000-01 to 2007-08, coinciding with a phase of high domestic investment rates that peaked at 37.7 per cent of GDP in 2007-08.

V.7 Volatility in capital flows – both gross and net – declined during the FIT period in terms of both standard deviations over a rolling window of four quarters (Engle *et al.*, 2008; Broto *et al.*, 2011; Eichengreen *et al.*, 2017; and Pagliari and Hannan 2017) and standard deviations of residuals obtained from an auto-regressive moving average (ARMA (1, 2)) model to check for the presence of any ARCH effects[1] (Val and Libanio, 2009; Pagliari and Hannan, 2017) (Chart V.4).[2]

3. Exchange Rate Dynamics and FIT

V.8 EMEs have been late movers in the adoption of FIT in view of large exogenous effects of exchange rate volatility on inflation and price competitiveness, embodied in the 'fear of floating' (Calvo and Reinhart, 2002) and 'fear of appreciation' (Levy-Yeyati and Sturzenegger, 2007). This also reflected their large dependence on trade in goods and services and the existence of less developed financial markets (Cavoli, 2009). In practice, most of the EMEs and some AEs have resorted to frequent and large interventions

Chart V.4: Volatility in Capital Flows in India

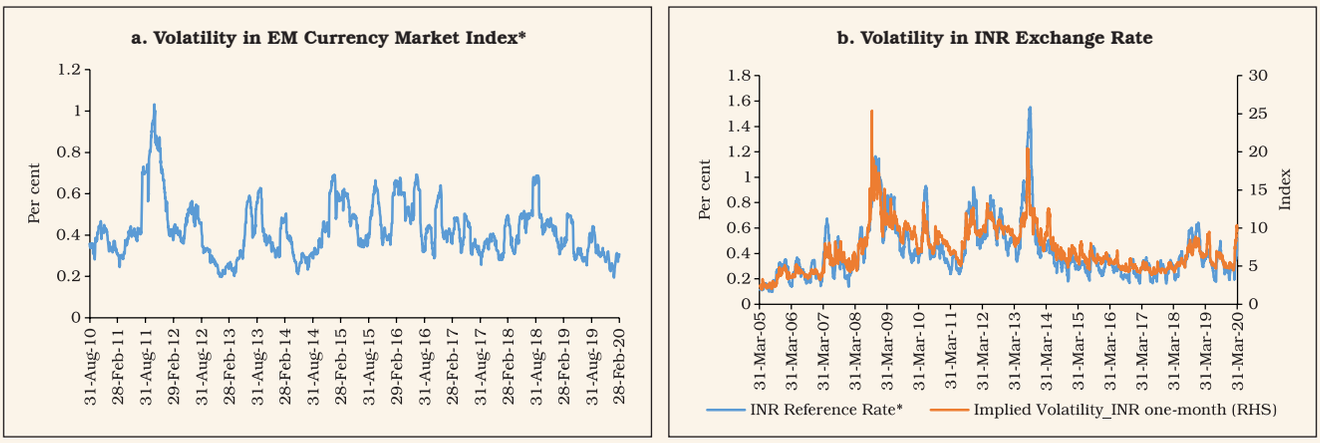


Source: RBI staff estimates.

1 ARCH effects refer to the phenomenon of volatility or variance clustering, where periods of high volatility are followed by periods of higher volatility and period of low volatility are followed by periods of lower volatility.

2 Quarterly data for the period 2000-01:Q1 to 2019-20:Q3 (as per cent of GDP) are used.

Chart V.5: Exchange Rate Volatility



*: 30-day Standard Deviation.
Source: Calculations based on JP Morgan EM Currency Market Index and INR Reference Rate.

in the foreign exchange market to deal with the challenges arising from excessive capital flows and the associated impact on exchange rate volatility (BIS, 2005; IMF, 2011; Berganza and Broto, 2012).

V.9 In India, exchange rate policy aims at containing excessive volatility, without any pre-specified target or band for the Indian rupee (INR). With the decline in volatility of capital inflows (as highlighted in the previous section and Chart V.4), the INR has also exhibited stability during the FIT period (Chart V.5). In India, changes in capital flows emerge as one of the key forces influencing INR volatility (Box V.1).

Box V.1
Drivers of INR Volatility

There is considerable variation across different instruments of capital flows in terms of observed volatility, with net portfolio flows being the most volatile (Table 1).

A six-variable vector autoregression (VAR) model, using quarterly data from 1996:Q2 to 2019:Q4, is estimated. Exchange rate volatility (ERV) is represented by ARMA based residuals (US dollar per INR). Other variables, *viz.*, the current account balance (CABGDP) and net capital flows (both FPI (FPIGDP) and non-FPI (NONFPI) flows) expressed as ratios to GDP, changes in foreign exchange reserves (D(RESERVES)) and GDP growth are also used in the VAR. All variables are found to be stationary. The impulse response paths suggest that INR volatility declines in response to an increase in net FPI flows *vis-à-vis* non-FPI flows (Chart 1).

Table 1: Component-wise Volatility in Net Capital Flows (Coefficient of Variation)

(Per cent)

Period	FDI	FPI	Other Investments	Net capital flows
2000-01 to 2007-08	106	118	95	75
2008-09 to 2015-16	48	153	155	63
2016-17 to 2019-20	43	222	138	46

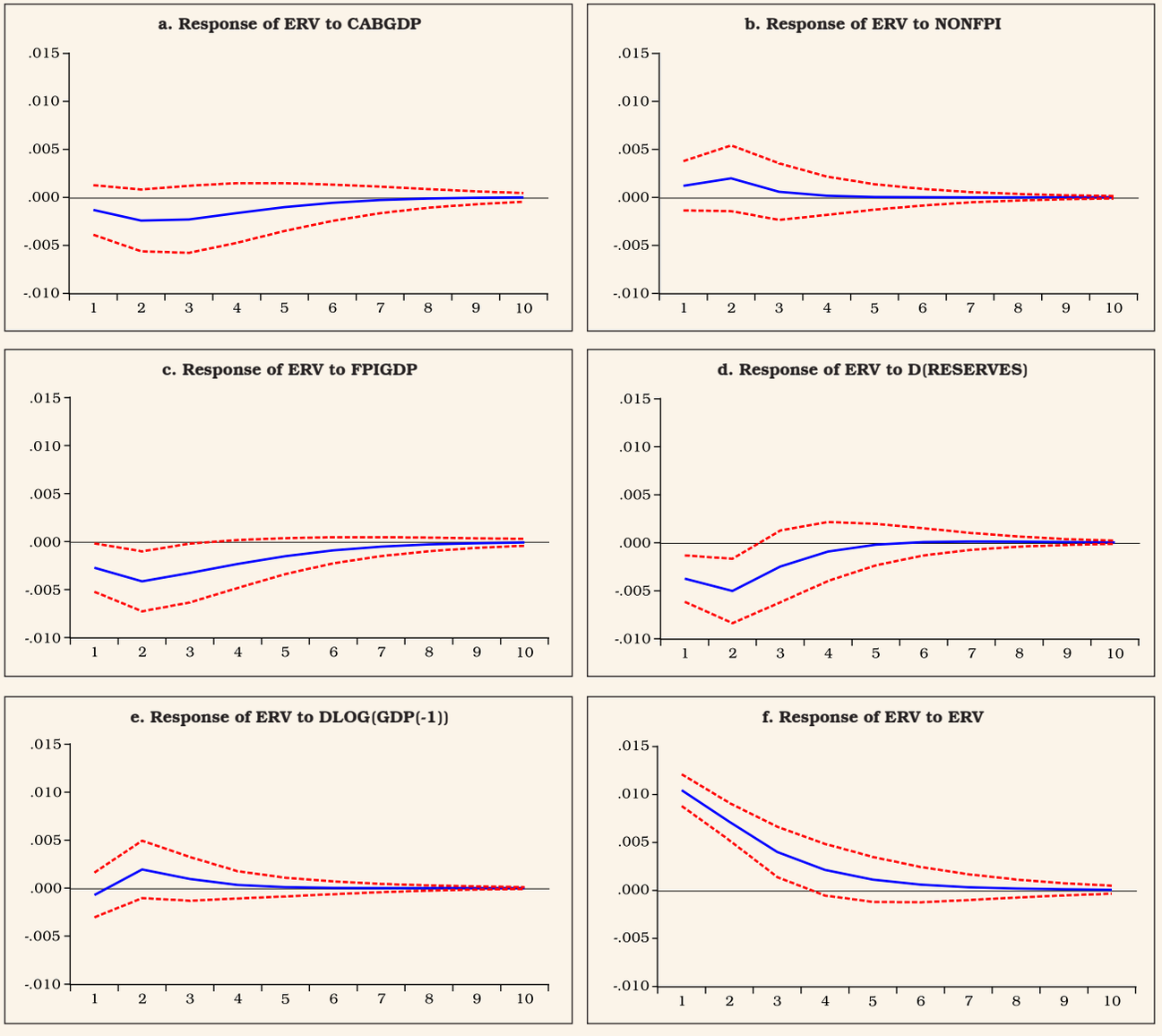
Source: RBI staff calculations.

The forecast error variance decomposition suggests that change in reserves is the dominant factor in explaining variations in exchange rate volatility (15.1 per cent), followed by foreign portfolio investment flows (13.1 per cent), the current account balance (4.8 per cent), and non-FPI flows and GDP growth (less than 2 per cent each). These results reinforce the volatility smoothing role of the Reserve Bank's foreign exchange interventions and the degrees of freedom that interventions allow for conducting domestic monetary policy.

(Contd.)

Chart 1: Response Paths of INR Exchange Rate Volatility

Response to Cholesky One S.D. Innovations ±2 S.E.



Source: RBI staff estimates.

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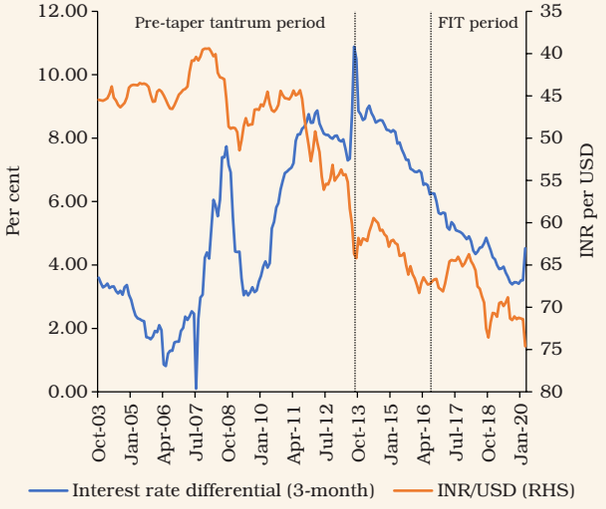
Kohli, R (2015), "Capital Flows and Exchange Rate Volatility in India: How Crucial Are Reserves?", *Review of Development Economics,* Vol.19, No.3, pp.577–591.

Rafi, O. P. C. Muhammed and M. Ramachandran (2018), "Capital Flows and Exchange Rate Volatility: Experience of Emerging Economies", *Indian Economic Review*, Vol.53, pp.183-205.

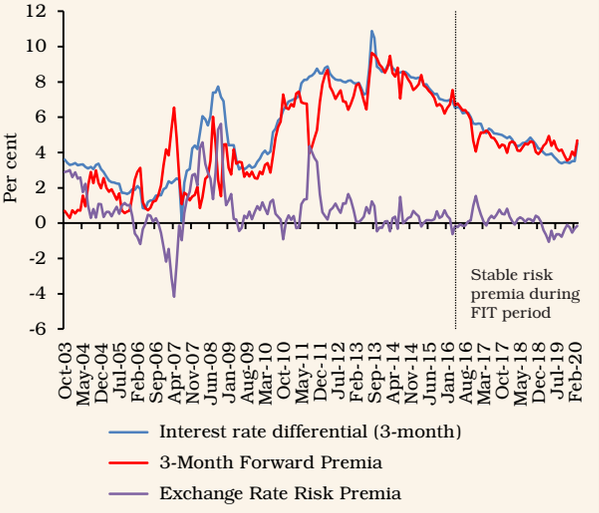
V.10 The sensitivity of INR to monetary policy changes – in India and abroad (in the US as a representative numeraire) – can be examined through the covered and uncovered interest rate parity conditions. The empirical literature on this subject, however, remains divided, with some views emphasizing the role of higher interest rates in attracting foreign capital which, in turn, leads to appreciation of the domestic currency (Dornbusch 1976, Frankel 1979 and Christiano *et al*. 1998), and others interpreting interest rate differential as an indicator of rising inflation, which must reflect in depreciation of the domestic currency in due course (Mussa 1979 and Bilson 1978, 1979). In India, the co-movement between interest rate differentials (based on three-month treasury bill rates in India and the US) and the INR (Chart V.6) does not provide empirical support for uncovered interest rate parity (UIP).[3] The covered interest rate parity is more directly verifiable and holds for the INR in the behaviour of forward premia (Chart V.7). Empirical estimates of determinants of the INR find weak evidence of any role for interest rate differentials; instead global VIX, an indicator of global risk aversion, emerges as a statistically significant determinant (Box V.2).

Chart V.6: Differential in Short-term Interest Rates (India-US) and INR Exchange Rate



Source: RBI and Bloomberg.

Chart V.7: Interest Rate Differentials and Forward Premia on USD/INR



Source: RBI, FBIL and Bloomberg.

V.11 Given the dominant role of capital flows in exchange rate volatility in India and the offset provided by reserve accumulation, it is inevitable that monetary policy design gets strongly influenced by the choice between non-sterilised interventions (and associated implications for domestic liquidity conditions) *versus* sterilised interventions (with associated implications for yields and forward premia). While unsterilised interventions can create surplus liquidity that can depress short-term interest rates to levels lower than the policy interest rate, sterilisation of surplus liquidity through open market operations (OMOs) can influence longer-term yields while the use of swaps to delay the liquidity impact of intervention

3 UIP theory states that the difference between interest rates between two economies should equal the expected change in exchange rate (rather than observed change in exchange rate) to nullify any opportunity for arbitrage gains.

Box V.2
Sensitivity of INR to Risk Premia

In order to analyse the role of interest rate differentials in influencing the risk premium embedded in movements of the INR, the following equation is estimated:

$$ERR_{t,t-3} = \beta 1_t + \beta 2_t * INTD3M_{t-3} + \beta 3 * ETDt + \beta 4 * LOG(CPIt) + \beta 5 * GVIX + \beta 6 * DUM * LOG(CPI) + \varepsilon_t$$

(Interest parity variable) (Risk premia variables)

where ERR is the change in the INR over a 3-month period; INTD3M represents the three-month interest rate differential between India and the US; and ETD is India's excess trade deficit (*i.e.*, trade deficit in excess of average deficit/surplus over past 12 months), CPI is India's consumer price index and the GVIX represents global VIX. An interaction term with a dummy for the CPI relating to the FIT period is used to examine any likely indirect effect on ERR due to change in inflation dynamics post FIT. The empirical results provide no strong evidence of interest rate differentials impacting movements in the INR while the impact of risk premia (GVIX) and excess trade deficit is found to be statistically significant (Table 1). It is possible that the US monetary policy influences the INR through the risk premia channel, but not directly through interest rate differentials.

Table 1: Dependent Variable - Change in Exchange Rate

N=195

Variables	Coefficient	Std. Error	t-Statistic	Prob.
C	1.87	4.99	0.38	0.71
INTD3M(-3)	-0.19	0.11	-1.64	0.10
GVIX	-0.07	0.02	-3.88	0.00
ETD(-1)	-0.10	0.05	-1.92	0.06
LOG(CPI)	0.04	1.08	0.03	0.97
DUM*LOG(CPI)	-0.05	0.13	-0.43	0.67
ERR(-1)	1.07	0.06	17.58	0.00
ERR(-2)	-0.52	0.06	-8.63	0.00
R-squared	0.72	F-statistic	68.67	
Adjusted R-squared	0.71	DW Statistic	1.93	

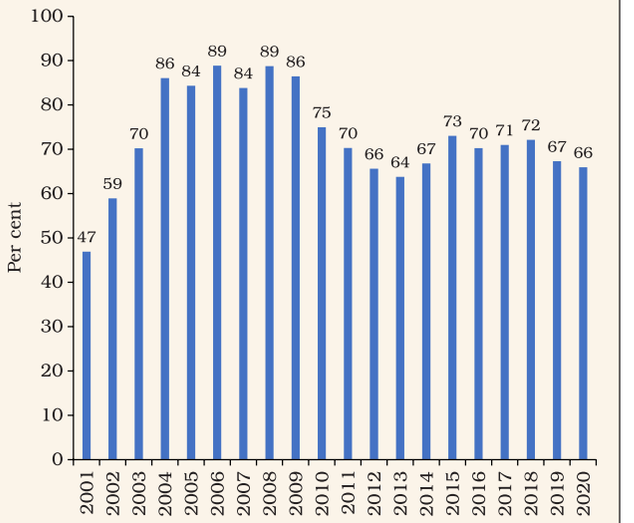
Reference:

Engle, Charles (2016), "Exchange Rates, Interest Rates and Risk Premium", *American Economic Review*, Vol. 106 (2), pp. 436-474.

could alter forward premia. Intervention operations to manage volatility in the exchange rate can thus pose challenges for monetary policy independence by influencing the term structure of interest rates.

V.12 Intervention operations alter the size and composition of the Reserve Bank's balance sheet. Sterilisation is conditioned by the size of domestic securities' holdings available with the Reserve Bank for conducting OMOs to absorb surplus liquidity. During the FIT period, the share of net foreign assets (NFA) has declined below 75 per cent of the Reserve Bank's balance sheet from around 85 per cent before the global financial crisis, creating space for sterilisation to manage the liquidity impact of interventions (Chart V.8). Besides, the high share of NFA induced the Reserve Bank to use multiple instruments such as market stabilisation scheme and cash reserve ratio in addition to open market sales operations for sterilisation purposes.

Chart V.8: Share of Foreign Currency Assets in Total Assets (End-June)



Source: RBI.

Table V.3: Reserve Money and Drivers of Durable Liquidity

(₹ crore)

Year	Change in Reserve Money	Net Forex Purchases by RBI	Net OMO Purchases
2013-14	2,17,856	58,619	52,324
2014-15	1,95,721	3,43,069	(-) 64,014
2015-16	2,52,277	63,087	53,285
2016-17	(-) 2,80,255	78,493	1,11,609
2017-18	5,18,295	2,22,827	(-)87,816
2018-19	3,51,702	(-) 1,11,945	2,99,232
2019-20	2,59,225	3,12,005	1,11,671

Source: RBI.

V.13 In some years, such as in 2017-18, net open market sales were undertaken to sterilise surplus liquidity (Table V.3). In 2018-19, however, a decline in NFA led to contraction in domestic liquidity and hence, the Reserve Bank conducted large open market purchase operations to counter the impact of lower NFA on liquidity and also to meet the normal incremental demand for primary liquidity in the economy. In 2019-20, open market purchases were undertaken to supplement the rupee liquidity generated from forex operations in order to first ensure easy financial conditions to counter the slowdown and in the context of the pandemic towards the close of the year.

V.14 Open market sales for sterilisation can harden yields which, in turn, can attract more yield-differential sensitive capital inflows and cause further addition to liquidity, eventually making sterilisation ineffective. Accordingly, updated estimates of the sterilisation coefficient and the offset coefficient become useful for policy purposes (Box V.3). The sterilisation coefficient indicates the extent of change in net domestic assets (NDA) in the balance sheet of the Reserve Bank that results in response to the change in the NFA. The offset coefficient indicates the change in NFA in response to the NDA-induced change in yields. Both the coefficients vary between 0 and -1. A sterilisation coefficient reaching close to -1 indicates a situation of full sterilisation of the liquidity generated from forex interventions, leaving the reserve money level unchanged. The

Box V.3
Sterilisation Effectiveness during FIT

Sterilisation and offset coefficients are estimated by using the standard model specification that captures the interactions between NFA and NDA in the balance sheet of a central bank (Gupta and Sen Gupta, 2013). In the sterilisation (NDA) equation, a change in NDA is regressed on change in NFA. Other control variables are used, depending on their expected influence on NDA. The estimation is carried out for two sub-periods, *i.e.*, January 2006 to June 2016 and for July 2016 to December 2019.

In the offset (NFA) equation, the change in NFA is regressed on change in NDA. Additional control variables such as the index of industrial production (IIP), the money multiplier (MM), and the interest rate differential between the US federal funds rate and call money rate in India are used, besides a dummy variable for the global financial crisis (Table 1 and Table 2). In NFA and NDA equations, IIP captures the impact of economic activity on capital flows and NDA. The interest rate differential represents the attractiveness of domestic securities for foreign investors in search of yields while the money multiplier serves as a proxy to capture the overall impact of creating or withdrawing reserve money. In the NDA equation, the spread between repo rate and call rate captures the stance of monetary policy as reflected in liquidity conditions.

The estimated results show that both sterilisation and offset coefficients have increased during the FIT period. The sterilisation coefficient at -0.42 suggests that on an average about 42 per cent of the increase in liquidity resulting from increase in the RBI's NFA is sterilised. The

(Contd.)

Table 1: Offset Coefficients (Dependent Variable: NFA)

Variables	Jan. 2006 - Jun. 2016		Jul. 2016 - Dec. 2019	
	Coefficient	p-value	Coefficient	p-value
NDA	**-0.21**	**0.00**	**-0.31**	**0.00**
IIP (-1)	-9.8	0.47	-81.5	0.05
MM	-386	0.21	-1105	0.00
Spread (Call rate – Fed Funds rate)	-22	0.43	-278	0.07
GFC dummy	-183	0.50		
Constant	589	0.01	2183	0.00
NFA (-1)	0.81	0.00	0.76	0.00
Adjusted R^2	0.87		0.84	
DW Statistic	1.70		1.88	

Note: (i) All the variables are taken in first difference form (12-month variation). However, IIP has been used in growth form. Spread has been used without first-difference; (ii) Newey-West estimator-based regression has been used to overcome heteroscedasticity and autocorrelation in the error terms. (iii) Variables used are found to be stationary.

Source: RBI Staff estimates.

Table 2: Sterilisation Coefficients (Dependent Variable: NDA)

Variables	Jan. 2006 - Jun. 2016		Jul. 2016 - Dec. 2019	
	Coefficient	p-value	Coefficient	p-value
NFA	**-0.04**	**0.09**	**-0.42**	**0.00**
IIP (-1)	-15.8	0.02	-36.5	0.21
MM	-798	0.00	-2219	0.00
Spread (Repo rate - Call rate)	-39.9	0.07	-4485	0.05
GFC dummy	414	0.00		
Constant	212	0.01	1659	0.00
NDA (-1)	0.95	0.00	0.36	0.00
Adjusted R^2	0.92		0.94	
DW Statistic	1.87		1.25	

offset coefficient of -0.31 shows partial effectiveness of sterilisation operations. Monetary policy independence is largely preserved in India although the role of sterilisation in this regard is diminishing.

Reference:

Gupta, A. Sen and R. Sengupta (2013), "Management of Capital Flows in India", *ADB South Asia Working Paper Series*, No. 17, Asian Development Bank.

sterilisation coefficient, however, does not convey anything on the effectiveness of sterilisation. This is given by the offset coefficient – a value close to -1 indicates perfect capital mobility, making sterilisation operations completely ineffective. On the other hand, an offset coefficient closer to zero helps in preserving monetary policy independence through sterilised interventions. In India, the size of the estimated offset coefficient has increased during the FIT period to -0.3 from about -0.2 in the pre-FIT period, but remains well below -1, thereby establishing sterilised intervention as an effective instrument for preserving monetary policy independence.

Pass-Through of Exchange Rate Changes to Inflation

V.15 The sensitivity of inflation to exchange rate shocks has a more direct implication for the effectiveness of monetary policy. Since the exchange rate is neither an instrument of policy nor an intermediate target under FIT, a precise assessment of exchange rate pass-through to domestic inflation provides a forward-looking dimension to guide the implementation of monetary policy. In several IT practicing countries, experiences characterised by high volatility in the exchange rate and large pass-through effects may require explicit incorporation of exchange rate shocks as an additional determinant of flexibility within the FIT framework, whether in terms of the tolerance band or the time horizon over which the inflation target could be achieved.

V.16 Available estimates of ERPT for India mostly relate to WPI/CPI-IW inflation (Table V.4). Two estimates which relate to CPI-C inflation suggest an ERPT coefficient of 0.15 over five months (Patra *et al.*, 2018) and 0.10 over four

Table V.4: ERPT Estimates from Select Studies in the Indian Context

Study	Sample Period	Price Index	ERPT Coefficients
Khundrakpam (2007)	Aug 1991 - Mar 2005	WPI	10 per cent change in exchange rate increases final prices by 60 basis points (bps) in short-run and 90 bps in long-run.
Patra and Kapur (2010)	Q2:1996 - Q3:2009	WPI	10 per cent appreciation (depreciation) of the INR *vis-à-vis* the USD lowers (increases) inflation by 50 bps in the same quarter and by 150 bps after seven quarters.
Kapur (2012); Kapur and Behera (2012)	Q2:1996 - Q1:2011	WPI	10 per cent appreciation (depreciation) of INR *vis-à-vis* the USD decreases (increases) inflation by 60 bps in the same quarter, while the long-run ERPT is 120 bps.
Patra, *et al.* (2013-14)	Q2:1996 - Q1:2013	WPI	A 10 per cent change in the exchange rate results in 1.5 per cent change in prices prior to the global crisis and 1.0 per cent change including the post crisis period.
Ghosh and Rajan (2007)	Q1:1980 - Q4:2006	CPI-IW	ERPT elasticity of the INR-USD to CPI is between 45 per cent and 50 per cent and is stable over the sample period.
Bhattacharya, *et al.* (2008)	Sep1997 - Oct 2007	CPI-IW	1 per cent increase in exchange rate increases CPI by 0.10-0.11 per cent in the short-run and 0.04-0.17 per cent in the long-run.
Patra, *et al.* (2018)	Apr 2005 - Mar 2016	CPI-C	About 15 per cent of exchange rate changes are cumulatively passed through to CPI inflation over 5 months timeline, with time varying parameter increasing to above 15 per cent by 2013-14 and declining since then.
Kundu (2019)	Apr 2004 - Sep 2018	CPI-C	Around 10 per cent of exchange rate changes are cumulatively passed through to changes in CPI-C over 4 months.
Cross-Country Studies with India in the Sample			
Jiménez-Rodríguez and Morales-Zumaquero (2020)	Q1:1995 - Q2:2017	CPI-IW	The short-run ERPT is 13 per cent while long run ERPT is not statistically significant.
Choudhri and Hakura (2006)	1979-2000	CPI-IW	1 per cent increase in NEER causes 0.06-0.10 per cent increase in CPI in 1-4 quarters.

months (Kundu, 2019). Updated estimates of ERPT for India using alternative approaches suggest a range of 0.10 to 0.13, with a gradual decline in ERPT during the FIT period (Box V.4).

4. Open Economy Taylor Rule

V.17 Taking into account the stylised facts in Section 2 and the characteristics of underlying inflation dynamics in an open economy in Section 3, this section turns to the implementation of rule-based inflation targeting in an open economy drawing on seminal work (Svensson, 1997; Ball, 1997). In an open economy, monetary policy transmits through both the interest rate and the exchange rate. Accordingly, any monetary policy rule should take into account: (i) the role of real exchange rate changes in explaining output (through net exports) and inflation (through pass-through of import prices to domestic prices and inflation expectations) and (ii) the role of the interest rate in influencing movements in the exchange rate.

V.18 An open economy monetary policy rule, which has attracted intuitive practitioner appeal, can be defined in the form of a monetary conditions index (MCI) (Ball, 1999):

Box V.4
Exchange Rate Pass-Through during FIT

The transmission of exchange rate changes into domestic prices could happen in two stages. In the first stage, a unit change in the exchange rate leads to changes in import prices. In the second stage, import prices cause changes in domestic producer prices which, in turn, can trickle down to consumer prices (Bhattacharya *et al.*, 2008; Aron *et al.,* 2014). Exchange rate pass-through **(**ERPT) to CPI-C inflation is estimated by using a similar two stage approach covering data for 16 years from April 2004 to March 2020 (Table 1).

The results indicate that ERPT accumulated over a duration of 4 months comes to about 0.10-0.11, *i.e.*, about 10-11 per cent of the changes in the exchange rate are cumulatively passed on to the CPI-C in 4 months.[4] The results based on equation 2 indicate that ERPT is higher in the case of depreciation as the coefficient on the quadratic term is positive. Furthermore, the coefficient on the cubic term is also positive, which indicates that ERPT associated with large changes in the exchange rate is lower than with small changes.

A major drawback of the single equation linear ERPT estimates is that the model specification does not take into account the dynamic adjustment of the variables. Therefore, a four-variable structural vector autoregression (SVAR) model with the ordering of variables as Δy_d^t , Δe_t , Δp_d^t, $wacmr_t$ was carried out to validate the already obtained ERPT estimates. The ordering assumes that domestic output growth does not respond immediately to changes in the exchange rate and consumer prices, but output growth and exchange rate movements impact prices contemporaneously. Further, a monetary policy variable, proxied by the weighted average call money rate (WACR), was incorporated with the assumption that monetary policy responds to output growth, consumer prices and exchange rate movements. Global crude oil prices were considered as exogenous variable in the model.

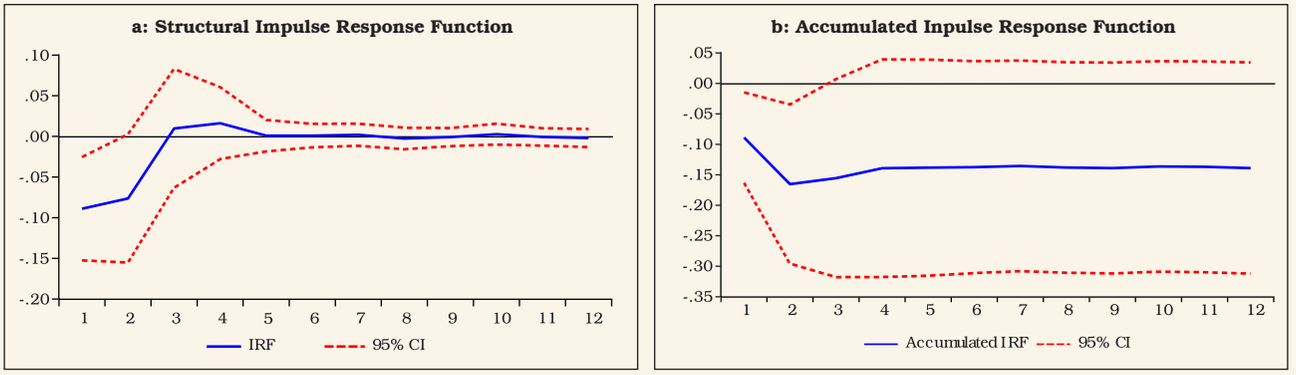
Table 1: Average ERPT Estimates - Dependent Variable Δ(logCPI-C)

Variables	Equation 1	Equation 2
Constant	0.001*** (2.75)	0.001** (2.37)
$\sum_{i=0}^{-4} \Delta NEER_{t-i}$	-0.10*** (-4.28)	-0.11*** (-4.65)
$\sum_{i=0}^{-1} C_i^f$	0.21 (1.10)	0.21 (1.11)
$\sum_{i=0}^{-2} \Delta IIPOECD_{t-i}$	0.08*** (2.97)	0.09*** (3.20)
$\Delta Foodprice_t$	0.39*** (18.81)	0.39*** (19.14)
$\Delta Foodprice_{t-1}$	0.08*** (2.84)	0.08*** (2.83)
$\Delta Crudeoilprice_{t-1}$	0.004** (2.07)	0.004** (2.16)
ΔGDP_{t-2}	0.01* (1.65)	0.01* (1.66)
$Dummy\_IIPOECD_t$	0.001** (2.38)	0.001** (2.35)
$Dummy\_GDP_t$	0.02*** (10.05)	0.02*** (10.45)
$\Delta e^2{}_{t-i}$	-	1.30*** (2.65)
$\Delta e^3{}_{t-i}$	-	34.60*** (2.46)
Adj. R^2	0.77	0.77
DW Statistic	2.03	2.03
F Statistic	679.22*** [0.000]	572.08*** [0.000]
Breusch Godfrey LM Test	Prob [chi²(2)]=0.35	Prob [chi²(2)]=0.30
Breusch Pagan Godfrey Test	Prob [chi²(9)]=0.00	Prob [chi²(11)]=0.00
No. of observations	190	190

(Contd.)

4 The study uses p^d as measured by the CPI-C published by the CSO under the MoSPI, GoI. *e* is represented by NEER (based on trade-based weights) published by the RBI. The indicator of foreign price/cost conditions is constructed as: c^f = NEER*CPI-C/REER. y^d is proxied by the CSO's quarterly real GDP series. Using the Denton method on the seasonally adjusted index of industrial production (IIP) of the CSO (taking average IIP as the indicator), the quarterly real GDP series at market prices was converted to a monthly series. IIP of the OECD countries available from the OECD statistics is used to incorporate y^f. p^c is proxied by the global average crude oil prices available from the World Bank Commodity Price Data (The Pink Sheet). Average crude oil prices are also treated as a proxy for domestic cost conditions. CPI-IW food is used for food prices. Variables were converted into their natural logarithms and were seasonally adjusted by the US Census Bureau X-13 ARIMA programme. The lag selection was done through the Schwarz Criterion (SC), Akaike Information Criterion (AIC), and the Hannan-Quinn Criterion (HQC). All variables were stationary at first differences. Dummy variables for IIPOECD and GDP were used to take into account the impact of the global financial crisis (2008-09 to 2010-11).

Chart 1: IRF of Δ(logCPI-C) from a ± 2 Standard Error Shock on Δ(log NEER)

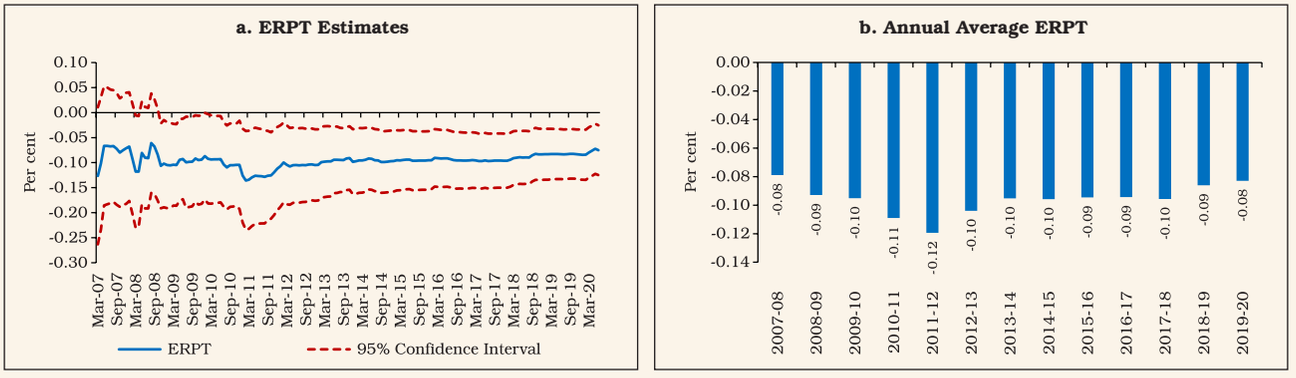


Source: RBI staff estimates.

The results indicate that a change in the exchange rate moves inflation by 16 per cent of the variation in the exchange rate during the first 2 months (Chart 1), which gradually reduces to 13 per cent at the end of a 12-month horizon.

Additionally, a rolling regression over a recursive window of 36 months is used to examine the time-varying nature of ERPT. The control variables remain the same as in the SVAR model, while autoregressive terms of the CPI-C with four lags are incorporated to take into account the intrinsic persistence of inflation (Patra *et al.,* 2014). The results suggest that ERPT has declined from 12 per cent in 2011-12 to 8 per cent in 2019-20 (Chart 2).

Chart 2: Time-varying Nature of ERPT in a Rolling Regression Framework - Dependent Variable Δ(log(CPI-C))



Source: RBI staff estimates.

Reference:

Patra, M. D.; J. K. Khundrakpam and A. T. George (2014), "Post-Global Crisis Inflation Dynamics in India: What has Changed," *India Policy Forum*, Vol. 10, pp.117-191.

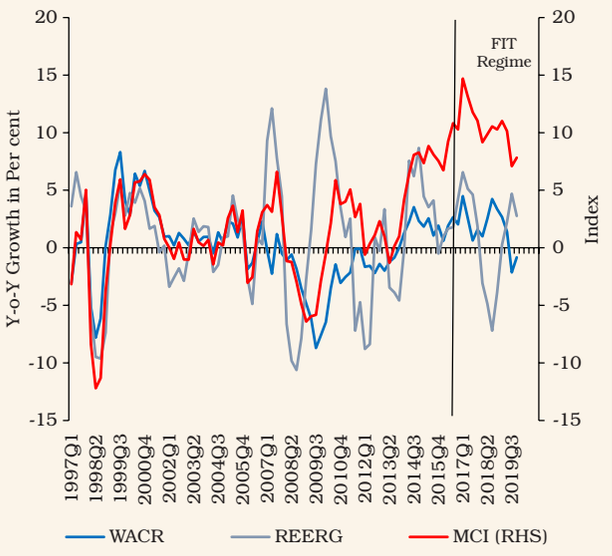
$$wr + (1 - w)e = ay + b\,\pi^{*}$$ [5]

The MCI is measured as a weighted sum of changes (per cent) in the short-term real interest rate relative to a base period and changes in the real effective exchange rate index relative to a base period. The MCI has been used by some inflation targeting central banks such as the Bank of Canada and the Reserve Bank of New Zealand

5 According to Ball (1999), π^{*} stands for $(\pi + \gamma e_{-1})$ where π is inflation, e is log of real exchange rate, y is log of real output and r is real interest rate.

as a short-term operational reference variable. The Bank of Canada generates short-term quarterly paths for desired MCI values, consistent with the quarterly inflation path. In some other countries like Sweden, Norway, Finland and Iceland, the MCI was used as one of several indicators for forming the policy stance (Gerlach and Smets 2000). The estimated MCI for India indicates that monetary conditions remained tighter during the FIT period than in the pre-FIT period (Chart V.9).[6]

Chart V.9: Movement in MCI



Source: RBI staff estimates.

V.19 The MCI is a statistical construct and is unobservable. Moreover, it is confined to monetary conditions as narrowly defined by the joint movements in the interest rate and the exchange rate. In order to set monetary policy, however, a broader array of macroeconomic and financial conditions need to be evaluated to determine the path of the policy instruments. For India, an open economy Taylor rule has been estimated with a global spillover index (GSI) that is constructed on

Box V.5
Open Economy Taylor Rule Estimates for India

An augmented open economy Taylor rule provides a convenient way to check whether domestic monetary policy responds only to domestic goal variables or it responds directly to global spillovers to mitigate proactively their impact on domestic goal variables. When monetary policy responds directly to resist exchange rate pressure, or follows the Fed's actions with policy changes in the same direction, or counters adverse global spillovers directly, it could be viewed as evidence of loss of monetary policy independence.

The model proposed by the Smets and Wouters (2007) is used here to estimate the Taylor-type interest rate rule for India:

$$r_t = \rho r_{t-1} + (1-\rho)\left[\phi_\pi \pi_t + \phi_y \tilde{y}_t\right] + \psi \Delta \tilde{y}_t + \epsilon_t$$

where r_t is the policy rate, π_t is the inflation rate, $\tilde{y}_t$ is the output gap at time period t. This formulation captures persistence in the policy rate or interest rate smoothing. Macroeconomic uncertainties are incorporated by taking the first difference of the output gap. Econometrically,

$$r_t = \theta_1 r_{t-1} + \theta_2 \pi_t + \theta_3 \tilde{y}_t + \theta_4 \tilde{y}_{t-1} + \epsilon_t$$

where

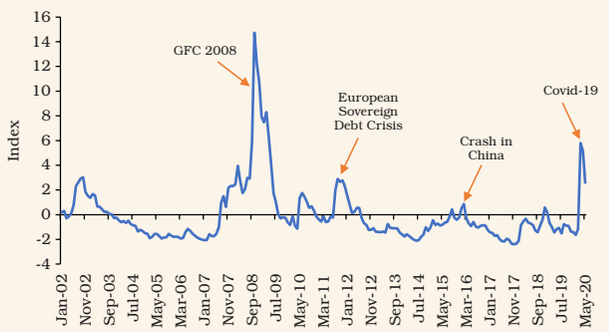
$$\theta_1 = \rho,\ \theta_2 = (1-\rho)\phi_\pi,\ \theta_3 = (1-\rho)\phi_y + \psi, \theta_4 = -\psi$$

A non-linear Taylor rule is estimated (Koustas and Lamarche, 2012). There is an interval of inflation in which monetary policy is accommodative, and the policy rate remains unchanged. Outside the interval, the standard Taylor rule works with different coefficients for above and below the pause interval. An instrument variable method is used to correct for endogeneity arising from aggregate demand and the Phillips curve equation.

(Contd.)

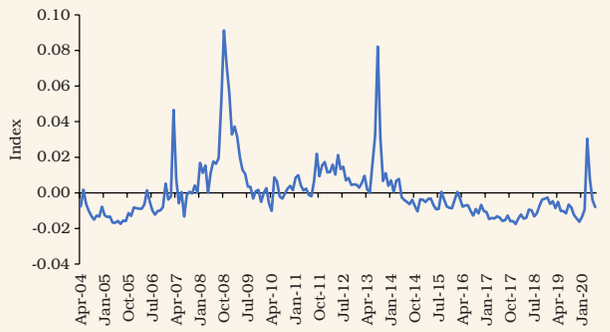
6 The weights w and 1-w for weighted average call rate and real effective exchange rate in MCI are estimated to be 0.65 and 0.35, respectively, and the overall MCI ratio works out to 1.83. A 1 percentage point change in the real interest rate has about the same effects over time on real aggregate demand as a 1.83 percentage point change in the real effective exchange rate.

Chart 1: Global Spillover Index



Source: Bloomberg and RBI staff estimates.

Chart 2: Financial Stress Index



Source: RBI staff estimates.

Quarterly data from 2004:Q2 to 2019:Q4 and an instrument variable GMM methodology have been used, with lags working as instruments to control for endogeneity. Along with inflation and real GDP gap, the standard Taylor rule equation has been augmented with the nominal effective exchange rate, the federal funds rate, the global spillover index (GSI) (Chart 1), and India's financial stress index (FSI) (Chart 2) in alternative specifications.[7]

It is found that monetary policy in India reacts mainly to inflation and the output gap. Domestic monetary policy does not seem to react to global monetary policy and INR exchange rate movements directly, as the relevant coefficients are found to be statistically insignificant. Global spillovers and domestic financial stress do seem to play an important role, however, in influencing domestic monetary policy responses (Table 1).

Table 1: Taylor-type Rule with Global and Financial Stress Variables

Variables	Policy Rate	Policy Rate	Policy Rate	Policy Rate
CPI Inflation Gap	0.175***	0.206***	0.118***	0.0753***
	(0.0397)	(0.0559)	(0.0212)	(0.0192)
Output Gap	0.225**	0.158	0.226***	0.188***
	(0.0928)	(0.106)	(0.0457)	(0.0473)
L. Policy Rate	0.915***	0.910***	0.887***	0.906***
	(0.0589)	(0.0632)	(0.0348)	(0.0400)
L. NEER	0.00214	-0.00149	-0.00566	0.00483
	(0.00565)	(0.00985)	(0.00365)	(0.00684)
L.FSI	-31.26***	-33.10***		
	(6.150)	(7.034)		
L. Federal Funds Rate		0.0360		-0.0476
		(0.0720)		(0.0299)
L.GSI			-0.112***	-0.132***
			(0.0260)	(0.0339)
Constant	-0.00830	-0.0680	0.218	0.414
	(0.359)	(0.411)	(0.206)	(0.350)
Observations	61	61	55	53
Adjusted R^2	0.840	0.835	0.826	0.837
Long-run Coefficient				
Inflation Gap	2.25	2.33	1.09	0.89
Output Gap	2.75	1.78	2.09	2.11

References:

Koustas, Z. and J-F. Lamarche (2012), "Instrumental variable estimation of a nonlinear Taylor rule", *Empirical Economics*, Vol. 42(1), pp.1–20.

Smets, F. and R. Wouters (2007), "Shocks and frictions in US business cycles: A Bayesian DSGE approach", *American Economic Review*, Vol. 97(3), pp.586–606.

Taylor, J. B. (1993), "Discretion versus policy rules in practice", *Carnegie-Rochester Conference Series on Public Policy*, Vol. 39, pp.195–214.

Patra, M. D., S. Pattanaik, J. John and H. Behera (2016), "Global Spillovers and Monetary Policy Transmission in India", *RBI Working Paper Series*, No. 3.

Stock, J.H. and Mark W. Watson (2016), *Handbook of Macroeconomics*, Volume 2A, Elsevier.

7 In order to identify global spillovers, a composite global spillover index (GSI) is constructed following Patra *et al.* (2016) with the following five global spillover variables in standardised form (i) VIX, an indicator of risk aversion of the foreign investors; (ii) LIBOR-OIS spread, an indicator of liquidity stress in the overseas market and risk of default in short-term lending; (iii) DXY- the dollar index, capturing the exchange rate channel of global spillovers; (iv)Term-spread, or the difference between 10-year US treasury bill yield and 3-month US treasury bill yield; and (v) Risk-spread, which is the 10-year US treasury bill yield subtracted from 10-year US corporate bond yield. A dynamic factor model (DFM) is used to estimate the GSI for India (Stock and Watson, 2016). The constructed GSI for India captures reasonably well the various phases of stress in global financial markets and their spillover to Indian markets (Chart 1). A high value of GSI indicates turbulence in the global financial markets. The financial stress index (FSI), which is also used in the Taylor rule, reflects a composite measure of stress in various domestic financial market segments at any point in time (Chart 2). The FSI is constructed capturing both source of stress, *i.e.*, external *versus* domestic.

the basis of the sensitivity of domestic financial markets to global financial stress/spillovers (Box V.5), nominal/real effective exchange rates, the federal funds rate and a composite indicator of domestic financial stress that combines pressures in four markets – equity, bond, forex and money – by using a dynamic factor model. Empirical estimates show that while both the inflation gap and output gap play statistically significant roles in determining the path of the policy interest rate, neither the exchange rate nor the federal funds rate seems to have any statistically significant influence on monetary policy rate decisions in India. Monetary policy is, however, found to be sensitive to both global spillovers and domestic financial stress.

5. Conclusion

V.20 India's observed pattern in capital flows to GDP ratio during the FIT period reflects the generalised moderation in capital flows to EMEs. Compared with interest rate differentials, time varying risk premium – which is a function of global as well as domestic factors – appears to be a major driver of INR volatility. The monetary policy rate is not found to respond directly to exchange rate movements or the federal funds rate, although the conduct of monetary policy is sensitive to financial shocks, both global and domestic. Estimates of ERPT suggest some moderation during the FIT period, but inflation can still alter by 10-13 per cent of the change in exchange rate, warranting that the exchange rate be closely monitored as a key information variable for the conduct of monetary policy.

V.21 Sterilised intervention is an effective solution to manage the trilemma in India. Enhancement of sterilisation capacity may be necessary to deal with possible surges in capital flows in future. Activation of the standing deposit facility (SDF) can address the security availability constraint of RBI for undertaking sterilisation operations, but market-based sterilisation instruments are required to avoid misalignment of the operating target relative to the policy repo rate. Adequate provisions for market stabilisation scheme (MSS) securities in the Union Budget every year may be necessary to strengthen monetary operations of the RBI, consistent with the level of international reserves that is considered conducive for managing exchange rate volatility. The precautionary requirements for building adequate buffers against global spillovers is a public policy objective, and not confined to the realm of monetary policy alone.

V.22 In the absence of budgetary allocations of marketable securities for the conduct of monetary policy in an open economy context, lessons can be drawn from the practice of several central banks that issue their own securities to effectively pursue goals set for monetary policy in the face of large autonomous increase in surplus liquidity due to capital flows. Globally, many advanced country central banks, such as Switzerland, Japan and Sweden issued their own securities to absorb surplus liquidity in the aftermath of GFC. Among the EMEs which have adopted an inflation targeting framework, the Bank of Indonesia pioneered the use of central bank securities even before the Asian financial crisis of 1997. Other inflation targeting central banks which issue their own securities include Thailand, Mexico, Israel, Peru and Chile. For a majority of central banks, their respective legislations allow them to issue their own securities. The option of issuance of its own securities by the RBI, currently prohibited under section 19(5) of the RBI Act 1934, may be explored by amending the Act suitably.

V.23 Sustained accretion to foreign exchange reserves in recent years has improved reserve

adequacy in terms of conventional metrics such as cover for imports and short-term debt. Reserve cover for imports is still lower, however, than other major reserve holding economies. Moreover, in an extremely stressed environment in which external obligations become callable, about half of the reserves can be potentially encumbered for repayment of short-term debt by residual maturity (*i.e.*, falling due over the next twelve months) (Annex V.1). Going by the post-taper tantrum experience, *i.e.*, sudden shifts in market assessment of adequacy and self-fulfilling multiple equilibria in the exchange market, the foreign exchange reserve buffer needs to be strengthened further.

V.24 Looking ahead, the emergence of INR as an international currency appears inevitable. While greater internationalisation of the INR can lower transaction costs of cross-border trade and investment operations by mitigating exchange rate risk, it can also complicate the conduct of monetary policy. Internationalisation of a currency makes the simultaneous pursuit of exchange rate stability and a domestically oriented monetary policy more challenging, unless supported by large and deep domestic financial markets that could effectively absorb external shocks. By broadening the scope for both residents and non-residents to buy and sell domestic currency denominated financial instruments, internationalisation can potentially limit the ability of the central bank to control domestic money supply and influence interest rates as per domestic macroeconomic conditions.

V.25 Besides deep and sophisticated financial markets, the most important pre-requisite for internationalisation of a currency is price stability. Inflation, higher than the world average, undermines the use of a currency as an international medium of exchange and a store of value and can restrict the role of such an economy in global value chains. While high inflation disincentivises cross-border trade and investment by enhancing the cost of acquiring information for pricing, stable prices build confidence of international investors in the domestic currency. In India, the primary focus of FIT on price stability augurs well for further liberalisation of the capital account and internationalisation of the INR.

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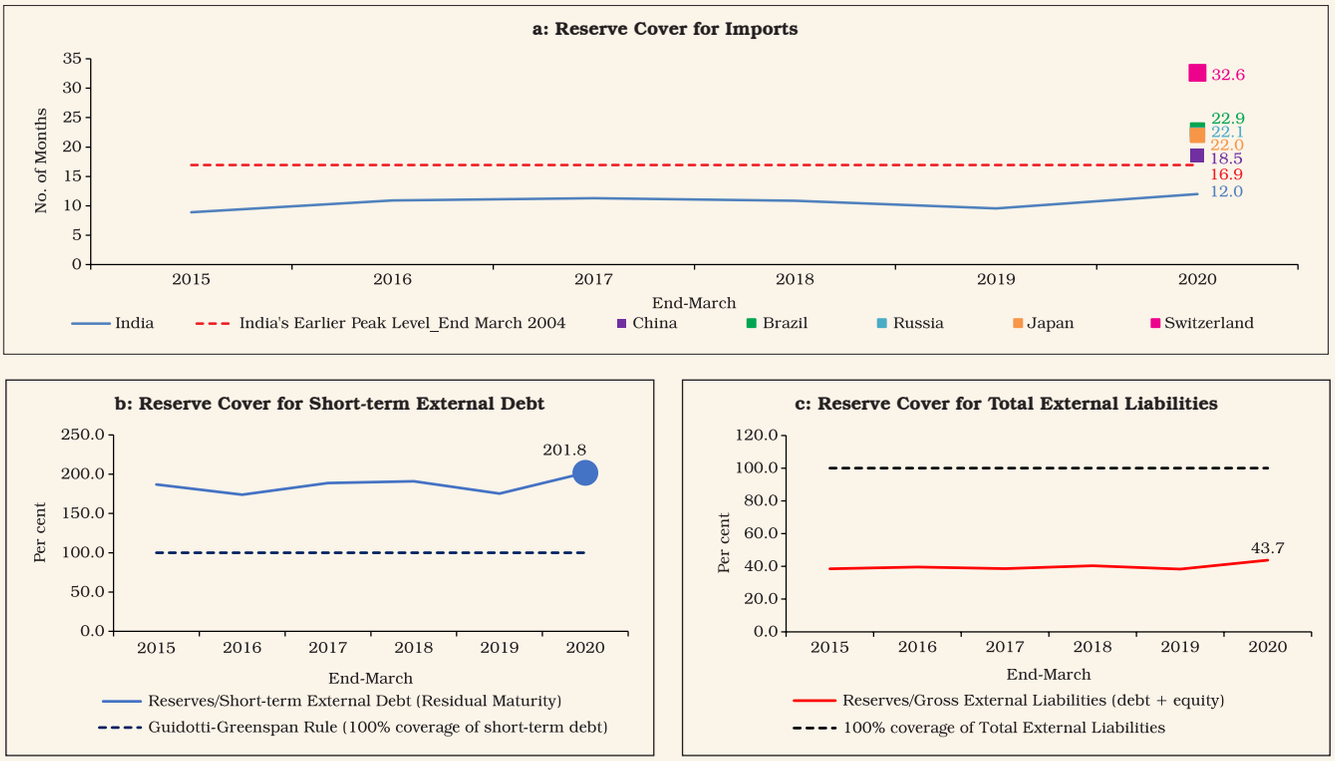
Annex V.1: India's Reserve Adequacy Indicators – A Comparison with Benchmarks



Source: RBI and CEIC.