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Recent Developments in Indian Central Banking: Flying through Turbulence but Aided by Some Tailwinds

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This paper, an extension of our earlier work, presents a narrative of select broad aspects of Indian central banking during the pandemic and thereafter. As elsewhere, Indian monetary policy during the pandemic was characterized by substantial monetary expansion both in terms of rate cuts as well as asset purchase programs. The inflation targeting regime of Indian monetary policy was put to severe stress following the spurt in inflation after the pandemic. Besides, there have been two positive developments in Indian central banking. First, there has been significant improvement in the balance sheets of the Indian banking sector, following the institution of an effective corporate bankruptcy regime, write-offs of earlier stressed assets, and recapitalization of public sector banks by the government. Second, India has made substantial progress in terms of adopting various facets of its digital financial infrastructure, where public initiatives were accompanied by private sector innovations. The digitalization of payments increased in both quantum and value and has touched the lives of the public through the ease of making daily payments, including the smallest of transactions.

Key words: banking, digitalization, India, inflation targeting, pandemic

JEL codes: E42, E52, E58

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1. Introduction

This paper takes stock of select developments in Indian monetary policy and central banking since 2019.[1] We show that, in dealing with the pandemic-related effects, Indian monetary policy had, as elsewhere, been expansionary. However, during the uncertainties and turbulence of the pandemic, the current framework of flexible inflation targeting in India has been assisted by two key positive developments, viz., (i) the restoration of the health of commercial bank balance sheets through significant reduction of bad debt; and (ii) the expansion and development of the digital financial architecture.

In presenting a narrative of Indian central banking during the 5-year period, 2019–2023, the rest of the paper is straightforward. Section 2 is a backdrop describing the broad macroeconomic configuration of the Indian economy. Section 3 examines the

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Indian experience of flexible inflation targeting (adopted since 2015) and monetary policy. Sections 4 and 5 are devoted to the two positive developments during this period, viz., reduction in non-performing assets of commercial banks in India, and the spread of the digital payment system, respectively. Section 6 concludes the paper.

2. Macro Configuration of the Indian Economy

With a gross domestic product (GDP) of around $US 3.7 trillion, population of around 1.4 million people, and a per capita of income of a little over $US 2600 in 2023, India

Table 1 India: Macroeconomic configuration

1. Population (million)	2018–2019	2019–2020	*2020–2021*	2021–2022	2022–2023	2023–2024 (P)
2. Nominal GDP at Market Exchange Rates (MER) (US$ billion)	2703	2836	*2672*	3150	3390	3732
3. Population (million)	1369	1383	*1396*	1407	1417	1429
4. Nominal per capita GDP (US$)	1974	2050	*1913*	2238	2391	2612
5. Global share of GDP (at purchasing power parity) (%)	6.9	7.0	*6.8*	7.0	7.3	7.5
6. Real GDP growth (%)	6.5	3.9	*−5.8*	9.7	7.0	7.8
7. Nominal GDP growth (%)	10.6	6.4	−1.2	18.9	14.2	9.7
8. Total investment (% of GDP)	32.3	30.1	*28.8*	31.2	31.0	31.7
9. Gross national savings (% of GDP)	30.2	29.2	*29.7*	30.0	29.1	29.9
10. Inflation (%)	3.4	4.8	*6.2*	5.5	6.7	5.5
11. General Government Revenue (% of GDP)	20.0	19.2	*18.2*	19.9	19.4	19.4
12. General government total expenditure (% of GDP) (nominal)	26.3	26.8	*31.1*	29.5	28.6	28.1
13. General government net borrowing (% of GDP) (nominal)	6.4	7.7	*12.9*	9.6	9.2	8.8
14. General government gross debt (% of GDP) (nominal)	70.4	75.0	*88.5*	83.8	81.0	81.9
15. Current account balance (% of GDP) (nominal)	−2.1	−0.9	*0.9*	−1.2	−2.0	−1.8

Notes: Indian financial year spans from April to March. Thus, 2018–2019 refers to April 2018 to March 2019.
Source: World Economic Outlook Database, International Monetary Fund, October 2023 and Government of India.
GDP, gross domestic product; P, provisional.

has been classified as a "lower-middle income" country by the World Bank (Table 1) (Hamadeh *et al.*, 2022). While in recent years, India's GDP growth has been creditable, it is often not realized that when the COVID-19 pandemic hit the Indian economy in 2020, the contraction in GDP was preceded by a low growth rate of 3.9% in 2019 (Table 1). There was also significant moderation in inflation till 2019. The slowdown in 2019 can primarily be accounted for by a contraction in the manufacturing sector on the supply side and both consumption and exports on the demand side. The lull in global exports and the collapse of credit from banks and Non-Banking Financial Companies (NBFCs) during the year could have also had their roles in the growth slowdown (Gupta & Tyagi, 2022). This apart, the medium-term lull in the investment rate in India emerged as one of the important concerns behind the Indian economy's growth performance (Mohan, 2022). At the same time, Indian authorities were prudent in using a comparatively moderate fiscal stimulus as a response to the economic disruptions caused by the pandemic, as compared with advanced economies. Indian inflation during 2020–2021 was high due to a sharp spike in food inflation and a combination of adverse developments like excess rains and supply disruptions. The current account deficit has been under check largely because of a slowdown in imports: import compression because of the contraction of GDP during the pandemic resulted in a transient current account surplus. With a large proportion of government securities being predominantly held internally, India has scrupulously avoided the phenomenon of "original sin." After reaching a high of about 89% of GDP in 2020 because of the pandemic-induced fiscal stimulus and GDP growth slowdown, general government gross debt (including both the central as well as state governments) came down to around 82% of nominal GDP by 2023. Since the advent of the pandemic, however, inflation concerns have emerged, as elsewhere in the world.

Thus, notwithstanding the significant adverse impact of the pandemic, wherein India registered the second highest number of confirmed reported cases in the world (after the United States), with 45 million reported cases of COVID-19 infection and the third-highest number of COVID-19 deaths (after the US and Brazil) and more than 500,000 officially reported deaths, India's macroeconomic management and results fared relatively well (Panagariya, 2025).[2]

3. Inflation and Monetary Policy

3.1 Inflation experience

India has adopted a "flexible inflation targeting" (FIT) regime since May 2016, when the RBI Act, 1934 was amended to provide a statutory basis for the implementation of the FIT framework. The motivation for moving to inflation targeting in the Indian context has been summarized in the Report of the Expert Committee to Revise and Strengthen the Monetary Policy Framework (2014) as: "Drawing from the review of cross-country experience, the appraisal of India's monetary policy against the test of outcomes and the recommendations made by previous committees, the Committee recommends that inflation should be the nominal anchor for the monetary policy

framework" (RBI, 2014).[3] The adoption of inflation targeting was also a response to the high inflation experienced during 2009–2014.

In this framework (under the Reserve Bank of India Act, 1934), the Central Government, in consultation with the Reserve Bank of India (RBI), determines the inflation target in terms of the Consumer Price Index (CPI), once in 5 years. Accordingly, on August 5, 2016, the Central Government notified the target rate of CPI inflation as 4% for the period from August 5, 2016, to March 31, 2021, with the upper tolerance limit of 6% and the lower tolerance limit of 2%. On March 31, 2021, the Central Government retained the inflation target and the tolerance band for the following 5-year period, viz., April 1, 2021, to March 31, 2026.

In view of the large external supply shocks, there is a view whether adoption of the core inflation rate as a target variable could be more appropriate. There was considerable discussion about this issue in the Report of the Working Group that recommended FIT in India, which categorically stated:

> In India, food has 48 per cent weight in the CPI-Combined. If 'food' and 'fuel and light' are excluded in order to arrive at a core inflation measure, 57.1 per cent of the consumption basket will be discarded. …Shocks to food inflation and fuel inflation also have a much larger and more persistent impact on inflation expectations than shocks to non-food non-fuel inflation. In these conditions, the CPI-Combined based headline inflation measure appears to be the most feasible and appropriate measure of inflation – as the closest proxy of a true cost of living index – for the conduct of monetary policy. (RBI, 2014)

If inflation targeting is designed to shape inflation expectations, it can also be argued that, in view of the high weights of energy and food, household inflation expectations would be influenced much more by the experience of overall inflation.

Eichengreen *et al.* (2020) have noted that the RBI became more hawkish following the transition to inflation targeting. However, they found that adjusting for inflation and the output gap, policy rates became lower and argued, "inflation has become better anchored: increases in actual inflation excite inflation expectations less, which is indicative of improved anti-inflation credibility." Others have also found that the experience of the first 5 years of FIT in India have been encouraging (Rajadhyaksha & Misra, 2021). However, in line with our earlier research (Mohan & Ray, 2019), they too argued that the decline in average consumer price inflation during this period may not be totally explained by the adoption of the FIT regime.[4] It is still too early to arrive at a definitive conclusion on the actual effectiveness of the FIT regime.

Along with the lockdown-induced supply shocks, there was a sharp spurt in Indian inflation during the pandemic years, particularly with respect to food, and fuel and light (Figure 1a,b).

Given the fact that India has been a major importer of petroleum, the phenomenon of imported inflation has been a recurrent concern in India. Inflation in the second and third quarters of 2020–2021 averaged 6.6%, higher than the upper tolerance of 6% as prescribed under the FIT regime. Inflationary trends continued to remain elevated

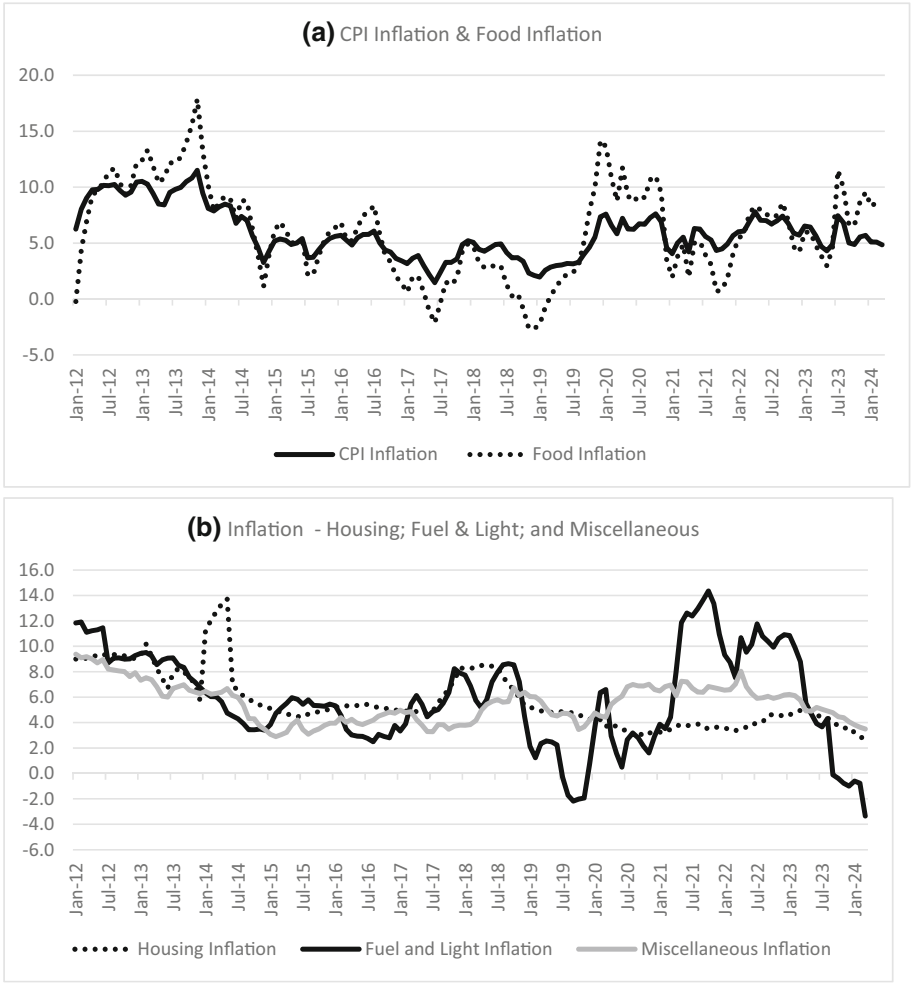

Figure 1 Inflation in India (%).
Source: Handbook on the Indian Economy, RBI (Online version).

in 2022 as well. The International Monetary Fund, in its 2022 Article IV Consultation Report for India, noted, "Inflation has been at or above the Reserve Bank of India's (RBI) tolerance band of 4 ± 2 per cent since January 2022, in the context of growing domestic demand, commodity and food price shocks and supply chain disruptions" (IMF, 2022). Such overshooting of the inflation target was, however, common across the world, especially pronounced in advanced economies. Despite some moderation, inflation often remained outside RBI's comfort zone in 2023, reflecting predominance of both food prices and fuel prices. Illustratively, RBI Governor's Monetary Policy statement of December 8, 2023, noted categorically, "Going ahead, inflation outlook would be considerably influenced by uncertain food prices. High frequency food price

indicators point to an increase in prices of key vegetables which may push CPI inflation higher in the near-term. The ongoing *rabi* sowing progress for key crops like wheat, spices and pulses needs to be closely monitored.[5] Elevated global sugar prices are also a matter of concern" (RBI, 2023a). Thus, the appropriateness of the FIT regime could be questioned on the ground that Government policies related to the management of food grain, petroleum, and electricity prices could well be as or more important than monetary policy for inflation management in India.[6]

3.2 Monetary policy during the pandemic

Both conventional and unconventional policy measures were taken recourse to by the Indian authorities. In terms of conventional monetary policy measure, the policy repo rate[7] was cumulatively reduced by an unprecedented 115 basis points (bps) and the interest rate on the overnight fixed rate reverse repo window was reduced cumulatively by 155 bps during March–May 2020 (Figure 2).[8] Mohan (2021) summarized the initial response of the RBI as follows:

> As the monetary authority, the Monetary Policy Committee (MPC) laid a triple objective of mitigating negative effects of the virus, reviving growth, and preserving financial stability. To ease economic hardship while keeping inflation in check, the RBI slashed interest rates keeping the policy repo rate at a low of 4%. The cash reserve ratio (CRR) was lowered, which provided additional liquidity to help aid the banking system. The goal

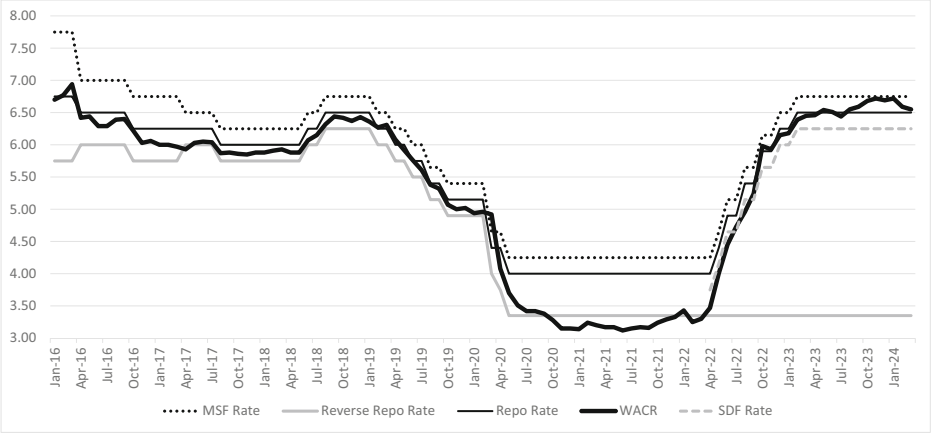

Figure 2 Monetary policy rates (%). Notes: WACR (Weighted average of call money rate) is the RBI's operating target; MSF (Marginal Standing Facility) rate is the penal rate at which banks can borrow, on an overnight basis, from the RBI by dipping into their Statutory Liquidity Ratio (SLR) portfolio up to a predefined limit (2%). The MSF rate is placed at 25 basis points above the policy repo rate. SDF, Standing Deposit Facility.
Source: Reserve Bank of India.

was to ensure that no part of the financial system faced liquidity concerns or credit constraints.

Later, after a pause during June 2020 through April 2022, with the spurt in inflationary pressures, the policy repo rate was increased steadily from 4% to 6.5% between April 2022 and May 2023. Interestingly, faced with an abundance of liquidity, in April 2022, the RBI introduced a new facility, viz., the Standing Deposit Facility (SDF); the SDF rate is the rate at which the RBI started accepting uncollateralized deposits, on an overnight basis, from all the liquidity adjustment facility (LAF) participants, mostly banks. The SDF rate is placed at 25 basis points below the policy repo rate and has replaced the fixed reverse repo rate as the floor of the LAF corridor.

In addition to conventional monetary policy measures after the COVID-related lockdown was announced in India on March 24, 2020, several unconventional monetary policy measures were announced by the RBI. Extended lending operations and asset purchase programs were added to their policy armory (Table 2). Interestingly, long-term repo operations (LTROs) were introduced by the RBI in February 2020 to improve policy transmission amid a cyclical slowdown in the economy, just before the declaration of the pandemic. The cumulative quantum of all such measures turned out to be 8.7% of nominal GDP. The *availed* unconventional monetary expansion during the pandemic was slightly lower than the *announced* liquidity injection during September 2008–September 2009, when it was around 10.5% of GDP (Mohan & Ray, 2019). However, despite a large, announced liquidity injection, contrary to global trends, the RBI's balance sheet during the North Atlantic Financial Crisis (NAFC) did not show an unusual increase because of the release of the earlier sterilized liquidity (RBI, 2010). Thus, in effective terms, the liquidity injection during the pandemic could have been higher than that during the NAFC.

Interestingly, unlike the advanced countries, these unconventional measures were undertaken even before hitting the zero lower bound. As the efficacy of the interest rate channel was in question in India, and corporates and banks suffering from extreme risk aversion, resorting to unconventional monetary policy made ample sense even before exhausting the conventional policy space. Besides, lowering interest rates further could have made the real rate of interest negative.

While financial markets were stabilized and, in general, credit was made available to productive sectors, the Indian authorities were careful not to overdo the monetary and fiscal expansion. In retrospect, and in view of the future inflationary pressures, it made ample policy sense.

What have been the major achievements of the FIT regime in India?

In an ideology-agnostic way, we have looked at inflation in a before–after manner over a longer period.[9] A comparison of consumer price behavior from 1995 to 1996 is fraught with the issue of using comparable data because the unified all India CPI index did not exist until December 2010. Notwithstanding such difficulty, the fall in inflation during 1998–1999 through 2006–2007 seems to be quite comparable with the fall in inflation during the FIT years (Figure 3). Why did it happen? RBI's Annual Report for

Table 2 Pandemic-related liquidity measures (Indian rupee [INR] billion).(during February 2020 to March 2022)

No	Liquidity facility	Announced	Availed
1	Long-term Repo Operation	2000	1251
2	Variable rate repo	2250	900
3	Special Liquidity Facility (SLF) for Primary Dealers	72	60[†]
4	Cut in Cash Reserve Ratio	1370	1370
5	Marginal Standing Facility (MSF) (dip by additional 1% in SLR)	1370	—
6	Targeted Long-term Repo Operations (TLTRO)	1000	1001
7	Targeted Long-term Repo Operations 2.0 (TLTRO 2.0)	500	129
8	Net Open Market Operation purchases + G-Sec Acquisition Programme (G-SAP)	3700	5703
9	Special liquidity facility for mutual funds	500	24
10	Refinance to NABARD, SIDBI and NHB, and EXIM Bank	1410	1298
11	Special liquidity scheme for NBFCs	300	71
12	56-day term repo	1000	10
13	On tap Targeted Long-term Repo Operations (TLTRO)	1000	90
14	Special Long-term Repo Operations (SLTRO) for small finance banks	100	31
15	On tap liquidity for emergency health services	500	—
16	On tap liquidity window for contact-intensive sectors	150	—
17	Total	17,222	11,937
18	*As % of nominal GDP for 2020–2021*	*8.7*	*6.0*

Notes: 1. NABARD: National Bank for Agriculture and Rural Development (an apex regulatory body [fully owned by Government of India] for overall regulation of regional rural banks and apex co-operative banks in India).
2. SIDBI: Small Industries Development Bank of India (the apex regulatory body for overall licensing and regulation of micro, small and medium enterprise finance companies in India).
3. NHB: National Housing Bank.
4. EXIM Bank: Export–Import Bank of India.
Source: Patra and Bhattacharyya (2022).
[†]Maximum during the period.

1999–2000 emphasized the role of supply-side factors and noted: "The overall deceleration in CPI-Industrial workers reflects the subdued movement in the price of food products emanating from the bumper food grains production, better management of the Public Distribution System and improved supply position of essential items like edible oils and sugar through imports, which quelled the inflationary expectations in respect of primary articles." In fact, a comparison of inflation rates between three periods, viz., (i) 1995–1996 to 2007–2008 (without inflation targeting); (ii) 2008–2009 to 2012–2013; and (iii) 2013–2014 to 2023–2024 (with inflation targeting), reveals that while inflation rates during the periods I and III are quite comparable, period II is clearly an outlier.

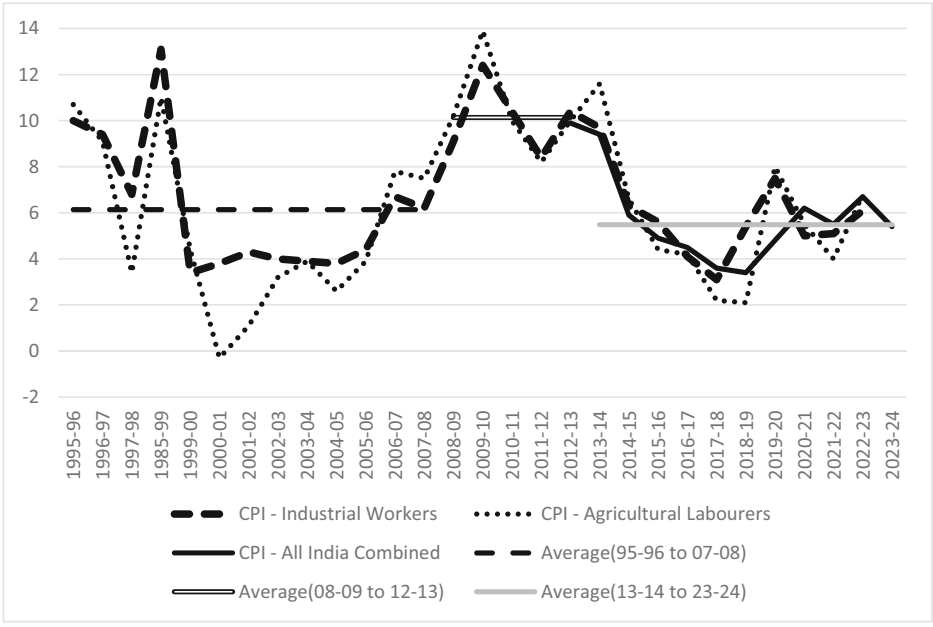

Figure 3 Measures of Inflation based on Different Price Indices (%): 1995–1996 through 2022–2023.

Source: Handbook on the Indian Economy, RBI (Online version).

This conclusion gets reinforced if one compares the average rate of inflation over three distinct subperiods, viz., (a) 1995–1996 to 2007–2008; (b) 2008–2009 to 2012–2013; and (c) 2013–2014 to 2022–2023. Interestingly, inflation rates during 1995–1996 to 2007–2008 are quite comparable with those during the FIT years (Table 3).

Admittedly, the presence of the pandemic and associated supply shocks in between makes any objective assessment of the FIT regime difficult. However, as the RBI is supposed to anchor inflation expectations, a detailed analysis of Inflation Expectations Survey of Households (IESH) on a quarterly basis and using a novel methodology led Garga *et al.* (2022) to conclude, "Since the adoption of inflation targeting, markets believe that the RBI has been more responsive to inflation." However, there is significant variation across regions in household expectations. Interestingly, the volatility in inflation seems to have come down in the post-FIT period. Alternative interpretations exist as well. Illustratively, Balakrishnan and Parameswaran (2022) investigated the inflationary trajectory of India and found that subdued inflation in India can be put down to the behavior of commodity prices.

4. Restoration of the Health of the Banking Sector

Another major tailwind helping the financial sector has been an improvement in the nonperforming assets of the banking sector in recent years. Trends in nonperforming

Table 3 Consumer price inflation (based on the relevant CPI at average of months): Averages for three subperiods (%)

	CPI – Industrial workers (IW)	CPI – IW (food and beverages)	CPI – Agri laborers	CPI All India General Index			CPI All India combined: Food and BEVERAGES
				Rural	Urban	Combined	
1995–1996 to 2007–2008	6.1	5.8	5.3	—	—	—	—
2008–2009 to 2012–2013	10.1	11.1	10.5	10.6	9.1	9.9	11.2
2013–2014 to 2022–2023	5.8	5.5	5.5	5.5	5.4	5.5	5.5

Source: Handbook on the Indian Economy, RBI (Online version).

assets (NPAs) in the Indian banking sector reveal an interesting pattern. They showed a consistent downward trend from 1996–1997 through 2007–2008. Notwithstanding some elements of pro-cyclicality, the deterioration of NPAs since the advent of the NAFC was marked. They deteriorated at a slow pace initially, but following the asset quality review (AQR) of public sector banks in 2015, the NPAs rose almost exponentially (Figure 4). The deterioration in the credit quality of commercial banks can be traced to factors like the fall in commodity prices, regulatory forbearance (that started after the NAFC but continued until 2015), corporate sector debt problems, and issues relating to corporate governance both in the corporate sector and in banks (Kumar *et al.*, 2022; Mohan & Ray, 2023). Thus, on account of the deterioration of credit quality, and some liquidity issues in the nonbanking financial sector, credit growth declined thereafter. A significant achievement after 2017 is the restoration of health of bank balance sheets due to both RBI actions (such as the framework of prompt corrective action, or better monitoring) and government recapitalization of banks. In fact, the gross nonperforming asset (GNPA) ratio of scheduled commercial banks fell to a decadal low of 3.2% at end-September 2023; this was, of course, higher than the 2% GNPA ratio in 2008–2009 (RBI, 2023b).

A number of factors are responsible for improvement of nonperforming assets of commercial banks in India.

First, legislation of the Insolvency and Bankruptcy code (IBC), 2016 and the subsequent establishment of the Insolvency and Bankruptcy Board of India (IBBI) in

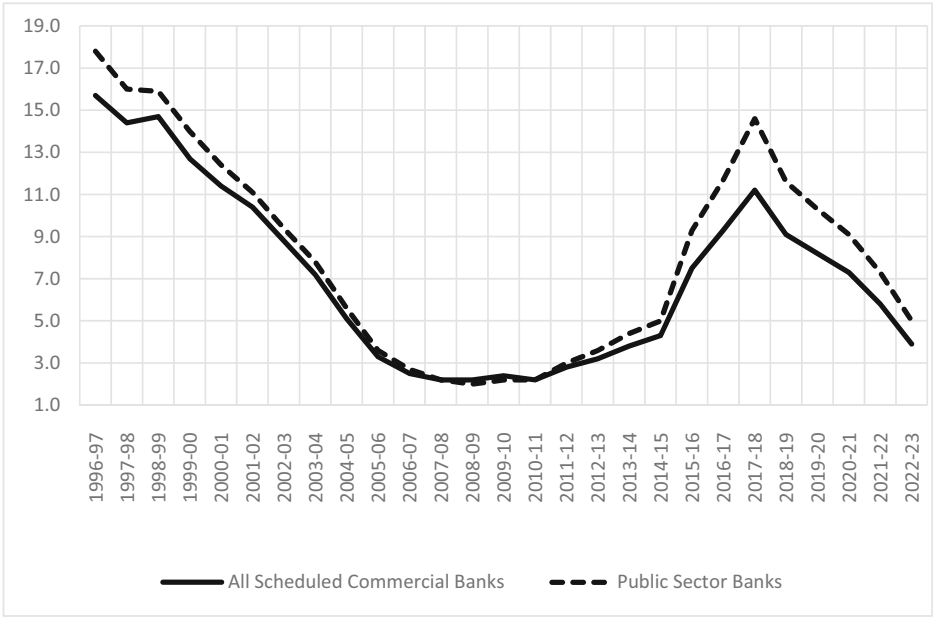

Figure 4 Gross NPA as percentage of gross advances (%).
Source: Handbook on the Indian Economy, RBI (Online version), an RBI (2023b).

October 2016 simplified and accelerated the process of corporate bankruptcy in India (Bhagwati, 2022). The new bankruptcy system has improved credit recovery, and the resolved firms that have gone through the resolution process seemed to have significantly improved their performance in the post-resolution period (Mohan & Balagopal, 2023). The performance of the IBC has been better than the more prevalent channels of NPA recovery (Table 4).

Second, RBI's off-site surveillance systems have been made more focused and comprehensive by harnessing SupTech (a web-based end-to-end workflow application and an automatic data reporting platform). Besides, big data techniques are increasingly being leveraged to supplement supervisory initiatives while Cyber Range – a virtual controlled environment and tool – helps in cyber security drills.

Third, in a banking system dominated by public sector banks, the Central Government announced in 2019 that 10 public sector banks would be merged into four entities. Arithmetically, of course, the GNPA ratio would be neutral of bank mergers. Nevertheless, mergers have brought in efficiency gains leaving improved balance sheets.

Fourth, the current improved health of the banking sector was not without cost. The Central Government infused Rs 3.1 trillion to recapitalize banks during the five financial years from 2016–2017 to 2020–2021, out of which Rs 349 billion were sourced through budgetary allocations and about Rs 2.8 trillion through issuance of recapitalization bonds to these banks. The mechanism of the recapitalization bonds was

Table 4 NPAs recovered through various channels

		Lok Adalats	DRTs	SARFAESI Act	IBC @#	Total
2021–2022	No. of cases referred	8,506,741	30,651	249,645	891	8,787,928
	Amount involved (INR billion)	1190	690	1217	1980	5076
	Amount recovered (INR billion)	28	120	273	474	896
	Recovery as % of involved amount	*2.3*	*17.5*	*22.5*	*23.9*	*17.6*
2022–2023	No. of cases referred	14,249,462	58,073	185,397	1261	14,494,193
	Amount involved (INR billion)	1885	4026	1118	1339	8369
	Amount recovered (INR billion)	38	369	309	540	1256
	Recovery as % of involved amount	*2.0*	*9.2*	*27.6*	*40.3*	*15.0*

Notes: 1. *Lok Adalat* literally means Peoples court, wherein decisions are arrived at between two or more disputing parties on mutually acceptable terms amicably.
2. SARFAESI Act: Securitisation and Reconstruction of Financial Assets and Enforcement of Security Interest Act, 2002.
3. DRT: Debt Recovery Tribunals.
4. IBC: *Insolvency and Bankruptcy Code*.
Source: RBI (2023b).

innovative. These bonds, issued by the Government, are subscribed by commercial banks. As the money collected by the government goes to banks in the form of equity capital, it is classified as an investment of the banks. Because there is no outflow of money from the government budget, this did not have any impact on fiscal deficits.

Besides, there were write-offs of bad debt. In fact, commenting on the improved NPA situation, the RBI Annual Report, 2021–2022 commented, "The … GNPA ratio of all scheduled commercial banks … moderated to its lowest level in six years, aided by due efforts towards recoveries and technical write-offs."

Considering the fact that there was some regulatory forbearance for loans in the medium and small category during the pandemic, the improvement in the nonperforming assets of commercial banks is very creditable.

5. Advances in Digital Payment Infrastructure

While India has a long history of using technological solutions to payments systems, several initiatives in the recent past have placed India as a front runner among digital

payments systems in the world.[10] A game changer was the enactment of the Payment and Settlement Systems Act, 2007 (PSS Act, 2007), which came into force on 12 August 2008. This Act provided for the regulation and supervision of payment systems in India and designated the RBI as the relevant regulating authority.[11] Consequent to this legal framework, the establishment of the National Payments Corporation of India (NPCI) in 2009 set in place the key enabling initiative for facilitating the roll out of digital payment infrastructure. The NPCI is a not-for-profit umbrella organization, established by the RBI and the Indian Banks' Association (IBA) for creating a robust Payment and Settlement Infrastructure in India.[12]

A major initiative has been the establishment of the Unified Payments Interface (UPI) as "a system that powers multiple bank accounts into a single mobile application (of any participating bank), merging several banking features, seamless fund routing & merchant payments into one hood" (NPCI, 2024a). Launched in April 2016, the UPI also caters to the "Peer to Peer" collect request.[13] How is the UPI unique? Apart from immediate money transfer through mobile devices round the clock and 365 days, UPI allows a single mobile application for accessing different bank accounts via a single-click two-factor authentication. It allows merchant payments with Single Application or In-App Payments, as well as different utility bill payments, and QR code (Scan and Pay) based payments. Consequently, even roadside vegetable and fruit sellers, hawkers, and other small merchants use the QR code mechanism to receive electronic payments from their customers.

Such usage has been enabled and encouraged by the Aadhaar-based identity system. This is a 12-digit unique identity number that is obtained voluntarily by all Indian residents and is based on their biometrics (prints of 10 fingers, 2 iris prints and a photo of the face) and demographic data. The system was established under the Aadhaar (Targeted Delivery of Financial and Other Subsidies, Benefits and Services) Act, 2016. The data are collected by the Unique Identification Authority of India (UIDAI), now a statutory authority, which was established in January 2009 by the Government of India. As of 2023, nearly 99% of 1.4 billion India's population has been covered through Aadhaar (UIDAI, 2024).

What has been the progress of digital payments infrastructure in India? Following features are worth noting, in particular.

First, large-value transactions are routed through the Real Time Gross Settlement (RTGS) system. Started in 2004, the RTGS is "a system where there is continuous and real-time settlement of fund-transfers, individually on a transaction-by-transaction basis (without netting)" (RBI, 2022b). The RTGS is available on a 24 × 7 × 365 basis with effect from December 14, 2020. The minimum amount to be remitted through RTGS is Rs 200,000, and there is no upper or maximum ceiling.

Second, there are several distinct modes of retail digital transactions with varying degrees of importance.[14]

Third, expectedly, the standard pool credit and debit cards are also in use.

Fourth, PPIs (Prepaid payment instruments) also facilitate "purchase of goods and services, conduct of financial services, enable remittance facilities, etc., against the value stored therein" (RBI, 2022c).

Finally, the traditional paper-based nondigital instruments like cheques/demand drafts and the associated clearing house-based cheque clearing systems, evolved from manual clearing systems to Magnetic Ink Character Recognition (MICR) clearing systems in the mid-1980s (Gandhi, 2016). Subsequently, the Cheque Truncation System (CTS) was introduced to restrict the physical movement of cheques and for enabling the use of images for payment processing.

How far have all these initiatives borne fruit? Some broad trends are worth noting. First, paper-based instruments (like cheques or demand drafts) have slowly lost their importance, so much so that the volume of digital payments crossed 99% of total payments; even in terms of values, digital payments are currently 97% of the total payments, indicating the dwindling importance of paper-based cheques (Figure 5).

Expectedly, an interesting regularity has been the predominance of retail transactions in terms of volume, while large-value payments, despite a downward trend, in terms of their share in total payments, still account for around 70% of total payments. Illustratively, for 2022–2023, retail transactions, accounting for around 99% of total transactions, have a share of 30% in value terms.

Effectively, the real story of India's digital payments revolution is one of digitization of retail payments. Apart from various initiatives of the Government of India and the RBI, low transaction costs and convenience have encouraged digital payments.

What have been the main features of India's digital payments ecosystem? Several features may be flagged.

First, all the indicators are pointers to the significant progress that India has made in establishing a digital financial infrastructure. Some numbers may drive home this point: according to recent data, with 10 Operational Account Aggregators, 67 billion of total number of digital identity verifications, Rs 14.05 trillion as the total value

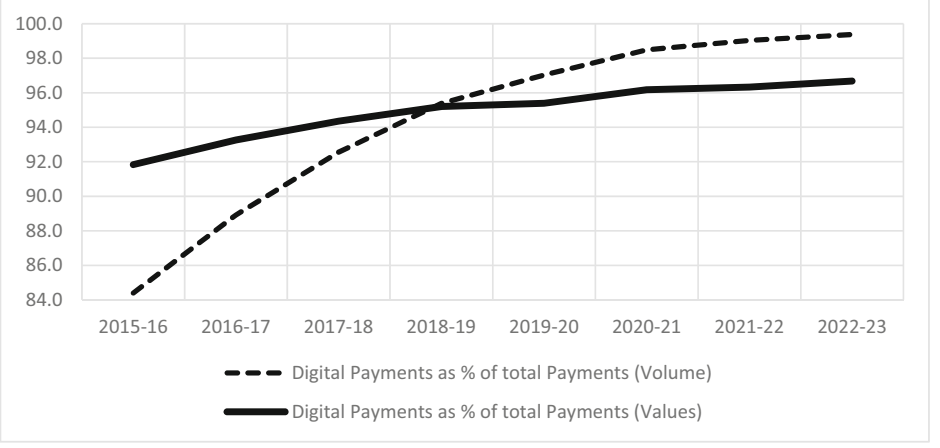

Figure 5 Share of digital payments in total payments (%).
Source: Authors' calculations based on RBI data.

of monthly real-time mobile payments, and 8.6 billion total volumes of monthly real-time mobile payments, India is indeed one of the leading success stories of using technology for mass participation in the organized financial sector (India Stack, n.d.).[15] Digital payments in India continue to grow at a massive rate with a year-on-year transaction volume growth of 56% in 2022–2023 and are expected to grow four times by 2026–2027 (PwC, 2023).

Second, India's digital payments infrastructure reflects effective functioning and coordination across diverse agencies and ministries. One can refer to the project named India Stack, which plays a key role in the establishment and running of digital payments infrastructure. The system comprises different components like (i) Aadhaar products such as e-KYC[16], (ii) eSign[17], (iii) Digilocker[18], and (iv) UPI. The Account Aggregator framework is regulated by the RBI and its technology standards and owned by the Reserve Bank Information Technology Private Limited (ReBIT).

Third, the digital payments infrastructure has played an effective role in the process of financial inclusion. For example, the APBS-AEPS (i.e. Aadhaar Payment Bridge System and Aadhaar Enabled Payment System) network formed the foundation of India's Direct-Beneficiary-Transfer (DBT) system. Till November 2021, INR 19.3 trillion has been disbursed by the Indian government via the DBT directly to identified beneficiaries as relief and income support (Holla, 2021).

Fourth, during the pandemic and particularly during the lockdown, the digital payments infrastructure was of great help. According to the results of a survey on the impact of COVID-19 and its resultant lockdowns, a majority of 81% of respondents reported higher usage of digital payment methods than cash (KPMG, 2020).

But what has been the behavior of cash holdings in India? Taking the definition of broad money (M3) as the sum of currency with the public, deposits with commercial and co-operative banks in India, and "other deposits" with the RBI (a small component), currency experienced a slow but steady decline of 16% of M3 in 2001 to 13% of M3 in 2023; per contra deposits have gone up from 83% of M3 to 86% of M3 (Figure 6). The sharp fall in the currency–M3 ratio (and corresponding rise in the deposit–M3 ratio) in 2017 is a one-off effect on account of demonetization. Also, as a percentage of GDP, the currency in circulation in India is comparable to countries like Thailand, Russia, or Poland (Shirai & Sugandi, 2019).

How far has India progressed in terms of digital payments infrastructure? The RBI's composite Digital Payments Index (DPI) captures the extent of digitization of payments across the country. The DPI comprises five broad parameters capturing the deepening and penetration of digital payments in the country, namely, (i) Payment Enablers (weight 25%); (ii) Payment Infrastructure – Demand-side factors (10%); (iii) Payment Infrastructure – Supply-side factors (15%); (iv) Payment Performance (45%); and (v) Consumer Centricity (5%). The RBI has been publishing this index (RBI-DPI) since January 1, 2021, with March 2018 as the base to capture the extent of digitization of payments across the country. The index shows that India has made

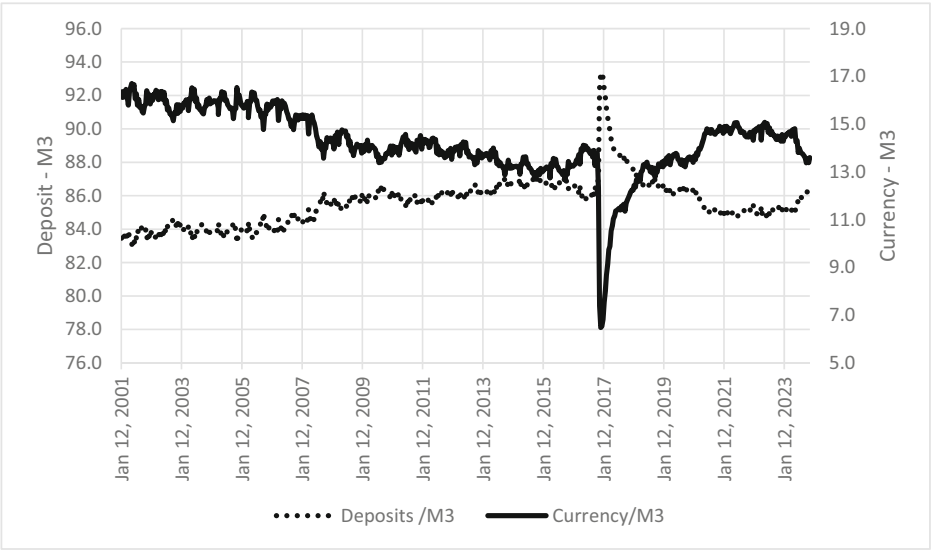

Figure 6 Currency and deposits as percentages of broad money (M3).
Source: Reserve Bank of India.

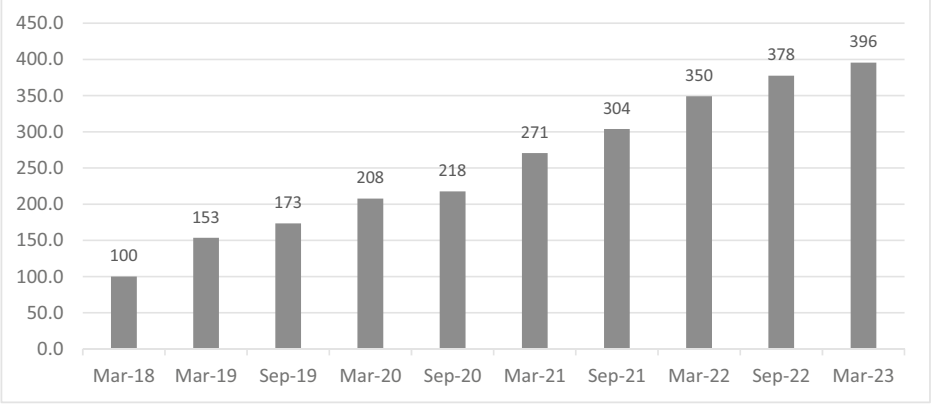

Figure 7 RBI – Digital Payment Index (March 2018 = 100).
Source: RBI (2023).

significant progress in its digital payment infrastructure (Figure 7). Paul Romer, Nobel Laureate, and a former World Bank Chief Economist, has reportedly praised Aadhaar as "the basis for all kinds of connections that involve things like financial transactions," and added, "It could be good for the world if this became widely adopted" (India Today Web Desk, 2018).

6. Concluding Observations

Thanks to agile and vigilant monetary and financial sector policies, the Indian financial sector has exhibited remarkable stability since 2019 despite COVID-related disruptions. India has been able to repair the balance sheets of commercial banks through the infusion of capital in the public sector banks, as well as initiatives toward effective corporate bankruptcy resolution. On the macroeconomic front, India has been able to maintain its growth momentum after the COVID year. Inflation has also been range-bound, though higher than the target range of the FIT regime. Its deviation from the target has been lower than in many of the advanced economies. India's digital payment infrastructure has been effective in enhancing financial deepening of the economy as well as financial inclusion. However, adoption of fintech technology comes with a number of challenges including the possibilities of financial frauds and newer instruments like cryptocurrencies and central bank digital currency or spurt in digital retail lending in recent times. Overall, with a reasonable control of inflation, improvement in balance sheets of commercial banks, increasing digitalization and sustained macro-stability, the future of Indian central banking looks promising.

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Notes

1 Developments till 2019 have been covered in Mohan and Ray (2019).

2 On a population adjusted basis India's casualties because of COVID were quite low. This was probably because of the large proportion of people who live in rural areas that are not as crowded as towns and cities.

3 See Mohan and Ray (2019) for a detailed discussion on the context of India moving over the flexible inflation targeting.

4 Also see Patra (2021).

5 India has two distinct crop cycles, which in local parlance are known as: *Kharif* (Monsoon crops), and *rabi* (winter crops).

6 For example, the Central government is going to provide free food grains to about 833 million beneficiaries for a period of 5 years with effect from January 1, 2024.

7 The interest rate at which the RBI provides liquidity under the liquidity adjustment facility (LAF) to all LAF participants, mostly banks, against the collateral of government and other approved securities.

8 The reverse repo rate is "the interest rate at which the Reserve Bank absorbs liquidity from banks against the collateral of eligible government securities under the LAF. Following the introduction of SDF, the fixed rate reverse repo operations will be at the discretion of the RBI for purposes specified from time to time" RBI (n.d.).

9 Eichengreen *et al.* (2020) compared fall in inflation during the FIT years with the 2008–2013 period, which was atypical.

10 Illustratively, earlier initiatives included: (i) MICR clearing in the early 1980s; (ii) Electronic Clearing Service (ECS) and Electronic Funds Transfer (EFT) in the 1990s; (iii) Issuance of credit and debit cards by banks in the 1990s; (iv) ATMs, Mobile and Internet Banking in early 2000; (v) The National Financial Switch (NFS) in 2003; (vi) RTGS and NEFT in 2004; and (vii) the Cheque Truncation System (CTS) in 2008.

11 Under this Act, the RBI was authorized to constitute a Committee of its Central Board for this purpose. The Act also provided the legal basis for "netting" and "settlement finality." This is of great importance, since, in India, other than the Real Time Gross Settlement (RTGS) system all other payment systems function on a net settlement basis (RBI, 2022a).

12 It was set up under the provisions of Section 25 of the Companies Act 1956 (now Section 8 of the Companies Act 2013) by leading public and private sector baks in India. In 2016 the shareholdings became more broad-based to 56-member banks to include more banks representing all sectors. Furthermore, in 2020, new entities regulated by RBI were inducted, consisting of Payment Service Operators, payment banks, and Small Finance Banks (NPCI, 2024b).

13 A Collect Request is a transaction where the customer is pulling funds from the intended remitter by using Virtual ID. Banks have started to upload their UPI enabled Apps on Google Play store from 25 August 2016 onwards.

14 Some of these are: Aadhaar Enabled Payment System (AePS); Aadhaar Payment Bridge System (APBS); Electronic Clearing Service (ECS); Immediate Payment Service (IMPS); National Automated Clearing House (NACH); National Electronic Funds Transfer (NEFT); Bharat Interface for Money (BHIM).

15 An Account Aggregator (AA) is a type of RBI regulated entity (with an NBFC-AA license) that helps an individual to securely and digitally access and share information from one financial institution they have an account with to any other regulated financial institution in the AA network. Prominent examples of the AA's are Phone-Pe or Perfios.

16 UIDAI has launched Aadhaar Paperless Offline e-KYC Verification; the e-KYC service provides an authenticated instant verification of identity and significantly lowers the cost of paper-based verification and KYC (know your customer).

17 For creating electronic signatures, the signer is required to obtain a Digital Signature Certificate (DSC) from a Certifying Authority (CA) licensed by the Controller of Certifying Authorities (CCA) under the Information Technology (IT) Act, 2000. eSign is an online electronic signature service which can be integrated with service delivery applications via an API to facilitate an eSign user to digitally sign a document. Using authentication of the eSign user through e-KYC service, online electronic signature service is facilitated.

18 DigiLocker is a digitization service provided by the Ministry of Electronics and Information Technology, Government of India (https://www.digilocker.gov.in/). It is a secure cloud-based platform for storage, sharing and verification of documents and certificates.

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