Chapter II

Financial Institutions: Soundness and Resilience

Bank credit growth moderated across constituent bank groups during the second half of 2019-20. The profitability ratios of Scheduled Commercial Banks (SCBs), although better in FY 2019-20 relative to FY 2018-19, have declined in the second half of FY 2019-20 and the outlook is weighed down by the moratorium's implications for loan classification. Macro-stress tests for credit risk indicate that under the baseline scenario, SCBs' gross non-performing assets (GNPA) ratio may increase from 8.5 per cent in March 2020 to 12.5 per cent (14.7 per cent in a very severe stress scenario) by March 2021, whereas the system-level[1] capital to risk-weighted assets ratio (CRAR) may fall from 14.6 per cent in March 2020 to 13.3 per cent (11.8 per cent in a very severe stress scenario) by March 2021. Banks' exposure to NBFCs/HFCs has increased. Contagion risks through financial networks have moderated due to higher capital buffers as also the shrinking interbank market.

Introduction

2.1 The deterioration in the macroeconomic and financial environment since the December 2019 FSR, globally and domestically, impinged on credit demand, asset quality, capital adequacy and profitability of scheduled commercial banks which are bracing up for the fuller impact of COVID-19. Stress on non-banking financial companies and co-operative banks, that had mounted in the wake of credit events in 2019, has been exacerbated by risk aversion and flight to safety among banks, leading to funding constraints and differentiation in market access. The outlook remains clouded with considerable uncertainty as the pandemic takes its toll. In the interregnum, however, financial markets have stabilised in response to recent policy measures and liquidity stress experienced by several financial intermediaries has eased.

2.2 Against this backdrop, this chapter sets out to evaluate the soundness and resilience of banks and NBFCs. Section II.1 presents an assessment of SCBs' credit performance, asset quality, capital adequacy and risks. It also evaluates their resilience against macroeconomic shocks through stress tests for credit risk, which are supplemented by (a) bank level single factor sensitivity analysis for credit, interest rate, liquidity, concentration and equity price risks; and (b) bottom-up stress tests for capital and liquidity as well as derivatives portfolios. Section II.2 undertakes an examination of recent performance of scheduled urban cooperative banks (SUCBs) and the results of stress tests for credit and liquidity risks. Section II.3 discusses the major financial parameters of NBFCs, the recent disruptions in the sector and the results of stress tests at system level as well as for individual NBFCs. An analysis of the ratings distribution of the underlying assets for special mention accounts (SMAs) is presented in section II.4. The concluding section II.5 presents a detailed analysis of the network structure and connectivity of the Indian financial system, including the inter-bank market, exposure of / to various groups of financial entities and the results of contagion analysis under adverse scenarios.

II.1 Scheduled Commercial Banks[2]

2.3 The recent period is marked by a structural shift in the performance of India's commercial banking sector. A reduction in the overhang of

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[1] Analyses are based on RBI's supervisory returns which cover only domestic operations of SCBs, except in the case of data on large borrowers, which are based on banks' global operations. For CRAR projections, a sample of 53 SCBs (including public sector banks (PSBs), private sector banks (PVBs) and foreign banks (FBs)) accounting for 98 per cent of the assets of the total banking sector have been considered.

[2] The analyses done in the chapter are based on latest available data as of June 10, 2020, which are provisional. SCBs only include public sector banks, private sector banks and foreign banks. To ensure comparability of data across the years, IDBI Bank is included under public sector banks for the analyses in this section though it has been declared a private sector bank for regulatory purposes from January 21, 2019.

stressed assets continued up to the early part of 2019-20, and fresh slippages were arrested, despite a prolonged slowdown in global and domestic growth impinging on credit demand. Towards the close of the financial year, these slow moving improvements were overwhelmed and halted by the outbreak of COVID-19. The regulatory dispensations that the pandemic has necessitated in terms of the moratorium on loan instalments and deferment of

interest payments may have implications for the financial health of SCBs, going forward.

II.1.1 Performance – Assets and Earnings

2.4 Credit growth (y-o-y) of SCBs, which had considerably weakened during the first half of 2019-20, slid down further to 5.9 per cent by March 2020 (Chart 2.1) and remained muted up to early June 2020. This moderation was broad-based across

Chart 2.1: Select Performance Indicators
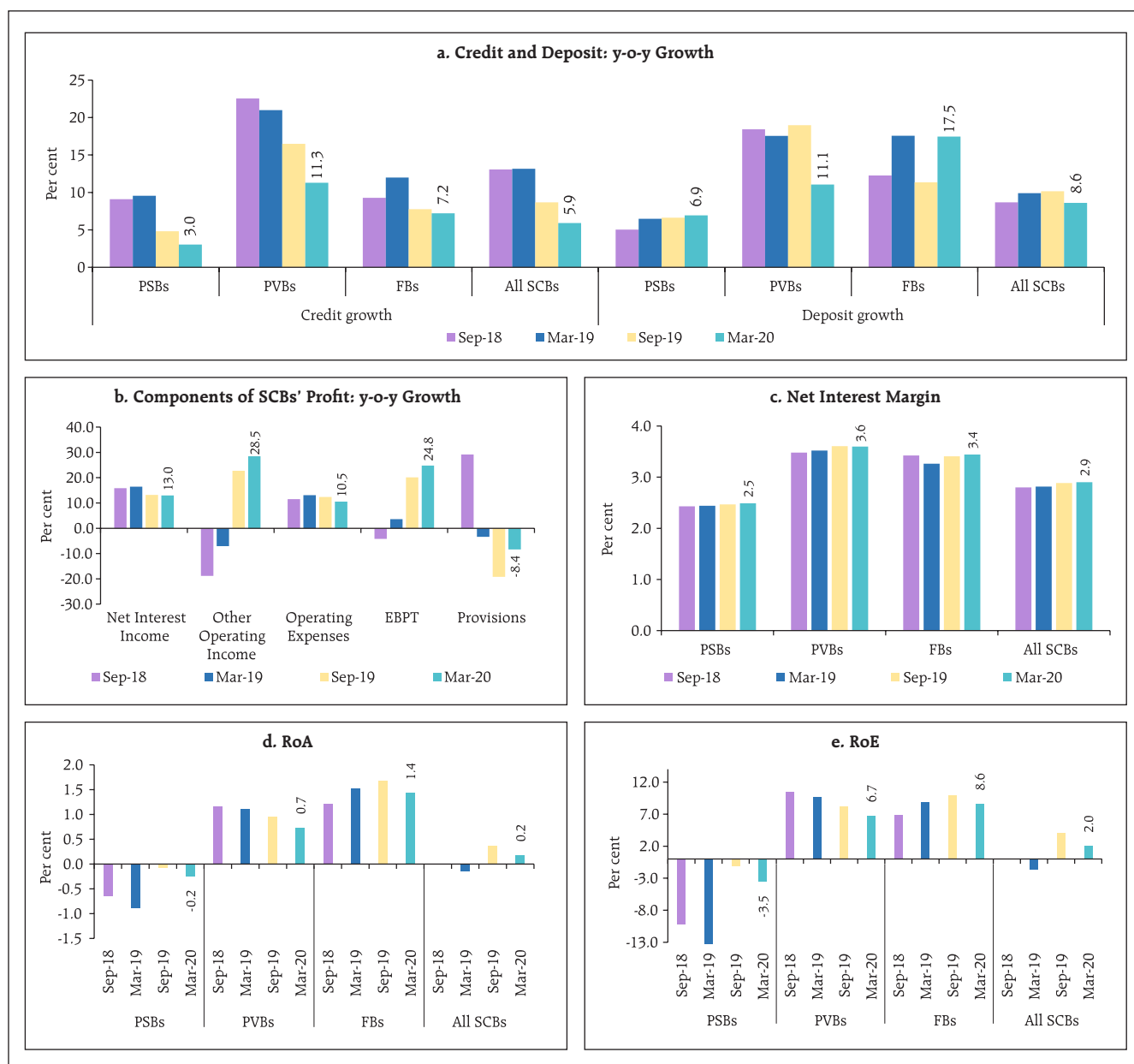
Source: RBI Supervisory Returns and Staff Calculations.

all bank groups. Year-on-year (y-o-y) deposit growth also moderated during the second half of 2019-20, mainly on account of PVBs (Chart 2.1 a), although a pick-up has occurred in the early months of 2020-21, reflecting COVID-19 related precautionary savings behaviour. Commercial banks' earnings before provisions and taxes (EBPT) were supported by increases in other operating income (OOI) and some moderation in the growth of operating expenses (Chart 2.1 b). Net interest income (NII) slowed down marginally, taking down net interest margins (NIM) to the September 2019 level (Chart 2.1 c). Profitability ratios, *viz.*, return on assets (RoA) and return on equity (RoE), declined in the second half of FY 2019-20 across all bank groups (Chart 2.1 d and Chart 2.1 e).
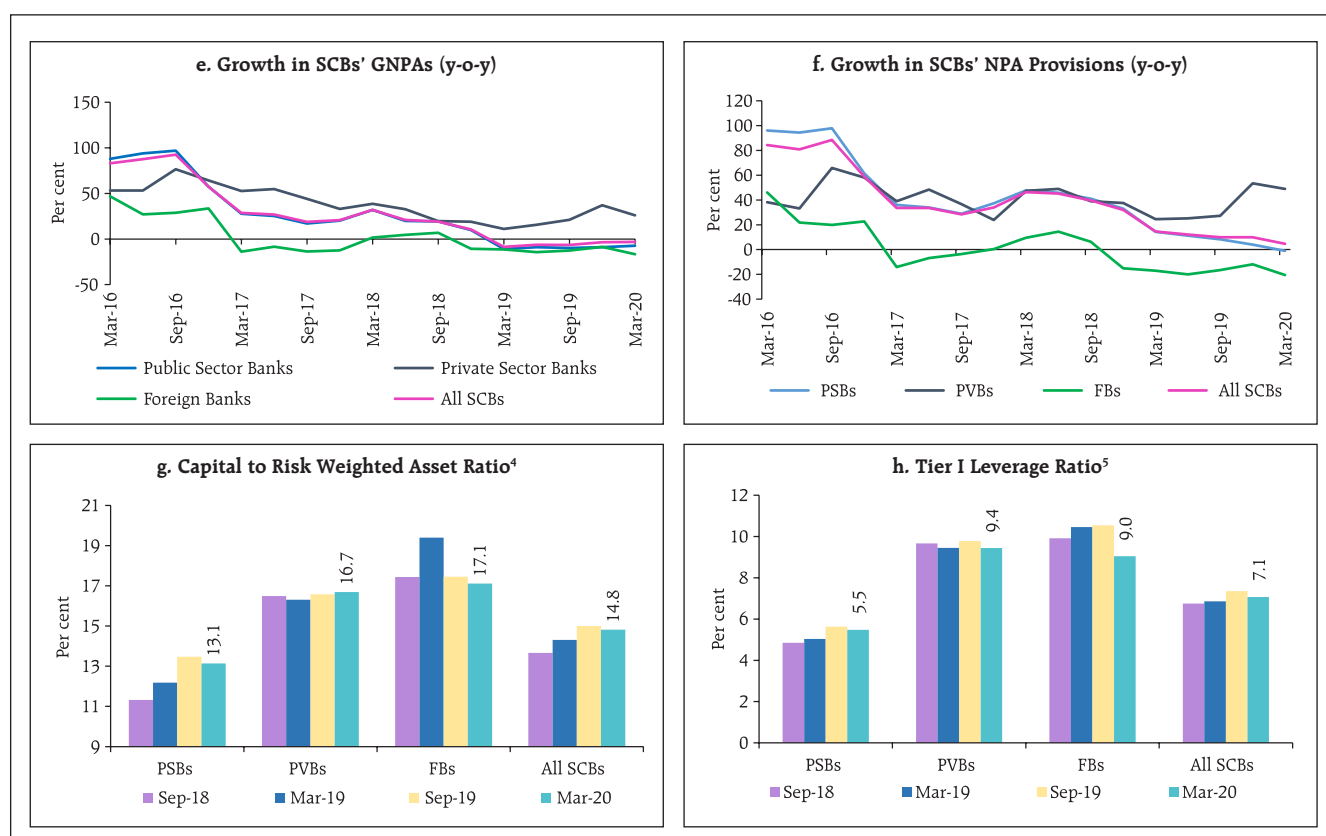
II.1.2 Asset Quality and Capital Adequacy

2.5   The gross and net non-performing asset (GNPA and NNPA) ratios of all SCBs which had reached 9.3 per cent and 3.7 per cent in September 2019 have come down to 8.5 per cent and 3.0 per cent in March 2020 (Chart 2.2 a & b). This is evident from the receding quarterly slippage ratios (calculated as new accretion to NPAs in the quarter as a ratio to the standard advances at the beginning of the quarter) across all bank groups (Chart 2.2 c). As a result, the provision coverage ratio (PCR) of SCBs improved to 65.4 per cent in March 2020 from 61.6 per cent in September 2019 (Chart 2.2 d). NPA provisions have been decelerating for PSBs and FBs since March 2019 (Chart 2.2 f).

Chart 2.2: Select Asset Quality Indicators *(Contd.)*

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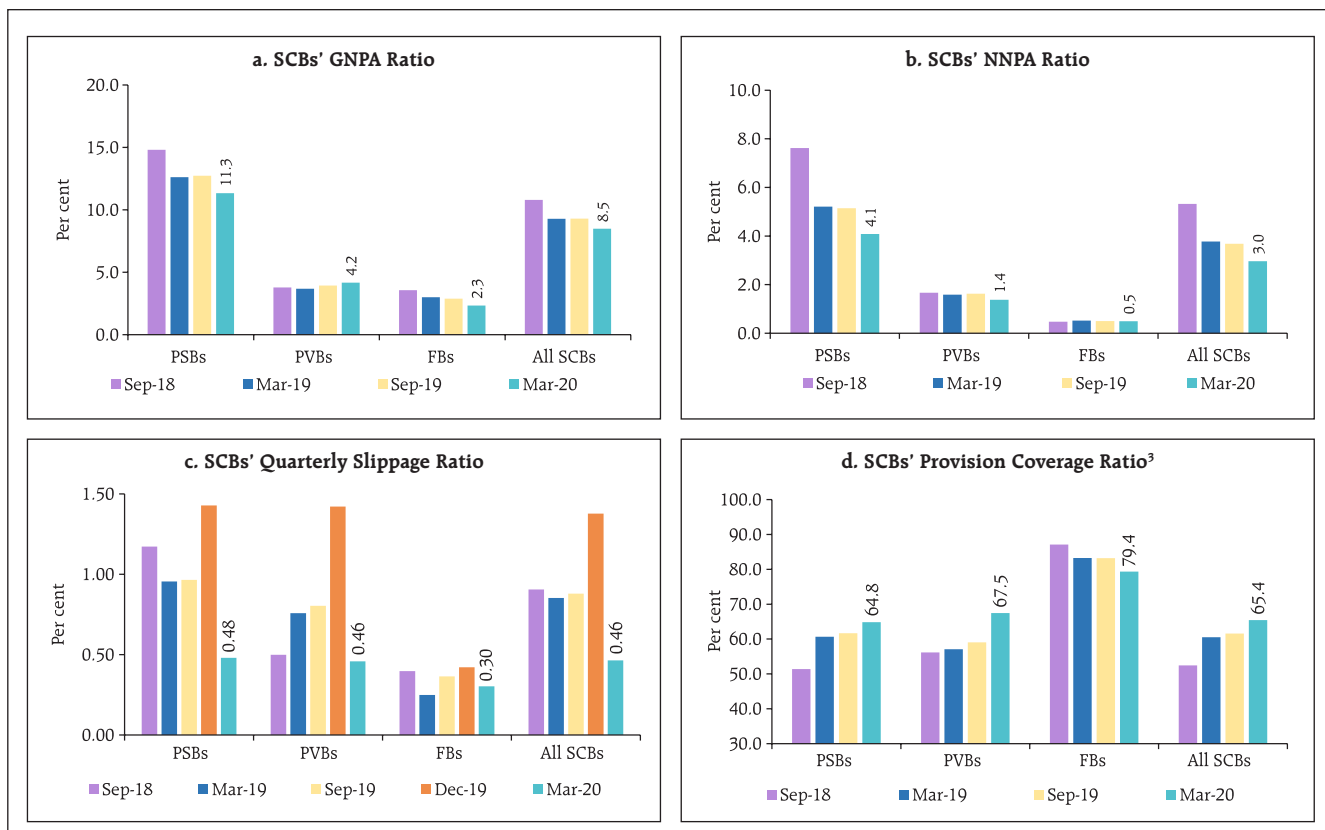
[3]   Provision Coverage Ratio (without write-off adjustment) =Provisions held for NPA*100/GNPAs.

Chart 2.2: Select Asset Quality Indicators *(Concld.)*

e. Growth in SCBs' GNPAs (y-o-y)

f. Growth in SCBs' NPA Provisions (y-o-y)

g. Capital to Risk Weighted Asset Ratio[4]

h. Tier I Leverage Ratio[5]

Source: RBI Supervisory Returns and Staff Calculations.

2.6   The capital to risk-weighted assets ratio (CRAR) of SCBs edged down to 14.8 per cent in March 2020, mainly due to reduction of CRARs of the PSBs. Their RoA continued to be negative as a group, notwithstanding lukewarm credit growth and moderate slippages. Among bank groups, PVBs recorded a marginal rise in CRAR whereas the ratio weakened for PSBs and FBs (Chart 2.2 g). Tier I leverage ratio contracted in March 2020 for all bank groups (Chart 2.2 h).
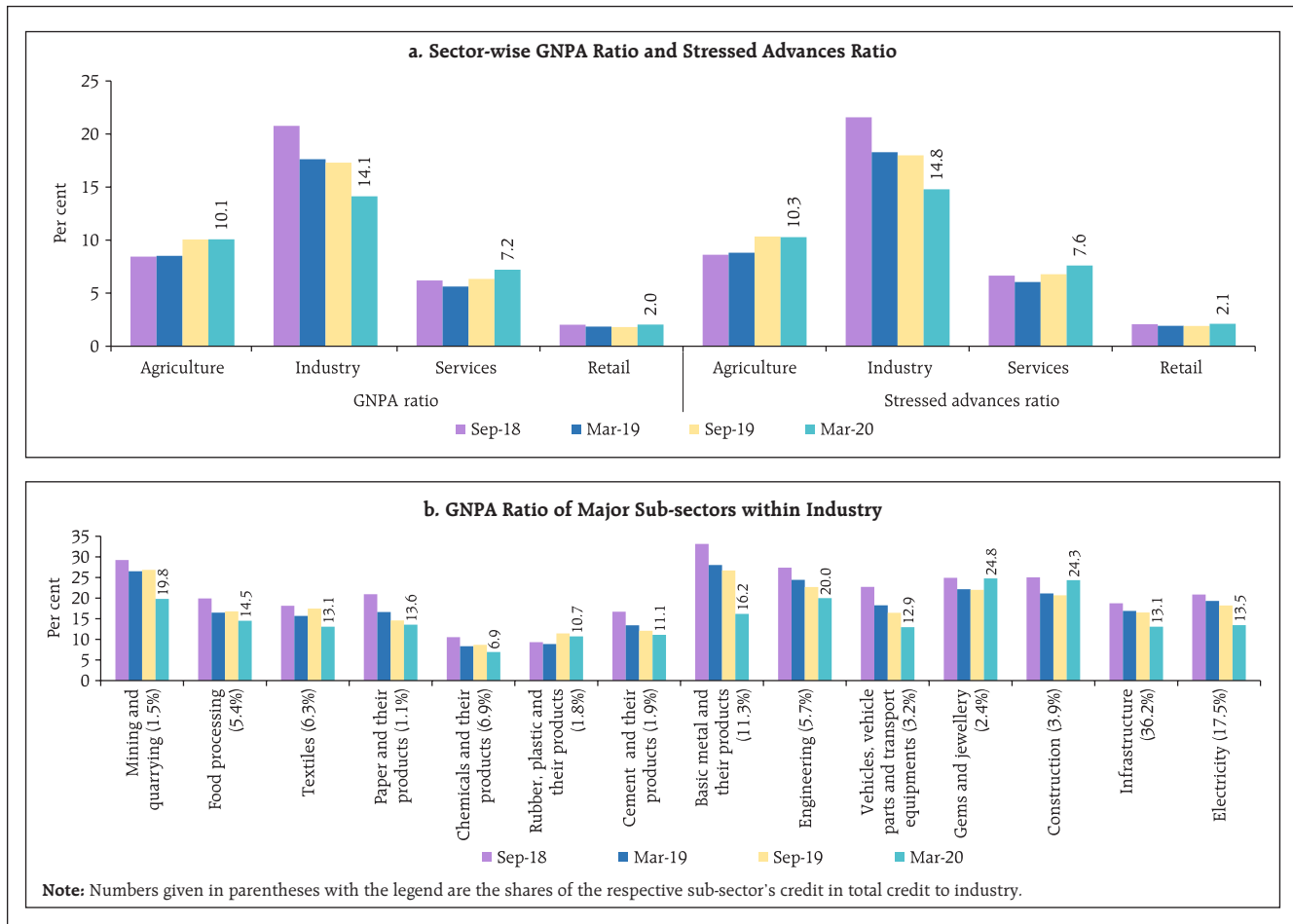
II.1.3 Sectoral Asset Quality

2.7   Sectorally, the quality of bank loans to services sector worsened in March 2020. The GNPA ratio of the retail loan sector also edged up (Chart 2.3 a). Among major sub-sectors within industry, GNPA ratios in respect of construction and gems and jewellery sectors swelled up in March 2020 (Chart 2.3 b). On the other hand, the infrastructure sector (with a share of 36.2 per cent in bank credit to the industrial sector), basic metals (11.3 per

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[4]   The CRAR pertains to all SCBs.

[5]   Tier I leverage ratio is the ratio of Tier I capital to total assets.

Chart 2.3: Sectoral Asset Quality Indicators

a. Sector-wise GNPA Ratio and Stressed Advances Ratio

Legend: ■ Sep-18 ■ Mar-19 ■ Sep-19 ■ Mar-20

(GNPA ratio) Agriculture: 10.1; Industry: 14.1; Services: 7.2; Retail: 2.0
(Stressed advances ratio) Agriculture: 10.3; Industry: 14.8; Services: 7.6; Retail: 2.1

b. GNPA Ratio of Major Sub-sectors within Industry

Mining and quarrying (1.5%): 19.8; Food processing (5.4%): 14.5; Textiles (6.3%): 13.1; Paper and their products (1.1%): 13.6; Chemicals and their products (6.9%): 6.9; Rubber, plastic and their products (1.8%): 10.7; Cement and their products (1.9%): 11.1; Basic metal and their products (11.3%): 16.2; Engineering (5.7%): 20.0; Vehicles, vehicle parts and transport equipments (3.2%): 12.9; Gems and jewellery (2.4%): 24.8; Construction (3.9%): 24.3; Infrastructure (36.2%): 13.1; Electricity (17.5%): 13.5

Legend: ■ Sep-18 ■ Mar-19 ■ Sep-19 ■ Mar-20

Note: Numbers given in parentheses with the legend are the shares of the respective sub-sector's credit in total credit to industry.

Source: RBI Supervisory Returns and Staff Calculations.

cent) and electricity (17.5 per cent) have shown a perceptible decline in GNPA ratios. This has implications for aggregate asset quality of the banking sector.

II.1.4 Credit Quality of Large Borrowers

2.8   Large borrowers[6] accounted for 51.3 per cent and 78.3 per cent of the aggregate loan portfolio and GNPAs, respectively, of SCBs in March 2020

(Chart 2.4 a). Both these shares have declined since March 2018 implying that, on an incremental basis, credit and NPA accretions are occurring in the small borrower category in the recent period. The outstanding amount under SMA[7]-0, SMA-1, SMA-2 and restructured standard loan categories and NPAs of large borrowers declined during the quarter ending March 2020 (Chart 2.4 b). GNPA ratios of large borrowers edged down during the quarter

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[6]   A large borrower is defined as one who has aggregate fund-based and non-fund-based exposure of ₹5 crore and above. This analysis is based on SCBs' global operations.

[7]   SMA-0, SMA-1 and SMA-2 categories: Standard assets which are overdue for 1-30 days, 31-60 days and 60-90 days, respectively.

across all banks, except for PVBs (Chart 2.4 c). SMA-2 ratios of large borrowers plunged across all bank groups, except for foreign banks (Chart 2.4 d). At the same time, the share of loss assets has been rising within the funded amount for large borrowers (Chart 2.4 e).

2.9   The top 100 borrowers accounted for 17.5 per cent of gross advances, but only 12.6 per cent of GNPAs of SCBs in March 2020 (Chart 2.4 f). Since the SMA ratios factor in the COVID-19 related regulatory moratorium, a separate analysis to assess the quality of the SMA assets by examining the ratings distribution is presented in Section II.4.

Chart 2.4: Select Asset Quality Indicators of Large Borrowers

Source: RBI Supervisory Returns and Staff Calculations.

Chart 2.5: Banking Stability Map
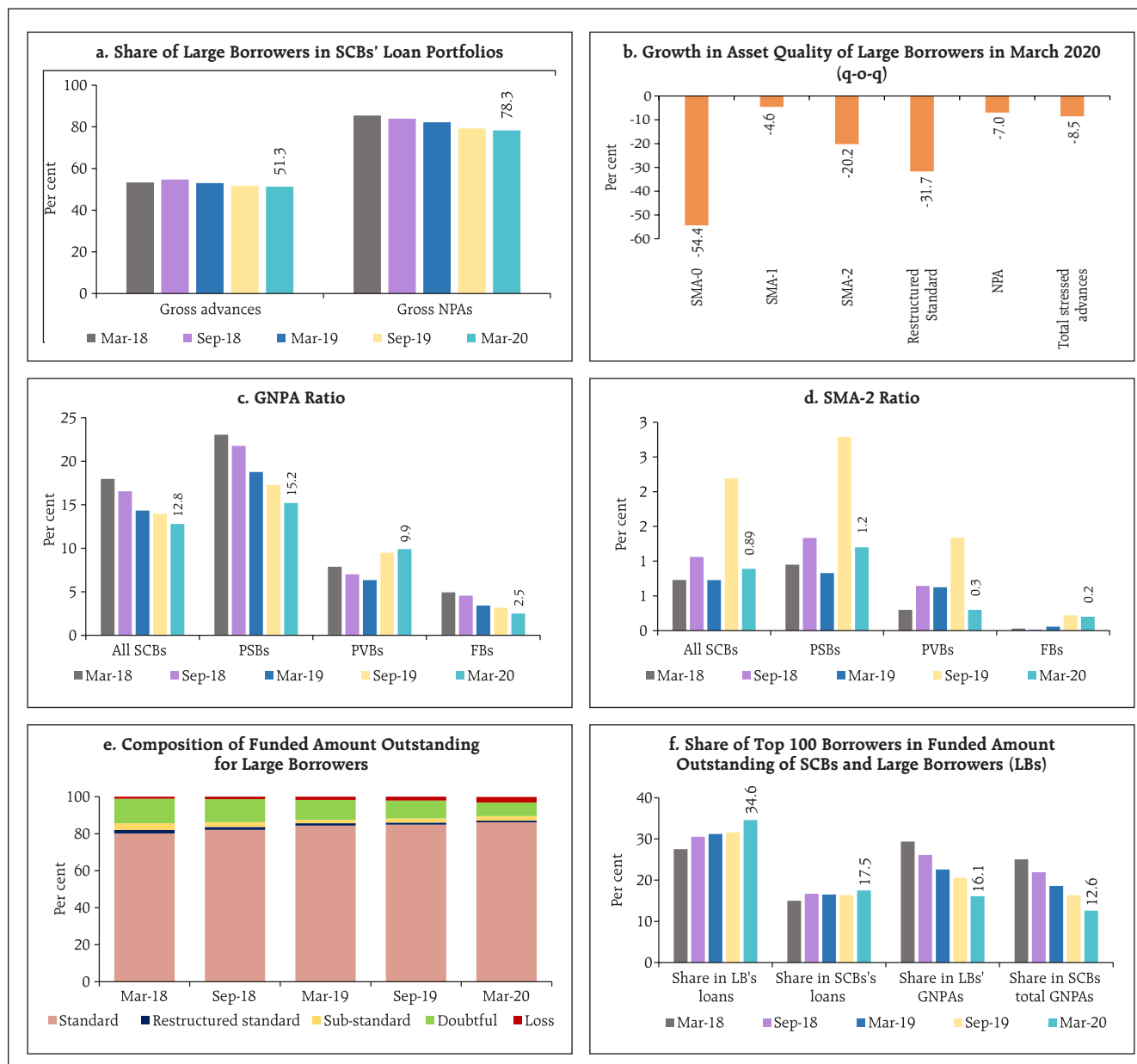
Note: Away from the centre signifies increase in risk.
Source: RBI Supervisory Returns and Staff Calculations.

II.1.5 Risks

2.10   The banking stability indicator (BSI)[8] shows that, among the five dimensions considered for assessing the changes in underlying conditions and risk factors, SCBs have recorded deterioration in soundness, liquidity and efficiency in March 2020 as compared with the September 2019 position, whereas asset quality and profitability showed marginal improvement (Chart 2.5). Nevertheless, no comfort can be drawn on this front since any loss of income of banks during COVID-19 will be visible only from the first quarter of 2020-21.

II.1.6 Resilience – Macro Stress Tests

2.11   The resilience of Indian banking in the face of macroeconomic shocks was tested through macro-stress tests which attempt to assess the impact of cumulative shocks on SCBs' balance sheet and generate projections of GNPA ratios and CRARs over a one year horizon under a baseline and three adverse[9] (medium, severe and very severe) scenarios. The baseline scenario is derived from the forecasted values of macroeconomic variables[10]. As the asset classification in March 2020 could have been influenced by the regulatory moratorium in the face of the COVID-19 pandemic, the projections for this exercise are built up using data from June 2011 up to the quarter ended December 2019 (instead of March 2020). The medium, severe and very severe adverse scenarios have been obtained by applying 0.25 to one standard deviation (SD) shocks, 1.25 to two SD shocks and 2.25 to three SD shocks, respectively, to each of the macroeconomic variables, increasing the shocks by 25 basis points in each subsequent projection quarter (Chart 2.6).
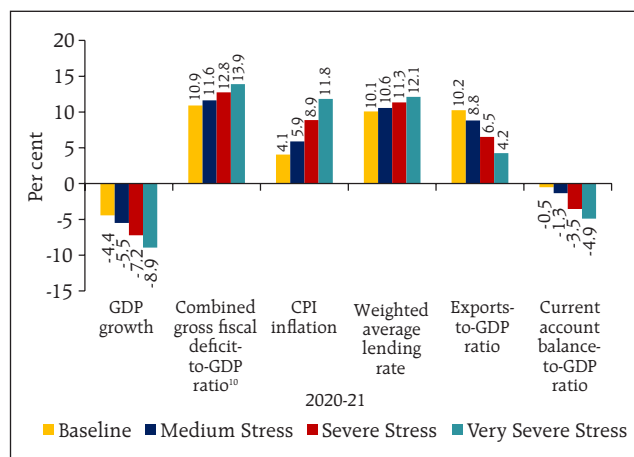
2.12   Given the fact that impact of moratorium is still uncertain and evolving, the exact nature of how the same will play out on the quality of banking
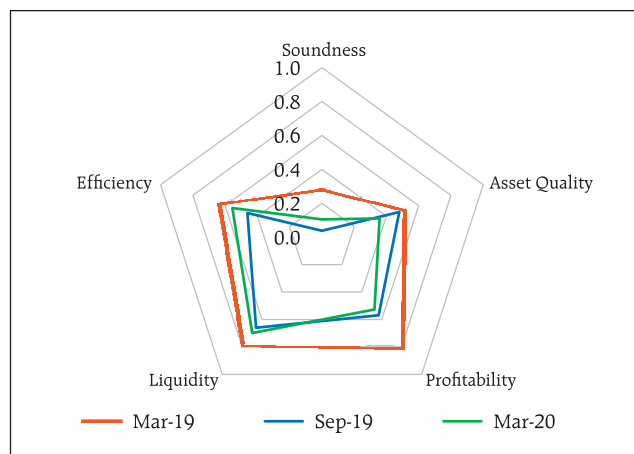
Chart 2.6: Macroeconomic Scenario Assumptions
(Assessment under stringent hypothetical adverse economic conditions and should not be interpreted as forecasts)

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[8]   For a detailed methodology and basic indicators used under different BSI dimensions please refer to Annex 2.

[9]   The adverse scenarios are stringent assessments under hypothetical adverse economic conditions and model outcomes should not be interpreted as forecasts.

[10] GDP growth,combined gross fiscal deficit-to-GDP ratio, CPI inflation, weighted average lending rate, exports-to-GDP ratio and current account balance-to-GDP ratio. Combined Gross fiscal deficit (GFD) represents the aggregate fiscal deficit of centre and states as against GFD of centre used previously.

assets is difficult to ascertain accurately. Therefore, this will only be ascertainable with passage of time, and outcomes would be disseminated in the forthcoming publications of RBI, from time to time.

2.13 The stress tests indicate that the GNPA ratio of all SCBs may increase from 8.5 per cent in March 2020 to 12.5 per cent by March 2021 under the baseline scenario (Chart 2.7). If the macroeconomic environment worsens further, the ratio may escalate to 14.7 per cent under the very severely stressed scenario.

2.14 Among the bank groups, PSBs' GNPA ratio of 11.3 per cent in March 2020 may increase to 15.2 per cent by March 2021 under the baseline scenario; the GNPA ratio of PVBs and FBs may increase from 4.2 per cent and 2.3 per cent to 7.3 per cent and 3.9 per cent, respectively, over the same period.

2.15 The system level CRAR is projected to drop from 14.6 per cent in March 2020 to 13.3 per cent in March 2021 under the baseline scenario and to 11.8 per cent under the very severe stress scenario (Chart 2.8 a).

2.16 Stress test results indicate that, five banks may fail to meet the minimum capital level by March 2021 in a very severe stress scenario. This, however, does not take into account the mergers

Chart 2.7: Projection of SCBs' GNPA ratios
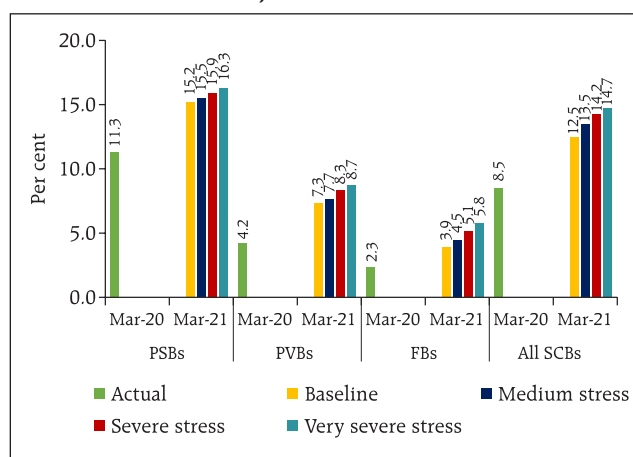
Note: The system level GNPAs are projected using three complementary econometric models- Multivariate Regression; Vector Autoregression (VAR) and Quantile Regression; and averaging the resulting GNPA ratios. For bank group level projections, average of Multivariate Regression and VAR results are used.
Source: RBI Supervisory Returns and Staff Calculations.

or any further recapitalization, which will further increase systemic resilience (Chart 2.8 b).

2.17 The common equity Tier I (CET 1) capital ratio of SCBs may decline from 11.7 per cent in March 2020 to 10.7 per cent under the baseline scenario and to 9.4 per cent under the very severe stress scenario in March 2021 (Chart 2.9 a). Furthermore, under these conditions, three banks may fail to meet the minimum regulatory CET 1 capital ratio of 5.5 per cent by March 2021 (Chart 2.9 b).
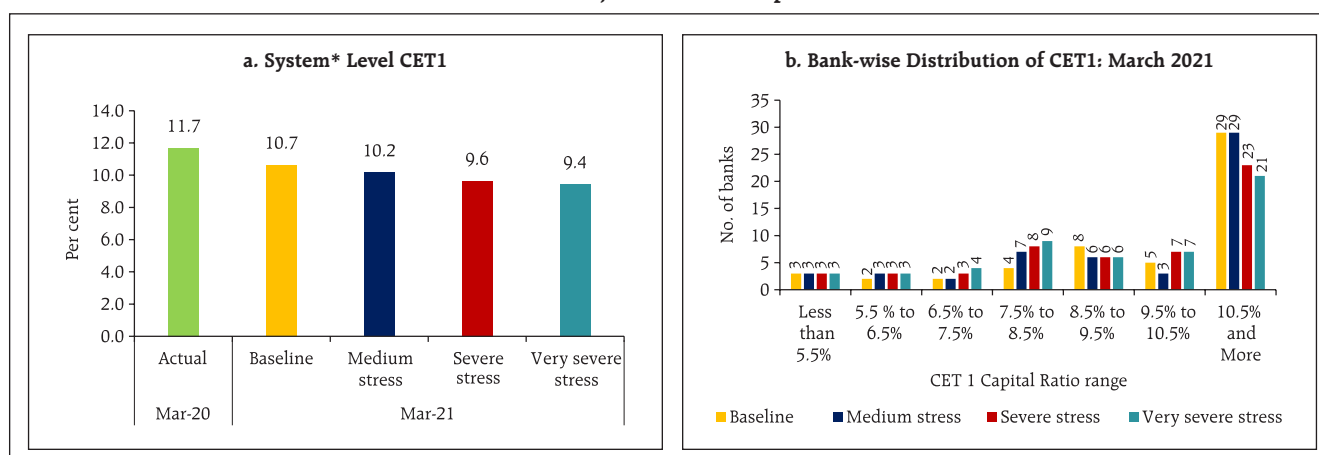
Chart 2.8: CRAR Projections
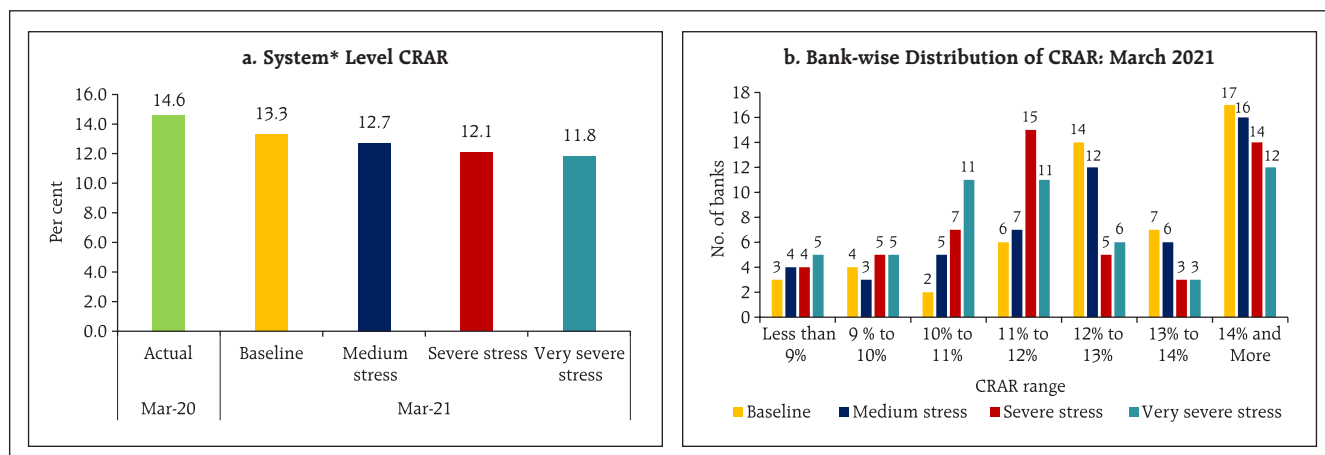
* For a sample of 53 select banks accounting for 98 per cent of the assets of the total banking sector.
Note: The capital projection is made under a conservative assumption of minimum profit transfer to capital reserves at 25 per cent for profit making SCBs. It does not take into account any capital infusion by the stakeholders.
Source: RBI Supervisory Returns and Staff Calculations.

Chart 2.9: Projection of CET 1 Capital Ratio

* For a sample of 53 select banks accounting for 98 per cent of the assets of the total banking sector.
Note: The capital projection is made under a conservative assumption of minimum profit transfer to capital reserves at 25 per cent for profit making SCBs. It does not take into account any capital infusion by stakeholders.
Source: RBI Supervisory Returns and Staff Calculations.

2.18 While the regulatory moratorium may be holding back some stress, the industry-wise composition of good quality loans (*i.e.,* standard advances which have not yet turned into SMA; and SMA-0 loans) of PSBs and PVBs reveals that some of the industries with higher share of such loans across bank groups are severely affected by the COVID-19 crisis (Table 2.1).

II.1.7 Sensitivity Analysis[11]

2.19 In order to assess vulnerabilities of SCBs under various scenarios[12], a number of single-factor sensitivity stress tests[13] were carried out on quarterly data from March 2011 up to March 2020 to simulate credit, interest rate, equity prices and liquidity risks materialising under a top-down[14] sensitivity analysis.

Table 2.1: Top 10 Industries with High Share of Good Quality Assets

| Public Sector Banks		Private Sector Banks	
Industry	Share of good quality loans of the industry as share of total good quality loans as on March 2020	Industry	Share of good quality loans of the industry as share of total good quality loans as on March 2020
NBFCs- general purpose loans	10.4	NBFCs- general purpose loans	7.9
Generation of Electricity	9.8	Generation of Electricity	6.0
NBFCs- in the housing sector	7.7	Real Estate Activities	5.5
Developmental Financial Institutions	4.6	Manufacturing of Basic Iron and Steel	4.1
Manufacturing of Refined Petroleum Products	4.6	NBFCs- in the housing sector	3.6
Manufacturing of Basic Iron and Steel	4.4	Construction/ Maintenance of Roads	2.4
Construction/Maintenance of Roads	3.9	Basic Telecom Services	2.4
Public Utility Services through Consumer Coops.	3.3	Manufacturing of Refined Petroleum Products	2.4
Collection and Distribution of Electricity	2.5	Manufacturing of Basic Non-ferrous Metals	1.7
Real Estate Activities	2.3	Manufacturing of Cement, Lime and Plaster	1.7

Source: RBI Supervisory Returns and Staff Calculations.

[11] Under the macro stress tests, the shocks were in terms of adverse macroeconomic conditions while in sensitivity analysis shocks are applied to single factors like GNPAs, interest rate, equity prices, deposits, *etc.,* at a time. Also, macro stress tests for GNPA ratios were applied at the system and major bank group levels, whereas the sensitivity analysis was done at system and bank levels.

[12] Single factor sensitivity analysis stress tests were conducted for a sample of 53 SCBs accounting for 98 per cent of the assets of the total banking sector. The shocks designed under various hypothetical scenarios are extreme but plausible.

[13] For details of the stress tests, please see Annex 2.

Chart 2.10: Credit Risk - Shocks and Outcomes
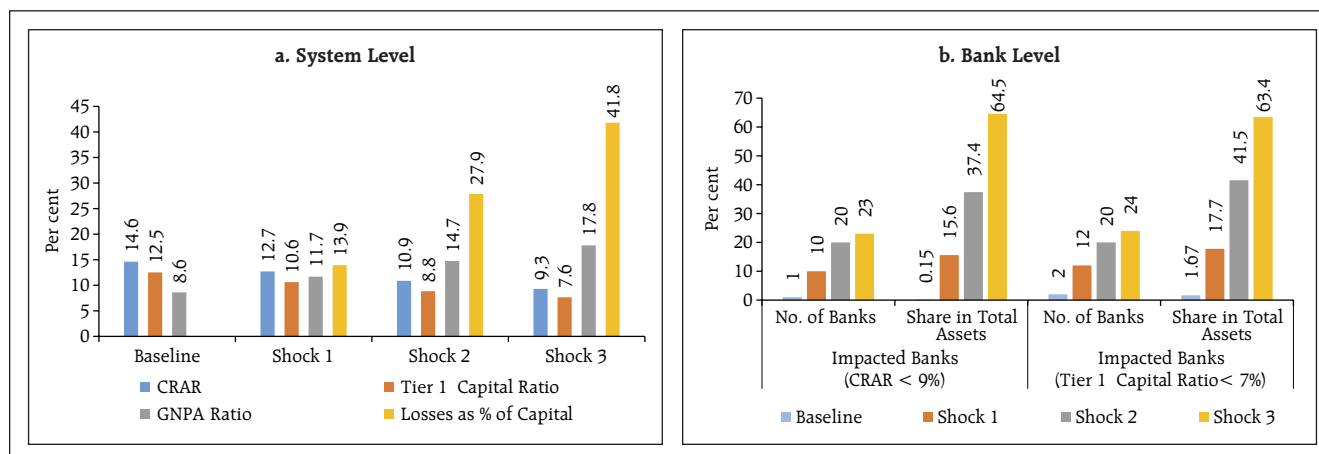
Shock 1:   1 SD shock on GNPAs
Shock 2:   2 SD shock on GNPAs
Shock 3:   3 SD shock on GNPAs
Note: System of select 53 SCBs.
Source: RBI Supervisory Returns and Staff Calculations.

a. Credit Risk

2.20   Under a very severe shock of 3 SD[15] to the system level GNPA (*i.e.,* if the GNPA ratio of 53 select SCBs moves up from 8.6 per cent to 17.8 per cent), the system-level CRAR would decline from 14.6 per cent to 9.3 per cent and the Tier-1 capital ratio would decline from 12.5 per cent to 7.6 per cent. The impairment in capital at the system level could thus be about 41.8 per cent. The results of reverse stress test show that it requires a shock of 3.26 SD to bring down the system-level CRAR to 9 per cent.

2.21   Bank-level stress test results show that 23 banks[16] with a share of 64.5 per cent in SCBs' total assets might fail to maintain the required CRAR under the scenario of 3 SD shock to the GNPA ratio (Chart 2.10). In such an extreme shock scenario, the CRAR of all the 18 PSBs is likely to go down to 9 per cent.

2.22   Under the scenario of 3 SD shock to the GNPA ratio, CRAR would fall below 7 per cent for as many as 20 banks (Chart 2.11) which would dominate the list of banks witnessing large capital erosion.

2.23   15 and 20 banks would record over six percentage points decline in CRAR under 2 SD and 3 SD shocks, respectively (Chart 2.12).

Chart 2.11: CRAR-wise Distribution of Banks
(under 2 SD and 3 SD shocks on GNPA ratio)
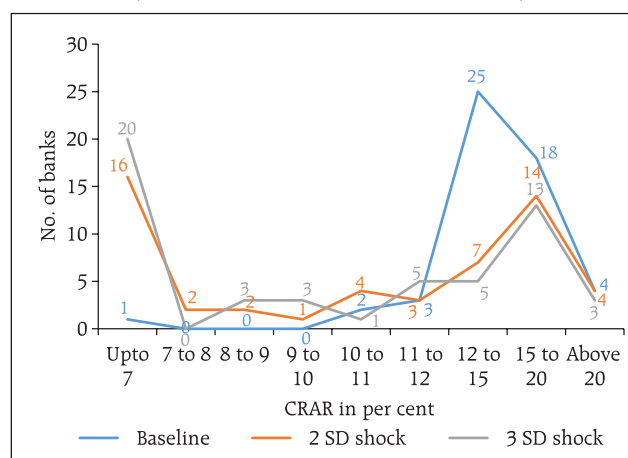
Note: System of select 53 SCBs.
Source: RBI Supervisory Returns and Staff Calculations.

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[14] Top down stress tests were based on specific scenarios and on aggregate bank-wise data to give a comparative assessment of the impact of a given stress across banks.

[15] The standard deviation (SD) of the GNPA ratio is estimated by using quarterly data since 2011. One SD shock approximates a 36 per cent increase in the level of GNPAs.

[16] Among these banks, one bank had its CRAR less than 9 per cent before the shocks were applied.

b. Credit Concentration Risk

2.24 Stress tests on banks' credit concentration with respect to top individual borrowers according to their stressed advances showed that, in the extreme scenario of the top three individual borrowers failing to repay[17], the impact was significant for three banks, which together account for 2.7 per cent of the total assets of SCBs. Under the assumed scenarios of failure of the top 1, top 2 and top 3 borrowers, the impact on CRAR at the system level would be 34, 51 and 63 basis points, respectively (Chart 2.13).

2.25 Stress tests on banks' credit concentration, considering top individual borrowers according to their standard exposures showed that in the extreme scenario of top three individual borrowers failing to repay[18], the impact was significant for two banks (Chart 2.14). Under the assumed scenario of default by all the top three individual borrowers, CRAR at the system level would go down by 140 basis points.

Chart 2.12: Range of Shifts in CRAR
(under 2 SD and 3 SD shocks on GNPA ratio)
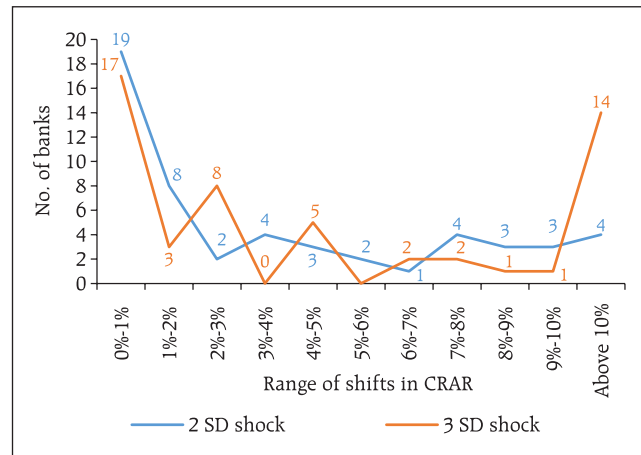
Note: System of select 53 SCBs.
Source: RBI Supervisory Returns and Staff Calculations.

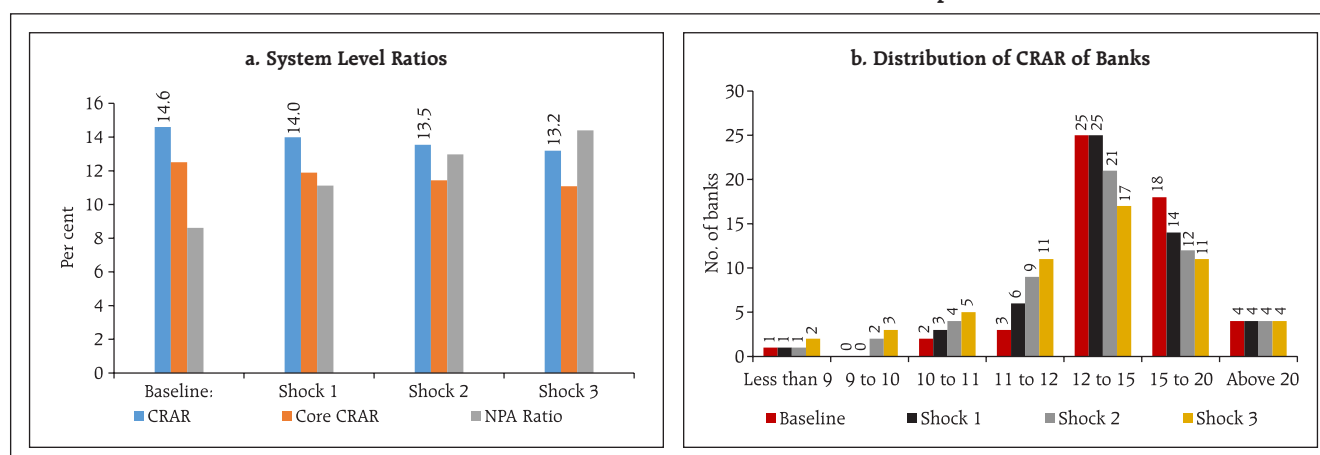**Chart 2.13: Credit Concentration Risk: Individual Borrowers – Stressed Advances**
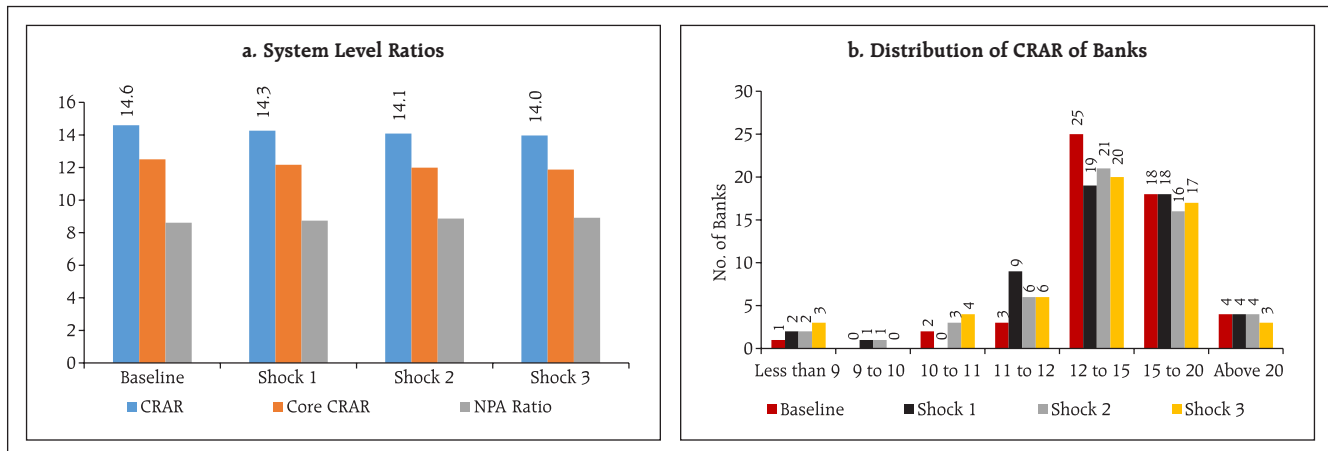
Note: For a system of select 53 SCBs.
Shock 1: Topmost stressed individual borrower fails to meet its payment commitments.
Shock 2: Top 2 stressed individual borrowers fail to meet their payment commitments.
Shock 3: Top 3 stressed individual borrowers fail to meet their payment commitments.
Source: RBI Supervisory Returns and Staff Calculations.

[17] In case of failure, the borrower in sub-standard or restructured category is considered to move to the loss category.

[18] In case of default, the borrower in standard category is considered to move to the sub-standard category.

Chart 2.14: Credit Concentration Risk: Individual Borrowers – Exposure

Note: For a system of select 53 SCBs.
Shock 1: Topmost individual borrower fails to meet its payment commitments.
Shock 2: Top 2 individual borrowers fail to meet their payment commitments.
Shock 3: Top 3 individual borrowers fail to meet their payment commitments.
Source: The Reserve Bank's supervisory returns and staff calculations.

Table 2.2: Credit Concentration Risk: Group Borrowers' Exposure

Shocks		System Level				Bank Level	
		CRAR	Core CRAR	NPA Ratio	Losses as % of Capital	Impacted Banks (CRAR < 9%)	
						No. of Banks	Share in Total Assets of SCBs (in %)
Baseline (Before Shock)		14.6	12.5	8.6	---		
Shock 1	The top 1 group borrower fails to repay	13.8	11.7	11.9	6.0	1	0.2
Shock 2	The top 2 group borrowers fail to repay	13.1	11.0	14.7	10.9	1	0.2
Shock 3	The top 3 group borrowers fail to repay	12.6	10.4	17.0	15.0	2	1.1

Note: For a system of select 53 SCBs.
Source: RBI Supervisory Returns and Staff Calculations.

2.26 Under the scenarios of default by group borrowers in the banks' credit exposure concentration, stress tests reveal that the system level capital losses[19] could be around (a) 6.0 per cent, if the top-most group borrower defaults and (b) 10.9 per cent, if the top two group borrowers default. Two banks will not be able to maintain their CRAR level at 9 per cent if top three group borrowers default (Table 2.2).

c. Sectoral Credit Risk

2.27 Sensitivity analysis of bank-wise vulnerability due to their exposures to certain sub-sectors (shocks based on subsector-wise historical SDs of GNPA ratio) reveals varying magnitude of increase in the GNPAs of banks in different sub-sectors (Table 2.3).

2.28 The resulting losses due to increased provisioning and reduced income were taken into account to calculate banks' stressed CRAR and

Table 2.3: Decline in System Level CRAR
(basis points, in descending order)

	1SD	2SD	3SD
Infrastructure - Energy (55%)	10	20	29
Basic Metal and Metal Products (74%)	10	17	22
All Engineering (38%)	3	5	7
Infrastructure - Transport (29%)	3	6	6
Textiles (29%)	2	4	5
Infrastructure - Communication (78%)	2	3	5
Construction (27%)	2	3	5
Food Processing (25%)	1	3	4
Vehicles, Vehicle Parts and Transport Equipment (52%)	1	2	3
Gems and Jewellery (24%)	1	1	2

Note: For a system of select 53 banks.
Note: Numbers in parentheses represent the growth in GNPAs due to 1SD shock to the subsector's GNPA ratio.
Source: RBI Supervisory Returns and Staff Calculations.

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[19] In case of default, the borrower group is considered to move to the sub-standard category.

risk weighted assets (RWAs). A 2SD shock to the infrastructure – energy segment and basic metals and metal products segment would reduce the system level CRAR by 20 bps and around 17 bps, respectively (Table 2.3). Although the impact of even a 3 SD shock in various sectors is seen to be limited, the cumulative impact may be sizable for a few banks.

d. Interest Rate Risk

2.29   The market value of the portfolio subject to fair value for a sample of 52 SCBs accounting for 98 per cent of the total assets of the banking system stood at ₹17 lakh crore as on end-March 2020 (Chart 2.15). About 91.7 per cent of the investments subjected to fair value were classified as available for sale (AFS).

2.30   The sensitivity (PV01[20]) of the AFS portfolio of PSBs and PVBs declined *vis-a-vis* the December 2019 position, whereas it marginally increased for FBs. In terms of PV01 curve positioning, the tenor-wise distribution indicates continuing bias of PSBs in favour of 5-10 year tenor and a marginal decrease in the proportion of PV01 in the 1-5 year bucket with a corresponding marginal increase in the longer maturity tenors. PVBs and FBs, however, continue to place their bets in the 1-5 year tenor bucket, though the proportion was lower for PVBs in this case (Table 2.4).

2.31   Softening interest rates and the resultant impact on yield curve movements across the tenors led to surge in profit booking by banks (Chart 2.16). PSBs and PVBs continued to book profits on securities trading for the quarter ended March 2020, while FBs reversed losses in the previous quarter (Table 2.5).

2.32   PVBs and FBs continue to have significant interest rate exposure in their held for trading (HFT) portfolios relative to their AFS book. The PV01 tenor-

Chart 2.15: Trading Book Portfolio: Bank Group-wise
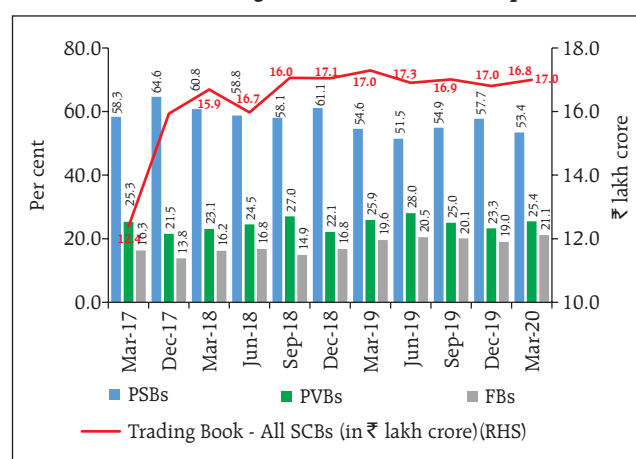
**Source:** Individual Bank Submissions and Staff Calculations.

Table 2.4: Tenor-wise PV01 Distribution of AFS Portfolio (per cent)

	Total (in ₹ crores)	< 1 year	1 year-5 year	5 year-10 year	> 10 years
PSBs	212.4 (255.8)	6.4 (5.8)	25.4 (29.3)	54.4 (51.8)	13.9 (13.1)
PVBs	43.7 (46.4)	20.0 (18.2)	49.2 (51.7)	25.0 (25.2)	5.7 (5.0)
FBs	43.9 (41.1)	6.4 (8.3)	64.2 (60.5)	10.1 (9.9)	19.4 (21.3)

Note: Values in the brackets indicate December 2019 figures.
Source: Individual Bank Submissions and Staff Calculations.

Chart 2.16: Yield Curves (G-Sec) and Shift in Yields Across Tenors since December 2019
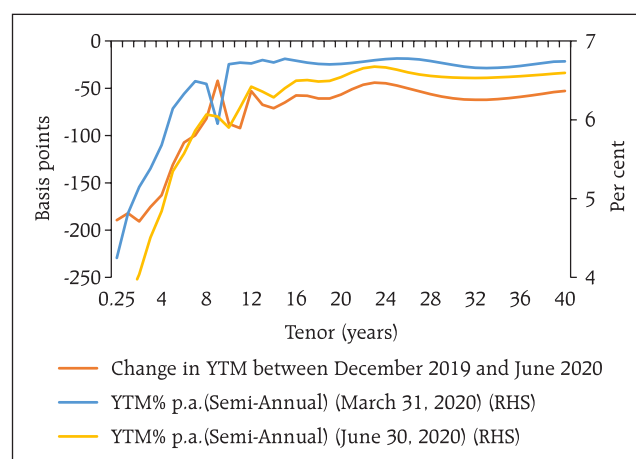
Note: Current as on June 30, 2020.
Source: Fixed Income Money Markets and Derivatives Association of India (FIMMDA).

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[20] PV01 is a measure of sensitivity of the absolute value of the portfolio to a one basis point change in the interest rate.

wise distribution for PVBs shows dominant exposure in the 1-5-year tenor, similar to AFS positioning, while FBs seem to have increased PV01 sensitivity in the 5-10 year tenor (Table 2.6).

2.33 Any hardening of interest rates would depress investment income under the AFS and HFT categories (direct impact). A parallel upward shift of 2.5 percentage points in the yield curve will lower the CRAR by about 69 basis points at the system level while it would reduce system level capital by 5.5 per cent (Table 2.7).

e. Equity Price Risk

2.34 An analysis of the impact of a fall in equity prices on bank capital and profits indicates that the system-level CRAR would decline by 57 basis points in the baseline under a 55 per cent drop in equity prices (Chart 2.17). The impact of a drop in equity prices for the overall system is limited as banks typically have a low proportion of capital market exposures on their balance sheets due to regulatory limits.

f. Liquidity Risk: Impact of a Deposit Run-off

2.35 The liquidity risk analysis aims to capture the impact of a possible run on deposits and increased demand for unutilised portions of sanctioned / committed / guaranteed credit lines. Banks, in general, may be in a position to withstand liquidity shocks with their high-quality liquid assets (HQLAs)[21].

2.36 Under the assumed scenarios, there would be increased withdrawals of un-insured deposits[22] and a simultaneous increase in usage of the unutilised

Table 2.5: OOI - Profit/(loss) on Securities Trading

(₹ crore)

	30-Jun-19	30-Sep-19	31-Dec-19	31-Mar-20
Public Sector Banks	3912.66	8993.73	4184.28	8375.85
Private Sector Banks	2545.25	2590.44	2291.46	4110.63
Foreign Bank Group	225.21	926.75	-58.74	223.53

Source: RBI Supervisory Returns and Staff Calculations.

Table 2.6: Tenor-wise PV01 Distribution of HFT portfolio
(per cent)

	Total (in ₹ crore)	< 1 year	1 year-5 year	5 year-10 year	>10 years
PSBs	0.2 (1.2)	4.8 (1.1)	17.8 (43.4)	71.0 (49.9)	6.5 (5.6)
PVBs	11.0 (7.7)	11.3 (6.7)	64.9 (77.8)	19.3 (0.4)	4.5 (15.0)
FBs	18.7 (10.2)	3.7 (4.7)	33.2 (48.0)	33.6 (23.6)	29.5 (23.7)

**Note:** Values in the brackets indicate December 2019 figures
Source: Individual Bank Submissions and Staff Calculations.

Table 2.7: Interest Rate Risk – Bank groups - Shocks and Impacts
(under shock of 250 basis points parallel upward shift of the INR yield curve)

	Public Sector Banks		Private Sector Banks		Foreign Banks		All SCBs	
	AFS	HFT	AFS	HFT	AFS	HFT	AFS	HFT
Modified Duration	2.3	2.7	1.2	1.5	1.5	2.9	1.9	2.1
Reduction in CRAR (bps)	82		32		138		69	

Source: Individual Bank Submissions and Staff Calculations.

Chart 2.17: Equity Price Risk
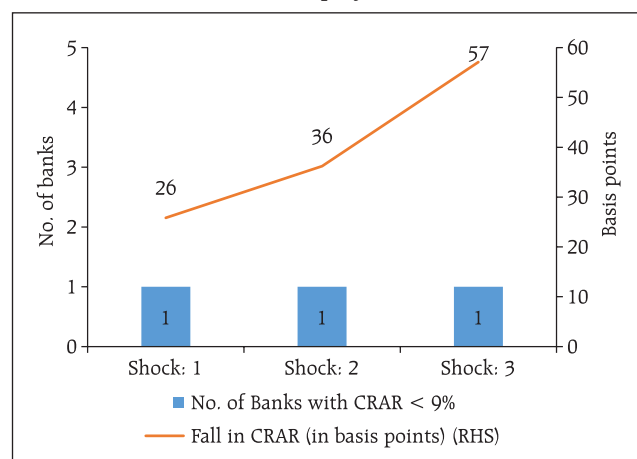
Note: For a system of select 53 SCBs.
One bank had CRAR less than 9 per cent before the shocks were applied.
Shock 1:   Equity prices drop by 25 per cent
Shock 2:   Equity prices drop by 35 per cent
Shock 3:   Equity prices drop by 55 per cent
Source: RBI Supervisory Returns and Staff Calculations.

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[21] In view of the implementation of the liquidity coverage ratio (LCR) with effect from January 1, 2015 in India, the definition of liquid assets was revised for stress testing. HQLAs were computed as cash reserves in excess of required CRR, excess SLR investments, SLR investments at 2 percent of NDTL (under MSF) and additional SLR investments at 14.5 per cent of NDTL (following the Circular DBR.BP.BC.No.4/21.04.098/2018-19 September 27, 2018 and the First Bi-Monthly Monetary Policy 2019-20 dated April 4, 2019.).
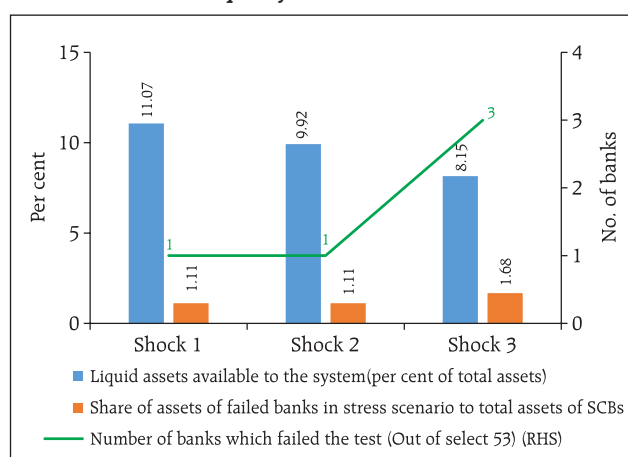
portions of sanctioned working capital limits as well as utilisation of credit commitments and guarantees extended by banks to their customers. Using their HQLAs required for meeting day-to-day liquidity requirements, 50 out of the 53 banks in the sample will remain resilient in a scenario of sudden and unexpected withdrawals of around 15 per cent of deposits along with the utilisation of 75 per cent of their committed credit lines (Chart 2.18).

II.1.8 Bottom-up Stress Tests - Credit, Market and Liquidity Risk

2.37 The bottom-up stress tests (sensitivity analyses) carried out for select banks[23] (sensitivity analyses) with March 31, 2020 as the reference date, also testified to the banks' general resilience to different kinds of shocks. While confirming the top-down stress tests results in general, the bottom-up stress tests show that, owing to better capitalisation of PSBs, average CRAR remains above 9 per cent though some banks may have to contend with stressed CRAR positions falling below the regulatory minimum of 9 per cent (Chart 2.19).

2.38 In certain scenarios, bottom-up stress tests of the impact of liquidity shocks on select banks' liquid assets ratios[24] show that HQLAs enable banks

Chart 2.18: Liquidity Risk – Shocks and Outcomes

- Liquid assets available to the system(per cent of total assets)
- Share of assets of failed banks in stress scenario to total assets of SCBs
- Number of banks which failed the test (Out of select 53) (RHS)

Note: 1. A bank was considered to have 'failed' in the test when it was unable to meet the requirements under stress scenarios with the help of its liquid assets – the stock of liquid assets turned negative under stress conditions.

2. Liquidity shocks include a demand for 75 per cent of the committed credit lines (comprising unutilised portions of sanctioned working capital limits as well as credit commitments towards their customers) and also a withdrawal of a portion of un-insured deposits as given below:

Shock	Shock 1	Shock 2	Shock 3
Percent withdrawal of un-insured deposits	10	12	15

Source: RBI Supervisory Returns and Staff Calculations.

Chart 2.19: Bottom-up Stress Tests — Credit and Market Risks – Impact on CRAR
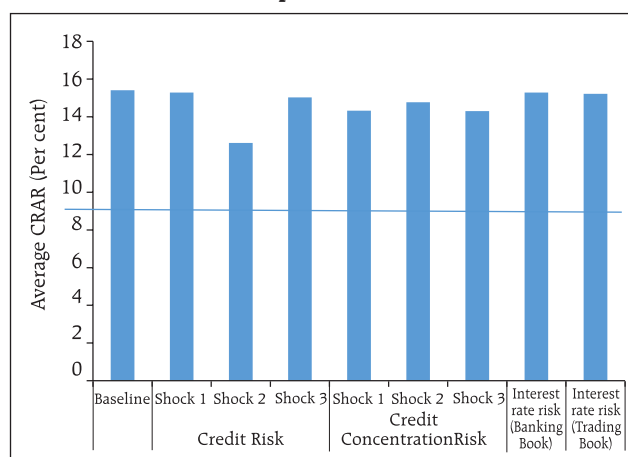
Credit Risk: Gross Credit	Shock1	NPAs increase by 50 per cent
	Shock2	30 per cent of restructured assets become NPAs
	Shock3	5 percentage points increase in NPAs in each top 5 sector / industry
Credit Risk: Concentration	Shock1	The top three individual borrowers default
	Shock2	The top largest group defaults
	Shock3	The largest borrower of each of top five industries/ sectors defaults
Interest Rate Risk – Banking Book	Shock	Parallel upward shift in INR yield curve by 2.5 percentage points
Interest Rate Risk – Trading Book	Shock	Parallel upward shift in INR yield curve by 2.5 percentage points

Source: Select banks (Bottom-up stress tests).

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[22] Un-insured deposits are about 72 per cent of total deposits (Source: DICGC Annual Report, 2018-19).

[23] Stress tests were conducted on a sample of 19 select banks. The same set of shocks was used for conducting top-down and bottom-up stress tests (Annex 2).

in the sample to sustain pressures from sudden and unexpected withdrawal of deposits by depositors (Chart 2.20). Banks, on an average, have higher liquid asset ratios compared to the exercise carried out based on March 2019 liquid assets.

II.1.9 Bottom-up Stress Tests: Derivatives Portfolio

2.39   A series of bottom-up stress tests (sensitivity analyses) on derivative portfolios of select banks[25] was conducted with the reference date of March 31, 2020. The banks in the sample were subjected to four separate shocks on interest and foreign exchange rates, where the shocks on interest rates ranged from 100 to 250 basis points, while 20 per cent appreciation/depreciation shock was assumed for exchange rates. The stress tests were carried out for individual shocks.

2.40   The impact of the sharp moves reflected in mark-to-market (MTM) valuation as a proportion to CET 1 capital (Chart 2.21) are mostly muted for individual banks, particularly PSBs and PVBs. Since risks can only be transferred and not eliminated, a thorough assessment of hedging profile of corporates as given in the disclosures would help understand the true extent of risks, going forward.

2.41   The average net impact of interest rate and exchange rate shocks are in the range of 2.5 per cent of the total capital funds and the profit and loss (P&L) effect is almost symmetric in opposite shocks. A rise in domestic interest rates leads to P&L gains and *vice versa*, implying that the interest rate positions are in the nature of a net short. Similarly, exchange rate shocks in the form of INR depreciation leads to P&L gains and *vice versa*, implying that the foreign exchange book is positioned to gain from INR depreciation (Chart 2.22).

Chart 2.20: Bottom-up Stress Tests — Liquidity Risk
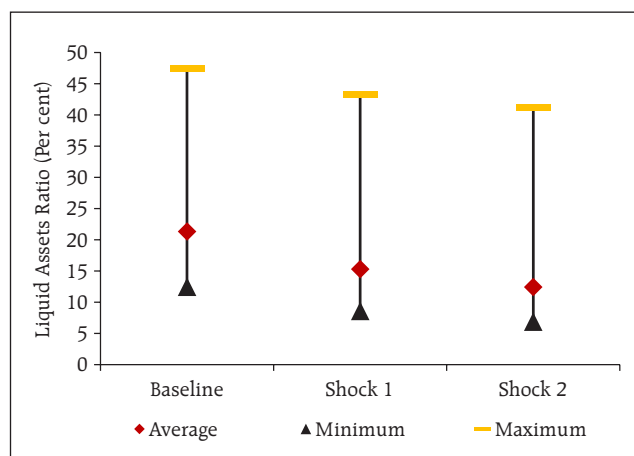
Liquid Assets Definitions	
1	High Quality Liquid Assets (HQLAs) as per Liquidity Coverage Ratio (LCR) guidelines.
Liquidity Shocks	
Shock1	10 per cent deposits withdrawal (cumulative) during a short period (say 1 or 2 days)
Shock2	3 per cent deposits withdrawal (each day) within 5 days

Source: Select banks (Bottom-up stress tests).

Chart 2.21: Net MTM of Total Derivatives Portfolio – Select Banks, March 2020
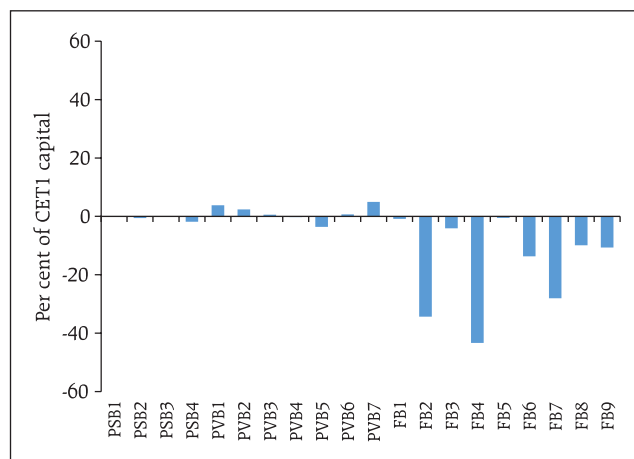
Note: PSB: Public sector bank, PVB: Private sector bank, FB: Foreign bank.
Source: Sample banks (Bottom-up stress tests on derivatives portfolio).

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[24] Liquid Assets Ratio $= \frac{Liquid\ Assets}{Total\ Assets} \times 100$. Under shock scenarios, the negative liquid assets ratio reflects the percentage deficit in meeting the required deposit withdrawal.

[25] Stress tests on derivatives portfolios were conducted for a sample of 20 banks constituting the major active authorised dealers and interest rate swap counterparties

2.42 The battery of stress tests gives plausible scenarios, at the system-level as well as at individual bank level, of the impact of COVID-19 on banks' balance sheets. In this context, the RBI has instructed banks to assess the impact of COVID-19 under severe but plausible scenarios on their balance sheets, asset quality, liquidity, profitability and capital adequacy for the financial year 2020-21. Banks have also been advised to ensure that such analyses are supplemented with possible mitigating measures, including capital and liquidity planning with the objective of ensuring uninterrupted credit supply to different sectors of the economy.

## II.2 Scheduled Urban Cooperative Banks

2.43 The performance of scheduled urban cooperative banks (SUCBs) broadly remained stable between September 2019 and March 2020. At the system level[26], the CRAR of SUCBs remained at 9.8 per cent for both the quarters. Their GNPAs declined from 10.5 per cent of gross loans and advances to 9.9 per cent and their provision coverage ratios[27] increased from 40.9 per cent to 61.4 per cent over this period. SUCBs' RoAs improved but remained in negative territory in March 2020 at -1.8 per cent as against -3.6 per cent observed in September 2019 whereas liquidity ratios[28] remained stable at 34.0 per cent.

II.2.1 Stress Test – Credit Risk

2.44 The impact of credit risk shocks on CRAR of SUCBs was simulated under four different scenarios.[29] The results show that (i) under a 1 SD shock to GNPAs classified as loss assets, system

Chart 2.22: Stress Tests – Impact of Shocks on Derivatives Portfolio of Select Banks – (change in net MTM on application of a shock)

(per cent of capital funds)
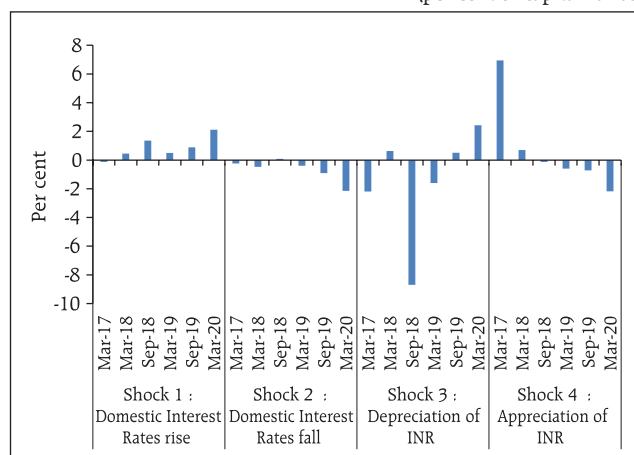
Note: Change in net MTM due to an applied shock with respect to the baseline.
Source: Sample banks (Bottom-up stress tests on derivative portfolio).

level CRAR would decline to 9.1 per cent and two SUCBs would fail to achieve the minimum CRAR requirement; in addition to 3 which had CRARs below 9 per cent even before the shock; (ii) under a 2 SD shock to GNPAs classified as sub-standard assets, one additional UCB would fail to achieve the 9 per cent CRAR minimum; and (iii) under a 2 SD shock to GNPAs classified as loss advances, system level CRAR declines to 8.1 per cent and eight more UCBs would fail to maintain the minimum CRAR requirement.

II.2.2 Stress Test - Liquidity Risks

2.45 A stress test on liquidity was carried out using two different scenarios of increase in cash outflows in the 1 to 28 day time bucket by i) 50 per cent, and ii) 100 per cent, with cash inflows remaining unchanged. Under the two scenarios, 20 banks and 34 banks, respectively, would face liquidity stress.[30]

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[26] Comprising 54 SUCBs.

[27] Provision coverage ratio=provisions held for NPA*100/GNPAs.

[28] Liquidity ratio = (cash + dues from banks + dues from other institutions + SLR investment) *100/total assets.

[29] The four scenarios are: i) a 1 SD shock to GNPA (classified as sub-standard advances), ii) a 2 SD shock to GNPA (classified as sub-standard advances), iii) a 1 SD shock to GNPA (classified as loss advances), and iv) a 2 SD shock to GNPA (classified as loss advances). SD was estimated by using 10 years data (Annex 2).

[30] As per the RBI's guidelines, a mismatch [negative gap i.e., cash inflows less cash outflows] should not exceed 20 per cent of outflows in the time bucket of 1 to 28 days. SUCBs which are above a 20 per cent mismatch after the shock function under very thin liquidity margins.

II.3 Non-Banking Financial Companies

2.46   A total of 9,601 NBFCs were registered with the RBI at end-March, 2020 of which 66 were deposit-accepting (NBFCs-D) and 278 were systemically important non-deposit accepting NBFCs (NBFCs-ND-SI). All NBFCs-D and NBFCs-ND-SI, including Government owned NBFCs, are subject to prudential regulations such as capital adequacy requirements and provisioning norms, along with reporting requirements. Although the combined balance sheet size of the NBFCs is about one fifth of that of SCBs, the importance of the former lies in last mile credit delivery and niche segment support in the Indian financial system.

II.3.1 Asset Quality and Capital Adequacy

2.47   The GNPA ratio of the NBFC sector declined during successive quarters till December 2019, however, surged in March 2020 quarter. The net NPA ratio was marginally lower in March 2020 quarter than the previous year. The CRAR of the sector stood at 19.6 per cent in March 2020, which was lower than its level a year ago (Table 2.8).

II.3.2 Post COVID-19 Response

2.48   Banks and market borrowings account for over 70 per cent of total outside liabilities of the NBFC sector. With the waning of market confidence, the share of long-term market debt [*i.e.*, non-convertible debentures (NCDs)] in total borrowings of the NBFC sector declined from 49.1 per cent at end-March 2017 to 40.8 per cent at end-December 2019. The consequent funding gap was met through bank borrowings, which rose from 23.1 per cent of total borrowings to 28.9 per cent over this period.

2.49   The declining share of market funding for NBFCs is a concern as it has the potential to accentuate liquidity risk for NBFCs as well as for the financial system. Smaller / mid-sized and AA or lower rated / unrated NBFCs have been shunned by both banks and markets, accentuating the liquidity tensions faced by NBFCs which was also reflected in the lacklustre response to the Targeted Long-Term Repo Operations 2.0 (TLTRO 2.0).

2.50   In the aftermath of the IL&FS crisis, NBFCs have been facing differentiation in market access and financial conditions, with only the higher rated entities able to raise funds. They have also started maintaining liquidity cover of two to three months, despite the higher costs. In the context of COVID-19, however, risks to the sector and consequently, systemic risks can intensify. IndAS accounting could impinge on the balance sheet risks, especially asset quality and provisioning; finances of NBFC-MFIs; contagion from Mutual Funds due to redemption pressures and customer confidence.

Table 2.8: Asset Quality[31] and CRARs[32] of NBFCs

(Per cent)

	GNPA Ratio	NNPA Ratio	CRAR
Mar-2015	4.1	2.5	26.2
Mar-2016	4.5	2.5	24.3
Mar-2017	6.1	4.4	22.1
Mar-2018	5.8	3.8	22.8
Mar-2019	6.1	3.3	20.1
Sep-2019	5.6	2.9	19.9
Dec-2019	5.9	3.1	19.5
Mar-2020*	6.4	3.2	19.6

*: Provisional
Source: RBI Supervisory Returns

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[31] Not based on a common set of companies, given the churn in the NBFC sectors; the GNPA ratio may not be based on common criteria, given that prudential norms have been progressively tightened since 2015.

[32] Based on Basel 1 capital framework which provides for capital on uniform credit risk.

II.3.3 Stress Tests

2.51   System-level stress tests for the NBFC sector's aggregate credit risk for the quarter ending December 2019 were carried out under three scenarios: increase in GNPA by (i) 1 SD; (ii) 2 SD; and (iii) 3 SD. It is assessed that the sector's CRAR would decline from 19.4 per cent to 17.2 per cent in the first scenario, to 16.4 per cent in the second scenario and to 15.2 per cent in the third scenario.

2.52   Stress tests results on individual NBFCs indicate that, under the above-mentioned three scenarios, 11.2 per cent, 14.0 per cent and 19.5 per cent of the companies would not be able to comply

with the minimum regulatory capital requirements of 15 per cent.

II.4 SMA Ratio Analysis

2.53   A rating mapping of special mention account (SMA) assets has been carried out on Non-PSU obligors, a cohort highly vulnerable to risk aversion, in order to examine the resilience of corporates, especially in view of the regulatory moratorium. The aggregate share of AA and above ratings in the SMA[33] category for Non-PSU obligors has been low relative to their presence in the standard category[34] for non-financial Non-PSU obligors as on March 2020 (Tables 2.9 & 2.10). The SMA analysis was

Table 2.9: Share of Ratings Category in SMA (SMA 1 & 2) Loans to Non-PSU Obligors

(per cent)

	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20
AAA	0.0	4.2	0.0	0.2	14.7	21.5	0.0	2.1	0.0	0.0	0.7	0.0	1.8
AA	6.9	8.6	6.4	18.3	16.3	16.6	18.8	11.1	2.8	0.2	1.2	1.9	0.2
AA and Above	**6.9**	**12.8**	**6.5**	**18.6**	**31.0**	**38.1**	**18.8**	**13.1**	**2.8**	**0.2**	**1.9**	**1.9**	**1.9**
A	17.4	12.5	15.4	14.6	15.5	5.2	2.3	9.1	14.6	7.8	3.8	5.6	13.4
BBB	17.1	16.5	11.3	14.1	16.4	16.6	16.0	15.6	16.5	13.2	16.4	15.0	18.8
BB	12.3	11.3	16.3	12.8	12.0	13.2	18.4	17.1	12.8	18.0	15.8	18.1	9.3
B	4.3	5.5	5.1	3.8	4.2	3.3	6.1	7.2	5.5	6.6	6.5	9.7	6.9
C	2.1	1.7	1.0	1.3	0.2	0.7	5.1	1.2	1.1	3.1	0.5	0.8	1.7
D	20.6	18.9	26.4	18.4	10.0	10.8	17.1	20.5	23.9	26.9	30.5	19.1	24.0
Unrated	19.3	20.9	18.0	16.5	10.6	12.1	16.2	16.1	22.8	24.2	24.7	29.7	24.0

Source: Prime database, RBI Supervisory Returns and Staff Calculations.

Table 2.10: Share of Ratings category - Standard Loans (0 days past due and SMA-0) to Non-PSU Non-financial Obligors

(per cent)

	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20
AAA	3.4	3.6	4.4	4.2	3.4	2.3	4.3	4.3	5.7	5.7	6.3	6.1	6.4
AA	16.2	16.5	16.3	17.8	19.4	21.2	21.2	21.1	19.9	19.9	20.4	20.4	20.6
AA and above	**19.6**	**20.0**	**20.7**	**22.0**	**22.8**	**23.5**	**25.5**	**25.4**	**25.6**	**25.6**	**26.7**	**26.5**	**27.0**
A	19.2	20.5	19.9	19.5	18.4	18.5	17.6	19.5	20.3	20.2	19.8	19.3	18.9
BBB	18.8	18.5	18.6	16.8	16.9	18.1	17.3	17.1	15.8	16.3	15.3	17.1	15.9
BB	7.9	7.1	7.3	8.5	8.6	7.7	8.7	7.4	7.8	7.3	6.8	6.4	7.2
B	3.2	3.2	2.9	3.0	2.8	2.8	2.9	2.8	2.7	2.6	2.8	2.8	3.8
C	0.2	0.2	0.3	0.1	0.1	0.1	0.4	0.2	0.1	0.1	0.1	0.2	0.3
Unrated	31.1	30.6	30.2	30.1	30.3	29.2	27.6	27.6	27.8	27.8	28.5	27.5	26.8

Source: Prime database, RBI Supervisory Returns and Staff Calculations.

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[33] An obligor is considered as an SMA for the banking sector if it has been classified as SMA 1 or SMA 2 by any bank in a given quarter.

[34] Standard asset is defined as an asset that is 0 days past due or in SMA -0 category.

Chart 2.23: Non-PSU NBFC/HFC - Funded Amount Outstanding to Banks
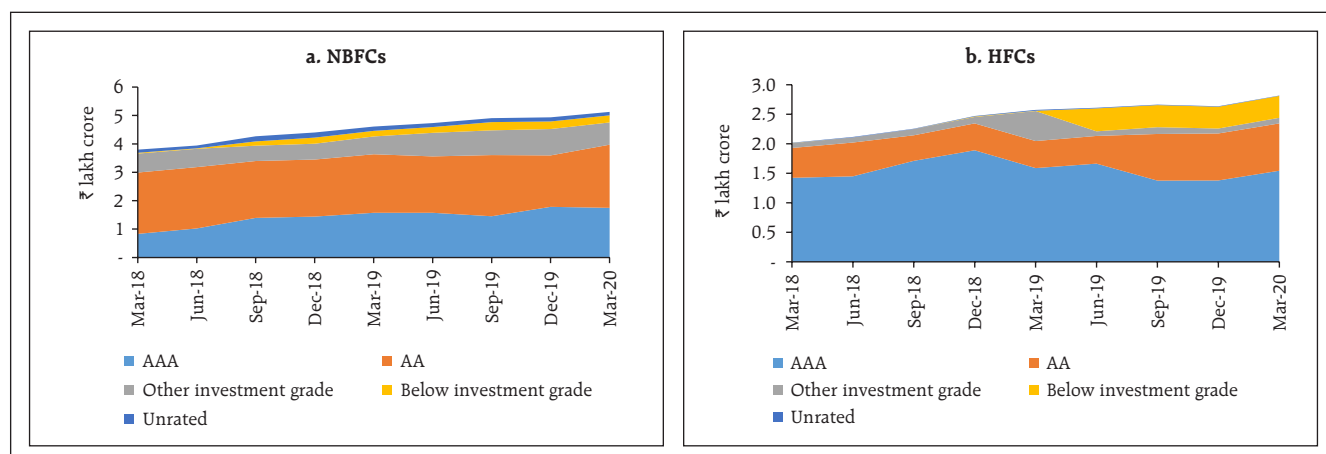
Source: CRILC, Prime database.

conducted on aggregate obligors rather than on non-financial obligors, since the presence of financial obligors in the SMA category has been generally sparse. Nonetheless, both standard and SMA asset categories show sizeable and comparable presence of the unrated cohort. Moreover, as noted in Chapter 1, flow of credit to Non-PSU obligors in the rating grade A and below has been somewhat restrained, specifically from PVBs in Q4:2019-20 with the onset of COVID-19. Consequently, the financial health of this cohort is vital for systemic stability.

2.54 Given the importance of non-banking financial intermediation in the credit spectrum and the high funding of the sector through banking channels (Chart 2.23), the dispersion of NBFCs and HFCs across the impairment spectrum for given rating grades show a good payment record of NBFCs prior to the imposition of moratorium

(Tables 2.11 & 2.12). The impact of the moratorium on private NBFCs/HFCs can be substantial, with proportion of assets under the moratorium for NBFCs averaged between 39-65 per cent based on underlying assets with approximately 50 per cent of the aggregate assets under moratorium as on end April 2020. Based on the disclosures made by NBFCs/HFCs, the assets under moratorium are dominated by wholesale customers and real-estate developers, although retail portfolios in the micro-loans and auto loan segments have also been affected. Access of NBFCs/HFCs to capital markets, both debt and equity, is of significant importance to the sector.

2.55 Given the uncertainty relating to cash flows induced by COVID-19, the short-term maturities of market liabilities of Non-PSU NBFCs/ HFCs become relevant. There are significant near-term maturities across all rating grades (Table 2.13). The partial credit

Table 2.11: Asset Impairment Status of Bank Loans to Non-PSU NBFCs, March 2020 (per cent)

Non-PSU NBFCs	Standard (0 days past due and SMA-0)	SMA (SMA 1/ SMA 2)	Non-performing
AAA	99.1	0.9	0.0
AA	100.0	0.0	0.0
Other investment grade	88.6	11.4	0.0
Below investment grade	5.2	1.4	93.4
Unrated	96.2	0.1	3.7

Source: Prime database, RBI Supervisory Returns and Staff Calculations.

Table 2.12: Asset Impairment Status of Bank Loans to Non-PSU HFCs, March 2020 (per cent)

Non-PSU HFCs	Standard (0 days past due and SMA-0)	SMA (SMA 1/ SMA 2)	Non-performing
AAA	100.0	0.0	0.0
AA	100.0	0.0	0.0
Other investment grade	100.0	0.0	0.0
Below investment grade	1.1	0.0	98.9
Unrated	93.4	0.0	6.6

Source: Prime database, RBI Supervisory Returns and Staff Calculations.

Table 2.13: Issuances and Near-term maturities of CPs & NCDs of Non-PSU NBFCs/HFCs

(₹ crore)

	Issuances			Maturing						
	Mar-20	Apr-20	May-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20
AAA	21,885	17,465	22,980	34,680	8,363	19,454	27,645	15,735	24,792	11,802
AA	7,427	3,351	7,377	19,520	6,517	7,142	8,815	4,622	5,790	4,389
Others	937	694	138	2,885	3,413	4,037	1,658	1,887	3,589	2,559
Total	**30,249**	**21,510**	**30,495**	**57,084**	**18,293**	**30,633**	**38,117**	**22,243**	**34,171**	**18,750**

Source: Prime database, RBI Supervisory Returns and Staff Calculations.

guarantee scheme wherein Government would absorb up to 20 per cent of the first loss assumes critical importance in this context.

II.5 Interconnectedness

II.5.1 Network of the Financial System[35] [36]

2.56 A financial system can be visualised as a network with financial institutions as *nodes* and bilateral exposures as *links* joining these nodes. While these links enable efficiency gains and risk diversification, they can become conduits of risk transmission in case of a crisis. Understanding the nuances in propagation of risk through networks is useful for devising appropriate policy responses for safeguarding financial and macroeconomic stability (Box 2.1).

Box 2.1: Pandemics to Financial Crises – Importance of Understanding Networks and Contagion

Financial network analysis tackles questions relating reasons for the growing interconnectedness of the financial system; whether connections tend to amplify or dampen systemic shocks; and whether the structure of the network matters. This helps to identify structural features relevant for setting policy (Glasserman and Young, 2016). Further, attempts were made to understand how the network structure interacts with other potential sources of contagion. One aspect that came out emphatically during the global financial crisis (GFC) is that the health of individual financial institutions may not ensure the health of the financial system as a whole. Given interconnectivity, extreme stress can disrupt normal functioning of the markets and asset market illiquidity could lead to solvency issues and finally result in contagion – akin to virus spreading from the infected to the healthy through various forms of contact. In the run-up to the GFC, leverage levels had increased, reliance on short-term funding was high and capital buffers at some banks were extremely thin.

All of these factors affect the stability of the financial system to varying degrees. The key issue is how the network of obligations relates to these potential sources of contagion, and whether it serves to amplify or dampen them. Network connections can be net positive for the financial system by providing opportunities for investment, risk diversification and liquidity management. At the same time, network connections can also have a negative effect by creating channels through which shocks can spread, and thus leading to contagion.

Foreseeing financial contagion is, however, a challenge, involving balancing of the efficiency inducing aspects of financial networks, on the one hand, and not reacting to false alarms on the other. Financial networking related concepts require adaptation for application in the pandemic domain. While networked entities are inevitably affected by a default in one of the elements in the chain, pandemic transmission is probabilistic - a

(contd...)

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[35] The network model used in the analysis has been developed by Professor Sheri Markose (University of Essex) and Dr. Simone Giansante (Bath University) in collaboration with the Financial Stability Unit, Reserve Bank of India.

[36] Analysis presented here and in the subsequent part is based on data of 199 entities from the following eight sectors: SCBs, scheduled UCBs (SUCBs), AMC-MFs, NBFCs, HFCs, insurance companies, pension funds and AIFIs. These 199 entities covered include 78 SCBs; 20 SUCBs; 22 AMC-MFs (which cover more than 90 per cent of the AUMs of the mutual fund sector); 32 NBFCs (both deposit taking and non-deposit taking systemically important companies, which represent about 60 per cent of total NBFC assets); 21 insurance companies (that cover more than 90 per cent of assets of the sector); 15 HFCs (which represent more than 90 per cent of total HFC asset); 7 PFs and 4 AIFIs (NABARD, EXIM, NHB and SIDBI).

healthy person coming in contact with an infected one will catch the infection with a certain probability. Such probabilistic connections imply that contagion impact is best approximated through a pooled approach rather than through a case by case one. In this regard, it is somewhat similar to modelling of asset price "bubbles" in behavioural finance wherein asset price movements induce psychological effect in others probabilistically and not deterministically.

The analogy between pandemics and financial crises goes back to the Asian financial crisis - "Asian flu" - for the first time. The use of the term contagion seldom applied to crises in the financial markets before the global financial crisis.

The utility of urban agglomerations (or *networks*), which have currently turned themselves into epicentres of COVID-19 pandemic transmission, comes up for scrutiny. Urban agglomeration is cost saving, with associated network effects, leading to economies of

scale. Elements which, in the natural course of business, allow the seamless flow of expertise and creative inputs flowing from one domain to another related domain, leads to links for spread of contagion in the context of a pandemic.

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Ulrich Beck, Scott Lash, Brian Wyne (1992), Risk Society- Towards a New Modernity, Sage Publications.

2.57 The total outstanding bilateral exposures[37] among the entities in the financial system marginally declined during 2019-20 (Chart 2.24 a).

2.58 Notwithstanding a secular decline in share, SCBs had the largest bilateral exposures in the Indian

financial system in March 2020. SCBs' lending to and borrowing from other entities (including other SCBs) stood at 44.6 per cent of total lending and borrowings in the system (Chart 2.24 b). Among bank groups, PSBs had a net receivable position *vis-*

Chart 2.24: Bilateral Exposures between Entities in Financial System
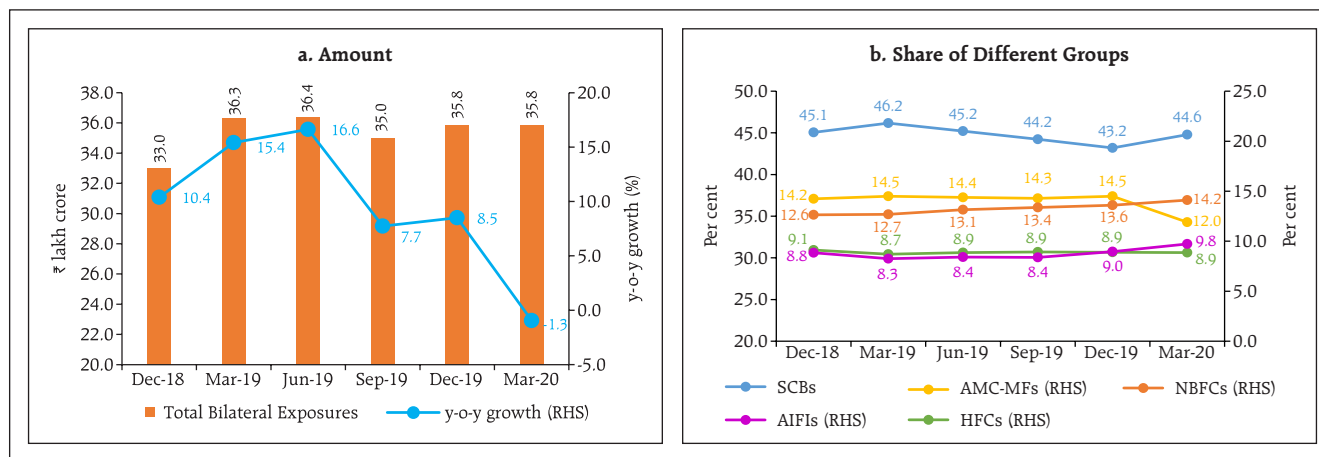
Source: RBI Supervisory Returns and Staff Calculations.

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[37] Includes exposures between entities of the same sector.

à-vis the entire financial sector, whereas PVBs had a net payable position and FBs were evenly balanced (Charts 2.25 and 2.26).

2.59 AMC-MFs veered away from trend performance and registered a sizable decline in their share during 2019-20, while their AUM fell. On the other hand, the share of AIFIs increased during the year as deposits from SCBs, borrowings from AMC-MFs and refinancing to PVBs and HFCs expanded. The shares of NBFCs, HFCs, insurance companies and pension funds also increased during 2019-20 and stood at 14.2 per cent, 8.9 per cent, 8.8 per cent and 1.6 per cent, respectively, in March 2020 (Chart 2.24 b).

2.60 In terms of inter-sectoral[38] exposures, AMC-MFs, followed by insurance companies, were the biggest fund providers in the system, while NBFCs were the biggest receivers of funds, followed by HFCs. Among the entities which received funds from the financial system, PVBs recorded a decline of 22 per cent, while payables of NBFCs and HFCs increased marginally (Chart 2.26).

2.61 Among the fund providers to the financial system, AMC-MFs recorded a sharp decline in their receivables from the financial system, which increased for PSBs and insurance companies (Chart 2.26).

a. Inter-bank market

2.62 The size of the inter-bank market (both fund-based[39] and non-fund-based[40]) has been persistently declining over the last few years. Fund-based inter-bank exposures as a share of total assets of the banking system moderated further during the year
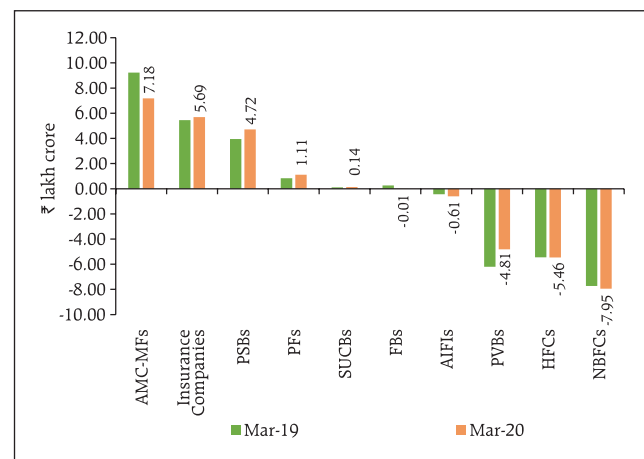
Chart 2.25: Network Plot of the Financial System, March 2020
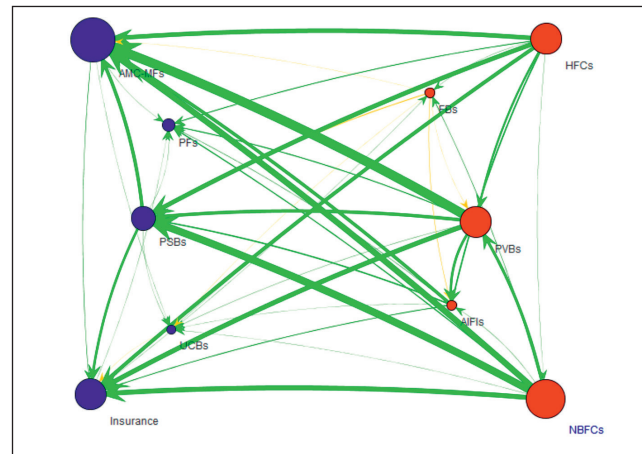
Note: Receivables and payables do not include transactions among entities of the same group. Red circles are net payable institutions and the blue ones are net receivable institutions.
Source: RBI Supervisory Returns and Staff Calculations.

Chart 2.26: Net Receivables (+ve) / Payables (-ve) by Institutions

Source: RBI Supervisory Returns and Staff Calculations.

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[38] Inter-sectoral exposures do not include transactions among entities of the same sector in the financial system.

[39] Fund-based exposures include both short-term exposures and long-term exposures. Data on short-term exposures are collected across seven categories – repo (non-centrally cleared); Call/Notice/Term Money; commercial paper; certificates of deposits; short-term loans; short-term deposits and other short-term exposures. Data on Long-term exposures are collected across five categories – Equity; Long-term Debt; Long-term loans; Long-term deposits and Other long-term liabilities.

[40] Non-Fund based exposure includes - outstanding bank guarantees, outstanding Letters of Credit, and positive mark-to-market positions in the derivatives market (except those exposures for which settlement is guaranteed by the CCIL).

due to excess liquidity in the banking system as well as due to the impact of LCR norms, which incentivise secured funding over unsecured inter-bank market funding. (Chart 2.27).

2.63   PSBs remained the dominant players in the inter-bank market, followed by PVBs and FBs as at end-March 2020 (Chart 2.28).

2.64   Around 70 per cent of the fund-based inter-bank market was short-term (ST) in nature, in which ST deposits had the highest share, followed by ST loans. The composition of long-term (LT) fund-based inter-bank exposure shows that LT loans constituted slightly more than half of LT exposure followed by LT deposits (Chart 2.29).
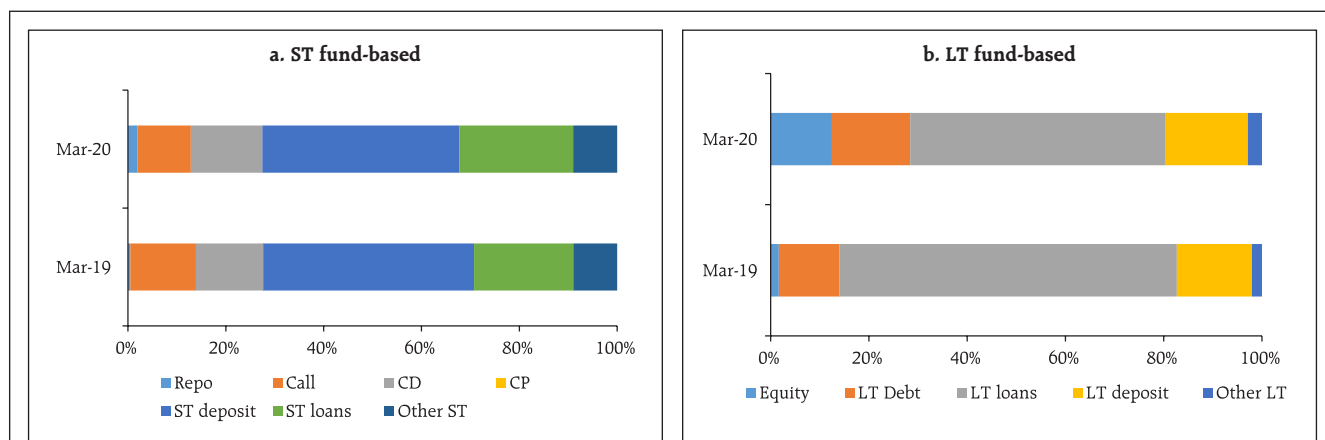
Chart 2.27: Inter-bank market
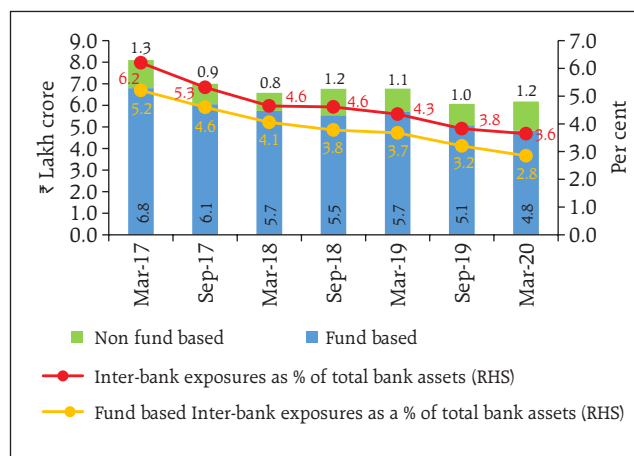
Source: RBI Supervisory Returns and Staff Calculations.

Chart 2.28: Different Bank Groups in the Inter-bank Market
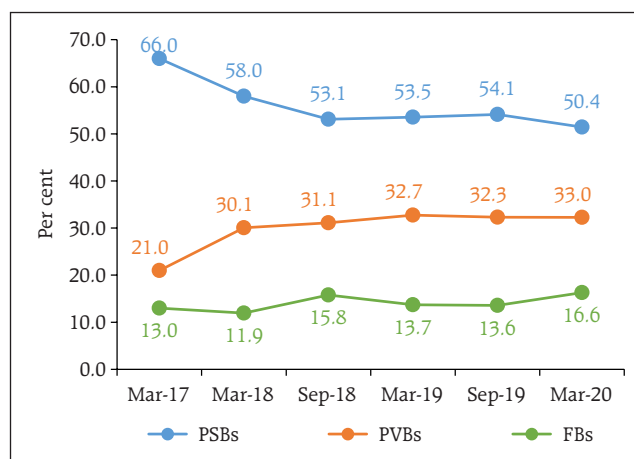
Source: RBI Supervisory Returns and Staff Calculations

**Chart 2.29: Composition of Fund-based Inter-bank Market**

Source: RBI Supervisory Returns and Staff Calculations.

2.65 The inter-bank market typically has a core-periphery network structure[41][42]. At end-March 2020, there were 4 banks in the inner-most core and 9 banks in the mid-core circle. This is in line with the pattern seen during the last 5 years, with the number of banks in the inner-most core ranging between 2 and 5. These are usually the biggest PSBs or PVBs. Most foreign banks and almost all old private banks are usually in the outermost periphery, making them the least connected banks in India. The remaining PSBs and PVBs, along with a few major FBs, make up the mid and outer core. The merger of some PSBs with effect from April 2020 would largely impact the mid-core and outer core (Chart 2.30).

2.66 The degree of interconnectedness in the banking system (SCBs), as measured by the connectivity ratio[43], has been declining slowly over the last few years. This is in line with a shrinking inter-bank market, as mentioned earlier. The cluster coefficient[44], which depicts local interconnectedness

Chart 2.30: Network Structure of the Indian Banking System (SCBs+ SUCBs) – March 2020
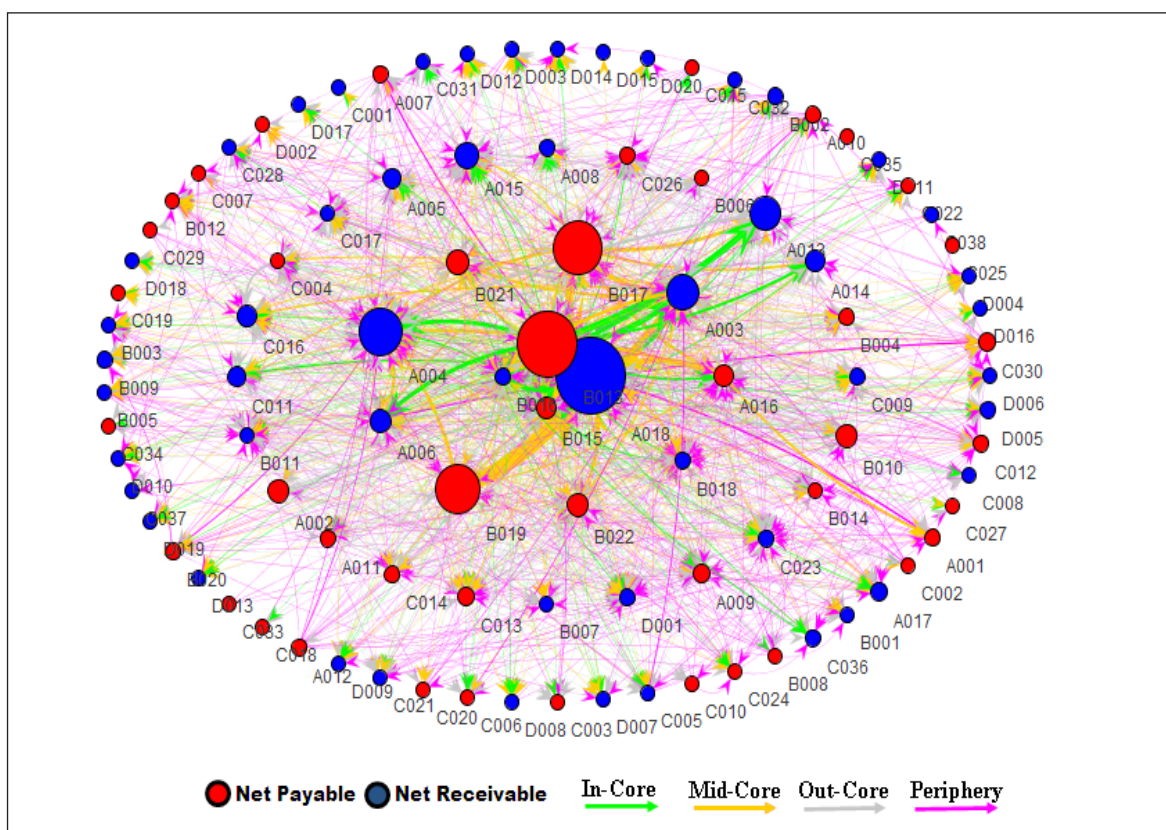
Source: RBI Supervisory Returns and Staff Calculations.

[41] The diagrammatic representation of the network of the banking system is that of a tiered structure, in which different banks have different degrees or levels of connectivity with others in the network. The most connected banks are in the inner most core (at the centre of the network diagram). Banks are then placed in the mid core, outer core and the periphery (concentric circles around the centre in the diagram), based on their level of relative connectivity. The colour coding of the links in the tiered network diagram represents borrowings from different tiers in the network (for example, the green links represent borrowings from the banks in the inner core). Each ball represents a bank and they are weighted according to their net positions *vis-à-vis* all other banks in the system. The lines linking each bank are weighted on the basis of outstanding exposures.

[42] 78 SCBs and 20 SUCBs were considered for this analysis.

[43] *The Connectivity ratio* measures the actual number of links between the nodes relative to all possible links in a complete network. For methodology, please see Annex 2.

[44] *Cluster Coefficient:* Clustering in networks measures how interconnected each node is. Specifically, there should be an increased probability that two of a node's neighbours (banks' counterparties in case of the financial network) are also neighbours themselves. A high cluster coefficient for the network corresponds with high local interconnectedness prevailing in the system. For methodology, please see Annex 2.

(*i.e.*, tendency to cluster), has remained almost constant over the last 5 years (Chart 2.31).

b. Exposure of AMCs-MFs

2.67   Notwithstanding the recent decline in AUM, AMC-MFs' gross receivables were around ₹7.86 lakh crore (29.5 per cent of their average AUM) whereas their gross payables were around ₹0.68 lakh crore as at end-March 2020.

2.68   The top recipients of their funding were SCBs followed by NBFCs, HFCs and AIFIs. Their receivables from SCBs, which had gone up sharply in 2018-19, registered a decline in 2019-20. In absolute terms, however, SCBs, NBFCs and HFCs have all seen a decline in their payables to AMC-MFs. In contrast, AIFIs' reliance on AMC-MFs increased as they expanded refinancing provided to other financial institutions. Funding from AMC-MFs was a big way of subscription to debt and CDs issued by AIFIs. (Chart 2.32 a).

2.69   Instrument-wise, AMC-MFs' receivables saw a sharp increase in the share of equity funding, especially in recent quarters which, however, reversed in Q4: 2019-20, but was compensated by an increase in debt funding. AMC-MFs continued to show preference for CDs over CPs (Chart 2.32 b).

Chart 2.31: Connectivity Statistics of the Banking System (SCBs)
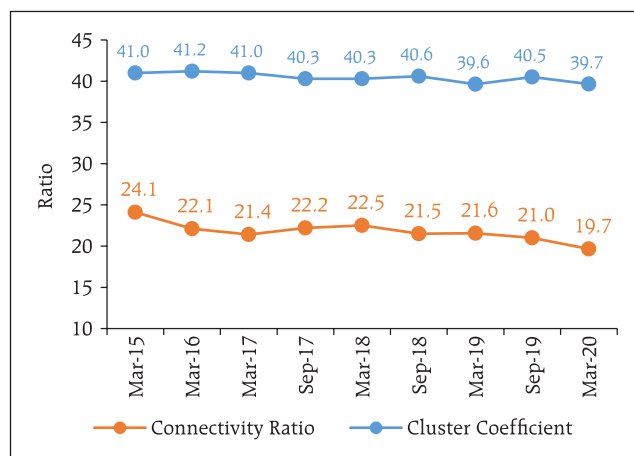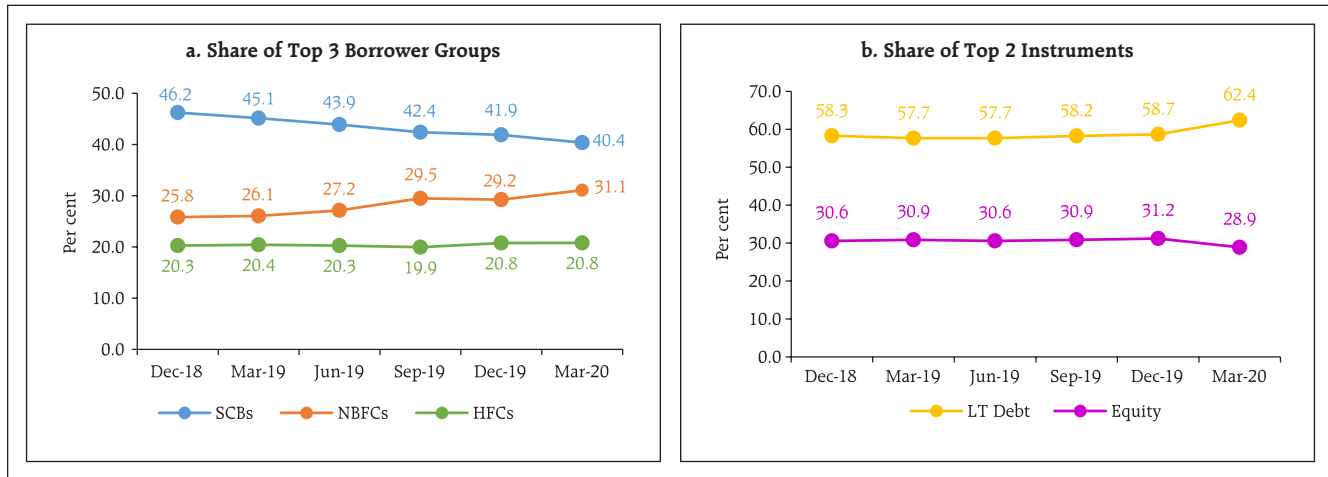

Source: RBI Supervisory Returns and Staff Calculations.

Chart 2.32: Gross Receivables of AMC-MFs from the Financial System
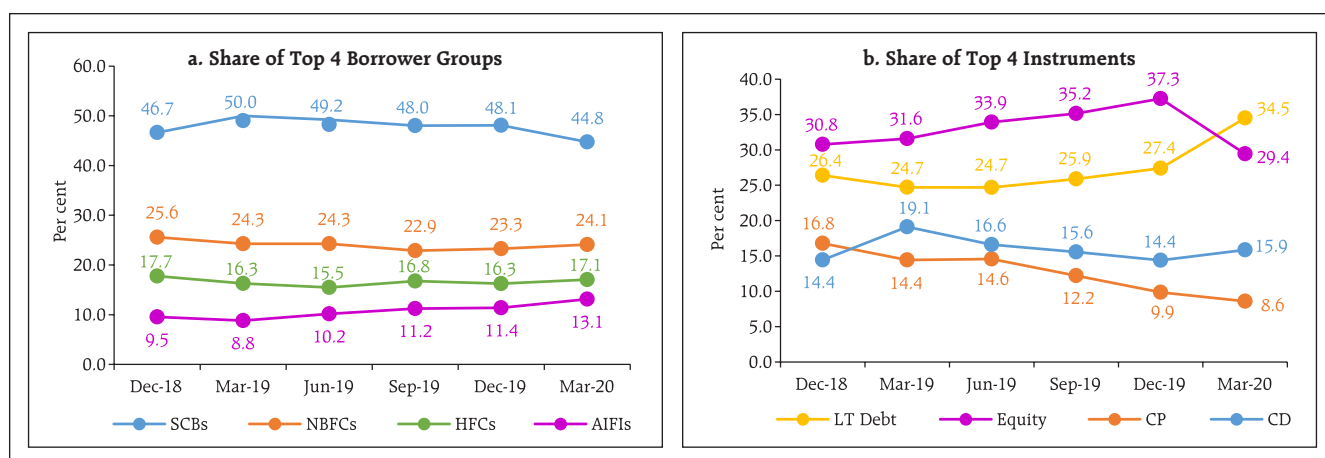
Source: RBI Supervisory Returns and Staff Calculations.

Chart 2.33: Gross Receivables of Insurance Companies from the Financial System

Source: RBI Supervisory Returns and Staff Calculations.

c. Exposure of Insurance Companies

2.70 Insurance companies are the second largest net providers of funds to the financial system (gross receivables were ₹5.93 lakh crore and gross payables were ₹0.24 lakh crore in March 2020).

2.71 SCBs were the top recipients of their funds, followed by NBFCs and HFCs. LT debt and equity accounted for almost all the receivables of insurance companies, who had only limited exposure to short-term instruments. The share of LT debt, which had been falling, gradually saw a reversal in 2019-20 as

these companies subscribed to debt issued by NBFCs and AIFIs (Chart 2.33 a and b).

d. Exposure of AIFIs

2.72 Gross receivables of AIFIs increased by around 16 per cent y-o-y to ₹3.18 lakh crore as at end March 2020. The top recipients of funds provided by them were SCBs (primarily PVBs), followed by HFCs and NBFCs. Instrument-wise, these funds primarily took the form of loans – both LT and ST refinancing purposes (Chart 2.34 a and b).
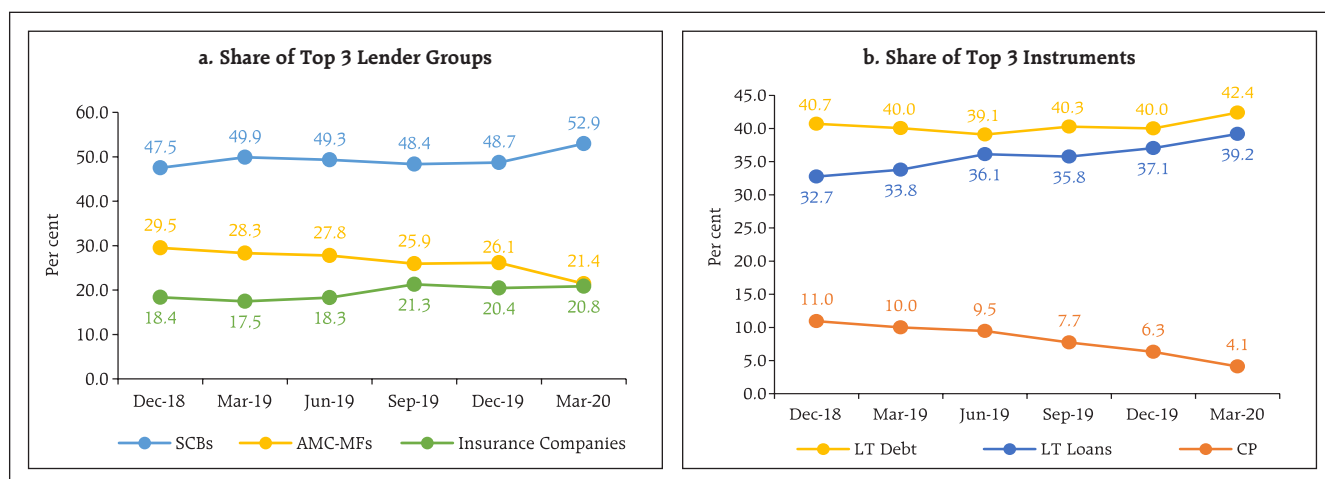
Chart 2.34: Gross Receivables of AIFIs from the Financial System
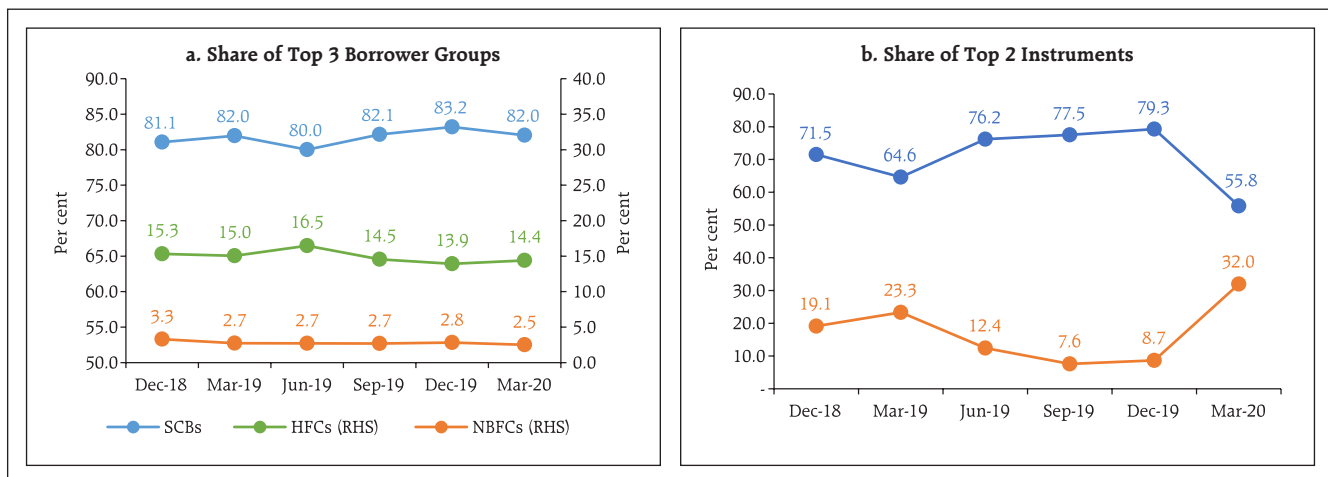
Source: RBI Supervisory Returns and Staff Calculations.

Chart 2.35: Gross Payables of NBFCs to the Financial System

a. Share of Top 3 Lender Groups

b. Share of Top 3 Instruments

Source: RBI Supervisory Returns and Staff Calculations.

e. Exposure to NBFCs

2.73   NBFCs were the largest net borrowers of funds from the financial system, with gross payables of ₹8.84 lakh crore and gross receivables of ₹0.89 lakh crore as at end-March 2020. They obtained more than half of the funds from SCBs, followed by AMC-MFs and insurance companies (Chart 2.35 a).

2.74   The choice of instruments in the NBFC funding mix reflects the increasing role of LT Loans (provided by SCBs and AIFIs) and LT debt (held by insurance companies and AMC-MFs) and a declining share of CPs (subscribed to by AMC-MFs and SCBs) (Chart 2.35 b).

f. Exposure to HFCs

2.75   HFCs were the second largest borrowers of funds from the financial system, with gross payables of around ₹5.91 lakh crore and gross receivables of ₹0.45 lakh crore as at end-March 2020. HFCs' borrowing profile was similar to that of NBFCs, except that AIFIs played a significant role in providing funds to HFCs. The share of AMC-MFs in funding HFCs has come down sharply in the last quarter. In contrast, the share of SCBs has increased (Chart 2.36 a).

2.76   As is the case of NBFCs, LT debt, LT loans, and CPs were the top three instruments through which HFCs raised funds from the financial system,

Chart 2.36: Gross Payables of HFCs to the Financial System

a. Share of Top 4 Lender Groups

b. Share of Top 3 Instruments
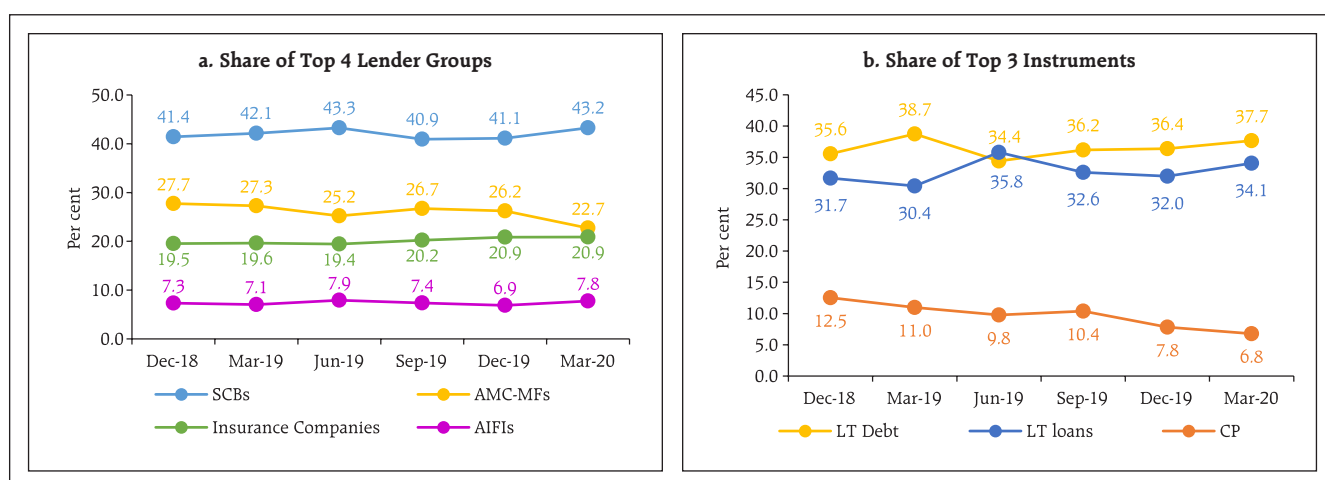
Source: RBI Supervisory Returns and Staff Calculations.

though their funding mix has been in a flux in the last six quarters. Reliance on CP (subscribed to by AMC-MFs and, to a lesser extent, by SCBs) has been on a consistent decline over the last six quarters. This was compensated by an increasing share of LT loans (from banks and AIFIs) and LT debt (Chart 2.36 b).

2.77 The aggregate funding by PSBs for stressed NBFCs/HFCs is increasing (Table 2.14 and Chart 2.26). This has implications for contagion if there is an adverse selection bias in NBFCs'/HFCs' credit portfolio. Also, an over-reliance on bank funding makes the NBFCs uncompetitive over a host of financial products, especially in those where the sector has to compete with banks and hence NBFCs' portfolio choices may tend to have an adverse selection bias[45].

II.5.2 Contagion Analysis[46]

2.78 Contagion analysis uses network technology to estimate the systemic importance of different banks. The failure of a bank which is systemically important leads to greater solvency and liquidity

losses for the banking system which, in turn, depend on the initial capital and liquidity position of banks along with the number, nature (whether it is a lender or a borrower) and magnitude of the interconnections that the failing bank has with the rest of the banking system.

a. Joint Solvency[47]-Liquidity[48] Contagion Losses for SCBs due to Bank Failure

2.79 In this analysis, the impact of discrete shocks on the banking system is seen in terms of the number of bank failures that take place and the amount of solvency and liquidity losses that are incurred.

2.80 A contagion analysis of the banking network[49] based at end-March 2020 position indicates that if the bank with the maximum capacity to cause contagion losses fails, it will cause a solvency loss of 4.30 per cent of total Tier 1 capital of SCBs and liquidity loss of 0.30 per cent of total high quality liquid assets (HQLA) of the banking system. Lower losses as at end-March 2020 relative to a year ago reflect a better capitalised public sector

Table 2.14: Net Funding Sources of Select Classes of Financial Intermediaries from Financial System

(₹crore)

		Sep-19				Mar-20			
		Users of Funds							
		PSB	PVB	NBFC	HFC	PSB	PVB	NBFC	HFC
Source of Funds	AIFIs	-54,249	1,35,195	8,063	42,956	-84,353	97,172	7,904	45,555
	PSBs	-	1,22,443	2,50,694	1,53,810	-	1,33,892	3,02,375	1,67,220
	PVBs	-1,22,443	-	84,518	55,889	-1,33,892	-	90,529	44,442
	AMCs	1,03,736	3,33,158	2,06,488	1,51,440	91,248	2,37,978	1,74,517	1,29,605

Source: RBI Supervisory Returns and Staff Calculations.

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[45] Financial Stability Report, June 2019.

[46] For methodology, please see Annex 2.

[47] In solvency contagion analysis, gross loss to the banking system owing to a domino effect of one or more borrower banks failing is ascertained. Failure criterion for contagion analysis has been taken as Tier 1 capital falling below 7 per cent.

[48] In liquidity contagion analysis, a bank is considered to have failed when its liquid assets are not enough to tide over a liquidity stress caused by the failure of large net lender. Liquid assets are measured as: 16.5 per cent of NDTL + excess SLR + excess CRR.

[49] Two SCBs, which did not meet the solvency criteria at the beginning before the initiation of contagion, have been excluded from this exercise.

banking system and a shrinking inter-bank market (Table 2.15).

b. Solvency Contagion Losses for SCBs due to NBFC/ HFC failure

2.81   As noted earlier, NBFCs and HFCs are the largest borrowers of funds from the financial system. A substantial part of this funding comes from banks. Therefore, failure of any NBFC or HFC will act as a solvency shock to their lenders which can spread by contagion.

2.82   An analysis of the possible solvency contagion losses[50] to the banking system caused by idiosyncratic failure of any NBFC indicates that, as at end-March 2020, contagion losses on account of failure of the top three PSU NBFCs ranged between 4.3 per cent to 5 per cent of the banking system's Tier-1 capital. Furthermore, Non-PSU NBFCs with the maximum capacity to cause solvency losses to the banking system could knock off 2.7 per cent of the latter's total Tier 1 capital but it would not lead to failure of any bank (Table 2.16).

2.83   Failure of the HFC with the maximum capacity to cause solvency losses to the banking system will knock off 6.77 per cent of the latter's total Tier 1 capital but without failure of any bank (Table 2.17).

2.84   Although SCBs' lending to NBFCs and HFCs has gone up as noted earlier (Charts 2.35 and 2.36; Table 2.14), the losses as at end-March 2020 were lower than a year ago due to a better capitalised public sector banking system and a shrinking inter-bank market.

Table 2.15: Contagion Losses due to Bank Failure – March 2020

Trigger	% of Tier 1 capital of the Banking System	% of HQLA	Number of Banks defaulting due to solvency losses	Number of Banks defaulting due to liquidity losses
Bank 1	4.30	0.30	1	0
Bank 2	3.23	0.35	1	0
Bank 3	1.87	2.47	0	2
Bank 4	1.74	1.65	0	4
Bank 5	1.72	1.01	0	0

Note: Top five 'Trigger banks' have been selected on the basis of solvency losses caused to the banking system.
Source: RBI Supervisory Returns and Staff Calculations.

Table 2.16: Contagion Losses due to Non-PSU NBFC Failure – March 2020

Trigger	Solvency Losses as % of Tier -1 Capital of the Banking System	Number of Defaulting banks due to Solvency Losses
NBFC 1	2.71	0
NBFC 2	2.17	0
NBFC 3	1.88	0
NBFC 4	1.57	0
NBFC 5	1.29	0

Note: Top five 'Trigger NBFCs' have been selected on the basis of solvency losses caused to the banking system.
Source: RBI Supervisory Returns and Staff Calculations.

Table 2.17: Contagion Losses due to HFC Failure – March 2020

Trigger	Solvency Losses as % of Tier -1 Capital of the Banking System	Number of Banks Defaulting due to solvency losses
HFC 1	6.77	0
HFC 2	3.64	0
HFC 3	1.65	0
HFC 4	1.63	0
HFC 5	1.20	0

Note: Top five 'Trigger HFCs' have been selected on the basis of solvency losses caused to the banking system.
Source: RBI supervisory returns and staff calculations.

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[50] Two SCBs did not meet the solvency criterion (Tier I CRAR less than or equal to 7 per cent) before the initiation of contagion. These two banks have been excluded from this exercise.

### c. Solvency Contagion Losses[51] for SCBs due to Macroeconomic Shocks

2.85   The contagion impact of the failure of a bank is likely to be magnified if macroeconomic shocks result in distress in the banking system in a generalised downturn in the economy. Macroeconomic shocks cause some SCBs to fail the solvency criterion, which then acts as a trigger for further solvency losses. In the previous iteration, the shock was applied to the entity that could cause the maximum solvency contagion losses. In this iteration, however, the initial impact of macroeconomic shocks on individual bank's capital was taken from the macro-stress tests in which a baseline, three (medium, severe and very severe) adverse scenarios were considered for March 2021[52].

2.86   Initial capital loss due to macroeconomic shocks is 8.80 per cent, 12.60 per cent, 17.16 per cent and 18.78 per cent of Tier 1 Capital for baseline, medium, severe and very severe stress scenarios, respectively. The number of banks that fail to maintain Tier I adequacy ratio of 7 per cent due to macroeconomic shocks are 5 in the baseline, 6 each in medium and severe stress scenarios and 7 in the very severe stress scenario. At the end of March 2020, these banks had low Tier 1 capital (either already below 7 percent or marginally higher).

2.87   Additional solvency losses to the banking system due to contagion (over and above the initial loss of capital due to the macro shocks), in terms of Tier 1 capital of the banking system is 4.09 per cent in the case of baseline and medium stress scenarios and 4.15 and 4.18 per cent in case of severe stress and very severe stress scenarios, respectively. Under such conditions, two additional banks fail due to

contagion in the baseline scenario, severe and very severe stress scenarios, while one additional bank fails in the medium stress scenario. The contagion impact is low because these are relatively smaller banks with limited borrowings in the inter-bank market and also because other banks are well capitalised. Going forward, merger of two of the failing banks with stronger banks (which became effective on April 01, 2020) will further increase systemic resilience (Chart 2.37).

Chart 2.37: Contagion Losses due to Macroeconomic Shocks
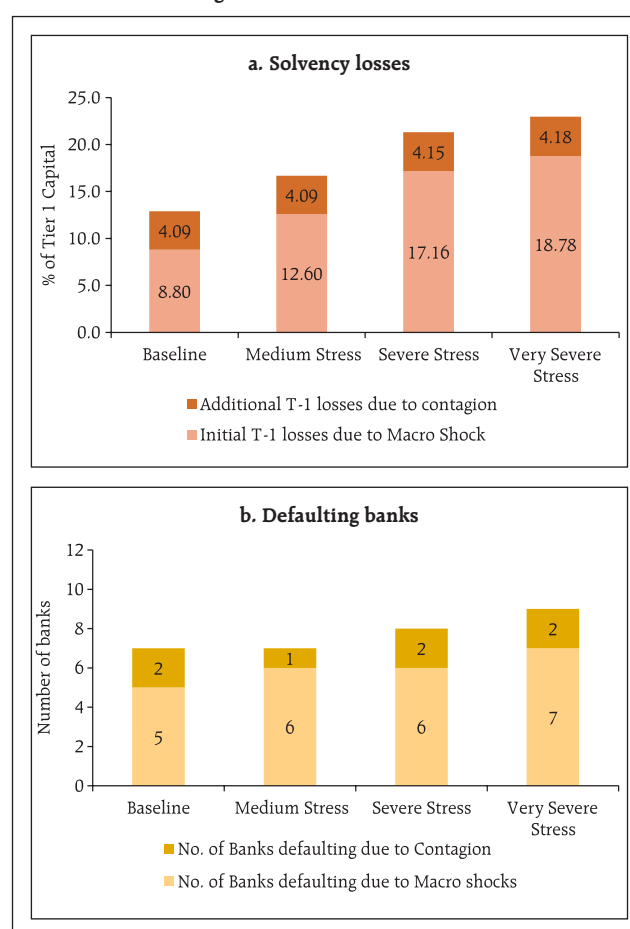
Note: The projected capital in March 2021 makes a conservative assumption of minimum profit transfer to capital reserves at 25 per cent and does not take into account any capital infusion by stakeholders.
Source: The Reserve Bank's supervisory returns and staff calculations.

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[51] Failure Criterion for both PSBs and PVBs has been taken as Tier 1 CRAR falling below 7 per cent.

[52] The contagion analysis used the results of the macro-stress tests and made the following assumptions:
   a)   The projected losses under a macro scenario (calculated as reduction in projected Tier 1 CRAR, in percentage terms, in March 2021 with respect to the actual value in March 2020) were applied to the March 2020 capital position assuming proportionally similar balance sheet structures for both March 2020 and March 2021.
   b)   Bilateral exposures between financial entities are assumed to be similar for March 2020 and March 2021.

2.88 In sum, in the wake of COVID-19 induced disruptions, the regulatory dispensations extended across regulatory jurisdictions are intended to minimise the risks in an effort to protect solvency of the overall system. As a consequence, there will inevitably be an increased stress in the financial system. Given the importance of the overall system to function as a going concern, the policy measures have ensured the resilience of the financial system.

2.89 The banking system may need to augment its capital to cater to a post-COVID-19 revival in the economy. A shrinking inter-bank market along with higher capitalisation have moderated the inter-bank contagion risks. While the exposure of mutual funds to NBFCs/HFCs moderated, the same of banks increased. Mutual funds have to improve their liquidity framework to contain spillovers.