Chapter II

Financial Institutions: Soundness and Resilience

The Indian banking system has remained resilient with robust capital buffers, strong operational performance, and declining asset impairment. Macro stress tests indicate that banks' aggregate capital would remain above the regulatory minimum even under adverse scenarios. The NBFC sector witnessed robust credit growth while maintaining strong balance sheet and profitability. In terms of bilateral exposures, interconnectedness among financial sector entities continued to rise. Mutual funds remain the largest fund providers in the financial system, whereas NBFCs are the largest receivers of funds.

Introduction

2.1 Financial intermediation by banks and other financial institutions supports private sector funding needs as well as public finance requirements in a growing economy. Even as banking business has expanded at a strong pace, asset quality and profitability have both witnessed sustained improvement, and capital positions have been strengthened. After the post-pandemic acceleration, however, credit by both banks and non-banking financial companies (NBFCs) in India has recorded some moderation across major sectors during 2024 so far.

2.2 This chapter presents stylised facts and analyses on latest developments in the domestic financial sector. Section II.1 outlines the performance of SCBs in India through various parameters, *viz.*, business mix; asset quality; concentration of large borrowers; capital adequacy; earnings; and profitability. Macro stress tests and sensitivity analyses are also performed to evaluate the resilience of SCBs under adverse scenarios. Sections II.2 and II.3 examine the financial parameters of urban cooperative banks (UCBs) and NBFCs, respectively, including their resilience under various simulations of stress. Sections II.4, II.5 and II.6 examine the soundness and resilience of mutual funds, clearing corporations and insurance sector, respectively. Section II.7 concludes the chapter with a detailed analysis of the network structure and connectivity of the Indian financial system, with contagion analysis under adverse scenarios.

II.1 Scheduled Commercial Banks (SCBs)[1][2][3][4]

2.3 Against the backdrop of the recent monetary policy tightening cycle in India, bank deposits continue to exhibit double digit growth but their profile has gradually shifted towards schemes offering higher returns (Chart 2.1 a). While term deposit growth moderated for both PSBs and PVBs, they continue to outpace current and savings account (CASA) deposit growth (Chart 2.1 b). As on December 13, 2024, aggregate deposits of SCBs rose (y-o-y) by 11.4 per cent.

[1] Analyses are mainly 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 this exercise, SCBs include public sector banks, private sector banks and foreign banks.

[2] The analyses done in the chapter are based on the data available as on December 12, 2024 which are provisional.

[3] Personal loans refer to loans given to individuals and consist of (a) consumer credit, (b) education loan, (c) loans given for creating/enhancement of immovable assets (*e.g.* housing, *etc.*), and (d) loans given for investment in financial assets (shares, debentures, *etc.*).

[4] Private sector bank data for September 2023 quarter onwards are inclusive of merger of a large housing finance company with a private bank and therefore, the data may not be comparable to past periods before the merger (applicable for all charts and tables).

2.4 The growth in bank credit has converged towards deposit growth – as on December 13, 2024, bank credit increased by 11.3 per cent (y-o-y). Bank group-wise break-up shows a moderation in credit growth for both PSBs and PVBs in September 2024; foreign banks (FBs) recorded a rise after a period of low growth (Chart 2.1 c). Industrial credit has been accelerating from low levels but remains below the growth in loans to other major sectors, *viz.*, agricultural, services and personal loans segments (Chart 2.1 d and e). Services and personal loans led the overall credit growth; within personal loans, credit card receivables continued to post robust growth. Growth in personal loans has halved from high levels on the back of both high base and lower originations, but its expansion continued to be broad-based, with housing loans as the standout contributor (Chart 2.1 e, f, g and h).

Chart 2.1: Deposit and Credit Profile of SCBs *(Contd.)*

Chart 2.1: Deposit and Credit Profile of SCBs *(Concld.)*

Notes: Transfer of retail business of a foreign bank to a PVB in March 2023 has impacted the growth rates of PVBs and FBs. The spurt in housing loans of PVBs in Sep-23 and Mar-24 is attributable to the merger of a large housing finance company with a private bank.
Sources: RBI supervisory returns and staff calculations.

II.1.1 Asset Quality

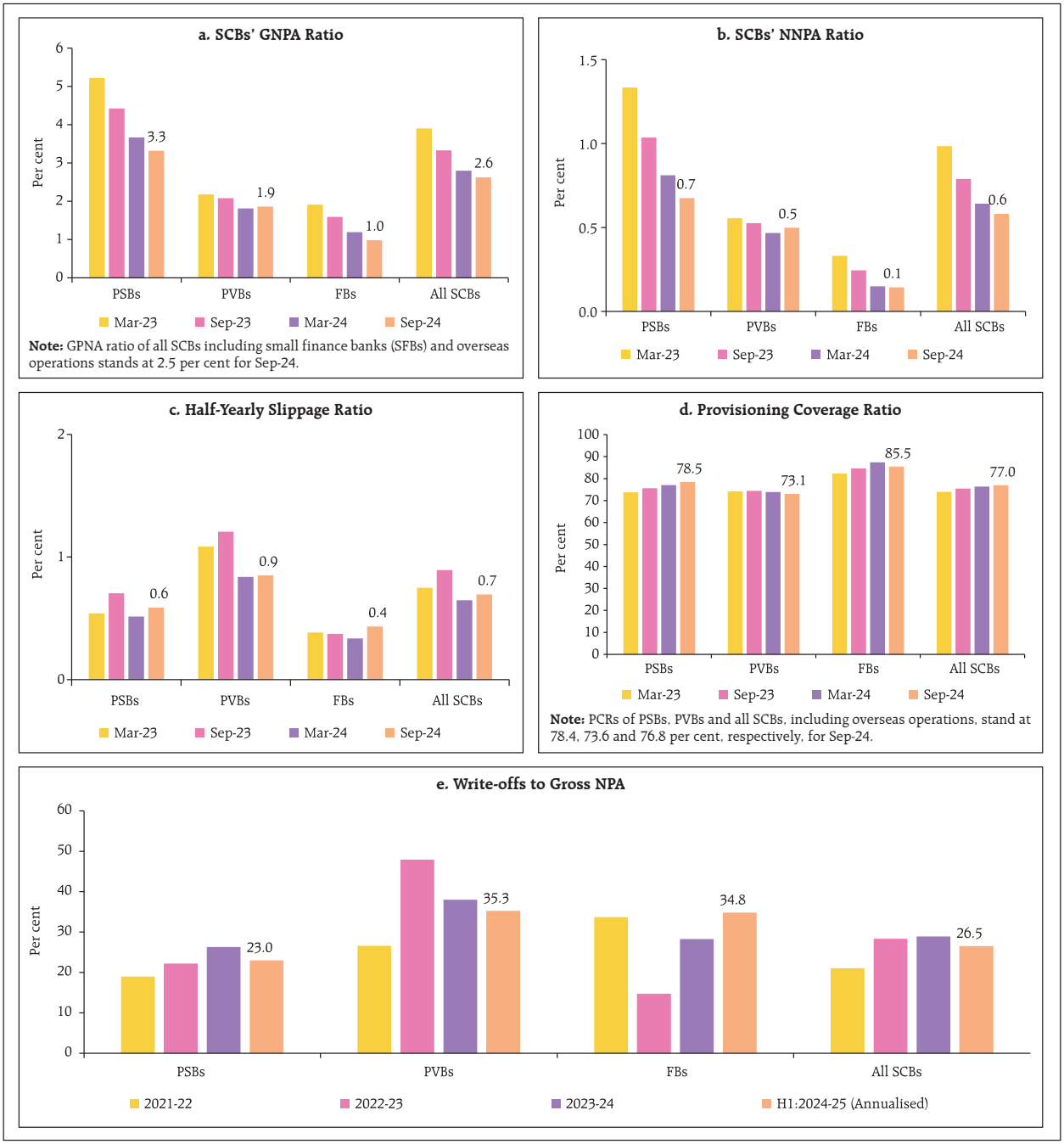
2.5 Asset quality of SCBs improved further, with their GNPA ratio declining to a 12-year low of 2.6 per cent in September 2024 (Chart 2.2 a). The NNPA ratio[5] remained at around 0.6 per cent (Chart 2.2 b). The half-yearly slippage ratio, measuring new accretions to NPAs as a share of standard advances at the beginning of the half-year, increased marginally to 0.7 per cent (Chart 2.2 c). The provisioning coverage ratio (PCR)[6] of SCBs improved further to 77.0 per cent in September 2024, largely due to proactive

[5] NNPA ratio is the proportion of net non-performing assets in net loans and advances.

[6] PCR is the proportion of provisions (without write-offs) held for NPAs to GNPA.

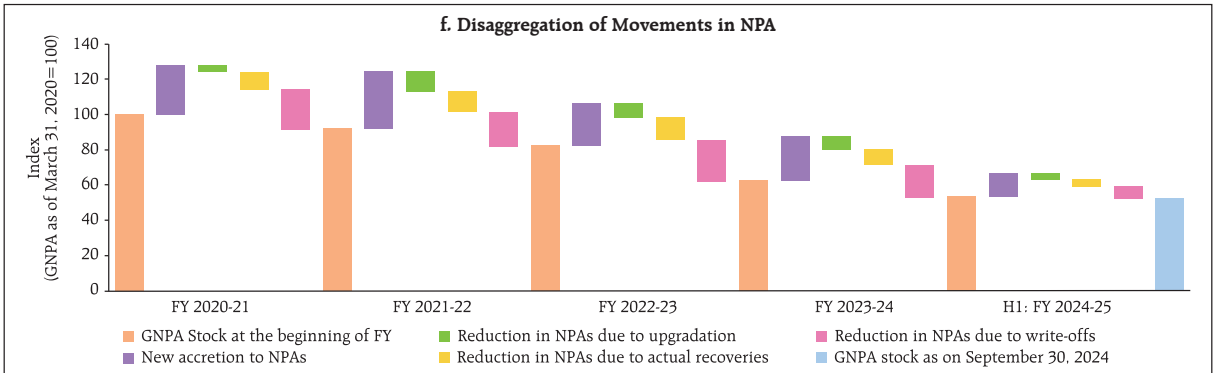
provisioning by PSBs (Chart 2.2 d). The write-off to GNPA ratio[7] for FBs increased in September 2024 while that of PSBs and PVBs declined marginally (Chart 2.2 e). Disaggregation of NPA movements reveals that write-offs remain a significant component of NPA reduction (Chart 2.2 f).

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



[7] Ratio of write-offs (including technical/prudential write-offs and compromise settlement) during the period to GNPA at the beginning of the period.

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



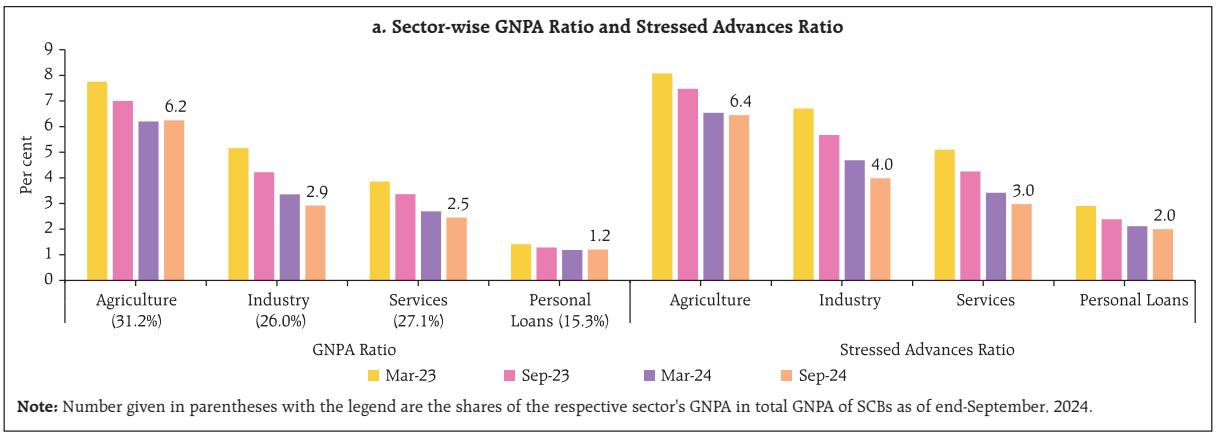
Note: Stock of GNPA, new accretions, reduction in NPAs due to upgradation, actual recoveries and write-offs have been derived as an index with GNPA stock as on 31st March, 2020 as 100.

Sources: RBI supervisory returns and staff calculations.

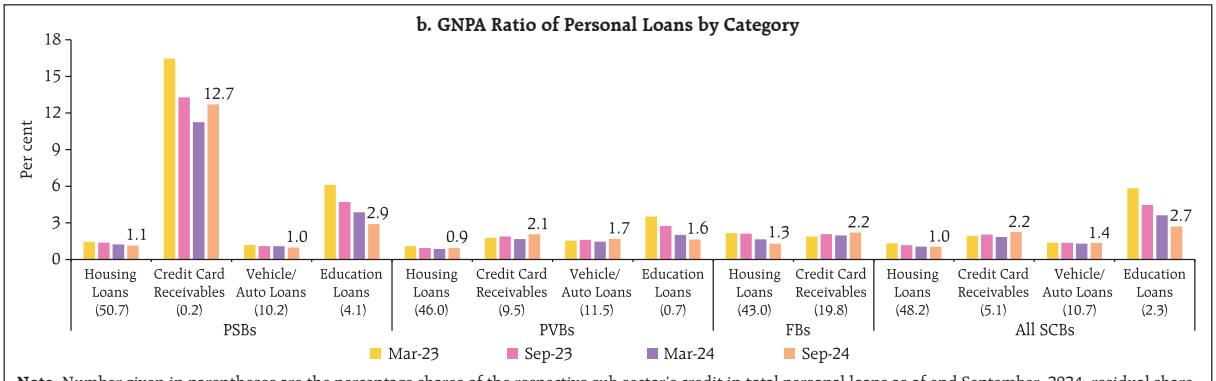
II.1.2 Sectoral Asset Quality

2.6 The improvement in asset quality of SCBs was broad based across sectors and bank groups (Chart 2.3 a). In the personal loans segment, asset quality remained largely stable, except for a marginal uptick in respect of credit card receivables

Chart 2.3: Sectoral Asset Quality Indicators *(Contd.)*

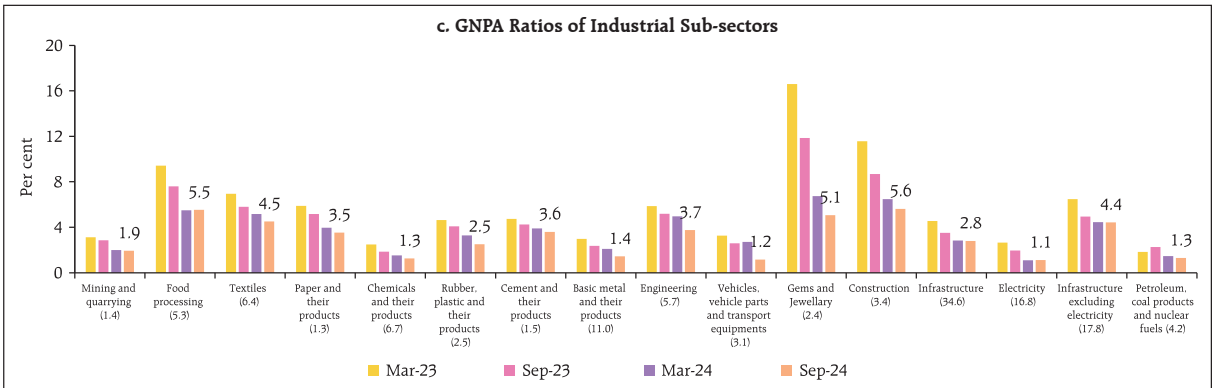


Note: Number given in parentheses with the legend are the shares of the respective sector's GNPA in total GNPA of SCBs as of end-September, 2024.



Note: Number given in parentheses are the percentage shares of the respective sub-sector's credit in total personal loans as of end-September, 2024; residual share pertains to other personal loans. Vehicle/auto loans and education loans for FBs have not been considered due to negligible amounts.

Chart 2.3: Sectoral Asset Quality Indicators *(Concld.)*



Note: Numbers given in parentheses with the legend are the percentage shares of the respective sub-sector's credit in total credit to industry as of end-September, 2024.

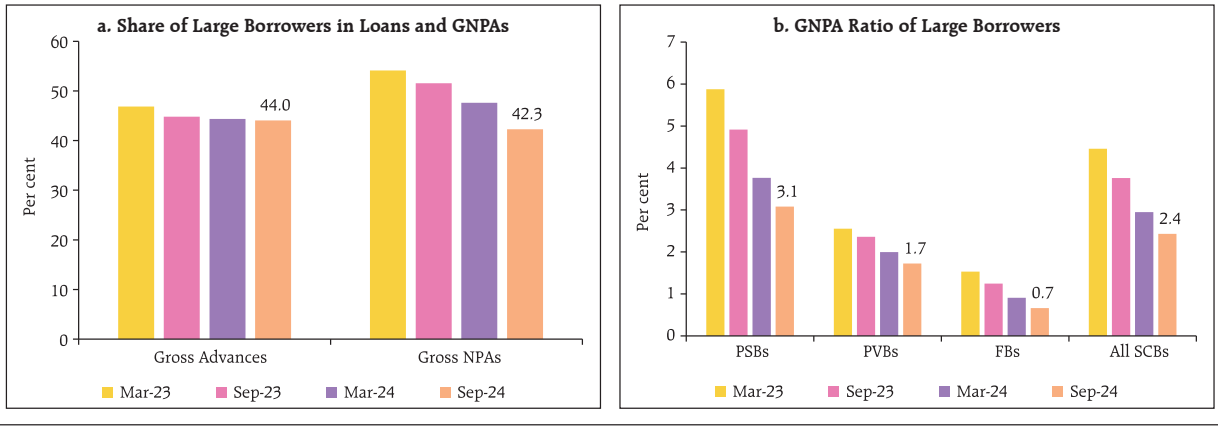
Sources: RBI supervisory returns and staff calculations.

across bank groups, which recorded the highest credit growth within the personal loans segment and may require careful monitoring. Within the industrial sector, asset quality exhibited sustained improvement across the major sub-sectors (Chart 2.3 b and c).

II.1.3 Credit Quality of Large Borrowers[8]

2.7 The share of large borrowers in GNPA of SCBs has steadily declined over the past two years, faster than the reduction in their share in overall credit (Chart 2.4 a). The asset quality of banks' large borrower portfolios has improved considerably, with the GNPA ratio falling from 4.5 per cent in March 2023 to 2.4 per cent in September 2024 (Chart 2.4 b). SMA-1 and SMA-2[9] loans have, however, risen sequentially (q-o-q) in the September 2024 quarter (Chart 2.4 c). Furthermore, the SMA-2

Chart 2.4: Select Asset Quality Indicators of Large Borrowers *(Contd.)*



[8] 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.

[9] Special mention account (SMA) is defined as
(a) Loans in the nature of revolving facilities like cash credit/overdraft: if outstanding balance remains continuously in excess of the sanctioned limit or drawing power, whichever is lower, for a period of 31-60 days - SMA-1; 61-90 days - SMA-2.
(b) Loans other than revolving facilities: if principal or interest payment or any other amount wholly or partly overdue remains outstanding up to 30 days - SMA-0; 31-60 days - SMA-1; 61-90 days - SMA-2.

Chart 2.4: Select Asset Quality Indicators of Large Borrowers *(Concld.)*

Sources: RBI supervisory returns and staff calculations.

ratio for large borrowers increased significantly for PSBs in September 2024 from a year ago, warranting close monitoring (Chart 2.4 d). In the large borrower segment, the share of standard assets in total funded amount has consistently improved over the past two years (Chart 2.4 e). Within the large borrowers' cohort, the share of top 100 borrowers has decreased to 34.6 per cent in September 2024, reflecting a growing credit appetite among medium-sized borrowers. Notably, none of the top 100

borrowers are classified as NPAs in September 2024 (Chart 2.4 f). In terms of value, investment grade advances (rated BBB and above) constituted 91.5 per cent of the funded advances to large borrowers with long-term external ratings (Chart 2.4 g).

II.1.4 Capital Adequacy

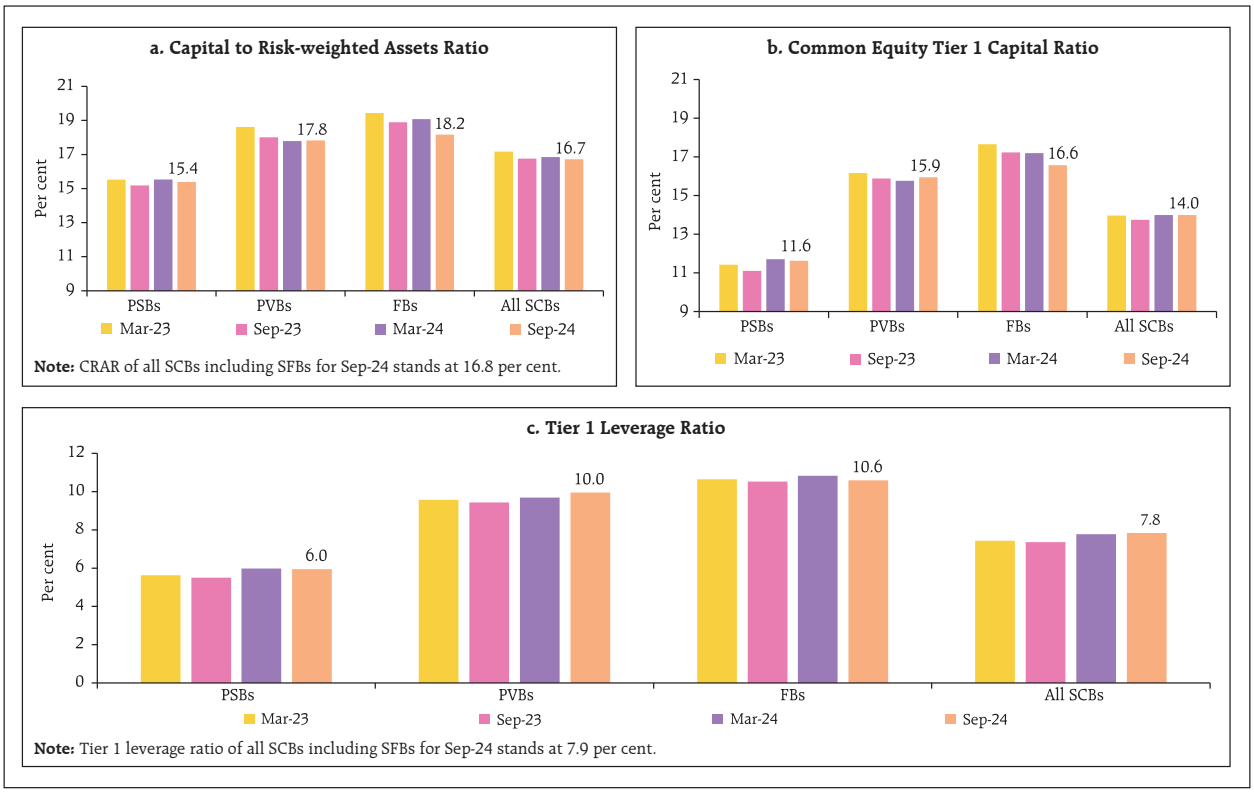
2.8 CRAR and CET1 ratios of SCBs displayed similar movements and stood at 16.7 per cent and 14.0 per cent, respectively, in September 2024, which were much higher than the regulatory minimum (Chart 2.5 a and b). The overall Tier 1 leverage ratio[10] remained stable (Chart 2.5 c). CRAR, CET1 and leverage ratios of foreign banks declined marginally during H1:2024-25.

II.1.5 Earnings and Profitability

2.9 Profitability of SCBs improved during H1:2024-25, with profit after tax (PAT) surging by 22.2 per cent (y-o-y). PSBs and PVBs recorded PAT growth of 30.2 per cent and 20.2 per cent, respectively, while FBs experienced single digit growth (8.9 per cent). The rise in other operating income (OOI) contributed significantly to the rise in profits of PSBs and PVBs (Chart 2.6 a).

2.10 The cost of funds has risen in sync with the monetary policy tightening cycle (Chart 2.6 b). On the other hand, overall yield on assets remained broadly stable (Chart 2.6 c). As a result, net interest margin (NIM) has marginally contracted

Chart 2.5: Capital Adequacy



Sources: RBI supervisory returns and staff calculations.

[10] Tier I leverage ratio is the ratio of Tier I capital to total exposure.

across all bank groups (Chart 2.6 d). Nevertheless, both return on equity (RoE) and return on assets (RoA) ratios have improved in September 2024 (Chart 2.6 e and f).

Chart 2.6: Select Performance Indicators of SCBs *(Contd.)*

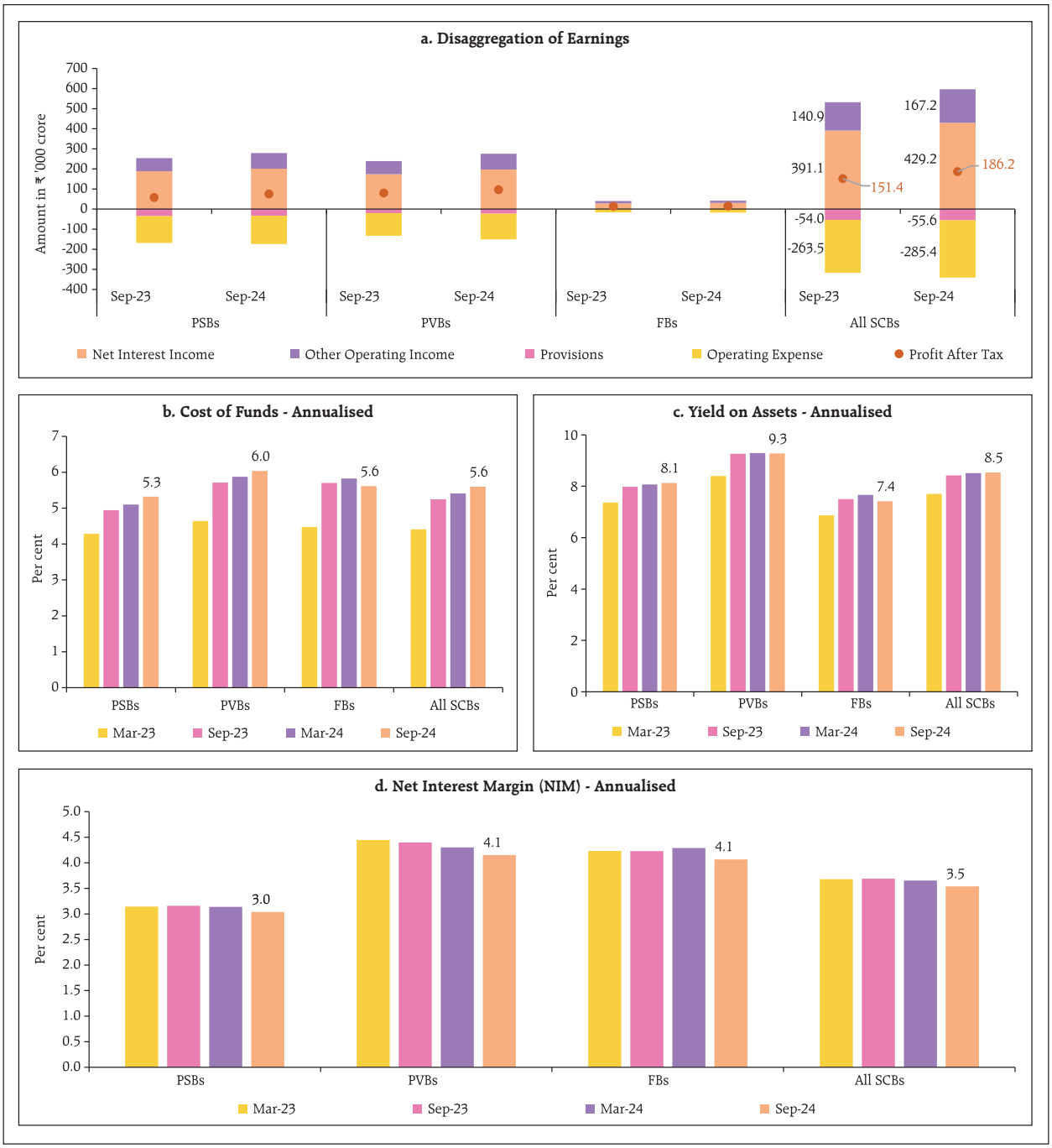
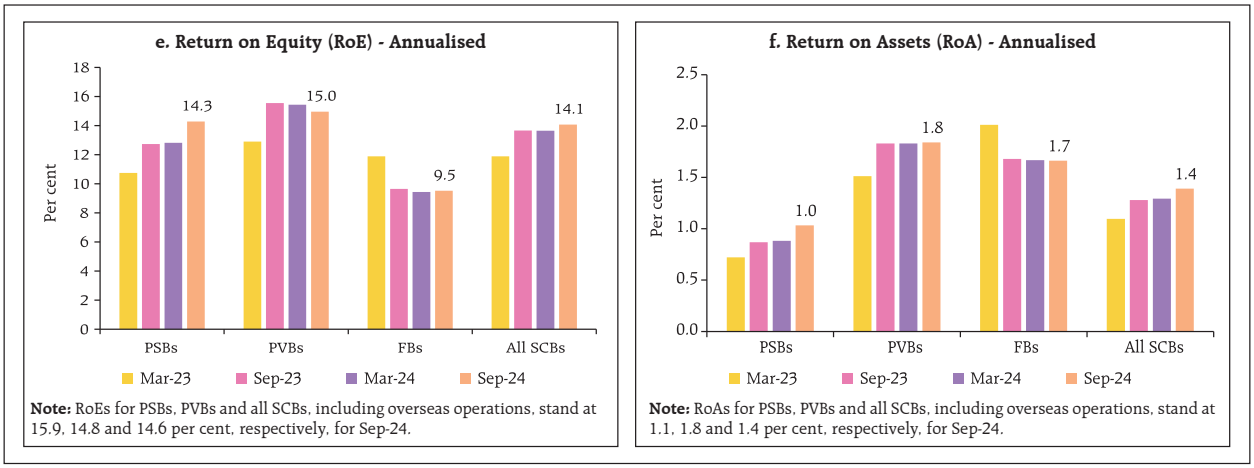


Chart 2.6: Select Performance Indicators of SCBs *(Concld.)*



Note: RoEs for PSBs, PVBs and all SCBs, including overseas operations, stand at 15.9, 14.8 and 14.6 per cent, respectively, for Sep-24.

Note: RoAs for PSBs, PVBs and all SCBs, including overseas operations, stand at 1.1, 1.8 and 1.4 per cent, respectively, for Sep-24.

Sources: RBI supervisory returns and staff calculations.

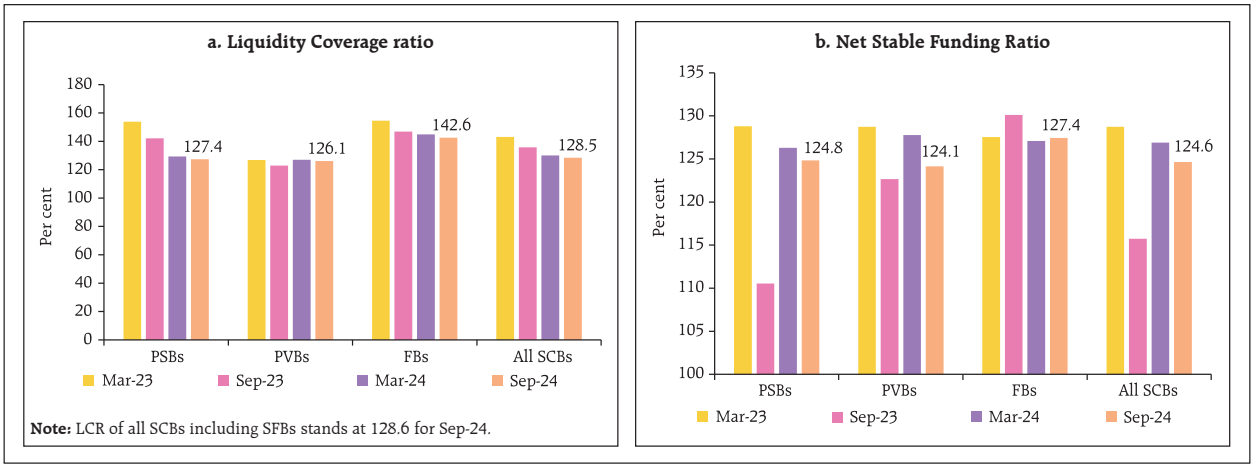
II.1.6 Liquidity

2.11 The liquidity coverage ratio (LCR) has been comfortably above the regulatory minimum of 100 per cent across bank groups. It is the highest in the case of FBs (Chart 2.7 a). The net stable funding ratio (NSFR) has also remained above the regulatory minimum of 100 per cent across all bank groups. The growth of 'required stable funding' for PSBs and PVBs between March 2024 and September 2024 has outpaced the growth of 'available stable funding' during the same period, which has resulted in a marginal decline in NSFR for these bank groups (Chart 2.7 b).

II.1.7 Resilience – Macro Stress Tests

2.12 Macro stress tests are performed to assess the resilience of SCBs' balance sheets to unforeseen shocks emanating from the macroeconomic environment. The framework for macro stress testing has been revised from this issue of the FSR (Box 2.1). The macro stress tests attempt to project capital ratios of banks under a baseline and two adverse macro scenarios over a one-and-half year horizon, *i.e.*, till end-March 2026 incorporating credit risk, interest rate risk in the banking book and market risk. The baseline scenario is derived from the forecasted path of macroeconomic

Chart 2.7: Liquidity Ratios



Note: LCR of all SCBs including SFBs stands at 128.6 for Sep-24.

Sources: RBI supervisory returns and staff calculations.

Box 2.1: Revised Macro Stress Testing Framework

The macro stress testing framework has been revamped with the technical support of the International Monetary Fund (IMF, 2024). The salient features of the revised framework are enlisted below:

(i) Projection of internally consistent adverse macro-financial scenarios based on scenario narratives and by performing simulations based on a vector autoregression model with exogenous variables (VARX).

(ii) Projection of slippage ratio, interest income and interest expense at bank level using panel regression models.

(iii) Incorporation of market risk in the solvency stress testing framework.

(iv) Scenario horizon of 1.5 - 2 years, generating projections of key financial ratios as at the end of the ensuing financial years.

Macro-scenario design: The test envisages three scenarios - a baseline and two hypothetical adverse macro scenarios. While the baseline scenario is derived from the forecasted path of macroeconomic variables, the two adverse scenarios are hypothetical stringent stress scenarios derived by performing simulations using the VARX model,

$$Y_t = \sum_{p=1}^{P} A_p Y_{t-p} + \sum_{s=0}^{S} B_s X_{t-s} + u_t \quad \ldots(1)$$

based on GDP growth, CPI inflation, repo rate and lending spread as endogenous variables and US-GDP growth and US-VIX as exogeneous variables, as well as by assuming hypothetical stress scenario narratives.

Projection of key financial variables: Bank-wise slippage ratio, interest income and interest expense are projected based on bank-level panel regression models. GNPA ratios and provisions are projected using structural models. Non-interest income comprising of (a) fee income and (b) other operating income excluding fee income, and non-interest expenses are projected based on assumed growth rates of these variables under each scenario.

(i) **Projection of slippage ratios:** The quarterly slippage ratios are projected using the following panel regression model;

$$Z_{i,t} = \beta_Z * Z_{i,t-1} + \beta'_X * X_{t-s} + \mu'_i + \lambda'_{it} + \varepsilon'_{i,t}, \quad \ldots(2)$$

for $t = 1, \ldots, T$ and $i = 1, \ldots, N$

$Z_{i,t}$ is the quarterly slippage ratio of bank *i* during quarter *t*, X_t is a vector of macroeconomic variables including lending spread and GDP growth, μ'_i represents bank-specific fixed effects, λ'_{it} represents adjustments for specific quarters and $\varepsilon'_{i,t}$ is an i.i.d. error term. Subsequently, the estimates of quarterly slippage ratios, $\hat{Z}_{i,t}s$, are computed based on first differences of the regression equation (2) as,

$$\hat{Z}_{i,t} = \hat{Z}_{i,t-1} + \Delta\hat{Z}_{i,t} = \hat{Z}_{i,t-1} + \{\beta_Z \times \Delta\hat{Z}_{i,t-1} + \beta'_X \times \Delta\hat{X}_{i,t-1}\} \quad \ldots(3)$$

(ii) **Projection of GNPAs:** Bank-level GNPAs are projected using the equation,

$$NPL_{i,t} = NPL_{i,t-1}(1 - WRO_{i,t} - CURER_{i,t} - RECR_{i,t}) + PD_{i,t}.PL_{i,t-1} \quad \ldots(4)$$

where $NPL_{i,t}$ represents the stock of GNPA of bank *i* at the end of quarter *t*, $WRO_{i,t}$, $CURER_{i,t}$ and $RECR_{i,t}$ are write-off, upgradation and recovery rates of bank *i* during the quarter respectively, $PD_{i,t}$ is the probability of default (slippage ratio) projected in (3) and $PL_{i,t-1}$ is the stock of performing loans at the end of quarter t-1.

(iii) **Projection of performing loans:** The stock of performing loans for bank *i* at the end of quarter, t, $PL_{i,t}$ is projected as,

$$PL_{i,t} = PL_{i,t-1}(1 - PD_{i,t}) + NPL_{i,t-1}.CURER_{i,t} \quad \ldots(5)$$

(iv) **Projection of provisions:** Provisions of bank *i* for quarter t are projected as follows,

$$Provisions_{i,t} = PD_{i,t}.LGD_t.PL_{i,t-1}.PCR \quad \ldots(6)$$

where provisioning coverage ratio (PCR) is assumed at 75 per cent, loss given default (LGD) during quarter t is derived based on the model of Frye and Jacobs (2012),

$$LGD_{i,t0+h} = \frac{\Phi(\Phi^{-1}(PD_{i,t0+h}) - k)}{PD_{i,t0+h}} \quad \ldots(7)$$

and the parameter k is derived as,

$$k = \frac{\Phi^{-1}(PD^*_{i,t0}) - \Phi^{-1}(PD^*_{i,t0} \times LGD^*_{i,t0})}{\sqrt{1-\rho}} \quad \ldots(8)$$

PD* and LGD* are long-term average PDs and LGDs and Φ represents the cumulative normal distribution function.

(Contd.)

(v) **Projection of interest income and expenses:** Interest income (as share of interest-earning assets) and interest expenses (as share of interest-bearing liabilities) are modelled as functions of macroeconomic variables (GDP growth and call rate) and bank fixed effects with structure similar to equation (2). Bank-wise projections of these ratios are applied to derive shocks to yield on assets and cost of funds for each bank. These shocks are further applied on granular risk sensitive asset and risk sensitive liability portfolio of each bank to assess interest rate risk which comprises of, (i) interest rate risk due to changes in risk-free rates and (ii) interest rate risk due to changes in credit and funding spreads.

(vi) **Projection of market risk:** Market risk is estimated by applying MTM revaluation of bond (AFS and HFT portfolio) exposures of banks using three inputs, (1) bond exposure, (2) Macaulay duration, and (3) interest rate shock, using the bond revaluation formula:

$$\Delta V_{t+1} = -V_t \frac{D}{(1+r_t+s_t)}(\Delta r_{t+1} + \Delta s_{t+1}) \quad \ldots(9)$$

where D is the Macaulay duration, r is the risk-free rate, s is credit spread component, V_t is the market value at time t , Δr_{t+1} represents the risk-free rate shift and Δs_{t+1} the credit spread shift. Further, equity and foreign exchange risks are also factored into market risk.

(vii) **Projection of net profit:** Net profit is projected as,

Net Profit = Interest Income – Interest Expenses + Non-interest income – Non-interest Expenses + Trading income – Loss Provisions – Provisions for Income Tax

(viii) **Projection of capital:** Capital is projected as,

$Capital_{t+1}$ = *Capital*$_t$ + *Net Profit*$_{(t,t+1)}$ + *Other Comprehensive Income*$_{(t,t+1)}$ – *Dividend*

(ix) **Projection of Risk weighted assets (RWA):** RWA-credit risk is projected as,

RWA_{t+1} = *(RWA*$_t$ *– Reduction in RWA due to new provisions).(1+g/100) + Additional RWA due to new defaulted loans*

where g is the growth rate assumed to be at nominal GDP growth rate. RWA-market risk and RWA-operational risk are projected to grow at assumed growth rates.

Major assumptions: Provisions for income tax are assumed at 30 per cent, 25 per cent and 35 per cent of profit before tax respectively for public sector banks (PSBs), private banks (PVBs) and foreign banks (FBs), based on the data of previous years. Dividend payout ratio is assumed at 35 per cent of net profit. Balance sheet is projected to grow at the rate of nominal GDP growth.

References:

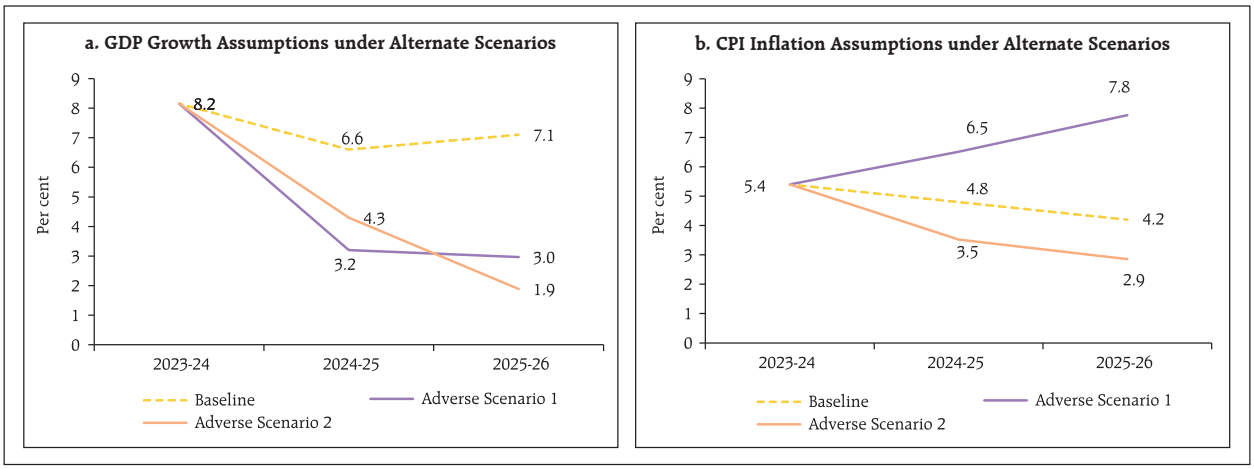
1. Frye and Jacobs (2012), "Credit Loss and Systematic Loss Given Default," The Journal of Credit Risk.
2. International Monetary Fund (2024). 'India: Technical Assistance Report-Review and Evaluation of the Reserve Bank of India's Stress Test Model Framework', November 01, 2024.

variables. The two adverse scenarios, as described below, are stringent conservative hypothetical stress scenarios (Chart 2.8). The paths of the macro variables under the adverse scenarios are derived by performing simulations that are based on a vector autoregression model with exogenous variables (VARX).

(i) ***Adverse Scenario 1:*** This scenario assumes persisting geopolitical risks and escalation of global financial market volatility. Due to supply chain disruptions percolating to commodity prices, domestic inflation soars. Consequently, domestic monetary policy tightens and the spread between policy rate and lending rate widens.

(ii) ***Adverse Scenario 2:*** This scenario assumes that global and idiosyncratic risk factors blend to trigger a synchronized sharp growth slowdown in key economies. Spillovers through trade and financial channels as well as market fragmentation impact domestic GDP growth. The scenario further assumes that although the central bank eases monetary policy, incomplete monetary policy transmission due to high uncertainty widens the spread between policy rate and lending rate.

Chart 2.8: Macro Scenario Assumptions

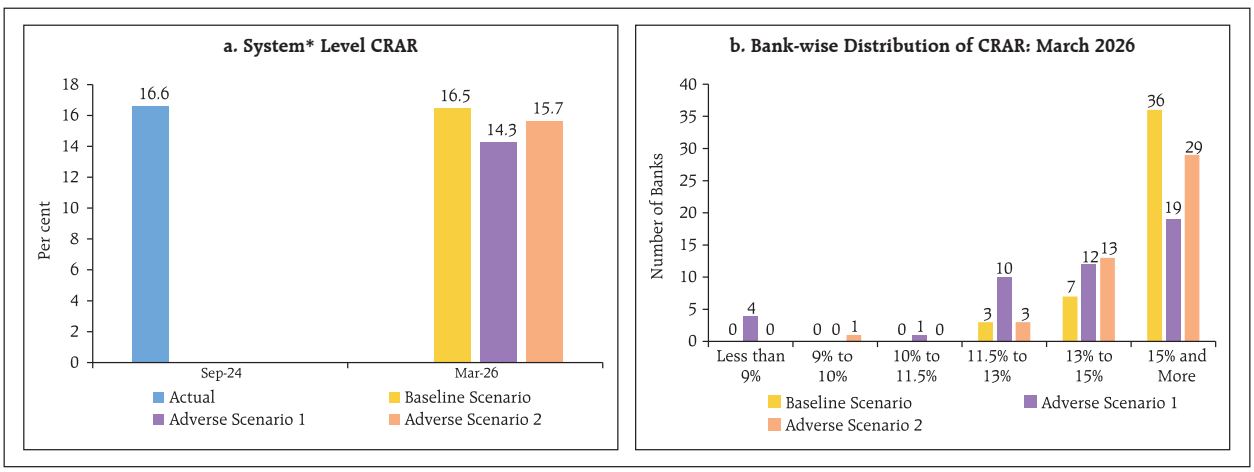


Source: RBI staff calculations.

2.13 The stress test results reveal that the aggregate CRAR of 46 major SCBs may fall from 16.6 per cent in September 2024 to 16.5 per cent by March 2026 under the baseline scenario and to 15.7 per cent under adverse scenario 2. No bank would fall short of the minimum capital requirement of 9 per cent under both the scenarios. However, under adverse scenario 1, SCBs' aggregate CRAR may deplete to 14.3 per cent and four banks may breach the minimum capital requirement of 9 per cent (Chart 2.9).

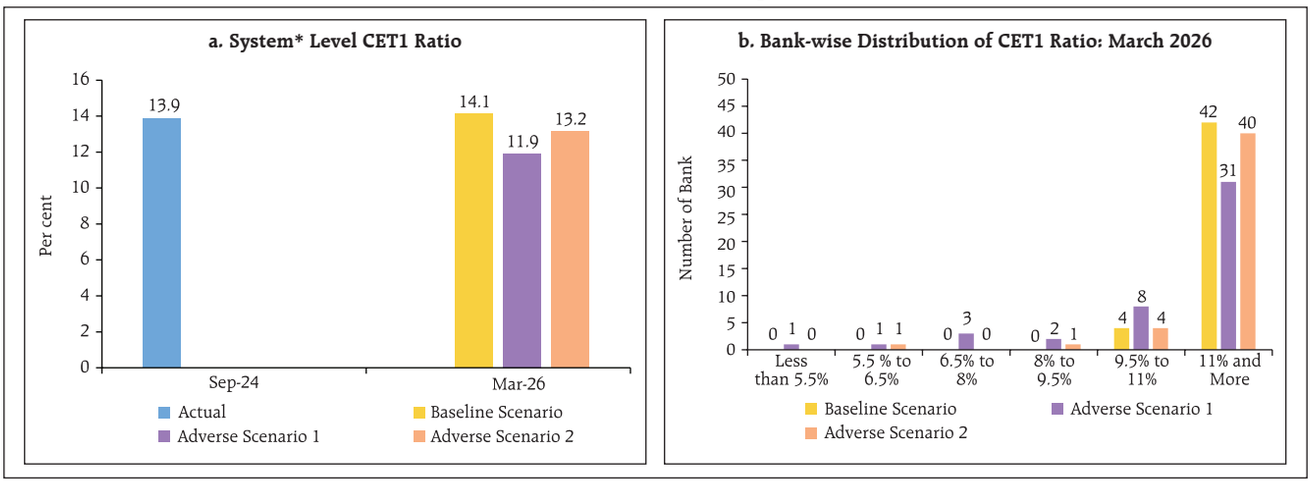
2.14 The CET1 capital ratio of the select 46 banks may marginally rise from 13.9 per cent in September 2024 to 14.1 per cent by March 2026 under the baseline scenario, but it may worsen to 13.2 per cent under adverse scenario 2. Under adverse scenario 1, the ratio may fall to 11.9 per cent and one bank may breach the minimum capital requirement of 5.5 per cent, although none of the banks would fail under the baseline scenario and adverse scenario 2 (Chart 2.10).

Chart 2.9: CRAR Projections



Note: * For a system of 46 select banks.
Source: RBI staff calculations.

Chart 2.10: Projection of CET1 Capital Ratio

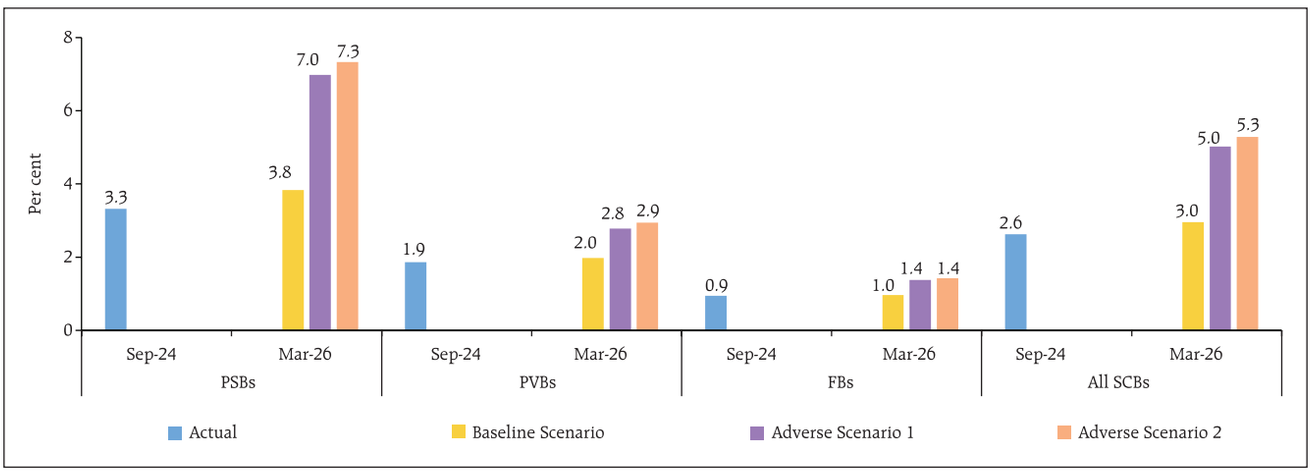


Note: * For a system of 46 select banks.
Sources: RBI supervisory returns and staff calculations.

2.15 The aggregate GNPA ratio of the 46 banks may rise from 2.6 per cent in September 2024 to 3.0 per cent in March 2026 under the baseline scenario and further to 5.0 per cent and 5.3 per cent, respectively, under adverse scenario 1 and adverse scenario 2. Credit risk is comparatively severe under adverse scenario 2; the GNPA ratios of PSBs may rise from 3.3 per cent in September 2024 to 7.3 per cent in March 2026, whereas it may go up from 1.9 per cent to 2.9 per cent for PVBs and from 0.9 per cent to 1.4 per cent for FBs (Chart 2.11).

2.16 The impact of liquidity risk on the solvency of SCBs has been simulated under the hypothetical scenario of a run of 25 per cent on customer deposits along with 75 per cent demand on unutilised portion of committed credit lines. It is further assumed that banks try to meet the deposit run and demand from committed credit lines by using cash and cash equivalents first, followed by liquidation of held for trading (HFT) and available for sale (AFS) securities; and if the liquidity shortfall persists further, they resort to pledging of held for maturity (HTM) securities with the RBI. When banks avail central bank funding (CBF), the capital impact is estimated on the basis of the increased funding costs at the marginal standing facility (MSF) rate.

Chart 2.11: Projection of SCBs' GNPA Ratios



Sources: RBI supervisory returns and staff calculations.

The results show that under this assumed liquidity risk scenario, the CRAR of SCBs would reduce by additional 80-90 bps by March 2026, owing to expenses related to the use of CBF (Chart 2.12).

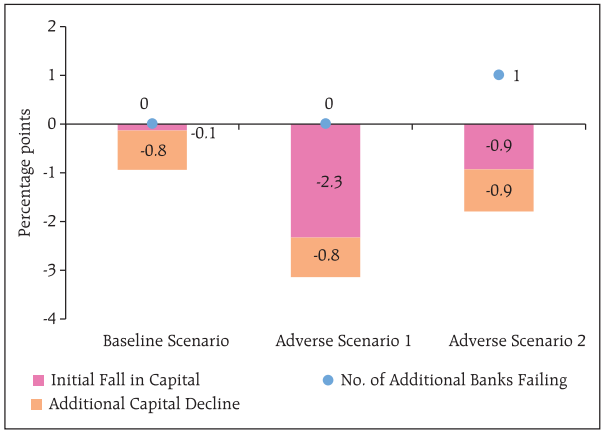
II.1.8 Sensitivity Analysis[11]

2.17 In case of macro stress tests, the shocks are in terms of adverse macroeconomic conditions, while in sensitivity analyses, shocks are applied to single factors like GNPA, interest rate, equity prices, deposits, and the like, one at a time. This sub-section presents the results of top-down sensitivity analyses involving several single-factor shocks to assess the vulnerabilities of SCBs to simulated credit, interest rate, equity and liquidity risks under various stress scenarios[12].

a. Credit Risk

2.18 Credit risk sensitivity has been analysed under two scenarios wherein the system level GNPA ratio is assumed to rise from its prevailing level by (i) one standard deviation (SD)[13]; and (ii) two SD in a quarter. Under a severe shock of two SD during Q2:2024-25: (a) the aggregate GNPA ratio of 46 select SCBs moves up from 2.6 per cent to 8.0 per cent; (b) the system-level CRAR depletes by 350 bps from 16.6 per cent to 13.1 per cent; and (c) the CET1 ratio declines from 13.9 per cent to 10.3 per cent, but both CRAR and CET1 ratio remain well above the respective regulatory minimum levels. The system level capital impairment could be 22.7 per cent in this case (Chart 2.13 a). The reverse stress test shows that a shock of 4.4 SD would be required to bring down the system-level CRAR below the regulatory minimum of 9 per cent. A shock of 6.3 SD would be required to bring down the system-level CET1 ratio below the prescribed regulatory minimum of 5.5 per cent.

Chart 2.12: Impact of Liquidity Risk on Solvency



Sources: RBI supervisory returns and staff calculations.

2.19 Bank-level stress tests indicate that under the severe (two SD) shock scenario, seven banks with a share of 11.8 per cent of SCBs' total assets may fail to maintain the regulatory minimum level of CRAR (Chart 2.13 b). In such a scenario, the CRAR would fall below 7 per cent in the case of three banks (Chart 2.13 c) and six banks would record a decline of over eight percentage points in the CRAR. In general, PVBs and FBs would face lower erosion in CRARs than PSBs under both scenarios (Chart 2.13 d).

b. Credit Concentration Risk

2.20 Stress tests on banks' credit concentration – considering top individual borrowers according to their standard exposures – show that in the extreme scenario of the top three individual borrowers of respective banks failing to repay[14],

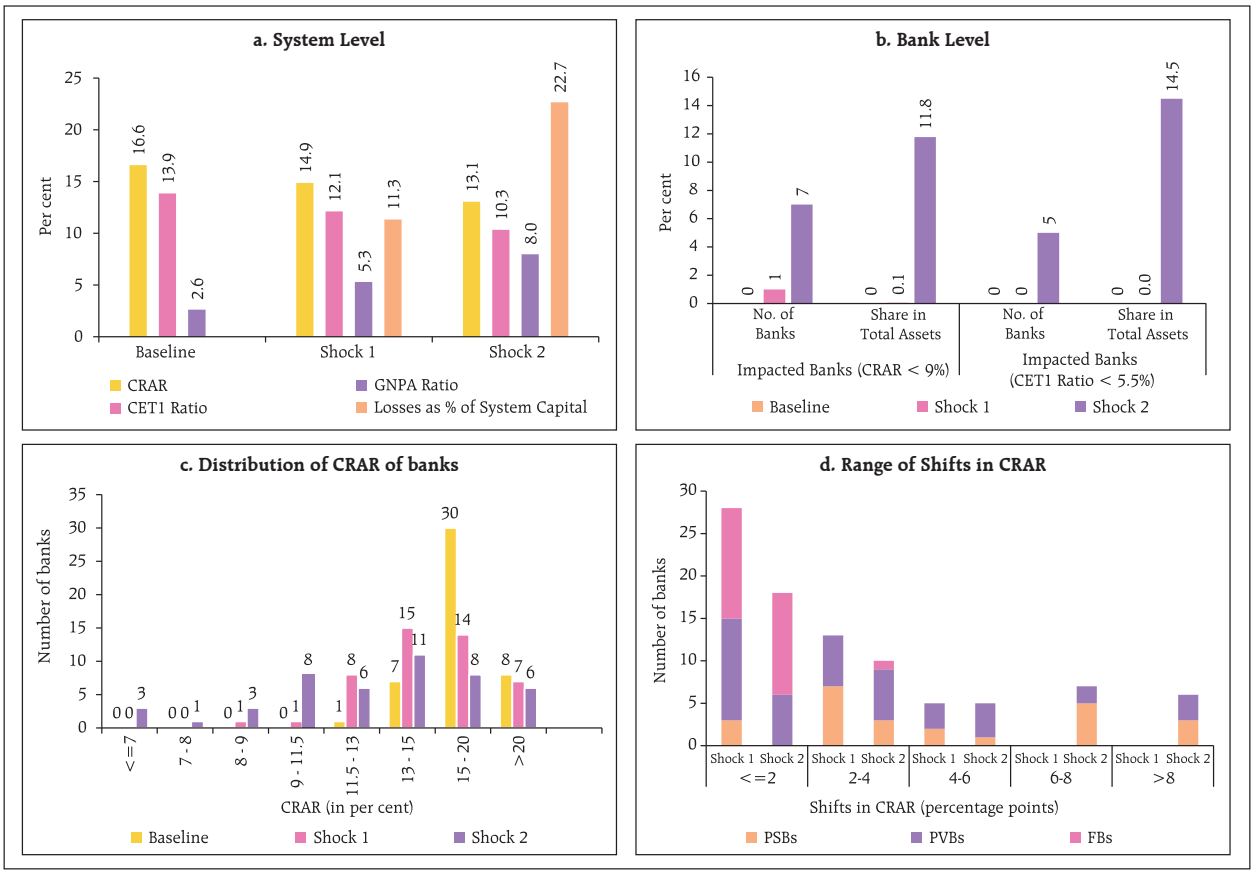
[11] Detailed methodology is provided in Annex 2.

[12] Macro stress test and single factor sensitivity analyses are conducted for a sample of 46 SCBs accounting for 98 per cent of the total assets of the banking sector, excluding RRBs and cooperative banks. From this round, the sample of 46 banks for stress test/ sensitivity analysis has been updated. The sample now includes 12 PSBs, 21 PVBs and 13 FBs. The shocks designed under various hypothetical scenarios are extreme but plausible.

[13] The SD of the GNPA ratio is estimated by using quarterly data for the last 10 years.

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

Chart 2.13: Credit Risk - Shocks and Outcomes



Note: For a system of select 46 SCBs.
Shock 1: 1 SD shock on GNPA ratio.
Shock 2: 2 SD shock on GNPA ratio.
Sources: RBI supervisory returns and staff calculations.

no bank would face a situation of a drop in CRAR below the regulatory minimum of 9 per cent (Chart 2.14 a). In this extreme stress case, four banks would experience a fall of more than two

Chart 2.14: Credit Concentration Risk: Individual Borrowers – Exposure *(Contd.)*

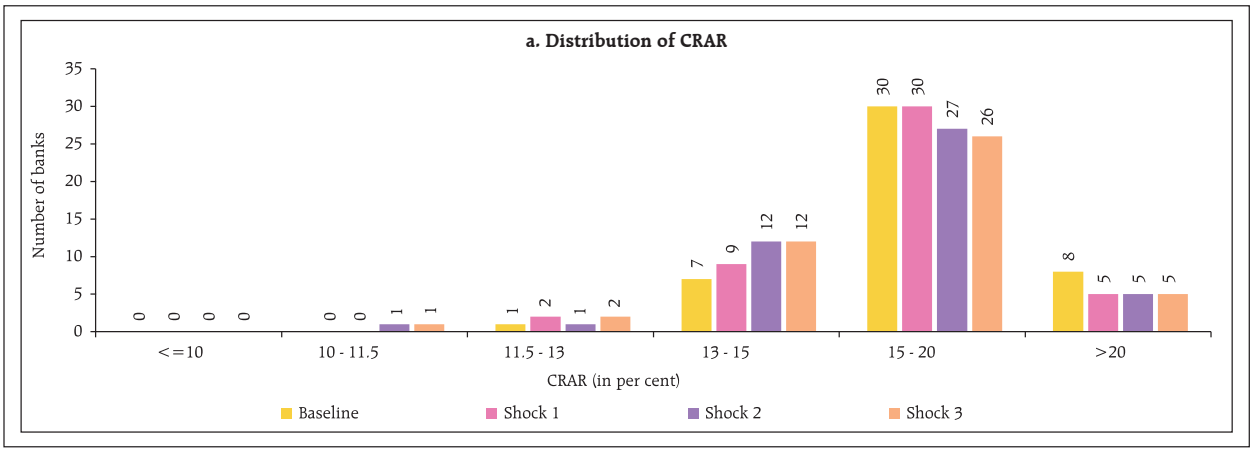
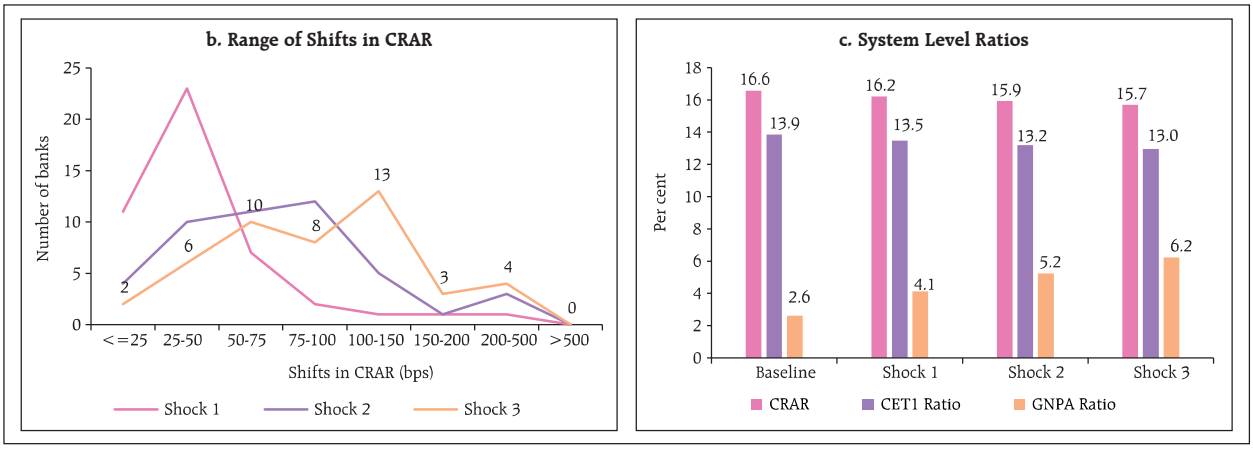


Chart 2.14: Credit Concentration Risk: Individual Borrowers – Exposure *(Concld.)*



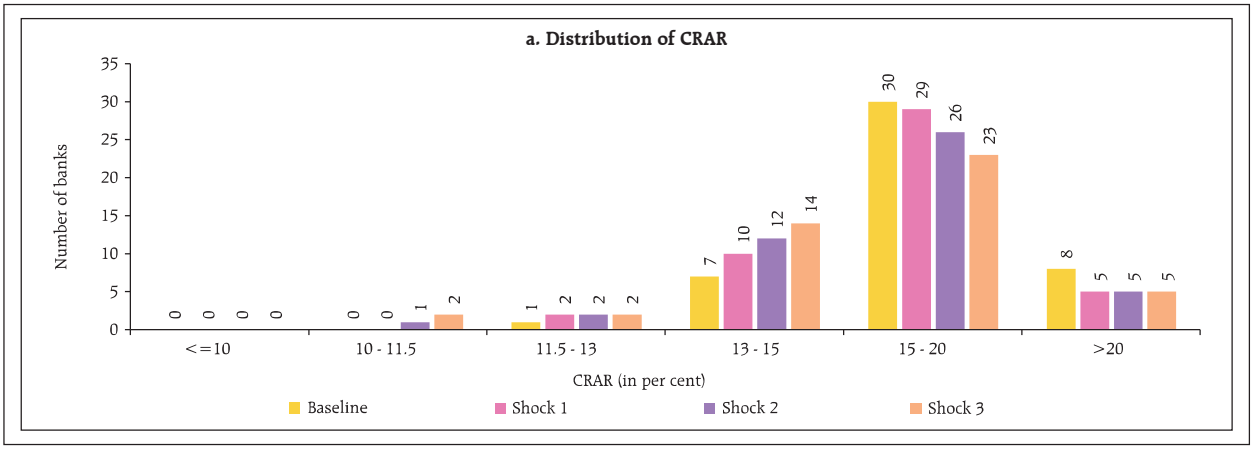
Note: For a system of select 46 SCBs.
Shock 1: Topmost individual borrower fails to meet payment commitments.
Shock 2: Top 2 individual borrowers fail to meet their payment commitments.
Shock 3: Top 3 individual borrowers fail to meet their payment commitments.
Sources: RBI supervisory returns and staff calculations.

percentage points in their CRARs (Chart 2.14 b) and the system level CRAR would fall by 90 bps (Chart 2.14 c).

2.21 Under the extreme scenario of the top three group borrowers in the standard category failing to repay[15], the system level CRAR would decline by 130 bps but the ratio for all banks would remain above the regulatory minimum. Five banks would face a CRAR decline of over two percentage points (Chart 2.15 a, b and c).

2.22 In the extreme scenario of the top three individual stressed borrowers of respective banks failing to repay[16], all the banks would remain resilient (Chart 2.16 a). For the majority of the banks, the CRAR would deplete by 25 bps or less (Chart 2.16 b). Under this scenario,

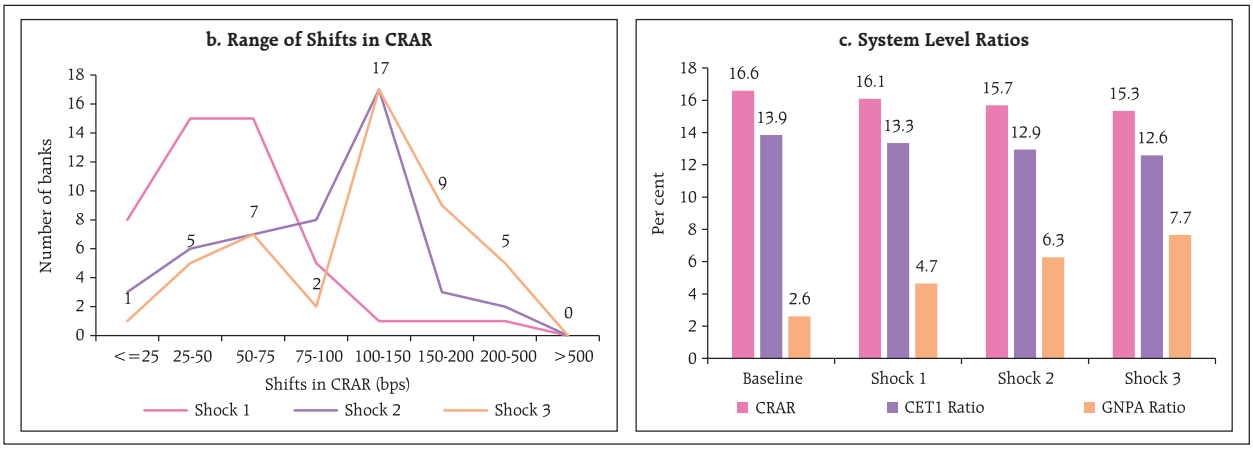
Chart 2.15: Credit Concentration Risk: Group Borrowers – Exposure *(Contd.)*



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

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

Chart 2.15: Credit Concentration Risk: Group Borrowers – Exposure *(Concld.)*



Note: For a system of select 46 SCBs.
Shock 1: The top 1 group borrower fails to meet payment commitments.
Shock 2: The top 2 group borrowers fail to meet payment commitments.
Shock 3: The top 3 group borrowers fail to meet payment commitments.
Sources: RBI supervisory returns and staff calculations.

the system level CRAR would decline by 20 bps (Chart 2.16 c).

c. Sectoral Credit Risk

2.23 Shocks applied on the basis of volatility of industry sub-sector-wise GNPA ratios indicate varying magnitudes of impact. By and large, sectoral credit risk remains muted – a two SD shock to basic metals and energy sub-sectors would reduce the system-level CRAR by 17 bps and 12 bps, respectively, whereas the impacts of shocks on the rest of the sub-sectors are negligible (Table 2.1).

Table 2.1:Decline in System Level CRAR
(basis points, in descending order for top 10 most sensitive sectors)

	1 SD	2 SD
Basic Metal and Metal Products (1048 per cent)	9	17
Infrastructure - Energy (615 per cent)	6	12
Infrastructure - Transport (145 per cent)	3	6
All Engineering (220 per cent)	2	5
Textiles (121 per cent)	2	4
Vehicles, Vehicle Parts and Transport Equipments (673 per cent)	1	2
Construction (111 per cent)	1	2
Food Processing (66 per cent)	1	2
Chemicals (222 per cent)	1	2
Gems and Jewellery (121 per cent)	1	1

Notes: (1) For a system of select 46 SCBs.
(2) Numbers in parentheses represent the growth in GNPA of that sub-sector due to 1 SD shock to the sub-sector's GNPA ratio.
Sources: RBI supervisory returns and staff calculations.

Chart 2.16: Credit Concentration Risk: Individual Borrowers – Stressed Advances *(Contd.)*

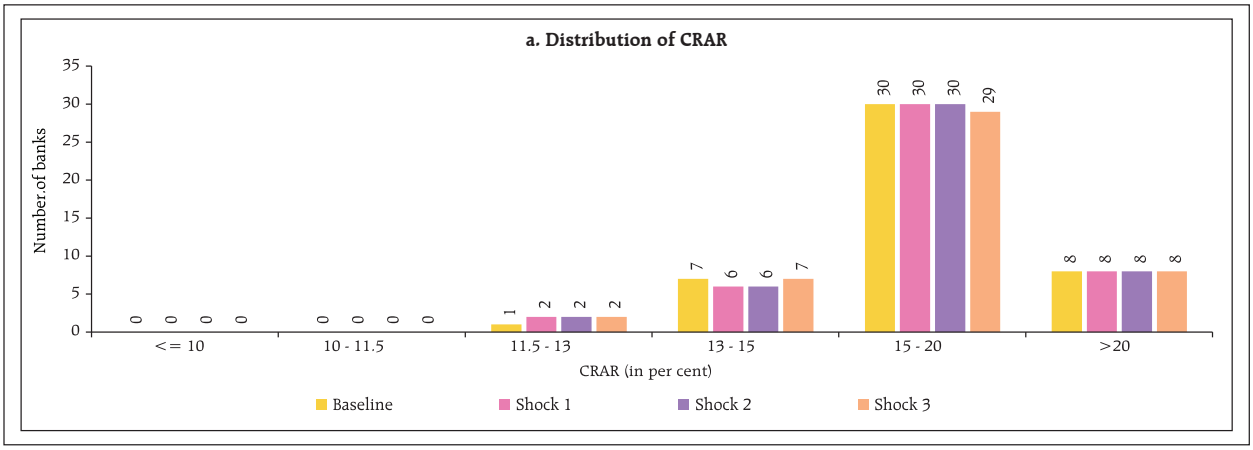
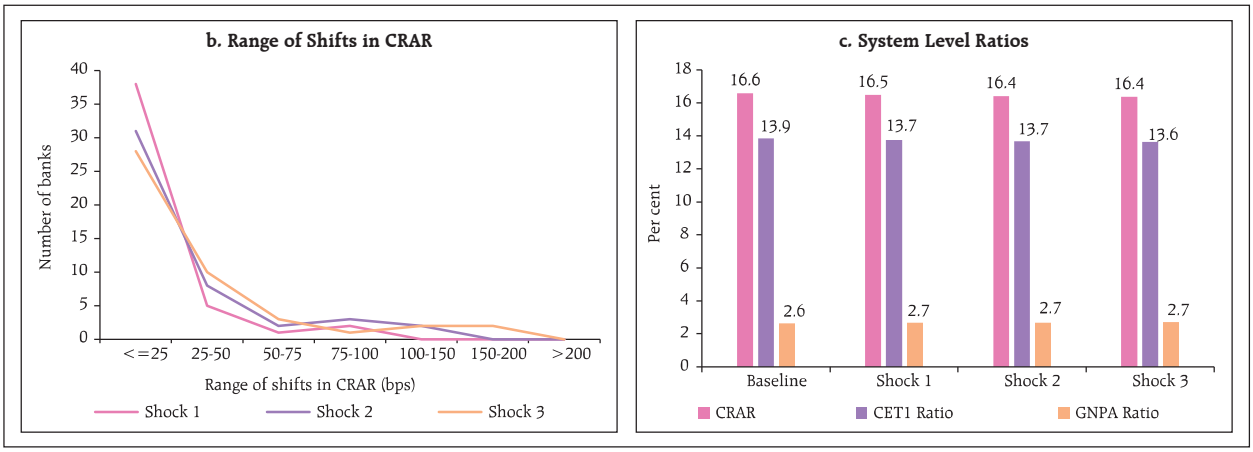


Chart 2.16: Credit Concentration Risk: Individual Borrowers – Stressed Advances *(Concld.)*



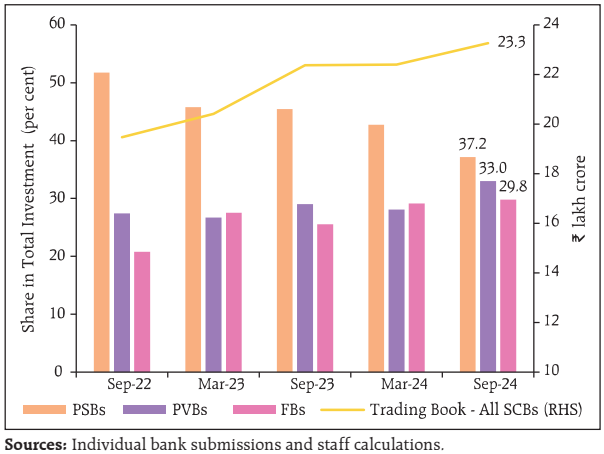
Note: For a system of select 46 SCBs.
Shock 1: Topmost stressed individual borrower fails to meet payment commitments.
Shock 2: Top 2 stressed individual borrowers fail to meet their payment commitments.
Shock 3: Top 3 stressed individual borrowers fail to meet their payment commitments.
Sources: RBI supervisory returns and staff calculations.

d. Interest Rate Risk[17 18]

2.24 A revised framework for classification, valuation and operation of SCBs' investment portfolios was introduced by the Reserve Bank[19] with effect from April 1, 2024 under which the classification and operation norms for investments are principally aligned with global financial reporting standards. Major changes include the removal of ceiling on held to maturity (HTM) book, a clearly identifiable trading book, introduction of fair value hierarchy for investments and symmetric treatment of fair value gains and losses.

2.25 For the sample of SCBs under assessment, the market value of investments subject to fair value has been on the rise and stood at ₹23.3 lakh crore in September 2024. Out of this, 68.2 per cent was in the available for sale (AFS) category and the remaining amount in the fair value through profit and loss (FVTPL) category, which includes the held for trading (HFT) portfolio (Chart 2.17). The fall in the share of the AFS portfolio (from 89.3 per cent in March 2024) is mainly attributable to the framework revision. The clearly identifiable trading book (*viz.*, the HFT category) accounts for 93.2 per cent of the FVTPL portfolio. PSBs' share in the fair-valued investment portfolio of SCBs has declined to reach a low of 37.2 per cent in September 2024, while the share of PVBs has increased to nearly one-third.

Chart 2.17: AFS and FVTPL (including HFT) Portfolios: Bank-group wise



Sources: Individual bank submissions and staff calculations.

[17] Prior period consistency and comparability may be limited as historical data has not been recast using the updated accounting standards.

[18] The analysis in this portion is restricted to investments in India by the domestic operations of SCBs. For HTM, AFS and FVTPL (including HFT) portfolios, only interest rate related instruments and for "Investment in Subsidiaries, Associates and Joint Ventures" both interest and non-interest related investments are taken into account.

[19] "Master Direction - Classification, Valuation and Operation of Investment Portfolio of Commercial Banks (Directions)" dated September 12, 2023.

2.26 The sensitivity (PV01[20]) of the AFS portfolio decreased in September 2024 relative to March 2024, predominantly on account of shrinkage in the size of the AFS portfolio. The modified duration of PSBs' and PVBs' AFS portfolios rose, whilst it declined for FBs.

2.27 The PV01 of FVTPL (including HFT) portfolios of all banking cohorts increased because of the significant increase in market value of securities held in the portfolio (Table 2.2). Additionally, the modified duration of the FVTPL portfolio of PVBs and FBs rose by 50 per cent, while it declined marginally for PSBs.

2.28 It is assessed that the impact of a parallel upward shift of 250 bps in the yield curve on the fair-valued portfolio (AFS and FVTPL) would reduce the system level CRAR and CET1 ratio by 114 and 115 bps, respectively (Table 2.3). At a disaggregated level, four foreign banks' CRAR will fall below the regulatory minimum of 9 per cent in the event of such a major shock.

2.29 As of September 2024, yields have decreased across the curve from their levels prevailing in March 2024. This is because the Government borrowing programme (gross and net) for 2024-25 announced in the Union Budget in July 2024 was lower than that announced in the interim budget in February 2024 – the adherence to the glide path of fiscal consolidation generated positive sentiments. The shorter end of the yield curve eased on account of the announcement in the Union Budget of reduction of T-bills borrowing by ₹1 lakh crore, easing of US treasury yields and increased demand by FPIs across the curve. Yields have trended up since end-September, 2024 on account of the negative sentiment caused by acceleration of domestic retail inflation (Chart 2.18).

2.30 The updated accounting guidelines require symmetrical treatment of fair value gains/losses for AFS and FVTPL portfolios, wherein both mark to market (MTM) gains and losses will be recognised in the books. The unrealised MTM gains/losses from performing investments in the AFS portfolio will be routed through the newly constituted "AFS-Reserve". This would be considered as common equity tier 1 (CET1) capital subject to certain conditions. Similarly, MTM gains/losses in the FVTPL portfolio will be reported through the profit and loss (P&L) account, which is in

Table 2.2: PV01 of AFS and FVTPL (including HFT) Portfolios

(in ₹crore)

	AFS Portfolio		FVTPL (including HFT) Portfolio	
	Mar-24	Sep-24	Mar-24	Sep-24
PSBs	231.4	209.1	4.4	48.5
PVBs	93.2	93.6	26.3	101.6
FBs	215.4	82.7	68.5	275.3

Note: FVTPL (including HFT) data for March 2024 pertains to HFT portfolio as per the earlier accounting norms.

Sources: Individual bank submissions and staff calculations.

Table 2.3: Interest Rate Risk – Bank-groups - Shocks and Impacts

(under shock of 250 basis points parallel upward shift of the INR yield curve)

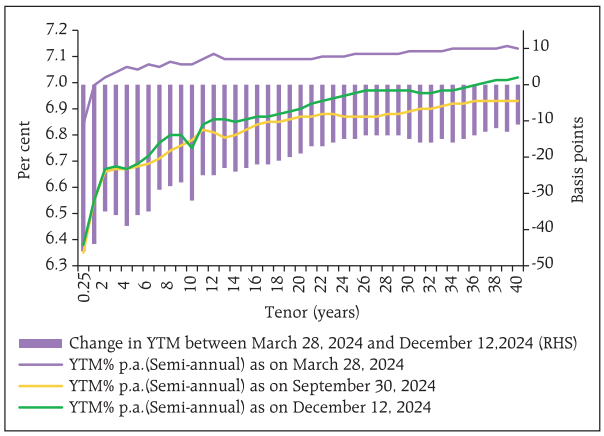
	PSBs		PVBs		FBs		All SCBs	
	AFS	FVTPL (incl. HFT)	AFS	FVTPL (incl. HFT)	AFS	FVTPL (incl. HFT)	AFS	FVTPL (incl. HFT)
Modified Duration (year)	2.9	3.4	1.9	3.7	2.2	8.7	2.4	5.7
Share in total Investments (per cent)	18.3	3.7	21.2	12.0	48.3	40.8	22.6	10.5
Reduction in CRAR (bps)	77		60		605		114	
Reduction in CET1 (bps)	78		61		608		115	

Note: Share of total investments has been computed excluding investment in associates, subsidiaries and Joint Ventures (JVs).

Sources: Individual bank submissions and staff calculations.

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

Chart 2.18: Yield Curves and Shift in Yields across Tenors since March 2024 (updated till December 12, 2024)



Source: FBIL.

contrast to previous standards which overlooked MTM appreciation while accounting for MTM depreciation in the P&L statement.

2.31 Trading profits increased on an annual basis (y-o-y) for all bank cohorts in Q2:2024-25, but on a sequential (q-o-q) basis, they increased for PSBs and FBs. Securities trading earnings contributed to more than a third of FBs' net operating income and were much lower for PSBs and PVBs (Table 2.4).

2.32 PSBs increased their holdings in government securities (G-secs) and state development loans (SDLs) as compared to other HTM-eligible securities (Chart 2.19). PVBs reduced their holding of G-secs in the HTM category while increasing their holding of SDLs. The inclusion of pass-through certificates

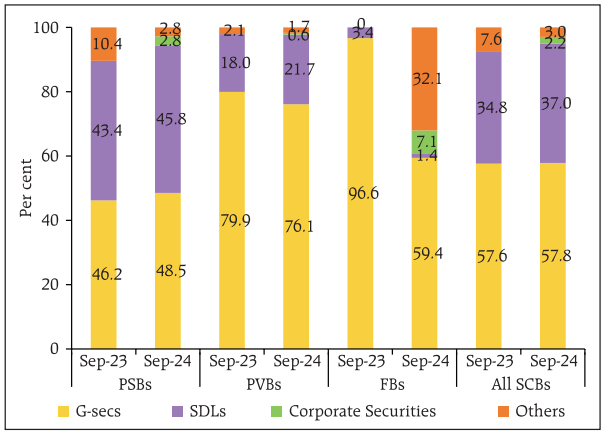
Table 2.4: Other Operating Income - Profit/ (Loss) on Securities Trading – All Banks

(in ₹crore)

	Q2: 2023-24	Q3: 2023-24	Q4: 2023-24	Q1: 2024-25	Q2: 2024-25
PSBs	3,914 (6.9)	3,187 (6.4)	7,565 (10.7)	4,883 (7.5)	9,134 (12.6)
PVBs	872 (1.4)	3,628 (5.4)	10,459 (13.7)	4,960 (6.6)	3,803 (5.1)
FBs	-617 (-5.2)	-1,864 (-19.6)	1,546 (17.6)	968 (8.0)	4,363 (33.7)

Note: Figures in parentheses represent other operating income (OOI)-Profit/ (Loss) on securities trading as a percentage of net operating income.
Source: RBI supervisory returns.

Chart 2.19: HTM Portfolio – Composition



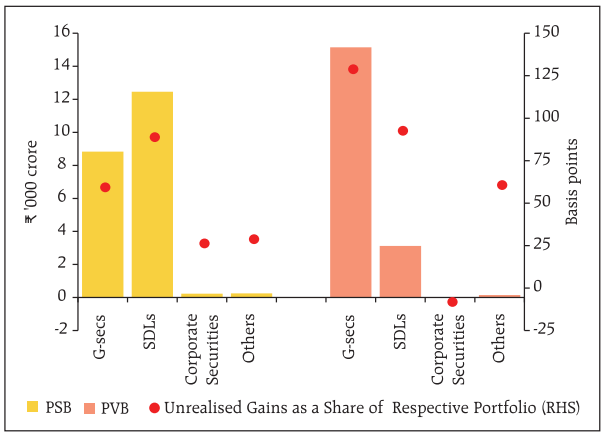
Note: Prior to April 1, 2024 corporate securities were not eligible to be included in HTM book.
Sources: Individual bank submissions and staff calculations.

of standard assets in the HTM book has increased the share of 'others' category for foreign banks – it forms nearly a third of their HTM book. Corporate bonds, which are eligible to be included in HTM books beginning April 1, 2024, accounted for 2.2 per cent of SCBs' HTM holdings as of September 30, 2024.

2.33 In September 2024, the notional MTM losses in the HTM books of SCBs (PSBs and PVBs) turned a corner, with a notional gain of ₹40,187 crore from a notional loss of ₹34,024 crore in March 2024, as the yield curve shifted down in H1:2024-25. The notional gains were predominantly concentrated among the larger banks. Nine banks (PSBs + PVBs) continue, however, to have notional MTM losses in their HTM book.

2.34 The distribution of unrealised gains across investment categories suggests that PVBs have the largest proportion of gains in their G-sec books, while PSBs have the largest proportion of their gains in their SDL books. PSBs have MTM gains in all categories of their HTM books. The loss in the corporate securities portfolio of PVBs is due to lower grade corporate bonds held in the HTM book (Chart 2.20).

Chart 2.20: HTM Portfolio – Unrealised Gain/ Loss as on September 30, 2024



Sources: Individual bank submissions and staff calculations.

2.35 If a parallel upward shock of 250 bps in the yield curve is applied, the MTM impact on the HTM portfolio of banks excluding unrealised gains/losses would reduce the system level CRAR by 318 bps but no bank would see a reduction in CRAR and CET-I ratio below the respective regulatory minimums.

2.36 The new guidelines do not place any ceiling on investments that can be made under the HTM category, unlike the previous guidelines which limited HTM holdings of banks. However, the new guidelines have not resulted in any substantial increase in the holding of statutory liquidity ratio (SLR) eligible securities in HTM books of PSBs and PVBs, which amounted to 22.9 per cent and 18.5 per cent of their net demand and time liabilities (NDTL), respectively, while it stood at 4.6 per cent for FBs.

2.37 The revised framework has established a new category for classification of investments *viz.*, 'Investments in Subsidiaries, Associates and Joint Ventures' separate from the other investment categories (*viz.*, HTM, AFS and FVTPL). This portfolio is predominated by the equity portfolio and has large unrealised gains, which could provide strength to the balance sheet during periods of stress, but its valuation is subject to market risk.

2.38 An assessment of the interest rate risk of banks[21] using traditional gap analysis (TGA) for rate sensitive global assets, liabilities and off-balance sheet items estimates that for a 200 bps increase in interest rate, the earnings at risk (EAR) for time buckets up to one year is 11.7 per cent and 11.3 per cent of NII for PSBs and PVBs, respectively. The impact would be minimal for FBs and SFBs (Table 2.5). The impact of an interest rate rise on earnings would be positive as the cumulative gap[22] at bank group level was positive in September 2024. Conversely, if the interest rates would decrease, they would lead to an adverse impact.

2.39 As per the duration gap analysis[23] (DGA) of rate sensitive global assets, liabilities and off-balance sheet items, the market value of equity (MVE) for PVBs, FBs and SFBs would reduce from an upward movement in the interest rate, while that of PSBs would be positively impacted. The MVE of SFBs would be particularly weighed down by an interest rate rise (Table 2.6). If the interest rates decrease, the impact would be in the opposite direction.

Table 2.5: Earnings at Risk (EAR) - Traditional Gap Analysis (TGA)

Bank Group	Earnings at Risk (till one year) as percentage of Net Interest Income (NII)	
	100 bps increase	200 bps increase
PSBs	5.9	11.7
PVBs	5.7	11.3
FBs	0.5	0.9
SFBs	0.9	1.8

Sources: RBI supervisory returns and staff calculations.

[21] In terms of circular on "Guidelines on Banks' Asset Liability Management Framework – Interest Rate Risk" dated November 04, 2010.

[22] Gap refers to rate sensitive assets (RSA) minus rate sensitive liabilities (RSL). Advances, investments, swaps/ forex swaps, and reverse repos are major contributors to RSA whereas deposits, swaps/ forex swaps and repos are observed to be the main elements under RSL.

[23] The DGA involves bucketing of all RSA and RSL as per residual maturity/ re-pricing dates in various time bands and computing the Modified Duration Gap (MDG).

Table 2.6: Market Value of Equity (MVE)-Duration Gap Analysis (DGA)

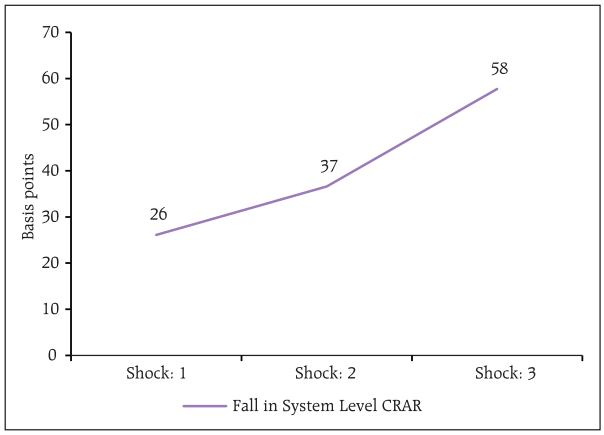
Bank Group	Market Value of Equity (MVE) as percentage of Equity	
	100 bps increase	200 bps increase
PSBs	0.3	0.5
PVBs	-1.1	-2.2
FBs	-3.7	-7.3
SFBs	-5.8	-11.6

Sources: RBI supervisory returns and staff calculations.

e. Equity Price Risk

2.40 As banks have limited direct capital market exposures owing to regulatory prescriptions, any impact of a possible significant fall in equity prices on banks' CRAR would be low for the system of 46 banks. Under scenarios of 25 per cent, 35 per cent and 55 per cent drop in equity prices, the system level CRAR would reduce by 26 bps, 37 bps and 58 bps, respectively (Chart 2.21).

Chart 2.21: Equity Price Risk



Note: For a system of select 46 SCBs.
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.
Sources: RBI supervisory returns and staff calculations.

f. Liquidity Risk

2.41 Liquidity risk analysis aims to capture the impact of any possible run on deposits and increased demand for unutilised portions of sanctioned/committed/guaranteed credit lines. The methodology for the liquidity stress test has been updated (Box 2.2).

Box 2.2: Revamped Liquidity Stress Test of SCBs based on LCR Framework

In 2010, the Basel Committee on Banking Supervision (BCBS) introduced two key minimum standards for funding liquidity: the liquidity coverage ratio (LCR) and the net stable funding ratio (NSFR) (BCBS, 2010). The LCR [*viz.*, the ratio of high quality liquid assets (HQLA) holdings to total net cash outflows over the next 30 calendar days] aims to enhance banks' short-term resilience by ensuring that they hold enough HQLAs to withstand a 30-day stress scenario. The NSFR, on the other hand, focuses on long-term stability by requiring banks to finance their operations with more reliable and stable funding sources. Since 2019, Indian banks are required to maintain a minimum LCR of 100 per cent on a continuous basis, although certain temporary relaxations were provided during the COVID-19 pandemic.

The LCR is computed on the basis of granular data on HQLA as well as expected cash inflows and outflows over the next 30 days, by applying appropriate weights to each of these components (RBI, 2014). The baseline scenario for the stress test applies weights to each component, similar to that used for LCR computation. The adverse scenarios are designed by applying higher weights (run-off rates) to certain cash outflows than the baseline (Table 1).

The LCR-based liquidity stress test has been performed for a sample of 46 major SCBs, based on the data submitted by banks for the September 2024 quarter. The results show that the aggregate LCR of 46 SCBs may reduce from 128.0 per cent in the baseline scenario to 120.9 per cent in stress scenario 1 and further to 114.8 per cent in stress scenario 2. No bank would fail to maintain LCR above the minimum requirement of 100 per cent in stress scenario 1, while two banks would fail to meet minimum regulatory LCR in stress scenario 2 (Chart 1a).

The median LCRs of these banks decreases from 130.3 per cent in the baseline to 123.2 per cent under stress

(Contd.)

Table 1: Run-off Factors applied on Cash Outflow Components

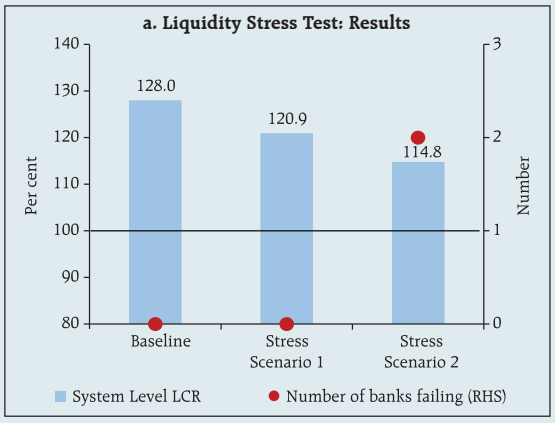
(per cent)

Cash Outflow Components	Baseline	Stress Scenario 1	Stress Scenario 2
Retail Deposits			
Stable deposits	5	6	7
Less stable retail deposits	10	11	12
Unsecured Wholesale Funding			
Demand and term deposits, residual maturity < 30 days, small business			
Stable deposits	5	6	7
Less stable deposits	10	11	12
Non-financial corporates, sovereigns, central banks, multilateral development banks, PSEs	40	42.5	45
Currently undrawn but committed credit and liquidity facilities			
Retail and small business	5	10	12
Non-financial corporates, sovereigns, central banks, multilateral development banks, PSEs			
Credit facilities	10	12	15
Liquidity facilities	30	40	50

scenario 1, and further to 117.1 per cent under stress scenario 2 (Chart 1b).

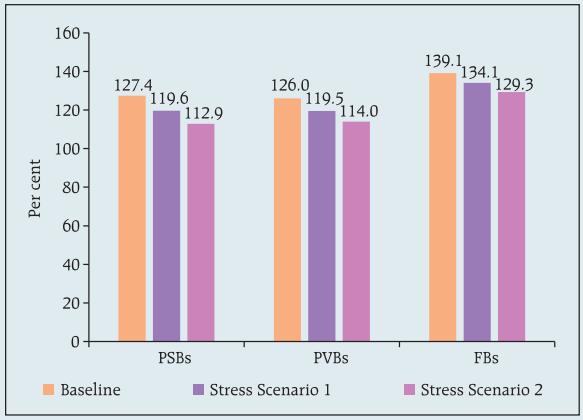
Foreign banks (FBs) have the highest LCR among bank groups under all the three scenarios. The impact of liquidity stress on PSBs is the highest (decline of 14.5 percentage points under stress scenario 2) among bank groups (Chart 2).

Chart 1: LCR-based Liquidity Stress Test



Source: RBI staff calculations.

Chart 2: Bank Group-wise LCR under alternate Scenarios



Source: RBI staff calculations.

References:

1. Basel Committee on Banking Supervision. (2010). Basel III: International framework for liquidity risk measurement, standards and monitoring. Basel: Bank for International Settlements.
2. Reserve Bank of India (2014). Basel III Framework on Liquidity Standards – Liquidity Coverage Ratio (LCR), Liquidity Risk Monitoring Tools and LCR Disclosure Standards, June 09, 2014. RBI/2013-14/635 DBOD.BP.BC.No.120/21.04.098/2013-14.

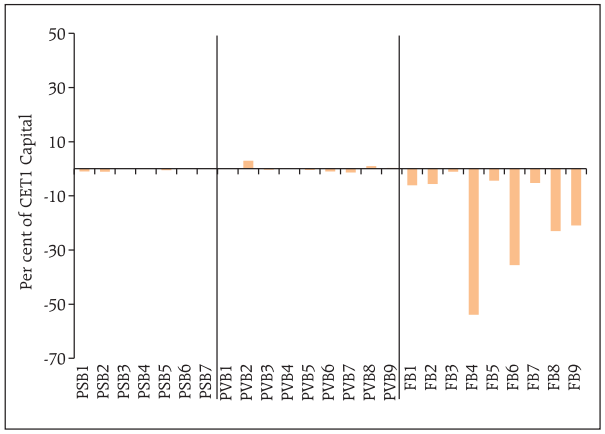
II.1.9 Bottom-up Stress Tests: Derivatives Portfolio

2.42 A series of bottom-up stress tests (sensitivity analyses) on derivatives portfolios have been conducted for select banks[24] with the reference date of end-September 2024. The derivatives portfolios of the banks in the sample are subjected to four separate shocks on interest rates and foreign exchange rates. While the interest rate shocks range from 100 to 250 basis points, in the case of foreign exchange rates, shocks of 20 per cent appreciation/depreciation are assumed. The stress tests are carried out for individual shocks on a stand-alone basis.

2.43 Keeping parity with the trend observed in the recent past, most of the FBs maintained a significantly negative net MTM position as a proportion to CET1 capital in September 2024. The MTM impact is, by and large, muted for PSBs and PVBs (Chart 2.22). For the overall system, the extent of negative MTM position increased in the half-year ending September 2024.

2.44 The stress test results show that the select set of banks would, on an average, gain from an interest rate rise and lose from an interest rate fall (Chart 2.23). As regards exposures to forex derivatives, banks stand to benefit more from INR depreciation in September 2024 than in March 2024; also, their potential losses from INR appreciation get reduced.

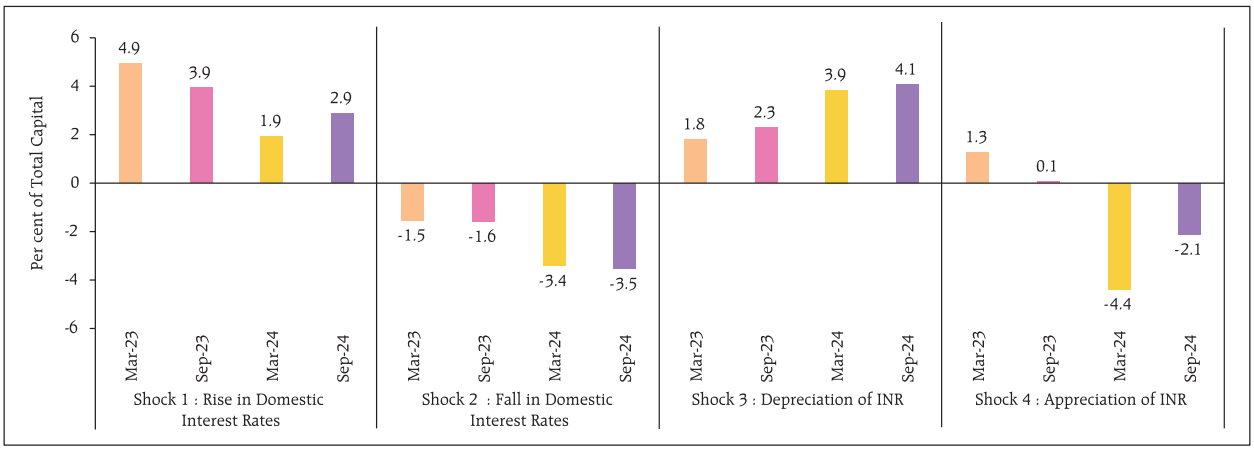
Chart 2.22: MTM Position of Total Derivatives Portfolio of Select Banks – September 2024



Note: PSB: Public sector bank, PVB: Private sector bank, FB: Foreign bank.
Source: Sample banks (bottom-up stress tests on derivatives portfolio).

2.45 The income from the derivatives portfolios includes changes in net MTM positions and the realised income. The contribution of the derivatives portfolio of FBs to their net operating income (NOI)

Chart 2.23: Impact of Shocks on Derivatives Portfolios of Select Banks
(change in net MTM position on application of a shock)



Note: Change in net MTM due to an applied shock is with respect to the baseline.
Source: Sample banks (bottom-up stress tests on derivatives portfolio).

[24] Stress tests on derivatives portfolios were conducted by a sample of 25 banks, constituting the major active authorised dealers and interest rate swap counterparties. Details of test scenarios are given in Annex 2.

hit a low in March 2024 and then turned negative in September 2024. A possible reason for the same may be that their realised income was unable to compensate for the decrease in their net MTM positions (net MTM positions of most FBs turned more negative). For PSBs and PVBs, the contribution declined marginally in September 2024 as compared to March 2024, although income from the derivatives portfolios witnessed an uptick in the case of PSBs (Chart 2.24). Based on the notional principal amount, FBs have more diversified counterparties while most of the positions taken by PVBs and PSBs are with other banks.

II.2 Primary (Urban) Cooperative Banks[25]

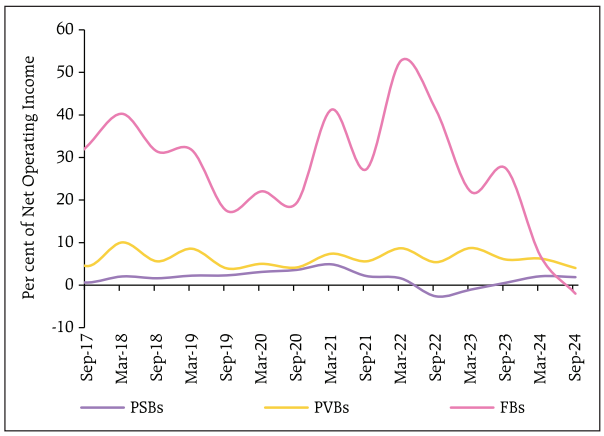
2.46 Credit by primary urban cooperative banks (UCBs) recorded a growth of 7.4 per cent (y-o-y)[26] in September 2024. Both scheduled UCBs (SUCBs) and non-scheduled UCBs (NSUCBs) recorded increases in growth (Chart 2.25 a).

2.47 The capital position of UCBs has remained robust, with their combined CRAR rising to 17.5 per cent in September 2024. This improvement has been mainly due to Tier 1[27] institutions (Chart 2.25 b and c).

2.48 The GNPA and NNPA ratios of UCBs increased in September 2024 from March 2024, but have remained below September 2023 levels (Chart 2.25 d and e). The provisioning coverage ratio (PCR), which showed improvement in March 2024, has decreased to 67.5 per cent in September 2024 (Chart 2.25 f). GNPA ratios of large borrowers, which accounted for 23.8 per cent of UCBs' loan book, followed similar movements as the overall GNPA ratio (Chart 2.25 g). Improvement in asset quality was witnessed across all tiers, except the smallest one (Tier 1), in September 2024 from a year ago (Chart 2.25 h).

2.49 UCBs' profitability ratios went up in September 2024 from March 2024, despite a broad-based moderation of the net interest margin (NIM). However, these ratios declined in H1:2024-25 from a year ago (Chart 2.25 i, j and k). Compared to September 2023, both RoA and RoE decreased in September 2024 for all tiers, except for Tier 1 (Chart 2.25 l).

Chart 2.24: Income from the Derivatives Portfolio



Source: Sample banks (bottom-up stress tests on derivatives portfolio).

II.2.1 Stress Testing

2.50 Stress tests were conducted on a select set of UCBs[28] to assess credit risk (default risk and concentration risk), market risk (interest rate risk in trading book and banking book) and liquidity risk, based on their financial positions reported for September 2024.

[25] Data are provisional and based on off-site surveillance (OSS) returns.

[26] Based on common sample of 1438 UCBs covering over 90 per cent of gross loans extended by UCBs.

[27] Revised Regulatory Framework for Urban Co-operative Banks (UCBs) – Net Worth and Capital Adequacy (Circular DOR.CAP.REC.No.86/09.18.201/2022-23 dated December 01, 2022 and DOR.CAP.REC. No.109/09.18.201/2022-23 dated March 28, 2023).

[28] The stress test is conducted with reference to the financial position of September 2024 for select 197 UCBs with asset size of more than ₹500 crore, excluding banks under the Reserve Bank's All Inclusive Directions (AID). These 197 UCBs together cover 69 per cent of the total assets of the UCB sector. The detailed methodology used for stress test is given in Annex 2.

Chart 2.25: Credit Profile and Asset Quality Indicators of UCBs *(Contd.)*

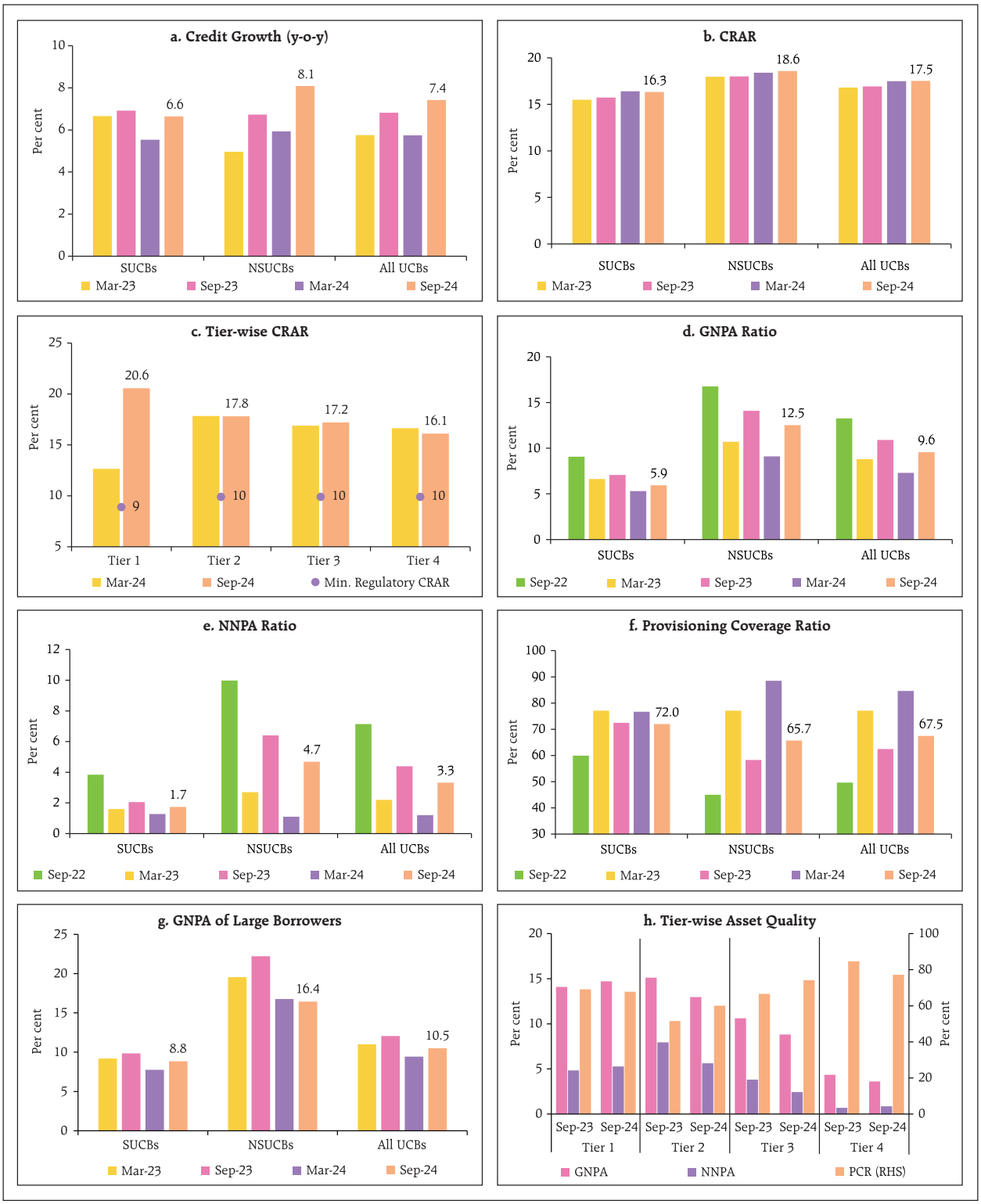
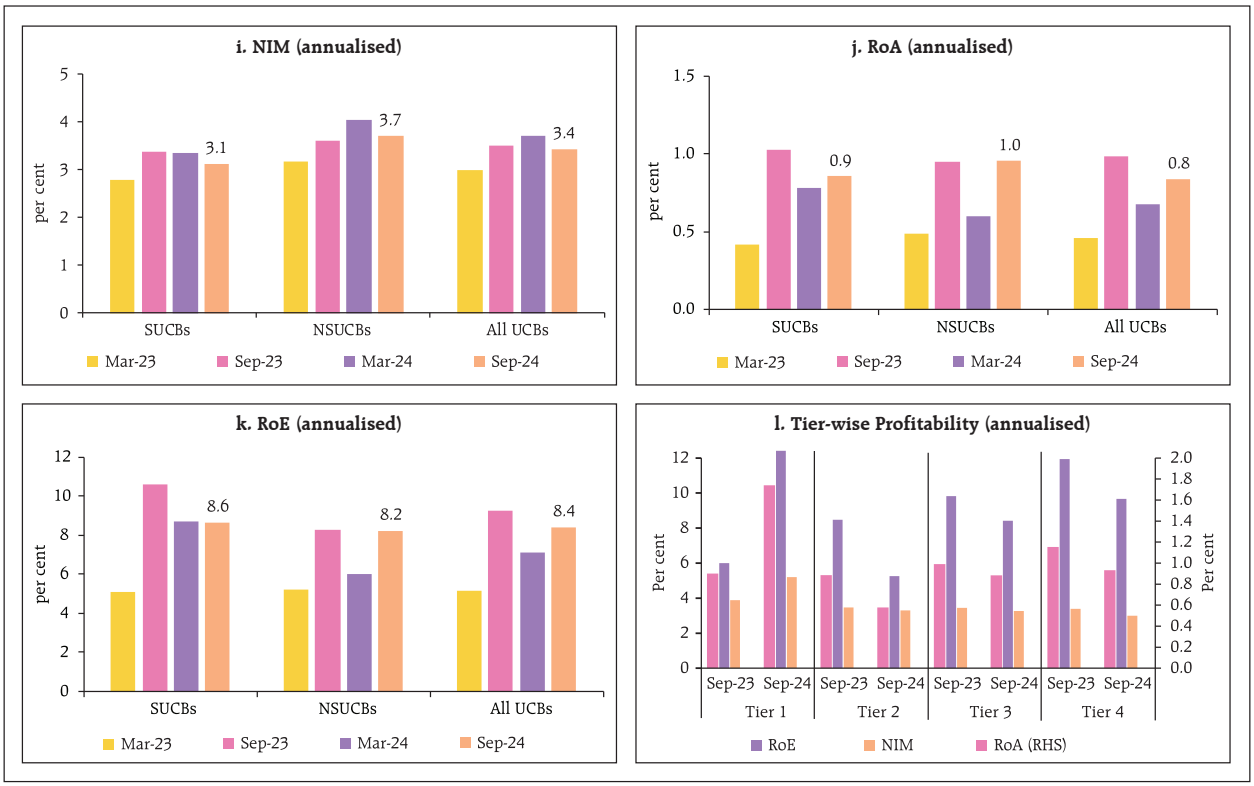


Chart 2.25: Credit Profile and Asset Quality Indicators of UCBs *(Concld.)*



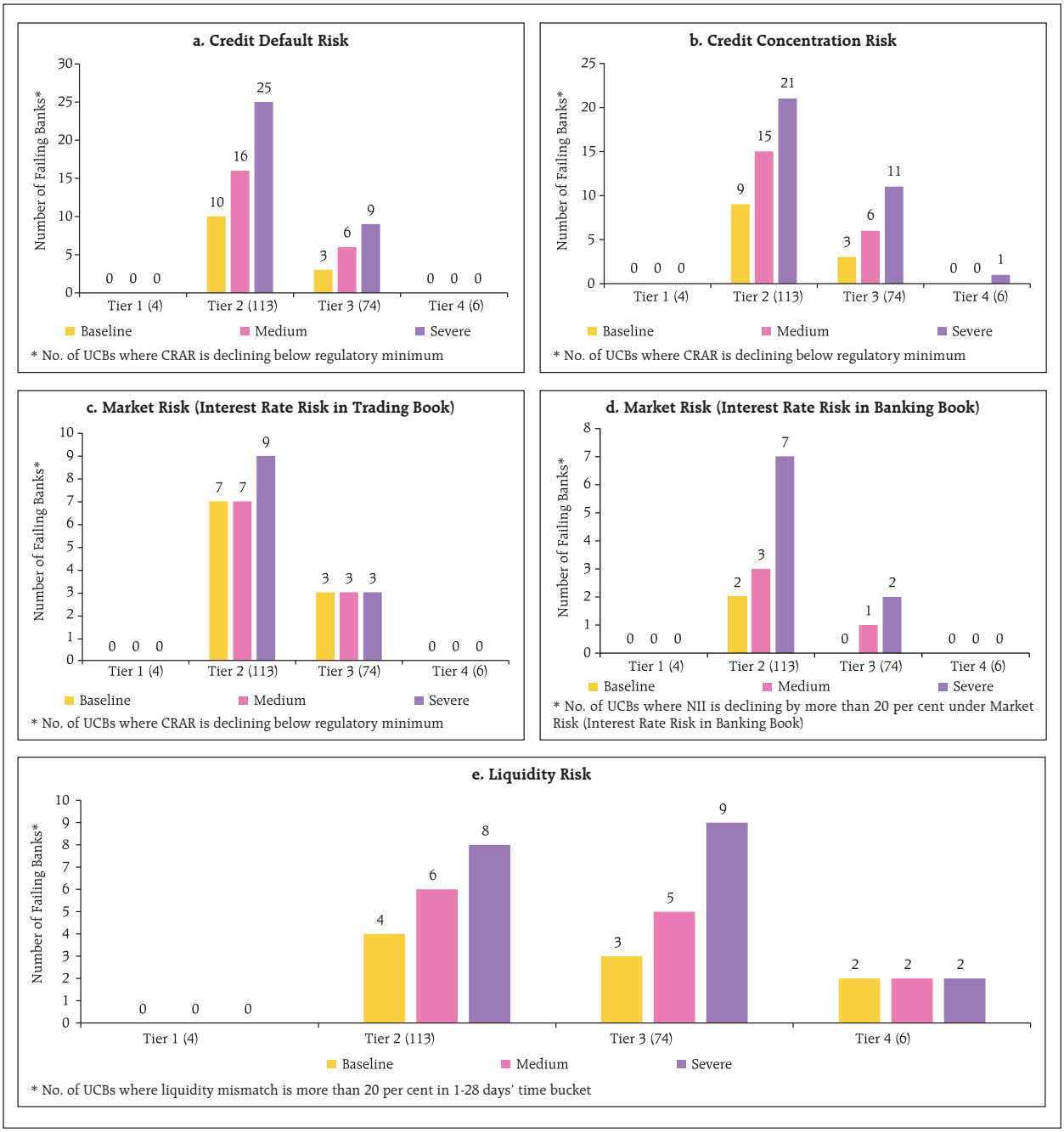
Sources: RBI supervisory returns and staff calculations.

2.51 All banks in the Tier 4 UCB sample - the largest category of UCBs with deposits above ₹10,000 crore - would be able to meet the minimum regulatory requirement[29] of 10 per cent CRAR even under a severe stress scenario for credit default risk. Under a severe stress scenario for credit concentration risk, however, one Tier 4 UCB would fail. In case of liquidity risk, two UCBs in the Tier 4 category will face a liquidity mismatch of more than 20 per cent in 1-28 days maturity bucket under the severe stress scenario. For Tier 2 and Tier 3 UCBs, the impact of credit default risk and credit concentration risk under the severe stress scenario is significant. The smallest UCBs (Tier 1) show resilience under stress scenarios for all the tested risk factors (Chart 2.26).

2.52 Under the severe stress scenario of credit default risk, credit concentration risk and interest rate risk in the trading book, the system level CRAR would reduce from the pre-shock position of 16.9 per cent to 14.9 per cent, 13.5 per cent and 15.5 per cent, respectively. A severe interest rate shock in the banking book would dent the system level net interest income (NII) by 6.9 per cent. At the aggregate level, there would be no liquidity mismatch in 1-28 days time bucket under the severe stress scenario.

[29] The regulatory minimum CRAR for Tier 1 UCBs is 9 per cent and for the UCBs in Tiers 2 to 4 is 10 per cent. Further, UCBs in Tiers 2 to 4 shall achieve the CRAR of at least 11 per cent by March 31, 2025, and 12 per cent by March 31, 2026.

Chart 2.26: Stress Test of UCBs



Notes: Figures in brackets represent sample size of the Tier.
Sources: RBI supervisory returns and staff calculations.

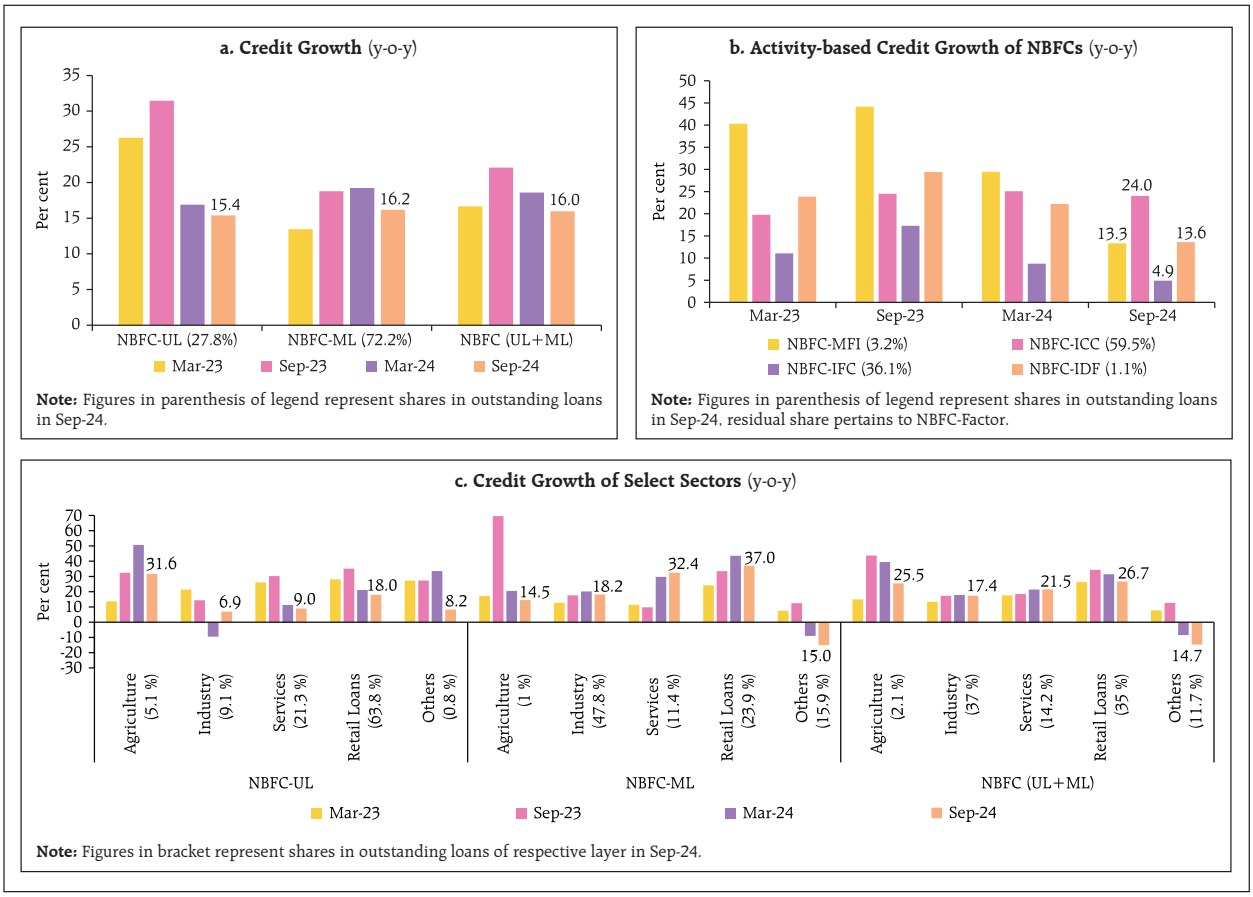
II.3 Non-Banking Financial Companies (NBFCs)[30]

2.53 NBFCs have been categorised into four layers - Base Layer (6.0 per cent[31]); Middle Layer (71.2 per cent); Upper Layer (22.8 per cent); and Top Layer – with effect from October 1, 2022. The focus in this section is on NBFCs in the upper layer and the middle layer (excluding CICs, HFCs and SPDs).

2.54 The credit growth of NBFCs slowed down to 16.0 per cent from 22.1 per cent a year ago, due to the high base effect and the increased risk weight for consumer lending prescribed by the Reserve Bank in November 2023. This impact was especially pronounced for NBFC-UL, comprising mostly of NBFC-ICCs whose portfolios are dominated by retail lending (Chart 2.27 a).

2.55 In September 2024, credit growth for the largest category of NBFCs, *viz.*, investment and credit companies (NBFC-ICCs), remained strong. The second largest category of NBFCs (*viz.*, NBFC-IFCs) continued to slow down further in H1: 2024-25 and recorded low single digit credit growth (Chart 2.27 b). Advances by HFCs in the upper

Chart 2.27: Credit Profile of NBFCs



Sources: RBI supervisory returns and staff calculations.

[30] The analyses done in this section are based on the provisional data available for NBFCs in upper layer and middle layer (excluding CICs, HFCs and SPDs) as of November 25, 2024. Prior period consistency and comparability may be limited as NBFC data has been reclassified based on scale-based regulation. The effect of mergers and reclassifications, if any, has not been considered for recasting historical data.

[31] Numbers in parentheses represent the share of respective layer in NBFCs' overall assets as of March 31, 2024.

layer have grown by 11.6 per cent (y-o-y) as of end-September 2024[32].

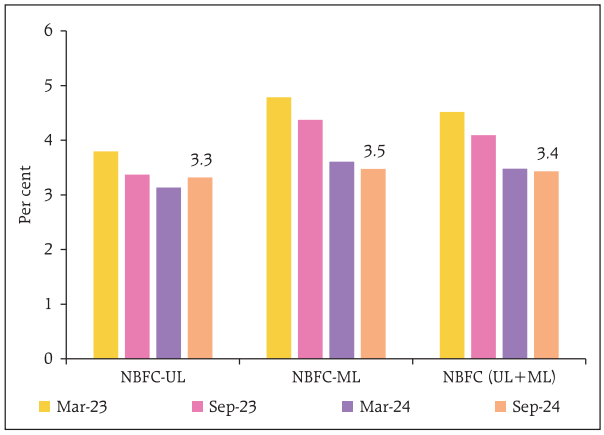
2.56 For NBFC-UL, credit growth decelerated across all major sectors other than industry during H1:2024-25. The pace of credit expansion by NBFC-ML also moderated but remained positive across major sectors (Chart 2.27 c).

2.57 Credit growth in the unsecured personal loan segment has slowed down significantly since September 2023. Similarly, the growth rate of microfinance/SHG loans within the retail advances category has decreased by more than two-thirds in the recent year. Gold loans have clocked rapid growth in the period ending September 2024 as compared to a year ago (Chart 2.28).

2.58 Delinquency level in NBFC-UL edged up marginally from March 2024, while they improved for NBFC-ML in September 2024 (Chart 2.29). PCR of NBFC-ML remained higher than that of NBFC-UL (Chart 2.30). GNPA ratio of Government owned NBFCs (55.4 per cent share in advances by NBFC-ML) improved to 2.0 per cent while that of privately owned NBFCs of NBFC-ML stood at 5.3 per cent in September 2024.

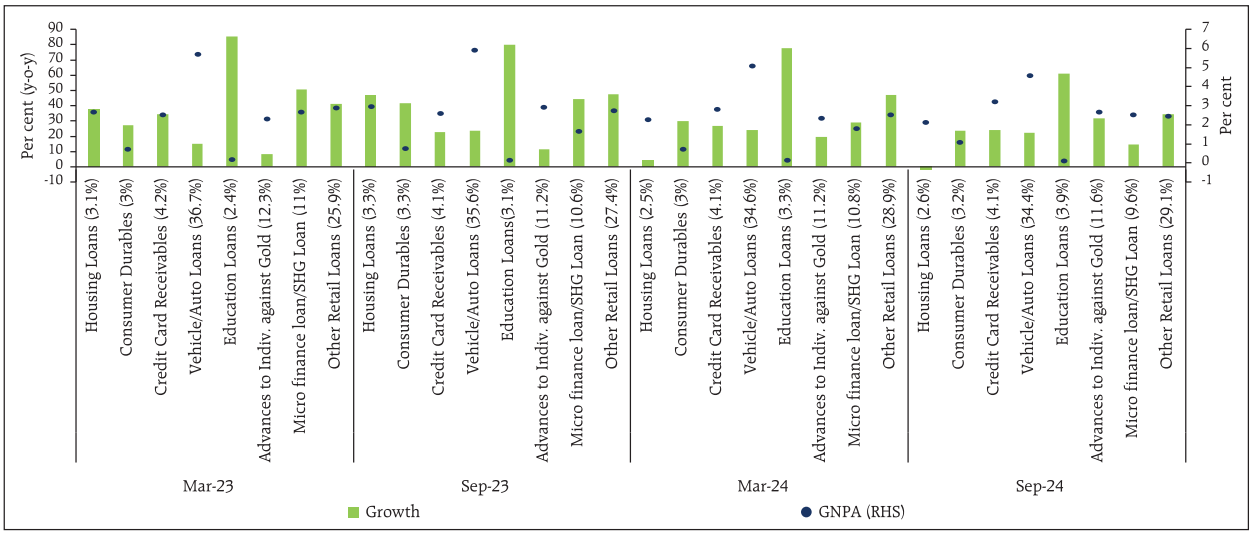
2.59 The system level CRAR of NBFCs was

Chart 2.29: GNPA Ratio



Sources: RBI supervisory returns and staff calculations.

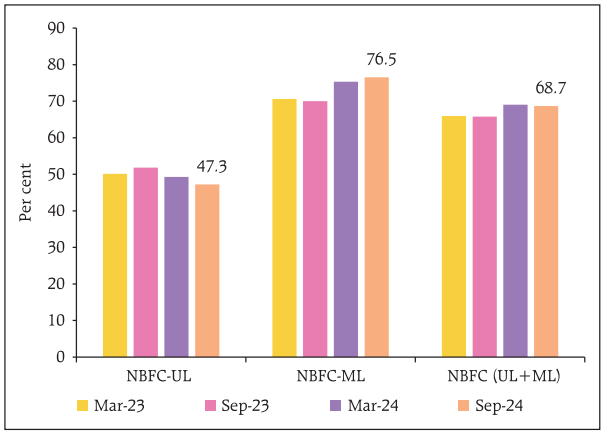
Chart 2.28: Growth and Delinquency of Components of Retail Loans



Note: Figure in parenthesis represents share of respective category of loans within retail sector at the end of each period. Residual share represents small loan categories like (i) advances against fixed deposits and (ii) advances to individuals against shares, bonds, *etc.*
Sources: RBI supervisory returns and staff calculations.

[32] Growth rate is based on the common sample of HFCs in Sep-23 and Sep-24.

Chart 2.30: Provision Coverage Ratio



Sources: RBI supervisory returns and staff calculations.

healthy at 26.1 per cent in September 2024. CRAR of NBFC-UL was, however, lower at 20.5 per cent. CRARs of HFCs (UL+ML) stood at 27.2 per cent as of end-September 2024. Upper layer NBFCs were consistently maintaining an elevated NIM at around 8 per cent, which was more than double that of NBFC-ML. Nevertheless, profitability of NBFC-UL and NBFC-ML remained comparable in terms of ROA and ROE (Chart 2.31).

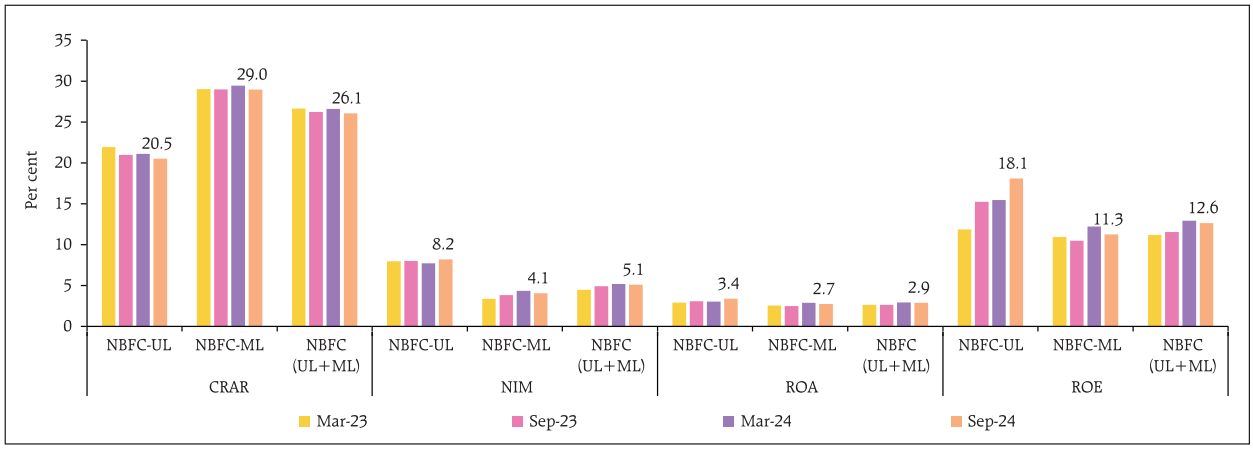
2.60 On the liquidity front, upper layer NBFCs were more vulnerable, given that they had a higher proportion of short-term liabilities to total assets in comparison with NBFC-ML. The share of long-term assets in total assets of NBFC-UL stood at 56.5 per cent as against nearly two-thirds for NBFC-ML. This share is higher for NBFC-ML as this layer includes NBFC-IFCs, which account for half of NBFC-ML's gross loans and predominantly lend for longer term projects (Chart 2.32).

2.61 The reliance of NBFC-UL on bank borrowings and public deposits was higher than NBFC-ML. 97 per cent of the funds sourced from banks by NBFC-UL was secured in nature as against about 70 per cent by NBFC-ML. The share of resources mobilised by NBFCs from banks have decreased over the last one year (Table 2.7).

II.3.1 Stress Test[33] - Credit Risk

2.62 System level stress tests for assessing the resilience of the NBFC sector to shocks in credit risk were conducted on a sample of 162[34] NBFCs, whose

Chart 2.31: Capital Adequacy and Profitability



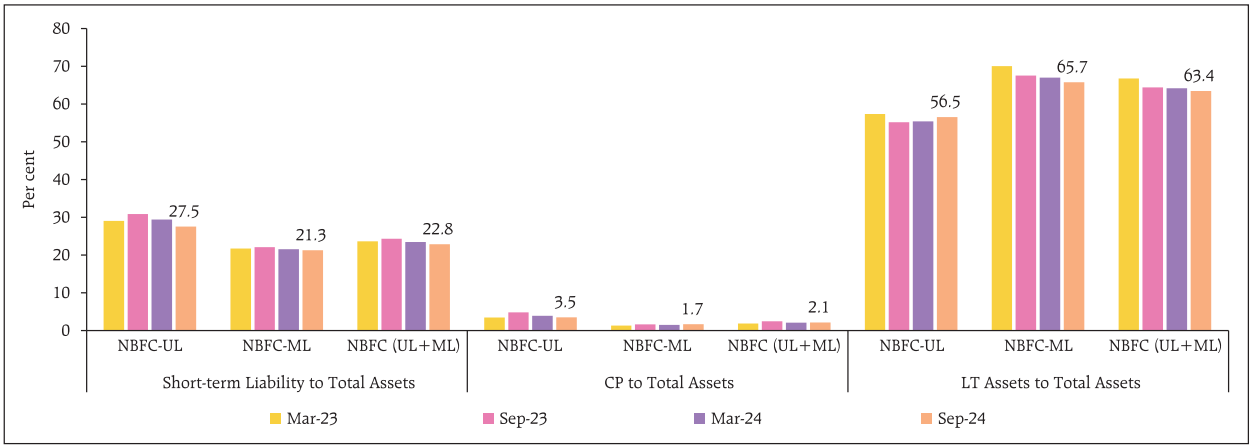
Notes: 1) NIM = (Interest Income – Interest Expense) / Average (Gross loans and advances + Total Investments)
2) RoE = (Annualised PAT) / Average (Capital + Reserves)

Sources: RBI supervisory returns and staff calculations.

[33] The detailed methodology used for stress tests of NBFCs is given in Annex 2.

[34] The sample comprised of 162 NBFCs from Upper Layer and Middle Layer with total advances of ₹25.00 lakh crore as of September 2024, which forms around 95 per cent of total advances of non-Government NBFCs. The sample for stress test excluded Government NBFCs, companies presently under resolution, standalone primary dealers, and investment focused companies to ensure better representation of credit risk of the sector.

Chart 2.32: Liquidity Stock Measures



Sources: RBI supervisory returns and staff calculations.

combined capital adequacy ratios and GNPA ratios stood at 23.6 per cent and 2.9 per cent, respectively, in September 2024. The tests were carried out under a baseline and two stress scenarios – medium and high risk – with increase in GNPA ratios by 1 SD and 2 SD, respectively.

2.63 Under the baseline scenario, the one year ahead GNPA ratio for the system is estimated at 3.4 per cent and the system level CRAR at 21.2 per cent. CRARs of 11 NBFCs fall below the minimum regulatory requirement of 15 per cent. Under the medium and high-risk scenarios, income loss and additional provision requirements would reduce CRAR of the sector further (compared to the baseline) by 70 bps and 100 bps, respectively (Chart 2.33).

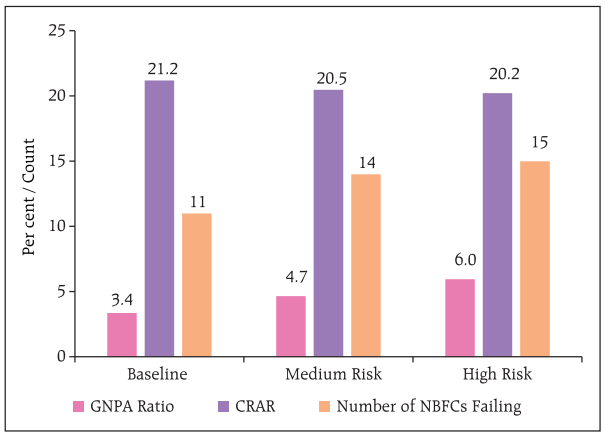
Table 2.7: NBFCs' Sources of Funds

(per cent)

Item Description	NBFC-UL		NBFC-ML	
	Sep-23	Sep-24	Sep-23	Sep-24
1. Share Capital, Reserves and Surplus	18.1	18.4	23.2	24.2
2. Total Borrowings	70.3	69.9	67.4	67.0
Of which:				
2 (i) Borrowing from banks	30.4	30.0	24.2	24.1
2(ii) CPs subscribed by banks	1.1	0.8	0.3	0.2
2(iii) Debentures subscribed by banks	4.3	3.8	2.2	2.1
Total from banks [2(i)+2(ii)+2(iii)]	**35.8**	**34.6**	**26.7**	**26.3**
2(iv) CPs excluding 2(ii)	3.7	2.7	1.4	1.4
2(v) Debentures excluding 2(iii)	16.0	16.4	23.9	23.7
3. Public Deposits	6.8	7.2	0.6	0.5
4. Others	4.8	4.6	8.8	8.3
Total	**100.0**	**100.0**	**100.0**	**100.0**

Sources: RBI supervisory returns and staff calculations.

Chart 2.33: Credit Risk in NBFCs - System Level



Note: Baseline scenario is based on assumptions of business continuing under usual conditions for one year ahead, whereas medium risk and high-risk scenarios assume GNPA ratio increasing by 1 SD and 2 SD, respectively, over one year horizon.

Sources: RBI supervisory returns and staff calculations.

II.3.2 Stress Test - Liquidity Risk

2.64 The resilience of the NBFC sector to liquidity shocks has been assessed by estimating the impact of an increase in cash outflows coupled with a decline in cash inflows[35]. A liquidity mismatch over one year is likely to be capped within 20 per cent; although a weak tail of NBFCs may experience higher liquidity mismatch in medium and high risk scenarios (Table 2.8).

II.4 Stress Testing of Mutual Funds

2.65 The Securities and Exchange Board of India (SEBI) has mandated that asset management companies (AMCs) should carry out stress testing[36] of all open-ended debt schemes (except overnight schemes) every month to evaluate the impact of various risk parameters (*viz.*, interest rate risk, credit risk, liquidity risk and redemption risk) faced by such schemes on their net asset values (NAVs). The Association of Mutual Funds in India (AMFI) and AMCs specify the thresholds of impact for risk parameters: breach of either the AMFI or the AMC threshold requires reporting and remedial action.

2.66 In September 2024, 34 open-ended debt schemes with total AUM of ₹2.75 lakh crore breached the AMFI or AMC prescribed threshold (Table 2.9). In this respect, all the mutual funds (MFs) have reported initiation of remedial action to be completed in the prescribed timeframe.

2.67 Furthermore, as part of liquidity risk management for open-ended debt schemes, two types of liquidity ratios, *viz.*, (i) redemption at risk (LR-RaR), which represents likely outflows at a given confidence interval, and (ii) conditional redemption at risk (LR-CRaR), which represents the behaviour of the tail at the given confidence interval, have been used. All AMCs are mandated to maintain these liquidity ratios above the threshold limits which are derived from scheme type, scheme asset composition and potential outflows (modelled from investor concentration in the scheme). MFs are required to carry out back-testing of these liquidity ratios for all open-ended debt schemes (except overnight funds, gilt funds and gilt funds with 10-year constant duration) on a monthly basis.

Table 2.8: Liquidity Risk in NBFCs

Cumulative Mismatch as percentage of Outflows over next one year	No. of NBFCs having Liquidity Mismatch		
	Baseline	Medium	High
Over 50 per cent	0 (0.0)	1 (0.1)	1 (0.1)
Between 20 and 50 per cent	1 (0.1)	3 (0.9)	7 (1.6)
Between 15 and 20 per cent	2 (0.8)	1 (0.3)	6 (4.8)
Between 10 and 15 per cent	1 (0.1)	3 (0.3)	7 (0.8)
Between 5 and 10 per cent	1 (0.3)	5 (4.3)	8 (10.1)
5 per cent and below	3 (0.3)	8 (1.7)	5 (1.6)

Notes: (i) Baseline scenario is based on projected outflows and inflows over next one year as of September 2024; medium risk scenario assumes 5 per cent decrease in inflows and 5 per cent increase in outflows and high-risk scenario assumes 10 per cent decrease in inflows and 10 per cent increase in outflows.
(ii) Figures in parenthesis represent percentage share in asset size of the sample.
Sources: RBI supervisory returns and staff calculations.

Table 2.9: Stress Testing of Open-Ended Debt Schemes of Mutual Funds – Summary Findings – September 2024

	Risk above Threshold	Risk below Threshold	Total
No. of AMCs	20	24	44
No. of Schemes	34*	261	295
AUM (₹crore)	2,74,724	11,93,923	14,68,647

Note: * No. of schemes showing interest rate risk, credit risk and liquidity risk above threshold are 22, 13 and 0, respectively, while total number of unique schemes remain 34.
Source: SEBI.

[35] Stress testing based on liquidity risk was performed on a sample of 218 NBFCs from Upper Layer and Middle Layer. The total asset size of the sample was ₹33.61 lakh crore, comprising around 99 per cent of total assets of non-government, non-CIC NBFCs in the sector.

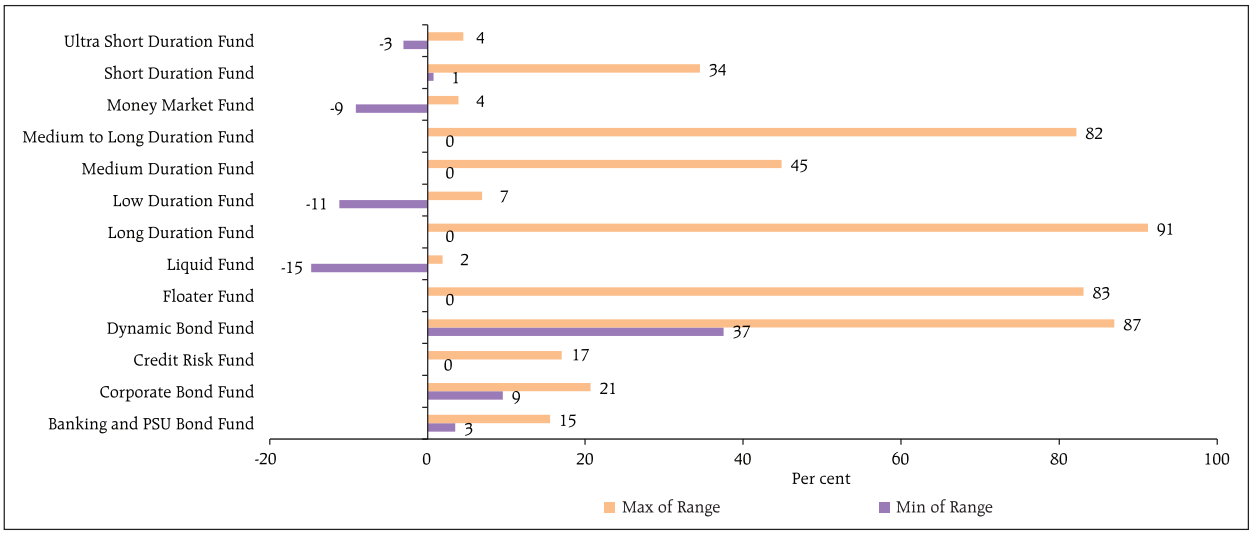
[36] The methodology used for stress testing of mutual funds is given in Annex 2.

2.68 The LR-RaR and LR-CRaR computed by top 10 MFs (based on AUM) for 13 categories of open-ended debt schemes were well above the respective threshold limits for most of the MFs in September 2024. A few instances of the ratios falling below the threshold limits were addressed by the respective AMCs in a timely manner (Chart 2.34 and Chart 2.35).

II.5 Stress Testing Analysis at Clearing Corporations

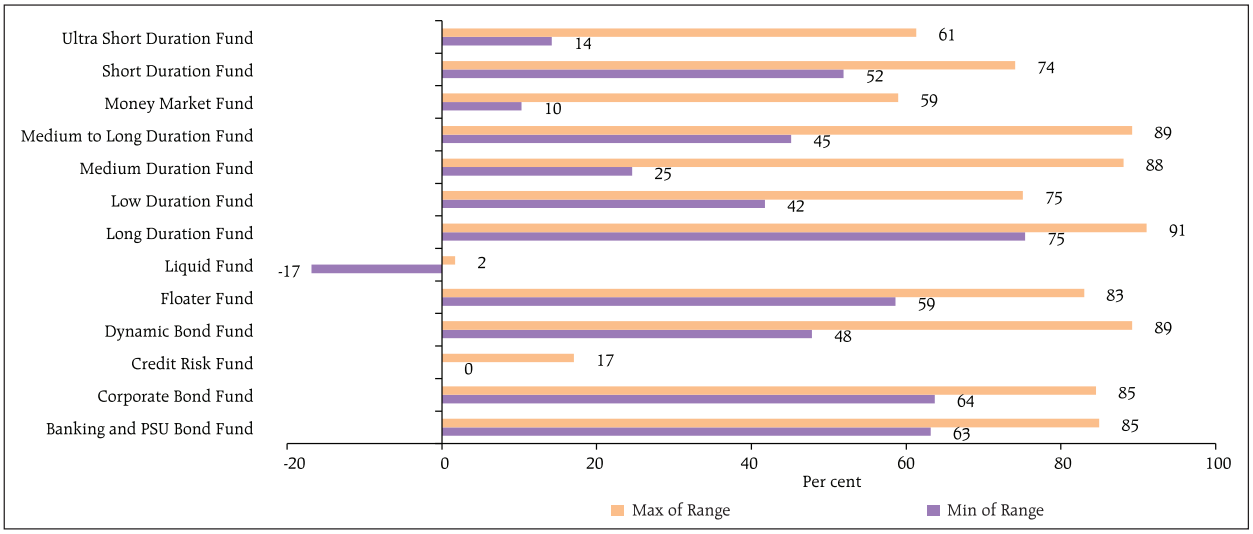
2.69 Stress testing[37] has been carried out at clearing corporations (CCs) to determine the

Chart 2.34: Range (Surplus (+)/ Deficit (-)) of LR-RaR Maintained by AMCs over AMFI Prescribed Limits



Note: Data pertains to Top 10 AMCs based on AUM as on September 30, 2024.
Source: SEBI.

Chart 2.35: Range (Surplus (+)/ Deficit (-)) of LR-CRaR Maintained by AMCs over AMFI Prescribed Limits



Note: Data pertains to Top 10 AMCs based on AUM as on September 30, 2024.
Source: SEBI.

[37] The methodology used for stress testing at clearing corporations is given in Annex 2.

segment-wise minimum required corpus (MRC), which needs to be contributed by clearing members (CMs) to the core settlement guarantee fund (Core SGF). The stress testing exercises aid in determining MRC for each segment (*viz.*, equity cash, equity derivatives, currency derivatives, commodity derivatives, debt and tri-party repo segment) every month.

2.70 The actual MRC requirement for any given month is determined as the higher of the MRC of the month and the MRC arrived at any time in the past. Stress test analysis for the period May 2024 to September 2024 indicated that while the monthly calculated amounts of MRC at CCs varied over months, the actual MRC requirement remained the same for most of the segments. The MRC requirement for one of the CCs in equity derivatives segment and another CC in the commodity derivatives segment, however, increased during the period (Table 2.10).

Table 2.10: Minimum Required Corpus of Core SGF Based on Stress Testing Analysis at Clearing Corporations-(Amount in ₹crore)

Segment	May-24	Jun-24	Jul-24	Aug-24	Sep-24
Clearing Corporation 1					
Average Stress Test Loss					
Equity Cash Segment	69	172	39	102	69
Equity Derivatives Segment	630	2616	768	755	714
Currency Derivatives Segment	126	144	132	124	108
Debt Segment	0	0	0	0	0
Tri-Party Repo Segment	0	0	0	0	0
Commodity Derivatives Segment	0	0	1	2	3
Total	826	2932	940	982	894
Actual MRC Requirement					
Equity Cash Segment	388	388	388	388	388
Equity Derivatives Segment	2423	2423	2423	2616	2616
Currency Derivatives Segment	242	242	242	242	242
Debt Segment	4	4	4	4	4
Tri-Party Repo Segment	17	17	17	17	17
Commodity Derivatives Segment	10	10	10	10	10
Total	3,085	3,085	3,085	3,277	3,277
Clearing Corporation 2					
Average Stress Test Loss					
Equity Cash Segment	27	32	30	19	24
Equity Derivatives Segment	22	57	17	23	14
Currency Derivatives Segment	0.0	0.2	0.0	0.2	0.5
Commodity Derivatives Segment	0	0	0	0	0
Total	48	89	47	42	38
Actual MRC Requirement					
Equity Cash Segment	194	194	194	194	194
Equity Derivatives Segment	74	74	74	74	74
Currency Derivatives Segment	388	388	388	388	388
Commodity Derivatives Segment	14	14	14	14	14
Total	670	670	670	670	670
Clearing Corporation 3 (Commodity Derivatives Segment)					
Average Stress Test Loss	50	44	50	47	56
Actual MRC requirement	124	124	124	124	124
Clearing Corporation 4 (Commodity Derivatives Segment)					
Average Stress Test Loss	483	477	618	626	504
Actual MRC requirement	562	562	562	562	618

Note: Average stress test loss calculated for a month M is applicable as MRC, from the month M+2.
Source: Clearing corporations.

II.6 Insurance Sector

2.71 The solvency ratio of an insurance company assesses its ability to meet its obligations towards policyholders by reflecting the level of its assets over and above its liabilities. The higher the solvency ratio, the better the ability of the insurer to meet its liabilities. The Insurance Regulatory and Development Authority of India (IRDAI) has set the minimum solvency ratio requirement for insurance companies in India at 150 per cent. As insurance liabilities are contingent upon future events, a higher solvency ratio implies resilience of the insurer to withstand future uncertainties.

2.72 The aggregate solvency ratio for life insurance companies has remained above the prescribed threshold for both public and private sectors (Table 2.11). The solvency ratio for three public sector non-life insurers, however, stood below the baseline prescription. It remained well above the threshold for rest of the non-life insurer categories (Table 2.12).

Table 2.11: Solvency Ratio of Life Insurance Sector

(per cent)

	Public Sector	Private Sector	Life Insurance Industry
Sep-23	190	220	197
Dec-23	193	215	198
Mar-24	198	207	200
Jun-24	199	210	202

Source: IRDAI.

Table 2.12: Solvency Ratio of Non-Life Insurance Sector

(per cent)

	PSU Insurers	Private Insurers	Stand Alone Health Insurers	Specialised Insurers	Non-Life Insurance Industry
Sep-23	39	228	195	689	164
Dec-23	39	223	209	774	165
Mar-24	35	223	208	835	166
Jun-24	31	227	208	855	167

Source: IRDAI.

II.7 Interconnectedness

2.73 Interconnections among financial institutions involve funding gaps arising due to liquidity mismatches and maturity transformation, payments processes, and risk transfer mechanisms. The financial system can be visualised as a network where financial institutions act as nodes and the bilateral exposures among them serve as links connecting these nodes. These links could be in the form of loans to, investments in, or deposits with each other, which act as a source of funding, liquidity, investment and risk diversification. While these links enable gains in efficiency and diversification of risks, they can become conduits of risk transmission and risk amplification in a crisis. Understanding the nuances in propagation of risk through networks is useful for devising appropriate policy responses for safeguarding macroeconomic and financial stability.

II.7.1 Financial System Network[38] [39]

2.74 The total outstanding bilateral exposures[40] among the entities in the Indian financial system continued to expand during H1:2024-25. While the annual growth of bilateral exposures fluctuated between 15 and 19 per cent, a surge during H1:2024-25 was primarily driven by the rise in exposure of AMC-MFs and NBFCs to SCBs. Further, the conversion of two HFCs to NBFCs (non-HFC) also contributed to a higher share of NBFCs (non-HFC) and a decline in the share of HFCs in bilateral exposures. (Chart 2.36 a and b).

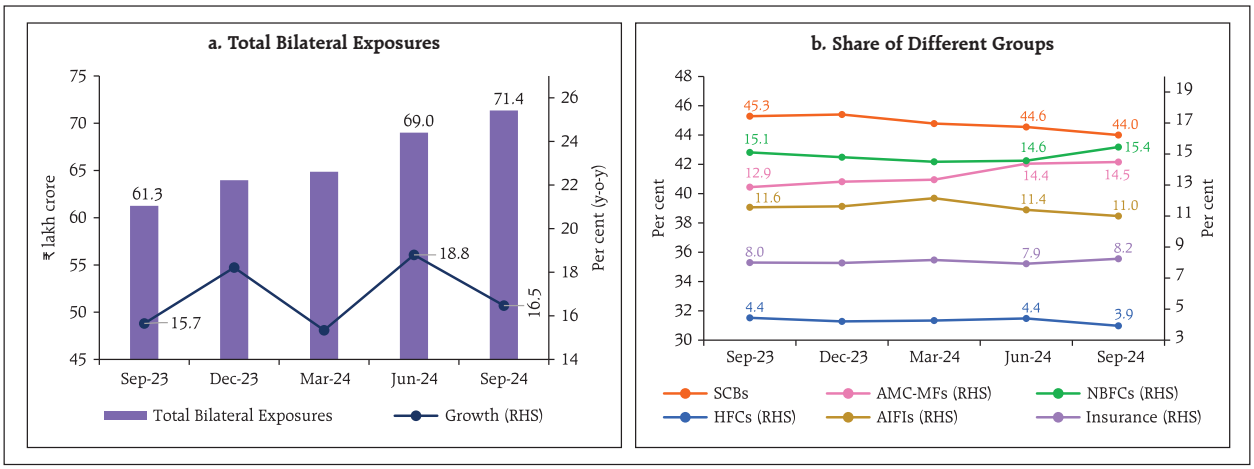
2.75 The funding mix of the financial system shows that long-term (LT) funding - primarily loans and advances, equity and other LT debt instruments - provided a major channel for bilateral exposures in the system. A segment wise analysis broadly indicated that (a) LT loans were mainly advanced by SCBs to NBFCs; (b) AMC-MFs were major investors in the equities issued by PVBs and NBFCs; and (c) in the LT debt market, insurance companies held the majority of instruments issued by PVBs,

[38] 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 Department, Reserve Bank of India.

[39] Analyses presented here and in the subsequent part are based on data of 229 entities from the following eight sectors: SCBs, scheduled UCBs (SUCBs), AMC-MFs, NBFCs, HFCs, insurance companies, pension funds and AIFIs. These 229 entities covered include 77 SCBs, 11 small finance banks (SFBs), 20 SUCBs; 25 AMC-MFs (which cover more than 98 per cent of the AUMs of the mutual fund sector); 43 NBFCs (both deposit taking and non-deposit taking systemically important companies, which represent about 70 per cent of total NBFC assets); 22 insurance companies (that cover more than 95 per cent of assets of the sector); 16 HFCs (which represent more than 75 per cent of total HFC assets); 10 PFs and 5 AIFIs (NABARD, EXIM, NHB, SIDBI and NaBFID).

[40] Includes exposures between entities of the same group. Exposures are outstanding position as on September 30, 2024 and are broadly divided into fund-based and non-fund-based exposure. Fund-based exposure includes money market instruments, deposits, loans and advances, long-term debt instruments and equity investments. Non-fund- based exposure includes letter of credit, bank guarantee and derivative instruments (excluding settlement guaranteed by CCIL).

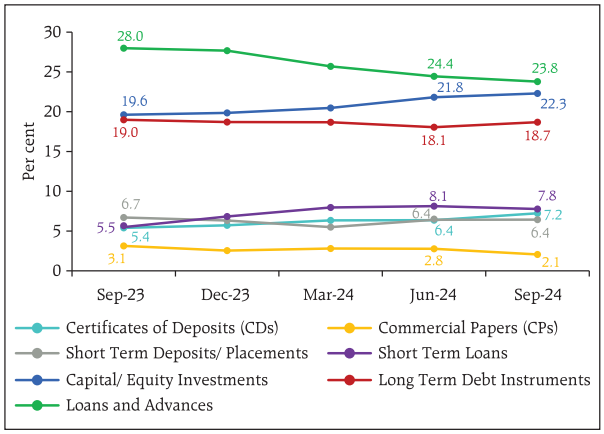
Chart 2.36: Bilateral Exposures between Entities in the Financial System



Note: Exposures between entities of the same group are included.
Sources: Supervisory returns of various regulators and RBI staff calculations.

NBFCs (non-HFC) and HFCs. In the short-term (ST) funding mix, apart from inter-bank ST loans and deposits, CPs and CDs played a significant role. In the CP market, AIFIs, NBFCs (non-HFC) and HFCs were the largest receivers of funds and AMC-MFs were the largest investor group. On the other hand, PSBs, PVBs and AIFIs were the major fund receivers in the CD market, where AMC-MFs were the largest fund providers (Chart 2.37).

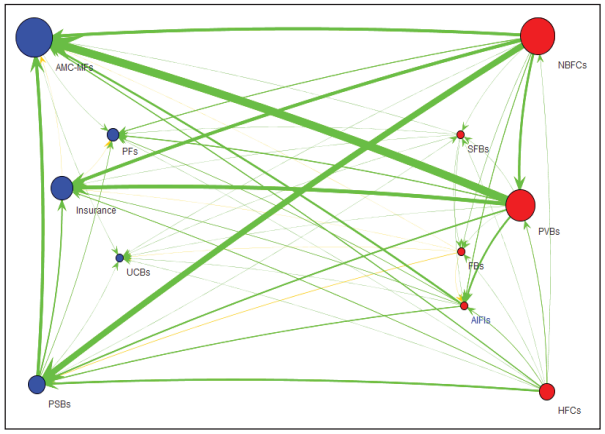
Chart 2.37: Instrument-wise Exposure among Entities in the Financial System



Note: Exposures between entities of the same group are included.
Sources: Supervisory returns of various regulators and RBI staff calculations.

2.76 In terms of inter-sectoral exposures[41], AMC-MFs, insurance companies and PSBs remained the largest fund providers in the system, whereas NBFCs and PVBs were the largest receivers of funds, followed by HFCs. Among bank groups, PSBs and UCBs had net receivable positions *vis-à-vis* the entire financial sector whereas PVBs, FBs and SFBs had net payable positions (Chart 2.38).

Chart 2.38: Network Plot of the Financial System - September 2024



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.
Sources: Supervisory returns of various regulators and RBI staff calculations.

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

2.77 The net receivable positions of AMC-MFs and net payable positions of PVBs and NBFCs recorded large increases in September 2024 *vis-à-vis* September 2023 (Chart 2.39).

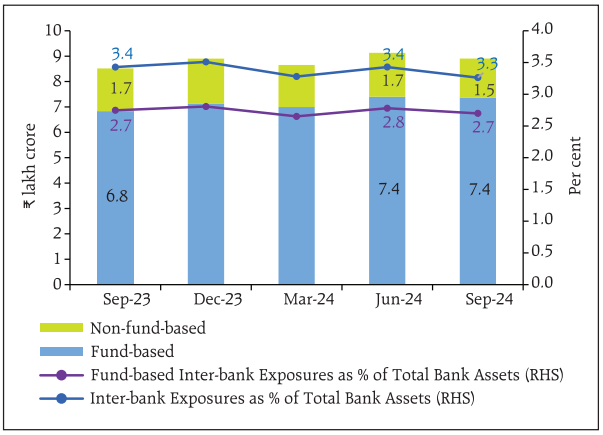
a. Inter-Bank Market

2.78 Inter-bank exposures were 3.3 per cent of the total assets of the banking system in September 2024. During H1:2024-25, fund-based exposures[42] increased marginally while non-fund-based exposures[43] receded marginally (Chart 2.40).

2.79 PSBs continued to dominate the inter-bank market, followed by PVBs and FBs. The share of PSBs increased while that of PVBs and FBs declined in H1:2024-25 (Chart 2.41).

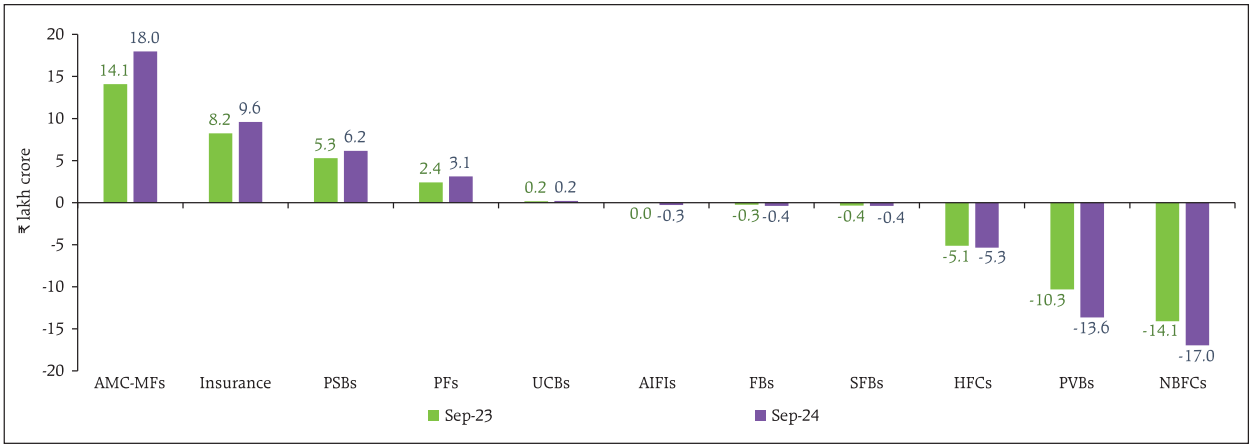
2.80 Unlike in the overall financial network in which LT fund-based exposure forms a major part, ST funding plays a crucial role in the inter-bank market. As at end-September 2024, 74 per cent of the fund-based inter-bank market was short-term in nature in which ST deposits and ST loans constituted over 70 per cent. There was a notable rise (y-o-y) in share of CDs, *inter alia*, due to higher issuance of CDs by banks. The share of LT deposits increased whereas that of LT loans and LT debt in LT fund-based inter-bank market declined during this period (Chart 2.42).

Chart 2.40: Inter-Bank Market



Sources: RBI supervisory returns and staff calculations.

Chart 2.39: Net Receivables (+ve)/ Payables (-ve) by Institutions

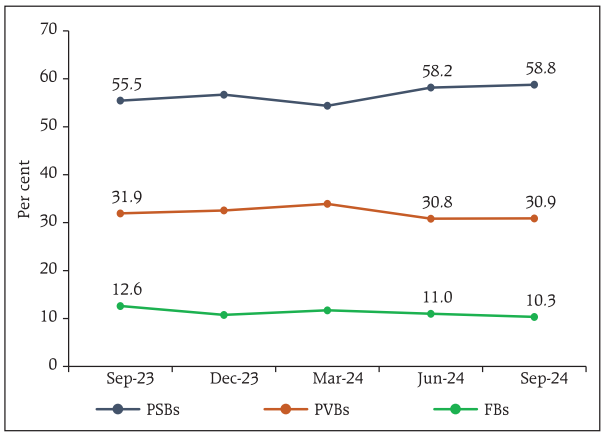


Note: Receivables and payables do not include transactions among entities of the same group.
Sources: Supervisory returns of various regulators and RBI staff calculations.

[42] 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 money; commercial papers; 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.

[43] Non-Fund based exposures include - 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).

Chart 2.41: Share of Different Bank Groups in the Inter-Bank Market



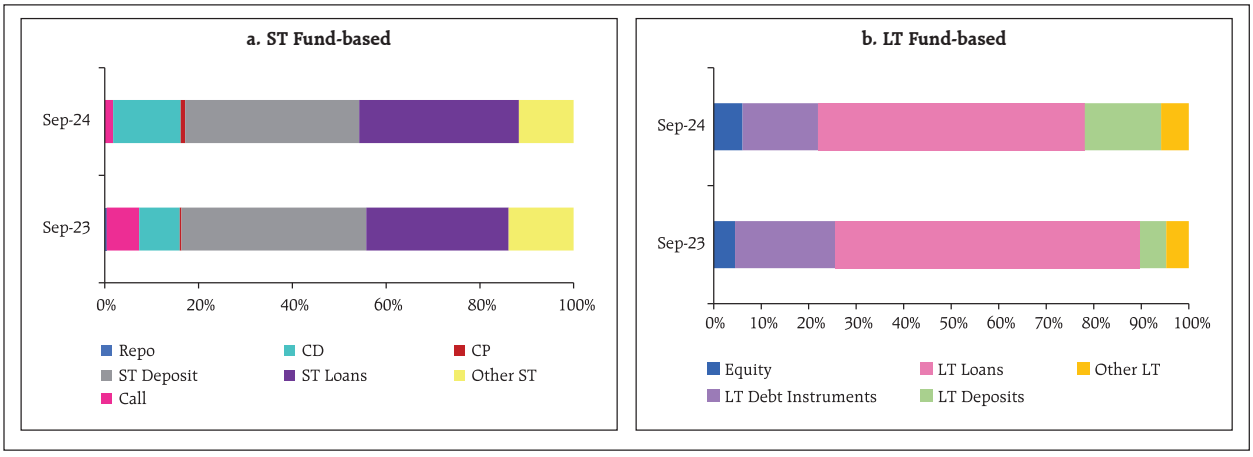
Sources: RBI supervisory returns and staff calculations.

b. Inter-Bank Market: Network Structure and Connectivity

2.81 The distribution of the number of links between entities in the inter-bank market network is highly skewed, with most banks having few links and few banks having many links. This has resulted into a typical core-periphery network structure[44 45]. As of end-September 2024, two banks (one PSB and one PVB) were in the inner-most core and nine banks in the mid-core circle. The mid-core consisted of PSBs, PVBs and FBs. Most of the old PVBs along with FBs, SUCBs and SFBs formed the periphery (Chart 2.43).

2.82 While the degree of interconnectedness among SCBs in terms of the number of links, as measured by the connectivity ratio[46], increased marginally in H1:2024-25, the cluster coefficient[47], *i.e.*, the number of connections along with interconnections of neighbouring nodes, reduced marginally (Chart 2.44).

Chart 2.42: Composition of Fund based Inter-Bank Market



Sources: RBI supervisory returns and staff calculations.

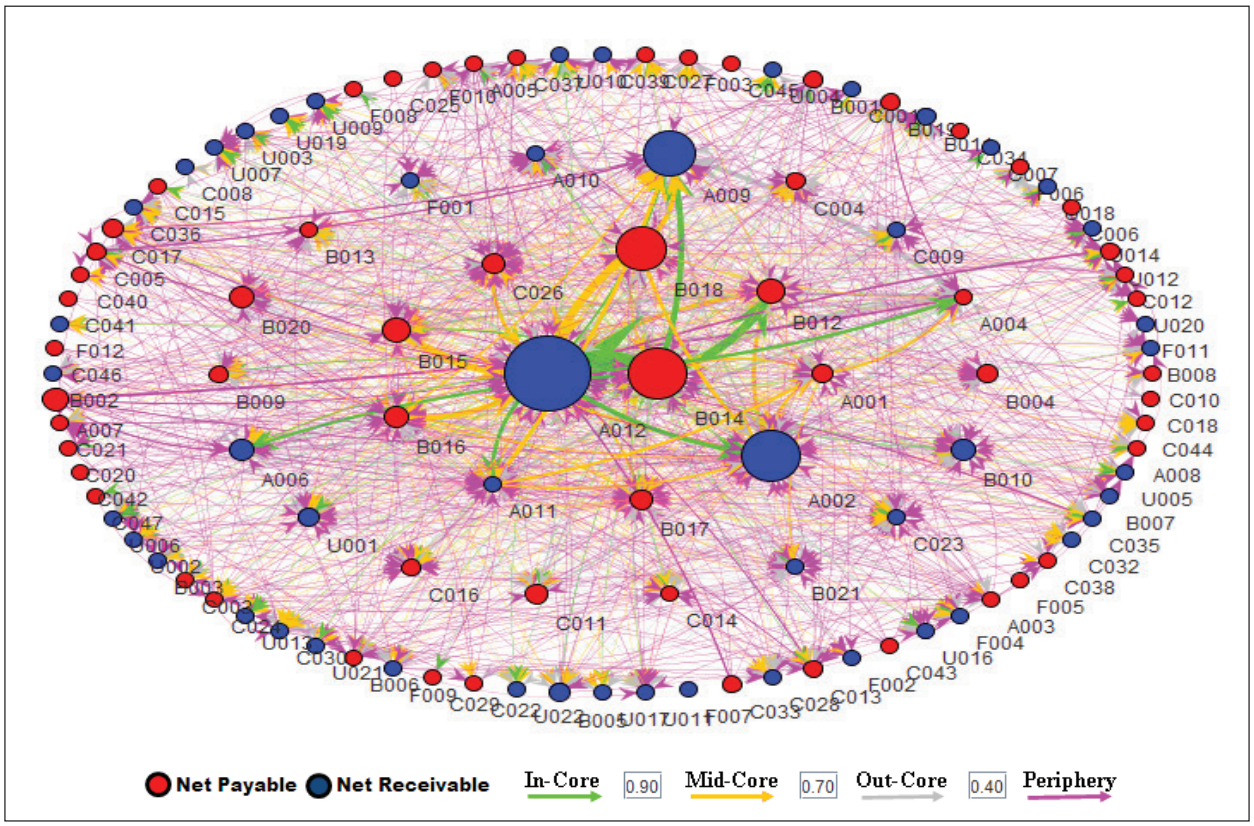
[44] The diagrammatic representation of the network of the banking system is that of a tiered structure, in which different banks have different degrees or levels of connectivity with others in the network. The most connected banks are in the inner-most core (at the centre of the network diagram). Banks 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.

[45] 77 SCBs, 11 SFBs and 20 SUCBs were considered for this analysis.

[46] The Connectivity ratio measures the actual number of links between the nodes relative to all possible links in a complete network.

[47] 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.

Chart 2.43: Network Structure of the Indian Banking System (SCBs + SFBs + SUCBs) – September 2024

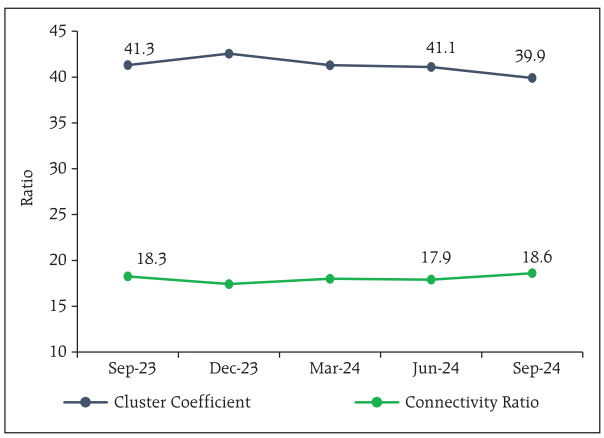


Sources: RBI supervisory returns and staff calculations.

c. Exposure of AMC-MFs

2.83 Gross receivables of AMC-MFs stood at ₹19.16 lakh crore (around 29 per cent of their average AUM) whereas their gross payables were ₹1.19 lakh crore as at end-September 2024. SCBs (primarily PVBs) remained the major recipients of their funding, followed by NBFCs, AIFIs and HFCs (Chart 2.45 a).

Chart 2.44: Connectivity Statistics of the Banking System (SCBs)



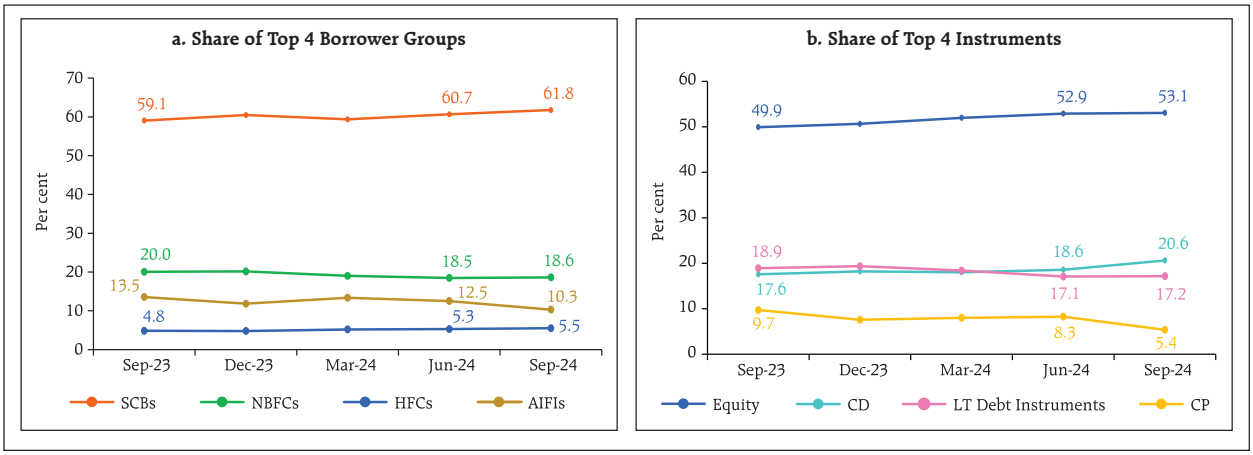
Sources: RBI supervisory returns and staff calculations.

2.84 The share of equity holdings in total assets of AMC-MFs continued to rise. There was notable increase in AMC-MFs' investment in CDs whereas their CP investment came down during the period (Chart 2.45 b).

d. Exposure of Insurance Companies

2.85 With gross receivables at ₹10.44 lakh crore and gross payables at ₹0.86 lakh crore, insurance companies were the second largest net providers of funds to the financial system in September 2024. SCBs (primarily PVBs) were the largest recipients

Chart 2.45: Gross Receivables of AMC-MFs from the Financial System



Sources: Supervisory returns of various regulators and RBI staff calculations.

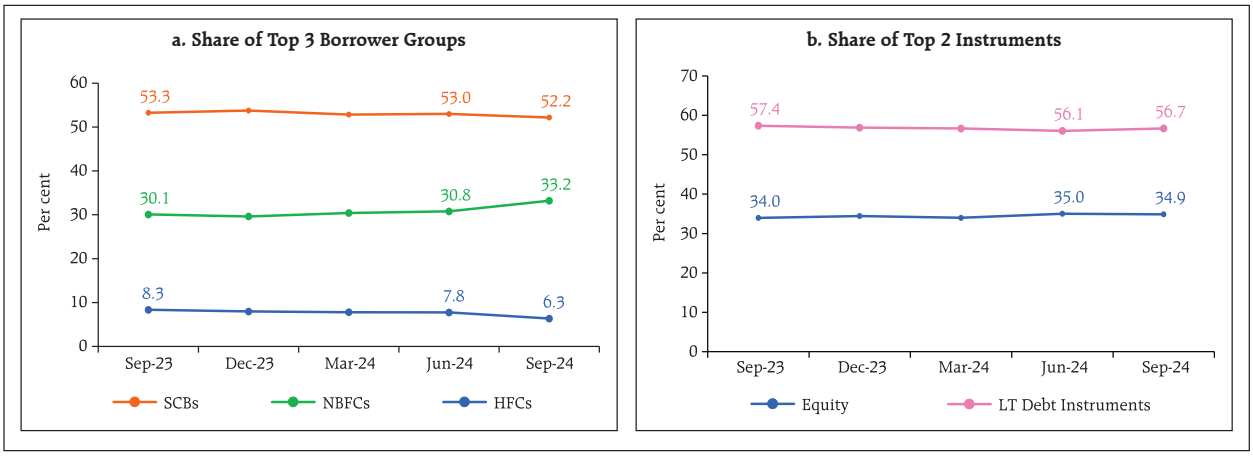
of their funds, followed by NBFCs (non-HFC) and HFCs. LT debt and equity accounted for more than 90 per cent of receivables of insurance companies; they had limited exposure to ST instruments (Chart 2.46 a and b).

e. Exposure to NBFCs (non-HFC)

2.86 NBFCs (non-HFC) were the largest net borrowers of funds of the financial system, with gross payables of ₹19.16 lakh crore and gross receivables of ₹2.19 lakh crore in September 2024. A breakup of their gross payables reveals that the bulk of funds were sourced from SCBs, followed by AMC-MFs and insurance companies (Chart 2.47 a).

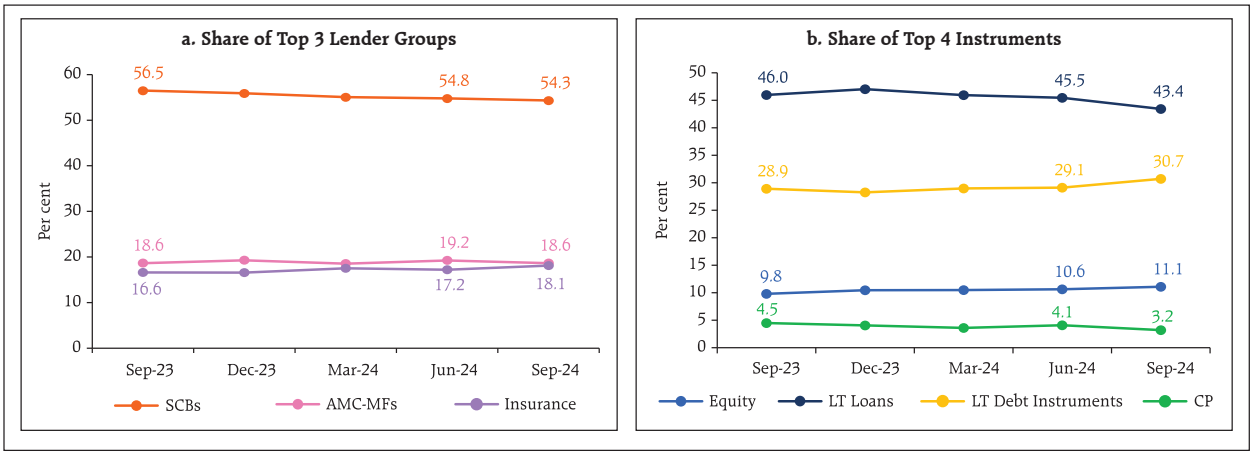
2.87 The choice of instruments in the funding mix of NBFCs (non-HFC) shows high reliance on LT funds. While the raising of funds by NBFCs through LT loans (from SCBs) declined during H1:2024-25, the reliance on borrowing through LT debt instruments increased, which were largely held by insurance companies and AMC-MFs (Chart 2.47 b).

Chart 2.46: Gross Receivables of Insurance Companies from the Financial System



Sources: Supervisory returns of various regulators and RBI staff calculations.

Chart 2.47: Gross Payables of NBFCs to the Financial System



Sources: Supervisory returns of various regulators and RBI staff calculations.

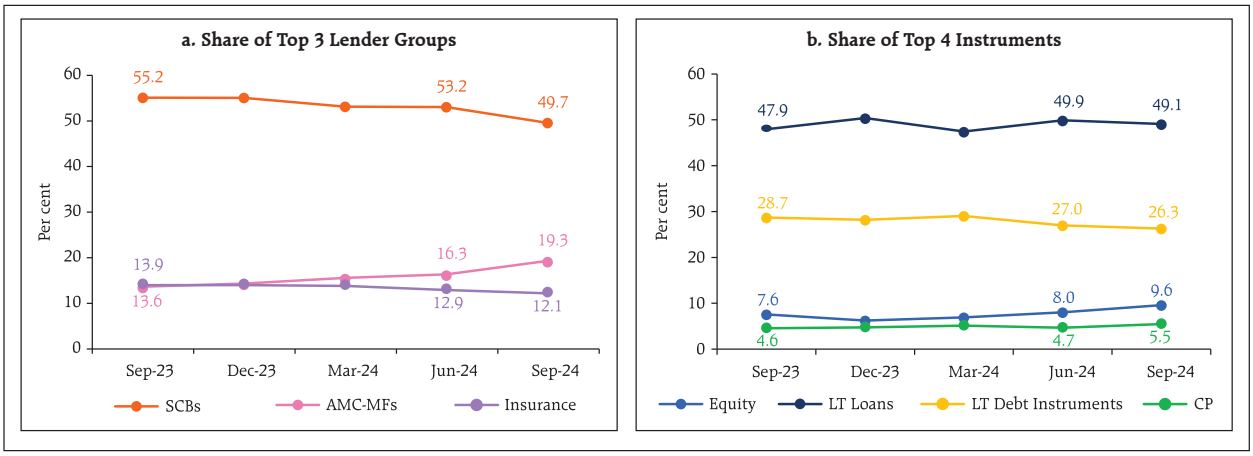
f. Exposure to HFCs

2.88 HFCs remained the second largest net borrowers and had gross payables of ₹5.45 lakh crore against gross receivables of ₹0.12 lakh crore in September 2024. SCBs followed by AMC-MFs and insurance companies were the major providers of funds. About 75 per cent of HFCs' resource mobilisation was through LT loans and LT debt instruments (Chart 2.48 a and b).

g. Exposure to AIFIs

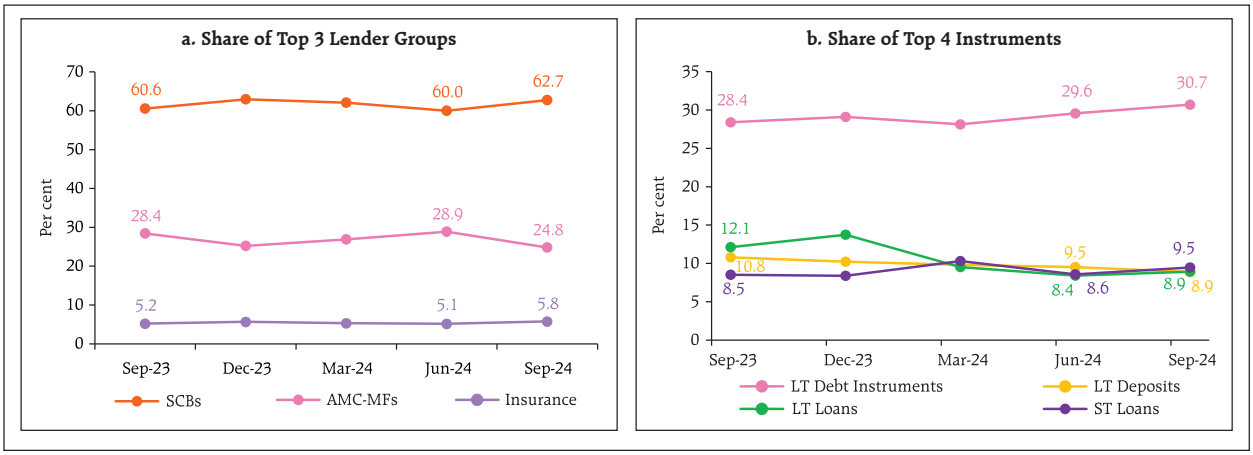
2.89 With gross payables and receivables at ₹7.95 lakh crore and ₹7.66 lakh crore, respectively, AIFIs were net borrowers of the financial system in September 2024. They raised funds mainly from SCBs, AMC-MFs and insurance companies. Given their nature of operations, long-term instruments such as LT debt, LT loans and LT deposits remained their preferred instruments for resource mobilisation, though the combined share of these instruments came down marginally to 48.5 per cent from 51.3 per cent a year ago, while the borrowing through ST loans and other ST instruments increased (Chart 2.49 a and b).

Chart 2.48: Gross Payables of HFCs to the Financial System



Sources: Supervisory returns of various regulators and RBI staff calculations.

Chart 2.49: Gross Payables of AIFIs to the Financial System



Sources: Supervisory returns of various regulators and RBI staff calculations.

II.7.2 Contagion Analysis

2.90 Contagion analysis uses network technology to estimate the systemic importance of different financial institutions. The failure of a systemically important bank entails greater solvency and liquidity losses for the banking system which, in turn, depend on the initial capital and liquidity positions of banks along with the number, magnitude, and nature (whether it is a lender or a borrower) of the interconnections that a failing bank has with the rest of the banking system.

a. Joint Solvency[48]- Liquidity[49] Contagion Impact on SCBs due to Bank Failure

2.91 Contagion analysis of the banking network on the end-September 2024 position indicates that if the bank with the maximum capacity to cause contagion losses fails, it will cause a solvency loss of 3.10 per cent (as compared to 5.06 per cent in March 2024) of total Tier 1 capital of SCBs and liquidity loss of 0.22 per cent (as compared to 0.31 per cent in March 2024) of total HQLA of the banking system. Also, it will not lead to failure of any additional bank (Table 2.13).

b. Solvency Contagion Impact on SCBs due to NBFC/ HFC Failure

2.92 As NBFCs (non-HFC) and HFCs are among the largest borrowers of funds from the financial system with a substantial part of funding from banks, failure of any of such institution will act as a solvency shock to their lenders which can spread through contagion.

Table 2.13: Contagion Losses due to Bank Failure – September 2024

Name of Bank	Solvency Losses as per cent of Tier 1 Capital of the Banking System	Liquidity Losses as per cent of HQLA	Number of Banks Defaulting due to Solvency	Number of Banks Defaulting due to Liquidity
Bank 1	3.10	0.22	0	0
Bank 2	1.78	0.00	0	0
Bank 3	1.59	0.51	0	0
Bank 4	1.46	0.40	0	0
Bank 5	1.34	0.06	0	0

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

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

[49] 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 hypothetical failure of large net lender. Liquid assets are measured as: 18 per cent of NDTL + excess SLR + excess CRR.

Table 2.14: Contagion Losses due to NBFC Failure – September 2024

NBFC Name	Solvency Losses as per cent of Tier 1 Capital of the Banking System	Number of Banks Defaulting due to Solvency
NBFC 1	2.74	0
NBFC 2	2.58	0
NBFC 3	2.28	0
NBFC 4	1.80	0
NBFC 5	1.75	0

Note: Only Private NBFCs are considered. Top five 'Trigger NBFCs' have been selected on the basis of solvency losses caused to the banking system.
Sources: RBI supervisory returns and staff calculations.

Table 2.15: Contagion Losses due to HFC Failure – September 2024

HFC Name	Solvency Losses as per cent of Tier 1 Capital of the Banking System	Number of Banks Defaulting due to Solvency
HFC 1	4.14	0
HFC 2	1.29	0
HFC 3	1.04	0
HFC 4	0.77	0
HFC 5	0.73	0

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

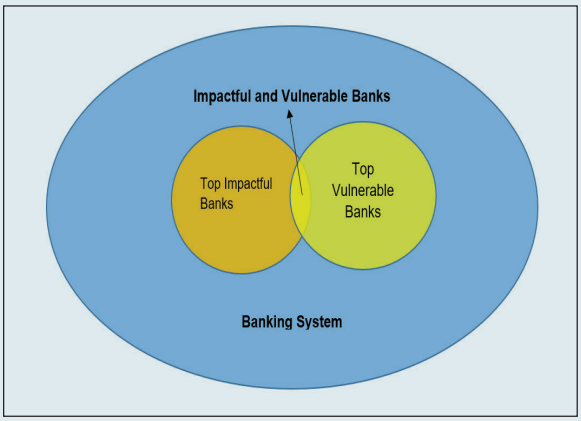
2.93 By end-September 2024, the hypothetical failure of the NBFC with the maximum capacity to cause solvency losses to the banking system would have knocked off 2.74 per cent (2.29 per cent in March 2024) of the latter's total Tier 1 capital but it would not lead to failure of any bank. Similarly, the hypothetical failure of the HFC with the maximum capacity to cause solvency losses to the banking system would have knocked off 4.14 per cent (3.87 per cent in March 2024) of the latter's total Tier 1 capital but without failure of any bank (Tables 2.14 and 2.15).

2.94 By leveraging the bilateral exposure data collected for contagion analysis, impact and vulnerability metrics have been constructed to identify banks which are highly impactful and vulnerable at the same time (Box 2.3).

Box 2.3: Identification of Impactful and Vulnerable Banks

The evolving landscape of the financial system calls for better understanding of the build-up of systemic risk in the complex interactions between different financial intermediaries - not only banks but also non-bank financial institutions. When a bank experiences financial stress, its vulnerabilities may spill over and contaminate the broader financial system. The identification of such banks that are impactful (*i.e.*, those causing sizeable capital losses throughout the system upon their default) and vulnerable (*i.e.*, their own capital loss susceptibility conditional on other entities' failures) can help understand how the vulnerabilities in impactful entities propagate shocks through the network and lead to contagion in the broader financial system during a crisis and can possibly guide policy makers on macro-prudential policy measures (Chart 1). Based on the recommendations of the IMF (2024), impact and vulnerability metrics for banks have been compiled.

Chart 1: Representation of Impactful and Vulnerable banks



(Contd.)

Data on bilateral exposures among entities of the financial system can be leveraged to compute impact and vulnerability metrics to identify entities that are impactful and vulnerable, using the following metrics and methodology (IMF, 2017):

(i) Index of contagion (impact) of a bank represents the average loss experienced by other banks (expressed as a percentage of their Tier 1 capital) due to failure of the bank.

Index of contagion (impact) of bank i $= 100 * (\sum_{j \neq i} L_{ji} / K_j) / (N-1)$

where K_j is bank j's capital, L_{ji} is the loss to bank j due to the default of bank i and N is the total number of banks;

(ii) Index of vulnerability of a bank represents the average loss experienced by the bank (expressed as a percentage of its Tier 1 capital) across individually triggered failures of all other banks.

Index of vulnerability of bank i $= 100 * (\sum_{j \neq i} L_{ij} / K_i) / (N-1)$

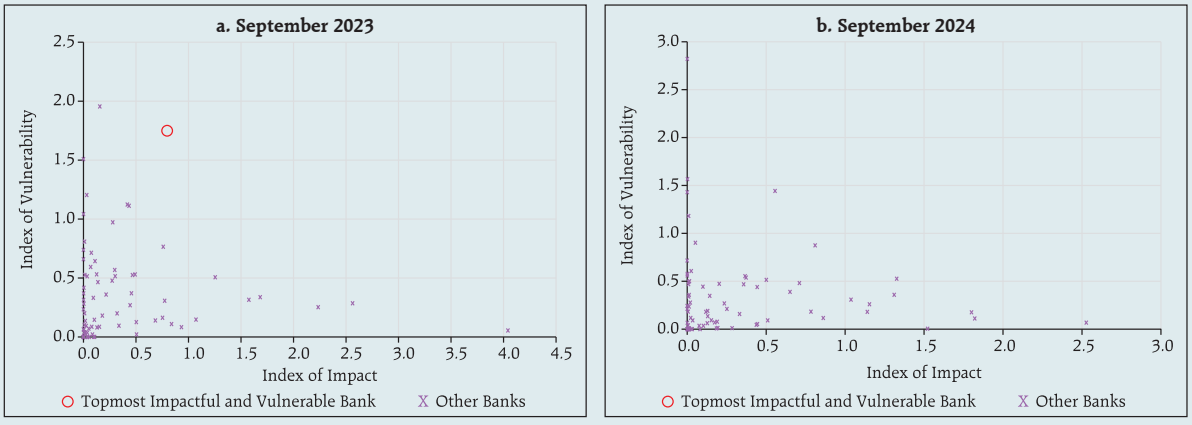
where K_i is bank i's capital, L_{ij} is the loss to bank i due to the default of bank j and N is the total number of banks;

(iii) To analyse the effects of a credit shock, the present exercise simulates individual default of each bank with 100 per cent loss-given-default ($\lambda = 1$), where the counterparties' capitals absorb the losses on impact. Then, bank i is said to fail, if its capital is insufficient to fully cover its losses due to the default of bank j, *i.e.*, if $K_i - \lambda X_{ji} < 0$, where X_{ji} stands for exposure of bank i to bank j and K_i stands for bank i's capital. In the subsequent rounds, if there are further failures, the losses are aggregated.

Scatter plot of impact and vulnerability indices of all 77 banks (PSBs, PVBs and FBs) included in the analysis for September 2024 shows that the bank which occupies the topmost position in terms of impact is different from the topmost bank in terms of vulnerability. Hence, the set of top ten highly impactful banks and the set of top ten highly vulnerable banks are considered. However, there is no bank common between these two sets in September 2024. Over a longer horizon (September 2019 to September 2024), one bank emerged to be both impactful and vulnerable at the same time in each period among the top ten ones, although such bank differed from period to period (Chart 2 a and b).

As an extension of the analysis, vulnerability of banks due to failure of NBFCs and HFCs is also assessed. Vulnerability indices of PSBs due to the failure of NBFCs/HFCs are found to be higher relative to other bank groups during 2019 to 2024. Within the PVBs' cohort, old banks are more vulnerable as compared to the newer ones. Further, vulnerability indices of four banks on account of failure of NBFCs are comparatively higher (more than 2 per cent), while these indices are higher for only two banks due to the failure of HFCs

Chart 2: Scatter Plot of Impactful and Vulnerable Banks



Source: RBI staff calculations.

(Contd.)

(Chart 3 a and b). Also, the impact index shows that the failure of one NBFC can impact banks by more than 2 per cent of their capital on an average due to its higher borrowings from banks, whereas HFCs do not have a significant contagion impact on banks (Chart 3 c and d).

In short, within the cohort of top ten highly vulnerable and impactful banks, there is no bank which is highly impactful and vulnerable at the same time. Among the bank groups, PSBs are more vulnerable to failures of NBFCs/HFCs and, NBFCs may cause higher contagion impact on banks as compared to HFCs.

Chart 3: Impact and Vulnerability Metrics of NBFCs/HFCs - September 2024

Source: RBI staff calculations.

References:

1. International Monetary Fund (2017), Luxembourg Financial Sector Assessment Program Technical Note - Risk Analysis, August.

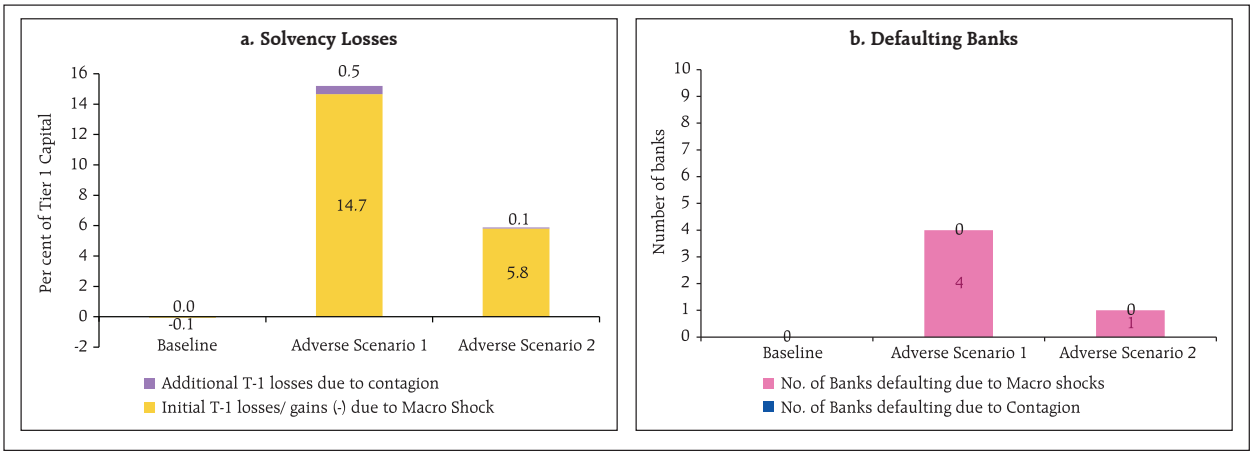
2. International Monetary Fund (2024), 'India: Technical Assistance Report-Review and Evaluation of the Reserve Bank of India's Stress Test Model Framework', November 01, 2024.

c. Solvency Contagion Impact[50] after Macroeconomic Shocks to SCBs

2.95 Any contagion from failure of a bank is likely to get magnified if macroeconomic shocks result in distress to the banking system. In such a situation, similar shocks may cause some SCBs to fail the solvency criterion, which, then, acts as a trigger for further solvency losses.

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

Chart 2.50: Contagion Impact of Macroeconomic Shocks (Solvency Contagion)



Sources: RBI supervisory returns and staff calculations.

2.96 In the previous iteration, the shock was applied to the entity that could cause the maximum solvency contagion losses. Here, we consider another iteration, where the initial impact on an individual bank's capital is taken from the macro stress test results[51]. In such conditions, capital loss(+)/gain(-) under various macroeconomic scenarios stood at (-) 0.1 per cent, 14.7 per cent and 5.8 per cent of Tier I capital for baseline, adverse scenario 1 and adverse scenario 2, respectively. All banks would maintain the regulatory minimum capital in the baseline scenario, whereas Tier I capital ratio would fall below 7 per cent for four banks in adverse scenario 1 and for one bank in adverse scenario 2. As a result, there would be marginal additional solvency losses to the banking system due to contagion (over and above the initial loss of capital due to the macro shocks), without failure of additional banks (Chart 2.50 a and b).

Summary and Outlook

2.97 Bank credit growth has moderated but remains in double digits and broad based. The asset quality parameters of banks have improved further and their capital levels remain robust. Although net interest margins have narrowed, banks' return on equity and return on assets have improved. MTM losses in the HTM books of SCBs have turned a corner to record gains. The balance sheet of the NBFC sector has gained further strength.

2.98 Macro stress tests reveal that SCBs' aggregate capital would remain much higher than the minimum regulatory capital requirements in March 2026 under adverse scenarios. Stress test for NBFCs shows that even under a high-risk scenario, their CRARs would remain much above the regulatory minimum level. The ability of the financial institutions to absorb shocks in adverse scenarios provide comfort on financing of economic growth dynamics, going forward.

[51] 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 2026 with respect to the actual value in September 2024) were applied to the September 2024 capital position assuming proportionally similar balance sheet structures for both September 2024 and March 2026.

(b) Bilateral exposures between financial entities are assumed to be similar for September 2024 and March 2026.