

Chapter II

Financial Institutions: Soundness and Resilience

The business of scheduled commercial banks (SCBs) remained subdued mainly due to the muted performance of public sector banks (PSBs). The asset quality of banks deteriorated further between March and September 2016. PSBs continued to record the lowest capital to risk-weighted assets ratio (CRAR) among the bank groups with negative returns on their assets.

The banking stability indicator shows that the risks to the banking sector remained elevated due to continuous deterioration in asset quality, low profitability and liquidity. Given the higher levels of impairment, SCBs may remain risk averse in the near future as they clean up their balance sheets and their capital position may remain insufficient to support higher credit growth. Stress tests of SCBs show that their GNPA ratio may increase further if macroeconomic conditions deteriorate sharply.

The asset quality of scheduled urban co-operative banks (SUCBs) as well as non-banking financial companies (NBFCs) deteriorated. The capital adequacy of SUCBs, however, improved marginally.

Section I

Scheduled commercial banks¹

2.1 In this section, the soundness and resilience of scheduled commercial banks (SCBs)² is discussed under two broad sub-heads: i) performance on functional aspects and ii) resilience using macro-stress tests through scenarios and single factor sensitivity analyses.

Performance

2.2 SCBs' business growth continued to be subdued with public sector banks (PSBs) continuing to lag behind their private sector peers. Overall,

capital adequacy in terms of capital to risk-weighted assets ratio (CRAR) remained unchanged at 13.3 per cent, whereas, the Tier-I leverage ratio³ at the system level increased marginally between March and September 2016. System level profit after tax (PAT) contracted on y-o-y basis in the first half of 2016-17 due to higher growth in risk provisions, loan write-off and decline in net interest income (NII). PSBs as a group continued to record losses. SCBs' return on assets (RoA) marginally improved to 0.4 per cent from 0.3 per cent and return on equity (RoE) increased to 5.0 per cent from 3.2 per cent between March and September 2016 (Chart 2.1).

¹ Analyses undertaken in the chapter are based on latest available data which are provisional.

² Analyses are based on supervisory returns which cover only domestic operations of SCBs, except in the case of data on large borrowers, which is based on banks' global operations. SCBs include public sector, private sector and foreign banks.

³ Tier-I leverage ratio is defined as the ratio of Tier-I capital to total assets. Total assets include the credit equivalent of off-balance sheet items.

Chart 2.1: Select performance indicators of SCBs



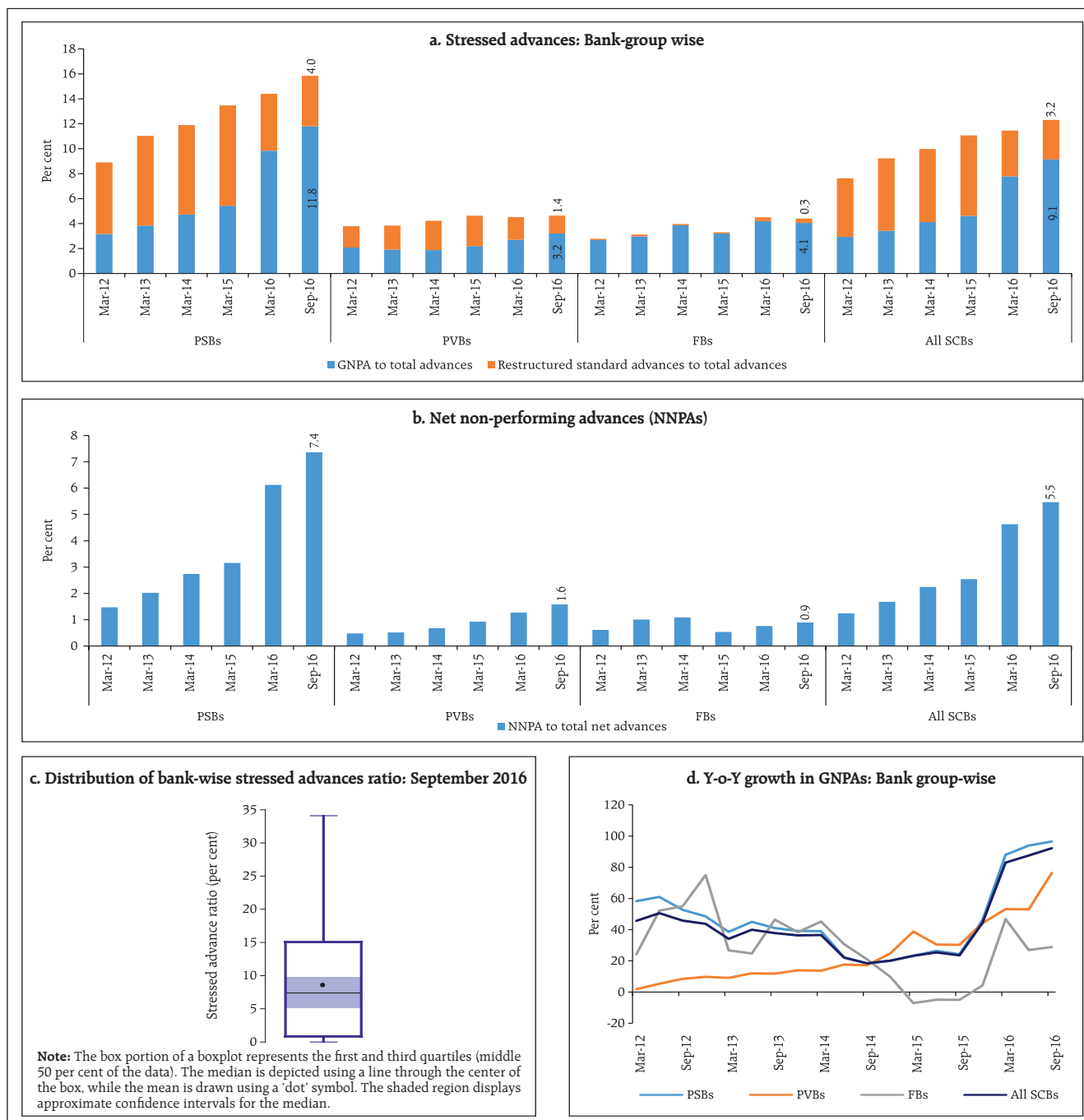
Source: RBI supervisory returns.

Asset quality

2.3 The asset quality of banks deteriorated further. The gross non-performing advances (GNPAs) ratio of SCBs increased to 9.1 per cent from 7.8 per cent between March and September 2016, pushing the overall stressed advances⁴ ratio to 12.3 per cent

from 11.5 per cent (Chart 2.2). Given the higher levels of impairment, SCBs may remain risk averse in the near future as they clean up their balance sheets and their capital position may remain insufficient to support higher credit growth.

Chart 2.2: Select asset quality indicators of SCBs



⁴ For the purpose of analysing the asset quality, stressed advances are defined as GNPAs plus restructured standard advances.

Chart 2.2: Select asset quality indicators of SCBs (Concl.)



Note: Numbers given in parenthesis with the legend is share of the respective sub-sector's credit in total credit to industry.

Note: Numbers given in parenthesis with the legend is share of the respective sub-sector's credit in total retail credit.

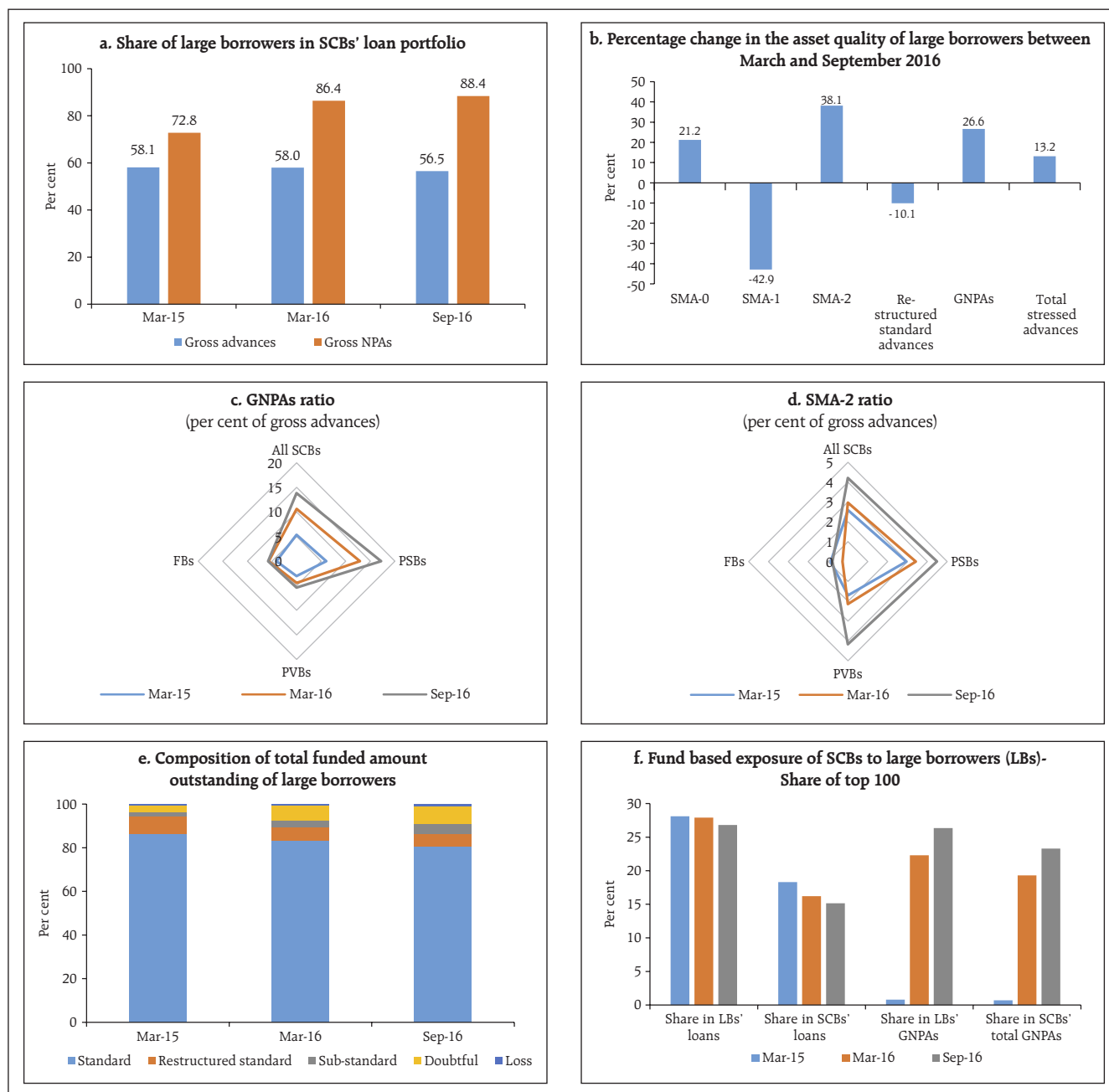
Source: RBI supervisory returns.

Credit quality of large borrowers⁵

2.4 The asset quality of large borrowers deteriorated significantly. The share of special mention accounts⁶ (SMA)-2 increased across bank-

groups. The share of large borrowers' in SCBs' total loan portfolio declined between March and September 2016, whereas, their share in GNPA's increased during the same period (Chart 2.3).

Chart 2.3: Select asset quality indicators of large borrowers



Source: RBI supervisory returns.

⁵ A large borrower is defined as one who has aggregate fund-based and non-fund based exposure of ₹50 million and more.

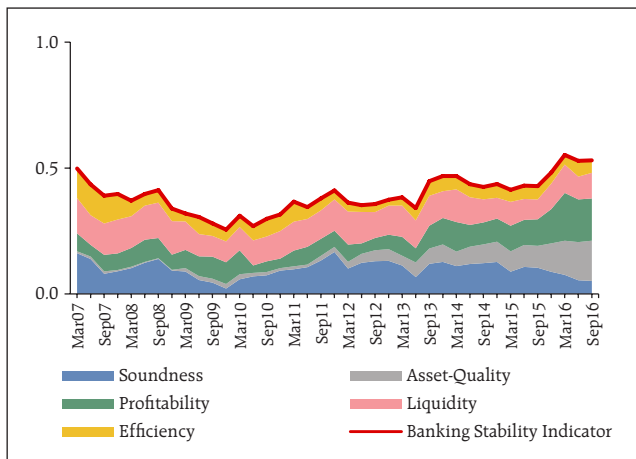
⁶ Before a loan account turns into a NPA banks are required to identify incipient stress in the account by creating three sub-asset categories of SMAs: i) SMA-0: Principal or interest payment not overdue for more than 30 days but account showing signs of incipient stress, ii) SMA-1: Principal or interest payment overdue between 31-60 days, and iii) SMA-2: Principal or interest payment overdue between 61-90 days.

Risks

Banking stability indicator

2.5 The banking stability indicator (BSI)⁷ shows that the risks to the banking sector remained elevated since the publication of the last FSR.⁸ Though the soundness of banks reflecting their capital position improved further, continuous deterioration in their asset quality, low profitability and liquidity contributed to the high level of overall risk (Charts 2.4 and 2.5).

Chart 2.4: Banking stability indicator



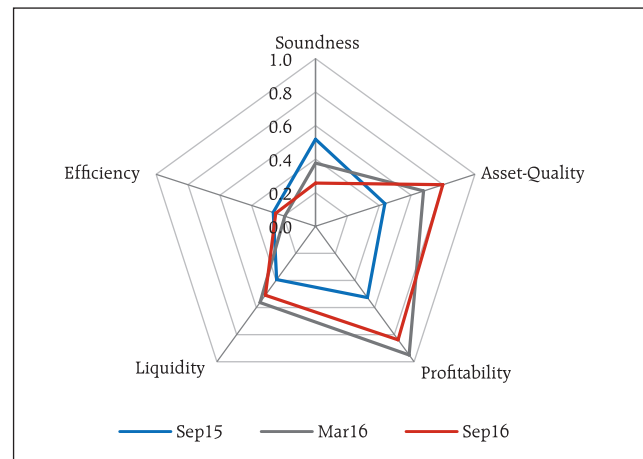
Note: Increase in indicator value shows lower stability. The width of each dimension signifies its contribution towards risk.
Source: RBI supervisory returns and staff calculations.

Resilience – Stress tests

Macro stress test-Credit risk⁹

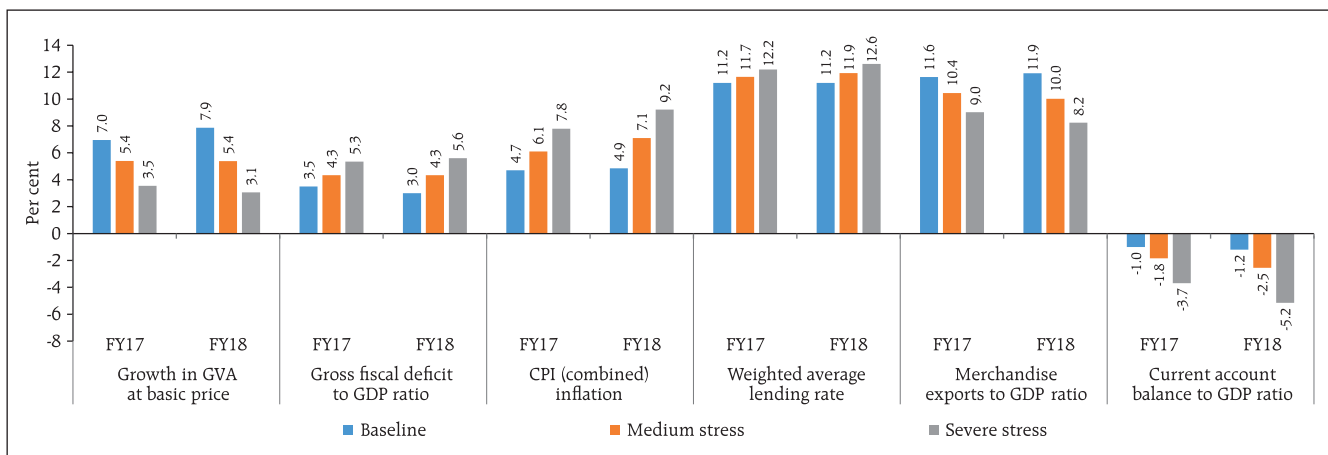
2.6 The resilience of the Indian banking system against macroeconomic shocks was tested through a series of macro stress tests for credit risk at system, bank group and sectoral levels. These tests encompassed assumed risk scenarios incorporating a baseline and two (medium and severe) adverse macroeconomic risk scenarios (Chart 2.6). The adverse scenarios were derived based on standard

Chart 2.5: Banking stability map



Note: Movement away from the centre signifies increase in risk.
Source: RBI supervisory returns and staff calculations.

Chart 2.6: Macroeconomic scenario assumptions¹⁰



⁷ The detailed methodology and basic indicators used under different BSI dimensions are given in the Annex 2.

⁸ FSR, June 2016 (with reference to data as at end March 2016).

⁹ The detailed methodology is given in Annex 2.

¹⁰ These stress scenarios are stringent and conservative assessments under hypothetical-severely adverse economic conditions and should not be interpreted as forecasts or expected outcomes. For the financial year 2016-17 (FY17) the numbers correspond to the last two quarters.

deviations of the historical values of the macroeconomic variable: up to 1 standard deviation (SD) for medium risk and 1.25 to 2 SD for severe risk (10 years historical data).

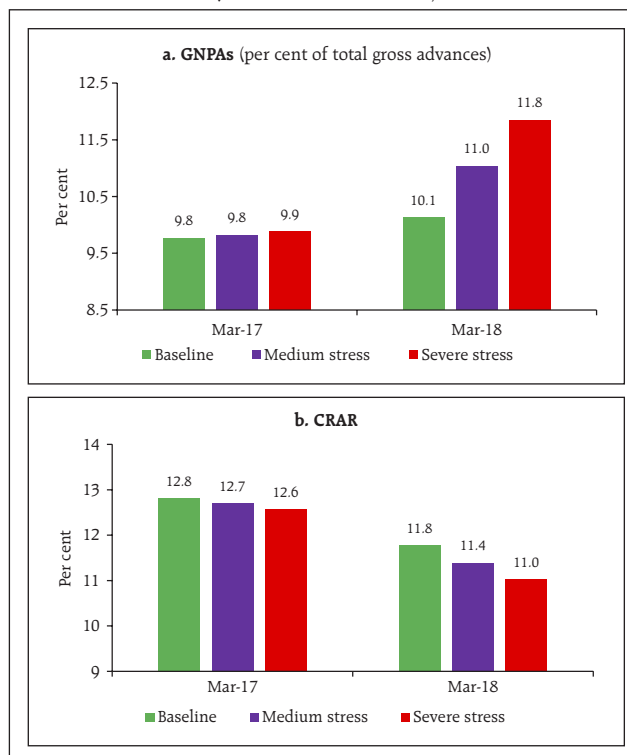
System level credit risk

2.7 The stress test indicated that under the baseline scenario, the GNPA ratio may increase from 9.1 per cent in September 2016 to 9.8 per cent by March 2017 and further to 10.1 per cent by March 2018. If the macroeconomic conditions deteriorate, the GNPA ratio may increase further under such consequential stress scenarios. However, the system level CRAR may remain above the required regulatory minimum (Chart 2.7).

Bank group level credit risk

2.8 Among the bank groups, PSBs may continue to register the highest GNPA ratio. Under baseline scenario, the PSBs' GNPA ratio may increase to 12.5 per cent in March 2017 and then to 12.9 per cent in March 2018 from 11.8 per cent in September 2016, which could increase further under a severe stress scenario. PSBs may continue to record the lowest CRAR among bank groups (Chart 2.8).

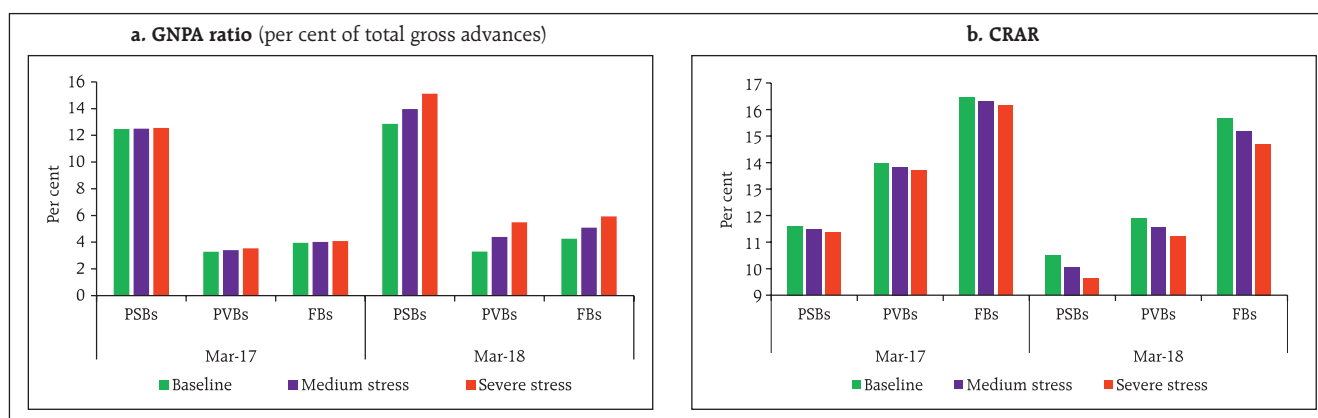
Chart 2.7: Projection of system level GNPA and CRAR of SCBs (under various scenarios)



Note: 1. The projection of system level GNPA has been done using three different, but complementary econometric models: multivariate regression, vector autoregressive and quantile regression. The average GNPA ratio of these three models is given in the chart.
2. The CRAR projection is made under a conservative assumption of minimum profit transfer to capital reserves at 25 per cent. It does not take into account any capital infusion by stakeholders. However, capital infusion in PSBs planned by the government will have positive impact on projected CRAR of SCBs.

Source: RBI supervisory returns and staff calculations.

Chart 2.8: Projection of bank group-wise GNPA ratio and CRAR (under various scenarios)



Note: 1. The projection of bank groups-wise GNPA has been done using two different but complementary econometric models: multivariate regression and vector autoregressive. The average GNPA ratio of these two models is given in the chart.
2. The CRAR projection is made under a conservative assumption of minimum profit transfer to capital reserves at 25 per cent. It does not take into account any capital infusion by stakeholders. However, capital infusion in PSBs planned by the government will have positive impact on their projected CRAR.

Source: RBI supervisory returns and staff calculations.

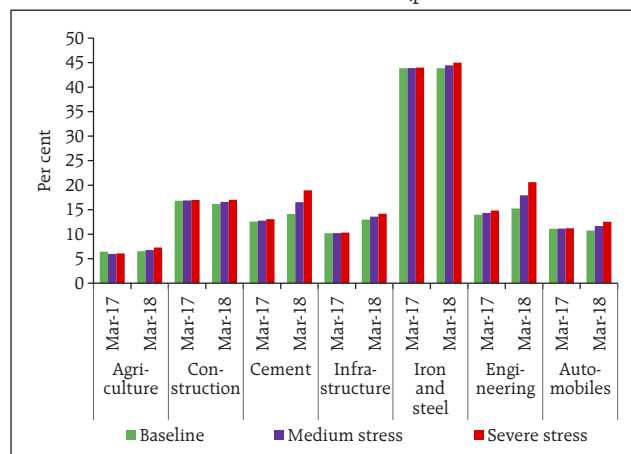
Sectoral credit risk

2.9 A macro-stress test of sectoral credit risk reveals that among the select seven sectors, iron and steel is expected to register the highest GNPA's followed by construction and engineering in March 2017 as well as in March 2018 under the baseline scenario (Chart 2.9).

Estimation of losses¹¹ for credit risk: Provisioning and capital adequacy

2.10 Extant provisions¹² as per cent of their total advances – 5.8 per cent for PSBs, 2.3 per cent for PVBs and 4.1 per cent for FBs as of September 2016 – seem to be insufficient to meet expected losses (ELs) under stress scenarios. Specifically, PSBs need to further increase their provisioning levels to meet the ELs arising from credit risk, under baseline and adverse macroeconomic risk scenarios. However, the present level of total capital¹³ (Tier-I plus Tier-II) as

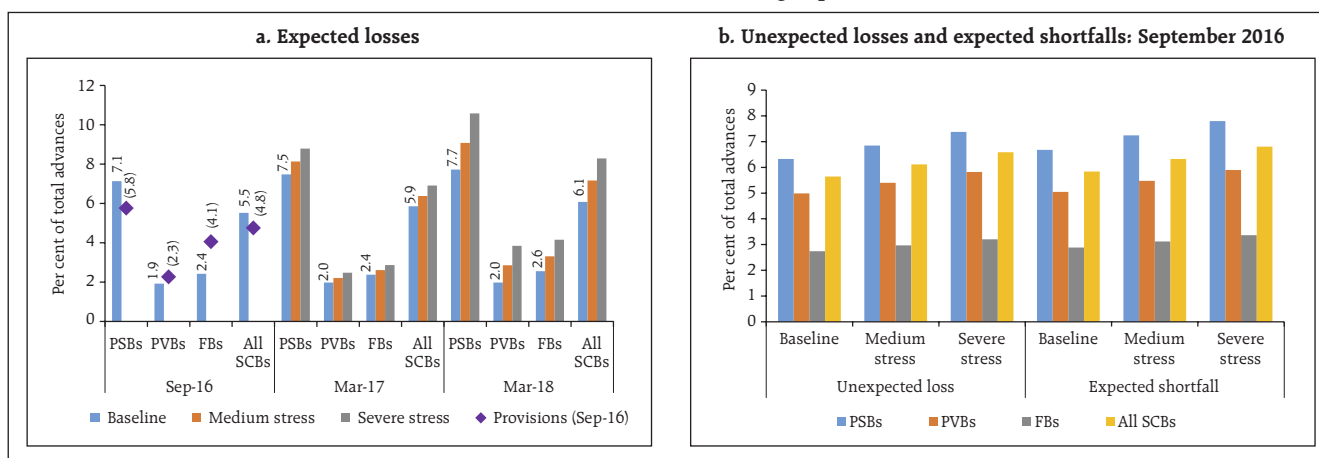
Chart 2.9: Projected Sectoral NPAs under various scenarios (per cent to total advances)



Source: RBI supervisory returns and staff calculations.

per cent of total advances across bank groups is expected to be sufficient to meet estimated unexpected losses (ULs) and expected shortfalls (ESs) arising from credit risk, even under severe macroeconomic stress conditions (Chart 2.10).

Chart 2.10: Estimated losses-Bank group wise



Source: RBI supervisory returns and staff calculations.

¹¹ The procedure adopted for estimating losses is given in Annex 2. Internationally, estimated losses (ELs& ULs) approach is recommended for the purpose of making provisions and capital for the next one year. For this, PD is derived based on annual slippage. As the purpose of this study is to judge the adequacy of provisioning and capital levels being maintained by SCBs and not to estimate the required level of provisions and capital to be maintained for the next one year, the PD used here is based on GNPA ratio.

¹² Provisions include provisions for credit losses, risk provisions for standard advances and provisions for restructured standard advances.

¹³ As of September 2016, the level of total capital as per cent of total advances was 14.0 per cent for PSBs, 20.1 per cent for PVBs and 34.9 per cent for FBs.

2.11 The bank-wise¹⁴ estimation of ELs and ULs arising from credit risk shows that 33 banks, which had a 74 per cent share in the total advances of the select 60 banks, may be unable to meet their ELs with their existing provisions. On the other hand, six banks (with a 7 per cent share in the total advances of the select banks) were estimated to have ULs exceeding their total capital (Chart 2.11).

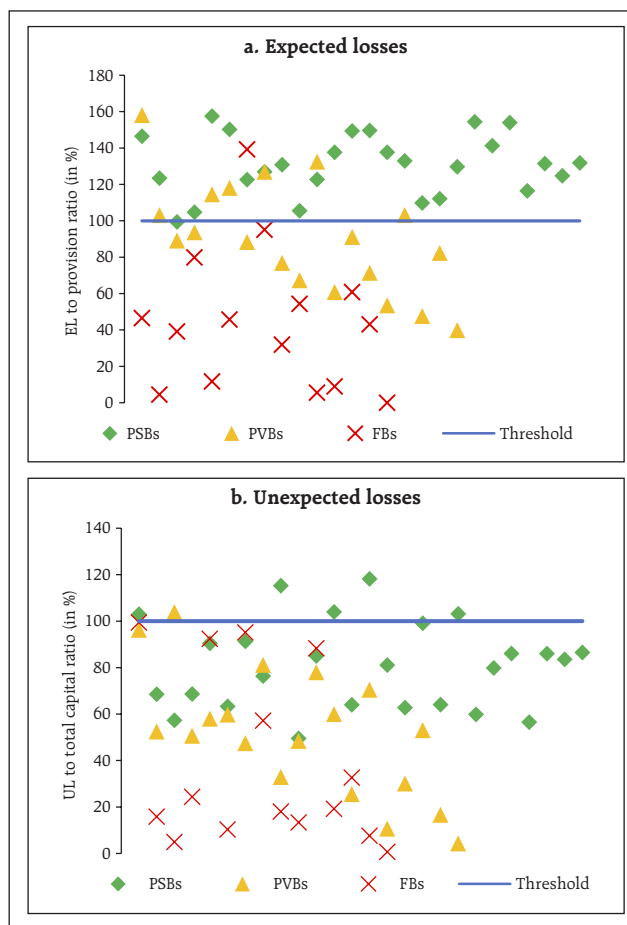
Sensitivity analysis: Bank level¹⁵

2.12 Single factor sensitivity stress tests¹⁶ (top-down) were carried out on SCBs¹⁷ to assess their vulnerabilities and resilience under various scenarios.¹⁸ SCBs' resilience with respect to credit, interest rate and liquidity risks was studied by imparting extreme but plausible shocks. The results are based on September 2016 data.

Credit risk

2.13 A severe credit shock is likely to impact capital adequacy and profitability of a significant number of banks. The impact of various static credit shocks for banks showed that system level CRAR will remain above the required minimum of 9 per cent. Under a severe shock of 3 SD¹⁹ (that is, if the average GNPA ratio of 60 select SCBs moves up to 15.3 per cent from 9.3 per cent), the system level CRAR and Tier-1 CRAR will decline to 10.6 per cent and 8.0 per cent respectively. At the individual bank-level, the stress test results show that 23 banks having a share of 40.7 per cent of SCBs' total assets might fail to

Chart 2.11: Estimation of losses: Bank-wise: September 2016



Source: RBI supervisory returns and staff calculations.

¹⁴ Bank-wise estimation of ELs and ULs was done for 60 SCBs which cover 99 per cent of the total assets of SCBs.

¹⁵ The sensitivity analysis was undertaken in addition to macro stress tests for credit risk. While in the former shocks were given directly to asset quality (GNPAs), in the latter the shocks were in terms of adverse macroeconomic conditions. Also, macro stress tests were done at the system, major bank group and sectoral levels, whereas the sensitivity analysis was done at aggregated system and bank levels. While the focus of the macro stress tests was credit risk, the sensitivity analysis covered credit, interest rate and liquidity risks.

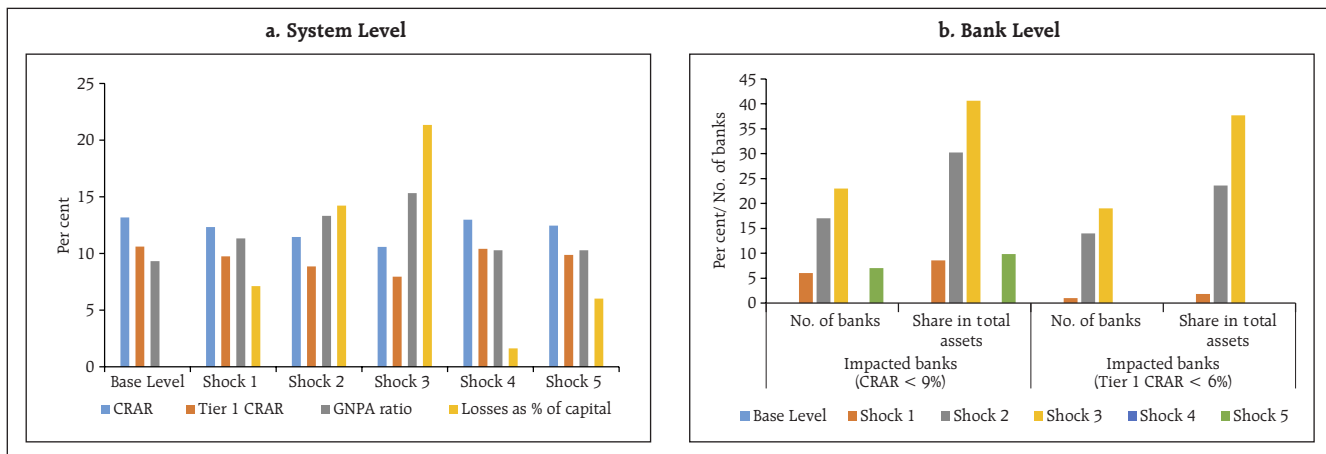
¹⁶ For details of the stress tests, see Annex 2.

¹⁷ Single factor sensitivity analysis stress tests were conducted for a sample of 60 SCBs accounting for 99 per cent of the total assets of SCBs.

¹⁸ The shocks designed under various hypothetical scenarios are extreme but plausible.

¹⁹ The SD of the GNPA ratio is estimated using quarterly data since 2003. One SD shock approximates a 21 per cent increase in GNPAs.

Chart 2.12: Credit risk – Shocks and Impacts



Shock 1: 1 SD shock on GNPA's
 Shock 2: 2 SD shock on GNPA's
 Shock 3: 3 SD shock on GNPA's
 Shock 4: 30 per cent of restructured standard advances turn into GNPA's (sub-standard category)
 Shock 5: 30 per cent of restructured standard advances turn into GNPA's (loss category) – written off

Note: System of select 60 SCBs.
Source: RBI supervisory returns and staff calculations.

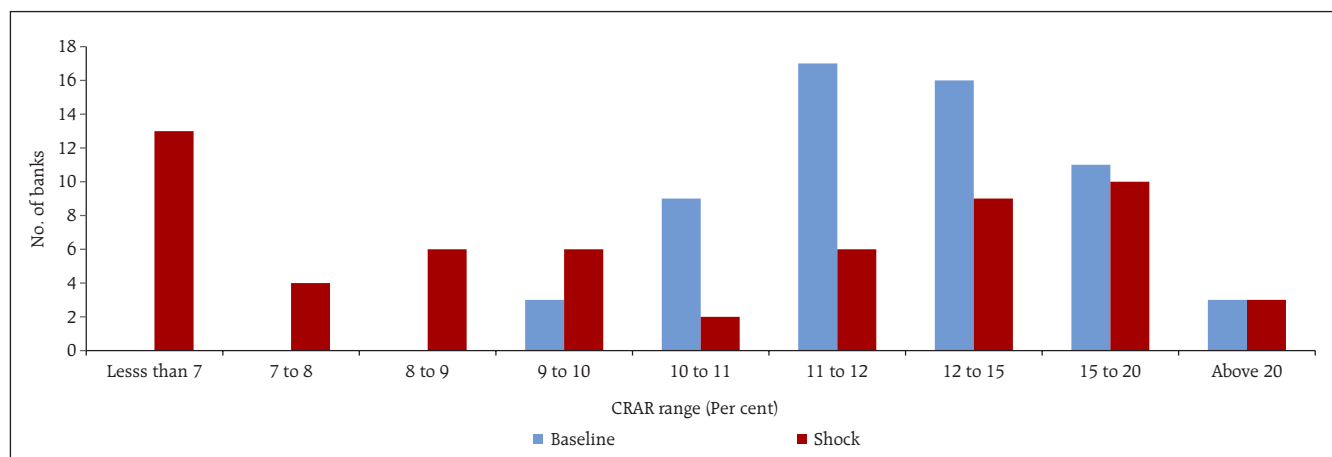
maintain the required CRAR under such severe shock. PSBs were found to be severely impacted with the CRAR of 20 PSBs likely to go down below 9 per cent (Charts 2.12 and 2.13).

Credit concentration risk

2.14 Stress tests on banks' credit concentration risks, considering top individual borrowers according to their stressed advances showed that the impact²⁰

(under three different scenarios) was significant for 11 banks, comprising about 13.5 per cent of the assets, which may fail to maintain 9 per cent CRAR in at least one of the scenarios. The impact could be 63 per cent of profit before tax (PBT) under the scenario of a default by the topmost stressed borrower and 112 per cent in case the top two stressed borrowers fail. The impact on CRAR at the system level under the assumed scenarios of failure

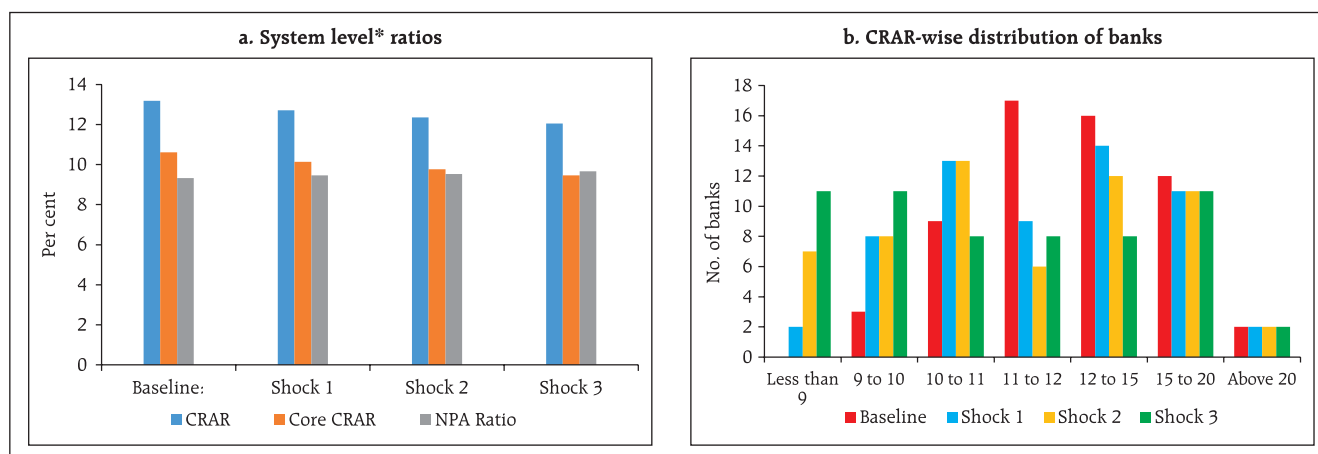
Chart 2.13: CRAR-wise distribution of banks (under a 3 SD shock on GNPA ratio)



Note: System of select 60 SCBs.
Source: RBI supervisory returns and staff calculations.

²⁰ In case of failure, the borrower is considered to move into the loss category. Please see Annex 2 for details.

Chart 2.14: Credit concentration risk: Individual borrowers – Stressed advances



Shock 1: Top stressed individual borrower defaults
 Shock 2: Top two stressed individual borrowers default
 Shock 3: Top three stressed individual borrowers default

Note: * System of select 60 SCBs.

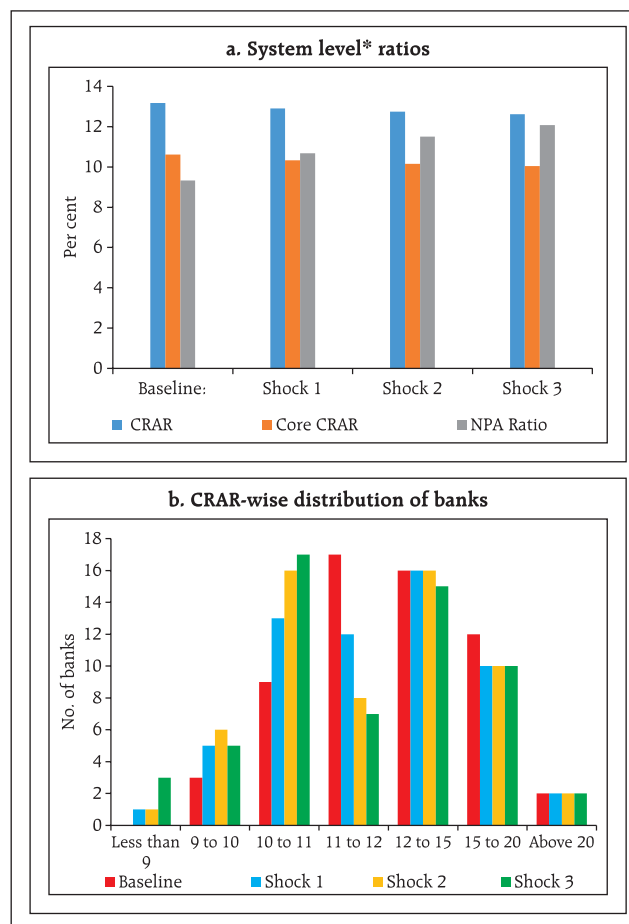
Source: RBI supervisory returns and staff calculations.

of the top one, two and three stressed borrowers will be 46, 83 and 112 basis points (Chart 2.14).

2.15 Stress tests on banks' credit concentration risks, considering top individual borrowers according to their exposures, showed that the impact²¹ (under three different scenarios) was significant for three banks, comprising about 3.9 per cent of the assets, as they may fail to maintain 9 per cent CRAR in at least one of the scenarios. The losses could be 37 per cent of PBT under the scenario of a default by the topmost individual borrower and 59 per cent in case the top two individual borrowers default. The impact on CRAR at the system level under the assumed scenarios of default of the top three individual borrowers will be 56 basis points (Chart 2.15).

2.16 Stress tests using 10 different scenarios, based on the information of group borrowers reveal that the losses could be around 5 per cent and 9 per cent of the capital at the system level under the

Chart 2.15: Credit concentration risk: Individual borrowers – Exposure



Shock 1: Top individual borrower defaults
 Shock 2: Top two individual borrowers default
 Shock 3: Top three individual borrowers default

Note: * System of select 60 SCBs.

Source: RBI supervisory returns and staff calculations.

²¹ In case of default, the borrower is considered to move into the sub-standard category. Please see Annex 2 for details.

Table 2.1: Credit concentration risk: Group borrowers – Exposure

Shocks		System level*				Bank level	
		CRAR	Core CRAR	NPA ratio	Losses as % of capital	Impacted banks (CRAR < 9%)	
Baseline (Before shock)		13.2	10.6	9.3	---	No. of banks	Share in total assets of SCBs (in %)
Shock 1	The top 1 group borrower defaults	12.6	10.0	12.4	5.1	2	0.2
Shock 2	The top 2 group borrowers default	12.1	9.5	14.6	8.8	5	4.9
Shock 3	The top 3 group borrowers default	11.7	9.1	16.5	12.0	8	9.7
Shock 4	The top 4 group borrowers default	11.4	8.8	18.1	14.7	10	11.0
Shock 5	The top 5 group borrowers default	11.1	8.5	19.6	17.2	12	16.2
Shock 6	The top 6 group borrowers default	10.8	8.2	20.8	19.3	15	18.4
Shock 7	The top 7 group borrowers default	10.6	8.0	21.9	21.0	17	22.8
Shock 8	The top 8 group borrowers default	10.4	7.8	22.7	22.4	20	28.2
Shock 9	The top 9 group borrowers default	10.3	7.7	23.4	23.6	21	28.8
Shock 10	The top 10 group borrowers default	10.3	7.7	23.7	24.2	22	29.5

Note: * System of select 60 SCBs.

Source: RBI supervisory returns and staff calculations.

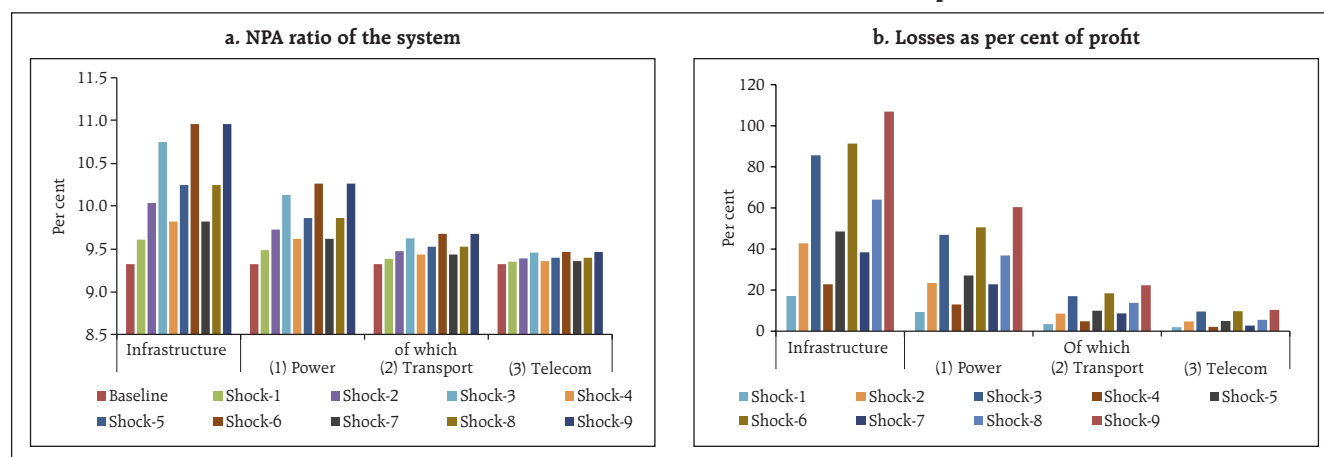
assumed scenarios of default²² by the top group borrower and by the top two group borrowers. As many as 22 banks will not be able to maintain their CRAR at 9 per cent if top 10 group borrowers default (Table 2.1).

Sectoral credit risk

2.17 Credit risk arising from exposure to the infrastructure sector (specifically power, transport

and telecommunications) was examined through a sectoral credit stress test where GNPA ratio of the sector was assumed to increase by a fixed percentage point impacting the overall GNPA ratio of the banking system. The results showed that shocks to the infrastructure segment will impact the profitability of banks considerably, with the most significant effect of the single factor shock being on the power and transport sectors (Chart 2.16).

Chart 2.16: Sectoral credit risk: Infrastructure – Shocks and Impacts



Note: 1. A system of select 60 SCBs.

2. Shock assumes percentage increase in the sectoral NPA ratio and conversion of a portion of restructured standard advances into NPAs.

Shocks	Shock-1	Shock-2	Shock-3	Shock-4	Shock-5	Shock-6	Shock-7	Shock-8	Shock-9
Shock on restructured standard advances ^a	0		15			15			
Shock on other standard advances [#]	2	5	10	2	5	10	2	5	10

& Shocks 1-3: No shock on restructured standard advances; Shocks 4-6: Restructured standard advances to sub-standard category; Shocks 7-9: Restructured standard advances to loss category.

The new NPAs arising out of standard advances (other than restructured standard advances) have been assumed to be distributed among different asset classes (following the existing pattern) in the shock scenario.

Source: RBI supervisory returns and staff calculations.

²² In case of default, the borrower is considered to move into the sub-standard category. Please see Annex 2 for details.

Interest rate risk

2.18 For investments under available for sale (AFS) and held for trading (HFT) categories (direct impact) a parallel upward shift of 2.5 percentage points in the yield curve will lower the CRAR by about 94 basis points at the system level (Table 2.2). At the disaggregated level, five banks accounting for 4.7 per cent of the total assets were impacted adversely and their CRAR fell below 9 per cent. The total loss of capital at the system level is estimated to be about 8.1 per cent. The assumed shock of a 2.5 percentage points parallel upward shift of the yield curve on the held to maturity (HTM) portfolios of banks, *if marked-to-market*, will reduce the CRAR by about 281 basis points resulting in 23 banks' CRAR falling below 9 per cent. The income impact on SCBs' banking books²³ could be about 29 per cent of their latest annual PBT under the assumed shock of a parallel downward shift of 2.5 percentage points in the yield curve.²⁴

Liquidity risk

2.19 The liquidity risk analysis aims to capture the impact of deposit run-offs and increased demand for the unutilised portions of credit lines which were sanctioned/committed/guaranteed. Banks in general may be in a position to withstand liquidity shocks with their high quality liquid assets (HQLAs)²⁵ and SLR investments. In assumed scenarios, there will be increased withdrawals of un-insured deposits²⁶ and simultaneously there will also be

Table 2.2: Interest rate risk – Bank groups – Shocks and Impacts
(under shock of 250 basis points parallel upward shift of the INR yield curve)

(per cent)

	PSBs		PVBs		FBs	
	AFS	HFT	AFS	HFT	AFS	HFT
Modified duration	3.6	5.1	2.1	4.2	1.1	2.4
Share in total investments	32.5	0.7	34.7	5.5	86.2	13.8
Reduction in CRAR (bps)	112		48		131	

Source: RBI supervisory returns and staff calculations.

increased demand for credit resulting in withdrawal of the unutilised portions of sanctioned working capital limits as well as utilisation of credit commitments and guarantees extended by banks to their customers. Using their HQLAs for meeting day-to-day liquidity requirements, most banks (49 out of the 60 banks in the sample) will remain resilient in a scenario of assumed sudden and unexpected withdrawals of around 10 per cent of deposits along with the utilisation of 75 per cent of their committed

²³ The income impact on banking books, considering the exposure gap of rate sensitive assets and liabilities, excluding AFS and HFT portfolios, is calculated for one year only.

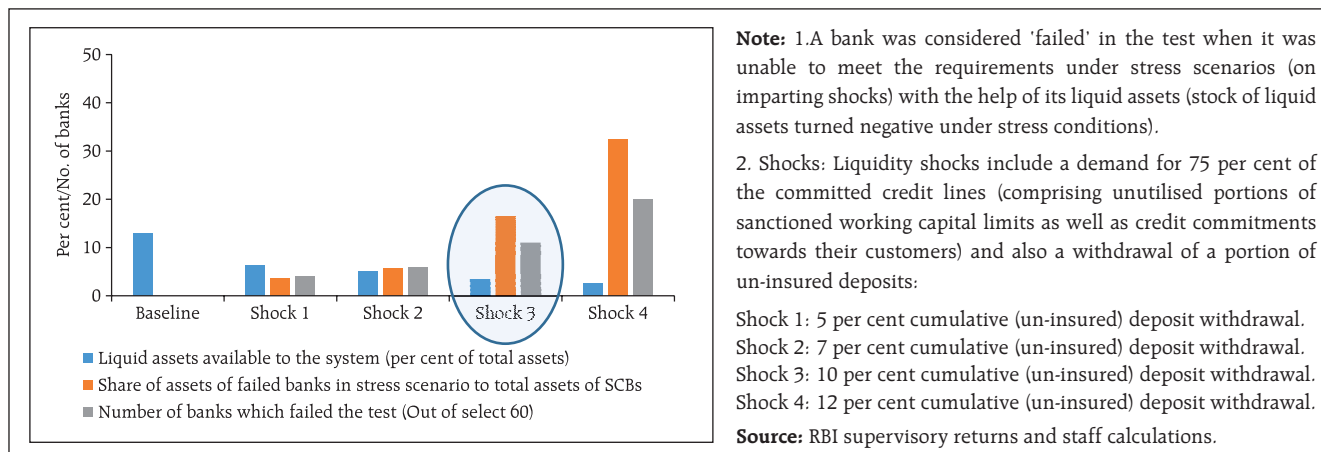
²⁴ The stress test results give the conservative estimates by considering the movements which may result in losses for banks. For a parallel downward shift of 2.5 percentage points in the yield curve, the valuation gain in trading books may be 8.1 per cent of capital or about 120 per cent of total annual profits of SCBs. On the other hand, for a parallel upward shift of 2.5 percentage points in the yield curve, the income gain in banking books may be about 29 per cent of the total annual profits of SCBs or 1.9 per cent of capital. Therefore, for a parallel upward shift in the yield curve, the net loss may be 6.1 per cent of capital or about 91 per cent of total annual profits of SCBs, whereas the system will gain the same in case of a downward shift in the yield curve.

²⁵ In view of the implementation of the liquidity coverage ratio (LCR) with effect from January 1, 2015 in India, the definition of liquid assets was revised for stress testing. For this stress testing exercise, HQLAs were computed as cash reserves in excess of required CRR, excess SLR investments, SLR investments at 2 per cent of NDTL (under MSF) and additional SLR investments at 8 per cent of NDTL (following the circular DBR.BP.BC 52/21.04.098/2014-15 dated November 28, 2014 and DBR.BP.BC.No. 77/21.04.098/2015-16 dated February 11, 2016).

²⁶ Presently un-insured deposits are about 69 per cent of total deposits (Source: DICGC, *Handbook of Statistics on the Indian Economy*).

Chart 2.17: Liquidity risk – Shocks and impacts using HQLAs

(using HQLAs for liquidity support)



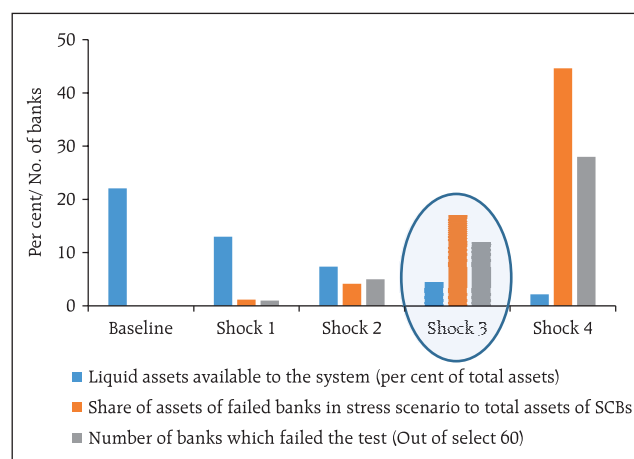
credit lines (Chart 2.17). In case of 'incremental shocks' in an extreme crisis, banks will be able to withstand further (about 15 per cent) withdrawals of deposits using their remaining SLR investments through specific policy measures taken as per requirements (Chart 2.18).

Stress testing of the derivatives portfolio of banks – Bottom-up stress tests

2.20 A series of bottom-up stress tests (sensitivity analyses) on derivatives portfolio were conducted for select sample banks²⁷ with the reference date as at end of September 2016. The banks in the sample, reported the results of four separate shocks on interest and foreign exchange rates. The shocks on interest rates ranged from 100 to 250 basis points, while 20 per cent appreciation/depreciation were assumed for foreign exchange rates. The stress tests were carried out for individual shocks on a stand-alone basis.

2.21 In the sample, the marked-to-market (MTM) value of the derivatives portfolio for the banks varied with PSBs and PVBs, except one, registering small positive as well as negative MTM, while most of the FBs had a relatively large positive as well as negative MTM. Most of the PSBs and PVBs had positive net

Chart 2.18: Liquidity risk – Shocks and Impacts
(using full SLR along with excess CRR for liquidity support)



²⁷ Stress tests on derivatives portfolio were conducted for a sample of 22 banks. Details are given in Annex 2.

MTM, while most of the FBs recorded negative net MTM (Chart 2.19).

2.22 The stress test results showed that the average net impact of interest rate shocks on sample banks were negligible. The foreign exchange shock scenarios also showed a relatively lower impact in recent quarters (Chart 2.20).

Section II

Scheduled urban co-operative banks

Performance

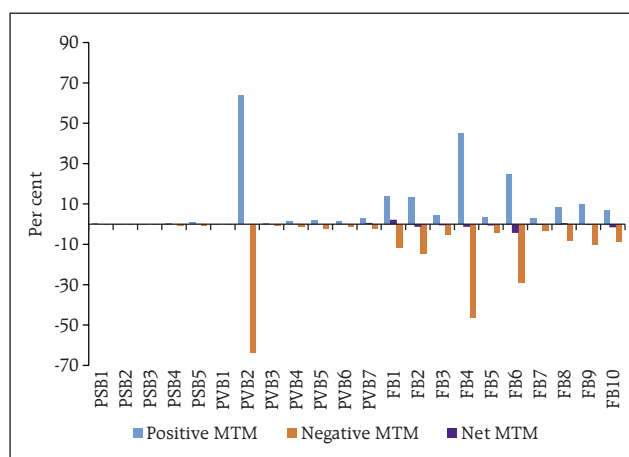
2.23 At the system level,²⁸ the CRAR of scheduled urban co-operative banks (SUCBs) increased marginally from 12.8 per cent to 13.0 per cent between March and September 2016. However, at a disaggregated level, five banks failed to maintain the minimum required CRAR of 9 per cent. GNPA of SUCBs as a percentage of gross advances increased sharply to 8.6 per cent from 6.6 per cent and their provision coverage ratio²⁹ increased to 47.2 per cent from 46.7 per cent during the same period. Further, RoA increased from 0.6 per cent to 0.9 per cent and the liquidity ratio³⁰ fell marginally from 34.8 per cent to 34.7 per cent during the same period.

Resilience – Stress tests

Credit risk

2.24 The impact of credit risk shocks on the CRAR of SUCBs was observed under four different scenarios.³¹ The results show that even under the adverse scenario of one SD increase in GNPA (third scenario), the system level CRAR of SUCBs came down below the minimum regulatory requirement. Individually, a large number of banks (out of 54

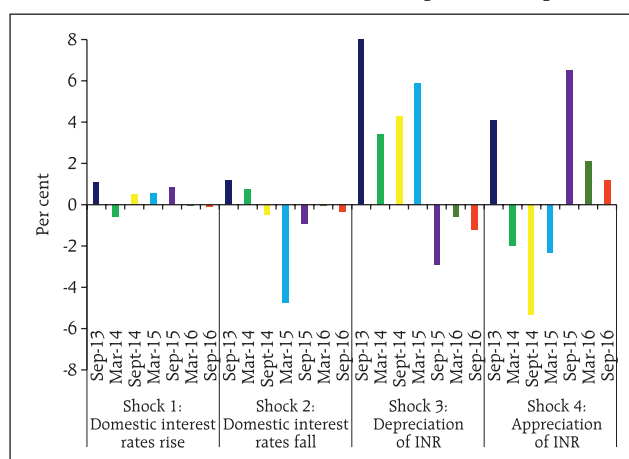
Chart 2.19: MTM of Total Derivatives- September 2016
(per cent to total balance sheet assets)



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

Chart 2.20: Stress tests – Impact of shocks on derivative portfolio of select banks (change in net MTM on application of a shock)

(per cent to capital funds)



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

²⁸ System of 54 SUCBs.

²⁹ Provision coverage ratio = provisions held for NPA*100/GNPAs.

³⁰ Liquidity ratio = (cash + dues from banks + SLR investment)*100/total assets.

³¹ The four scenarios are: i) 1 SD shock in GNPA (classified into sub-standard advances), ii) 2 SD shock in GNPA (classified into sub-standard advances), iii) 1 SD shock in GNPA (classified into loss advances), and iv) 2 SD shock in GNPA (classified into loss advances). SD was estimated using 10 years' data. For details of the stress tests, see Annex 2.

banks, 28 banks under scenario iii and 40 banks under scenario iv) may not be able to meet the required CRAR levels.

Liquidity risk

2.25 A stress test on liquidity risk was carried out using two different scenarios; i) 50 per cent and ii) 100 per cent increase in cash outflows, in the one to 28 days' time bucket. It was further assumed that there was no change in cash inflows under both the scenarios. The stress test results indicate that SUCBs may be significantly impacted under a stress scenario (out of 54 banks, 26 banks under Scenario i and 35 banks under Scenario ii).

Section III

Non-banking financial companies

2.26 As of September 2016, there were 11,555 non-banking financial companies (NBFCs) registered with the Reserve Bank, of which 188 were deposit-accepting (NBFCs-D) and 11,367 were non-deposit accepting (NBFCs-ND). There were 220 systemically important non-deposit accepting NBFCs (NBFCs-ND-SI)³². All NBFCs-D and NBFCs-ND-SI are subject to prudential regulations such as capital adequacy requirements and provisioning norms along with reporting requirements.

Performance

2.27 The aggregated balance sheet of the NBFC sector expanded by 8.5 per cent on a y-o-y basis in September 2016 as compared to 15.5 per cent in March 2016. Loans and advances increased by 10.5 per cent while total borrowings increased by 7.4 per cent in September 2016 (Table 2.3). Net profit as a percentage to total income improved between March and September 2016, whereas, RoA remained unchanged at 2.2 per cent (Table 2.4).

**Table 2.3: Consolidated balance sheet of the NBFC sector:
Y-o-Y growth**

(per cent)

	Mar-16	Sep-16
1. Share capital	4.8	9.9
2. Reserves and surplus	14.3	9.1
3. Total borrowings	15.3	7.4
4. Current liabilities and provisions	31.8	13.8
Total liabilities / assets	15.5	8.5
1. Loans & advances	16.6	10.5
2. Investments	10.8	0.6
3. Other assets	12.7	4.8
Income/expenditure		
1. Total income	15.8	6.4
2. Total expenditure	15.8	1.5
3. Net profit	15.6	20.8

Source: RBI supervisory returns.

Table 2.4: Select ratios of the NBFC sector

(per cent)

	Mar-16	Sep-16
1. Capital market exposure (CME) to total assets	8.5	8.1
2. Leverage ratio	3.9	3.6
3. Net profit to total income	18.3	18.6
4. RoA (Annualised)	2.2	2.2
5. RoE (Annualised)	10.6	10.5

Source: RBI supervisory returns.

³² NBFCs-ND-SIs are NBFCs-ND with assets of ₹5 billion and above.

Asset quality and capital adequacy

2.28 GNPA of the NBFC sector as a percentage of total advances increased to 4.9 per cent from 4.6 per cent between March and September 2016. NNPA as a percentage of total advances also increased to 2.7 per cent from 2.5 per cent during the same period (Chart 2.21).

2.29 As per extant guidelines, NBFCs³³ are required to maintain a minimum capital consisting of Tier-I³⁴ and Tier-II capital, of not less than 15 per cent of their aggregate risk-weighted assets. The CRAR of NBFC sector as a whole declined to 23.1 per cent from 24.3 per cent between March and September 2016 (Chart 2.21).

Resilience – Stress tests

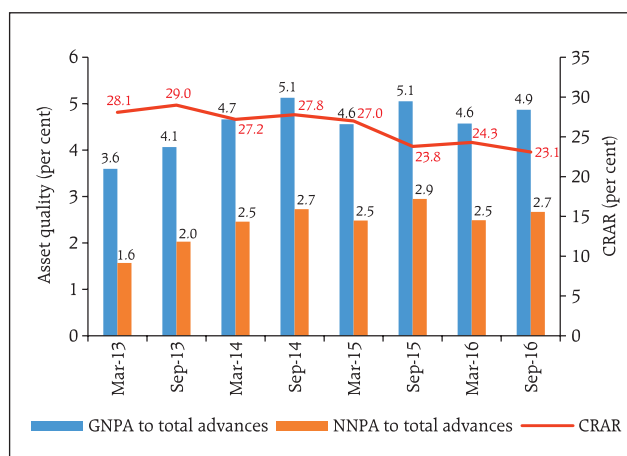
System level

2.30 A stress test on the credit risk for the NBFC sector as a whole for the half year ended September 2016 was carried out under three scenarios: (i) GNPA increase by 0.5 SD, (ii) GNPA increase by 1 SD and (iii) GNPA increase by 3 SD. The results indicate that in the first scenario, CRAR of the sector declined to 21.0 from 23.1 and in the second scenario, it declined to 15.3 per cent but remained above the regulatory minimum of 15 per cent.

Individual NBFCs

2.31 A stress test on the credit risk for individual NBFCs was also conducted for the same period under the above three scenarios. The results indicate that under scenarios (i) and (ii), around 5 per cent of the

Chart 2.21: Asset quality and capital adequacy of the NBFC sector



Source: RBI supervisory returns.

companies will not be able to comply with the minimum regulatory capital requirements of 15 per cent; 9 per cent of the companies will not be able to comply with the minimum regulatory CRAR norm under the third scenario.

Section IV

Interconnectedness³⁵

Trends in the interbank market

2.32 The size of the interbank market³⁶ declined by around 2 per cent (y-o-y) in September 2016. Interbank exposures in September 2016 constituted nearly 6 per cent of the total assets of the banking system. The fund-based segment recorded a share of

³³ Deposit taking NBFCs and non-deposit taking NBFCs having asset size of ₹5 billion and above.

³⁴ As per the revised guidelines issued on November 10, 2014, minimum Tier-I capital for NBFCs-ND-SI (having asset size of ₹5 billion and above) and all deposit taking NBFCs was revised up to 10 per cent (earlier Tier-I capital could not be less than 7.5 per cent) and these entities have to meet compliance in a phased manner: 8.5 per cent by end-March 2016 and 10 per cent by end-March 2017).

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

³⁶ Besides transacting among themselves over the call, notice and other short-term markets, banks also invest in each other's long-term instruments and take positions through derivatives and other non-fund based exposures. The interbank market as connoted in the current analysis is a total of all outstanding exposures; short-term, long-term, fund and non-fund based between banks.

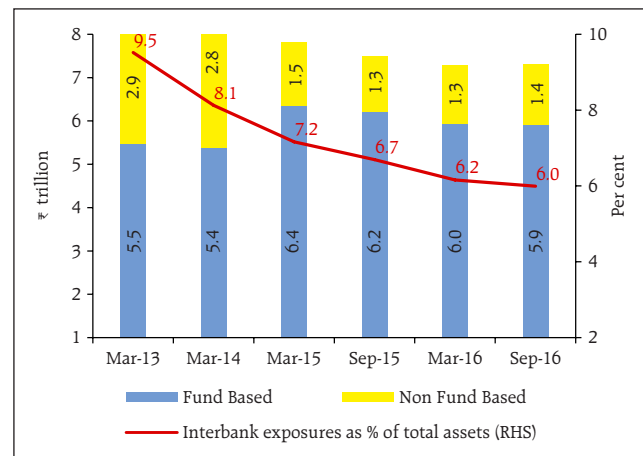
around 81 per cent in September 2016 as against 83 per cent in September 2015 (Chart 2.22).

2.33 PSBs continued to be the largest contributors in the interbank market followed by PVBs. However, the share of PSBs has been decreasing since March 2015 even as private and foreign banks are increasing their exposure (Chart 2.23).

2.34 The quantum and share of long-term³⁷ bilateral exposures (fund based) between banks have been steadily increasing over the years. Long-term exposures increased from ₹2.6 trillion in March 2013 to ₹3.5 trillion in September 2016. From a share of 53 per cent in the interbank market (fund-based) in March 2013, short-term³⁸ exposures fell to 40 per cent in September 2016 (Chart 2.24).

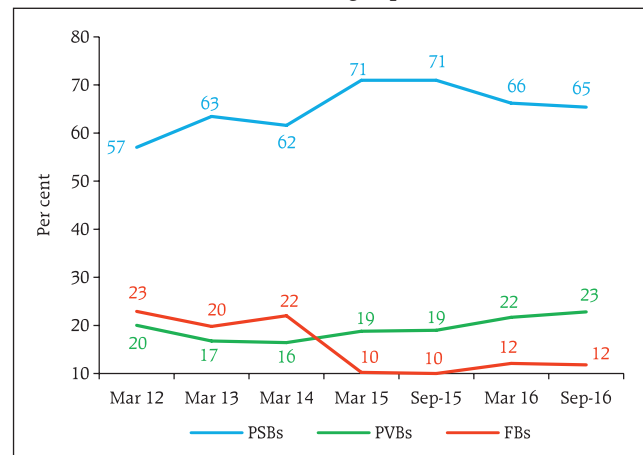
2.35 In the short term market, the share of call and certificate of deposits (CDs) has been decreasing steadily and accounted for about 39 per cent in September 2016. In the long term market, the share of capital instruments and of debt instruments and

Chart 2.22: Size (turnover) of the interbank market



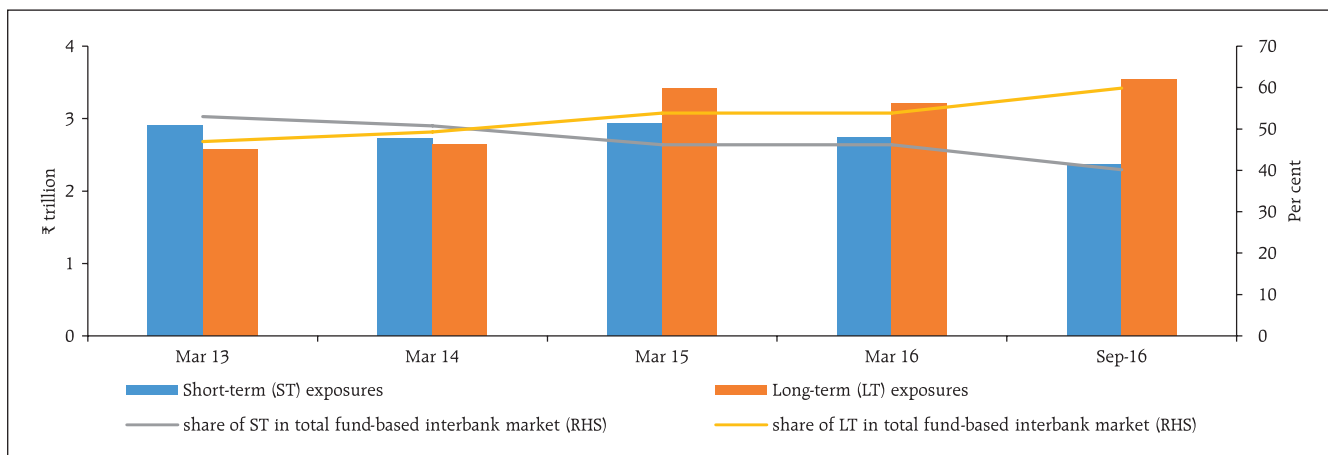
Source: RBI supervisory returns and staff calculations.

Chart 2.23: Share of different bank groups in the interbank market



Source: RBI supervisory returns.

Chart 2.24: Long-term and short-term exposures in fund-based interbank market

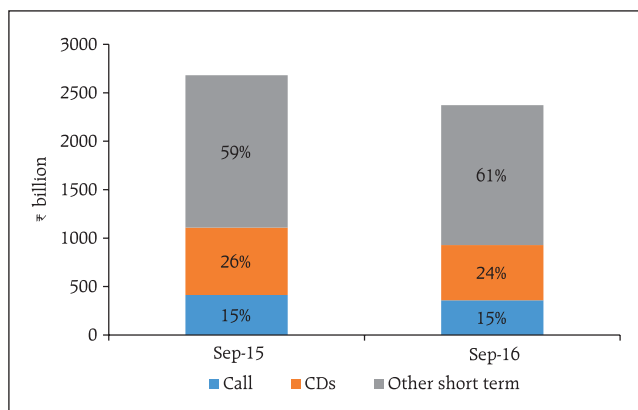


Source: RBI supervisory returns.

³⁷ Long-term exposures (fund based) denote those where residual maturity is above 1 year.

³⁸ Short-term exposures (fund based) denote those where residual maturity is less than 1 year.

Chart 2.25: Composition of short-term fund-based interbank market



Note: Other short term includes short term deposits, short term lending, etc.

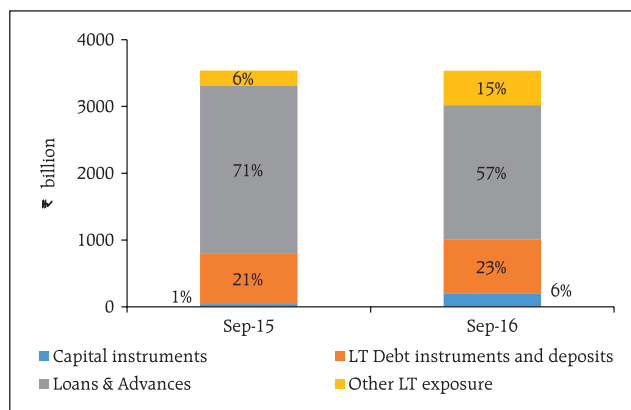
Source: RBI supervisory returns.

deposits increased while that of loans and advances declined (Charts 2.25 and 2.26).

Network structure and connectivity

2.36 The network structure³⁹ of the banking system has been consistently tiered over the years,

Chart 2.26: Composition of long-term fund-based interbank market

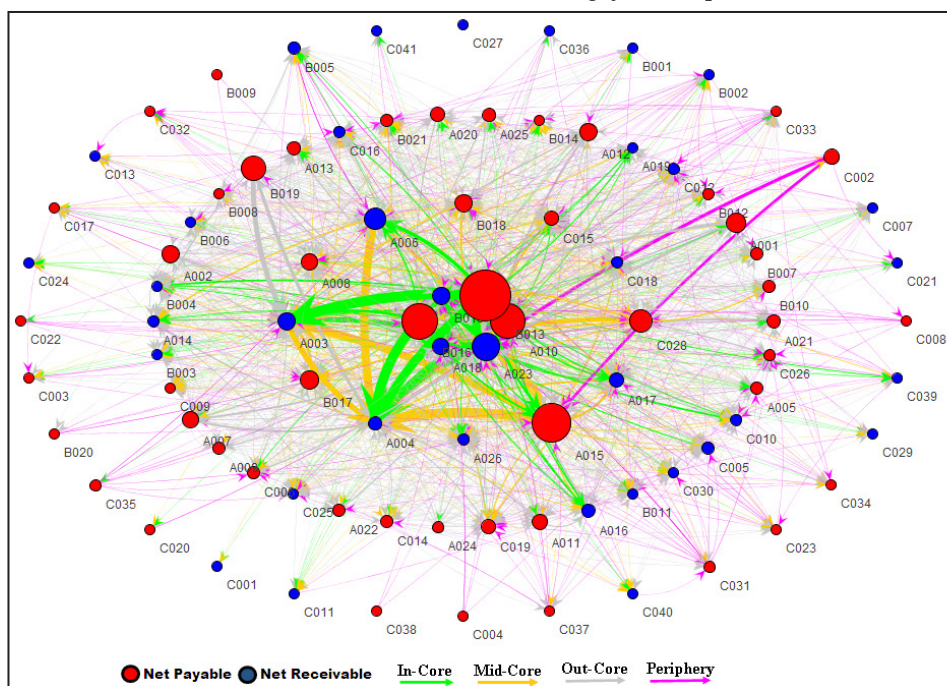


Note: Other long term primarily includes funded trade finance products.

Source: RBI supervisory returns.

with the same set of banks dominating. The number of such banks was nine in March 2012 which came down to six in September 2016. The dominant banks are depicted in the inner most circle of the network plot (Chart 2.27).

Chart 2.27: Network structure of the Indian banking system – September 2016



Source: RBI supervisory returns and staff calculations.

³⁹ The diagrammatic representation of the network of the banking system is that of a tiered structure, where different banks have different degrees or levels of connectivity with others in the network. In the present analysis, 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 (the respective 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.

2.37 The degree of interconnectedness in the banking system can be measured by the connectivity ratio⁴⁰ which showed a declining trend indicating that the links/ connections between the banks have reduced over time. The cluster coefficient⁴¹ which depicts local interconnectedness remained stable during March 2012 and September 2016 indicating that the clustering/grouping within the banking system network did not change much over time (Chart 2.28).

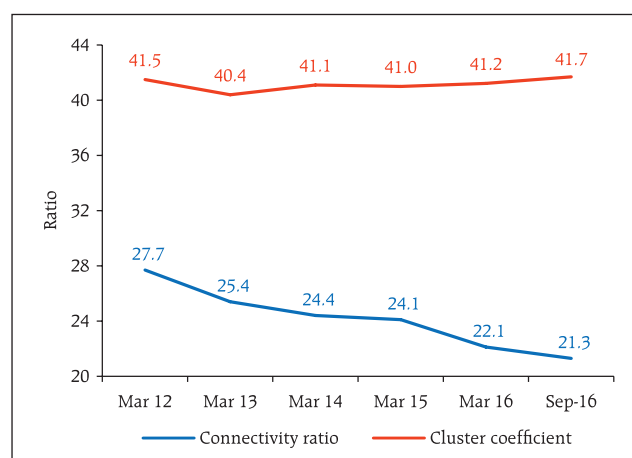
Network of the financial system⁴²

2.38 From the perspective of the larger financial system, SCBs are the dominant players accounting for nearly 57 per cent of the total bilateral exposures followed by NBFCs at 13 per cent, asset management companies managing mutual funds (AMC-MFs) at 11 per cent, insurance companies and all India financial institutions (AIFIs) at 9 per cent each. UCBs and pension funds together account for nearly 1 per cent of the total bilateral exposures in the financial system.

2.39 On a net basis, AMC-MFs followed by the insurance companies are the biggest fund providers in the system while NBFCs followed by SCBs are the biggest receivers of funds. Within the SCBs, however, both PVBs and FBs have a net payable position *vis-à-vis* the entire financial sector whereas PSBs have a net receivable position (Chart 2.29).

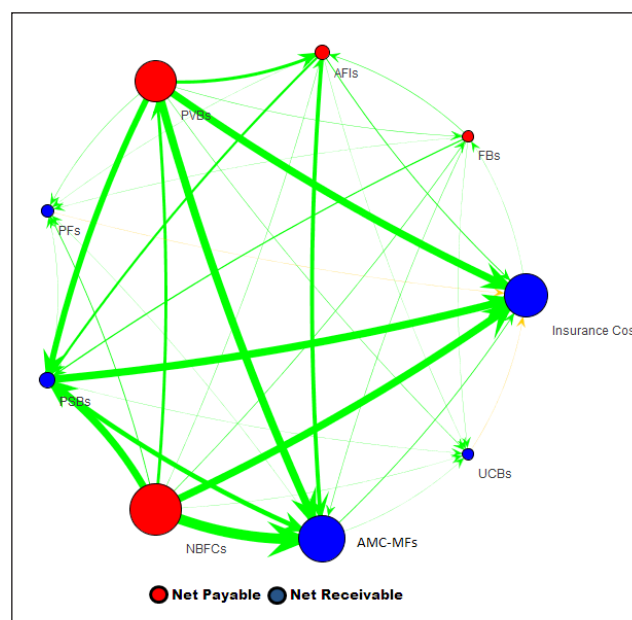
2.40 Among the net lenders (that is those who have a net receivable position against the rest of the financial system), the net exposure of AMC-MFs declined between March and September 2016, while

Chart 2.28: Connectivity statistics of the banking system



Source: RBI supervisory returns and staff calculations.

Chart 2.29: Network plot of the financial system



Note: The analysis is confined to bilateral exposure (both fund and non-fund based) among a select sample of regulated financial institutions. Source: RBI supervisory returns and staff calculations.

⁴⁰ *Connectivity ratio*: This is a statistic that measures the extent of links between the nodes relative to all possible links in a complete graph.

⁴¹ *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.

⁴² The financial system as connoted in the current analysis refers to a select sample of regulated financial institutions. The analysis is confined to bilateral exposure (both fund and non-fund based) among the entities in the sample. The sample includes 86 SCBs, 22 AMC-MFs (which cover more than 90 per cent of the AUMs of the mutual fund sector), 21 insurance companies (both life and non-life that cover more than 90 per cent of assets of the insurance companies), 34 NBFCs (both deposit taking and non-deposit taking systemically important NBFCs), 20 SUCBs (that cover nearly 80 per cent of the assets of SUCBs), four AIFIs (*viz.*, NABARD, Exim Bank, NHB, SIDBI) and seven pension funds appointed by PFRDA under NPS. In case of pension funds, the data pertains to the schemes managed by pension funds and regulated/ administered by PFRDA.

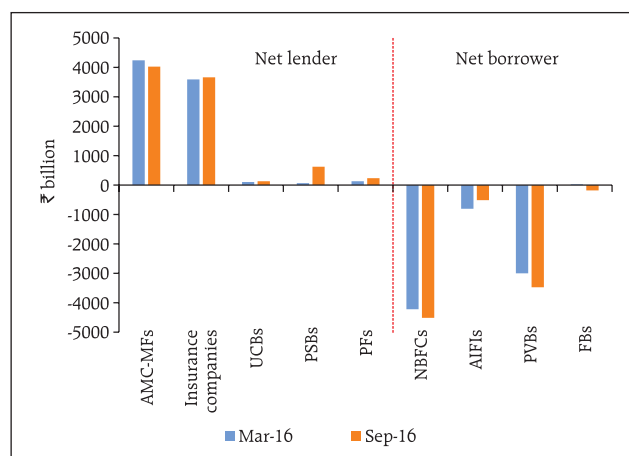
that of insurance companies, pension funds, UCBs and PSBs increased. Among the net borrowers (*i.e.* those who have a net payable position against the rest of the financial system), the net exposure of AIFIs declined, while that of NBFCs and PVBs increased. FBs which were net lenders in March 2016 turned net borrowers in September 2016 (Chart 2.30).

Interaction between SCBs, AMC-MFs and insurance companies⁴³

2.41 As at the end of September 2016, the gross receivables of AMC-MFs towards the financial system was around 28 per cent of its average assets under management (AUM), while the gross receivables of the banking system was around 9 per cent of its total assets.⁴⁴

2.42 The banking sector had a gross exposure (receivable) of nearly ₹134 billion in September 2016 towards the insurance and mutual fund sectors taken together (as against ₹176 billion in March 2016). At the same time, the combined exposure (gross receivable) of AMC-MFs and insurance

Chart 2.30: Net lending (+ve)/ borrowing (-ve) by the institutions

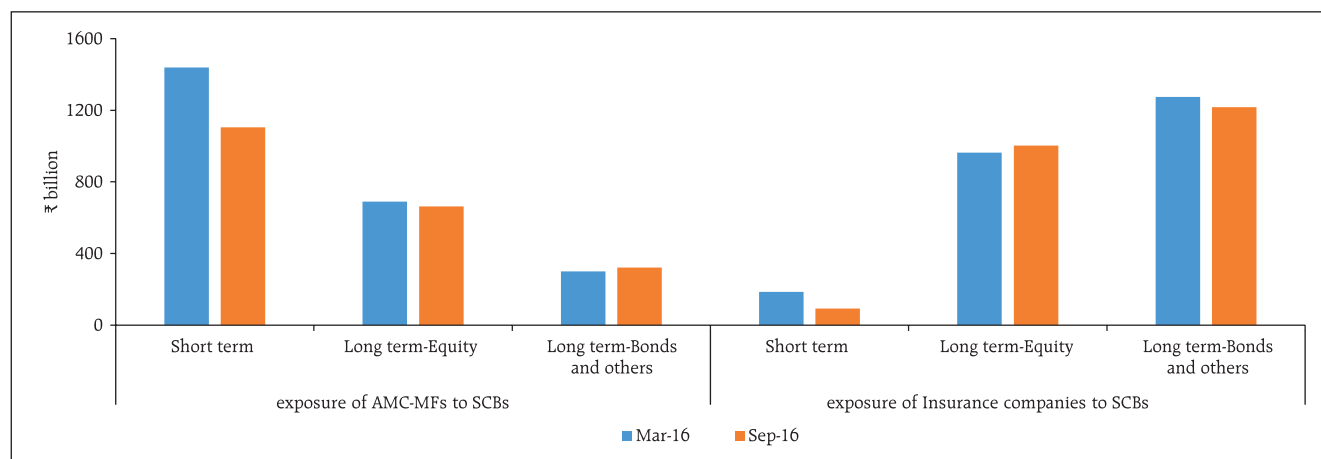


Note: The analysis is confined to bilateral exposure (both fund and non-fund based) among a select sample of regulated financial institutions.
Source: RBI supervisory returns and staff calculations.

companies towards the banking sector was nearly ₹4.4 trillion (as against ₹4.9 trillion in March 2016), which accounted for nearly 4 per cent of the total liabilities of the banking system in September 2016.

2.43 While the gross exposure (receivable) of AMC-MFs to banks was primarily short-term (₹1.1 trillion), the insurance companies had substantial long-term exposure (₹2.2 trillion) (Chart 2.31).

Chart 2.31: Pattern of AMC-MFs' and insurance companies' exposure (gross fund based receivables) to banks



Note: The analysis is confined to bilateral exposure among 86 SCBs and a select sample of AMC-MFs and insurance companies.
Source: RBI supervisory returns.

⁴³ The analysis is confined to bilateral exposure (both fund and non-fund based) among 86 SCBs and a select sample of AMC-MFs and insurance companies.

⁴⁴ The exposure of AMC-MFs and SCBs to the financial system also includes exposure to entities within the same group. Only on-balance sheet assets from domestic operations of the SCBs have been considered.

Exposure to NBFCs

2.44 NBFCs were the largest net receivers of funds from the rest of the financial system with SCBs accounting for 36 per cent, followed by AMC-MFs (at 34 per cent) and insurance companies (at 25 per cent). Pension funds accounted for nearly 3 per cent of the net borrowings by NBFCs from within the financial system.⁴⁵

2.45 A part of the churning in the domestic banking sector is probably benefitting the NBFCs even as the regulatory stance is to harmonise the regulation of NBFCs with that of banks. Notwithstanding the increasing level of regulations for NBFCs, a significant share of bank finance to NBFCs and the better performance of the latter suggest that banks which are currently distressed have a scope to improve their margins by reworking their strategies.

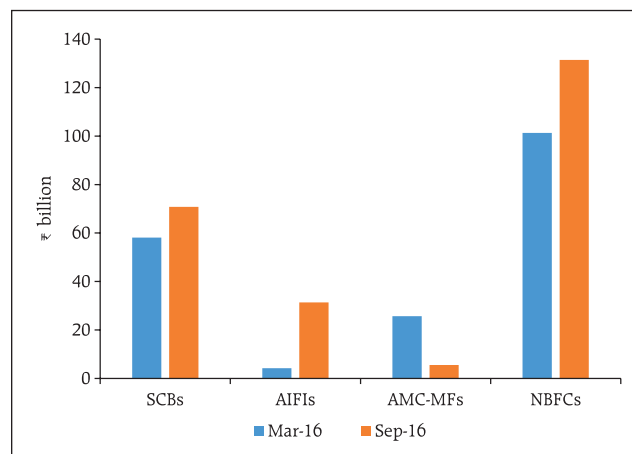
Exposure of Pension funds⁴⁶

2.46 Pension funds were net lenders in the financial system with a gross exposure (receivable) of ₹239 billion in September 2016, of which almost 97 per cent was by way of bonds and other long term instruments. Within the financial system as referred to in the analysis here, nearly 55 per cent of the exposure (gross receivables) of pension funds was to the NBFC sector followed by the banking sector (30 per cent).⁴⁷ Pension funds' exposure (gross receivables) grew by 26 per cent between March and September 2016, mainly fuelled by an increase in their exposure to the NBFC sector (Chart 2.32).

Contagion analysis⁴⁸

2.47 A contagion analysis using network tools is a stress test which is carried out to estimate potential

Chart 2.32: Gross exposure (receivable) of pension funds

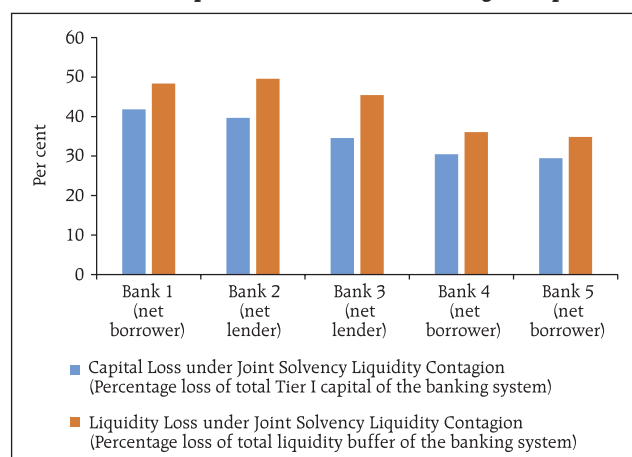


Note: These exposures are not on the balance sheet of the pension funds but on the balance sheet of the NPS schemes managed by pension funds. The analysis is confined to bilateral exposure (both fund and non-fund based) among a select sample of regulated entities.

Source: RBI supervisory returns.

losses that could happen in the event of failure of one or more banks. The maximum (top 5) estimated impact under the joint solvency liquidity contagion⁴⁹ in terms of loss of liquidity and Tier-I capital of the banking system is given in Chart 2.33.

Chart 2.33: Top 5 banks with maximum contagion impact



Note: A bank is classified as net lender if its receivables are more than its payables within the interbank system and as net borrower if its payables are more than its receivables.

Source: RBI Supervisory returns and staff calculations.

⁴⁵ The numbers quoted in this paragraph are confined to a select sample of NBFCs which are significant from a contagion perspective and their bilateral exposure with a sample of regulated financial institutions.

⁴⁶ The data pertains to the exposure of the schemes managed by the seven pension funds and regulated/ administered by PFRDA.

⁴⁷ Exposure of pension funds to UCBs and Insurance companies (in the selected sample) was nil.

⁴⁸ For methodology, refer Annex 2.

⁴⁹ Theoretically, a net borrower bank will generate a solvency contagion while a net lender bank will generate a liquidity contagion. However, in reality, both solvency and liquidity contagions are likely to occur simultaneously (*i.e.* joint solvency liquidity contagion) as typically a bank is net borrower *vis-à-vis* some counterparties while remaining a net lender against some others.