3.3 Resilience of the Banking Sector under Stress Scenarios

The stress scenario is not a forecast of macroeconomic and financial conditions. It is a hypothetical but coherent tail-risk setting designed specifically to assess the resilience of the banking sector to potential deterioration in macroeconomic conditions. This year's stress testing exercise assesses the extent to which the banking sector is able to withstand hypothetically designed domestic and global shocks in the medium term, besides considering the business as usual conditions in the baseline. Given the existing vulnerabilities, under the baseline scenario, the sector's current level of solvency may deteriorate moderately yet it will remains well above the domestic regulatory benchmark. Under the hypothetical shock scenarios, however, the banking sector can withstand for three years the severe and protracted downturn induced by adverse global macroeconomic conditions. In terms of size, all categories of banks can withstand the stress conditions as well. Reassuringly, the large size banks with potential to cause systemic disruptions carry sufficiently higher capital buffers and are able to sustain the impact of hypothesized shocks for around four years. The resilience of medium sized banks, however, may come under stress after three years, while small size banks continue to meet solvency criteria during the projection horizon of five years. Encouragingly, the banking system with adequate capital buffers can cater to the credit needs of the economy even during stress periods, albeit at a slower pace.

3.3.1 Background and Developments

The feedback effects between the real and financial sectors, where vulnerabilities in one sector spillover to the other, have been most prominently highlighted by the onset of global financial crises (GFC) of 2007-08. Since then, the regulators and supervisors have enhanced the level of financial sector oversight, thereby emphasizing on its resilience to withstand shocks transmitting from the rest of the economy. At the same time, stress-testing framework is also being extensively used by the domestic authorities as well as multilateral agencies to assess the resilience of the banking sector to certain hypothetically designed adverse yet plausible event(s). The results of stress-tests, therefore, depict the *projected* behavior of macro-financial variables and health of the banking sector under the assumed scenarios.

The SBP has been conducting this exercise internally on a quarterly basis since 2005 while for the external stakeholders, the stress-testing results are being published in the FSRs since 2007-08. The stress-testing framework, while still in its evolutionary phase, is continuously being revamped and strengthened over the recent years.

The current year's stress testing exercise includes *three* separate scenarios, designed to assess the health of the banking sector over the medium term, i.e. five years from Q1CY19 to Q4CY23.

The *baseline scenario* traces the path of macro-financial variables under the current dynamics of the domestic macro-economy, i.e., business as usual. The other two scenarios, *domestic* and *global,* on the other hand, assume crystallization of idiosyncratic and systemic shocks, such as natural disasters and disruptions in global economy, and project their impact on the resilience of the banking sector. Of the latter two stress scenarios, *global* has been designed to be severer.[154]

[154] Usually three types of shocks are considered in stress testing based on the length of the shock events i.e. V-shaped, L-shaped and U-shaped. The shapes are envisaged in terms of recovery. V-shaped assumes quick recovery; L-shape assumes protracted downturn while U-shaped assumes recovery towards the end of projection horizon. Under this

The methodology used to evaluate the resilience of banking sector in all the three scenarios is similar but differs in terms of paths being followed by the macroeconomic variables. Given the interaction between various sectors of the economy, a number of variants of vector autoregressive (VAR) models have been employed.[155,156] In addition, the cross-sectional heterogeneity has been captured by including segments of banking industry in terms of size (i.e., small, medium, large).

3.3.2 Scenario Design Overview

The *baseline scenario* assumes business as usual environment, both globally and domestically, and is based on recent macroeconomic developments. The *domestic scenario* has been constructed to assess vulnerability of the banking sector to risks emanating from agrarian nature of domestic economy. These risks include catastrophic events generally attributed to climate change and, disruption in river flows due to rising geopolitical tensions. The *global scenario* focuses upon implications of slowdown in key trading partner economies, down grading by Financial Action Task Force (FATF), volatile oil prices and stabilization measures taken post-anticipated IMF program.

The implications of changes in macroeconomic indicators; such as output, inflation, exchange rate, interest rate and exports, on the health of the banking sector have been captured via non-performing loans, profitability and solvency. Specifically, the economic downturns can negatively influence the income levels of borrowers and affect their debt servicing capacity, thereby amplifying the credit risk for banks. This in turn would put adverse pressures on the profitability of banks, thus negatively affecting their solvency.

Given the feedbacks, the solvency issues in banking sector could spill over to the real economy as the banks would be reluctant to provide credit to even potentially profitable investment opportunities, amplifying the downturn. The sharp deceleration in credit flows by the banks during the downturns, could further slowdown the pace of economic growth.

Stress test models, designed to test banking industry's resilience against adverse shocks, capture these inter-linkages among the various sectors of the macro economy. The monetary authority's feedback reactions, in response to the shocks, are assumed to reflect in the interest rate adjustments.

In terms of risk coverage, the resilience of the banking sector has been assessed against credit, market (interest rate and exchange rate) and operational risks.

Baseline Scenario

The baseline scenario, *Scenario 0*, assumes absence of any idiosyncratic or systemic shocks over the simulation period. However, in 2018, domestic economy has experienced rise in inflation and downward adjustment in value of currency;[157] primarily owing to challenges on fiscal and external accounts. Policy makers have countered this situation by contractionary monetary and fiscal policies.[158] Owing to these stabilization measures, uncertainties surround the short run growth

terminology, domestic scenario is assumed to be V-shaped, while global as U-shaped. The recovery under the domestic shock takes place earlier while economy takes a little longer to recover under global shock.

[155] For details, please see 'Box 4.1 Technical Details' of Chapter 4: Resilience of the Banking Sector, Financial Stability Review 2016, SBP.

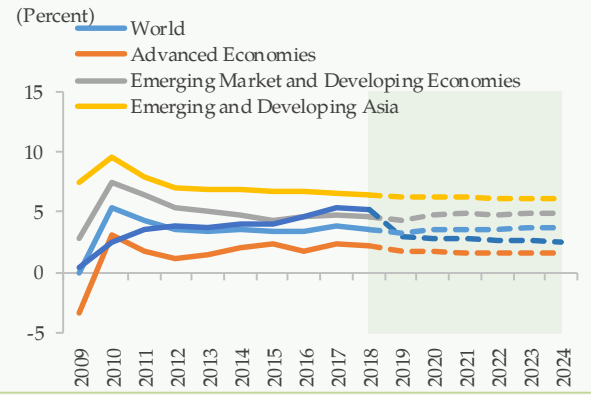
[156] As per BIS study, one fifth of the authorities use VARs. [Bank for International Settlements. Supervisory and Bank Stress Testing: A Range of Practices. December 2017].

[157] CPI and PKR-USD exchange rate increased by 6.5 and 26 percent during CY 2018, respectively.

[158] Policy rate was raised by4.25 percent in CY2018 while development expenditures were cut by 37.2 percent during 2nd half of CY2018.

prospects. Considering these developments, international observers, e.g., IMF, are also expecting lower growth trajectory (**Chart 3.3.1**).[159]

Chart 3.3.1: IMF annual real GDP growth forecast



Source: IMF World Economic Outlook April 2019

In the medium run, adoption of contractionary monetary and fiscal policies is expected to tame inflationary pressure; albeit at the cost of economic activity. On the other hand, adjustment in exchange rate is expected to support current account deficit by rationalizing imports demand and boosting exports. So far as the oil prices are concerned, *Scenario 0,* assumes prices to remain in the range of USD 55-60 per barrel; which is consistent with medium term projections based on oil futures.[160]

Domestic Scenario

The agriculture sector remains one of the important component of domestic economy. Though its share is slowly declining, the sector's output accounts for around one-fifth of the total GDP. Further, its interlinkages with industry and services sectors make it an important driver of the economic growth. Naturally, the sector remains prone to climate change and natural calamities such as periodic floods and droughts. Such shocks, in the past, have led to periods of low growth, surging inflation and reduced productive capacity in the economy.

Global warming and the consequent climate change have been postulated to lead to extreme weather conditions causing droughts, floods, famine and cyclones. According to Long-Term Climate Risk Index (CRI) 2019, during last two decades, Pakistan experienced 145 climate related events and remains 8th most affected country in terms of human and output losses.

The domestic stress scenario, *Scenario 1*, of the current exercise is largely similar to the previous year's design, as discussed earlier. However, some adjustments have been made so that the scenario remains relevant and plausible. It considers the effects of climate change, particularly water shortage, on the agriculture sector, overall economy and ultimately the banking sector. The less availability of water is assumed to mainly stem from reduced rainfall, lower river flows,[161] less snowfall and depletion of glaciers due to extreme temperatures. Additionally, the scenario is also motivated by the recently escalated geopolitical tensions and potential threats of water blockage. Such climate change and geopolitical risks may raise concerns about water conditions and its availability in the medium term.

In this context, the basis of shock design stands on the footprints of 1999-2001 drought, one of the longest and worst episodes of droughts (**Chart 3.3.2**).[162] A substantial fall in agriculture output, mainly due to crops failure, is therefore assumed and the domestic economic growth contracts to 2 percent for initial two years and recovers to around 3 percent by the end of the scenario.

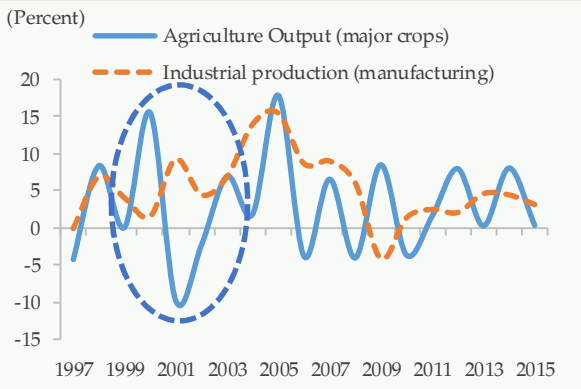
[159] IMF World Economic Outlook, April 2019

[160] IMF World Economic Outlook, April 2019

[161] River flows constitute, on average, 75 percent of total water supply in the country. SBP Annual Report on State of Pakistan's Economy, 2016-17.

[162] Pakistan Meteorological Department (2018). Drought Bulletin of Pakistan, October-December.

Chart 3.3.2: Drought period (1999-2002)



Source: S&DWH (SBP)

The assumed crop failure may prompt the government to provide post-disaster relief packages, pushing current expenditure up and worsening the fiscal position.

With a drop in agriculture output, it is assumed that agri-exports, which constitute around 17 percent of total exports in December 2018, would fall.[163] Non-agriculture exports, which use agriculture produce as raw materials, would also be hampered. Overall, the exports would decline before rising back by the end of scenario. The imports of raw materials and food could also rise, which in turn would further aggravate country's current account balance.

The PKR/USD parity may also weaken, leading to cost-push inflationary pressures. Given low domestic savings - lowest among peer countries - the severity of the shock may amplify. [164]

The expected water shortages could also weigh significantly on the hydropower generation, which, during Jul-Feb FY18, constituted around 27 percent of total electricity generation.[165] The stressed energy conditions may depress the industrial production and domestic investments, causing a drop in overall output. The supply shock may further intensify the price pressures as well.

To meet the shortfall, among other alternatives, thermal sources of power generation is expected to be pushed further. However, such a remedy may lead to higher import of oil and coal, thus amplifying the already high import bill. Besides pressures on the external account, the situation would result in higher prices, mainly via pass-through to consumer goods. Headline inflation is, thus expected to reach as high as 14 percent before falling back to 8 percent during the projection horizon. In response to these vulnerabilities, appropriate adjustments in interest rates is also presumed to check inflationary expectations.

On the upside, the much-anticipated IMF bailout package and other aid/inflows from multilateral and bilateral sources are assumed to materialize over the simulation period. Given the severity of shock and its spillovers, a gradual rather than a quicker recovery is assumed.

The growth paths considered in this scenario for various macro-financial variables are projected through the same feedback models used in *Scenario 0*.

Global Scenario

This years' global scenario incorporates four key global risks. These risks include the decline in world economic growth, escalations of trade tensions among major economies, volatile oil prices and potential downgrading of Pakistan from grey-list by FATF. The scenario (*Scenario 2*), designed to assess the capability of the domestic banking sector to withstand simultaneous materialization of the above

[163] Statistics and Data Warehouse Department, SBP.

[164] Gross Domestic Savings (as percent of GDP in 2017): Pakistan (6.8 percent), Bangladesh (25.3 percent), India (29.8 percent), Bhutan (25.2 percent), Vietnam (25.5 percent), Malaysia (32.5 percent) and Iran (44.3 percent). Source: World Bank.

[165] Pakistan Economic Survey 2017-18, Ministry of Finance

mentioned downside risks, portrays a considerably extreme but plausible set of events.

The IMF, in its latest issue of WEO April 2019, estimates Pakistan economy to grow by 2.9, 2.8 and 2.5 percent in 2019, 2020 and 2021, respectively. While, it estimates the world GDP growth for 2018 to slightly taper and tick in at 3.6 percent.[166] Moreover, forecasts of world GDP growth for 2019 and 2020 are revised downward by 40 and 10 basis points to 3.3 and 3.6 percent, respectively. One of the key factors behind slowdown of global growth is US-China trade tensions. *Scenario 2* assumes intensification of these trade tensions, which may detract ongoing recovery of global financial markets.

Apart from general recessionary impact of trade tensions, downsides include uncertainty regarding no-deal Brexit in UK, geopolitical tensions in Middle East and larger than anticipated slowdown in these economies. If materialized, these risks may negatively affect exports and remittances related flows to Pakistan economy.[167]

International observers are foreseeing oil prices to stay around USD 55 per barrel in the medium run.[168] Despite this stable and low outlook for oil prices, risk of resurgence in prices exists and explains the recent rise in oil prices.[169] For instance, OPEC member countries and Russia have been trying to cut oil production in response to prolonged low oil prices, which are not viable for most of the oil producing countries.[170] Further, the effective materialization of US imposed sanctions on oil exports from Iran might beget the rise in oil prices at a higher pace.[171] Accordingly, *Scenario 2* assumes oil prices to reach USD 80 per barrel before stabilizing at USD 75 per barrel during the last year of projection period.

The global scenario also assumes adverse migration of Pakistan from grey-list by Financial Action Task Force (FATF). This can affect external position of Pakistan in several ways: an increase in sovereign risk premium, de-risking by portfolio investors, slowdown in remittances and increase in transaction costs. It is assumed that remitting and trading procedures through banking channels, like transfer of funds via correspondent banking, opening of trade LCs etc., would become restricted and costly. These disruptions in trade and investment inflows may lead to further pressures on external account balance and exchange rate. This may also impact the non-interest income of banks, particularly, fee income and commissions etc.

Under *Scenario 2,* the above global risk factors will accentuate the domestic economic vulnerabilities, especially the twin deficits. Keeping in view the above facts, our global scenario also assumes that the fiscal and BoP vulnerabilities would necessitate support from IMF. However, IMF programs typically accompany macroeconomic consolidation measures, including a floor on net foreign assets (NFA) and a ceiling on net domestic assets (NDA). As a result, exchange rate depreciation and upward adjustment in utility prices may be anticipated. Further, with a ceiling on NDA in place, the government generally turns towards scheduled banks to finance budget

[166] IMF World Economic Outlook, April 2019.

[167] UK and China are 2nd and 3rd major export destinations for Pakistan. For FY2018, remittances from Middle East economies constitute 57 percent of total remittances in Pakistan.

[168] World Economic Outlook, April 2019, IMF.

[169] A rise of USD 12 per barrel is observed in Dubai crude oil price during Jan-Apr 2019.

[170] https://www.bloomberg.com/graphics/opec-production-targets/

[171] Eight countries; including China, India, Italy, Greece, Japan, South Korea, Taiwan and Turkey; were granted exemptions expiring May 2, 2019.
https://www.state.gov/secretary/remarks/2018/11/287132.htm
https://www.reuters.com/article/us-usa-iran-sanctions-waivers/us-grants-temporary-iran-oil-waivers-to-eight-countries-including-china-pompeo-idUSKCN1NA1OS

deficit, which may crowd out private sector investment during initial phase of macroeconomic consolidation. However, as the consolidation efforts bear fruits and economy stabilizes, fundamentals are likely to improve, albeit gradually, during the second half of our projection period.

Amid these anticipated developments and recovery, this scenario design assumes a U-shaped trajectory, with a sharp initial deterioration, followed by gradual recovery towards end of the projection period.

In line with global dynamics, *Scenario 2* assumes that real GDP growth may decline to below one percent; leading to significant slowdown in exports and remittances. Resulting pressure on external account is expected to weaken PKR/USD parity; causing imports to be more expensive and resulting in buildup of significant domestic price pressures.

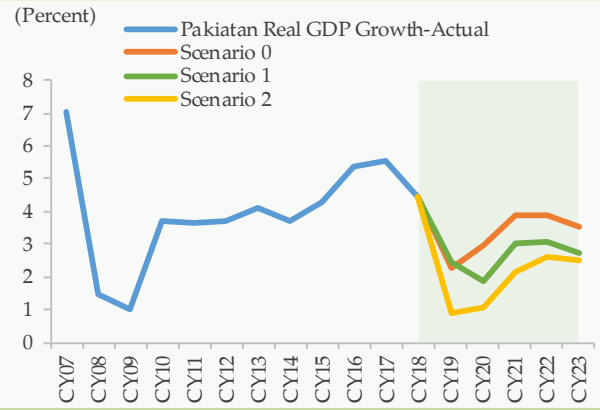
In view of the assumed inflationary and exchange rate pressures, an appropriate policy response may be required. Particularly monetary authority may appropriately adjust the benchmark interest rates. Therefore, the assumed external sector pressures, a slowdown of aggregate demand and tighter monetary conditions, would translate into elevated levels of credit risk, leading to higher infections and some brake on bank lending. The slowdown in lending activity may also hurt the interest income of banks. This, coupled with higher provisioning expenses, could possibly impair banking industry's profitability and ultimately the capital adequacy.

3.3.3 Stress Testing Results: System Level

(a) Impact on Credit Riskiness

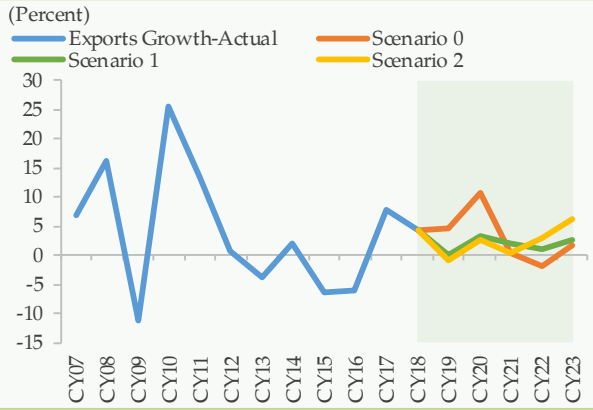
The results of stress test exercise indicate that gross non-performing loans ratio (GNPLR), under *Scenario 0*, is likely to remain somewhat elevated over the five year projection horizon, given the domestic and external pressures (**Chart 3.3.6**). Over the initial two years of projection horizon, GNPLR may rise to 11.54 percent and would settle at the level of 13.07 percent by the end of projection period, which is 5.16 percentage points higher than 7.91 percent as of end 2018. This is mainly in line with our assessment of the domestic economy, where existing macro-economic vulnerabilities may cause a moderate level surge in NPLs of the banking sector.

Chart 3.3.3: Projected real GDP under various scenarios



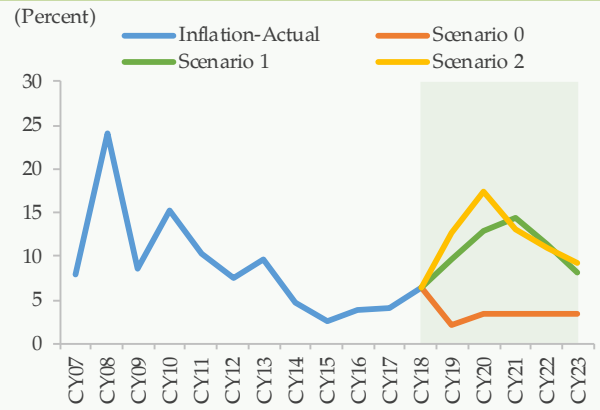
Source: Staff Calculations

Chart 3.3.4: Projected exports under various scenarios



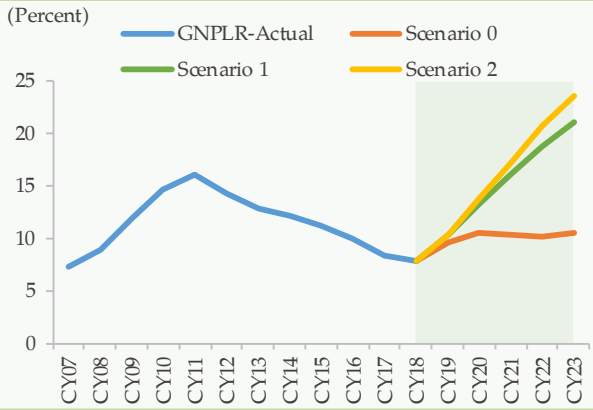
Source: Staff Calculations

Chart 3.3.5: Projected inflation under various scenarios



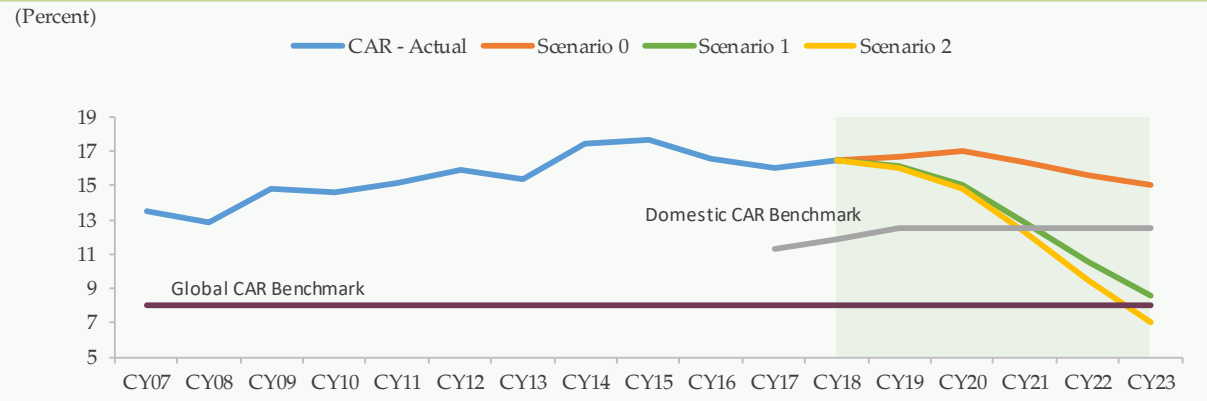
Source: Staff Calculations

Chart 3.3.6: Projected system-level GNPLR under various scenarios



Source: Staff Calculations

Chart 3.3.7: Projected system-level Capital Adequacy Ratio (CAR) under various scenarios



Source: Staff Calculations

The GNPLR, under hypothetical scenarios, rises faster than in the baseline because of the assumed deterioration in macroeconomic conditions. Banking industry shows less resilience towards global shocks (*Scenario 2*) as delinquency rate touches 23.64 percent by the end of projection horizon. In response to domestic shocks (*Scenario 1*), on the other hand, delinquency reaches to 21.10 percent. Credit risk under both stress scenarios are higher than the GNPLR levels observed during last 15 years. The assumed crisis under global shocks might pose stability concerns to the banking system.

Likewise, domestic led vulnerabilities also threaten banking sector stability but to a slightly lesser extent. The assumed faster recovery under domestic scenario by the end of projection period could be the reason behind lesser severity of GNPLR levels under *Scenario 1* compared with *Scenario 2*.

(a) Impact on Solvency

The impact on solvency is measured via Capital Adequacy Ratio (CAR) of the banking system. As expounded in the scenario design, besides the *credit risk*, other risks viz., the *market risk*, realized via movements in interest and exchange rates, as well as the *operational risk* are likely to have impact on solvency. These risks, therefore, have been factored in while analyzing the impact of each scenario on eligible capital as well as risk weighted assets. Under the business as usual environment, the CAR of the banking system moderately deteriorates by 0.86 percentage points by the end of projection period. This is mainly on the back of existing macroeconomic risks discussed earlier. The CAR, under scenario 1 and 2, falls to 10.45 percent and 8.94 percent, respectively.

More specifically, under *Scenario 1* (Domestic Shock), the banking industry breaches domestic regulatory benchmark in fourth year while it falls below the international regulatory benchmark (10.5 percent) in the last year of the projection horizon. (**Chart 3.3.7**).[172] The banking sector's CAR significantly declines in the event of a global shock. In this case, the industry breaches domestic and international CAR benchmarks, respectively, in the third and fourth years of projections horizon. It is important to highlight that the domestic CAR requirements are set at levels higher than the global standards.

3.3.4 Stress Testing Results – Segment Level

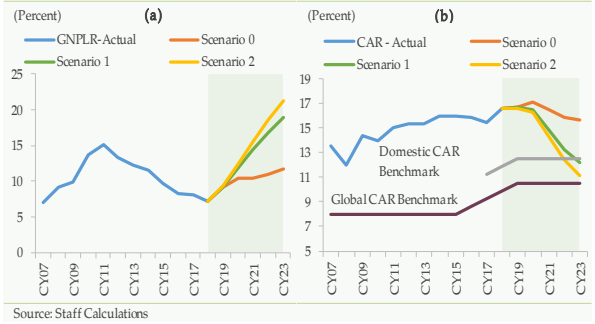
In line with the system-level default analysis, segment level (small, medium, large) infection ratio has also been projected. This aspect of banking industry is included to assess how the cross-sectional heterogeneity affects the resilience of banks against various macroeconomic risks.

For GNPLR, system-level projections of NPLs and gross loans are distributed proportionately based on the contribution of each segment in the loan portfolio of entire banking system as of end 2018. Similarly, capital is also distributed proportionately to compute segment level CAR.

Large Banks

By the end of simulation horizon, large banks witness a rise of 4.63, 11.83 and 14.11 percentage points in GNPLR and a fall of 0.94, 4.45 and 5.45 percentage points in CAR, under scenarios 0, 1 and 2, respectively. *Scenario 2* turns out to be the most severe and deteriorates profitability of large banks the most (**Chart 3.3.8 (a & b)**).

Chart 3.3.8: Projected GNPLR and CAR of Large Banks



Source: Staff Calculations

The local CAR standard of 12.5 percent gets breached for this category of banks by CY22 in case of *Scenario 2* and CY23 in case of *Scenario 1* (**Chart 3.3.8 (b)**). This implies that the large banks can generally withstand the stress for three years. Reassuringly, the minimum global benchmark, however, would not be violated in any stress scenario over the projection

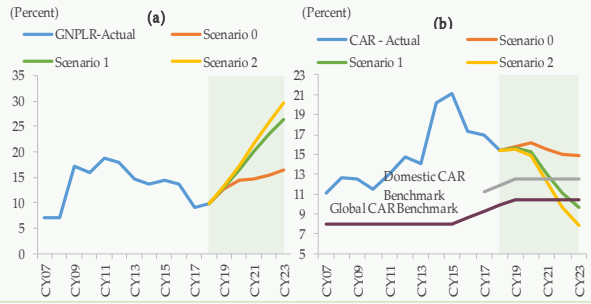
[172] The domestic CAR benchmarks are 11.90 percent (December 2018) and 12.5 percent (December 2019 onwards).

period. Sufficiently higher capital buffers available with larger banks would help them withstand even the severe shocks. More importantly, the systemically important banks remain well capitalized and resilient to support real economic growth even in times of stress, although some deceleration in the extension of loans could be observed.

Medium Banks

By the end of projection period, GNPLR of medium-size banks rises in scenarios *0*, *1* and *2* by 6.47, 16.52 and 19.70 percentage points, respectively, while the CAR falls by 0.46, 5.61 and 7.47 percentage points. Again, the adverse impact of shocks emanating under global scenario outweighs the consequences of domestic scenario in terms of severity (**Chart 3.3.9(a & b)**).

Chart 3.3.9: Projected GNPLR and CAR of Medium Banks



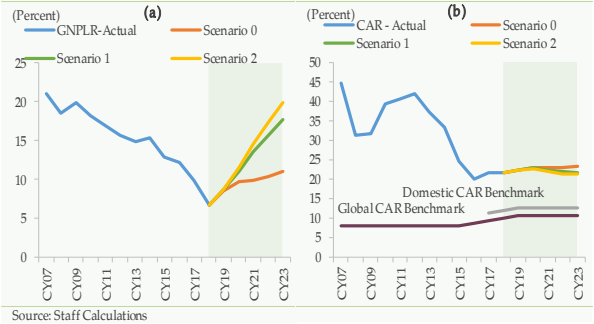
Source: Staff Calculatioons

In case of domestic shocks, *Scenario 1*, this segment of industry breaches local and global CAR standards in CY22 and CY23, respectively. In case of global shocks, *Scenario 2*, medium sized banks breach local and global CAR standards in CY21 and CY22, respectively. (**Chart 3.3.9(b)**). Comparatively higher levels of delinquency ratios and lower level of pre-shock capital buffers possibly make medium banks more vulnerable to shocks.

Small Banks

Small banks are found to be the most resilient against domestic and global shocks. Although, their CAR does fall like large and medium size banks yet, it remains well above both the local and global minimum capital requirements (**Chart 3.3.10 (a & b)**).

Chart 3.3.10: Projected GNPLR and CAR of Small Banks



Source: Staff Calculations

The loan delinquency rate of small banks rises by 4.36, 11.13 and 13.27 percentage points under scenario *0*, *1* and *2*, by the end of five-year horizon (**Chart 3.3.10 (b)**), which happens to be the lowest among all three categories. Given the lower exposure, comparatively, in terms of loans, the CAR of small banks rises by 1.16 percentage points in *Scenario 0* and by 0.03 percentage points in *Scenario 1*; however, it falls 0.50 percentage points in *Scenario 2*. Nonetheless, due to a comfortable pre-shock capital position, small banks demonstrate enough resilience to maintain compliance with domestic and global minimum capital requirements despite credit losses.

Overall, under the baseline scenario, the solvency of banking sector could experience some moderation; however, it remains well above the domestic regulatory capital benchmark. Under hypothetical shock scenarios, nonetheless, the banking sector can withstand some severe and protracted downturn induced by adverse global macroeconomic conditions for three years. In terms of size, all segments of banks including the small, medium and large, can withstand the stress conditions as well. Reassuringly, the large size banks with potential to cause systemic disruptions carry sufficiently higher capital buffers and are thus able to sustain the impact of hypothesized shocks for around four years. The resilience of medium sized banks, however, starts waning after three years, while small size banks never breach the solvency criteria during the projection horizon of five years