7 Resilience of the Banking Sector Under Adverse Conditions

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 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. The sector maintains its current level of solvency under the baseline scenario. Under the shocks, however, the solvency benchmark falls below the local standards after three years. In case of severe and protracted downturn induced by global macroeconomic conditions, the system even falls below the minimum global capital adequacy benchmark. In terms of size, the medium and large banks turn out to be vulnerable to both domestic and global adverse shocks while the small banks, on the back of their strong capital adequacy, largely withstand the stress.

7.1 Background and Developments

The stress-testing framework is being extensively used by various regulators and supervisors in order 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.

SBP has been publishing the stress-testing results in FSRs since 2007-08. The stress-testing framework has been strengthened in recent years. This year's assessment, building on similar premises as in FSR 2016, extends it in a number of ways.

The current 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 Q1CY18 to Q4CY22, unlike the previous stress testing exercise which spanned over three years horizon.

The *baseline scenario* captures the current dynamics of the macroeconomy and precludes any externalities. While, the other two scenarios, *domestic* and *global,* assume crystallization of idiosyncratic and systemic shocks, such as natural disasters and disruptions in global economy. Of the two stress scenarios, global has been designed to be severer.[298]

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, variants of vector autoregressive (VAR) models have been employed.[299,300]

Moreover, in addition to the overall assessment, the cross-sectional heterogeneity has been captured by including segments of banking industry in terms of size (i.e., small, medium, large). The analysis also

[298] 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 terminology, both domestic and global scenarios are assumed to be U-shaped. However, the recovery under the domestic shock takes place earlier while economy takes a little longer to recover under global shock.

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

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

complements the recent regulatory announcement regarding the framework for domestic systematically important banks (D-SIBs).[301]

7.2 Scenario Design Overview

The baseline scenario assumes business as usual environment, both globally and domestically, and is based on recent macroeconomic developments. Domestic scenario, on the other hand, follows the footprints of one of the worst episodes of droughts that hit Pakistan's economy in 1999-02. While global scenario, besides tracking the pattern of 2008 financial crisis, also considers the recently evolved global risks, making it extremely adverse.

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 and upturns can influence the income levels of borrowers, affecting their debt servicing capacity and amplifying the credit risk for banks. This in turn influences the profitability of banks, which has implications for their solvency.

Conversely, financial sector also has implications for (and can disrupt) the real economy as witnessed during GFC of 2008. The extension of credit by the banks is hampered during the downturns, slowing further the pace of economic growth. In fact, the recessions tend to be deeper and costlier when they coincide with the contraction phase of financial cycle.[302]

Stress test models, designed to test banking industry's resilience against adverse shocks, capture the inter-linkages among the various sectors of the macro economy. The authorities' feedback reactions, in response to the shocks, are assumed to be reflected in the adjustments of interest rate, inflation and exchange rate.

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

Baseline Scenario

Baseline scenario, *Scenario 0*, assumes absence of any idiosyncratic or systemic shocks over the simulation period. Nevertheless, short run risks, as highlighted in Chapter 1, may weigh on the domestic economy. The slowdown may occur due to ongoing political uncertainties, both domestic and global, pressures arising from external sector vulnerabilities as well as fiscal slippages, and reversal of oil prices. While Government has projected the GDP to grow by 6.2 percent in 2019, international observers, such as the IMF, are, however, expecting a slowdown in the economy in the upcoming years (**Figure 7.1**).[303]

In the medium term, CPEC projects are expected to support the manufacturing and structural development activities that may drive growth over the projection horizon.

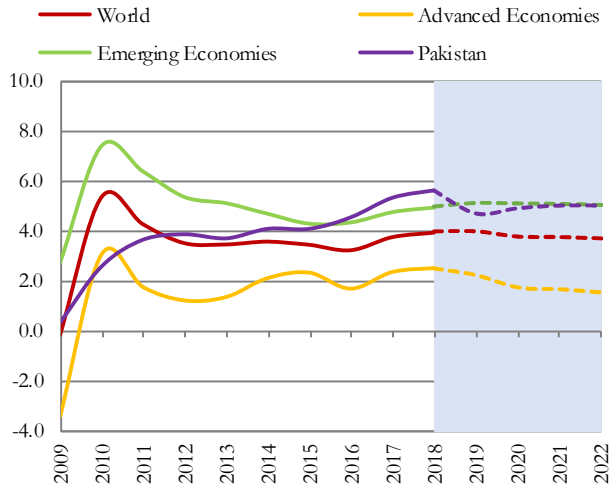
These developments are assumed to strengthen the demand conditions in the medium term, leading to some inflationary pressure; political uncertainties and balance of payment vulnerabilities are assumed to tighten financial conditions in the short run. On top of these risks, recent uptrend in oil prices might further worsen the external account. Exports are likely to tread on an accelerated growth trajectory in the wake of strengthening demand conditions in the AEs, the recent support package by the government

[301] BPRD Circular No. 04/2018.
[302] Drehmann M., Borio C., and Tsatsaronis K. (2012). Characterizing the Financial Cycle: Don't lose sight of the medium term! Bank for International Settlements, Working Paper No. 380.
[303] IMF (2018), World Economic Outlook, *April*

as well as lagged impact of bouts of weakening parity conditions.

Figure 7.1
IMF Annual Real GDP Growth Forecast

Percent GDP growth Actual and Forecast (Dotted lines)
(Percent)



Source: IMF World Economic Outlook April 2018

Amid these economic developments, banking industry is expected to continue its current course of profitability and solvency, punctuated, however, by some adjustments due to tighter financial conditions in the short-run.

All the estimations made under this scenario are purely model based and turn out to be broadly in line with the IMF's WEO forecasts of April 2018.

Domestic Scenario

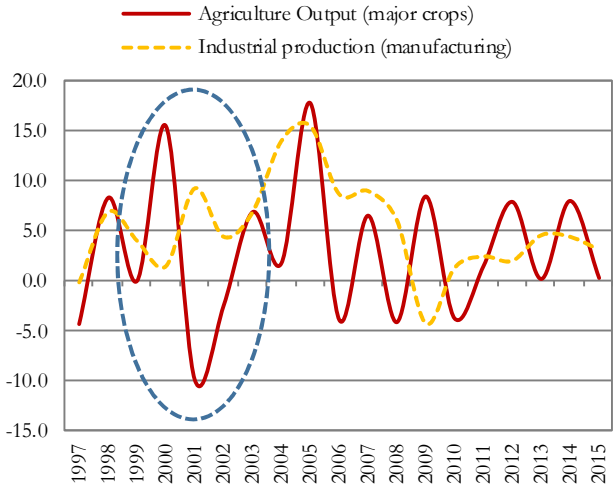
The domestic economy continues to be driven by, inter alia, the agriculture sector. Though slowly declining, the sector's output accounts for around one-fifth of the total GDP. Further, its interlinkages with industry and services sectors make it an important driver of the economic growth. Naturally, the sector remains prone to natural calamities such as earthquakes and periodic floods and droughts.

Such shocks, in the past, have led to periods of low growth, surging inflation and reduced investor confidence.

Climate change and the consequent global warming have been postulated to lead to extreme weather conditions causing droughts, floods, famine and cyclones. According to Long-Term Climate Risk Index (CRI) 2018, during last two decades, Pakistan experienced 141 climate related events and remains 7th most affected country in terms of human and output losses.[304] Concretely, the country suffered a 0.605 percent loss of its GDP due to extreme weather conditions.

Figure 7.2
Drought Period (1999-2002)

Growth Trend in Agriculture Output and Industrial Production
(Percent)



Source: S&DWH (SBP)

The domestic stress scenario, *Scenario 1*, therefore, considers the effects of climate change on the economy and its impact on the banking sector. The scenario is also motivated by the recent concerns about water conditions and availability. In this context, our benchmark period is 1999-2002 when the country experienced one of the longest and

[304] German Watch:
https://germanwatch.org/en/download/20432.pdf

worst episodes of droughts.[305] As a result, Pakistan's economic growth slowed down to 1.97 percent in FY01 and exports fell by 2.25 percent. Agriculture output also witnessed negative growth with some lags (**Figure 7.2**).

Recently, the Indus River Systems Authority (IRSA), country's water resources management body, projected 40 percent shortage of water during the upcoming Kharif season, mainly due to a reduced amount of snow-melting, lower river flows, rainfall as compared to previous year.[306]

The expected water shortages could also weigh on the hydropower generation, which, during FY17, constituted around 30 percent of total electricity generation.[307] The stressed energy conditions may depress the industrial production causing a drop in domestic output.

To meet the shortfall, among other alternatives, thermal sources of power generation could be used. 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.

The *Scenario 1*, therefore, assumes a natural shock, similar to 1999-2002 drought, to hit Pakistan over the simulation period. Substantial fall in agriculture output, mainly due to crops failure, is assumed, while some recovery could take place on account of relief packages expected from the government.

In view of the post disaster relief initiatives of the government, it is assumed that the government's current expenditure would rise. At the same time, inflationary pressures could also rise in response to this supply shock.

With a drop in agriculture output, it is assumed that agri-exports, that constitutes around 20 percent of total exports in December 2017,[308] would fall. The imports of raw material and food could rise, which in turn would further aggravate country's current account balance.

Moreover, investor confidence is assumed to shake resulting in bearish sentiments in the stock market while the PKR-USD parity may experience some adjustment. In response to these vulnerabilities, interest rates may also adjust accordingly.

The growth paths assumed in this scenario for various macro-financial variables are projected through the same feedback models used in *Scenario 0*. As this scenario assumes output to, initially, decline but then recover towards the end of the simulation period, pressures on repayment capacity of borrowers are assumed. A moderate rise in non-performing loans is expected.

Global Scenario

The global economy currently faces multiple challenges on various fronts. These include lower but uncertain oil and commodity prices; political uncertainties in the Middle East and elsewhere; tapering or tightening of monetary policy by major central banks like Federal Reserve, Bank of England (BoE) and European Central Bank (ECB) and potential trade policy shift towards protectionism in the United States and probable retaliatory actions from major economic players.

The IMF's WEO, April 2018, estimates the world output at the level of 3.8 percent in 2017, lower from 5.4 percent in 2010 (*a slump of 160 basis points*). As per IMF's projections, the output of major economies like, US, EU, Japan, China and Russia,

[305] Pakistan Meteorological Department (2017). Drought Bulletin of Pakistan, October-December.
[306] IRSA meeting 22 March 2018.
[307] Pakistan Economic Survey 2016-17, Ministry of Finance
[308] State Bank of Pakistan

will fall short of or remain close to the level of post-crisis period till 2019.

The inward looking trade policies, initiated by United States, could lead to build up of inflationary pressures in the US via external account, possibly motivating quicker and tighter than anticipated normalization of monetary policy. Some retaliatory responses like tariffs imposition and rise in interest rates are also expected to come up from various jurisdictions such as UK, EU, and China.

The repercussions of these risks, which have already started building up across the globe, could be severe for Pakistan's economy in the medium term. The key vulnerabilities of global economy such as shifts in trade policies,[309] uncertainties surrounding oil prices and a slower growth in China could weigh on Pakistan's trade volume, investment portfolio, remittances, exchange rate and interest rate environment, and ultimately the real output.

All these global political and economic risks are assumed to crystallize in a hypothetically designed *Scenario 2*. Given the already slower real growth in the major economies, the events surrounding the scenario are assumed to lead to a severer downturn in the world economy than the one experienced in the wake of GFC 2008.

Amid this backdrop, it is assumed that world real GDP growth would fall but then recover over the simulation period. The real GDP growth of major economies of world is assumed to experience synchronized slowdown and fall at a higher rate than the one observed during 2008 financial crisis. This postulation is in line with the adverse scenarios considered by other Central Banks (*such as Bank of England*).[310]

In the low growth environment, global trade is assumed to stagnate initially and fall significantly in the latter period. Further, deteriorated market perceptions may diminish investors' risk appetite leading market participants to attempt de-risking their portfolios. Resultantly, capital flight is assumed from emerging markets and demand for less risky assets, often belonging to the developed countries, may rise. Emerging market currencies may depreciate against the benchmark currencies, e.g., the US dollar in such a situation.

Oil prices would also face downward pressures because of contracting global demand and trade. However, given that the supply conditions have changed due to availability of alternative energy sources (such as shale gas, wind, solar, Ethanol fuel etc.) the extent of adjustment in the oil prices has been assumed smaller than what was witnessed during GFC.

These developments justify the U-shaped downturn and assume that the decline of global growth would be deeper and would only reverse its course towards the end of projection period. This is unlike the actual event of 2008 where the start of recovery was observed in 2009.

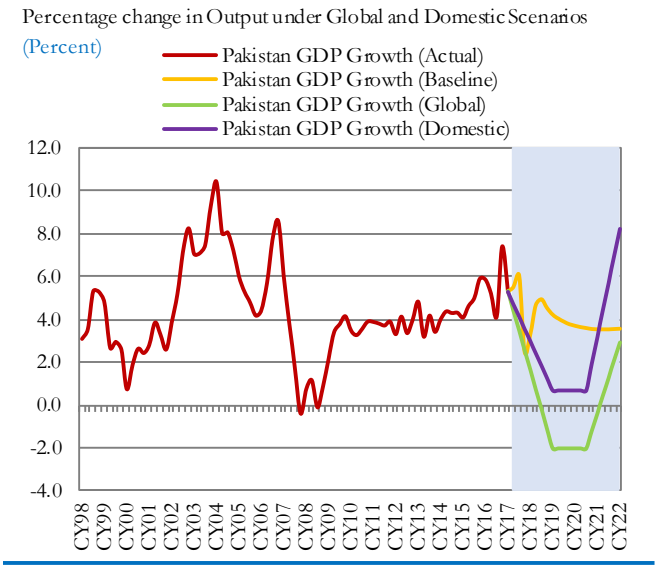
Consequently, the scenario assumes that Pakistan's GDP would experience a more severe fall than was observed during GFC 2008 (**Figure 7.3**).[311] The external account is assumed to take pressure of falling global trade, causing a significant drop in exports. This effect is captured by deterioration of domestic parity conditions vis-à-vis the US dollar. Expensive imports along with ER adjustment is assumed to contribute to the buildup of price pressures.

[309] For example, uncertainties surrounding NAFTA and renegotiation of economic arrangements between UK and rest of the EU.
[310] Stress testing the UK banking system: 2017 results

[311] The estimates of quartized GDP for Pakistan has been used. See Tahir A., Ahmed J. and Ahmed W. (2018). Determination of Business Cycles using Quarterized GDP of IGC Partner Countries. *Unpublished manuscript*. State Bank of Pakistan.

Figure 7.3

Annual Growth in Pakistan Real GDP



Source: Staff Calculations

In view of the assumed inflationary and exchange rate pressures, interest rates are likely to respond accordingly. Therefore, the assumed external sector pressures, a slowdown of aggregate demand and tighter monetary conditions, would translate into higher level of credit risk, leading to higher infection levels in the banking sector. At the same time, prompt slowdown of 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 capital adequacy.

7.3 Stress Testing Results: System Level

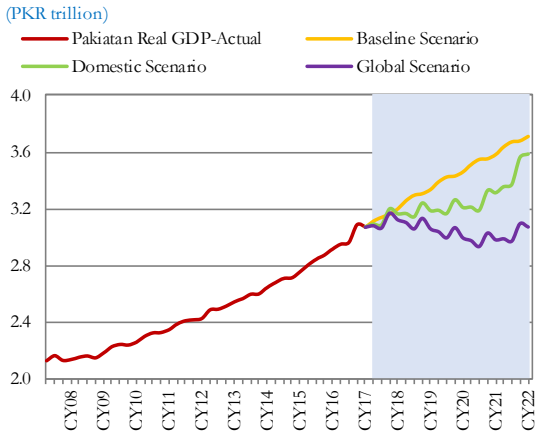
(a) Impact on Credit Riskiness

The results of stress test exercise indicates that GNPLR, under *Scenario 0*, oscillates broadly around the current level of 8.35 percent (as of Q42017) (**Figure 7.7**). Over the five-year projection horizon, GNPLR hits the lowest level of 7.40 percent in Q42018 and settles at the level of 8.10 percent in Q42022. This is mainly in line with our assessment of the domestic economy, where short run pressures are stronger while conditions are expected to improve in the medium term.

The GNPLR, under hypothetical scenarios, rises faster than in the baseline because of deteriorating macroeconomic conditions. Banking industry shows less resilience towards global shocks as delinquency rate touches 21.77 percent by the end of projection horizon. This is higher than the GNPLR levels attained over previous one and a half decade! The assumed crisis, erupted under global shocks, might pose stability concerns to the banking system of Pakistan.

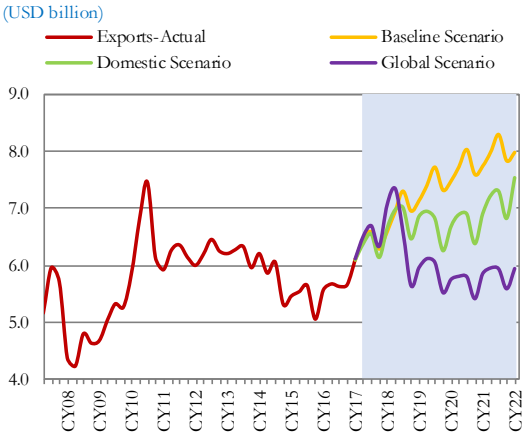
Likewise, domestic led vulnerabilities also threaten banking sector stability but to a lesser extent. The assumed faster recovery under domestic scenario by the end of projection period could be the reason behind less severe GNPLR levels attained under Scenario 1 in comparison with Scenario 2.

Figure 7.4
Projected Pakistan Real GDP under various scenarios



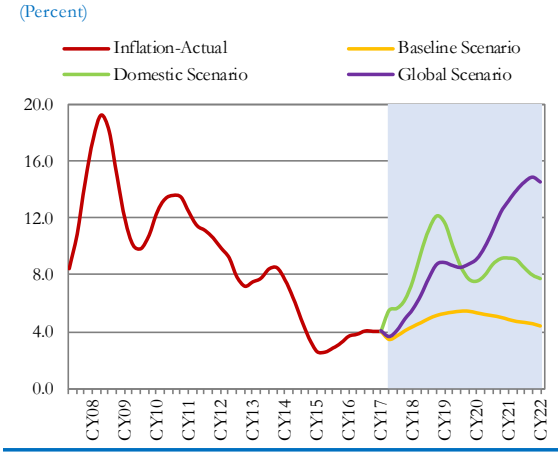
Source: Staff Calculations

Figure 7.5
Projected Exports under various Scenarios



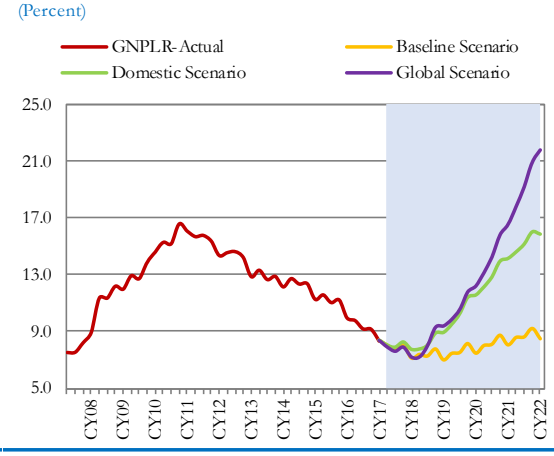
Source: SBP and Staff Calculations

Figure 7.6
Projected Inflation under various Scenarios



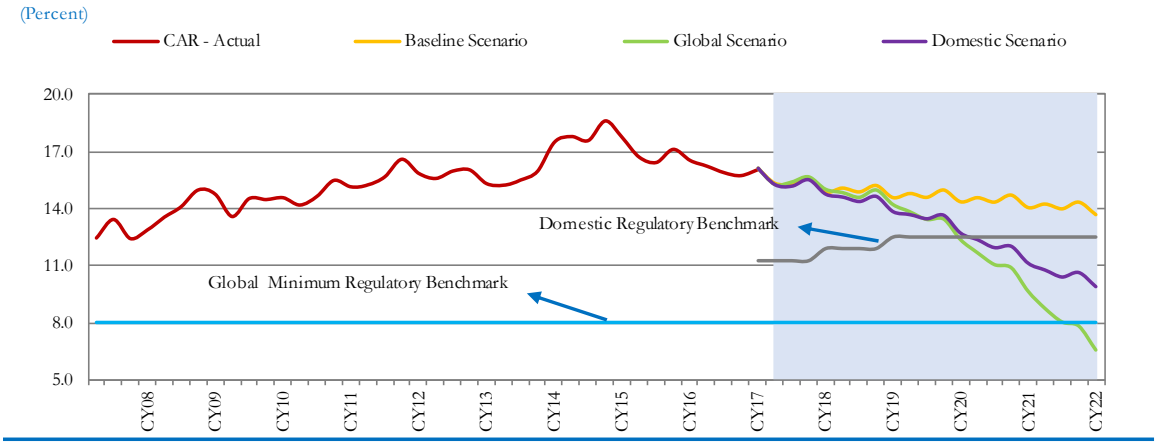
Source: SBP and Staff Calculations

Figure 7.7
Projected System Level GNPLR under various Scenarios



Source: SBP and Staff Calculations

Figure 7.8
Projected System Level Capital Adequacy Ratio under various Scenarios



Source: SBP and Staff Calculations

(b) 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 three risks, therefore, have also 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 deteriorates slightly, mainly on the back of existing macroeconomic risks discussed earlier as well as the expected upward growth trajectory of loans.

Under Scenario 1 (Domestic Shock), the banking industry manages to comply with the minimum international CAR requirement of 8.0 percent but fails to meet the domestic regulatory benchmark after two years (**Figure 7.8**).[312] The banking sector's CAR significantly declines in the event of a global shock, and even falls below the minimum international benchmark. It may be mentioned that the domestic CAR requirements are set at levels higher than the global standards.

7.3 Stress Testing Results – Segment Level

In line with the system level default analysis, segment level (small, medium and large sized banks) 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.

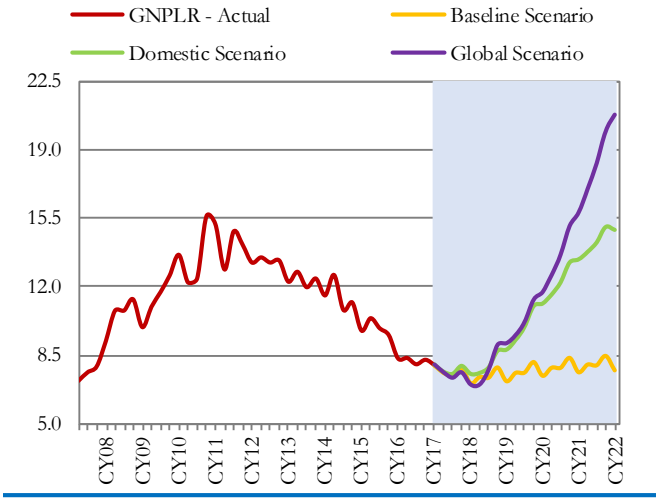
For GNPLR, system-level projections for non-performing loans and gross advances are distributed proportionately based on the contribution of each segment in the loan portfolio of entire banking system as of December 2017. Similarly, capital is also distributed proportionately to compute segment level CAR.

Large Banks

Large banks, by the end of simulation horizon, witness a rise of 0.51, 7.04 and 12.82 percentage points in GNPLR and fall of 2.11, 5.22 and 8.10 percentage points in CAR, under Scenario 0, Scenario 1 and Scenario 2, respectively. Scenario 2 turns out to be the most severe one and deteriorates profitability of large banks the most.

Figure 7.9
Global Shock increases the Credit Risk of Large Banks

Baseline and Projected under Global and Domestic Scenarios
(Percent)



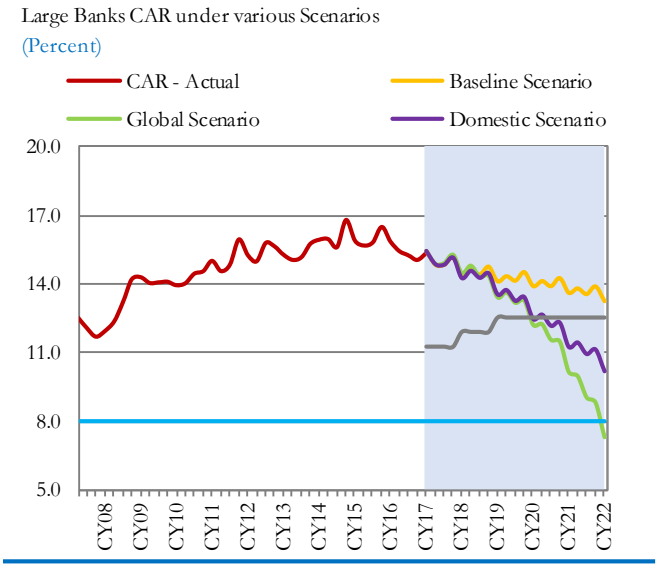
Source: Statf Calculations

The local standard for CAR gets breached under both stress scenarios towards the end of CY2020. The minimum global benchmark, however, would only be violated in case of a protracted downturn and that too in the last quarter of the projection period. Large banks are, thus, projected to show

[312] The domestic CAR benchmarks are 11.275 percent (December 2017), 11.90 percent (December 2018) and 12.5 percent (December 2019 onwards).

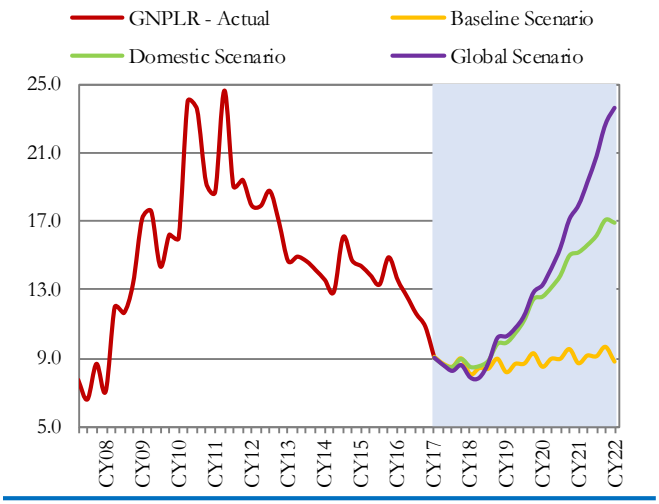
resilience against severe shock for up to two years (**Figure 7.10**).

Figure 7.10
Both the Stressed Scenarios breach Regulatory Benchmark



Source: Staff Calculations

Figure 7.11
Global Shock increases the Credit Risk of Medium Banks



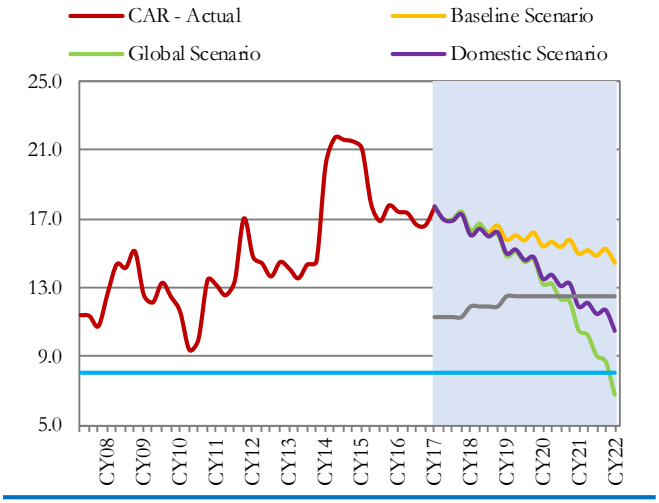
Source: Staff Calculations

Medium Banks

By the end of projection period, GNPLR of medium-size banks rises by 0.58, 8.00 and 14.57 percentage points and CAR falls by 3.23, 7.14 and 10.89 percentage points during scenario 0, 1 and 2, respectively. Again, the impacts of global shocks outweighs the consequences of baseline conditions and domestic vulnerabilities in terms of severity (**Figure 7.11**).

This category shows more resilience than large banks as it survives two quarters more before breaching local CAR requirement under Scenario 2 and four more quarters under scenario 1 (**Figure 7.12**). Comparatively lower exposure in terms of loans and a higher CAR, pre-shock, possibly help medium banks withstand the shocks.

Figure 7.12
Medium Banks are more vulnerable to credit Risks



Source: Staff Calculations

Small Banks

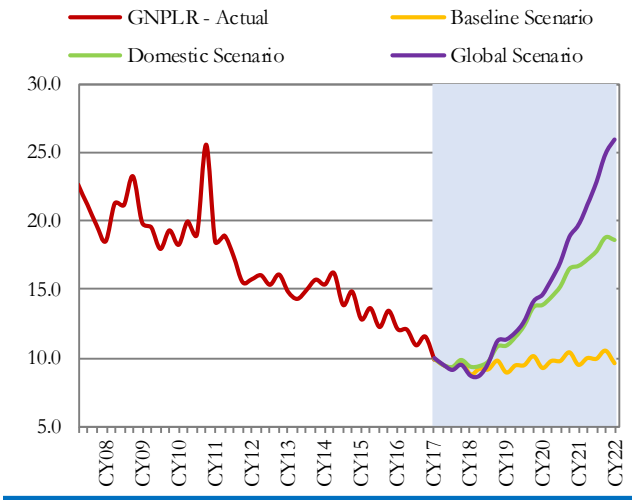
Small banks is the category of banks that happen to be the most resilient against domestic and global shocks. Although, it's CAR do fall like large and medium size banks but remains well above both the local and minimum global capital requirements (**Figure 7.14**).

Figure 7.13

Global Shock increases the Credit Risk of Small Banks

Baseline and Projected under Global and Domestic Scenarios

(Percent)



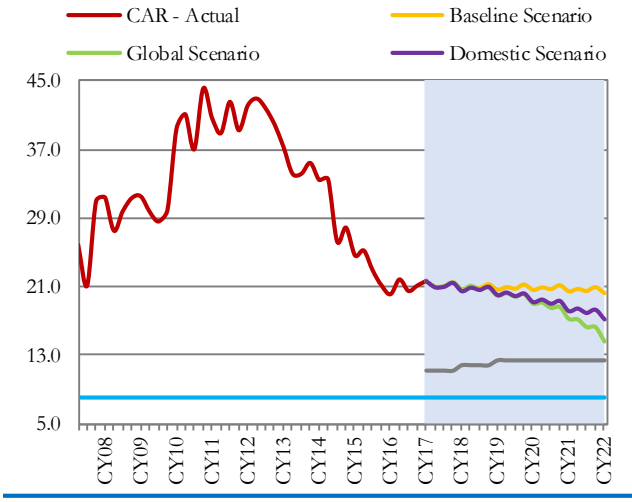
Source Staff Calculations

Figure 7.14

Small Banks are the most resilient to Credit Risks

Small Banks CAR under various Scenarios

(Percent)



Source: Staff Calculations

The delinquency rate of small banks rises by 0.63, 8.77 and 15.97 percentage points under scenario 0, 1 and 2, by the end of five-year horizon, which happens to be the highest among all three categories. However, due to a comfortable capital position of these banks, pre-shock, small banks turn out to be strong enough to absorb credit losses and still able to maintain capital above the minimum global and domestic regulatory requirements.