Guidelines on Stress Testing

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Contents

Introduction

Stress Testing refers to a range of techniques used to assess the vulnerability of a financial institution or the entire system to exceptional but plausible events. While the concept per se is not new as it is just an evolution of more primitive 'what if analysis, both the usage and sophistication of stress testing methodologies have grown considerably in recent years. Interest in stress tests has further intensified after the global financial crisis of 2008 and particularly since the results of stress tests, conducted by USA in 2009 and by EU in 2010-11, have been made public.

Cognizant of the critical role that stress tests can play in helping banks/DFIs indentifying their vulnerabilities at an early stage, State Bank of Pakistan (SBP) issued detailed Stress Testing Guidelines vide BSD Circular 5 of 2005. Since then, the increasing complexity and sophistication in our financial system and developments on international front prompted a review and update of the existing instructions on stress testing with an aim to make them robust and sensitive to the changing business environment. This document consists of a revised suite of guidelines which would help banks/DFIs in developing robust stress testing framework and effectively conduct mandatory stress tests.

These guidelines are divided into three sections. **Section 1** contains a brief review of stress testing concepts as well as some broad guidelines on establishing a robust stress testing framework. **Section 2** elaborates the mandatory set of predefined stress tests, based on sensitivity analysis, that all banks/DFIs are required to conduct and report their results to SBP on quarterly basis. **Section 3** provides some additional guidance on non-mandatory stress tests that banks/DFIs are encouraged to consider for their internal consumption.

Section 1. Stress Testing Framework

1.1 Stress Testing

Stress Testing is a risk management tool that helps identify the potential impact of extreme yet plausible events or movements on the value of a portfolio. Here, *exceptional* refers to events of high severity and *plausible* excludes improbable scenarios.

While traditional risk measures provide reasonable information on the behavior of risk factors and their impact on financial institutions in normal business conditions, risk managers need additional tools to test the resilience of their institutions during times of turmoil. Stress tests help identify and analyze the risks which might be latent under benign conditions but, if triggered, could have serious implications for the very existence of a financial institution.

1.2 Stress Testing Methodologies

In term of methodologies, stress tests can be broadly classified into following two types:

1.2.1 Sensitivity Analysis

Sensitivity Analysis typically examines the short-term impact of change in some variable(s) (eg. interest rate, equity prices or a combination of both) on the value of a portfolio/financial position. For instance, sensitivity tests may include (i) a parallel shift in the yield curve by 200 basis points, (ii) depreciation of domestic currency by 15% and (iii) increase in consumer loan defaults by 30%.

While the simplicity of sensitivity analysis makes it easier to use and understand, at best, it provides an approximation of the impact of a risk factor on a portfolio. Such an analysis does not take into account the reason behind the movement of a selected risk factor or the probability of occurrence of any such movement.

Potentially, a number of variables can be collectively stressed or different sensitivity tests can be combined to form a multifactor stress test. For instance, the worst ever movement in equity price and interest rates over the past 10 years can be combined to form a multifactor shock. However, this approach still ignores the correlation between risk factors and should be interpreted accordingly. The time horizon for sensitivity analysis is often shorter, usually instantaneous. These tests can be designed on the basis of historical or hypothetical movements in risk factors.

1.2.2 Scenario Analysis

Scenario Analysis assesses impact of extreme but plausible scenarios on a given portfolio/ financial position of an institution, using sophisticated modeling techniques and typically incorporating macroeconomic variables. Scenarios could be historical (events experienced in the past like stock market crashes, currency depreciations or natural disasters) or hypothetical (plausible events that are extreme but not improbable). At the supervisory level, scenario analysis has been extended to contagion analysis with the objective of examining the transmission of shocks from individual institutions to the system as a whole. Macro stress testing in particular has become very popular among supervisors as a tool to assess vulnerabilities of the overall financial system. Moreover, leading financial institutions use macro stress testing mostly in conjunction with their internal risk models of credit risk.

Scenario analysis takes into account correlations between risk factors, including macroeconomic variables. Shocks assumed are closer to real life as other factors are not supposed to be held constant - a big assumption under simple sensitivity test. However, the complexity of various techniques based on statistical/macroeconomic modeling has somewhat restricted its usage to banks with sophisticated risk management systems.

1.3 Key Elements of Stress Testing Framework

All banks/DFIs should develop an effective stress testing program and make stress testing a regular feature of their periodic risk assessment and reporting framework. Following paragraphs provide broad guidance on the key aspects of an effective stress testing program[1]. SBP requires the senior management in banks/DFIs to build a robust mechanism of stress testing which is commensurate with their size, complexity and risk profile.

1.3.1 Stress Testing as a Risk Management Tool

Stress Testing is an integral part of an institution's risk management framework and helps risk managers in variety of ways. Specifically, stress testing:

- Provides a useful base for communication of key risks across the organization;
- Supplements other risk measures by providing a complementary perspective on various risks;
- Indicates how much capital might be needed to absorb losses if worst-case scenarios materialize;
- Provides forward looking assessment of risks and facilitates capital allocation and liquidity management;

[1] For detailed guidance on establishing a robust stress testing framework, please see : "Basel Committee on Banking Supervision (2009): *Principles for Sound Stress Testing Practices & Supervision.* Bank for International Settlements, Basel, Switzerland".

- Helps development of risk mitigation or contingency plans across a range of stress conditions;
- Enables management to set limits for risk tolerance and redesign their risk strategies if required;
- Adds value to the risk analysis when combined with other statistical measures like value-at-risk models by particularly focusing on tail events;
- Highlights the limitations of models and historical data by exhibiting the impact of extreme yet plausible shocks which models using normal conditions fail to capture; and
- Helps in Internal Capital Adequacy Assessment Program (ICAAP), by providing information on how much capital, in addition to the minimum capital requirement under Pillar-I of the Basel-II regime, is adequate for an institution.

1.3.2 Governance of Stress Testing Framework

International best practices entail risk management as an oversight duty of the Board of Directors of a financial institution, while implementation of the risk framework resides with the senior management[2]. The Prudential Regulations for Corporate/Commercial Banking[3] also places responsibility on the Board, inter alia, for approving the risk management policy and its oversight. In terms of BIS principles for sound stress testing practices and supervision, stress testing should form an integral part of the overall governance and risk management culture of a bank. It is, therefore, vital that the Board of Directors of banks/DFIs take complete ownership of their stress testing framework and fully embed it in their risk management framework and strategic decision-making.

The governance of stress testing framework at banks/DFIs shall, at the minimum, comprise of the following:

- The Board shall take the responsibility of establishing a robust stress testing program, while the senior management shall design and implement the program;
- The senior management shall actively engage in the entire stress testing process and ensure appropriate designing, effective implementation, and its contribution into risk mitigation strategies of the institution;
- Senior management should ensure the documentation of policies and procedures governing the stress testing framework and its periodic review to ensure its continuous relevance for the institution;
- The stress testing program shall not only comply with regulatory stress testing requirements but also be capable of conducting additional tests covering various risk types and severities for internal consumption;
- The banks/DFIs should establish an appropriate stress testing infrastructure with adequate IT systems and resources in place, which should be periodically updated for its continued effectiveness;

[2] OECD Principles on Corporate Governance
[3] Regulation G-1 of Prudential Regulations for Corporate/Commercial Banking; State Bank of Pakistan. http://www.sbp.org.pk/publications/prudential/PRs-Corporate.pdf

- The key responsibility of implementing a sound stress testing program rests with the head of risk management; and
- Senior management should take suitable action based on stress results and incorporate stress testing outputs into the institution's strategic and business decision-making process and capital allocation.

Specifically, senior management, after reviewing the results of stress tests (whether mandatory tests or those produced for internal use), may consider taking appropriate actions like:

- Reducing risk limits if certain tolerance levels have been breached;
- Introducing some risk mitigation measures like increasing collateral requirements or hedging exposures;
- Re-pricing of portfolios to incorporate risks which were previously unidentified;
- Putting up additional arrangements for ensuring availability of sufficient funds (e.g; through credit lines or changing asset/liability structure); and
- Strengthening the capital base to withstand assumed shocks.

Section 2. Mandatory Stress Tests

This section describes some standard stress tests, using sensitivity analysis, which all banks/DFIs are required to conduct on quarterly basis and submit their results to SBP on a prescribed format (see Annexure **C**) within 30 days of the close of each quarter. The mandatory tests cover credit, market, and liquidity risk and contain three levels of shocks under each scenario. The three levels of shocks are defined as (i) Minor, (ii) Moderate, and (iii) Major shocks. This classification reflects the intensity of the shocks and magnitude of their impact.

In total, sixteen stress scenarios/shocks are defined in this section. **While banks (both conventional and Islamic) are required to conduct and report all sixteen stress tests, DFIs need to carry out only eleven of these tests. Specifically, five scenarios (two credit risk scenarios; CR-5, CR-6, and three liquidity risk scenarios L-1, L-3 and L-4) are not applicable to DFIs.**

It needs to be emphasized that stress tests are inevitably subjective. Designing shocks and defining their level is a challenging task. Our selection of scenarios is based on both the historical and hypothetical movements in the risk factors. The objective of this exercise is to measure the level of resilience against these 'what if' scenarios, which though are not the forecasts, have been designed under plausible but extreme assumptions. The banks/DFIs are expected to gauge their resilience against these and similar shocks and build their capacity to maintain either the level of resilience or preparedness against majority of these shocks.

2.1 Credit Risk Scenarios

Credit risk is a risk of an economic loss from a failure of the counterparty to fulfill its contractual obligations. Stress tests in this category assess the impact of the increase in provisions due to an adverse shift in the overall loan portfolio, default of top private borrowers, adverse migration of non-investment grade corporate borrowers, deterioration in default rates of the corporate credit portfolio, adverse shift in SME and Agriculture loans' portfolio and deterioration in the performing loans of the consumer portfolio.

For each of the credit risk scenario, banks/DFIs should:

- Calculate additional provisioning requirement under each shock. Benefit of liquid securities against the defaulted portfolio may be taken into account while calculating additional provisions; and
- Compute tax-adjusted impact of the additional provisions and after-shock Capital Adequacy Ratio (CAR).

2.1.1 Shocks to Overall Credit Portfolio: Following are the two stress scenarios applicable to overall loan portfolios of banks/DFIs.

CR – 1 **Adverse Shift in Overall Loan Portfolio:** This scenario estimates the impact of deterioration in the credit quality of banks/DFIs' overall credit portfolio by applying the following three levels of shocks:

(i) 5% of performing loans move to substandard, 50% of substandard loans move to doubtful and 50% of doubtful Loans move to the loss category of NPLs;

(ii) 10% of performing loans move to substandard, 70% of substandard loans move to doubtful and 70% of doubtful loans move to the loss category of NPLs; and

(iii) 20% of performing loans move to substandard, 100% of substandard loans move to doubtful and 100% of doubtful loans move to the loss category of NPLs.

CR – 2 **Default of Top Private Borrowers:** This scenario intends to ascertain the risk of credit concentration in financial institutions. Banks/DFIs should estimate the additional provisioning against the default (under substandard category requiring 25% provision) of their (i) **top 2**, (ii) **top 3** and (iii) **top 5** performing borrowers/groups, selected based on amount of exposure.

This shock should separately be applied to:

A. *Fund based exposure* of top private sector borrowers/groups, identified based on fund based exposure only; and

B. *Sum of the Fund based and Non-Fund based exposures* of top private sector borrowers/groups, identified based on gross sum of the fund based and non-fund based exposures. For calculation of impact under this shock, the credit conversion factor, as prescribed under BSD Circular No. 8 of 2006, should be applied to the non-fund based exposure to calculate credit equivalent amount. This credit equivalent amount should be added to the fund based exposure to get the total credit exposure (on balance sheet & off balance sheet) and provision be created on the sum balance, accordingly under this shock.

Under these shocks (A & B), the impact of the increase in NPLs should also be taken on risk weighted assets, by increasing the risk weight of the un-provided part of the additional NPLs to 100%[4].

2.1.2 Shocks to various Sub-categories of Overall Credit Portfolio:

Following stress scenarios are applicable to sub-categories of banks' credit portfolio, including corporate loans, consumer loans and SME/Agriculture loans.

CR – 3 **Adverse Migration of Non-Investment Grade Corporate Borrowers:** This scenario assumes a stressed situation where loans to below investment grade borrowers (rated as 7, 8 and 9 as per BSD circular No. 8 of 2007) become non-performing. Banks/DFIs

[4] For instance a top borrower carries 50% credit risk weight on its outstanding loan of say Rs100 million. Assuming the loan becomes substandard, a provision of 25% shall be deducted from capital. Since the loan becomes non-performing, the risk weight of the remaining 75% shall increase to 100%, thus increasing the credit risk weighted assets of the borrower from Rs 50m to Rs75 million. This additional Rs25 million should be added to the pre-shock credit risk weighted assets of the bank.

should calculate the additional provisioning requirements under the following three levels of shocks:

(i) Classify all loans to borrowers mapped under rating class 9 under loss category (100% provisioning);
(ii) Classify all loans to borrowers mapped under rating class 8 and 9 under doubtful (50% provisioning) and loss (100% provisioning) category respectively; and
(iii) Classify all loans to borrowers mapped under rating class 7, 8 and 9 under substandard (25% provisioning), doubtful (50% provisioning) and loss (100% provisioning) category respectively.

This shock should separately be applied to:

A. *Fund based exposure* only of the non-investment grade borrowers/groups; and
B. *Sum of the Fund based and Non-Fund based exposure* of private sector borrowers/groups. For calculation of the impact under this shock, the credit conversion factor as prescribed under BSD Circular No. 8 of 2006 should be applied to the non-fund based exposure to calculate total credit exposure.

Similar to that of the CR-2, under these shocks (A & B) the impact of increase in NPLs should also be taken on risk weighted assets, by increasing the risk weight of the un-provided part of the additional NPLs to 100%.

CR – 4 **Deterioration in Default Rates of Corporate Credit Portfolio:** This scenario assumes deterioration in the quarterly default rates of the overall corporate credit portfolio. For this purpose, benchmark default rate for the corporate portfolio needs to be calculated based on the default rates of the last four quarters as per **Annex-A** of these guidelines. The three shock levels for this scenario are (i) **1.5 times**, (ii) **2 times** and (iii) **2.5 times** of this benchmark default rate[5]. Under each scenario, assume the defaulted exposure is classified under substandard category, requiring 25% provisioning and calculate additional provisioning. Calibrate the shock and calculate the impact of additional provisioning on capital adequacy ratio of the bank.

CR - 5 **Adverse shift in SME & Agriculture Loans' Portfolio:** This scenario captures the impact of increased provisioning requirements due to deterioration in the quality of loans to both SME and Agriculture Sector under the following three levels of shocks:

(i) 5% of performing loans move to substandard, 50% of substandard loans move to doubtful and 50% of doubtful loans move to the loss category of NPLs;

[5] For example, if the benchmark default rate comes to 8%, *first shock of 1.5 times* would require that stressed default rate be taken as 12% (i.e =8%*1.5).

(ii) 10% of performing loans move to substandard, 70% of substandard loans move to doubtful and 70% of doubtful loans move to the loss category of NPLs; and

(iii) 20% of performing loans move to substandard, 100% of substandard loans move to doubtful and 100% of doubtful loans move to the loss category of NPLs.

CR - 6 **Deterioration in the Loans of Consumer Portfolio[6]:** This estimates the impact of weak economic outlook with attendant rise in unemployment, erosion in purchasing power of the borrowers, and increase in defaults in the overall consumer loan portfolio. The three levels of shocks assume (i) 5%, (ii) 10% and (iii) 20% of performing loans becoming overdue by 90 days and categorized under the substandard category of NPLs requiring 25% provisioning.

2.2 Market Risk Scenarios

Market risk arises out of changes in financial market prices and their impact on the value of an asset. It typically consists of four market risk factors namely: interest rates, exchange rates, stock prices and commodity prices.

2.2.1 Shocks to Interest Rate Portfolio: Interest rate risk is the likelihood of an adverse impact of the interest rate change on the interest income or the value of the portfolio. Following four shocks have been designed to assess the impact of an interest rate change. Under each shock, the impact needs to be calibrated on the capital adequacy ratio.

IR – 1 **Impact of Decrease in Interest Rate on Net Interest Income (NII):** This scenario assumes the impact of decrease in interest rates of the earning assets by (i) **2%**, (ii) **3%** and (iii) **4%**, on the net interest income (NII) of the banks/DFIs using the Re-pricing Gaps (see **Annex-B**). Following are the key steps involved:

- Determine total amount of Risk Sensitive Assets (RSA) and Risk Sensitive Liabilities (RSL);
- Compute the GAP between RSA and RSL i.e. GAP = RSA – RSL; and
- Multiply the change in the level of interest rates i.e. one of the assumed shocks, with the GAP amount. This would determine the decrease in net interest income under the shock, which should be adjusted in capital to calculate after-shock CAR.

IR – 2 **Impact of Parallel Shift in the Yield Curve on the Market Value of Equity (MVE):** This scenario captures impact of an upward movement of the yield curve by assuming increase in interest rates along all the maturities by (i) 2%, (ii) 3% and (iii) 4% and taking its impact on MVE or net worth of banks/DFIs. Repricing Gaps shall be used to calculate the impact of these shocks. Following steps shall be followed:

[6] This stress scenario is applicable to banks *overall consumer loan portfolios* which typically include segments like credit cards/balance transfer facility, auto loans, mortgage loans, personal loans and consumer durable loans.

- Categorize all the RSA & RSL across different maturity buckets[7]. The absolute amount of rate sensitive off-balance sheet items may be placed across these maturity buckets and categorized as RSA if positive or as RSL if negative;
- For each maturity bucket, calculate the gap between RSA & RSL (RSA – RSL) separately;
- Calculate average maturity (on annual basis) of each bucket;
- Calculate change in MVE for each maturity bucket using the following formula:

Δ in Market Value of Equity (MVE) = - (Av. Maturity in years)* Δ in yield/(1+Y) * (Gap amount)

- Calculate total change in MVE using the following formula:

Total Δ in Market Value of Equity (MVE) = Δ in MVE Bucket 1 + Δ in MVE Bucket 2 +……. + Δ in MVE Bucket 11

IR – 3 Impact of Movement in the Slope of Yield Curve on the Market Value of Equity (MVE): This scenario captures the impact of changes in the yield curve (shift, flattening or steepening of the yield curve) on MVE or Net Worth of banks/DFIs by assuming following changes in the interest rates along different maturities.

(i) 3% increase in interest rates of up to 1 year maturity (four buckets), 2.5% increase in interest rates of over-one year to up to 5 year maturity (four buckets) and 2% increase in interest rates on the remaining maturities (three buckets) - assuming an upward shift coupled with flattening of the yield curve;

(ii) 4% increase in interest rates of up to 1 year maturity (four buckets), 3% increase in interest rates of over-one year to up to 5 year maturity (four buckets) and 2% increase in interest rates on the remaining maturities (three buckets) - assuming an upward shift coupled with flattening of the yield curve; and

(iii) 2% increase in interest rates of up to 1 year maturity (four buckets), 2.5% increase in interest rates of over-one year up to 5 year maturity (four buckets) and 3% increase in interest rates on the remaining maturities (three buckets)- assuming an upward shift coupled with steepening of the yield curve.

Impact of this shock shall be calculated using the repricing gap methodology as mentioned under IR-2, which should be adjusted in capital to get after-shock CAR.

IR – 4 Impact of Increase in Interest Rates on Investments Categorized under Held-for-Trading (HFT) & Available-for-Sale (AFS): This scenario assumes impact of increase in interest rates on the value of interest bearing investments, which include investment in Federal Government Securities i.e. Market Treasury Bills (MTBs) and Pakistan Investment Bonds (PIBs), TFCs, and any other interest bearing investments categorized under the Held-for-Trading (HFT) and Available-for-Sale (AFS) categories. Decrease in the value of interest rate sensitive investments shall be calculated under the following shocks:

[7] 11 maturity buckets as per the Quarterly Report of Conditions submitted to SBP under the Reporting Chart of Accounts through the Data Ware House Portal.

(i) 2% increase in interest rates along all maturities;
(ii) 3% increase in interest rates of upto 1 year maturity, 2.5% increase in interest rates of upto 5 years maturity and 2% increase in interest rates of over 5 years maturities; and
(iii) 2% increase in interest rates of upto 1 year maturity, 2.5% increase in interest rates of upto 5 years maturity and 3% increase in interest rates of over 5 years maturities.

Mark-to-market value of these investments shall be calculated under each shock and deficit shall be adjusted in the regulatory capital to arrive at after-shock CAR.

2.2.2 Shocks to Exchange Rate Portfolio: Exchange rate risk arises when a movement in currency exchange rates adversely impacts the value of an institution's on-balance sheet assets, liabilities or its off-balance sheet positions. Exchange rate risk may be either a) direct wherein banks/DFIs hold a position in foreign currency; or b) indirect where a foreign currency position is held by the bank's clients. Following exchange rate scenario aims to capture only the direct foreign exchange risk of banks/DFIs.

ER – 1 **Depreciation of PKR Exchange Rate:** This scenario captures the direct foreign exchange risk by applying three different levels of shocks i.e. assuming depreciation in PKR by (i) **20%**, (ii) **30%** and (iii) **50%**. The shock, applicable both to on-balance sheet as well as off-balance sheet foreign currency exposures of banks/DFIs, is to be calibrated as under:

- Calculate the overall foreign currency exposure by taking either the sum of net short positions or sum of net long positions, whichever is higher regardless of the sign[8]; and
- Based on the overall exposure, compute the amount of profit/loss and revised CAR (on tax adjusted basis) for the assumed depreciation in PKR under each of the three shocks.

2.2.3 Shocks to Equity Investments: Equity price risk emanates from adverse impact of changes in equity prices or market indices on the share holdings of an individual/institution. Equity price risk may be further divided into specific/idiosyncratic and general equity price risk. Following shock is based on the latter category which assumes a fall in overall indices.

EQ – 1 **Decline in General Equity/Stock Market Prices:** Banks/DFIs may apply three levels of shocks, assuming a fall in general equity prices by (i) **30%,** (ii) **40%** and (iii) **50%** of their equity exposures / investments, and compute the amount of loss and report the tax-adjusted impact on their revised CAR. For this shock the equity exposure should include both direct and indirect equity exposures. The direct equity exposure includes all investments in shares/TFCs/Mutual Funds (excluding investments in associates & subsidiaries), whereas, indirect exposure includes

[8] For example, the bank may have net long position of Rs500 million in Yen, Euro and USD and the net short position in GBP and Australian dollar of Rs600 million. The total foreign currency exposure will be the greater of the two i.e. sum of the short positions of Rs600 million.

financing/lending against shares/TFCs/Mutual Funds. Fall in value of direct equity investments under the shocks will be equivalent to the shock level. However in case of financing/lending, the impact shall be calculated after adjusting the margins held by the banks[9].

2.3 Liquidity Risk Scenarios

Liquidity risk has been classified as Asset Liquidity Risk and Funding Liquidity Risk. The former refers to the inability to execute a transaction at the current market prices because of the size of the transaction whereas the latter signifies the inability to meet payment obligations in timely manner. The first three scenarios aim to test resilience against funding liquidity risk while the fourth scenario attempts to capture both aspects of liquidity risk.

For the purpose of liquidity risk scenarios, liquid assets include (i) cash and treasury balances, (ii) balances with other banks, (iii) lending to financial institutions and (iv) unencumbered investments in government securities and Sukuks, whereas liquid liabilities include (i) deposits & other accounts, and (ii) Unsecured Borrowings.

L– 1 Withdrawal of Deposits & Borrowings Over a Given Period: This shock assumes a significant withdrawal of deposits and unsecured borrowings for a particular time period. The shock assumes withdrawal of the liabilities for consecutive three days as per the followings:

(i) Withdrawal of deposits & unsecured borrowings by 5% on Day 1;
(ii) Withdrawal of deposits & unsecured borrowings by 5% on Day 1 and additional 10% on Day 2; and
(iii) Withdrawal of deposits & unsecured borrowings by 5% on Day 1, additional 10% on Day 2 and another 10% on Day 3.

This withdrawal of the liabilities should be deducted from the liquid assets and the level of remaining liquid assets needs to be re-calculated under each level of shock.

L– 2 Withdrawal of Wholesale[10] & Interbank Deposits/Borrowings: This shock measures an impact of high volatility in private sector wholesale deposits and deposits/unsecured borrowings from financial institutions on the liquidity condition of a bank. The shock assumes withdrawal of the private sector wholesale deposits and deposits/unsecured borrowings from financial institutions for consecutive three days, as per the following:

9 For instance; a bank has extended financing of Rs100 against shares of Rs130 million assuming a 30% margin requirement. Under a shock of 50% decline in equity price, the value of shares will fall to Rs65million, and the bank will book loss of Rs35million (100-65).
10 Includes all private sector deposits (excluding deposits under Lien) other than individual's deposits and deposits of financial institutions.

(i) Withdrawal of the private sector wholesale deposits and deposits/unsecured borrowings from financial institutions by 10% on Day 1;

(ii) Withdrawal of the private sector wholesale deposits and deposits/unsecured borrowings from financial institutions by 10% on Day 1 and additional 30% on Day 2; and

(iii) Withdrawal of the private sector wholesale deposits and deposits/unsecured borrowings from financial institutions by 10% on Day 1, additional 30% on Day 2, 60% on Day 3 and 100% on Day 4.

This withdrawal of the wholesale deposits & interbank liabilities should be deducted from the available liquid assets and the level of remaining liquid assets needs to be re-calculated after each day.

L – 3 Withdrawal of Top Deposits: This scenario tests the impact of deposit concentration on the resilience of banks/DFIs by assuming a withdrawal by key depositors. Three different levels of shocks assume complete withdrawals by (i) **top 10**, (ii) **top 15** and (iii) **top 20** depositors respectively. In order to honour the assumed withdrawals, liquid assets would be utilized, and after shock liquid assets shall be calculated, which if remain positive signifies that banks/DFIs can sustain the shock.

L – 4 Shock to Liquidity Coverage Ratio: This scenario has been designed in the light of Liquidity Coverage Ratio (LCR), recently introduced by Basel Committee on Banking Supervision (BCBS). Specifically,

Liquidity Coverage Ratio= A /max (B , C)

Where

A. Total Liquid Assets (as defined under Section 2.3)

B. Liabilities maturing within 1 month minus Assets maturing within 1 month (based on the behavioral study[11])

C. 25% of Liabilities maturing within 1 month

Banks should calculate **after-shock LCR** by using each of the following three scenarios:

(i) Applying 20% haircut to the value of Investments in Government Securities while calculating component "A" of the ratio.

(ii) Assuming C = 70% of liabilities maturing within 1 month

(iii) Applying 20% haircut to the value of Investments in Government Securities while calculating "A" component of the ratio and increasing the denominator "max (B, C)" by 20%.

[11] See *para no. 3* of BSD Circular Letter No. 3 of 2011.

Section 3. Guidance for Optional Stress Tests

Mandatory stress tests (*Section 2*) are minimum requirements to promote a culture of stress testing in banks/DFIs. However, SBP encourages banks/DFIs to conduct additional stress tests, for their in-house consumption that are commensurate with the size and complexity of their operations. This section provides guidance on designing more sophisticated stress tests, which, at present, are optional and include scenario analysis and reverse stress tests and stress tests for operational risk. Moreover, Islamic Banking Institutions[12] (IBIs) are also encouraged to design stress tests as per their unique risk profile.

Banks/DFIs should endeavor to build their capacity to regularly use these tests for internal consumption. **Large banks, with a share of 4% or above in total assets of the banking system are required to start working on advanced approaches- the scenario analysis and reverse stress tests, and share the same with SBP by December, 31, 2012.**

3.1 Scenario Analysis

While sensitivity analysis provides a quick initial assessment of resilience of a portfolio against specific shocks, it ignores the interrelationships between various risk factors. However, in reality, the risk factors do not move in isolation and are interrelated and affected by broader macroeconomic conditions. For instance, a surge in interest rates may impact the market value of assets and also increase the probability of default by impairing the repayment capacity of the borrower. Scenario analysis jointly accounts for multiple sources of risks and incorporates the interrelationships among the risk factors. This explains the widespread popularity of certain scenario-based techniques like Macro Stress Testing, particularly among supervisors. SBP is presently carrying out macro stress testing of the banks' credit portfolio and its results are being published.

Commercial banks, may also design their own scenarios using either a portfolio-driven approach or an event-driven approach. The former approach starts with risk identification at the portfolio level and then works backwards to conceive plausible scenarios which would cause identified risks to materialize. The later methodology begins with simulating plausible but extreme events that can have a serious bearing upon a given portfolio. Scenarios can be hypothetical (based on expert judgment), historical (like the stock market crash of 2008 or the impact of the 2010 floods), simulated (through Monte Carlo simulations) or hybrid (mix of historical and hypothetical).

Scenarios can be developed for all types of risks. Banks that have market risk models (like Value at Risk-VaR) in place can extend these models for calculation of stressed VARs for interest rate, exchange rate and equity price risks. For credit risk, macro stress testing offers a variety of

[12] Include Islamic Banks and Islamic Banking Branches

options. For instance, credit portfolio view model (CPV) helps to determine a relationship between macroeconomic variables and some indicators of asset quality (like the Non-Performing Loan Ratio-NPLR) by simulating a large number of scenarios using Monte Carlo simulation. Alternatively, some probit models can be used to generate conditional probability of loss for a given credit portfolio. Even VaR techniques are being widely applied to arrive at Credit Value at Risk (CVaR) of a given portfolio.

To carry out scenario based stress tests for credit risk at bank level, first some indicators of asset quality are calculated (eg. probability of default) using credit risk models like Credit Matrix, Credit Risk+ and Moody's KMV[13]. At the second stage, results from the credit risk model are used as a key input in establishing its relationship with macroeconomic variables. Once such a relationship is established, stressed values of macroeconomic variables can be used to generate the impact of macroeconomic shocks on a credit portfolio.

SBP encourages large banks to build requisite capacity for conducting scenario analysis and subsequently, to carry out scenario analysis and share the results at regular intervals[14]. The choice of methodology should fairly commensurate with the size and complexity of the institution, sophistication of the risk management framework in place and the level of expertise available.

3.2 Reverse Stress Tests

While traditional stress tests examine the impact of extreme yet plausible scenarios on a given portfolio, reverse stress tests, as the name implies, overturn this process. Such tests begin with a worst-case scenario (i.e. failure of a bank) and then proceeds to identify the circumstances which may cause this to happen.

Specifically, a reverse test may start with an assumed result (stress scenario) like (i) failure of the firm's business model, (ii) significant breach of a certain regulatory ratio/requirement like capital adequacy ratio, liquidity reserve requirements, etc., or (iii) materialization of an assumed amount of loss that is commensurate with the risk appetite of the bank. Once the outcome has been assumed, risk managers can proceed to identify and evaluate the circumstances/ changes in risk factors that would turn the assumed outcome into a reality.

For instance, a bank may assume that its CAR drops below the required level of 10% and then identify the potential sources for this problem to materialize. Alternatively, a DFI can assume a certain size of loss to take place and then explore the possible reasons that would lead to such an adverse outcome. As an extreme case, a bank may assume its insolvency and then identify the factors that can cause such an adverse outcome.

[13] For an accessible discussion on various credit risk models, please see 'Caouette, B. John et al (2008), *Managing Credit Risk; The Great Challenge for the Global Financial Market*s, Wiley Finance. For designing and implementation of credit risk models, please see Gunter Loeffler & Peter N. Posch (2007) **"***Credit Risk Modeling using Excel and VBA*", Wiley Finance Series.

[14] For detailed guidance on various methods of macro stress tests, please see Mario Quagliariello, (2009). "*Stress Testing the Banking System, Methodologies and Applications"*, Cambridge University Press.

Reverse stress testing forces senior management to forensically examine the circumstances that can make their worst fears come true[15]. The key benefit of such an approach is the elaborate consideration of various sources of risks that can undermine an institution's existence. The approach to identify such factors can be qualitative or quantitative, depending upon the sophistication of tools available. For small banks with unsophisticated risk management frameworks, even a qualitative assessment of the key risks that can threaten the viability of the institution is useful. For sophisticated banks, a rigorous quantitative approach can be used to identify a specific level of loss or some other impact like erosion of capital by a certain amount/percentage and then working backward to indentify the conditions that can make this happen.

After carrying out such analysis, the banks/DFIs can devise some counter strategies if the outcome is beyond their risk appetite. In case they choose to take no action, management should justify the same (e.g. assumed breach/size of loss might be within the range of bank's risk appetite).

SBP encourages the large banks/DFIs to carry out reverse stress tests commensurate with their risk exposure, size, complexity of operations, and sophistication of risk management systems and share the results of the exercise with SBP. It is expected that the idea of 'reverse stress tests' shall be used as a potential tool to not only generate a fruitful discussion on the key vulnerabilities of financial institutions but also as an effective mechanism for internal communication about the risks faced by these institutions.

3.3 Stress Tests for Operational Risk

For the purpose of risk measurement and management, operational risk may be defined as the risk of direct or indirect losses resulting from inadequate or failed internal processes, people and systems or from external events. Weaknesses in internal controls and corporate governance are the key risk factors which can lead to operational losses. Financial institutions have undergone a sea change in recent years in terms of financial engineering, technological innovation and growing consolidation. All this has a direct bearing on the level of operational risk the financial institutions face today. Recognizing its growing importance, all three pillars of the New Basel Capital Accord, minimum capital requirements, the supervisory review process and market discipline set forth guidance for operational risk. Pillar 1 offers three methods for calculating operational risk capital charge in a continuum of increasing sophistication and risk sensitivity. Since operational risk events can result into huge losses, sometimes bigger than the ones experienced under credit and market risk events, operational risk related stress tests need to be instituted.

[15] In the context of the global financial meltdown of 2007-8, it has been argued that banks could have identified some of their vulnerabilities by conducting reverse stress tests (i.e by asking what scenarios/exposures can render them bankrupt even in apparently benign conditions).

Banks should aim to develop a framework for operational risk management particularly for collecting operational loss data. In respect of designing operational risk stress tests, key indicators, like human errors, frauds, or failure to perform in timely manner, breaching limits, failure of information technology systems or events such as major fires or other disasters may be identified against the business lines. Shocks may be given to these risk events, their frequency and severity of losses. Once the operational loss events are identified, the level of shocks may be designed by looking into both the historical as well as hypothetical level of losses under those risk events.

SBP encourages the major banks/DFIs to design stress tests for their operational risk events, including both the quantitative and qualitative risk factors, as per the sophistication of their systems, availability of data and level of expertise to assess the resilience. With the increasing sophistication in the quantification of the systems used for operational risk management[16] at the bank's level, the stress tests may be refined further.

3.4 Stress Tests for Islamic Banking Institutions

Apart from the conventional risk factors affecting banks, Islamic Banking Institutions (IBIs) face unique risks like Shariah non-compliance risk, fiduciary risk, rate of return risk, and displaced commercial risk[17]. Further, transformation of risk from one category to another during different stages of a transaction also complicates the process of scenario selection for IBIs. For instance, in Murabaha transactions, market risk is an important risk before the commodities are sold to the counterparty; once done, market risk transforms into credit risk since the payment is on deferred terms. Such peculiarities necessitate a set of customized stress tests for IBIs.

Following paragraphs provide broad guidance on designing stress tests specifically for IBIs. Unlike section 2, these tests are not mandatory at this stage. However, IBs should conduct such or similar types of tests on regular basis for their in-house consumption.

- Stress scenarios can be developed assuming different magnitudes of withdrawals that might take place in situations where IBIs pay below market returns;
- In times of stress, displaced commercial risk is likely to be higher as investment returns normally drop. This may compel IBIs to draw upon their funds/reserves to maintain a given level of payouts to their profit sharing investment accounts. Scenarios can be developed incorporating different depletion levels of reserves and thus determining the adequacy of such reserves under times of stress;
- Some IBIs may have significant exposure to real estate, a popular asset class due to IBIs' preference for asset based financing. Given the cyclical trends in real estate markets, scenarios could be developed assuming a substantial drop in property prices. While the data set of property prices in emerging markets is not readily available and imprecise at

[16] For additional information on operational risk management please see: "Basel Committee on Banking Supervision June 2011: Principles for the Sound Management of Operational Risk, Bank for International Settlements, Basel, Switzerland".
[17] For definitions of these terms, please refer to Islamic Banking Department's Circular No. 3 of January 02, 2008.

best, housing markets in advanced countries can be studied for developing some appropriate scenarios for the decline in property prices[18];

- Investment book of IBIs typically consists of some investment in Sukuks which are prone to market shocks and should be suitably stress tested;
- IBIs may also hold large inventories of commodities against contracts like Murabaha, Salam, and Istisna. Stress scenarios can be developed assuming a significant drop in prices of such commodities or tangible losses due to inadequate storage facilities of such commodities;
- Liquidity related stress tests are also relevant because of balance sheet imbalances on the duration of assets and liabilities. The fluctuations linked to different types of cash flow based portfolios need to be stressed such as: i) known cash flows (Murabaha, Ijara and Diminishing Musharakah), ii) conditional but predictable cash flows (Salam and Istisna receivables) and iii) conditional but unpredictable cash flows (Musharakah investment). Further, stress scenarios for limited access to Shariah compliant funding and its impact on solvency can also be tested; and
- Scenarios assuming non-compliance with Shariah standards and materialization of fiduciary and legal risks can also be tested with an aim to determine their potential impact on the reputation of Islamic banking business. IBIs may use various stress scenarios of deposit withdrawals that may take place due to adverse reputation regarding Shariah compliance and their impact on bank solvency. Further, if certain Islamic modes of financing are declared non-Shariah compliant by the courts, the impact of existing and future financing extended in that particular mode may also be stress tested.

The above list is by no means exhaustive. By highlighting a few areas particularly relevant for Islamic banking, SBP encourages IBIs to develop scenarios which better capture their business complexity and risk profiles.

[18] For instance, *Case-Shiller Housing Price Index*, which provides data for US housing market from 1987, can be studied to develop some scenarios of housing market crash.

ANNEXURES

Annexure- A

Scenario CR-4:

Calculation of Default Rate:

Credit Risk Scenario-4 (CR-4) stresses the default rate of a corporate portfolio and gauges its impact on capital adequacy ratio of a bank. For this shock, the *Default Rate* shall be defined as follows:

Definition of default: An exposure is categorized under default if;

i. classified under substandard category or below and/or claims are overdue by 90 days or more; or
ii. has undergone restructuring/rescheduling

For the shock C-4, the default rate is defined as a ratio of amount of *outstanding exposure that defaulted* (as per definition above) to the *total amount of exposure that could potentially default* during a specified period of time.

Formula to Calculate Quarterly Default Rate:

Following formula should be used to calculate quarterly default rate using outstanding exposures of the borrowers:

$$\text{Default Rate of a Quarter} = DR_{qi} = D_{qi} / (L_{Pi} - R_i)$$

Here

- L_{Pi} = Outstanding amount of performing loans at the beginning of the quarter
- D_{qi} = Amount of defaults at the end of the quarter out of the total L_P.
- R_i = Repayments i.e. Amount of loans repaid during the quarter out of the total L_{Pi}.

Following example describes default rate calculation:

Example:

First Quarter (Assume its Jan-Mar Quarter)

Assume that the outstanding exposure of performing borrowers of a bank on January 1st, the start of the quarter was Rs105 billion. By the end of the quarter i.e. March 31st , out of these Rs105 billion, Rs5 billion of loans were repaid, which means they are no more on books, and additional Rs3 billion loans defaulted (as per definition above). The default rate for the March quarter shall be calculated as follows:

L_{P1} = Outstanding amount of performing loans on January 1st= Rs105 billion

D_{q1} = Amount of defaults at the end of the quarter out of the total L_P = Rs3 billion

R_1 = Amount of loans repaid during the quarter = Rs5 billion

Default Rate for March quarter shall be calculated as follows:

$$DR_{q1} = D_{q1} / (L_{P1} - R_1) = 3/(105-5) = 3\%$$

Second Quarter (Mar-Jun)

Now, on April 1st, outstanding exposure of the performing loans may have increased to Rs104 billion due to new loans booked during the last quarter. During the June quarter, out of this Rs104 billions, Rs 4billion were repaid and Rs 5 billion stand defaulted by June 30th. The default rate for the June quarter shall be calculated using the above formula.

L_{P2} = Outstanding amount of performing loans on April 1st= Rs104 billion

D_{q2} = Amount of defaults at the end of the quarter out of the total L_P = Rs5 billion

R_2 = Amount of loans repaid during the quarter = Rs4 billion

Default Rate for June quarter shall be calculated as follows:

$$DR_{q2} = D_{q2} / (L_{P2} - R_2) = 5/(104-4) = 5\%$$

The same method shall be used to calculate default rate for the other two quarters.

Once default rate for the last four quarters is calculated, the benchmark default rate for the shock C-4 shall be taken as the maximum of the last four quarters' default rate or the 2%, which ever is higher. This can also be calculated using the following formula:

$$\text{Benchmark Default Rate for Shock C-4} = \text{Max}(\text{Max}(DR_{q1}, DR_{q2}, DR_{q3}, DR_{q4}), 2\%)$$

This 2% has been set as the minimum benchmark default rate.

Annexure -B

Scenario IR-1:

Change in Net Interest Income (NII) using Repricing Gap:

The repricing gap is the difference between the rate sensitive assets (RSA) and the rate sensitive liabilities (RSL) for a particular time band. The change in net interest income (NII) can be estimated using the repricing gaps.

A bank with more rate sensitive assets than rate sensitive liabilities would have positive repricing gap, thus with any increase in interest rates there will be an increase in net interest income. Accordingly, a financial institution with more rate sensitive liabilities than rate sensitive assets would be negatively gapped, and in case of increase in the interest rates, there will be a decrease in net interest income. Change in NII of a bank/DFI due to changes in interest rates can be calculated by using the following formula:

$$\Delta NII = GAP * \Delta R$$

where GAP= (RSA – RSL)

Annexure - C

Name of Bank/DFI----------

Table: 1 -Stress Test Results

For the Quarter ended on ……

(Amount in Million PKR)

Regulatory Capital	xxxxxxxxxxxx
Risk Weighted Assets	xxxxxxxxxxxx
CAR (%)	xx.xx%

		Shocks to Overall Credit Portfolio	Shock Level-1	Shock Level-2	Shock Level-3
CR-1	Adverse Shift in Overall Loan Portfolio	*Increase in NPLs*			
		After Shock NPLs to Loans Ratio (%)			
		Increase in Provisions			
		Tax adjusted Impact of Provisions			
		After Shock Capital			
		After Shock CAR (%)			
CR-2	Default of Top Private Borrowers (Shock-A)	*Increase in NPLs*			
		After Shock NPLs to Loans Ratio			
		Increase in Provisions (25% of NPLs)			
		Tax adjusted Impact of Provisions			
		After Shock Capital			
		After Shock Risk Weighted Assets			
		After Shock CAR			
	Default of Top Private Borrowers (Shock-B)	*Increase in NPLs*			
		After Shock NPLs to Loans Ratio			
		Increase in Provisions (25% of NPLs)			
		Tax adjusted Impact of Provisions			
		After Shock Capital			
		After Shock Risk Weighted Assets			
		After Shock CAR			
		Shocks to Various Sub-categories of Overall Credit Portfolio			
CR-3	Adverse Migration of Non-Investment Grade Corporate Borrowers (Shock-A)	*Increase in NPLs*			
		After Shock NPLs to Loans Ratio (%)			
		Increase in Provisions			
		Tax adjusted Impact of Provisions			
		After Shock Capital			
		After Shock Risk Weighted Assets			
		After Shock CAR (%)			
	Adverse Migration of Non-Investment Grade Corporate Borrowers (Shock-B)	*Increase in NPLs*			
		After Shock NPLs to Loans Ratio (%)			
		Increase in Provisions			
		Tax adjusted Impact of Provisions			
		After Shock Capital			
		After Shock Risk Weighted Assets			
		After Shock CAR (%)			
CR-4	Deterioration in Default Rates of Corporate Credit Portfolio	*After Shock Default Rate*			
		Increase in NPLs			
		After Shock NPLs to Loans Ratio (%)			
		Increase in Provisions			
		Tax adjusted Impact of Provisions			
		After Shock Capital			
		After Shock CAR (%)			
CR-5	Adverse shift in SME & Agriculture Loans' Portfolio	*Increase in Provisions*			
		After Shock NPLs to Loans Ratio (%)			
		Tax adjusted Impact of Provisions			
		After Shock Capital			
		After Shock CAR (%)			
CR-6	Deterioration in the Loans of Consumer Portfolio	*Increase in Provisions*			
		After Shock NPLs to Loans Ratio (%)			
		Tax adjusted Impact of Provisions			
		After Shock Capital			
		After Shock CAR (%)			

Shocks to Interest Rate Portfolio					
IR-1	Impact of Decrease in Interest Rate on Net Interest Income (NII)	*Change in Net Interest Income*			
		Tax adjusted Impact			
		After Shock Capital			
		After Shock CAR (%)			
IR-2	Impact of Parallel Shift in the Yield Curve on the Market Value of Equity (MVE)	*Change in MVE*			
		Tax adjusted Impact			
		After Shock Capital			
		After Shock CAR (%)			
IR-3	Impact of Movement in the Slope of the Yield Curve on the Market Value of	*Change in MVE*			
		Tax adjusted Impact			
		After Shock Capital			
		After Shock CAR (%)			
IR-4	Impact of increase in Interest Rates on Investments categorized under Held-for-Trading (HFT) & Available-for-Sale (AFS)	*Fall in Market Value of PIBs & MTBs*			
		Fall in the Market Value of other Interest Bearing Investments			
		Total Fall in the Market Value of Investments			
		Tax adjusted Impact			
		After Shock Capital			
		After Shock CAR (%)			
Shocks to Exchange Rate Portfolio					
ER-1	Depreciation of PKR Exchange Rate	*Currency Exposure*			
		Estimated Gain/(Loss) under the Shock			
		Tax adjusted Impact			
		After Shock Capital			
		After Shock CAR (%)			
Shocks to Equity Investments					
EQ-1	Decline in General Equity Prices	*Total Equity Exposure (Shares+ Other Listed Stocks)*			
		Estimated Loss under the Shock			
		Tax adjusted Impact			
		After Shock Capital			
		After Shock CAR (%)			
Shocks to Liquidity					
L-1	Withdrawal of Deposits & Borrowings Over a	*Withdrawal of Deposits & Unsecured Borrowings*			
		Liquid Assets net of Withdrawal			
		After Shock Liquid Assets to Total Assets Ratio (%)			
L-2	Withdrawal of Wholesale & Interbank Deposits	*Withdrawal of Wholesale Deposits & Unsecured Borrowings*			
		Liquid Assets net of Withdrawal			
		After Shock Liquid Assets to Total Assets Ratio (%)			
L-3	Withdrawal of Top Deposits	*Amount of Total Deposits Withdrawal*			
		Liquid Assets net of Withdrawal			
		After Shock Liquid Assets to Total Assets Ratio (%)			
L-4	Shock to Liquidity Coverage Ratio	*Liquid Assets*			
		- *Of which- Investments in Government Securities*			
		Assets maturing within One Month			
		Liabilities maturing within One Month			
		After Shock Liquidity Coverege Ratio (%)			

Name of Bank/DFI----------

Table: 2 -Summary Data for Stress Testing

For the Quarter ended on ……

(Amount in Million PKR)

Shocks to the Overall Credit Portfolio			
CR-1	Adverse Shift in Overall Loan Portfolio	*Performing Loans*	
		Non-Performing Loans	
		of which: Substandard	
		Doubtful	
		Loss	
CR-2	Default of Top Private Borrowers (Shock-A)	*Funded Exposure of Top 2 borrowers*	
		Funded Exposure of Top 3 borrowers	
		Funded Exposure of Top 5 borrowers	
	Default of Top Private Borrowers (Shock-B)	*Funded Exposure of Top 2 borrowers*	
		Non-Funded Exposure of Top 2 borrowers	
		Funded Exposure of Top 3 borrowers	
		Non-Funded Exposure of Top 3 borrowers	
		Funded Exposure of Top 5 borrowers	
		Non-Funded Exposure of Top 5 borrowers	
Shocks to Various Sub-categories of Overall Credit Portfolio			
CR-3	Adverse Migration of Non-Investment Grade Corporate Borrowers	*Funded Exposure of 7 rated Borrowers*	
		Non-Funded Exposure of 7 rated Borrowers	
		Funded Exposure of 8 rated Borrowers	
		Non-Funded Exposure of 8 rated Borrowers	
		Funded Exposure of 9 rated Borrowers	
		Non-Funded Exposure of 9 rated Borrowers	
CR-5	Adverse shift in SME & Agriculture Loans' Portfolio	*Performing Loans of SMEs & Agri.*	
		Non-Performing Loans of SMEs & Agri	
		of which: Substandard	
		Doubtful	
		Loss	
CR-6	Deterioration in the Loans of Consumer Portfolio	*Performing Loans of Consumer*	
		Non-Performing Loans of Consumer	
Shocks to Interest Rate Portfolio			
IR-1	Impact of Decrease in Interest Rate on Net Interest Income (NII)	*Rate Sensitive Assets*	
		Rate Sensitive Liabilities	
IR-2 / IR-3	Impact of Shift/Movement in the Yield Curve on the Market Value of Equity (MVE)	*Repricing Gap (RSA - RSL) of upto 1 month*	
		Repricing Gap (RSA - RSL) of 1-3 months	
		Repricing Gap (RSA - RSL) of 3-6 months	
		Repricing Gap (RSA - RSL) of 6months -1Year	
		Repricing Gap (RSA - RSL) of 1-2 Years	
		Repricing Gap (RSA - RSL) of 2-3 Years	
		Repricing Gap (RSA - RSL) of 3-4 Years	
		Repricing Gap (RSA - RSL) of 4-5 Years	
		Repricing Gap (RSA - RSL) of 5-7 Years	
		Repricing Gap (RSA - RSL) of 7-10 Years	
		Repricing Gap (RSA - RSL) of over 10 years	

IR-4	Impact of increase in Interest Rates on Investments categorized under Held-for-Trading (HFT) & Available-for-Sale (AFS)	*Investments in PIBs & MTBs categorized under HFT & AFS*	
		Investments in other Interest Bearing Instruments categorized under HFT & AFS	
Shocks to Exchange Rate Portfolio			
ER-1	Depreciation of PKR Exchange Rate	*Sum of Net Long Positions in Foreign Currency*	
		Sum of Net Short Positions in Foreign Currency	
Shocks to Equity Investments			
EQ-1	Decline in General Equity Prices	*Investmentsin Shares (Shares/Mutual Funds/Preference Shares)*	
		Financings against Shares/Stocks	
		Margin Requirements against Financings (Amount)	
Shocks to Liquidity			
L-1	Withdrawal of Deposits & Borrowings Over a Given Period	*Liquid Assets*	
		Total Deposits	
		Unsecured Borrowings	
L-2	Withdrawal of Wholesale & Interbank Deposits	*Total Wholesale Deposits (net of deposits under lien)*	
		Financial Institutions' Deposits	
L-4	Shock to Liquidity Coverage Ratio	*Liquid Assets*	
		- Of which- Investments in Government Securities	
		Assets maturing within One Month	
		Liabilities maturing within One Month	

Name of Bank/DFI----------
Tabl:3 Summary Data for Stress Testing
For the Quarter ended on ……

(Amount in Million PKR)

		Default Rate Calculation	Quarter Q (Current Quarter)	Quarter Q-1	Quarter Q-2	Quarter Q-3
CR-4	Deterioration in Default Rates of Corporate Credit Portfolio	*Amount of performing loans in the beginning of the quarter (a)*				
		of which: Amount repaid during the quarter (b)				
		Amount defaulted (c.)				
		Default Rate (c/(a-b))				