सूचना

इजाजतपत्रप्राप्त "क", "ख" र "ग" वर्गका बैंक तथा वित्तीय संस्थाहरु तथा पुर्वाधार विकास बैंक,

इजाजतपत्रप्राप्त बैंक तथा वित्तीय संस्थाहरुका लागि Stress Testing Guidelines, 2012 प्रतिस्थापन गरी Stress Testing Guidelines, 2023 जारी गरिएको हुँदा सोहीबमोजिम गर्नु/गराउनु हुन नेपाल राष्ट्र बैंक ऐन, २०५८ को दफा ७९ ले दिएको अधिकार प्रयोग गरी यो सूचना जारी गरिएको छ ।

भवदिय,

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Stress Testing Guidelines

Bank Supervision Department
Nepal Rastra Bank

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Contents

1. Background

Nepal Rastra Bank (NRB) issued Stress Testing Guidelines in January 2012 for the first time. It was the first initiative of NRB to establish the practice of conducting stress tests in Nepalese Banking Industry. Since then, the banking industry has evolved and grown exponentially in terms of its capital base, assets size and branch networks. The services and products offered by these institutions have also changed to a large extent and there is a huge dependency in information technology. Similarly, various cyber attacks have made banks and financial institutions to deploy their resources on information security. In short, during the period of 2012 to 2023, banking sector has changed to a greater extent. As a result, risks faced by banking sector has also increased significantly requiring banks and financial institutions to focus more and more on risk management.

In this context, NRB has felt the need to revisit stress testing guidelines and undertook a detailed review of existing guidelines and practices of stress testing. The review revealed that there is need to make current stress testing practice more dynamic and relevant to the present context of banking environment. Basel Committee on Banking Supervision also updated Stress Testing Principles, 2009 in 2018. The updated document contains set of principles that are set at a high level so that they may be applicable across many banks and jurisdictions, remain relevant as stress testing practices evolve over time, and be used by jurisdictions to guide all elements of a sound stress testing framework. Introducing these principles of stress testing in a structured way applying the principle of proportionality is one of the major objectives of revising current stress testing guidelines.

2. Stress Testing

Stress test is a process which shows the resilience of a bank to adverse scenario that may occur in the future. The scenarios may be entity specific or industry specific but should be severe and plausible. It assesses the impact of an event or a series of events on the bank's solvency, liquidity and profitability. Internationally, Stress testing techniques began to be widely applied in the early 1990s and is now a core internal risk management tool. Financial authorities began to use stress tests to assess banks' resilience in the early 2000s, and their use deepened during and since the financial crisis. Stress testing is now used as a tool to identify systemic risks and increase confidence in the banking sector and its loss-bearing capacity.

Stress testing complements a bank's other quantitative risk management tools that may use quantitative models based on historical data and estimated statistical relationships and informs on the bank's risk profile and alerts management on vulnerabilities to exceptional events. Therefore, it forms an integral part of Risk Management Guidelines, 2018. Stress Testing also complements determination of economic capital of the bank by identifying the vulnerabilities of banks to stressed scenarios. This provides a view to the board and the management about the capital that needs to be maintained by the

bank and provides key inputs while forming a capital plan. That is why stress testing tool should also form an indispensable part of Internal Capital Adequacy Assessment Process (ICAAP).

Stress testing also plays an important role in communication of risk within the bank itself and with the regulator. It plays an important role in encouraging discussions between the risk managers, business-unit heads and senior management of a bank regarding the risks taken by the institution and the methods for monitoring and managing those risks. It helps board and senior management understand material risks faced by the bank and likely condition of the bank in stressed scenarios. Stress Test results can also be used by board and senior management to set risk appetite and risk tolerance of the bank and developing contingency plan for the times of market stress. Stress testing contributes to a number of improvements in governance, data quality, analytical capabilities and risk management practices. It also fosters greater understanding of the relationship between capital, liquidity and risk.

These guidelines lay foundation to carry out stress test in two ways:

- **Supervisory Stress Test:** Nepal Rastra Bank shall conduct stress test of banks and financial institutions based on the data submitted by bank. Banks and financial institutions are required to send the data to NRB in the specified format.
- **Internal Stress Test:** Apart from stress test conducted by NRB, each bank and financial institutions should develop their own stress testing model to conduct stress tests and report to NRB. Scenarios used in the Stress testing model developed by banks must include, at least, the shocks assumed in supervisory stress test. Apart from those shocks, BFIs may assume other shocks based on their respective risk appetite, business complexities, future strategies, etc. and analyze its impact. Bank's internal stress test model must also include the reverse stress test analysis. Reverse stress test must include, at least, defined outcome and related scenarios used in supervisory stress test (refer section 4.5 of this guideline).

3. Principles of Stress Testing[1]

The Basel Committee had published stress testing principles in May 2009 previously and updated it on 2018. The principles laid out by Basel Committee in Stress Testing Principles, October, 2018 is equally relevant to Nepalese Banking Industry as well, and hence, same principles have been adopted in these guidelines.

3.1 Stress Testing Framework should have clearly articulated and formally adopted objectives

Bank and financial institutions should formulate a stress testing framework from its Board of Directors. The framework should clearly mention the objective of conducting stress tests. The objectives should

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[1]*Basel Committee on Banking Supervision, Stress testing principles, October 2018*

be consistent with the bank and financial institutions' risk appetite and overall risk management framework.

3.2 Stress Testing Framework should include an effective governance structure

Stress testing frameworks should clearly specify the roles and responsibilities of board of directors, senior management, and those responsible for the ongoing operation of the stress testing framework. The banks' boards of directors should have the ultimate responsibility for the overall stress testing framework, including the oversight of the framework. Roles and responsibilities should be specified for all aspects of the stress testing framework, including scenario development and approval, model development and validation, reporting and challenge of results and the use of stress test outputs. The roles of the second and third lines of defense should be specified (e.g. risk management and compliance, and internal audit, respectively).

3.3 Stress testing should be used as a risk management tool and to inform business decisions

Stress testing constitutes a key input into banks' activities related to risk identification, monitoring and assessment. As such, stress testing should also contribute to formulating and pursuing strategic and business decisions. When using the results of stress tests, board of directors and senior management should have a clear understanding of their key assumptions and limitations, for instance in terms of scenario relevance, risk coverage and model risk. For this purpose, the stress test results should be reported to the board and senior management at least once in a quarter. The reports should also include the main modeling and scenario assumptions as well as any significant limitations.

3.4 Stress testing frameworks should capture material and relevant risks and apply stresses that are sufficiently severe

Stress testing frameworks should capture material and relevant risks, as determined by a sound risk identification process. The risk identification process should be in line with risk assessment process of Risk Management Guidelines, 2018 and should include risks deriving from on- and off-balance sheet exposures, earnings vulnerabilities, operational risks, and other factors that could affect the solvency or liquidity position of the bank.

Stress test scenarios should be designed to capture material and relevant risks identified in the risk identification process and key variables within each scenario should be internally consistent. If certain material and relevant risks are excluded from the scenarios, their exclusion should be explained and documented. The scenarios should be sufficiently severe but plausible. The scenarios and sensitivities used in stress tests should be reviewed periodically to ensure that they remain relevant. Consideration should be given to historical events and hypothetical future events that consider new information and emerging risks in the present and foreseeable future. The scenarios and the sensitivities should also

consider the current macroeconomic and financial environment. The scenarios and sensitivities that banks use for their internal stress tests should not be limited to those used in supervisory stress tests. Banks should ensure that scenarios are tailored to their businesses and address their bank specific vulnerabilities.

Reverse stress tests explore scenarios that could potentially lead banks to fail and thus can be useful in helping banks to identify their core vulnerabilities.

3.5 Resources and organizational structures should be adequate to meet the objectives of the stress testing framework

Stress testing frameworks should have organizational structures that are adequate to meet their objectives. Governance processes should ensure the adequacy of resourcing for stress testing, including ensuring that the resources have the appropriate skill sets to execute the framework. Resourcing decisions should take account of the fact that stress tests have become more sophisticated over time, increasing the need for specialized staff, systems and IT infrastructure. Processes to ensure resources have the appropriate skill sets could include building the skills of internal staff, ensuring knowledge transfer to internal staff, as well as hiring personnel with specialized stress testing skills. The set of skills typically required includes (but are not limited to) expertise in liquidity risk, credit risk, market risk, capital rules, financial accounting, modeling and project management.

3.6 Stress tests should be supported by accurate and sufficiently granular data and by robust IT systems

In order for risks to be identified and the results of stress tests to be reliable, the data used should be accurate and complete, and available at a sufficiently granular level and in a timely manner. The granularity of the data should align with the objectives of the stress test (see also principle 7). Both banks and authorities should have in place a robust data infrastructure capable of retrieving, processing, and reporting information used in stress tests to ensure that the information is of adequate quality to meet the objectives of the stress testing framework. Processes should be in place to address any identified material information deficiencies.

3.7 Models and methodologies to assess the impacts of scenarios and sensitivities should be fit for purpose

Stress tests employ a certain amount of expert judgment, including assumptions within a model or methodology. In some cases, model overlays are appropriate. Like the models, these overlays or expert judgments should be well justified, documented and subject to credible challenge (including, where appropriate, validation and/or independent review).The models and methodologies used to derive stress estimates and impacts should fit the purpose and intended use of the stress tests which implies the need to adequately define at the modeling stage, the coverage, segmentation and granularity of the data and types of risk in line with the objectives of the stress test framework; the level of sophistication of the

models should be appropriate for both the objectives of the exercise and the type and materiality of the portfolios being monitored using the models; and the models and methodologies used for stress tests should be well justified and documented. Sound model development requires the collaboration of different experts.

The mix of a bank's business lines, its strategy, the risk characteristics of its activities/exposures and the objective of the stress testing exercise should guide the development of appropriate models. Banks should consider a range of methodologies to quantify the stress impacts, ranging from, for instance, point-in time static approaches to more sophisticated dynamic simulations that reflect future business activities and management actions. Banks should ensure that adequate model inventory and model management processes are in place for their stress testing activities, including a robust model validation function. The documentation of models used for stress testing, including performance testing, should be maintained and made available to Nepal Rastra Bank.

3.8 Stress testing models, results and frameworks should be subject to challenge and regular review

Regular review and challenge are key steps in the stress testing process. They are critical to improving the reliability of stress test results, aiding an understanding of their limitations, identifying areas where the stress testing approach should be improved and ensuring that the stress test results are being used in a way that is consistent with the framework's objectives. Such reviews should provide coverage of all aspects of the stress testing framework on a periodic basis and should be used to ensure that stress testing frameworks are maintained and regularly updated. As with any critical management process at a bank, the independent audit function should regularly review the bank's stress testing framework and its implementation, both for internal stress testing exercises. Such reviews should be comprehensive and provide feedback on areas of improvement for the bank.

3.9 Stress Testing Practices and Findings should be communicated to stakeholder

Communication of stress testing activities across relevant stakeholders can have benefits for both banks and Nepal Rastra Bank. Sharing of results provide important perspectives on risks that would not otherwise be available to an individual bank or Regulatory authority. Regulatory authority can help in identifying the major systemic risk arising in banking industry which can be timely address through policy interference.

Disclosure of results of stress tests, whether by banks or authorities, can help to improve market discipline and provide confidence in the resilience of the banking sector to identified stresses. Banks and authorities that choose to disclose stress test results should carefully consider ways to ensure that market participants understand the data that are disclosed, including the limitations of and the assumptions on which it is based.

Bank and financial institutions should report the result of internal stress test and data required for supervisory stress test to Nepal Rastra Bank within prescribed time frame of each quarter end.

4. Supervisory Stress Test

Supervisory stress test is to be conducted based on following assumptions/shocks:

4.1 Shocks relating to Credit Risk

Increase in the level of non-performing loan has adverse impact in the capital and earnings of the bank. Increase in NPL level, attracts additional provision requirements which has an adverse impact on bank's profit and capital adequacy ratio. Credit Risks stress tests include the analysis of what is the impact of the same in capital adequacy ratio and level of NPL if:

- Certain Percentage of pass loans deteriorated to substandard.
- Certain Percentage of watch list loans deteriorated to substandard
- Certain Percentage of Substandard loans deteriorated to doubtful loans.
- All substandard loans downgraded to doubtful
- Certain Percentage of doubtful loans deteriorated to loss loans.
- All doubtful loans downgraded to loss.
- Certain Percentage of pass loans deteriorated to loss.
- Large exposures downgraded from Pass to substandard.
- Large exposures downgraded from Pass to loss.
- Different percentage of Pass loans of different sectors converted into substandard simultaneously.
- Different percentage of Pass loans of different sectors converted into loss simultaneously.
- Different percentage of watch list loans of different sectors converted into substandard simultaneously.
- Certain percentage of guarantee converted into force loans certain percentage of such force loans converted into loss.

4.2 Shocks relating to Operational Risk

Operational risk shocks determine the resilience of bank towards huge operational losses resulting from fraud, cybercrimes, natural disaster, adverse court decisions on pending litigations. Operational Risks stress tests include the analysis of what happens to capital adequacy ratio if certain percentage of Gross Income is lost due to different operational incidents like cybercrimes, frauds, robbery, natural disasters, etc.

4.3 Shocks relating to Market Risk

4.3.1 Interest Rate Shocks

Interest rate shocks explain the impact of change in market interest rate on Profitability and Capital adequacy.

4.3.2 Exchange Rate Shocks

Exchange rate shocks explain the impact of change in exchange rate (Rs/$) on Profitability and Capital adequacy.

4.3.3 Equity Price Shocks

Equity price shocks explain the impact of adverse movement in price of equity investment exposure on Profitability and Capital adequacy.

4.4 Shocks relating to Liquidity risk

Liquidity risk stress test assesses the bank's ability to discharge its liabilities during the stressed events. The bank with sufficient liquid assets will have strong liquidity strength. Liquid assets are those assets, which can be converted into cash easily. Liquid Assets are cash, bank balances, money at call and bank's investment in government securities. On the other hand, liquid liabilities are deposits, borrowing and payables. Banks are required to maintain minimum level of liquidity to meet their day to day obligation. Liquidity risk shocks explain what happens if:

- Withdrawal of deposits in certain percentage for certain number of days.
- Withdrawal of deposit other than fixed deposit in certain percentage for certain number of days.
- Withdrawal of deposits in certain percentage in a single day.
- Withdrawal of deposits other than fixed deposit in certain percentage in a single day.
- Deposits withdrawal by certain number of top depositors
- Certain percent of irrevocable credit commitments utilized and its impact on CD ratio.

4.5 Reverse Stress Test

Reverse stress testing is a tool that starts by assuming an outcome as given (for example, bank's capital adequacy ratio falling to 8.5%, NPL rising to 5%) and then works backward to determine the external shocks and related scenarios that would trigger the defined outcome. It complements usual stress testing process. It determines the depth of resilience of banks to extreme adverse scenarios. Defined outcome and scenarios leading to such defined outcome used in supervisory stress testing are as follows:

Defined Outcome	Related scenarios leading to such defined outcome (determined by backward calculation)
Capital Adequacy fall to 11%	X% of Pass Loan converted into substandard
Capital Adequacy fall to 11%	X% of Pass Loan converted into loss
Capital Adequacy fall to 8.5%	X% of Pass Loan converted into substandard
Capital Adequacy fall to 8.5%	X% of Pass Loan converted into loss
Tier 1 Capital fall to 8.5%	X% of Pass Loan converted into substandard
Tier 1 Capital fall to 8.5%	X% of Pass Loan converted into loss
Tier 1 Capital fall to 6%	X% of Pass Loan converted into substandard
Tier 1 Capital fall to 6%	X% of Pass Loan converted into loss
NPL rise to 5%	X% of Pass Loan converted into NPL
NPL rise to 5%	X% of Watch list Loan converted into NPL

Stress Testing Example

Credit Risk Stress Test #1

Given Information

Total Loan: Rs. 45,076 million.
Pass Loan: Rs. 42,536 million
Watch-list Loan: Rs 2246 million.
Restructure/Reschedule Loan: Rs. 12 million.
Substandard Loan: Rs. 84 million.
Doubtful Loan: Rs. 8 million.
Loss Loan: Rs 190 million
Total NPL: Rs. 294 million.
NPL in Percentage: 0.65
1st Large Exposure Loan (Performing): Rs. 944 million.
2nd Large Exposure Loan (Performing): Rs. 912 million.
Capital Fund: Rs. 7,018 million.
Total Risk Weighted Exposure: Rs. 57,319 million.
Capital Adequacy Ratio (CAR in %): 12.24

Find out:
1. What happens if certain percentage (5%, 10% & 15%) of pass loans deteriorated to substandard?
2. What happens if certain percentage (5%, 10% & 15%) of watch-list loans deteriorated to substandard?
3. What happens if certain percentage (5%, 10% & 15%) of substandard loans deteriorated to doubtful loans?
4. What happens if certain percentage (5%, 10%&15%) of doubtful loans deteriorated to loss?
5. What happens if certain percentage (5%, 10%&15%) of pass loans deteriorated to loss?
6. What happens if all substandard loans downgraded to doubtful?
7. What happens if all doubtful loans downgraded to Loss?
8. What happens if large Pass exposures (Top 2 big borrower) downgraded to substandard?
9. What happens if large Pass exposures (Top 2 big borrower) downgraded to loss?

1. **What happens if certain percentage (5%, 10% & 15%) of pass loans deteriorated to substandard?**

Magnitude of Shock:	5%	10%	15%
Increase in Provision	42536 x 0.05 x 0.237 = 504	42536 x 0.1 x 0.237 = 1008	42536 x 0.15 x 0.237 =1512
Impact on profit	504*0.7=353	1008*0.7=706	1512*0.7=1059
Revised Capital Fund	7018 - 353 = 6665	7018–706 = 6312	7018 - 1059 = 5959
Revised Risk Weighted Exposure	57319 –(42536*0.05*0.25)= 56787	57319 –(42536 x 0.1 x 0.25) = 56256	57319 –(42536 x 0.15 x 0.25) = 55724
Revised CAR	**11.74**	**11.22**	**10.69**
Pre Shock CAR	**12.24**	**12.24**	**12.24**
Revise NPL	**(294+42536*.05)/45076=5.37**	**5.37**	**5.37**
Pre Shock NPL	**0.65**	**0.65**	**0.65**

2. What happens if certain percentage (5%, 10% & 15%) of watchlist loans deteriorated to substandard loans?

Magnitude of Shock:	5%	10%	15%
Increase in Provision	2246 x 0.05 x 0.20 = 22.46	2246 x 0.1 x 0.20 = 45	2246 x 0.15 x 0.20 =67
Impact on profit	22.46*0.7=16	45*0.7=32	1531*0.7=47
Revised Capital Fund	7018 - 16= 7002	7018 – 32 = 6986	7018 - 47= 6971
Revised Risk Weighted Exposure	57319 – (2246*0.05*0.25) = 57291	57319 – (2246 x 0.1 x 0.25) = 57263	57319 – (2246 x 0.15 x 0.25) = 57235
Revised CAR	**12.22**	**12.20**	**12.18**
Pre Shock CAR	**12.24**	**12.24**	**12.24**
Revise NPL	**(294+2246*.05)/45076=0.90**	**0.90**	**0.90**
Pre Shock NPL	**0.65**	**0.65**	**0.65**

3. What happens if certain percentage (5%, 10% & 15%) of substandard loans deteriorated to doubtful loans?

Magnitude of Shock:	5%	10%	15%
Increase in Provision	84 x 0.05 x 0.25 = 1	84 x 0.10 x 0.25 = 2	84 x 0.15 x 0.25 = 3
Impact on profit	1*0.7=0.7	2*0.7=1.4	3*0.7=2.1
Revised Capital Fund	7018 -0.7 = 7017.3	7018–1.4 = 7016.6	7018–2.1 = 7015.9
Revised Risk Weighted Exposure	57319 - 1 = 57318	57319 - 2 = 57317	57319 - 3 = 57316
Revised CAR	**12.24**	**12.24**	**12.24**
Pre Shock CAR	**12.24**	**12.24**	**12.24**

4. What happens if certain percentage (5%, 10% & 15%) of doubtful loans deteriorated to loss loans?

Magnitude of Shock:	5%	10%	15%
Increase in Provision	8 x 0.05 x 0.5 = .20	8 x 0.1 x 0.5 = .40	8 x 0.15 x 0.5 = .60
Impact on profit	0.20*.7=0.14	0.4*0.7=0.28	0.6*0.7=0.42
Revised Capital Fund	7018 - .14= 7017.86	7018 - .28 = 7017.72	7018 - .42 = 7017.58
Revised Risk Weighted Exposure	57319 - .20 = 57318.80	57319 - .40 = 57318.60	57319 - .60 = 57318.40
Revised CAR	**12.24**	**12.24**	**12.24**
Pre Shock CAR	**12.24**	**12.24**	**12.24**

5. What happens if certain percentage (5%, 10% & 15%) of pass loans deteriorated to loss loans?

Magnitude of Shock:	5%	10%	15%
Increase in Provision	42536 x 0.05 x 0.987 = 2099	42536 x 0.1 x 0.987 = 4198	42536 x 0.15 x 0.987 = 6297
Impact on profit	2099*0.7=1469	4198*0.7=2939	6297*0.7=4408
Revised Capital Fund	7018 - 1469 = 5549	7018 - 2939 = 4079	7018 - 4408 = 2610
Revised Risk Weighted Exposure	57319 –(42536 x 0.05) = 55192	57319 –(42536 x 0.1) = 53065	57319 –(42536 x 0.15) = 50939
Revised CAR	**10.05**	**7.69**	**5.12**
Pre Shock CAR	**12.24**	**12.24**	**12.24**
Revise NPL	**(294+42536*.05)/45076=5.37**	**5.37**	**5.37**
Pre Shock NPL	**0.65**	**0.65**	**0.65**

6. **What happens if all loans under substandard category downgraded to doubtful?**

Increase in Provision	84 x 0.25 = 21
Impact on profit	21*0.7=14.7
Revised Capital Fund	7018–14.7 = 7003
Revised Risk Weighted Exposure	57319 - 21 = 57298
Revised CAR	**12.22**
Pre Shock CAR	**12.24**

7. **What happens if all loans under doubtful category downgraded to Loss?**

Increase in Provision	8 x 0.50 = 4
Impact on profit	4*0.7=2.8
Revised Capital Fund	7018 –2.8 = 7015
Revised Risk Weighted Exposure	57319 - 4 = 57315
Revised CAR	**12.24**
Pre Shock CAR	**12.24**

8. **What happens if top 2 large pass exposures downgraded to substandard?**

Increase in Provision	(944+912)x 0.237 = 440
Impact on profit	445*.7=308
Revised Capital Fund	7018 - 308 = 6710
Revised Risk Weighted Exposure	57319 –[(944+912)x 0.25] = 56855
Revised CAR	**11.80**
Pre Shock CAR	**12.24**
Revise NPL	**(294+944+912)/45076 =4.77**
Pre Shock NPL	**0.65**

9. **What happens if top 2 large pass exposures downgraded to loss?**

Increase in Provision	(944+912)x 0.987 = 1832
Impact on profit	1832*.7=1282
Revised Capital Fund	7018 - 1282 = 5736
Revised Risk Weighted Exposure	57319 - (944+912)*1 = 55463
Revised CAR	**10.34**
Pre Shock CAR	**12.24**
Revise NPL	**(294+944+912)/45076 =4.77**
Pre Shock NPL	**0.65**

Credit Risk Stress Test #2

Given Information

Sectors	Loan	Pass Loan	Watchlist Loan	NPL
Agriculture	2,700	2543	135	22
Agriculture, Forestry & Beverage Production Related	2,341	2212	117	12

Construction	4,599	4316	230	53
Consumable Loan	2,079	1939	104	36
Electricity, Gas and Water	2,393	2258	120	15
Finance, Insurance and Fixed Assets	3,484	3310	174	0
Fishery	72	68	4	0
Hotel or Restaurant	1,982	1862	99	20
Local Government	26	26	0	0
Metal Production, Machinery and Electrical Tools	669	636	33	0
Mining	99	94	5	0
Non-food Production Related	5,870	5544	294	33
Other Service Industries	1,998	1898	100	0
Others	6,093	5754	305	34
Transportation, Communications and Public Services	1,078	1024	54	0
Wholesaler and Retailer	9,593	9051	473	69
Total	45,076	42,536	2,246	294

What happens if following % of sector-wise pass or watch list loan is downgraded into substandard or loss loans?

Sector	Pass loan converted into Loss	Pass loan converted into Substandard	Watch list loan converted into substandard
Agriculture	5%	5%	5%
Agriculture, Forestry & Beverage Production Related	5%	5%	5%
Construction	5%	5%	5%
Consumable Loan	5%	5%	5%
Electricity, Gas and Water	5%	5%	5%
Finance, Insurance and Fixed Assets	5%	5%	5%
Fishery	5%	5%	5%
Hotel or Restaurant	5%	5%	5%
Local Government	5%	5%	5%
Metal Production, Machinery and Electrical Tools	5%	5%	5%
Mining	5%	5%	5%
Non-food Production Related	5%	5%	5%
Other Service Industries	5%	5%	5%
Others	5%	5%	5%
Transportation, Communications and Public Services	5%	5%	5%
Wholesaler and Retailer	5%	5%	5%

Analysis

Sector	Additional provision due to Pass loan converted into Loss	Additional provision due to Pass loan converted into Substandard	Additional provision due to Watch list loan converted into substandard
Agriculture	2543*.05*.987=125.50	2543*.05*.237=30.13	135*.05*0.2=1.35
Agriculture, Forestry & Beverage Production Related	2212*.05*.987=109.16	2212*.05*.237=26.21	117*.05*0.2=1.17
Construction	212.99	51.14	2.30
Consumable Loan	95.69	22.98	1.04
Electricity, Gas and Water	111.43	26.76	1.20
Finance, Insurance and Fixed Assets	163.35	39.22	1.74
Fishery	3.36	0.81	0.04
Hotel or Restaurant	91.89	22.06	0.99
Local Government	1.28	0.31	-
Metal Production, Machinery and Electrical Tools	31.39	7.54	0.33
Mining	4.64	1.11	0.05
Non-food Production Related	273.60	65.70	2.94
Other Service Industries	93.67	22.49	1.00
Others	283.96	68.18	3.05
Transportation, Communications and Public Services	50.53	12.13	0.54
Wholesaler and Retailer	446.67	107.25	4.73
Total Additional Provision	2,099.10	504.04	22.47
Impact on Profit	2,099.10*.7=1469.37	504.04*.7=352.83	22.47*.7=15.73
Revised Capital Fund	7018-1469.37=5549	7018-352.83=6665	7018-15.73=7002
Revised Risk Weighted Exposure	57319-(2,099.10/.987)=55192	57319-(504.04/0.237*0.25)=56787	57319-(22.47/.20*.25)=57,292
Revised CAR	10.05	11.74	12.22
Pre-shock CAR	12.24	12.24	12.24
Revised NPL	[294+(2,099.10/.987)]/45076=5.37%	[294+(504.04/0.237)]/45076=5.37%	[294+(22/0.2)]/45076=0.90
Pre-shock NPL	0.65	0.65	0.65

Credit Risk Stress Test #3

Given Information
Bid Bond, Performance Bond and Counter guarantee: Rs 2000 million
Domestic Counterparty: Rs 1200 million
Foreign Counterparty:
ECA Rating 0-1: Nil
ECA Rating 2: Nil
ECA Rating 3-6: Rs 600 million
ECA Rating 7: Rs 200 million
Advance Payment Guarantee: Rs 1500 million
Financial Guarantee: Rs 500 million
Capital Fund: Rs. 7,018 million.
Total Risk Weighted Exposure: Rs. 57,319 million.
Capital Adequacy Ratio (CAR in %): 12.24
Total Loan: Rs. 45,076 million
Total NPL: Rs. 294 million

What happens if 10 percentage of guarantee converted into force loans 30 percentage of such force loans converted into loss?

Increase in Provision	*(2000+1500+500)x 10%*30%*100%= 120*
Impact on profit	*120*.7=84*
Revised Capital Fund	*7018 - 84 = 6934*
Revised Risk Weighted Exposure	*57319 – (1200*10%*40%)- (600*10%*100%)- (200*10%*150%)- (1500*10%*100%)- (500*10%*100%)=57 319-48-60-30-150- 50=56981*
Revised CAR	***12.16***
Pre Shock CAR	***12.24***
Revised Total Loan	***45076+(2000+1500+5 00)*10%*30%= 45196***
Revise NPL	***(294+120)/45196= 0.91***
Pre Shock NPL	***0.65***

Operational Risk Stress Tests

Given Information
Gross Income for calculation of Risk weighted exposure for operational risk: Rs 5,216 million
Capital Fund: Rs 7,018 million
Total Risk Weighted Exposure: Rs. 57,319 million
What happens if there is a sudden loss due to fraud/cybercrime equivalent to 20% of Gross Income?

Impact in Profit	*5,216*0.2*0.7 = 730*
Revised Capital Fund	*7,018 - 730 = 6,288*
Revised CAR	***10.97***
Pre Shock CAR	***12.24***

What happens if there is a sudden loss due to fraud/cybercrime equivalent to 50% of Gross Income?

Impact in Profit	*5216*0.5*0.7 = 1826*
Revised Capital Fund	*7018 - 1826 = 5192*
Revised CAR	**9.06**
Pre Shock CAR	**12.24**

Market Risk Stress Tests

Given Information

Deposits (Excluding Fixed & Current): Rs. 29,316 million.
Loans & Advances (Excluding Term Loan): Rs. 36,406 million.
Net Open Position: Rs. 134million
Investment in Shares & Debentures: Rs. 73 million.

Interest Rate Shocks

What happens if, there is an increase in deposit interest rate by 100, 150 or 200 basis point?

Magnitude of Shock: Deposit Interest Increase by	*100 Basis point*	*150 Basis Point*	*200 Basis point*
Impact(-) in Profit	*(29316 x 0.01)/12 = 24*	*(29316 x 0.015)/12 = 34*	*(29316 x 0.02)/12 = 42*
Revised Capital Fund	*7018 - 24 = 6994*	*7018 - 34 = 6984*	*7018 - 42 = 6976*
Revised CAR	**12.20**	**12.18**	**12.17**
Pre Shock CAR	**12.24**	**12.24**	**12.24**

What happens if, there is a decrease in Loan interest rate by 100, 150 or 200 basis point?

Magnitude of Shock: Deposit Interest Increase by	*100 Basis point*	*150 Basis Point*	*200 Basis point*
Impact(-) in Profit	*(36406 x 0.01)/12= 30*	*(36406 x 0.015)/12 = 46*	*(36406 x 0.02)/12= 61*
Revised Capital Fund	*7018 - 30 = 6988*	*7018 - 46 = 6972*	*7018 - 61 = 5847*
Revised CAR	**10.25**	**12.16**	**12.14**
Pre Shock CAR	**12.24**	**12.24**	**12.24**

Exchange Rate Shocks
What happens if, there is an appreciation of currency exchange rate by 20 %?

Impact in Profit	*134 x 0.20 = 27*
Revised Capital Fund	*7018 - 27 = 6991*
Revised CAR	**12.20**
Pre Shock CAR	**12.24**

Equity Price Shocks
What happens if prices of equity fall by 50 percent?

Impact(-) in Profit	*73 x 0.50 = 36*
Revised Capital Fund	*7018 - 36 = 6982*
Revised Risk Weighted Exposure	*57319 - 36 = 57283*
Revised CAR	**12.18**
Pre Shock CAR	**12.24**

Liquidity Risk Stress Tests

Given Information

Liquid Assets: Rs. 11876 million.
Non Liquid Assets: Rs. 47438 million
Net Liquid Assets: Rs. 11277 million
Deposits: Rs. 48860 million.
Fixed Deposit: Rs 24200 million
Net Liquidity Ratio: 23.08
Deposit amount of top 2 Institutional Depositor: Rs. 4,568 and Rs. 2,802 million respectively.
Deposit amount of top 2 Individual Depositor: Rs. 542 and Rs.420 million respectively.
Inter Bank Lending to top 2 Banks: Rs. 50 and 30 million respectively.
Capital Fund: Rs 7,018 million
Risk Weighted Exposure: Rs 57,319 million

Find out:
  What happens if?

i) **Withdrawal of deposits by 2%, 5%, 10%, 10% and 10% for five consecutive days respectively.**

Day	Liquid Assets	Cumulative Value of Firesale of Liquid assets	Non Liquid Assets	Cumulative Value of Firesale of non-Liquid assets	Deposit	Cumulative Deposit Withdrawal	Remaining Liquid Assets	Remarks
A	B	C	D	E	F	G	H=(BxC+DxE)-(FxG)	I
1st	11876	80.00%	47438	1.00%	48860	2.00%	8,997.98	Liquid
2nd	11876	96.00%	47438	1.99%	48860	6.90%	8,973.64	Liquid
3rd	11876	99.20%	47438	2.97%	48860	16.21%	5,269.69	Liquid
4th	11876	99.84%	47438	3.94%	48860	24.59%	1,711.38	Liquid
5th	11876	99.968%	47438	4.90%	48860	32.13%	-1,502.06	Illiquid

ii) **Withdrawal of deposits by 5%, 10% or 15%.**

Magnitude of Shock: Deposit withdraw by	5%	10%	15%
Revised Deposits	48860 - 2443 = 46417	48860 - 4886 = 43974	48860 - 7329 = 41531
Revised Net Liquid Assets	11277 - 2443 = 8834	11277 - 4886 = 6391	11277 - 7329 = 3948
Revised Liquidity Ratio	19.03	14.53	9.51
Pre Shock Liquidity Ratio	23.08	23.08	23.08
Capital Fund	7018	7018	7018
Additional Risk Weighted Exposure	48860 x 0.01 = 489	48860 x 0.06 = 2932	48860 x 0.11 = 5375
Revised Risk Weighted Exposure	57319 + 489 = 57808	57319 + 2932 = 60251	57319 + 5375 = 62694
Revised CAR	12.14	11.65	11.19
Pre Shock CAR	12.24	12.24	12.24

iii) Withdrawal of deposits other than fixed deposits by 2%, 5%, 10%, 10% and 10% for five consecutive days respectively.

Day	Liquid Assets	Cumulative Value of Firesale of Liquid assets	Non Liquid Assets	Cumulative Value of Firesale of non-Liquid assets	Unstable Deposit (Total Deposit – Fixed Deposit)	Cumulative Deposit Withdrawal	Remaining Liquid Assets	Remarks
A	B	C	D	E	F	G	H=(BxC+DxE)-(FxG)	I
1st	11876	80.00%	47438	1.00%	24660	2.00%	9,481.98	Liquid
2nd	11876	96.00%	47438	1.99%	24660	6.90%	10,643.44	Liquid
3rd	11876	99.20%	47438	2.97%	24660	16.21%	9,192.51	Liquid
4th	11876	99.84%	47438	3.94%	24660	24.59%	7,662.16	Liquid
5th	11876	99.968%	47438	4.90%	24660	32.13%	6,273.40	Liquid

iv) Withdrawal of deposits other than fixed deposits by 5%, 10% or 15%.

Magnitude of Shock: Deposit withdraw by	5%	10%	15%
Revised Deposits	48860 - 1233 = 47627	48860 - 2466 = 46394	48860 - 3699 = 45161
Revised Net Liquid Assets	11277 - 1233 = 10044	11277 - 2466 = 8811	11277 - 3699 = 7578
Revised Liquidity Ratio	**21.09**	**18.99**	**16.78**
Pre Shock Liquidity Ratio	**23.08**	**23.08**	**23.08**
Capital Fund	7018	7018	7018
Additional Risk Weighted Exposure	0	48860 x 0.02 = 977	48860 x 0.04 = 1954
Revised Risk Weighted Exposure	57319 + 0= 57319	57319 + 977 = 58296	57319 +1954 =59273
Revised CAR	**12.24**	**12.04**	**11.84**
Pre Shock CAR	**12.24**	**12.24**	**12.24**

v) Withdrawal of Top 2 Institutional Depositors.

Revised Deposits	48860 - 7370 = 41490
Revised Net Liquid Assets	11277 - 7370 = 3418
Revised Liquidity Ratio	**9.42**
Pre Shock Liquidity Ratio	**23.08**
Capital Fund	7018
Additional Risk Weighted Exposure	48860 x 0.11 = 5375
Revised Risk Weighted Exposure	57319 + 5375 = 62694
Revised CAR	**11.19**
Pre Shock CAR	**12.24**

vi) Withdrawal of Top 2 Individual Depositors.

Revised Deposits	48860 - 962 = 47898
Revised Net Liquid Assets	11277 - 962 = 10315
Revised Liquidity Ratio	**21.54**
Pre Shock Liquidity Ratio	**23.08**
Capital Fund	7018
Additional Risk Weighted Exposure	48860 x 0 = 0
Revised Risk Weighted Exposure	57319 + 0 = 57319
Revised CAR	**12.24**
Pre Shock CAR	**12.24**

vii) Default on Interbank by Top 2 Counterparties?

Deposits	*48860*
Revised Net Liquid Assets	*11277 - 80 = 11197*
Revised Liquidity Ratio	***22.92***
Pre Shock Liquidity Ratio	***23.08***
Capital Fund	*7018*
Revised Capital Fund	*7018 - 80 = 6938*
Additional Risk Weighted Exposure	*48860 x 0 = 0*
Revised Risk Weighted Exposure	*57319 + 0 -16 = 57303*
Revised CAR	***12.11***
Pre Shock CAR	***12.24***

Reverse Stress Test

Given Information

Total Loan: Rs. 45,076 million.
Pass Loan: Rs. 42,536 million
Watchlist Loan: Rs 2246 million.
Total NPL: Rs. 294 million.
NPL in Percentage: 0.65
Capital Fund: Rs. 7,018 million.
Tier 1 Capital: Rs 5,965 million
Total Risk Weighted Exposure: Rs. 57,319 million.
Capital Adequacy Ratio (CAR in %): 12.24
Core Capital Adequacy Ratio (CCAR in %): 10.41

i. What % of pass loans needs to be downgraded to substandard for CAR to fall down to 11% and what will be NPL in such scenario?

Additional Loan Loss required (Before tax) Calculated using following equation where X is additional loan loss required before tax (Capital Fund-X*0.7)/(Total RWE-X/.237*.25)=0.11	Rs 1220.81 million
Revised Capital Fund	7018-1220.81*0.70= Rs 6163.44 million
Revised Total RWE	57319-(1220.81/.237*.25)=56031.23 million
Revised CAR	6163.44/56031.23 =11%
Pass loan that need to be downgraded to substandard for CAR to fall down to 11%	**1220.81/0.237=5151.08 million**
% of Pass loan that need to be downgraded to substandard for CAR to fall down to 11%	**5151.08/42536=12.11%**
NPL in that scenario	**(294+5151.08)/45076=12.08%**

ii. What % of pass loans needs to be downgraded to loss for CAR to fall down to 11% and what will be NPL in such scenario?

Additional Loan Loss required (Before tax) Calculated using following equation where X is additional loan loss required before tax (Capital Fund-X*0.7)/(Total RWE-X/.987)=0.11	Rs 1211.30 million
Revised Capital Fund	7018-1211.30*.7= Rs 6170.09 million
Revised Total RWE	57319-(1211.30/.987)=56091.75 million
Revised CAR	6170.09/56091.75=11%
Pass loan that need to be downgraded to substandard for CAR to fall down to 11%	**1211.30 /0.987=1227.25 million**
% of Pass loan that need to be downgraded to substandard for CAR to fall down to 11%	**1227.25/42536=2.89%**
NPL in that scenario	**(294+1227.25)/45076=3.37%**

iii. What % of pass loans needs to be downgraded to substandard for CAR to fall down to 8.5% and what will be NPL in such scenario?

Additional Loan Loss required (Before tax) Calculated using following equation where X is additional loan loss required before tax (Capital Fund-X*0.7)/(Total RWE-X/.237*.25)=0.085	Rs 3515.90 million
Revised Capital Fund	7018-3515.90*.7= Rs 4556.87 million
Revised Total RWE	57319-(3515.90/.237*.25)=53610.25 million
Revised CAR	4556.87/53610.25=8.5%
Pass loan that need to be downgraded to substandard for CAR to fall down to 8.5%	**3515.90/0.237=14835.02 million**
% of Pass loan that need to be downgraded to substandard for CAR to fall down to 8.5%	**14835.02/42536=34.88%**
NPL in that scenario	**(294+14835.02)/45076=33.56%**

iv. What % of pass loans needs to be downgraded to loss for CAR to fall down to 8.5% and what will be NPL in such scenario?

Additional Loan Loss required (Before tax) Calculated using following equation where X is additional loan loss required before tax (Capital Fund-X*0.7)/(Total RWE-X/.987)=0.085	Rs 3495.61 million
Revised Capital Fund	7018-3495.61*.7= Rs 4571.07 million

Revised Total RWE	57319-(3495.61/.987)=53777.35 million
Revised CAR	4571.07/53777.35=8.5%
Pass loan that need to be downgraded to substandard for CAR to fall down to 8.5%	**3495.61/0.987=3541.65 million**
% of Pass loan that need to be downgraded to substandard for CAR to fall down to 8.5%	**3541.65 /42536=8.33%**
NPL in that scenario	**(294+3541.65)/45076=8.51%**

v. What % of pass loans needs to be downgraded to substandard for CCAR to fall down to 8.5% and what will be NPL in such scenario?

Additional Loan Loss required (Before tax) Calculated using following equation where X is additional loan loss required before tax (Core Capital - X*0.7)/(Total RWE-X/.237*.25)=0.085	Rs 1790.62 million
Revised Core Capital	5965-1790.62*0.70= Rs 4711.56 million
Revised Total RWE	57319-(1790.62/.237*.25)=55430.16 million
Revised CCAR	4711.56/55430.16=8.5%
Pass loan that need to be downgraded to substandard for CCAR to fall down to 8.5%	**1790.62/0.237=7555.38 million**
% of Pass loan that need to be downgraded to substandard for CCAR to fall down to 8.5%	**7555.38/42536=17.76%**
NPL in that scenario	**(294+7555.38)/45076=17.41%**

vi. What % of pass loans needs to be downgraded to loss for CCAR to fall down to 8.5% and what will be NPL in such scenario?

Additional Loan Loss required (Before tax) Calculated using following equation where X is additional loan loss required before tax (Core Capital - X*0.7)/(Total RWE-X/0.987)=0.085	Rs 1780.29 million
Revised Core Capital	5965-1780.29*0.70= Rs 4718.80 million
Revised Total RWE	57319-(1780.29/0.987)=55515.26 million
Revised CCAR	4718.80/55515.26=8.5%
Pass loan that need to be downgraded to loss for CCAR to fall down to 8.5%	**1780.29/0.987=1803.74 million**
% of Pass loan that need to be downgraded to loss for CCAR to fall down to 8.5%	**1803.74/42536=4.24%**
NPL in that scenario	**(294+1803.74)/45076=4.65%**

vii. What % of pass loans needs to be downgraded to substandard for CCAR to fall down to 6% and what will be NPL in such scenario?

Additional Loan Loss required (Before tax) Calculated using following equation where X is additional loan loss required before tax (Core Capital - X*0.7)/(Total RWE-X/.237*.25)=0.06	Rs 3967.06 million
Revised Core Capital	5965-3967.06*0.70= Rs 3188.06 million
Revised Total RWE	57319-(3967.06/.237*.25)=53134.34 million
Revised CCAR	3188.06/53134.34 =6%
Pass loan that need to be downgraded to substandard for CCAR to fall down to 6%	**3967.06/0.237=16738.63 million**
% of Pass loan that need to be downgraded to substandard for CCAR to fall down to 6%	**16738.63 /42536=39.35%**
NPL in that scenario	**(294+16738.63)/45076=37.79%**

viii. What % of pass loans needs to be downgraded to loss for CCAR to fall down to 6% and what will be NPL in such scenario?

Additional Loan Loss required (Before tax) Calculated using following equation where X is additional loan loss required before tax (Core Capital - X*0.7)/(Total RWE-X/0.987)=0.06	Rs 3951.54 million
Revised Core Capital	5965-3951.54*0.70= Rs 3198.93 million
Revised Total RWE	57319-(3951.54/0.987)=53315.42 million
Revised CCAR	3198.93 /53315.42 =6%
Pass loan that need to be downgraded to loss for CCAR to fall down to 6%	**3951.54/0.987=4003.58 million**
% of Pass loan that need to be downgraded to loss for CCAR to fall down to 6%	**4003.58/42536=9.41%**
NPL in that scenario	**(294+4003.58)/45076=9.53%**

ix. What % of pass loans need to be downgraded to NPL for NPL to rise to 5%?

Additional NPL required to breach regulatory ceiling of 5%	45076*.05-294=1959.8
% of Pass loan that need to be downgraded to NPL for NPL to rise to 5%	**1959.8/42536=4.61%**