Nepal Rastra Bank
Stress Testing Guidelines

Nepal Rastra Bank
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Stress Testing - Guidelines

Background

- Banking business is a risky business. There are several risks inherent in banking business. Globally, a number of quantitative techniques have been developed to assess the potential risks to the individual bank and financial institution as well as financial system. Several quantitative techniques have been developed for the risk management in banking business. After recent global financial crisis the use of the quantitative techniques has been increasing. 'Stress testing' is the risk management tool and it is widely used in the global context. IMF and Basel Committee on Banking Supervision (BCBS) have also developed guidelines for conducting stress tests of the banks and financial sector.

- Stress testing alerts bank management to be aware on adverse situations related to a several risks and provides an indication of how much capital needed to absorb losses and liquidity required during the adverse situation. It is used to evaluate the potential impact on a bank of a specific event and movement in a set of financial variables and its applications are expanding.

- It is useful for;
    - Forward-looking risk assessments;
    - Overcoming limitations of historical data analysis;
    - Facilitating internal and external communication;
    - Capital and liquidity planning procedures;
    - Setting the risk tolerance; and
    - Facilitating the risk mitigation process and developing contingency plans

- Stress testing prescribes the analytical methods to evaluate the financial position under stressed scenario. Such analysis is useful to assist in decision-making process.

- Developing scenarios and studying the relationship of the financial variables have become necessary for the forward-looking assessments. These studies and analysis provides basis for decision-making process in banking. Stress testing provides the methodologies for studying the behaviors of financial variables.

- BCBS documents present the principles, applications and importance of the stress testing in bank management. It's considered as an integral part of overall governance and risk management culture of the bank. Stress testing requires the board and senior management's involvement in developing, studying and analyzing the stress test results. It is essential to incorporate the stress testing results in the process of business planning and decision-making.

- It is expected that stress testing program of a bank promotes risk identification and control, provides risk perspective to other risk management tool, enhances internal and external communication and improves capital and liquidity levels.

Principles for sound stress testing practices [*]

Recommendations to banks

Use of stress testing and integration in risk governance

1. Stress testing should form an integral part of the overall governance and risk management culture of the bank. Stress testing should be actionable, with the results from stress testing analyses impacting decision-making at the appropriate management level, including strategic business decisions of the board and senior management. Board and senior management involvement in the stress-testing program is essential for its effective operation.
2. A bank should operate a stress testing programmes that: promotes risk identification and control; provides a complementary risk perspective to other risk management tools; improves capital and liquidity management; and enhances internal and external communication.
3. Stress testing programmes should take account of views from across the organisation and should cover a range of perspectives and techniques.
4. A bank should have written policies and procedures governing the stress-testing programme. The operation of the programme should be appropriately documented.
5. A bank should have a suitably robust infrastructure in place, which is sufficiently flexible to accommodate different and possibly changing stress tests at an appropriate level of granularity.
6. A bank should regularly maintain and update its stress-testing framework. The effectiveness of the stress testing programme, as well as the robustness of major individual components, should be assessed regularly and independently.

Stress testing methodology and scenario selection

7. Stress tests should cover a range of risks and business areas, including at the firm-wide level. A bank should be able to integrate effectively across the range of its stress testing activities to deliver a complete picture of firm-wide risk.
8. Stress testing programmes should cover a range of scenarios, including forward-looking scenarios, and aim to take into account system-wide interactions and feedback effects.
9. Stress tests should be geared towards the events capable of generating most damage whether through size of loss or through loss of reputation. A stress-testing programme should also determine what scenarios could challenge the viability of the bank (reverse stress tests) and thereby uncover hidden risks and interactions among risks.
10. As part of an overall stress-testing programme, a bank should aim to take account of simultaneous pressures in funding and asset markets, and the impact of a reduction in market liquidity on exposure valuation.

Specific areas of focus

11. The effectiveness of risk mitigation techniques should be systematically challenged.
12. The stress-testing programme should explicitly cover complex and bespoke products such as securitised exposures. Stress tests for securitised assets should consider the underlying assets, their exposure to systematic market factors, relevant contractual arrangements and embedded triggers, and the impact of leverage, particularly as it relates to the subordination level in the issue structure.
13. The stress-testing programme should cover pipeline and warehousing risks. A bank should include such exposures in its stress tests regardless of their probability of being securitised.
14. A bank should enhance its stress testing methodologies to capture the effect of reputational risk. The bank should integrate risks arising from off-balance sheet vehicles and other related entities in its stress-testing programme.
15. A bank should enhance its stress testing approaches for highly leveraged counter parties in considering its vulnerability to specific asset categories or market movements and in assessing potential wrong-way risk related to risk mitigating techniques.

[*] *Principles for sound stress testing practices and supervision, January 2009, BCBS*

The principles require that the bank should have written policies and procedures for stress testing. Since the risk exposures of a bank may vary with other, the banks should develop their own stress-testing framework on the basis of the size, nature and complexity. The operation of the programs should be well documented.

Stress Testing in Nepalese Banking

In the global context, the banks are increasingly using stress testing as a risk management tool. Nepalese banking system is growing at a rapid pace. Similarly, there is a tendency of a gradual integration of Nepalese banking into global financial system.

After recent global financial crisis, stress testing has gained strength in the field of bank management. Merely studying and analyzing the historical data may not be sufficient to manage the future uncertainty. Therefore it's felt necessity of forward looking approaches for risk management. Stress testing is the forward-looking risk management tool popularly used by banks globally.

There are several methodologies, ranging from very simple to complex, to study the behaviors of financial variables. On the basis of relationship of these variables, stress-testing methodologies are generally classified as simple sensitivity test and scenario analysis. Stress testing can be conducted at micro level as well as macro level. At institutional level when banks conduct the stress testing to study the relationship of the variables it is understood as micro-level stress test. Similarly, when it's applied in the study of macro variables the stress test is known as macro-level stress test. Generally macro-level stress tests are conducted to measure the vulnerability of the financial system and to measure the resilience of a banking system towards the external shock events.

In this background, Nepal Rastra bank has presented these guidelines for conducting stress testing in Nepalese banking. As the first step in stress testing, these guidelines cover simple sensitivity tests in different areas of risk management. There are simple shocks, which provide the minimum standards for stress testing in Nepalese banking. At minimum, all the commercial banks are required to conduct stress test at corporate level on a regular basis. Banks are encouraged to introduce more complex and advanced techniques of stress testing to improve their own internal risk management practices. Based on the nature, size and complexities of the business activities, the techniques for stress testing may vary. These guidelines present simple methods of stress tests as an initial step and aim to establish link between our current banking practices and the Basel principles and international best practices.

Conducting Stress Test

Stress testing is a risk management tool used to evaluate the potential impact on a firm of a specific event and/or movement in a set of financial variables. Various risks in the banking business are mainly credit, market, operational and liquidity risk. Stress tests should be conducted to analyze the impact of these risks in the banks financial performance. There are several methodologies used for the stress testing. These methodologies are varying from the simple Sensitivity tests to complex stress tests. All of these methodologies assess the impact of a severe stress event on the variables like earnings, liquidity and capital. These guidelines present some shocks associated with the risk factors. Banks are required to conduct stress test on a quarterly basis and the result should be reported to Bank Supervision Department. These shocks are:

Credit Risk

Increase in the level of non-performing loan has adverse impact in the capital and earnings of the bank. When NPL level goes up, additional provision requirements has an adverse impact on the bank's profit and capital adequacy ratio. Presented below are the scenarios that should be studied in the credit risk stress test. NRB has developed the formats for analysis and reporting. Banks are required to study the relationship, analyze, discuss and report to NRB.

Credit Risks stress tests include the study of what happens if;

- Certain Percentage of performing loans deteriorated to substandard.
- Certain Percentage of Substandard loans deteriorated to doubtful loans.
- Certain Percentage of Doubtful loans deteriorated to loss loans.

- All NPLs under substandard category downgraded to doubtful.
- All NPLs under doubtful category downgraded to loss.
- Certain Percentage of performing loan of Real Estate & Housing sector loan directly downgraded to Doubtful category of NPLs.
- Certain Percentage of performing loan of Real Estate & Housing sector loan directly downgraded to Loss category of NPLs.
- Large exposures down graded:
  From Performing to Substandard.
  From Performing to Loss.

Market Risk

Market risk shock tries to study the relationship between change in the market risk factor and the bank's capital position. Bank's capital position may vary, when there is a change in the interest rate, equity prices and exchange rates. There are various tools to evaluate the relationship of these variables. But at minimum, banks are required to study, discuss and report on;

Interest Rate Shocks
  What happens if, there is a change in market interest rate.
Exchange Rate Shocks
  What happens if, there is a change in exchange rate.
Equity Price Shocks
  What happens if there is an adverse movement in the prices of equity exposures.

Liquidity Risk

Liquidity risk stress test assesses the banks 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, and money at call and bank's investment in government securities. On the other hand, liquid liabilities are deposits, borrowing and payables. Bank's are required to maintain minimum level of liquidity to meet their day to day obligation.
Banks may introduce advanced models or forecasting tools for liquidity risk analysis according to the nature, size and complexities of their business. But at minimum, banks are required to conduct stress test and report to NRB developing the scenarios:

What happens if?
i) Withdrawal of deposits in percentage for number of days.
ii) Deposits withdraw: No. of top depositors.

<u>Reporting Requirements</u>

Banks are required to conduct stress test on a regular basis. Results of the stress tests should be discussed in the board and senior management level. Bank Supervision Department has developed a spreadsheet for simple sensitivity tests. At minimum, the result of the spreadsheet should be reported to "Offsite Division, Bank Supervision Department" on a quarterly basis within 30 days of every quarter end. These reporting should be based on the standard assumptions made in the spreadsheet. Moreover banks can change the assumptions to analyze and study the relationship of the variable for their own internal purpose. Banks are encouraged to develop their own scenarios and use advanced techniques for stress testing based on the nature, size and complexity of the business. An example of stress test is included in the annexure.

Stress Testing

An Example

Credit Risk Stress Tests

Given Information

Total Loan: Rs. 42830 million.
Pass Loan: Rs. 42536 million.
Restructure/Reshedule Loan: Rs. 12 million.
Substandard Loan: Rs. 84 million.
Doubtful Loan: Rs. 8 million.
Total NPL: Rs. 294 million.
NPL in Percentage: 0.69
Real Estate Loan: Rs. 10640 million.
1st Large Exposure Loan (Performing): Rs. 944 million.
2nd Large Exposure Loan (Performing): Rs. 912 million.
Capital Fund: Rs. 5908 million.
Total Risk Weighted Exposure: Rs. 57319 million.
Capital Adequacy Ratio (CAR in %): 10.31

Find out:

1. What happens if certain percentage (5%, 10% & 15%) of performing loans deteriorated to substandard?
2. What happens if certain percentage (5%, 10% & 15%) of substandard loans deteriorated to doubtful loans?
3. What happens if certain percentage (5%, 10% & 15%) of doubtful loans deteriorated to loss loans?
4. What happens if certain percentage (5%, 10% & 15%) of performing loans deteriorated to loss loans?
5. What happens if all NPLs under substandard category downgraded to doubtful?
6. What happens if all NPLs under doubtful category downgraded to Loss?
7. What happens if certain percentage (5%, 10% & 15%) of performing loan of Real Estate loan downgraded to substandard category of NPLs?
8. What happens if certain percentage (5%, 10% & 15%) of performing loan of Real Estate loan directly downgraded to Loss category of NPLs?
9. What happens if large performing exposures (Top 5 big borrower) downgraded to substandard?

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

Magnitude of Shock:	***5%***	***10%***	***15%***
Increase in Provision	*42536 x 0.05 x 0.24 = 510*	*42536 x 0.1 x 0.24 = 1021*	*42536 x 0.15 x 0.24 =1531*
Revised Capital Fund	*5908 - 510 = 5398*	*5908 - 1021 = 4887*	*5908 - 1531 = 4377*
Revised Risk Weighted Exposure	*57319 - 510 = 56809*	*57319 - 1021 = 56298*	*57319 - 1531 = 55788*
Revised CAR	***9.50***	***8.68***	***7.85***
Pre Shock CAR	***10.31***	***10.31***	***10.31***

2. 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 0.24 = 1*	*84 x 0.10 x 0.24 = 2*	*84 x 0.15 x 0.24 = 3*
Revised Capital Fund	*5908 -1 = 5907*	*5908 - 2 = 5906*	*5908 - 3 = 5905*
Revised Risk Weighted Exposure	*57319 - 1 = 57318*	*57319 - 2 = 57317*	*57319 - 3 = 57316*
Revised CAR	***10.31***	***10.31***	***10.31***
Pre Shock CAR	***10.31***	***10.31***	***10.31***

3. **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*
Revised Capital Fund	*5908 - .20 = 5907.80*	*5908 - .40 = 5907.60*	*5908 - .60 = 5907.40*
Revised Risk Weighted Exposure	*57319 - .20 = 57318.80*	*57319 - .40 = 57318.60*	*57319 - .60 = 57318.40*
Revised CAR	***10.31***	***10.31***	***10.31***
Pre Shock CAR	***10.31***	***10.31***	***10.31***

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

Magnitude of Shock:	***5%***	***10%***	***15%***
Increase in Provision	*42536 x 0.05 x 0.99 = 2106*	*42536 x 0.1 x 0.99 = 4211*	*42536 x 0.15 x 0.99 = 6317*
Revised Capital Fund	*5908 - 2106 = 3802*	*5908 - 4211 = 1697*	*5908 - 6317 = -409*
Revised Risk Weighted Exposure	*57319 - 2106 = 55213*	*57319 - 4211 = 53108*	*57319 - 6317 = 51002*
Revised CAR	***6.89***	***3.20***	***-0.80***
Pre Shock CAR	***10.31***	***10.31***	***10.31***

5. **What happens if all NPLs under substandard category downgraded to doubtful?**

Increase in Provision	*84 x 0.25 = 21*
Revised Capital Fund	*5908 - 21 = 5887*
Revised Risk Weighted Exposure	*57319 - 21 = 57298*
Revised CAR	***10.27***
Pre Shock CAR	***10.31***

6. **What happens if all NPLs under doubtful category downgraded to Loss?**

Increase in Provision	*8 x 0.50 = 4*
Revised Capital Fund	*5908 - 4 = 5904*
Revised Risk Weighted Exposure	*57319 - 4 = 57315*
Revised CAR	***10.30***
Pre Shock CAR	***10.31***

7. **What happens if certain percentage (5%, 10% & 15%) of performing loan of Real Estate Loan downgraded to substandard category of NPLs?**

Magnitude of Shock:	***5%***	***10%***	***15%***
Increase in Provision	*10640x 0.05 x 0.24 = 128*	*10640x 0.10 x .24 = 255*	*10640 x 0.15 x .24 = 383*
Revised Capital Fund	*5908 - 128 = 5780*	*5908 - 255 = 5653*	*5908 - 383 = 5525*
Revised Risk Weighted Exposure	*57319 - 128 = 57191*	*57319 - 255 = 57064*	*57319 - 383 = 56936*
Revised CAR	***10.11***	***9.91***	***9.70***
Pre Shock CAR	***10.31***	***10.31***	***10.31***

8. What happens if certain percentage (5%, 10% & 15%) of performing loan of Real Estate Loan directly downgraded to Loss category of NPLs?

Magnitude of Shock:	***5%***	***10%***	***15%***
Increase in Provision	*10640x 0.05 x 0.99 = 527*	*10640x 0.10 x .99 = 1053*	*10640 x 0.15 x .99 = 1580*
Revised Capital Fund	*5908 - 527 = 5381*	*5908 - 1053 = 4855*	*5908 - 1580 = 4328*
Revised Risk Weighted Exposure	*57319 - 527 = 56792*	*57319 - 1053 = 56266*	*57319 - 1580 = 55739*
Revised CAR	***9.48***	***8.63***	***7.76***
Pre Shock CAR	***10.31***	***10.31***	***10.31***

9. What happens if top 2 large performing exposures downgraded to substandard?

Increase in Provision	*(944+913)x 0.24 = 446*
Revised Capital Fund	*5908 - 446 = 5462*
Revised Risk Weighted Exposure	*57319 - 446 = 56873*
Revised CAR	***9.60***
Pre Shock CAR	***10.31***

Market Risk Stress Tests

Given Information

Deposits (Excluding Fixed & Current): Rs. Rs. 29316 million.
Loans & Advances (Excluding Term Loan): Rs. 36406 million.
Net Open Position: Rs. 134 million:
Investment in Shares & Debentures: Rs. 73 million.

Interest Rate Shocks

What happens if, there is a 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	*5908 - 24 = 5884*	*5908 - 34 = 5874*	*5908 - 42 = 5866*
Revised CAR	***10.26***	***10.24***	***10.22***
Pre Shock CAR	***10.31***	***10.31***	***10.31***

What happens if, there is a decreased 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	*5908 - 30 = 5878*	*5908 - 46 = 5862*	*5908 - 61 = 5847*
Revised CAR	***10.25***	***10.23***	***10.20***
Pre Shock CAR	***10.31***	***10.31***	***10.31***

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	*5908 - 27 = 5881*
Revised CAR	***10.26***
Pre Shock CAR	***10.31***

Equity Price Shocks

What happens if prices of equity fall by 50 percent?

Impact(-) in Profit	*73 x 0.50 = 36*
Revised Capital Fund	*5908 - 36 = 5872*
Revised Risk Weighted Exposure	*57319 - 36 = 57283*
Revised CAR	***10.25***
Pre Shock CAR	***10.31***

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.
Net Liquidity Ratio: 23.08
Deposit amount of top 2 Institutional Depositor: Rs. 4568 and Rs. 2802 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.

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%	8998	Liquid
2nd	11876	96.00%	47438	1.99%	48860	6.90%	8974	Liquid
3rd	11876	99.20%	47438	2.97%	48860	16.21%	5270	Liquid
4th	11876	99.84%	47438	3.94%	48860	24.59%	1712	Liquid
5th	11876	99.968%	47438	4.90%	48860	32.13%	-1502	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	*5908*	*5908*	*5908*
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	***10.22***	***9.81***	***9.42***
Pre Shock CAR	***10.31***	***10.31***	***10.31***

iii) 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	*5908*
Additional Risk Weighted Exposure	*48860 x 0.11 = 5375*
Revised Risk Weighted Exposure	*57319 + 5375 = 62694*
Revised CAR	***9.42***
Pre Shock CAR	***10.31***

iv) 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	*5908*
Additional Risk Weighted Exposure	*48860 x 0 = 0*
Revised Risk Weighted Exposure	*57319 + 0 = 57319*
Revised CAR	***10.31***
Pre Shock CAR	***10.31***

v) 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	*5908*
Revised Capital Fund	*5908 - 80 = 5828*
Additional Risk Weighted Exposure	*48860 x 0 = 0*
Revised Risk Weighted Exposure	*57319 + 0 -16 = 57303*
Revised CAR	***10.17***
Pre Shock CAR	***10.31***