

Bangladesh Bank
Department of Offsite Supervision

GUIDELINES
ON
STRESS TESTING



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Foreword

It is of vital importance to understand and appreciate the risks the banking industry is exposed to so that soundness and sustainability of the industry can be ensured. Earlier, Bangladesh Bank has issued core risk management guidelines so that banks can develop a sound risk management practice while carrying out their day-to-day activities.

In the regulatory and supervisory sphere, the Central Bank's activities in banking supervision have often been determined by exogenous elements deriving mainly from the changes in the structure and scope; activities and risks that the financial sector is facing and the changes in regulatory standards occurring internationally. The recent financial turmoil in the US financial system has augmented the importance of establishing more developed risk management regime in the financial industry. Present risk management culture based on normal business conditions and historical trends is not enough to cope with the disorders that have happened in the financial systems globally. This required an appropriate response in the regulatory and supervisory activities of the Central Bank.

Financial institutions around the world are increasingly employing stress testing to determine the impact on the financial institution under a set of exceptional, but plausible assumptions through a series of battery of tests. Bangladesh Bank has designed a stress testing framework for banks and FIs to proactively manage risks in line with international best practices. Keeping in view with the divergence of skill levels and available resources among banks and FIs, a modest beginning focused with simple sensitivity and scenario analysis considering only credit risk and market risk is suggested in the Stress Testing Guideline, eventually to develop into a more comprehensive approach.

All banks and FIs are expected to carry out stress testing on half-yearly basis i.e. on June 30 and December 31 each year with their first stress testing exercise to be based on 30-06-2010. A training program will be initiated shortly for the relevant staff to ensure smooth implementation of the guidelines.

I would like to appreciate the role of those officers who were involved in this exercise. I also express my gratitude to the honourable Governor, Deputy Governor and Executive Director for their valuable guidance and support in this regard.

Sd/-

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Guidelines on Stress Testing

1. Stress Testing:

- Extreme market movements or crises in the past reveal the inadequacy of managing risks based only on normal business conditions and historical trends. In particular, crises in the 1990's (e.g. Asian Crisis) and current financial turmoil have augmented the importance of better understanding of potential vulnerabilities in the financial system and the measures to assess these vulnerabilities for both the regulators and the bankers. The regulators and managers of the financial system around the globe have developed a number of quantitative techniques to assess the potential risks to the individual institutions as well as financial system. A range of quantitative techniques that could serve the purpose is widely known as 'stress testing'. IMF and Basel Committee on banking supervision have also suggested for conducting stress tests on the financial sector.
- Stress testing is a simulation technique, which are used to determine the reactions of different financial institutions under a set of exceptional, but plausible assumptions through a series of battery of tests. At institutional level, stress testing techniques provide a way to quantify the impact of changes in a number of risk factors on the assets and liabilities portfolio of the institution. For instance, a **portfolio stress test** makes a rough estimate of the value of portfolio using a set of exceptional but plausible events in abnormal markets. However, one of the limitations of this technique is that stress tests do not account for the probability of occurrence of these exceptional events. For this purpose, other techniques, for example VAR (value at risks) models etc, are used to supplement the stress tests. These tests help in managing risk within a financial institution to ensure optimum allocation of capital across its risk profile.
- At the system level, stress tests are primarily designed to quantify the impact of possible changes in economic environment on the financial system. The system level stress tests also complement the institutional level stress testing by providing information about the sensitivity of the overall financial system to a number of risk factors. These tests help the regulators to identify structural vulnerabilities and the overall risk exposure that could cause disruption of financial markets. Its prominence is on potential externalities and market failures.

2. Techniques for Stress Testing:

a) Simple Sensitivity Analysis (single factor tests) measures the change in the value of portfolio for shocks of various degrees to different independent risk factors while the underlying relationships among the risk factors are not considered. For example, the shock might be the adverse movement of interest rate by 100 basis points and 200 basis points. Its impact will be measured only on the dependent variable i.e. capital in this case, while the impact of this change in interest rate on NPLs or exchange rate or any other risk factor is not considered.

b) Scenario Analysis encompasses the situation where a change in one risk factor affects a number of other risk factors or there is a simultaneous move in a group of risk factors. Scenarios can be designed to encompass both movements in a group of risk factors and the changes in the underlying relationships between these variables (for example correlations and volatilities). Stress testing can be based on the historical scenarios, a backward looking approach, or the hypothetical scenario, a forward-looking approach.

c) Extreme Value/ Maximum Shock Scenario measures the change in the risk factor in the worst-case scenario, i.e. the level of shock which entirely wipes out the capital.

3. Framework for Regular Stress Testing:

The stress-testing framework involves the scope of the risks covered and the process/procedure to carry out the stress test. This framework should be flexible enough to adopt advanced models for stress testing. It involves:

- A well constituted organizational structure defining clearly the roles and responsibilities of the persons involved in the exercise. Preferably, it should be the part of the risk management functions of the bank/FI. The persons involved should be independent from those who are actually involved in the risk taking and should directly report the results to the senior management.
- Defining the coverage and identifying the data required and available.
- Identifying, analyzing and proper recording of the assumptions used for stress testing.
- Calibrating the scenarios or shocks applied to the data and interpreting the results.
- An effective management information system that ensures flow of information to the senior management to take proper measures to avoid certain extreme conditions.
- Setting the specific trigger points to meet the benchmarks/standards set by Bangladesh Bank.
- Ensuring a mechanism for an ongoing review of the results of the stress test exercise and reflecting in the policies and limits set by management and board of directors.
- Taking this stress test as a starting point and developing in-house stress test model to assess the bank/FI's specific risks

4. Scope of Stress Test :

As a starting point the scope of the stress test is limited to **simple sensitivity analysis**. Five different risk factors namely; interest rate, forced sale value of collateral, non-performing loans (NPLs), stock prices and foreign exchange rate have been identified and used for the stress testing. Moreover, the liquidity position of the institutions has also been stressed separately. Though the decision of creating different scenarios for stress testing is a difficult one, however, to start with, certain levels of shocks to the individual risk components have been specified considering the historical as well as hypothetical movement in the risk factors.

- Stress test shall be carried out assuming three different hypothetical scenarios:
- ❖ **Minor Level Shocks:** These represent small shocks to the risk factors. The level for different risk factors can, however, vary.
- ❖ **Moderate Level Shocks:** It envisages medium level of shocks and the level is defined in each risk factor separately.
- ❖ **Major Level Shocks:** It involves big shocks to all the risk factors and is also defined separately for each risk factor.
- **Assumptions behind each Scenario:** The stress test at this stage is only a single factor sensitivity analysis. Each of the five risk factors has been given shocks of three different levels. The magnitude of shock has been defined separately for each risk factor for all the three levels of shocks.

5. Methodology and Calibration of Shocks :

➤ **Credit Risk :**

The stress test for credit risk assesses the impact of increase in the level of non-performing loans of the bank/FI. This involves six types of shocks:

- The first deals with the **increase in the NPLs** and the respective provisioning. The three scenarios shall explain the impact of 1%, 2% and 3% of the total performing loans directly downgraded to bad/loss category having 100% provisioning requirement.
- The second deals with the negative **shift in the NPLs categories** and hence the increase in respective provisioning. The three scenarios shall explain the impact of 50%, 80% and 100% downward shift in the NPLs categories. For example, for the first level of shock 50% of the SMA shall be categorized under substandard, 50% of the substandard shall be categorized under doubtful and 50% of the doubtful shall be added to the bad/loss category.
- The third deals with the **fall in the forced sale value (FSV) of mortgaged collateral**. The forced sale values of the collateral shall be given shocks of 10%, 20% and 40% decline in the forced sale value of mortgaged collateral for all the three scenarios respectively.
- The fourth deals with the **increase of the NPLs in particular 1 or 2 sector i.e. garments & Textiles** and the respective provisioning. The three scenarios shall explain the impact of 5%, 7.5% and 10% performing loans of particular 1 or 2 sectors directly downgraded to bad/loss category having 100% provisioning requirement.
- The fifth deals with the **increase of the NPLs due to default of Top 10 large borrowers** and the respective provisioning. The three scenarios shall explain the impact of 5%, 7.5% and 10% performing loans of Top 10 large borrowers directly downgraded to bad/loss category having 100% provisioning requirement.
- The sixth deals with **extreme events** in which due to increase in the certain percentage of NPLs, the whole capital position of a bank will be wiped out to offset the increased amount of provision due to cover respective loan losses. The forced sale value of the collaterals and tax-adjusted impact of the additional required provision (if any) will be calibrated in the CAR for the each scenario under all categories.

➤ Interest Rate Risk:

Interest rate risk is the potential that the value of the **on-balance sheet** and the **off-balance sheet** positions of the bank/DFI would be negatively affected with the change in the interest rates. The vulnerability of an institution towards the adverse movements of the interest rate can be gauged by using **duration GAP analysis**.

The banks and FIs shall follow the following steps in carrying out the interest rate stress tests:

- Estimate the market value of all on-balance sheet rate sensitive assets and liabilities of the bank/DFI to arrive at market value of equity
- Calculate the durations of each class of asset and the liability of the on-balance sheet portfolio. Arrive at the aggregate weighted average duration of assets and liabilities
- Calculate the duration GAP by subtracting aggregate duration of liabilities from that of assets.
- Estimate the changes in the economic value of equity due to change in interest rates on on-balance sheet positions along the three interest rate changes.
- Calculate surplus/(deficit) on off-balance sheet items under the assumption of three different interest rate changes i.e. 1%, 2%, and 3%
- Estimate the impact of the net change (both for on-balance sheet and off-balance sheet) in the market value of equity on the capital adequacy ratio (CAR).

Market value of the asset or liability shall be assessed by calculating its present value discounted at the prevailing interest rate. The outstanding balances of the assets and Liabilities should be taken along with their respective maturity or repricing period, whichever is earlier.

❖ Duration GAP & Price Sensitivity

Duration is the measure of a portfolio's price sensitivity to changes in interest rates. Longer the duration, larger the changes in the price for a given change in the interest rates. Larger the coupon, lower would be the duration and smaller would be the change in the price for a given change in the interest rates. The duration is measured as:

$$D = \frac{\sum_{t=1}^n \frac{t * CF_t}{(1 + YTM)^t}}{\sum_{t=1}^n \frac{CF_t}{(1 + YTM)^t}}$$

$$= \frac{\sum_{t=1}^n \frac{t * CF_t}{(1 + YTM)^t}}{Pv(Security)}$$

Where

CF_t = cash flow at time t,

t = the number of periods of time until the cash flow payment,

YTM = the yield to maturity¹ of the security generating the cash flow, and

n = the number of cash flows.

Examples:

- 1) The duration of a bond of Tk. 100 with the maturity of 3 years, 10% coupon and the effective YTM at 8% will be calculated as follows:

$$D = \frac{\frac{10 \times 1}{(1.08)} + \frac{10 \times 2}{(1.08)^2} + \frac{10 \times 3}{(1.08)^3} + \frac{100 \times 3}{(1.08)^3}}{\frac{10}{(1.08)} + \frac{10}{(1.08)^2} + \frac{10}{(1.08)^3} + \frac{100}{(1.08)^3}} = \frac{288.38}{105.15} = 2.74 \text{ years}$$

- 2) The duration of the same bond if the YTM declines to 4%:

$$D = \frac{\frac{10 \times 1}{(1.04)} + \frac{10 \times 2}{(1.04)^2} + \frac{10 \times 3}{(1.04)^3} + \frac{100 \times 3}{(1.04)^3}}{\frac{10}{(1.04)} + \frac{10}{(1.04)^2} + \frac{10}{(1.04)^3} + \frac{100}{(1.04)^3}} = \frac{321.48}{116.65} = 2.76 \text{ years}$$

¹The yield to maturity for zero coupon bonds and for other interest earning assets and liabilities would be the current market interest rates thereon.

- The duration GAP is measured by comparing the weighted average duration of assets with the weighted average duration of liabilities (leverage-adjusted)². The weighted average duration of assets and liabilities is calculated as follows:

$$\text{Weighted Average Duration of Assets (DA)} = \sum_a^n W_a D_a$$

$$\text{Weighted Average Duration of Liabilities (DL)} = \sum_l^m W_l D_l$$

Where

W_a = market value of the asset "a" divided by the market value of all the assets

W_l = market value of the liability "l" divided by the market value of all the liabilities

D_a = duration of the asset "a"

D_l = duration of the liability "l"

n = total number of assets

m = total number of liabilities

- The duration GAP indicates how the market value of equity (MVE) of a bank/FI will change with a certain change in interest rates. If the weighted average duration of assets exceeds the weighted average duration of liabilities (leverage-adjusted), the duration GAP is said to be positive. A positive duration gap signifies that the assets are relatively more interest rate sensitive than liabilities. Hence if the interest rates rise, the value of assets will fall proportionately more than the value of liabilities and the market value of equity will fall accordingly and vice versa. Duration Gap will be calculated as under:

$$\text{DGAP} = \text{DA} - \frac{(\text{MVL})}{(\text{MVA})} \times \text{DL}$$

The change in market value of equity shall be calculated as:

$$\Delta \text{MVE} \cong (-\text{DGAP}) \times \frac{\Delta i}{(1+y)} \times \text{Total Assets}$$

Δi = The change in the interest rate

y = The effective yield to maturity of all the assets

² The leverage adjustment takes into account the existence of equity as a means of financing assets.

- The impact of interest rate change on interest bearing off-balance sheet contracts shall be separately calculated. As a first step, the actual market price of each contract shall be determined which should represent the actual price of the contract if sold immediately. The second step involves calculating the market price again by marking to market each contract separately assuming a change in interest rate. The difference between the two market prices would determine the amount of revaluation surplus or deficit. The revaluation surplus would arise if the actual market price of the contract is less than the price calculated after assuming a change in the interest rate and revaluation deficit would result in, if otherwise. The revaluation surplus/deficit arising due to the change in the interest rates of the off-balance sheet contracts should be subtracted/ added to the fall in market value of equity derived by the DGAP approach to arrive at the net change in the market value of equity.
- The impact of this net change in the market value of equity will then be calibrated in the CAR. The tax-adjusted impact of this net fall (if any) in the MVE shall be adjusted from the regulatory capital and the risk-weighted assets and the revised CAR shall be calculated under each of the above scenarios.

➤ **Exchange Rate Risk :**

- The stress test for exchange rate assesses the impact of change in exchange rate on the value of equity. To assess foreign exchange risk the overall net open position of the bank/FI including the on-balance sheet and off-balance sheet exposures shall be charged by the weightage of 5%, 10% and 15% for minor, moderate and major levels respectively. The overall net open position is measured by aggregating the sum of net short positions or the sum of net long positions; whichever is greater. For example, the bank may have net long position of Tk.500 million in Yen, Euro and USD and the net short position in GBP and Australian dollar of Tk.600 million. The total exposure will be the greater of the two i.e. sum of the short positions of Tk.600 million. The impact of the respective shocks will have to be calibrated in terms of the CAR. The tax-adjusted loss if any arising from the shocked position will be adjusted from the capital. The revised CAR will then be calculated after adjusting total loss from the risk-weighted assets of the bank/FI.

➤ **Equity Price Risk :**

The stress test for equity price risk assesses the impact of the fall in the stock market index. Appropriate shocks will have to be absorbed to the respective securities if the current market value of all the on balance sheet and off balance sheet securities listed on the stock exchanges including shares, NIT units, mutual funds etc falls at the rate of 10%, 20% and 40% respectively. The impact of resultant loss will be calibrated in the CAR.

➤ **Liquidity Risk :**

The stress test for liquidity risk evaluates the resilience of the banks towards the fall in liquid liabilities. The ratio “liquid assets to liquid liabilities” shall be calculated before and after the application of shocks by dividing the liquid assets with liquid liabilities. Liquid assets are the assets that are easily turned into cash without the threat of loss. They include cash, balances with Bangladesh Bank and balances with banks, call money lending, lending under repo and investment in government securities. Liquid liabilities include the deposits and the borrowings. Appropriate shocks will have to be absorbed to the liquid liabilities if the current liquidity position falls at the rate of 10%, 20% and 30% respectively. The ratio of liquid assets to liquid liabilities shall be re-calculated under each scenario.

Comprehensive Example

Suppose ABC bank has the following positions as of end of Dec-09:

1. Cash of Tk. 80M.
2. 3-years Govt. Treasury Bonds (GTBs) of Tk.1,000M @ 6% coupon with 2 year remaining maturity held in Held-for-Trading (HFT) portfolio. The current yield to maturity (YTM) is 7%.
3. 5-years GTBs of Tk.500M @ 7% coupon with 2 year remaining maturity held in Available-for-Sale portfolio (AFS). The current YTM is 8%.
4. 8% GTBs of 10-years maturity of Tk.2,000M, categorized under Held to Maturity portfolio of the bank's investment. The bonds have the remaining maturity of 9 years.
5. Investment of Tk.100m in listed shares held under trading portfolio.
6. 3-year commercial loan of Tk.6,000M @ 10%. The remaining maturity of this loan is 3 years. Interest payments are on quarterly basis and principal is payable on maturity.
7. The bank has NPLs of Tk.200M of which 10%, 20% and 60% are classified as substandard, doubtful and loss respectively against which 20%, 50% and 100% provisioning is required.

	SMA	Substandard	Doubtful	Loss
NPLs	20	20	40	120
FSV of Mortgaged Collateral	-	10	14	20
Provision	0	2	13	100

8. Non-earning assets of Tk.320M.
9. Saving deposits of Tk.6,500M @ 3%. The bank revises its rates on saving deposits on quarterly basis.
10. A 3-year term deposit of Tk.1,000M @ 5% which is repriced on half yearly basis. Current interest rate is 6%.
11. Current deposits of Tk.1,000M.
12. A 3-month borrowing of Tk.500M @ 4% from financial institutions.
13. Net open position in both on-balance sheet and off-balance sheet foreign exchange position is long by Tk.150M.
14. Total RWA are Tk.6,420M and the total regulatory capital Tk.800M.
15. The tax rate is 42.5%.
16. Assumptions:
 - All the deposits including term deposits are considered as liquid.
 - Loan to garments and Textile sectors is Tk.1,200M.
 - Total Loan to 10 large borrowers is Tk.1,000M.
 - The bank has marked to market its interest bearing off-balance sheet positions and/or derivatives and arrived at a revaluation deficit of Tk.5m, Tk.10m and Tk.25m for the rise in interest rate by 1%, 2% and 3% respectively.
 - Forward purchase of shares of Tk.80M (not mandatory).

Interest Rate Shock:

Interest rate risk shall be assessed using simple duration analysis. Duration for all the assets and liabilities shall be calculated using the formula already described. Given below is the table showing the duration of the balance sheet ³.

Balance Sheet Duration					Tk. in million	
	Book Value	Coupon	Repricing Period in years	Yield to Maturity	Market Value	Duration
Assets :						
Cash	80	-	-	-	80	-
3 year GTBs (Held for Trading)	1,000	6.00%	2.00	7.00%	982	1.91
5 year GTBs (Available for sale)	500	7.00%	2.00	8.00%	491	1.90
10 year GTBs (held to maturity)	2,000	8.00%	9.00	9.00%	1,878	6.49
Investment in shares (Held for Trading)	100	-	-	-	100	-
3 year Commercial Loan	6,000	10.00%	3.00	10.00%	6,000	2.63
Non Earning Assets	320	-	-	-	320	-
Total Assets :	10,000	-	-	8.90%	9,851	3.12
Liabilities :						
Current Deposits	1,000	-	-	-	1,000	-
Saving Deposits	6,500	3.00	0.25	3.00%	6,500	0.25
3 years Term Deposit	1,000	5.00%	0.50	6.00%	995	0.50
3 months Borrowing	500	4.00%	0.25	4.00%	500	0.25
Total Liabilities :	9,000	-	-	3.05%	8,995	0.25
Capital	1,000	-	-	-	856	-
Total Liabilities and Equities :	10,000	-	-	-	9,851	-

The weighted average duration of assets shall be calculated as follows:

$$DA = 1.91 \times (982/9,851) + 1.90 \times (491/9,851) + 6.49 \times (1,878/9,851) + 2.63 \times (6,000/9,851) = 3.122$$

Similarly the weighted average duration of liabilities (leverage-adjusted) shall be calculated as follows:

$$DL = 0.25 \times (6,500/8,995) + 0.50 \times (995/8,995) + 0.25 \times (500/8,995) = 0.250$$

$$\frac{(MVL)}{(MVA)} \times DL = 0.250 \times (8,995/9,851) = 0.228$$

$$\text{Duration GAP} = 3.122 - 0.228 = 2.894 \text{ years}$$

³ For simplicity the bank/FI can calculate the duration for their loans and deposits portfolio by taking into account the effective weighted yield to maturity on the basis of the repricing buckets. In addition, primarily the bank/FI can use the highest maturity up to 5 years though the remaining maturity of assets/liabilities exceeds more than 5 years.

Here the duration of assets exceeds the duration of liabilities, which signifies that assets are more price sensitive than that of liabilities and certain rise in interest rate would cause greater decrease in the value of assets leading to decrease in the market value of equity. A 1-percentage point rise in interest rate would cause a fall in its market value of equity by:

$$\Delta MVE \cong (-DGAP) \times \frac{\Delta i}{(1+y)} \times \text{Total Assets}$$

$$\Delta MVE \cong -2.894 \times (0.01 / (1+0.089)) \times 9851 = -261.9M$$

For simplicity, this shock represents a parallel upward shift in the yield curve.

Now the impact shall be calibrated in CAR as follows:

<i>Fall in MVE-(on-balance sheet)</i>	<i>=261.8</i>
<i>Net fall in MVE-(on-balance sheet off-balance sheet)</i>	<i>= 266.8</i>
<i>Tax adjusted loss</i>	<i>= 266.8X(1-0.425)=153.4</i>
<i>Revised Regulatory Capital</i>	<i>= 800-153.4 =646.6</i>
<i>Revised risk weighted assets</i>	<i>= 6,420-153.4 = 6266.6</i>
<i>Revised CAR (%)</i>	<i>=646.6/6266.6=10.32</i>
<i>Fall in CAR (%age points)</i>	<i>12.46 -10.32=2.14</i>

The change in the MVE shall also be assessed for 2 and 3 percentage point rise in interest rates.

Exchange Rate Shock:

The impact of change in the exchange rate shall be determined by the following procedure:

For the first level shock of 5% adverse movement in exchange rate:

<i>Net on-balance sheet and off-balance sheet currency exposure</i>	<i>= Tk.150m</i>
<i>Exchange rate loss on 5% change</i>	<i>= 150 × 0.05 = 7.5</i>
<i>Tax adjusted loss</i>	<i>= 7.5 × (1-0.425) = 4.3</i>
<i>Revised Capital</i>	<i>= 800-4.3 = 795.7</i>
<i>Revised risk weighted assets</i>	<i>= 6420-4.3 = 6415.7</i>
<i>Revised CAR (%)</i>	<i>= 795.7 / 6415.7 = 12.4</i>
<i>Fall in CAR (% age points)</i>	<i>= 12.46-12.4 = 0.06</i>

The same procedure shall be followed for 10% and 15% shocks to exchange rate.

Credit Shock:

Of the six kinds of credit shocks, the impact of the increase in **NPLs** shall be accounted for as follows:

1. Increase in NPLs:

1% performing loan directly downgraded to bad/loss category:

Total Loan	=Tk.6,000M
Total Performing Loan	=Tk.5,800M
Total NPLs	= Tk.200M
NPLs to Loans (%)	3.3
Increase in NPLs	= 5,800 × 0.01 =58
Increase in Provisions (after adjustment of eligible securities; if any)	= 58-0=58 ×1.0 = 58
Tax adjusted provision (not yet applicable)	= 58 × (1-0) = 58
Revised Capital	= 800 -58 =742
Revised risk weighted assets	= 6420- 58 = 6362
Revised CAR (%)	= 742 / 6362 = 11.66
Fall in CAR (%age points)	= 12.46-11.66 = 0.8
Revised NPLs	Tk.258 M
Revised NPLs to Loans (%)	4.3

The same procedure shall be followed for 2% and 3% performing loans directly shifted to B/L category.

2. Shift in NPLs categories:

The impact of shift in 50% NPLs to next categories with no change in total NPLs shall be accounted for as follows:

Weighted amount of provision	=10×0.2+26×0.5+100×1=115
Weighted amount of provision after Shift in Categories	=(20×0.5×0.2+10×0.5×0.2)+(10×0.5×0.5+26×0.5×0.5)+(26×0.5×1+100×1)=126
Increase in Provisions	=126-115=11
Tax adjusted provision (not yet applicable)	= 11 × (1-0) =11
Revised Capital	= 800-11 = 789
Revised risk weighted assets	= 6420- 11 = 6409
Revised CAR	= 789 /6409 = 12.31
Fall in CAR (% age points)	= 12.46-12.31 = 0.15

The same procedure shall be followed for 80% and 100% shift in the NPLs to the respective downward category.

3. Fall in FSV of Mortgaged Collateral:

The impact of 10% fall in FSV of mortgaged collateral shall be calculated as:

Total FSV of Mortgaged Collateral	= Tk.44 M
Weighted FSV of Collateral	= 10 ×0.2+14 ×0.5 + 20 × 1 = 29
Fall in the FSV of Collateral	= 29 × 0.1 = 2.9
Tax adjusted provision	= 2.9 × (1-0) = 2.9
Revised Capital	= 800 – 2.9 = 797.1
Revised risk weighted assets	= 6,420 – 2.9 = 6,417.1
Revised CAR	= 797.1 / 6,417.1 = 12.42
Fall in CAR (% age points)	= 12.46 - 12.42 = 0.04

The same procedure shall be followed for 20% and 40% shocks to FSV of collateral.

4. Increase of NPLs in particular 1 or 2 sectors:

The impact of 5% performing loan of Garments & Textile Sectors directly downgraded to bad/loss category:

Total Loan in Garments & Textile Sectors	=Tk. 1,200 M
Increase in NPLS under B/L category	=Tk.60
Increase in Provisions (after adjustment of value of eligible securities)	=60
Tax adjusted provision	=60x (1-0) =60
Revised Capital	= 800-60 = 740.0
Revised risk weighted assets	= 6,420- 60 = 6,360
Revised CAR	= 740 / 6,360 = 11.64
Fall in CAR (% age points)	= 12.46-11.64 =0.82

The same procedure shall be followed for 7.5% and 10% increase in the NPLs under B/L category in Garments & Textile Sectors.

5. Increase of NPLs due to default of Top 10 large loan borrowers:

The impact of 5% performing loan of Top 10 large borrowers directly downgraded to bad/loss category:

Total Loan to Top 10 large borrowers	=Tk. 1000 M
Increase in NPLS under B/L category	=Tk.50
Increase in Provisions (after adjustment of value of eligible securities; if any)	=50
Tax adjusted provision	=150x (1-0) =50
Revised Capital	= 800-50 = 750
Revised risk weighted assets	= 6,420- 50 = 6,370
Revised CAR	= 750 / 6,370 = 11.77
Fall in CAR (% age points)	= 12.46-11.77 =0.69

The same procedure shall be followed for 7.5% and 10% performing loan of 10 large borrowers directly downgraded to B/L category.

6. Increase in NPLs up to that position in which whole capital will be wiped out:

Total NPLs	= Tk.200 M
NPL/Total Loan (%)	200/6000 =3.3
Total Capital	=Tk. 800M
Increase in NPL	= Tk. 800M
Increase in Provision	= Tk. 800 M
Revised Capital	= 800-800=0
Revised risk weighted assets	= 6,420 - 800 = Tk.5620
Revised CAR	= 0
Fall in CAR (% age points)	= 12.46 - 0 =12.46
Revised NPL	Tk.1000
Revised NPL (%)	1000/6000 =16.7

Equity Price Shock:

The impact of 10% fall in stock market prices shall be calculated as:

<i>Total exposure in stock market</i>	= Tk.180M
<i>Fall in the stock prices</i>	= $180 \times 0.1 = 18$
<i>Tax adjusted loss</i>	= $18 \times (1-0.425) = 10.4$
<i>Revised Capital</i>	= $800 - 10.4 = 789.6$
<i>Revised risk weighted assets</i>	= $6,420 - 10.4 = 6409.6$
<i>Revised CAR</i>	= $789.6 / 6,409.6 = 12.32$
<i>Fall in CAR (% age points)</i>	= $12.46 - 10.32 = 0.14$

The same procedure shall be followed for 20% and 40% fall in the equity prices.

Liquidity Shock:

The ratio of liquid assets to liquid liabilities after a 10% fall in the later shall be calculated as:

<i>Liquid assets (LA)</i>	= Tk.3,580M
<i>Liquid Liabilities (LL)</i>	=Tk.9,000M
<i>Liquidity Ratio (%) (LA/LL)</i>	$3,580/9,000=39.8$
<i>Fall in liquid liabilities</i>	= $9,000 \times 0.1=900$
<i>Revised Liquid Assets</i>	= $3,580-900=2,680$
<i>Revised Liquid Liabilities</i>	= $9,000-900=8,100$
<i>Revised Liquidity Ratio (%)</i>	= $2,680/8,100=33.1$

The same procedure shall be followed for 20% and 30% fall in Liquid liabilities.

The analysis has been summarized in the following format:

Stress Testing
ABC Bank
For the half year ended December 31, 2009

Tk. in million

Regulatory Capital	800	800	800
RWA	6,420	6,420	6,420
CAR (%)	12.46	12.46	12.46

1. Interest Risk –Increase in Interest Rate :

Scenario 1

Scenario 2

Scenario 3

Magnitude of Shock	1%	2%	3%
Weighted Average yield on asset (%)	8.90	8.90	8.90
Total Assets	9,851	9,851	9,851
Duration GAP	2.9	2.9	2.9
Fall in MVE (on-balance sheet)	261.8	523.6	785.4
Net fall in MVE(on- balance sheet & off-balance sheet)	266.8	533.6	805.4
Tax adjusted Loss	153.4	306.8	463.2
Revised Capital	646.6	493.2	336.8
Revised RWA	6,266.6	6,113.2	5,956.8
Revised CAR (%)	10.32	8.07	5.65

2.Exchange Rate Risk –Adverse Movement in Exchange Rate :

Magnitude of Shock	5%	10%	15%
Net Exposure in FX	150	150	150
Loss on Exchange Rate Change	7.5	15.0	22.5
Tax adjusted Loss	4.3	8.6	12.9
Revised Capital	795.7	791.4	787.1
Revised RWA	6,415.7	6,411.4	6,407.1
Revised CAR (%)	12.40	12.34	12.28

3. Credit Risk – increase in NPLs :

Magnitude of Shock	1%	2%	3%
Total Loan	6,000	6000	6000
Total Performing Loan	5,800	5800	5800
Total NPLs	200	200	200
NPLs to Loans (%)	3.3	3.3	3.3
Increase in NPLs	58	116	174
Increase in Provisions (after adjustment of eligible securities; if any)	58	116	174
Tax adjusted provision (not yet applicable)	58	116	174
Revised Capital	742	684	626
Revised risk weighted assets	6,362	6,304	6,246
Revised CAR (%)	11.66	10.85	10.02
Revised NPLs	258	316	374
Revised NPLs to Loans (%)	4.3	5.27	6.23

4. Credit Risk – Downward shift in NPLs' Categories :

Magnitude of Shock	50%	80%	100%
Weighted Amount of provision	115	115	115
Provision after shift in categories	126	131	135
Increase in provision	11	16	20
Tax adjusted provision	11	16	20
Revised Capital	789	784	780
Revised RWA	6,409	6,404	6,400
Revised CAR (%)	12.31	12.24	12.19

5. Credit Risk – Fall in the FSV of Mortgaged Collateral :

Magnitude of Shock	10%	20%	40%
Weighted Forced Sale Value of Collateral	29	29	29
Increase in provision	2.9	5.8	11.6
Tax adjusted provision	2.9	5.8	11.6
Revised Capital	797.1	794.2	788.4
Revised RWA	6,417.1	6,414.2	6,408.4
Revised CAR (%)	12.42	12.38	12.30

6. Credit Risk – Increase in NPLs' under B/L category in 1 or 2 sectors :

Magnitude of Shock	5%	7.5%	10%
Loan to Garments & Textile Sectors	1,200	1,200	1,200
Increase in NPLs	60	90	120
Increase in provision (after adjustment of value of eligible securities; if any)	60	90	120
Tax adjusted provision	60	90	120
Revised Capital	740	710	680
Revised RWA	6,360	6,330	6,300
Revised CAR (%)	11.64	11.22	10.79

7. Credit Risk – Increase in NPLs' due to Top 10 large loan borrowers :

Magnitude of Shock	5%	7.5%	10%
Loan to Top 10 large loan borrowers	1,000	1,000	1,000
Increase in NPLs	50	75	100
Increase in provision (after adjustment of value of eligible securities; if any)	50	75	100
Tax adjusted provision	50	75	100
Revised Capital	750	725	700
Revised RWA	6,370	6,345	6,320
Revised CAR (%)	11.77	11.43	11.08

8. Equity price Risk – Fall in Stock Prices :

Magnitude of Shock	10%	20%	40%
Total exposure in stock market	180	180	180
Fall in the stock prices	18	36	72
Tax adjusted loss	10.4	20.7	41.4
Revised Capital	789.6	779.6	758.6
Revised risk weighted assets	6,409.6	6,399.3	6,378.6
Revised CAR	12.32	12.18	11.89

A. Capital after one or more cumulative shocks :

Cumulative impact of Credit Shock (Aggregate of 5 types of Credit Shock)	181.9	302.8	425.6
Tax adjusted Provision	181.9	302.8	425.6
Revised Capital	618.1	497.2	374.4
Revised RWA	6,238.1	6,117.2	5,994.4
Revised CAR (%)	9.91	8.13	6.25

Cumulative impact of all shocks (Credit, Interest rate, FE and Equity prices)	474.2	887.4	1325.5
Tax adjusted Provision/Loss	350.0	638.9	943.1
Revised Capital	450.0	161.1	-143.1
Revised RWA	6,070.0	5,781.1	5,476.9
Revised CAR (%)	7.41	2.79	-2.61

i. Liquidity Shock – Fall in Liquid Liabilities :

Magnitude of Shock	10%	20%	30%
Liquid Assets	3,580	3,580	3,580
Liquid Liabilities	9,000	9,000	9,000
Liquidity Ratio (%)	39.78	39.78	39.78
Fall in Liquid Liabilities	900	1,800	2,700
Revised Liquid Liabilities	8,100	7,200	6,300
Revised Liquid Assets	2,680	1,780	880
Liquidity Ratio after shock (%)	33.09	24.72	13.97

Reporting Format:

Stress Testing
Name of the Bank:
For the half year ended on,

Balance Sheet Duration

Tk. in million

Property and Assets	Book Value	Coupon	Repricing Period in years	Yield to Maturity	Market Value	Duration
<u>Assets :</u>						
Cash						
Balance with Bangladesh Bank						
Balance with other Banks/FIs						
Money at call and short notice						
Investments (Break up required)						
Loans and Advances						
Fixed Assets						
Other Assets						
Total Assets :						
<u>Liabilities :</u>						
Borrowing from Bank/FIs						
Deposits & Other Accounts (Break up required)						
Subordinated Loans (if any)						
Liabilities against Assets subject to Finance lease (if any)						
Other Liabilities						
Total Liabilities :						
Equity						
Total Liabilities and Equities :						

Stress Testing
Name of the Bank :
For the half year ended on

Tk. in million

Regulatory Capital			
RWA			
CAR (%)			

1. Interest Risk –Increase in Interest Rate :

Scenario 1

Scenario 2

Scenario 3

Magnitude of Shock	1%	2%	3%
Weighted Average yield on asset (%)			
Total Assets			
Duration GAP			
Fall in MVE (on-balance sheet)			
Net fall in MVE(on- balance sheet & off-balance sheet)			
Tax adjusted Loss			
Revised Capital			
Revised RWA			
Revised CAR (%)			

2.Exchange Rate Risk –Adverse Movement in Exchange Rate :

Magnitude of Shock	5%	10%	15%
Net Exposure in FX			
Loss on Exchange Rate Change			
Tax adjusted Loss			
Revised Capital			
Revised RWA			
Revised CAR (%)			

3. Credit Risk – increase in NPLs :

Magnitude of Shock	1%	2%	3%
Total Loan			
Total Performing Loan			
Total NPLs			
NPLs to Loans (%)			
Increase in NPLs			
Increase in Provisions (after adjustment of eligible securities; if any)			
Tax adjusted provision (not yet applicable)			
Revised Capital			
Revised risk weighted assets			
Revised CAR (%)			
Revised NPLs			
Revised NPLs to Loans (%)			

4. Credit Risk – Downward shift in NPLs’ Categories :

Magnitude of Shock	50%	80%	100%
Weighted Amount of provision			
Provision after shift in categories			
Increase in provision			
Tax adjusted provision			
Revised Capital			
Revised RWA			
Revised CAR (%)			

5. Credit Risk – Fall in the FSV of Mortgaged Collateral :

Magnitude of Shock	10%	20%	40%
Weighted Forced Sale Value of Collateral			
Increase in provision			
Tax adjusted provision			
Revised Capital			
Revised RWA			
Revised CAR (%)			

6. Credit Risk – Increase in NPLs’ under B/L category in 1 or 2 sectors :

Magnitude of Shock	5%	7.5%	10%
Loan to Garments & Textile Sectors			
Increase in NPLs			
Increase in provision (after adjustment of value of eligible securities; if any)			
Tax adjusted provision			
Revised Capital			
Revised RWA			
Revised CAR (%)			

7. Credit Risk – Increase in NPLs’ due to Top 10 large loan borrowers :

Magnitude of Shock	5%	7.5%	10%
Loan to Top 10 large loan borrowers			
Increase in NPLs			
Increase in provision (after adjustment of value of eligible securities; if any)			
Tax adjusted provision			
Revised Capital			
Revised RWA			
Revised CAR (%)			

8. Equity price Risk – Fall in Stock Prices :

Magnitude of Shock	10%	20%	40%
Total exposure in stock market			
Fall in the stock prices			
Tax adjusted loss			
Revised Capital			
Revised risk weighted assets			
Revised CAR			

A. Capital after one or more cumulative shocks :

Cumulative impact of Credit Shock (Aggregate of 5 types of Credit Shock)			
Tax adjusted Provision			
Revised Capital			
Revised RWA			
Revised CAR (%)			

Cumulative impact of all shocks (Credit, Interest rate, FE and Equity prices)			
Tax adjusted Provision/ Loss			
Revised Capital			
Revised RWA			
Revised CAR (%)			

i. Liquidity Shock – Fall in Liquid Liabilities :

Magnitude of Shock	10%	20%	30%
Liquid Assets			
Liquid Liabilities			
Liquidity Ratio (%)			
Fall in Liquid Liabilities			
Revised Liquid Liabilities			
Revised Liquid Assets			
Liquidity Ratio after shock (%)			