
THE BANK OF THAILAND

4 February 2005

To Managers

All Commercial Banks Incorporated in Thailand
All Foreign Bank Branches
All Finance Companies and Credit Foncier Companies
Special State Owned Financial Institutions

No.: ThorPorTor. SorGorSor. (03) Wor. 227/2548 Re: Guidelines for Risk Management Practices

Whereas the Bank of Thailand completed risk audit manuals for financial institutions and had distributed to financial institutions to augment their management and operations;

Presently the Bank of Thailand has prepared guidelines for risk management practices as an addendum to the risk audit manuals for financial institutions distributed to every financial institution via circulars No.: ThorPorTor. SorGorSor. (03) Wor. 874/2547 and No.: ThorPorTor. SorGorSor. (03) Wor. 875/2547 dated 11 May 2005, as follows:

1. Internal Rating System,
2. Loan Portfolio Management,
3. Development and Utilization of Credit Scoring for Retail Loan Management,
4. Risk Model Validation,
5. Credit and Market Risk Stress Testing.

These are provided as guidelines for financial institutions in managing risks and development of mechanisms or risk management systems to support the development of audit supervision of financial institutions in accordance with the international guidelines and standards as had been clarified to the financial institutions in a meeting on Tuesday, 30 November 2004.

The Bank of Thailand hereby submit the guidelines for risk management practices for all 5 areas as mentioned to be duly applied in managing risks and in the operations of financial institutions.

Please be informed and implemented accordingly.

Yours sincerely,
-Signature-
(Mrs. Tarisa Watanagase)
Deputy Governor, Financial Institutions Stability
Governor For

Enclosed: Guidelines in Risk Management in 5 Areas
Risk Management and Information System Examination Department
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Introduction
Guidelines for Risk Management Practices

Introduction

Whereas the Bank of Thailand had disseminated the risk audit manuals for financial institutions during early 2004 for the examiners to use as guidelines for auditing and assessing strategic, credit, market, liquidity, operational risks as well as other material areas, it is to ensure that the financial institutions (FIs) have risk management systems to identify, measure, monitor and control various risks adequately and appropriately corresponding with the characteristics, volume and complexity of the transactions of the financial institutions including internal environment such as organization structure, management, various operational systems and external factors.

In order to effectively manage risks, the financial institutions must possess sound risk management system. They must be capable of measuring or assessing risks accurately in order to apply the outcome from the measure in monitoring and controlling of risk appropriately. Such needs to take into consideration the possible effects on earnings and capital of the financial institutions as well as the impacts from various stress situations in order to prepare to withstand, rectify or prevent any possible damage promptly.

The ability to measure and manage risks accurately depends on the effectiveness of the systems or tools utilized by the financial institutions and in order to possess effective operational systems or tools, financial institutions must have adequate resources albeit human resource, tools, equipments and operating systems. The Financial Institutions Supervision Group as the supervisor having realized the significance of the systems and tools to assist the aforementioned risk management, has prepared the applicable guidelines for risk management of financial institutions with the following primary objectives.

1. To enable the examiners to employ as guidelines in auditing and assessing risk management systems of financial institutions to ensure that they have systems to specify, measure, monitor and control various risks sufficiently where the duty and responsibility in arranging to have risk management systems that are appropriate with the volume, complexity and types of transactions of the financial institutions are that of the board of directors and management of the financial institutions.
2. To enable the financial institutions to apply as guidelines in developing and improving systems or tools in the risk management that are being developed or being utilized as well as to instigate development of tools or systems assisting in risk management and to be the foundation for financial institutions in the preparation for data storing to be used in the development of risk simulations in the future, in particular data concerning borrowers. Moreover, it is to be readiness preparation of financial institutions to undertake the prescription of Basel II – Pillar II which emphasizes overseeing financial institutions to develop sound risk management systems and maintain capital to withstand risks from various areas that commensurate with existed risks. The systems and tools of

sound risk management will aid assessment, measurement, monitor and control risks appropriately. Furthermore, they will assist financial institutions in having information to help managing their portfolios effectively and to support the business functions as well as enhancing the competitiveness.

Preliminarily the applicable guidelines for risk management are prepared in 5 areas whereby the objectives of each area are as follows:

1. **Guidelines for Internal Rating System** are for the following purposes:
   - To enable the financial institutions to use as guidelines in setting the levels of credit risk to be used in credit approval decision and to monitor positions and quality of loans in different periods particularly in following up problem loans;
   - To be employed as the foundation in developing credit risk model and credit portfolio model in due course;
   - To be utilized in credit portfolio management as well as in considering the clustering of loans in each risk level to enable financial institutions to assess risk adequately and to use it in capital charge to withstand existed risks;
   - To be a component in setting interest rates, in analyzing earning capability and in analyzing adequacy of reserves.

2. **Guidelines for Loan Portfolio Management** are for the following purposes:
   - To instruct financial institutions in setting policies, strategies, systems and procedures for credit approval as well as loan administration procedures which are appropriate and rigorous;
   - To stipulate financial institutions to acquire suitable and meticulous risk management for loan portfolio to enable them to assess, measure and monitor existed risks;
   - To ensure that the financial institutions are able to promptly resolve loans with indications that there may be repayment problems or there may be addition risk to the financial institutions;
   - To facilitate financial institutions to set provisions and/or maintain capital to adequately withstand risks.

3. **Guidelines for Development and Utilization of Credit Scoring for Retail Loan Management** are for the following purposes:
   - To require financial institutions to acquire effective tools in managing retail loans and to enable them to utilize the marketing strategies and risk management effectively and efficiently;
   - To ensure that risk scores of portfolios using credit scoring are reliable and capable of applying the information in the risk-based management with effectiveness.

4. **Guidelines for Risk Model Validation** are for the following purposes;:
   - To enable financial institutions to use in development planning and in testing reliability of the risk simulation models that are being developed;
   - To be aware of the limitations of the risk simulation models being utilized and to take into account the compatibility with international guidelines.

5. **Guidelines for Credit and Market Risk Stress Testing** are for the following purposes:
   - To enable financial institutions to prepare for any possible stress situation;
   - To compensate the effectiveness and efficiency limits of the tools employed in managing various risks.

Guidelines for
Internal Rating System

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Guidelines for
Internal Rating System

Objectives

1. This is provided as guidance to financial institutions in developing internal rating system (IRS) for credit approval and loan portfolio management to enable them to recognize the change in credit quality and the aggregate status of the loan portfolio in order the manage, alleviate or promptly apply remedy. Moreover, the internal rating system is the crucial foundation in the development of credit portfolio model which facilitates in calculating comprehensible risk and supports financial institution in risk management, interest rate pricing, setting reserves against doubtful loans, profit analysis, capital allocation, determining of business strategy and managing by taking into account of risk. It is also to provide guidance for examiners in auditing and assessing internal rating systems of financial institutions.

Definition

2. Internal rating system is a method for measuring risk and managing loan portfolio of financial institutions by converting information of related aspects including estimated factors and qualitative features prescribed by the financial institutions such as financial ratios, shareholder structure, etc. into scores. It is to classify customers into various grading buckets in according to the risk profile of each customer.

Guidelines

Policy

3. Financial institutions must develop an internal rating system which is a component of the risk management of loan portfolio. It is to group customers according to the quality and repayment ability; to monitor the loan loss of each risk level; for the committee or management of the financial institution to use as a tool in operating the business; and to be a foundation for further development of risk management simulation models.

4. An internal rating system should comprise of 2 following attributes.
   - 4.1 Obligor rating that is an indicator of the ability and intent in making repayment under the credit terms. Data on default rate in each grading bucket should be adequately collected to facilitate the estimation of probability of default (PD) in the next 12 months.

4.2 Facility rating that is an indicator of credit risk after deducting collateral and other risk mitigants by measuring the percentage of loss given default (LGD).

At the minimum, in the initial stage of internal rating of financial institution must possess the first attribute and the second one should be developed in due course.

5. The internal rating system should be approved by the board of directors of the financial institution or assigned committee. There should be a guideline in monitoring, improving and system testing on a regular basis. In addition, responsible persons should be clearly assigned for the said areas.

Benefits of an Internal Rating System

6. Financial institutions should have an internal rating system for individual loan, grading bucket and loan portfolio levels.

6.1 It is a warning system by identifying loans with deteriorated quality in the initial stage to reduce any possible loss.

6.2 It is to monitor and manage loan portfolio such that the quality is consistent with the risk tolerance level of the financial institution.

6.3 It is a guideline for setting reserves for doubtful loans and capital commensurate with loan quality on individual loan basis and portfolio basis.

6.4 It is the bases for the development of credit portfolio model which shall assist risk calculation. It shall facilitate financial institutions in the risk management, pricing, provisioning, profit analysis, capital allocation and establishing business strategy.

Components of an Internal Rating System

7. Risk management committee and senior management of financial institutions must be knowledgeable and understand procedures, methods and mechanisms used in credit risk management. There should be established policies, rules for measuring, monitoring and controlling of credit risk as well as clear responsibilities of related parties and credit culture must be created under the acceptable risk tolerance.

8. There must be an independent unit and knowledgeable personnel with capabilities to monitor, verify and control the quality of risk rating regularly and random testing for accuracy, comprehensiveness of the supporting documents for risk rating, control and valuation of collateral must be conducted.

9. Financial institutions should have credit risk simulation model that is capable of calculating the probability of default as well as unexpected loss of the loan

portfolio in aggregate. Nevertheless, for financial institutions without credit risk simulation model must have suitable procedures for identifying, measuring and monitoring credit risk.

10. Financial institutions should consider collecting information on loans at the point-in-time in conjunction with the through-the-cycle and where one does not have sufficient information to develop or improve the internal rating system, it may consider using external information instead.

11. Financial institutions should establish clear and appropriate rules, conditions and persons with authority to approve credit to borrower who fails to pass the IRS assessment.

12. Financial institutions should develop an information technology system to manage data collection required for credit risk management and to facilitate effective risk rating of borrowers.

13. Financial institutions should prepare a manual for its internal rating system and to update it regularly.

Characteristics of a Sound Internal Rating System

14. An internal rating system must be capable of grading and measuring risk accurately. It must be reliable and reflects the risk of the borrowers in separating borrowers with different risks and in measuring the probability of default.

15. The risk rating must be consistent with different loans and information to be employed must include on and off-balance-sheet items.

16. An internal rating system must categorize normal loans into at least 7 grades and defaulted loans into at least 1 grade. Additionally the definition of each grade must be clearly established to enable classification of normal loan, watch list and problem/default loans to enable appropriate risk management.

17. An internal rating system should be able to separate good loans from bad loans, to closely monitor the quality changes of the loan portfolio under the normal circumstances and atypical circumstances/crises that affect the loans that good loans may turn bad within a short period.

18. Financial institutions must establish clear rules in rating credit risk and specify factors used in the rating which may consist of quantitative and qualitative factors which reflect the true credit quality.

19. In rating loans, financial institutions may use a statistical simulation model in conjunction with the judgment of experts. However, they must be confident that the result of the risk rating closely reflects the reality.

20. For retail loans, financial institutions may grade risk of the entire portfolio or separated into sub portfolios.

Backtesting and Reliability

21. There must be backtesting of the internal rating system for separation of credit quality according to the risk grade and in measuring the probability of default as well as there should be review of definition of each risk grade on a regular basis in order to comply with the changing business environment.

22. In backtesting, financial institutions may compare its own risk level with the rating of rating organizations in order to improve the accuracy of its internal rating system.

Reporting and Monitoring

23. Over and above the reports on obligor rating and of loan portfolios, financial institutions should report the following information to its management on a regular basis.
    - 23.1 Volume and ratio of loans in each grading that moves 1 or more grade (migration matrix) in aggregate and by type of business, industry, loan officer and executives as well as by region, as specified internally, for effective measurement.
    - 23.2 Seasonal impact and credit cycle on the risk migration.
    - 23.3 Estimated probability of default and expected loss in each risk grade.
    - 23.4 Ratio of aggregate loans migrating up to loans migrating down.
    - 23.5 Change of rating of each type of business/industry separated by loan officer and responsible executive as well as by region as specified internally for effective measurement.

    The reports should express in terms of number of cases and amounts to prevent distorted picture due to effects from the change of a single large obligor.

24. In the case that a financial institution intends to develop an internal rating system for the calculation of capital fund, it should be prepared to comply with the guidelines which the Bank of Thailand will further issue.

Assessment Guidelines for Examiners

25. Examiners should take into account the objectives for using internal rating system of a financial institution and assess user's acceptance and utilization in according to the objectives by examining documents, related memorandum and interviews with the system developer and users to identify the actual facts on the following topics.
    25.1 Policy regarding internal rating system
    25.2 Benefits of an internal rating system
    25.3 Components of an internal rating system
    25.4 Characteristics of a sound internal rating system
    25.5 Backtesting and reliability of the internal rating system
    25.6 Reporting and monitoring of result from risk rating

Policy

26. Assessment of the development of an internal rating system of a financial institution is made on:
    26.1 Clarity of policy and development process;
    26.2 Supporting resources for the development, testing and implementation of the internal rating system;
    26.3 Scope of the utilization of the rating results in credit consideration, risk management of credit and other areas;
    26.4 Motivation and drive of the management to apply the internal rating successfully and to review that it still meets the objectives.

27. Assessment of the approval of internal rating system and the guideline for monitoring, development, improvement and testing of the system is made as follows:
    27.1 Suitability of level of the persons authorizing the employment of the system;
    27.2 Suitability and clarity in setting of the organization chart and line of authority;
    27.3 Persons responsible for the development and improvement of the internal rating system should be separate from the system users; however users may contribute opinions;
    27.4 Clarity of assumptions, suitability of factors used in rating, format setting and method or risk rating that correspond to the structure of the borrowers in the loan portfolio;
    27.5 Suitability and regularity of the timing of reviews, system testing and reporting of results to the committee and management of the financial institution where it must be consistent with the business environment of the financial institution;

27.6 Information related to development of the rating model from the initial development to the present modification that should be documented for reference and audit.

28. Assessment of the characteristics of an internal rating system is to be conducted that:

28.1 the financial institution has developed system which is capable of obligor rating and facility rating;

28.2 criteria for setting quantitative and qualitative factors for rating with rationale and referenced information such as statistical data, historical data, etc.; the various factors should be the indicators of the repayment ability for the next 12 months;

28.3 suitability of the development plan of the internal rating system that it is compatible with the characteristics and changes in the business environment and risks of the financial institution;

28.4 assessment of utilization of an internal rating system is made by:

28.4.1 examining the result of the rating by randomly review of lending files to inspect the details of the supporting information of the borrower and to assess the appropriateness of the rating;

28.4.2 examining the assessment result and follow up with the modification of the internal rating system ensuing implementation by the risk management/internal audit unit;

28.4.3 random interview of users regarding usage and assess their acceptance.

Benefits of an Internal Rating System

29. If the financial institution retains data and estimates the probability of default (PD), percentage of loss given default (LGD) and developed credit portfolio model, the examiners must assess:

29.1 the reliability of the model in measuring expected loss (EL) which can be computed if the financial institution calculates the PD in each grade of the rating and percentage of LGD and unexpected loss (UL) in the next 12 months and must verify the accuracy of the estimated risk components as following by the Guidelines for Risk Model Validation of the financial institution.

29.1.1 The PD

29.1.2 Percentage of LGD

29.1.3 Exposure at default (EAD)

29.2 the guidelines in employing IRS to develop credit portfolio model if PD, LGD, EAD as well as EL and UL are calculated, the examiner must assess:

29.2.1 Capability of pricing to cushion EL;

29.2.2 Adequacy of provision for loan loss commensurate with EL;
29.2.3 Adequacy of capital allocation to cushion UL.
29.2.4 Utilization of said risk components in assessing staff's remuneration.

Components of an Internal Rating System

30. Assessment of risk management committee and senior management of the financial institution on the followings.

30.1 Scope of duties and responsibilities of the committee, senior management and responsible individuals in the financial institution in development, modification, utilization of the IRS and preparation of a clear manual of IRS.
30.2 Understand and vision of the committee and senior management regarding the procedures, methods and tools used for risk management by evaluating from interviews, performance and success;
30.3 Participation in formulating policies, inputting of comments or suggestions, approval and monitoring the application of credit rating tools by assessing from the minutes of related meetings.
30.4 Adequacy of resources both in manpower and budget.
30.5 Efficiency of communication between senior management and staffs at all levels.
30.6 Compatibility of the conduct of the credit officers and the credit culture of the organization.

31. Unit responsible for risk model development should have independence without gain or loss from credit process.

32. Assessment of the monitoring, audit and quality control processes of the rating should be conducted by an independent unit as follows:

32.1 Standards in using the rating in credit decisions of the entire or parts of the portfolio which users must understand and concede to.
32.2 Staff must have sufficient analytical experience, knowledge and familiarity.
32.3 The up-to-date valuation of collateral that is crucial to facility rating must adhere strictly to principle and generally accepted method as well as there must be a review of the collateral value upon rating review.
32.4 Integrity of the information, documents, stringency and adherence to the quality control procedures of the rating process.
32.5 Exercise of judgment in risk rating must be in according to the framework/rules established by the financial institution and must be reasonable.

32.6 Validation must be reported to senior management to enable timely monitoring, revision and remedy.

33. If the financial institution develops a simulation model to measure credit risk, the examiner must assess the model validation as well.

34. In the case where the financial institution employs external information in developing or modifying the internal rating system, the examiner must assess:

34.1 Reliability, suitability and adequacy of information and source of the information used.

34.2 Compatibility with the conditions in the preparation of the risk rating system of the financial institution such as point-in-time or through-the-cycle.

34.3 Commensuration/semblance of the external information applied to the loan grouping of the financial institution, for example, similar industry, business environment, asset size, financial ratios, etc.

35. Criteria for approval of loans that are noncompliant with policy or normal procedures (override) must be assessed as followings.

35.1 The approval criteria and conditions must be clear and set as clear policy as well as documented.

35.2 Criteria for approval of overrides are approved by authorized executive and the approval authority granted to executives suitable with capabilities and experience.

35.3 Establishment of authority to approval overrides should be compatible with the risk tolerance of the financial institution.

36. Management information system (MIS) should be assessed on:

36.1 Retention of loan information and repayment history for at least one credit cycle within the data base;

36.2 Frequency of the data collection and verification of the accuracy of the information.

37. Manual for internal rating system should be assessed on:

37.1 Steps of process and practice method are clearly specified;

37.2 Responsible persons and persons with authorization power are clearly specified;

37.3 Update is performed regularly.

Characteristics of a Sound Internal Rating System

38. Assessment must be made to ensure accuracy and reliability of the internal rating system.

38.1 There should be a validation process to test the accuracy of the internal rating system during the development of simulation model as well as to test the precision of the prediction of the probability of default of each grade level.

38.2 There should be periodic re-validations after implementation and upon revision of the internal rating system.

38.3 There should be on-going reviews of the internal rating system to ensure that it meets the objectives in identifying and categorizing credit risks as well being revised when necessary.

39. Assessment on the risk grading is to be made whether:

39.1 the factors and data employed include all of those on and off-balance sheet;

39.2 there are qualitative and quantitative assessments and that they are commensurate with the characteristics of the credits of the financial institution in each credit type as well as each industry.

40. Assessment on the granularity/ grading/ rating bucket and the clarity of the definitions in each grade level is to be made whether:

40.1 the number of risk grade levels can clearly differentiate the credit risks;

40.2 the rules, assumptions, procedures and factors both qualitative and quantitative used in setting the number of risk grade levels take into account all credit risks;

40.3 the definition of each risk level is well-defined;

40.4 there is an established policy to review the number of risk grade level and the definitions when necessary e.g. when the structure of the portfolio changes or when there is high concentration of credit in certain risk levels.

41. Assessment of the changes in the quality of the credit portfolio is to be made as follows:

41.1 the lower grades clearly display substandard credit quality and the there are clear criteria for classifying debt as substandard;

41.2 the migration between risk grades is justified and transparent as well as having passed the review and approval of management;

41.3 stress testing is performed periodically to measure the impact of the credit risk rating of the individual debt and portfolio;

41.4 there are plans to mitigate or reduce risk expected to affect the portfolio (see Guidelines for Credit and Market Risk Stress Testing of Financial Institutions).

42. Assessment of the criteria and factors used in rating credit risk is to be made on:

42.1 the suitability with obligors in each business sector;

42.2 the comprehensiveness and direct effects both positive and negative on obligor buckets or portfolios e.g. financial ratios, quality of collaterals, guaranties, etc.;
42.3 appropriate criteria and test procedures for risk factors e.g. use of statistical approach and back test.

43. If the internal rating utilizes statistical simulation in conjunction with the judgment of experts, an assessment must be made:
    43.1 that the simulation model is reliable (see Guidelines for Risk Model Validation of Financial Institutions);
    43.2 on the experts' exercise of judgment that:
        43.2.1 they must be knowledgeable of the business of the obligor being rated;
        43.2.2 they must be able to offer independent opinions by utilizing information from the simulations supplemented with their judgment.

44. Assessment of rating of retail loans is to be made:
    44.1 grouping of retail loans into portfolios must be appropriate, compatible and clear according to the characteristics of the obligors;
    44.2 credit scoring is used in the management of retail loans (see Guidelines for Development and Utilization of Credit Scoring for the Management of Retail Loans)

Accuracy and Confidence Testing of an Internal Rating System

45. Assessment of the accuracy of the internal rating system after implementation must be made that:
    45.1 comparison is made between the estimate of defaults and the actual defaults in order to evaluate the accuracy of the rank order and the accuracy in estimating defaults in each grade (prediction) by such tools as cumulative accuracy profiles (CAP), receiver operating characteristics (ROC), accuracy ratio (AR), condition information entropy (CIER) and S-statistic, etc.;
    45.2 there are criteria and procedures in selecting data groups used in testing that observe generally accepted principles including borrower's information used in testing that is not used in the development but is from the same period (out-of-sample) and borrower's information used in testing that is not used in the development and is from a different period (out-of-time sample);
    45.3 analysis of the discrepancy of the previous default rate and the rate from the current back testing is made to find the cause and to improve the system; cause for being out of grading may be from the incorrect

simulation model or inadequate information or quality problem of the information;

45.4 report of the testing is made to the senior management and the results from the report are used in the development and improvement of the internal rating system.

46. Assessment is made if there is any comparison made between the internal rating system of the financial institution and the rating of external institutions by:

46.1 taking into account the congruence of the definitions, criteria and factors used in the rating and the PD;

46.2 considering the different factors used in rating e.g. the comparison with the rating of S&P's or Moody's KMV which assign the PD of few existed companies and taking into account the country/sovereign risk while the financial institution may not consider in the rating, comparison with the Thai Rating and Information Services (TRIS) which does not assign PD value but has a large sample of companies in Thailand and since the country/sovereign risk is not taken into account, it is comparable. If the result of the comparison is significantly different, the financial institution must be able to explain the cause and justify or certify that its internal rating system is still reliable.

Report and Monitor

47. Assessment on the reporting of the results from risk rating of individual borrowers and loan portfolios that:

47.1 they are accurate and up-to-date;

47.2 the reporting and follow-up analysis are efficient and are submitted to the senior management regularly;

47.3 the management uses the reports in the decision making and stipulating policy for risk management.

48. Assessment of the readiness of the financial institution is utilizing the internal rating system for credit risk management and as foundation in developing credit risk simulation models for maintaining capital fund in accordance with the guidelines of the Bank of Thailand that will be duly issued.

Guidelines for
Loan Portfolio Management

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Guidelines for
Loan Portfolio Management

Objective

1. This is to provide guidance to financial institutions in developing appropriate loan portfolio management to enable them to assess, monitor and control risk of borrowers, individually or as portfolio to be within an acceptable level; to enable the management to promptly apply remedy when a loan starts to indicate problem; that there are provisions and/or capital to withstand the risk adequately. Moreover, it will assist the financial institutions in pricing interest rates to reflect risk as well as enable them to establish loan portfolio management strategy appropriately. Further, it is also to provide guidance for examiners in auditing and assessing the loan portfolio management of financial institutions.

Definition

2. Credit risk management is a process or system which a financial institution uses to specify, monitor and control risks arisen from the borrower or counterparty is unable to comply with any condition or agreement under the contract that includes loans, investments and contingent liabilities to enable the financial institution to manage risk to be within the tolerance level while realizing returns commensurate with the risk which, herewith, will focus on loan portfolio management.

Guidelines

Establishing Credit Risk Management Environment

3. Creating an environment for credit risk management also consist of establishing a role for the board of directors of the financial institution, setting a strategic plan and loan policy, establishing roles and duties of senior management and lending procedures.
   - 3.1 The board of directors of financial institution has a role, duties and responsibilities as follows:
     - 3.1.1 to understand the credit culture and risk of the financial institution e.g. undertaking an aggressive business policy or sticking to conservative principle and to communicate such to all relevant staffs at every level that they are informed and understand;
     - 3.1.2 to set crucial strategies and policies related to credit and credit risk and to review said strategies and policies once a year at the minimum;

3.1.3 to oversee that senior management prepares strategic plans for medium and long-term lending, objective of the portfolio and crucial procedures related to lending;

3.1.4 to approve lending strategies and oversee that there is regular monitoring according to the revaluation plan of the strategies including lending criteria for both conditions and terms, at the minimum of once a year;

3.1.5 to monitor and assess the capability of the senior management in managing loan portfolio and credit risk to ensure that it is in according with the approved strategies, policies and risk tolerance;

3.1.6 to review the position and operations of the financial institution regularly and to establish an adequate level of capital to cushion against risk including risk from strategy changes (if any);

3.1.7 to set remuneration policy to employees such that there is no conflict with the credit strategy such as avoid any rewarding that is linked to short-term profit from credit business.

3.2 Strategy and lending policies must encompass all transactions with material credit risk and are in line with strategies, policies and objectives of overall risk management; must be continual and are able to be implemented within the specified period; and must be reviewed regularly at least once a year.

3.2.1 Strategy for a loan portfolio should:

- specify lending objectives, lending growth rate and income by taking into account the risk on transaction basis and overall loan portfolio;
- take into consideration the changes in economy and effects on risk tolerance;
- respond to the market need;
- set objective in line with the overall objectives of financial position;
- set ratio of loan portfolio on the balance sheet;
- set goals for diversifying loan portfolio by geographical, business sector, product and collateral grouping, etc.;
- set loan product mix;
- set goal for market share, market expansion and loan growth grouped by product;
- set goal for loan quality;
- set return ratio of the loan portfolio to the overall earnings.

3.2.2 Lending policies should:

- be in line with the lending strategy, loan quality goals, credit risk management and include complex transactions as well as being documented and clear;

- establish guideline related to credit approval standard, criteria, procedures and other minimum standards related to lending as well as guideline related to specifying, measuring, monitoring and controlling of credit risk, effective management of substandard loans and guideline for assessment of new business opportunity;
- clearly specify duties and responsibilities of relevant parties in lending procedures with separation of duties between approval, and loan review, in addition there must be an independent unit to assess credit risk management;
- establish criteria credit approval, risk tolerance level and clear procedures for items not compliant with the policy and normal procedures of credit decision;
- set criteria and procedures for lending to related parties e.g. shareholders, board of directors, management, employees and affiliated companies as well as establishing code of conducts for management of financial institution on the said subject;
- establish standards for valuation, for assessment of environment of business received credit approval, related accounting process and criteria for provisioning;
- specify, measure, monitor and control risk from foreign currency loans such as country risk and transfer risk, etc.

3.3 Senior management has a role and duties in implementing the strategy and lending policies approved by the board of directors as follows:

3.3.1 establishing policies and procedures to enable specifying, measuring, monitoring and controlling of credit risk extensively on the transaction level and loan portfolio level e.g. policy for controlling loan clustering by setting portfolio structure and setting limits of customer per individual, group, business sector, economic sector, geographical region and product; in setting policies, internal factors should be taken into consideration e.g. goal in dispersing portfolio and overall lending strategy as well as external factor e.g. market conditions, competition, technology and government policy, etc.;

3.3.2 assessing compatibility between the lending goal and market plan with budget and compatibility between credit culture and credit risk management regularly;

3.3.3 communicating credit policies to all relevant employees;

3.3.4 assessing the effectiveness of the credit policies, reviewing and revising credit policies to be in line with the strategies, risk tolerance and market conditions on a regular basis by considering the organization structure, transaction volume and complexity of lending procedures, earning goals, laws, regulations and business conditions;

3.3.5 regularly monitoring the credit decision process to comply with the strategies, goals and credit policies approved by the board of directors; in the event of non-compliance, analysis and remedy must be undertaken promptly;

3.3.6 assessing the impact on overall risk and ability to achieve the objectives prior to applying the revised policies and lending standards and comparing the result of such assessment with the actual.

4. New products or transactions must be approved by the board of directors or assigned committee and there must be management procedures and sufficient credit risk control for new products or transactions by providing clear plan and supervision that enable risk specification and management in addition to having adequate personnel to undertake related operations. Learning should be provided for related staffs to enhance the understanding of the products or transactions and risk. There should be operating procedures commensurate with the complexity of the products or transactions and credit risk. Moreover, there should be regular monitoring and supervision of policy and procedure compliance.

Credit Granting Process

5. The financial institutions must:

5.1 specify clear target customer group and set criteria for credit decision which include qualifications of worthy of credit approval, credit limit within approval, types of loans, maturity and any other conditions;

5.2 have sufficient information for assessing and risk rating the borrower to be used in the credit decision by taking into consideration the following information:

5.2.1 objective of credit application and sources of fund for repayment;

5.2.2 characteristics and overall risk of the borrower and sensitivity of the position of the borrower to the changes on economic and market conditions;

5.2.3 loan repayment history, current repayment ability, inclination of financial position and cash flow forecast under various possible scenarios;

5.2.4 know-how of the borrower in conducting their business, industry conditions and status of the borrower compared to other operators within the same industry;

5.2.5 conditions for lending and other stipulations to limit risk of the borrower that may change in the future;

5.2.6 adequacy of collateral or guarantee and risk related to the collateral or guarantee.

5.3 have an understanding and know the borrower well and have strict rules to prevent the borrower from using the financial institution as a tool in conducting unlawful transactions such as money laundering;

5.4 establish criteria in grouping debts deemed to be within the same group and criteria employed in the granting credit to related person or businesses which may consider from shareholding, common management, having close ties or possess management authority and furthermore credit limits should be set for borrowers on the individual basis as well as on a group basis;

5.5 analyze the position of the borrower, conditions, maturity term, credit risk and return on syndicated loan as if lending normally to such borrower;

5.6 assess risk and return to be received from each loan, set aggregate return and assess various scenarios that may affect the borrower under normal and unusual circumstances and the expected loss (EL) in order to set sufficient provision relative to the expected loss and to maintain adequate capital to cushion unexpected loss (UL).

5.7 establish collateral policies that encompass types of collaterals, assessors, valuation methods and procedures for foreclosing collaterals under the laws; where there is personal guarantee, loan repayment ability of the guarantor must also be considered. Nevertheless, the loan analysis must focus on repayment ability of the borrower as the key.

6. The financial institutions must set facility limits, in conducting transactions with obligors, which comprise of credit lines, various transactions both on and off-balance sheet, per obligor and per group, classified according to transaction types and aggregate transactions.

6.1 Credit limits are to be set per individual borrower and group according to the internal rating by considering the impact on the risk ceiling of the aggregate loan portfolios and sub-portfolios.

6.2 Risk ceiling for off-balance sheet is to be set based on potential future exposure.

6.3 Results from stress tests are to be used in setting risk ceilings whereas the stress tests shall be conducted in accordance with the Guidelines for Credit Risk Stress Testing.

6.4 There is a control system on the utilization of credit facilities for on and off-balance sheet items and approval from authorized persons is required if limit is exceeded or for additional facility.

7. Process in granting additional credit facility to an existing obligor, changing any condition in an agreement, extending maturity and refinance should have the following minimum conditions.

7.1 It should be assessed, analyzed and examined with guidelines commensurate with the characteristics, volume and complexity of the transactions and must be approved by authorized person(s).

7.2 Policies and practices related to information, documentation necessary for credit decision must be established whereby the information and documentation must be adequate, correct and reliable.

7.3 Experts should be arranged to analyze and approve the loan commensurate with the type, amount and risk level of the loan. Moreover, lending officers should be developed to possess sufficient knowledge and experience.

8. Granting loans to any related person or business of the financial institution must be transparent and there must not be any conflict of interest by:

8.1 defining related person or business of the financial institution;

8.2 conducting special approval process, careful observation, stringent and auditable supervision, and having balance of power appropriate with the risk exposure;

8.3 specifying lending conditions without any differentiation from other general lending under similar circumstances and stipulating strict risk ceiling;

8.4 in the case of granting materially significant credit (under the criteria stipulated by the financial institution), it must be approved by the board of directors, whereby the involved director with such loan must not participate in the approval process.

Credit Administration, Identification, Measurement and Monitoring Process of Credit Risk

9. Financial institutions should have an internal rating system that is effective and efficient as follows:

9.1 that there is precise segregation of duties and responsibilities of credit unit and commensurate with the characteristics, volume and complexity of transactions and credit portfolio in order to balance power and enable validation e.g. segregation of credit extension, loan administration and credit review must be separated from each other, etc.;

9.2 there is strict loan administration system by ensuring accuracy and completeness of loan documentation, supervising adherence to legal agreements, managing collateral and reporting for follow-ups and evaluation of performance;

9.3 there is supervision of compliance with policies, regulations, manuals and legal restriction.

10. Financial institutions should develop and employ an internal rating system commensurate with the characteristics, volume and complexity of its credit business. In the case of retail loans, credit scoring may be used. As for corporate loans, internal rating system or grading in according to expected loss may be used. Nonetheless, financial institutions should comply with the Guidelines for Development and Utilization of Credit Scoring for the Management of Retail Loans and Guidelines for Internal Rating System.

11. Financial institutions should specify risks in loan portfolio by:
    - 11.1 having credit risk rating of each obligor within the corporate loan portfolio which includes both loans and contingent liabilities and assessment of changes in quality of the borrowers and of the loan portfolio in order to apply it in the revision of strategies of portfolio management;
    - 11.2 systematically validating and analyzing the credit risk rating of each obligor to ensure that the same standard are applied to the whole portfolio and analyzing the trend of the quality changes as well as the credit risk exposure of the loan portfolio;
    - 11.3 validation of the accuracy of the risk rating should be performed by independent persons who understand the borrowers and are able to access financial information and qualitative information of the borrower in a timely manner;
    - 11.4 reviewing the risk rating at least once a year or when there is any material change whereby the frequency of the review depends on the characteristics, complexity and risk of the loan portfolio and examining the adequacy of the provisions to cushion possible losses together with the risk rating.

12. Financial institutions must have a risk measuring system that is able to measure on the obligor basis, product basis and loan portfolio basis. The said system must be appropriate with the characteristics, volume, complexity of transactions and risks. Moreover, it should be able to identify loan concentration, sensitivity of obligors or loan portfolios to the changes in the environment. Factors to be considered are as follows:
    - 12.1 types of loans and terms of agreements such as maturity, repayment condition and interest rates, etc.;
    - 12.2 changes of economic situations and impact on the repayment ability of the obligor;
    - 12.3 types and values of collaterals and standings of guarantors;
    - 12.4 likelihood of the obligors in each risk grade to default and expected loss upon the event of default.

13. Financial institutions should have a system to monitor the obligor's standings and have sufficient provision able to withstand any possible losses. Whereas they should:
    13.1 have systems, procedures and monitoring processes of changes of the financial standings of the obligors, changes of collateral values and loan quality and borrowers' compliance with conditions of the agreements;
    13.2 have an early warning system when a borrower may be likely to default or may develop into high risk exceeded the stipulated ceiling; whereas the system should be able to estimate the possible loss in order to affect timely rectification;
    13.3 prepare reports to be used in the monitoring e.g. reports of non-performing loans (NPLs) and potential NPLs, reports of risk exposure, reports of large borrower concentration, reports of concentration by industries, geographical regions and collateral types, exception reports and override reports such as reports of lending exceeded limits and reports of loan approval where the scoring fails to meet criteria or fails to pass the cut-off score or *vise versa*, etc.

14. Financial institutions should have an information technology (IT) system to enable management to assess and monitor risk of the loan portfolio and contingent liabilities accurately and timely. The IT should be able to provide information related to performance in comparison to the stipulated strategy and credit risk management plan and should aid capital allocation to commensurate with the risk of the loan portfolio. Additionally they should regularly evaluate the capability of the system.

15. Financial institutions shall regularly and continuously conduct assessment of impact to the repayment ability of the borrowers and to the loan portfolio from the changes of the economic situations, normal and unusual/stress, for the purpose of analyzing the capital adequacy, preparation of contingency plan to withstand any losses where the plan may include additional supervision, dispersion of risk, credit limits, limits of loan portfolio growth, prevention or mitigation of risk using various tools and mechanisms such as requesting additional collateral, utilization of credit derivatives or increase capital, etc. Such should be conducted in accordance with the Principles for Stress Testing of Credit Risk of Financial Institutions.

Controls over Credit Risk in Loan Portfolios

16. Financial institutions should have controls over credit risk in loan portfolios by:
    16.1 the board of directors and senior management being knowledgeable of loan portfolios and risk involved by establishing ratios of credit products,

segments in the portfolios, concentrations of credit, risk rating of obligors in the loan portfolios;

16.2 grouping credits in order to facilitate monitoring process on risk exposure of each group and accumulated risk of the portfolio, as well as stress testing to determine which group of credit has high risk which requires special attention and adjusting strategy to mitigate risk exposure or to spread risk;

16.3 using information systems for adequate and quality management to help establishing rations in the portfolios, to set target of credit concentrations in each category and to spread risk to match with the objective and/or strategy of the financial institution;

16.4 monitoring the changes of concentrations and/or diversification of risk and changes of quality of the credit portfolios due to changes in economic conditions on a regular basis.

17. The board of directors and senior management must set effective policies, procedures and methods in controlling risk on individual borrower basis and group basis to be with in the level of tolerance.

17.1 The role and duty of those responsible for loan portfolio management should be clearly defined and commensurate with the structure, sophistication and risk of the loan portfolio.

17.2 There must be an internal control system and procedures in monitoring and controlling credit granting process in order to ensure compliance with the credit policy and credit risk management as well as reporting of non-compliance of policies or procedures to respective manager of each level in a timely manner.

17.3 Limits and risk ceiling should be set to assist monitoring and controlling of amounts of loans and of contingency liabilities (exposures) and credit risk exposures to commensurate with the predetermined limits and ceiling as well as lending exceeding limits should be reported.

17.4 Effective credit review must be conducted.

17.4.1 Credit review unit must be independent form the unit involved in the credit approval.

17.4.2 There must be a credit review system to validate the accuracy of the loan volume, credit quality and rating of obligor's risk as well as to identify weakened or problem credits at the early stage in order to take timely remedial action.

17.4.3 Results from the credit review should be reported to the board of directors and senior management. Adequate information must be provided in order to evaluate the position of the loan portfolio and effectiveness of the performance of credit officers.

18. Financial institutions should conduct assessment of the evaluation and approval of credits, credit administration and credit risk management.
    - 18.1 The unit conducting assessment should be independent from those involved in evaluating, approving credits, administration unit and credit risk management unit.
    - 18.2 The assessment process must be systematic in order to assess the efficiency and compliance with established policies and procedures at least once a year.
    - 18.3 Results of the assessment should be directly reported to the board of directors and senior management by identifying weaknesses in the policies, credit evaluation and approval process, credit administration and risk management process as well as any non-compliance with the policies and normal procedures.

19. Financial institutions should systematically analyze and control items that are exceptions to the policies, procedures and principles for credit evaluation.
    - 19.1 Types, cause of exceptions and effects of such transactions should be clearly specified and internal audit and credit review unit must be assigned to review such exceptions.
    - 19.2 Such transactions should be monitored. Analysis f the exception items must be performed at the early stage to be able to effect timely remedy. The analysis must be conducted regularly and reported to the management, relevant committees and the board of directors relative to the materiality of the item in order to assess the integrity and stringency of the credit decision process and compliance with the credit policies. Moreover, the loan portfolio manager should compare the return and credit risk of the exceptions with the normally approved credits.
    - 19.3 The exception items must be clearly documented in the loan approval and information regarding risk mitigation of the said approved exception must also be documented and retained permanently in the file.
    - 19.4 Risk of the exceptions to the credit policies and procedures must be controlled to be within the tolerance level. If the number of exception is high, the board of directors must review the level of risk tolerance and/or amend credit policies to commensurate with the credit culture or current market conditions, amend limits or adjust categories of exceptions.

20. Financial institutions should take effective and efficient remedial action on weakened or problem credit. There should be remedial policies, procedures and mechanisms as well as appointing responsible individuals and clearly assigning duties and scope of remedy. This may be the unit approving the credit, loan workout unit or a combination of the two units. Such may vary with the size, nature and reason of the problem credit. Nonetheless, when a financial institution has significant credit-related problems, it is necessary to segregate the credit

approval unit and the workout unit. The effectiveness of loan workout may be enhanced by personnel with expertise and on-going monitoring of the loan workout.

Assessment Guidelines for Examiners

21. Examiners should assess the management capability of the loan portfolio management of a financial institution by examining documents, interview relevant staffs or involved parties or observing working processes in order to be aware of actual facts on the following areas.
    - 21.1. Establishing an appropriate credit risk management environment
    - 21.2. Credit granting process
    - 21.3. Credit administration, measurement and monitoring process of credit risk
    - 21.4. Controls over credit risk of loan portfolio

Establishing Credit Risk Management Environment

22. Examiners should audit and assess the following areas.
    - 22.1. Structure of the organization, role of the board of directors in formulating strategy and crucial policies regarding credit risk may be determined from the followings.
        - 22.1.1. Culture of the loan portfolio management is commensurate with risk level and strategy formulation and possession of a channel or communication tool to reach all relevant staffs in addition to staffs having adequate understanding.
        - 22.1.2. Rationales and methodologies used in determining risk tolerance level which may be derived from assessing financial market, financial institution system and possible effects on the organization and capital.
        - 22.1.3. Participation of the board of directors and frequency of the coordination and performance monitoring of senior management in preparing strategy and loan portfolio management. It may be examined from the minutes of the meeting to formulate the plan, meeting to approval the plan, agenda and their supporting documents, strategy approval documents, comments and instructions/assignments to senior management.
        - 22.1.4. Compatibility of the strategy, policies and goals of the loan portfolio management with the strategy, policies and goals of risk management in aggregate of the financial institution.
        - 22.1.5. Monitoring and assessment of changes of financial standings and performance of the financial institution with respect to related risks.
        - 22.1.6. Policies of employee’s remuneration.

22.2. Comprehensiveness, clarity and adaptability of the strategy, measuring method and assessment of the financial institution's plan by considering the details of the plan.

22.3. Analysis of changes of economic situations is conducted prior to the preparation of plan to supplement the information used in the preparation. Moreover, all relevant units should participate in the preparation of the plan.

22.4. Monitoring of the implementation of the strategy, cause analysis of differences between the actual results and the plan, review of the strategy and other operations (if any) by reviewing of the relevant minutes of meetings.

22.5. Upon changing of policy or credit granting criteria, caution should be made on cases where policies or credit granting criteria were relaxed, in particular in the business sectors subject to risk and cyclical volatility and experienced high credit growth especially where there is indication of rapid economic expansion or bubble economy. Risk must be carefully assessed and quality of the credit needs to be further monitored.

22.6. Compliance with the plan and credit policies is to be examined by sampling credit files of normal loans in order to determine whether criteria of credit decisions are adhered to.

22.7. Effectiveness, stringency of the administration, monitoring and control of weakened credits is to be determined from the strategy, procedures, processes, methodologies, tools/reports, monitoring and controls of credits that may become problem loans in the future or beginning to experience problems such as financial ratios, cash inflow projection or qualitative information indicating diminished repayment ability, ability to make installment payment but for the amount less than stipulated or ability to service a portion of the interest payment, etc.

22.8. Organization structure and balance of power is to be evaluated of its suitability and clarity in segregating duties of the credits section. Such may limit, reduce or mitigate risks.

22.9. Items that do not conform to policies and procedures for normal credit decisions are to be reviewed if they are within the stipulated framework.

22.10. Credit files of obligors qualified as transactions related to directors, management, staff and affiliated companies are to be reviewed if they comply with the policies and procedures stipulated.

22.11. Comprehensiveness of the policy on foreign currency credits is to be determined if there is identification, measuring, monitoring and control of risks in other areas such as country risk, transfer risk, etc. Moreover, assessment of methodologies, data, reports, etc. that the financial institution employed in the monitoring and method to cushion against risk such as granularity of risk, risk limits, provisioning and capital maintenance, etc.

22.12. Roles, duties and capabilities of senior management, effectiveness and frequency of supervision of credit management to conform to the strategy, policies and risk level stipulated.

22.13. Monitoring of performances, impacts on capital fund and capital charges to withstand risk upon changes of strategy as well as frequency of the monitoring of the changes of exposures and operating results of the financial institution.

22.14. Operating plans stipulated by the financial institution, performance targets, communication to relevant parties, implementation plan, method for measuring and monitoring performances, measurement, monitoring, and controlling of system/exposure of risk.

22.15. Effectiveness and timeliness of the procedures and processes of the supervision on compliance of stipulated policies and procedures as well as review and revision of plans which the senior management may delegate to supervisors to conduct and the effectiveness of the system, tools or reports employed by the senior management to monitor the performance.

22.16. Effectiveness of the performance monitoring system is to be determined from the procedures, processes or methodologies used in monitoring, time to completion, adequacy and quality of personnel and other necessary resources.

23. Examination of the process for managing new products or activities is to be conducted by assessing:

23.1. adequacy of the identification and analysis of risk of the new products and activities prior to the introduction such as preparation of product program that includes risk which may occur in the front office, middle office and back office;

23.2. adequacy and clarity of operating plans, procedures and controls in the product program;

23.3. adequacy and quality of personnel which may be determined from number of customers within their responsibilities and performance, quality of their analysis and frequency of the follow ups or credit reviews in conjunction with education, work experience and training;

23.4. comprehensiveness and adequacy of training for relevant staff regarding credit risk of sophisticated transactions may be determined from the training program and the frequency.

Credit Granting Process

24. Examination of the adequacy of credit granting criteria is to be conducted by assessing:

24.1. criteria of credit decisions such as qualification of borrower, limit, type of credits and repayment conditions, etc.;

24.2. sufficiency of information used for obligor rating;

24.3. familiarity with the borrower and stringency of regulations to prevent the financial institution from being a tool in fraudulent activities such as money laundering, etc.;

24.4. suitability and clarity of criteria used in bucket grading, which determine if the borrowers are within the same group or if they are related, is to be evaluated from shareholdings, sharing the same management team or being affiliated or having authority over the operations, whereby the facility limits of individual borrower and of the entire group are aggregately approved;

24.5. adequacy of exposure analysis of the borrower, repayment conditions, maturity, credit risk and returns for syndicated loans;

24.6. risk and returns from the borrower, during circumstances which are normal and unusual/stress from:

24.6.1. examining reports detailing risk assessment of each obligor if there is any consideration given to the external and internal factors, details of the simulations under stress/normal conditions, inclination of the financial standings and ratios of the obligor, result of the revised risk rating and migration of risk;

24.6.2. examining reports detailing returns of each obligor, expected loss, impact on loan portfolio and on capital of the financial institution.

24.7. procedures for measuring and assessing the quality of each obligor, adequacy of provisions for expected loss and capital maintenance to withstand unexpected loss;

24.8. comprehensiveness of the policies and criteria regarding collateral, qualification of the appraisers of the collateral, procedures, methods for valuating the collateral, procedures for approving collateral value and procedures for legal foreclosure as well as where there is any personal guarantee, repayment ability of the guarantor must also be evaluated.

25. Examination of the customer's facility limit, for on and off-balance sheet as well as per individual and group, grouped by type of activities and in aggregate, is to be conducted in addition to assessing:

25.1. the comprehensiveness of the facility limit to ensure that the limit per obligor is specified as well as per group in accordance with the internal risk rating and fitting with the criteria for determining facility limit;

25.2. the appropriateness of the risk ceiling for off-balance sheet items by:

25.2.1. examining methods for calculating exposure and potential future exposure including its application to determine the risk ceiling for off-balance sheet items;

25.2.2. examining criteria for determining the risk ceiling for off-balance sheet items, adequacy of capital to withstand potential future exposure;

25.2.3. examining legal enforcement proceedings for off-balance sheet items;

25.3. the application of the results from stress test in determining risk ceiling; such assessment shall comply with the Guidelines for Credit Risk Stress Testing of Financial Institutions;

25.4. the suitability in setting risk ceiling for overall loan portfolios, sub-portfolio, by business sector, geographical area, product and type of collateral by examining the historical loan loss, borrower's capacity to repay, ability to withstand future loan loss, compatibility of desired return and capital fund;

25.5. the controls of facility utilization which shall include on and off-balance sheet transactions and where the limit is exceeded or application for additional limit must be approved by an authorized person by considering criteria for granting credit in excess of facility limit or additional credit line as well as examining reports of approval of credit in excess of limit or additional credit line;

26. Examination of approval for additional loans to existing borrowers, amendment, renewal and refinancing of existing credits is to be conducted by assessing:

26.1. suitability of credit analysis in accordance with type, volume and sophistication of the activity, compliance with the prescribed guidelines and approvals from authorized persons;

26.2. sufficiency, accuracy and integrity of information and documents required in the credit decisions for granting additional line to existing borrower, amendment of agreement, contract renewal and refinancing of existing credits by examining policies and procedures regarding the said information and documentation;

26.3. expertise of the credit analyst in each type of credits.

27. Examination of credit granting to individual or business that is related to the financial institution and/or has conflict of interest is to be conducted by assessing:

27.1. suitability and compliance with the guidelines of the Bank of Thailand regarding related party transactions;

27.2. suitability and adequacy in monitoring, controlling and balancing of power in the credit decision process;

27.3. terms and conditions for such credits must not differ from those of credit granted to other borrowers in general, given the same factors and circumstances;

27.4. material transactions must comply with the guidelines stipulated by the financial institution such as must be approved by the board of directors and directors with conflicts on interest must be excluded from the board's decision of the said credit.

Credit Administration, Identification, Measurement and Monitoring Process of Credit Risk

28. Assessment on credit administration system must be made whether:
    - 28.1 its organizational structure is established and responsibilities of the front, middle and back offices are stipulated to create a balance of power by examining related documents such as organization chart, job description and operating manuals, etc.;
    - 28.2 the documentation and related information is completed and updated in compliance with prescribed procedures such as legal contracts, various collateral information by random review of credit files and/or additional interview with the staffs;
    - 28.3 the manuals and procedures are prepared, up-to-date and fitting with the operation process, characteristics of the structure and sophistication of the activities and loan portfolios including there is supervision to ensure that operations are conducted in accordance with the prescribed rules and procedures by examining from the internal audit reports and interviews with the staffs.

29. Assessment is to be made on the consistency of the internal rating system of the financial institution with the Guidelines for Development and Utilization of Credit Scoring for the Management of Retail Loans and Guidelines for Internal Rating System.

30. Examination of the risk rating of obligors of the financial institution is to be made and assess:
    - 30.1. risk rating should cover all credits and contingent liabilities of each obligor;
    - 30.2. effectiveness of the rating in assessing direction of the changes of quality of loan portfolios to enable identification of substandard loans in the portfolio during a given period such as monthly, quarterly, yearly, etc. by examining reports and credit review trails;
    - 30.3. transparency in assigning persons responsible for accuracy checking of the risk rating and independence of the person conducting the rating;
    - 30.4. suitability of the reviews of the rating by type of credits, nature of complexity and credit risk such as procedure for reviewing project financing, etc.
    - 30.5. up-to-date-ness and timeliness of the risk rating of the individual borrower and review of the rating upon occurrence of an event or obtaining of information which impacts the borrower's repayment capability and frequency of rating such as high risk may required rating review on a quarterly basis while moderate risk may be reviewed semi-annually and at the minimum rating review must be conducted once a year.

31. Examination of effectiveness, comprehensiveness and reliability of the internal rating system on the individual borrower, on product and on loan portfolio by assessing:
    31.1. adequacy and rationale for selecting internal and external factors used in the rating which must reflect the environment changes and risk of the borrower;
    31.2. value of collateral in estimating expected loss by examining adequacy of information on the collateral, suitability of the valuation method and value of the collateral;
    31.3. consistency of the information and method used to estimate expected loss in relations with characteristics, volume, complexity and risk level of the financial institution by:
        31.3.1. having the financial institution establishing policies and data collection plan as well as developing a simulation model to calculate the probability of default (PD), loss given default (LGD), exposure at default (EAD) and expected loss (EL) to be used in the determining the adequacy of provisions and unexpected loss (UL) to be used in determining the adequacy of capital in the case where it does not possess any data collection or has not developed any simulation model for the calculation of PD, percentage of LGD and EAD;
        31.3.2. making assessment in accordance with Guidelines for Risk Model Validation in the case where the financial institution already developed a simulation model for measuring borrower's risk.

32. Examination of adequacy and appropriateness of the system for monitoring borrower's conditions and provisions by assessing:
    32.1. clarity in stipulating roles, duties and responsibilities in monitoring of financial condition and risk rating of the obligor;
    32.2. sufficiency in monitoring and reporting of changes of the financial conditions, risk rating of the obligor, prospect of non-performing and substandard loans to ensure that the management has adequacy and timely information for its decisions and assessment of consistency of the frequency of the reports with the changes in rating of the obligor;
    32.3. the establishment of a warning system to monitor non-performing and substandard loans systematically and to set out criteria, processes and assign persons to be responsible for deal with the borrower as well as to prepare prompt report by signaling advance warning, while the borrower has not yet default, to the management and to undertake prompt remedy.
    32.4. the utilization of borrower's information in establishing provisioning policy and in assessing the adequacy of reserves according not only to the official regulations but to the risk rating of the borrower as well.

33. Assessment is to be made if the financial institution has analyzed the borrower's capacity for repayment in the circumstance which is abnormal/ critical, in accordance with the Guidelines for Credit Risk Stress Testing for Financial Institutions as well as assessment on the adequacy and feasibility of the contingency plan in face of uncertainty such as limitation, diversification or mitigation of risk exposure, revision of loan portfolio structure or increase capital funds as well as evaluating the persons responsible for implementing the plan.

Controls over Credit Risk of Loan Portfolio

34. Examination of the stipulation of proportions in the loan portfolio and the granularity of risk is to be made and assess:
    34.1. the guidelines that the financial institution uses in stipulating the proportions in the loan portfolio if it has taken into consideration the business strategy, business and profit targets, economic conditions, conditions of various business sector and risks, etc.;
    34.2. adequacy, accuracy and timeliness of the management information system to be used in the stipulating proportions in the loan portfolio and the granularity of risk;
    34.3. effectiveness of the operating system, procedures, information used in monitoring the changes of concentrations and the granularity of risk of the loan portfolio.

35. Examination of the granularity of risk of the loan portfolio by assessing:
    35.1. the granularity of risk of the loan portfolio is in line with the prescribed target;
    35.2. effectiveness and regularity in the monitoring of the changes in concentrations;
    35.3. overall risk level of the loan portfolio and the conduct of the management of the financial institution where the granularity of risk does not meet target.

36. Examination of the effectiveness and adequacy of controls over loan portfolio by assessing:
    36.1 the setting of policies, procedures and practices of the board of directors and senior management that can be apply to control risks on individual obligor, group and portfolio basis by considering of the information in the reports submitted to the board and senior management;
    36.2 knowledge, capability and experience of the credit portfolio managers, suitability and transparency of the role of the said managers;

36.3 criteria, rationales and procedures in stipulation tolerance level of the credit portfolio by interviewing relevant officers and considering of the minutes of meetings prepared by the financial institutions to get approval of the said criteria from the board of directors;

36.4 policies to mitigate or limit risks to be within the level of tolerance such as facility limit is determined by risk level of the borrower, stipulation of conditions in credit granting which are maturity and collateral, etc.;

36.5 effectiveness and adequacy in monitoring the exposure of each obligor, each group, and overall loan portfolio to ensure that the management is aware of the aggregate risk of the portfolio and material risk of various credit groups to facilitate loan portfolio management.

37. Examination of the oversight of the units making credit decisions and administration of credits by assessing:

37.1 the internal control system and practices in monitoring and controlling credit granting process as well as monitoring and controlling of compliance with the credit policies and credit risk management;

37.2 the stipulation of credit limits and credit risk ceiling and the assessment of controls over the granting process and exposure and credit risk exposures to be consistent and under the prescribed ceiling;

37.3 suitability and comprehensiveness of the criteria used in stipulating risk ceiling such as taking into account the level of tolerance, level of capital funds, prescribed risk ceiling and result of previous year, earning target by stipulating risk ceilings per business sector and per obligor group;

37.4 timely reports of volume and quality of credits, credit extension in excess of prescribed risk ceiling and non-compliance with the policies and normal procedures for the management in each level;

37.5 effectiveness in monitoring of credits that exceed limits, which should be monitored closely and required to report reasons and measures to return them to the limits;

37.6 application of the credit review results to assess weaknesses and rectify any deficiencies in the credit granting process.

38. Examination of the credit review process is to be made and assess:

38.1. independence of the credit review unit from the unit involved with the credit approval;

38.2. the administration system, the on-going and regularity of the credit review system such as requiring credit review to be conducted annually or every 6 months depending on the risk level of the borrower; however review should be at least once a year;

38.3. reports of credit review of their accuracy on both volume and quality of credits;

38.4. reports of credit review results to the board of directors. other assigned committees and relevant senior management and assess if the review results are able to identify weaknesses of the credit decision and credit administration processes including non-compliance with the policies and normal procedures, able to provide sufficient information in considering exposure of the loan portfolio and quality of the performance of credit officers and able to apply to the assessment of weaknesses and to rectify the deficiency, if any.

39. Examination of credit approval assessment, the credit administration and assessment of credit risk management and assess:

39.1 independence of the unit conducting assessment on the credit decision process, credit administration and credit risk ,management of credit risk by being independent from the units involved with the credit decision, credit administration and unit related to credit risk management by examining the structure of authority and actual operation.

39.2. the administration system, the on-going and regularity of the system for assessing credit granting process, credit administration and credit risk management;

39.3. accuracy of the rating of borrowers and the quality monitoring of individual borrower and of the entire loan portfolio;

39.4. reports of the assessment results to the board of directors, other assigned committees or relevant senior management whereby the results should identify the weaknesses in the policies, credit decision and administration processes and credit risk management process as well as non-compliance with the policies and normal procedures and management is to employ the assessment results or reports to rectify the deficiency, if any.

40. Examination of the exceptions from policies, procedures and guidelines of normal credit decisions is to be made and assess:

40.1. clarity of the stipulation of types of exceptions, analysis of possible risks, comparison with risk tolerance and rationales given as well as impacts from such exceptions;

40.2. impacts from exceptions from policies and normal credit decision process that is within the risk tolerance and mitigation or reduction of risk from such approvals to be within the level of tolerance.

41. Assessment of the effectiveness in monitoring and reporting exceptions by:

41.1. examining if the financial institution assigns internal audit unit/ credit review unit to review exceptions., assess related risks and review if the procedures for exceptions are observed and rationale for the approvals;

41.2. noting if exceptions are distinctly specified in the credit approval documents and information related to the reduction or mitigation of risk from the approvals of such exceptions should be provided and documented in the credit files;

41.3. examining if the financial institution submits the sufficient reports on the analyses of exceptions to its management and board of directors regularly;

41.4. assessing if such reports provide sufficient information to the management and board of directors to enable them to assess the compliance with credit policies, credit decision process, management of relevant risks and to be aware of the problems in the credit approval process and remedial actions such as review of risk tolerance level, revision of credit policies to be consistent with the credit culture or market conditions, changes of limits or criteria and types of exceptions, etc.;

41.5. assessing the effectiveness of remedial actions taken by the management and board of directors, in particular where there is a high number of exceptions and assessing the cooperation of employees in as well as timeliness of such remedies;

41.6. examining if the financial institution conducts comparisons of risk/reward of exceptions with those of normally approved credits and applies the results in the loan portfolio risk management as well as assessing the effectiveness of the management in such undertakings.

42. Examination of the system to remedy deteriorating and substandard credits is to be made and assess if:

42.1. there is a system to identify deteriorating or wakened credits such as internal rating system or others;

41.2. there is prescribed remedial policies and procedures by clearly specifying remedial methods as well as assigning responsible persons, duties, processes and scope of remedy such as stipulation on the number of months should repayment lapse before action is taken, what are the steps to be taken; whereby the responsibility may be assigned to the credit approval unit, workout unit or a combination of the two, depending on the nature, size and reason of the problem credit; where a financial institution having significant numbers of deteriorating or weakened credits, it must segregate the workout function from the credit approval unit;

41.3. timely reporting of credit sizes and qualities including reasons of problem credits is made to the responsible managers;

41.4. periodic reporting of the progress of the remedial actions is continuously made to the responsible managers at each level as well as stating the reasons and various difficulties to enable prompt remedial actions and to enhance their effectiveness.

Appendix

The stipulation of credit policies should include the following topics.

1. Approval Authorities: Credit policies should clearly assign authorized persons and approval limits. The credit approval may be assigned to a committee or joint authorities particularly for the cases which limits exceed the authority of a single person. Moreover, the credit approval committee should come from various department or business lines and there should be specific stipulation on the reporting system and the frequency of meetings of the committee.

2. Establishing Sizes of Loan Portfolio and Contingent Liabilities: Financial institutions may determine the sizes of loan portfolio and contingent liabilities in proportion to the on-balance sheet items such as in proportion to the deposits, capital and total assets. Additionally, they may take into consideration the market needs, volatility of sources of fund and risk exposure to earnings and capital.

3. Diversification by Credit and Product Types: Policies may set guidance in setting types of credits as a proportion to the aggregate credits such as commercial credits, construction loans, real estate loans and consumer credits, etc. Moreover, each type of credits may be further categorized by product types as well such as consumer credits may be set proportionately to credit card loans and to installment loans, etc.

4. Setting Credit Limits by Regions: Financial institutions should set market share by regions. Such regions should be distinctively defined such as Eastern industrial area, Chonburi Province, Rayong, shrimp farm area in the Southern provinces, etc. Setting credit limits by areas will enhance the ability to response appropriately to the credit appetite in each area and to enable the credit officers to control the credit portfolio effectively.

5. Determining Credit Types: Policies should set types of credits desired by the financial institution and specify the undesirable types by taking into account expertise of the credit officers, credit appetite in each geographical area, structure of deposits and capital charge for certain types of credits which may have high risk.

6. Minimum Financial Requirements: In general requirements are determined from the objectives and types of credits. Policies should set, at least, criteria for minimum payment, acceptable sources of repayments, cases or circumstances where guarantors are necessary as well as setting minimum qualification of the

borrower such as working capital, size of customer base, credit rating by external rating agencies, assets to liabilities ratio and debt repayment to earnings ratio, etc.

7. Financial Information of the Borrower: Policies should specify types and frequency of borrower's financial information such as audited financial statements, budgets, operating results, statements of cash flows, guarantors and projected financial statements as well as setting criteria for verifying accuracy and integrity of the information.

8. Conditions Related to Collateral and Credit Terms: Policies should specify types of collateral and credit terms acceptable to the financial institution, credit ceiling per value of collateral, maturities. Such may be evaluated from the objectives of the loans, sources of repayment and collateral.

9. Pricing Guideline: Policies should specify criteria for pricing interest rates and service fees which should cover cost and other expenses of the financial institution, in addition to providing acceptable yields. In setting profit targets, the management should consider the risk against expected return.

10. Documentation Standards: Policies should specify standards for internal documentation and legal documents of each type of credits.

11. Debt Collection and Charging Additional Interest: Credit policies should specify systematic debt collecting procedures and standards for charging additional interest.

12. Reporting to Senior Management: Policies should specify types of reports, information, and frequency to be submitted to the committees and senior management such as summary of exposures, projection of overdue, report of waived interest, non-performing loan report, credit concentration report and report of policy exceptions, etc. Report of large problem loans should provide information regarding exposure, projected loss and remedial action.

13. Risk Arisen from Off-Balance Sheet Items: Credit policies should specify facility limits while taking into account risk arisen from off-balance sheet items and should require line review upon renewal.

Guidelines
for Development and Application of Credit Scoring for Retail Loan Management

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Guidelines
for Development and Application of Credit Scoring
for Retail Loan Management

Objectives

1. This is provided as guidance to financial institutions in developing and applying credit scoring for the management of retail loans in various areas such as risk assessment, granting new credits, monitoring and controlling losses from credit extension, reduction of credit approval time, debt collection, reduction of errors in legal compliance and in observing regulations of the financial institutions as well as enhancing competitiveness and profitability. Such requires sufficient information, personnel with knowledge and capability to develop and modify credit scoring to be reliably applied. It is also to provide guidance for examiners in auditing and assessing a financial institution's development and application of credit scoring.

Definition

2. Credit scoring is a system which assists risk measuring and management of retail loan portfolio of financial institutions by calibrating information related to nature and behavior of customer to scores by analyzing and compiling related statistics from historical data with the objectives of:
   - 2.1 classification of good/ bad accounts and/or;
   - 2.2 calculation of probability of default based on the assumption that future behavior of a borrower is the same as the past behavior of a borrower with similar profile.

Guidelines

Credit Scoring Development

3. Financial institutions applying credit scoring in the management of retail loans, either using self-developed one or one purchased from vendor, should establish a clear policy whether the credit scoring is intended to apply with customer based or product based in order to set up an effective data collection process.

4. Credit scoring, either developed by the financial institution, purchased from vendor or outsourced the development to vendors, should have the following characteristics:

4.1. developed and tested using statistical principles, is reasonable and applicable;
4.2. developed from sample data which represents the whole population;
4.3. sample data must come from population with similar profile and behavior as the borrowers within the portfolio of the financial institution or the target customer on which the credit scoring is being applied.

Types of Credit Scoring

5. Financial institutions may choose to develop or use a single type of credit scoring model or both -
5.1. front-end or application scoring model which studies risk according to the profile of the population, geography and financial information of the new customers at the time of the application to be used for the credit limit approval, pricing and market strategy or in the prediction of probability of default;
5.2. back-end or behavioral scoring model which manages credit portfolio by ongoing monitoring the borrowers' behavior such as increasing or decreasing of credit limit, debt collection, renewal of limit, risk rating of the borrower, or prediction of expected and unexpected loss.

Review and Revision of Credit Scoring Systems

6. Financial institutions should review and revise their present credit scoring systems in order for it to be employed effectively and continuously and they should review or revise upon one of following events:
6.1. when good borrowers are unable to be segregated from bad borrowers under the prescribed level of confidence; or
6.2. when there is a change of goals or of credit approval procedures which materially impact the credit scoring system; or
6.3. when there is a revision of the business strategy such as expansion of market to a different group of target customers, introduction of new product or change of a credit policy which has material effect, etc.; or
6.4. when there is a change of an external factor which materially affects the credit scoring system.

Credit Scoring Development Process

7. In the case where a financial institution develops its own credit scoring system, it should organize the development process into at least 3 stages which are preparation of information, construction of credit scoring and testing of the reliability of separation and/or accuracy of prediction power.

Preparation of information

8. In the preparation and designing data collection of borrowers, financial institutions should take into consideration the selection of sample data for the development of credit scoring, consisted of:
    8.1. profile and behavior of the population that must be consistent throughout the development period until the credit scoring is implemented and the sample data must represent the entire population;
    8.2. at least 2 data collection periods, which are observation period meaning period which data is collected and observation is made on the nature and behavior of the customers whom credits are granted and performance period meaning period to observe and monitor the debt payment and borrowers' standings;
    8.3. definitions of good/bad borrowers that are consistent with the retail loan risk management policies of the financial institutions and the authority;
    8.4. credit policy in rejecting customers with certain profile must be clearly documented;
    8.5. borrowers' information categorized into 2 groups, the development sample and the hold-out sample where the 2 groups of data are within the same observation period and also in the same performance period;
    8.6. systematic retention of reject applications to be used in the preparation of reject inference;
    8.7. information from credit bureau.

Construction of Credit Scoring

9. Financial institutions may select several methods for constructing credit scoring, but must keep in mind the limitations of each method and should select a method that be applied to achieve the prescribed objectives at an acceptable level of confidence. Moreover, there should be sufficient data base and knowledgeable personnel.

Testing of the Reliability of Separation and/or Accuracy of Prediction Power of Credit Scoring

10. Statistical testing methods should commensurate with the objectives for using credit scoring of the financial institution i.e. to separate good/bad customers, or to predict probability of default. Moreover, prior to implementation several methods of testing used be conducted such as K-S Statistics (Kolmogorov-Smirnov), gain charts, Ln (odds) curve, weight-of-evidence or Chi-square (Hosmer-Lemeshow), etc.

Implementation of Credit Scoring System

11. Financial institutions may choose a strategy of setting cut-off score in order to maintain the balance between return and possible loss such as if the cut-off score is reduced, the credit approval rate will increase which means that the number of customers and earning will increase while losses will also increase accordingly.

12. If financial institutions apply credit scoring with a new group of population, it should be confident that the profile and behavior of such group of population is similar to the existing group and must close monitor the results.

Preparation of Manuals

13. Financial institutions must prepare user manual and application manual for the relevant persons to use them as an operating guide.

14. Credit scoring user manual must cover procedures, methods of evaluation of borrower's information from the application and from the credit bureau and scoring process. The application manual must cover problems and precautions during the installation of the credit scoring system, points to be considered and determined by the management during the installation as well as information or decisions already made such as the decision to install stand alone credit scoring system or general data processing, advantages/disadvantages and reasons for such decision.

Overrides in Credit Approval

15. Financial institutions must establish a practice for cases that do not conform to the policies or normal procedures (overrides) and document it in a clear and precise manner. Such shall include high-side overrides for rejections where the applicants pass the minimum score and low-side overrides for approval where the applicants fail to pass the minimum score.

Verification of the Applicant's Information

16. Financial institutions should possess a process to verify applicant's information to ensure accuracy of the information.

Monitoring and Reporting

17. Financial institutions must prepare monitoring reports on the reliability and/or accuracy of the credit scoring system regularly in order to be aware of the cause for the decrease of reliability and/or accuracy and to be used to revise the credit scoring. Nevertheless, frequency or period for the reporting may vary with the

transaction volume of the financial institutions. However, the reporting should, at the minimum, be made once every quarter.

18. Financial institutions shall prepare the following reports to be submitted to the management.
    18.1. Front-end reports are for monitoring and measuring the effectiveness of credit scoring to ensure that its reliability and/or accuracy are within an acceptable level.
    18.2. Back-end reports are reports for measuring quality of the loan portfolio and for estimating expected loss.

Front-end Reports:

19. Population stability reports are comparisons of score distributions of applicants of present population group and those of the group in the development period. The score distributions of the 2 groups should be similar.

20. Characteristic analysis reports are comparisons of changes of profiles and behaviors of the present population group with those of the group during development period. The differences in the changes of the 2 groups will affect accuracy of the credit scoring.

Back-end Reports:

21. Delinquency by score reports or delinquency distribution reports are reports that show delinquency rates distributed over the score levels to be used in loan portfolio management, where by the financial institutions must clearly specify period or conditions for delinquency.

22. Dynamic delinquency reports or vintage analysis reports are comparisons of delinquency of borrowers which have opened the accounts for equal length of periods such as comparison of delinquency rates of various borrower groups whose accounts have been opened for 12 months. Such may be borrower groups entering in January, February, March and April, etc.

23. Diary or chronology log reports are reports or logs of important events recorded in the chronological order starting from the beginning of development of credit scoring system to be used in audit and reference in later dates such as changing of credit scoring system, credit policies, market strategy, behavior and profile of population or other changes which affect the effectiveness of credit scoring.

Assessment Guidelines for Examiners

24. The coverage of the assessment of examiners on the development and application of credit scoring to manage retail loans must include the following topics.
    24.1. Objective of the development and/or for using credit scoring and related policies.
    24.2. Development process beginning from preparation of information, development methods and validation.
    24.3. Implementation of credit scoring system.
    24.4. Monitoring and reporting process

Purpose of the Development and/or for Using Credit Scoring and Related Policies

25. Objective of the credit scoring development of the financial institution must be reviewed if the intended purpose is to differentiate good/bad customers or to predict the probability of default or for both. If it is intended to be used for both purposes, the principal area should be specified. In other words, if credit scoring is developed to differentiate good customers from bad ones with reliability or to accurately predict the borrower's future repayment capacity. Methods and test results must be compared if it is consistent with the intended objective. For example, in the case that credit scoring is required to classify good/bad borrowers, test results such as K-S (Kolmogorov-Smirnov) Statistics, gain chart or Ln (odds) curve values, etc. should be reviewed for consistency. Where the intention is to forecast or predict the probability of default of customers, the Chi-square or H-L Statistics should be reviewed to determine if they are consistent with the prescribed assumptions. Such would reflect whether the actual value is correct or close to the prediction under the prescribed level of confidence or not and by what degree. In addition, review must be conducted on 2-3 values of test results in combination. Moreover, financial institutions may use other testing methods with the credit scoring development other than the said method.

26. Application of credit scoring of the financial institution must be monitored continuously from the process of development of methodology and testing tools and upon material policy changes to enable an assessment of reliability and/or accuracy of credit scoring.

27. It should be reviewed if credit scoring of the financial institution is developed or used as intended in according to the prescribed policies. Such policies should be clearly established and approved by senior management. In addition, it should take into consideration the types of credits, credit limit granted to each borrower and collateral which shall correspond with the selected population which have similar profiles such as residential loan borrowers with limits not exceeding THB 5 million may have profile and behavior that are different from those with limits exceeded THB 5 million but not exceeding THB 20 million, etc. As such, financial institutions may consider separating them into 2 groups. Moreover, the

policy is to use credit scoring for customer based and product based concurrently; financial institutions should select one risk simulation model as a basis for credit decisions and may use both types of models to analyze individual risk and product risk. For example, banks may select customer based model as the basis for credit decisions and use product based model to observe the default rate and profitability of each product. However, the financial institutions' management information systems and accuracy of the information must be at readiness.

28. Credit scoring should be assessed if its attributes follow statistical principals by:
    28.1. inquiring on and examining documents which stipulate statistical principles and methodologies adapted, data or samples used in testing, test results under statistical principles; moreover, responsible officers should possess knowledge, understanding of statistics to be able to explain the justification of the statistical methodologies selected;
    28.2. validating the sample data used in the development to ensure that they came from credit products of similar nature and within the closely approximated periods;
    28.3. auditing population stability reports of development sample, hold-out sample and out-of-time sample to see if the three sample groups have similar profiles and behaviors as the data of the present credit portfolio.

29. Upon revision, modification of the credit scoring system or employing of credit scoring on the new group of population, responsible officers should be interviewed on causes/reasons. Such changes should be approved by senior management and assessment of reliability and suitability should be conducted as well as there should be an ongoing monitoring of the details and result of the implementation.

Development Process (Data Preparation, Development Techniques and Revalidation)

30. It should be reviewed if the financial institution analyzes and prepares data for the credit scoring development by:
    30.1. reviewing the population stability reports and characteristic analysis reports to assess profiles and behaviors of the samples used in credit scoring development that they are similar to those of the entire population;
    30.2. reviewing the data collection for credit scoring development such as the period for collection data which is the observation period that normal set for 3-12 months and performance period of 18-24 months. The periods should commensurate with the nature or types of credits that it must be able to indicate the highest expected loss. Moreover, the stipulation of method and criteria for selecting data should be reviewed. Such borrowers' data or samples should be classified into 2 groups –

development samples and hold-out samples. Retention of rejects, reject inference preparation and utilization of information from credit bureau in the credit scoring development should be assessed for reliability.

31. A review should be conducted to assess if the management and responsible officers are knowledgeable and have a thorough understanding of the principles and statistical methodologies and have reasons for selecting the chosen method as well as are aware of the limitations in the application of each method such as regression methods may be using ordinary least squares or maximum likelihood while non-regression methods may use discriminant analysis, linear programming or tree-based methods, etc.

32. Revalidation of the financial institution should be reviewed to ensure that the objective for using the credit scoring is fulfilled i.e. if the objective is to differentiate good/bad customers, the method employed should be tested for reliability of credit scoring by statistical techniques such as K-S Statistics (Kolmogorov-Smirnov), Gains Charts, Ln (Odds) Curve, Weight-of-Evidence or Divergence and if the objective is to predict the probability of default, there should be statistical accuracy testing such as Chi-square or H-L Statistics (Hosmer-Lemeshow), etc.

Implementation of Credit Scoring System

33. The implementation of credit scoring should be assessed to ensure that it is effective as targeted, the strategy selected by the financial institution set minimum score, comparison is made with the actual loss and the ratio of approvals and reason for selecting such cut-off score is specified.

34. Examiners should review delinquency by score reports or delinquency distribution reports to monitor the default rate continuously, which may help as an accurate warning signal, as well as examining the reasonableness of the strategy, the financial institution chooses in stipulating the cut-off score that is to say that there must be a correlation between reward and possible loss from increasing the credit approval ratio.

35. [Examiners] shall review user manual for the credit scoring system and application manual to ensure that they include important details in full, that they are easy to understand. Moreover, it must be assessed if the work complies with the stipulation in the manuals from beginning to the end and that there is an internal control system as well as an adequate security system. In addition, the examiners should take into consideration where there is a change to the operating procedures or policy in adopting other credit scoring concurrently.

36. A review should be conducted on the procedures for overrides which the financial institution should document and approved by the senior management. It should be filed according to the category of such items which include high-side overrides and low-side overrides. In practice, if the number of the overrides is statistically significant (approximately 5% of all applicants), there is a possibility that there is an overlook of a variable or factor that is material to the prediction.

37. Examiners should review the policy regarding exclusion overrides that it may cause the present population to differ from those during the development or not. If during the credit scoring development, customers of certain profile are included but subsequently upon application of customers of such profile, they are excluded. This type of characteristics is a model-reversal override. Such override should be monitored during the credit scoring validation to determine if the credit scoring fails to accurately assess customers with excluded profile. In addition, the effectiveness of the override policy should also be assessed.

38. The procedure to verify applicants' information of the financial institution should also be reviewed for compliance with its manual or practical guidelines and a random audit should be conducted to verify the accuracy of the information.

Monitoring and Preparation of Reports

39. [Examiners] are to review and assess the report preparation system and reporting system that there is a back-up computer system for the report preparation as well as there is a directly responsible person(s) enabled to prepare reports and analyze the reliability of the credit scoring on a regular basis. Such are to be provided for senior management with coverage of material details and in a timely manner. Moreover, preparation of reliability analysis of the credit scoring should be monitored regularly.

40. Population stability reports should be reviewed to determine the resemblance of granularity of applicants' scores during development period and present to ensure that the profiles and behaviors of the 2 population groups are similar and the past behavior is able to be used in predicting the repayment of the present customers with accuracy.

41. Characteristic analysis reports should be reviewed to determine the key profile and behavior that causes the present population to differ from that during the development period. If it is found that there is material difference affecting the accuracy of the credit scoring, an inquiry should be made on the financial institution's remedial action or modification of other factors which affect the predictability of the borrowers' behavior in order to assess rationality of the remedy.

42. Delinquency by score reports or delinquency distribution reports should be reviewed to assess the borrowers' default rate and to assess if the credit scoring is capable or predicting the probability of debt repayment of the borrowers as stipulated. Such depends on the financial institution's definition of default. In general, borrowers receiving high scores should have low default rates and those with low scores should have high default rates.

43. Dynamic delinquency reports or vintage analysis reports should be reviewed to note the behavioral changes of the debt repayment of the borrowers accepted during different period. If it is discovered that the recently accepted borrowers have higher default rates than existing ones, inquiry should be made with the relevant officers if there is any contingency plan and how will it rectified to prevent the default rate to exceed the stipulated level.

44. Diary or chronology log reports should be reviewed if the financial institution prepares log of significant events in chronological order commencing from the development to date which comprehensively covers various important topics in accordance with the credit scoring development, in particular the changes under credit policies, revision of market strategy or changes in behaviors and profiles of the population or other factors that may impact the effectiveness of the credit scoring.

Guidelines for Risk Model Validation

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Guidelines for Risk Model Validation

Objectives

1. This is provided as guideline for financial institutions intended to develop and employ risk models and/or financial institutions already employing risk models to validate the risk models in accordance with generally accepted statistics, mathematics and econometrics or for internal control, etc. This is to ensure that financial institutions understand and exercise cautions in planning development and testing reliability of the risk models to fulfill the objectives and merit the investment, in addition to ensuring that they recognize and understand the limitations of the adopted risk models. It is also to provide guidance for examiners in auditing and assessing a financial institution's risk models.

Definitions

2. Risk model means a tool used in measuring and monitoring various risk using financial, statistics, mathematics and/or econometrics principles such as risk models for credit risk, market risk, liquidity risk, operational risk and other related risk models. Risk model is consisted of 3 essential parts, which are:
   - 2.1. input data including information and various assumptions;
   - 2.2. diagnosis that is consisted of application of various risk model concepts and computations including conversion of input data to estimates by computer processing;
   - 2.3. outcome that expresses estimates and conversion of the results into a ready to be used format.

3. Model risk is a risk that may incur damages to financial institutions, arisen from:
   - 3.1. utilization of risk model which yield inconsistent results which may instigate from input data and/or incorrect diagnosis such as using wrong theory, errors in the computer program or calculation, input data ineffectual to the forecast which in turn affects the accuracy of the risk model, etc.
   - 3.2. material miscalculation from the analysis/ conversion of outcome from the risk model such as the value at risk is deemed as the highest loss that could occur, however, the correct meaning is the highest loss which may occur under the stipulated level of confidence, e.g. at a level of confidence of 95% or 99%, etc.

4. Senior management means management as defined by the Notification of the Bank of Thailand No.: ThorPorTor. SorNorSor. (31) Wor. 2770/2545 Re: Structure of Corporate Governance Board dated 3 December 2002.

5. Input data means data used for the diagnosis in the risk model which may be collected from actual historical data, data derived from calculation or simulation.

Guidelines

Policies and Assignment of Responsibilities of Related Persons

6. Financial institutions must set clear and practical policies for risk model revalidation which shall include and be consistent with the characteristics of the risk model and model risk.

7. Financial institutions must clearly assign responsibilities of management and employees related to risk model validation.

Roles and Responsibilities of Management

8. Senior management must arrange to validate risk models in accordance with the set policies and to have periodic reviews as well as to validate the risk models upon every changes of the environment that may affect the risk models, modification of the risk models or changes of crucial assumptions or parameters used in the risk models.

9. Related management must understand the meaning of the outcomes and limitations of the validation of risk models.

Related Personnel

10. Users of the risk models must be knowledgeable, understand and be capable of exercising judgment adequately to provide data that is beneficial to the development and validation of risk models.

11. Risk model developers must be knowledgeable, understand, and be skillful technically and conceptually in finance, statistics, econometrics and related business as well as having received necessary training in such field as business in order to specify assumptions, select concepts and develop various risk models appropriately.

12. Persons conducting risk model validation:
    12.1. must be knowledgeable, understand, and be skillful technically and conceptually in finance, statistics, econometrics and related business as well as being capable of making business decisions to validate and assess

the suitability of the risk models and compatibility with the nature of business, volume, complexity of transactions and existing risks;

12.2. must be autonomous from the risk model developers.

13. Reviewers of risk model validation must conduct monitoring and auditing to ensure that the risk model validation conforms to the prescribed policies and guidelines. The reviewers must be independent from the users, developers and persons conducting validation.

Risk Model Validation

14. Financial institutions must validate risk models, both developed internal or acquired.

15. Financial institutions must validate each component of the risk models which are inputs, diagnosis and outcomes by a method or several methods in concurrently as follows:

    15.1. validation of the logical and conceptual soundness;

    15.2. comparison of the outcomes of the risk models with the actual;

    15.3. comparison with other risk models.

16. Scope of validation of a risk model must commensurate with its characteristics varied with complexity of transactions and existing risks.

17. Financial institutions must be confident that the acquired risk models have be validated in accordance with generally accepted standards and vendors disclose necessary details, methodologies and outcomes from model validation to the financial institutions.

18. Financial institutions must be able to identify reasons for the divergence of the outcomes of the validations and possess remedial plans where it impacts the accuracy and reliability of the risk model.

19. Financial institutions must document the risk model validation in details comprehensively and clearly.

<u>Validation of Input Data</u>

20. Financial institutions must test the accuracy of internal and external information utilized in the risk models and in validating the risk models which should include reconciliation and confirmation.

21. Financial institutions should appoint responsible persons who may be the risk model developers or those conducting validation, to assess problems related to inputs. They must be able to identify arisen errors precisely and timely as well as reporting to the management.

22. In the case where stipulated assumptions are derived from estimated values of other risk models, such models must also be validated under these guidelines.

23. Financial institutions must compare assumptions related to inputs with the actual ones periodically and report to the management.

Validation on the Diagnosis

24. Financial institutions must review the concepts used in the risk models such as economic, financial, mathematical and statistical concepts since most errors of the risk models are incorrect application of concepts.

25. Financial institutions must validate the computer programs and mathematical formulas used in the risk models which may be performed by several methods. The selection of each method must commensurate with the sophistication of the risk model.

Validation of the Outcomes

26. Financial institutions must compare outcomes derived from risk model with actual outcomes periodically and in the case where other risk models are used for comparison, the outcomes derived from the risk model must also be compared with the outcome from such other models.

Internal Control

27. Financial institutions must arrange to have security systems in the event of any modification made that is material to the risk model and to the risk model validation and such must be approved by the relevant management.

Assessment Guidelines for Examiners

28. Examiners must assess the risk model validation of the financial institutions on the following topics.
    - Policies and assignment of responsibilities of relevant persons in the risk model validation
    - Roles and responsibilities of management

- Qualification, knowledge, comprehension and independence of personnel related to risk model validation
- Scope and details of risk model validation
- Validation of the risk models developed by the financial institutions or purchased
- Documentation of risk model validation
- Validation of inputs to the risk model
- Validation of the diagnosis of the risk model
- Validation of the outcomes and reporting
- Related internal control system

Followings are details of each of the topics.

29. Policies and assignment of responsibilities in risk model validation of the financial institution shall be assessed if:
   29.1. the financial institution has formulated policies for risk model validation by documentation and has clearly communicated to relevant persons to comply with the stipulated policies;
   29.2. the validation policies set by the financial institution cover and commensurate with the volume and complexity of its activities including existing risks;
   29.3 the financial institution has appointed a unit and responsible managers for the risk model validation, whereby the appointment is sufficiently detailed and clear to enable validation to be conducted according to the said policies;
   29.4. knowledge and experience of the managers relevant to the risk model validation commensurate with the degree of risk within their own business line to ensure that the managers are capable of understanding the usage and validation of risk models used in the line of business;
   29.5. directions of the validation is practicable, extensive and commensurate with the volume and complexity of the activities including existing risks of the risk model.

30. Roles and responsibilities of management shall be assessed:
   30.1. on how importance the senior management deems the risk model validation by considering the validation policies, resource allocation, reviews and approval of validation plans and monitoring of the activity regularly until completion as planned;
   30.2. if relevant managers fully understand the meaning of outcomes from the risk model validation and recognize the limitations of the validation by examining the application of outcomes from the risk model validation in management or in modification and development of further risk models;

30.3. if validation has be arranged using other statistical techniques or other generally accepted methodologies.

31. Related personnel shall be assessed to determine that:
    31.1. users understand how to use risk models, are aware of rationale for selecting the concepts, recognize the limitations of the risk models, able to provide useful information for the development and validation of risk models by examining the education, work experience and training in related fields such as business, financial concepts and technical know-how, etc. as well by interviewing and having them demonstrate how to use the risk models;
    31.2. developers and persons who conduct validation of the risk models have in-depth technical know-how, business knowledge, relevant experience, adequate and regular training and able to apply their knowledge in the development and validation of risk models effectively.
    31.3. persons conducting risk models may not necessary come from audit line and/or risk management line, however must possess knowledge, capability as indicated within these guidelines and have adequate independence to perform their duties;
    31.4. financial institutions appoint an independent internal unit or engage external assessors to conduct risk model validation;
    31.5. initially, if financial institutions are unable to separate those conducting validation from the developers, they should possess an appropriate risk model validation process, documents demonstrating validation and indication that it is closely monitored by the management;
    31.6. financial institutions arrange to have independent units such as internal audit unit or external reviewers to audit the operating process of the unit conducting risk model validation if it is conducted in accordance with the prescribed policies and guidelines by examining the internal audit report or review report as well as interviewing such independent units.

32. Scope and details of the validation of the financial institution shall be assessed to determine if it covers all types of risk models employed by the financial institution, either self-developed or acquired.

33. It shall be assessed if the financial institution arranges to validate if the risk models are operable, reliable and meet the terms of agreements if purchased and/or when there is any medication to the component of the risk models, it is compatible with the usage of the financial institution.

34. Risk model validation of the financial institution shall be assessed:
    34.1. if the financial institution reviews the rationality, principle and various computation techniques used in the risk models;

34.2. if the financial institution compares the outcomes from the risk models with the actual such as in back testing, the validation of the outcomes from the risk model will ensure that they are correct, clear and reliable;

34.3 where the financial institution compares the risk models used with others whereby the others used for comparison have similar attributes to the validating risk models; such may be models that the financial institution utilized previously or generally accepted models capable of being used as reference and have been well tested. The comparison with other models may help to indicate areas required improvement and may promote better understanding of questionable points of the outcomes.

35. The scope and details of the validation shall be assessed to ensure the coverage and compatibility with the characteristics, volume and complexity of activities as well as existing risks by examining the details and validation process.

36. Frequency of risk model validation and review of the validation results shall be evaluated. Such frequency may differ in each financial institution depending on the level of the volatility of the risk factors that affect the financial institution and the extent of changes in the assets, liabilities and off-balance sheet items of the financial institution.

37. In the case that the financial institution purchases a risk model, it shall be assessed if the purchased model has been validated by generally accepted standards and details of the validations are disclosed in full where the vendor provide adequate details and validation techniques as well as outcomes to the financial institution.

38. It shall be assessed to determine if the financial institution is able to provide reasons where the outcomes from risk model validation materially differ from the outcomes of risk models or from actual events.

39. The documentation of risk model validation of the financial institution shall be evaluated if it is comprehensive, clear and has adequate details for future reference such as policy of details, validation technique, reasons for selecting the technique, data/sample used in the validation, validation process and outcomes from the validation, etc.

40. Validation of input data shall be assessed if:

40.1. financial institution validates internal and external data being used such as reconciliation of internal information with the related ledger accounts or review of external data with other reliable external sources which may be reviewed by using a system or experienced personnel; nevertheless, reconciliation may not be completed for every item, but it must cover crucial data by employing clear procedures and supporting evidence as well as being conducted continuously;

40.2. input data is improved and updated regularly either as an ongoing basis or upon material changes;

40.3. financial institution gives importance to the audit of the input data, assigns persons to be responsible for assessing problems and if there is an error, are able to rectify in time and report to the management;

40.4. financial institution, when uses outcomes from other models as input, validates every step of those models, for example, if a portion of the input of the value at risk model is the outcome derived from the financial derivative valuation model, the said valuation model must also be assessed under these guidelines;

40.5. persons conducting risk model validation compare the assumptions with actual data on a regular basis by examining the comparison reports such as loan valuation model must use an assumption regarding prepayment rate whereby such assumption must be compared with actual prepayment;

40.5.1. frequency of the comparison of assumptions and actual data varies with the magnitude of the changes;

40.5.2. accuracy assessment under statistical principle and assessment of rationality in selecting assumptions such as reasons must be stated as to why the normal distribution assumption is adopted with the market risk model, etc.

41. Validation of diagnosis component shall be assessed:

41.1. financial institution arranges for reviews of concepts used in risk models whereby the developers having prepared detailed information of the concepts and demonstrated that the economic, financial, mathematical and statistical concepts used are well accepted, for example in the academic circle, etc.;

41.2. in the case where financial institution adjusts the concepts to the characteristics and complexity of activities as well as existing risks, examiners must assess if it has sufficient reasons for making such concept adjustment and if the results of the adjustment is acceptable by examining the results of the risk model validation;

41.3. financial institution appropriately tests the computer programs and mathematical formulas by examining the reports of the risk model validation. For example, in the case where a risk model developed in the spreadsheets is a simple program and possess noncomplex mathematical formulas which can be tested easily by comparing with the results from other risk models constructed in the same fashion. If the outcomes of the two models match, it indicates that the computer program and mathematical formulas are reliable or in the case of highly sophisticated programs, experts may examine the programming.

42. Validation of outcome shall be assessed to determine if the financial institution arranges for regular validation of outcomes from the risk model by comparing with actual events or with results from other referenced risk models.

43. It shall be assessed if outcomes from risk models passed validation, are reliable, able to be applied in the operations and for decision making.

44. Internal control system shall be assessed if:
    44.1. various materially significant modifications in the risk models or in the validation are approved by relevant managers and delivered to the independent unit for review prior to implementation;
    44.2. financial institution has a security system when effecting any modification in the risk models such as appointing authorizers and passwords in accordance to the level of the significance of the changes;
    44.3. even if the financial institution develops a simple risk model from spreadsheet, it should appoint an authorizer and password to prevent access to the said information by any unauthorized person.

Guidelines for Credit Risk Stress Testing

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Guidelines for Credit Risk Stress Testing

Objectives

1. This is provided as guidelines for financial institutions to use in stress testing the credit risk in loan portfolios, investment portfolios and off-balance sheet items by prescribing appropriate and sufficient scenarios as well as means for mitigation or to limit possible losses within acceptable level. It is also intended as guidance for examiners in auditing and assessing credit risk stress testing of the financial institutions.

Definitions

2. Stress situation shall mean atypical situation which may occur and cause severe impact.

3. Credit stress testing shall mean testing of the level of capability of a financial institution to handle any impact from a credit stress situation on the financial institution by creating probable scenarios and analyze the impacts, for example a counter party fails to comply with an agreement, defaults or fails to deliver an asset as agreed upon; reduction of credibility of the borrower; or intensification of possible loss, etc.

Guidelines

Policies, Roles and Responsibilities of Management

4. Financial institution shall establish a credit stress testing policy in writing and specifically appoint responsible staff to ensure that the testing policy covers and commensurate with existing activities and risks.

5. Management must be knowledgeable, understand and participate in the setting of the credit stress testing procedures which shall consist of clear details and is practicable.

6. Stress testing plan must be officially approved by the management and should consist of objective of the testing, scenarios, various stipulated assumptions in detail, procedures, test methods, duties and responsibilities of relevant persons, outcome reporting and precise action plan to address the probable stress situations.

7. Scenarios used in the testing shall cover related risk factors, significant changes of various risk factors which may affect or incur from material losses to severe

losses as well as credit risk factors and market risk factors that may impact credit risk and other risks such as official regulations, internal and external economic conditions, new financial products and competitors, etc. Moreover, stress scenarios must commensurate with the characteristics and components of loan, investment and off-balance sheet portfolios of the financial institutions such that the outcomes of the testing have most thorough coverage.

8. Financial institutions shall conduct stress testing and report the outcomes to the management regularly including identifying problems and causes of possible losses in an easy to understand format and containing sufficient details to facilitate appropriate and timely remedial actions.

9. Financial institutions shall prepare plans or guidelines to withstand impact from the stress tests that are clear and practicable, such as reviewing or revoking contracts or contingent liabilities, restructuring of loan, investment and off-balance sheet portfolios and/or risk prevention, etc.

Stress Testing Tools

10. Financial institutions should have internal rating systems which consist of quantitative and qualitative criteria in accordance with the Guidelines for Internal Rating System where borrowers within the same grading bucket should have similar probability of default. An internal rating system will facilitate the stress testing.

    10.1. In the case where a financial institution has a model that is able to calculate the probability of default (PD) and percentage of loss given default (LGD), it can conduct shock testing at the PD and LGD numbers directly, and then calculates the expected loss (EL) and unexpected loss (UL) of the loan portfolio.

    10.2. In the case where a financial institution has an internal rating system but not a model to derive the PD and LGD figures, it may conduct stress testing by reducing the quality of borrowers in various grades and then calculate the aggregate amount of possible loss to the loan portfolio. In such case, the collateral values shall be taken into account when calculated the EL and UL of the loan portfolio as well.

11. Financial institutions without any internal rating system must analyze impacts of stress situations to the borrowers in the loan portfolio by studying the debt repayment capability of each borrower subsequent to having adjusted the borrower's financial statement information from impacts from various risk factors by assessing the impacts on such financial statement. The financial institutions may use historical data or discretion. They also must take into consideration the

value of the collateral. Such technique, however, is unable to examine the dependencies between the borrowers within the same portfolio or between sub-portfolios. Therefore, conservative principle may be observed by setting the correlation at +1 or any other value, if there is apparent supporting information.

Procedures for Credit Risk Stress Testing

Readiness Preparation of the Information

12. Information used in the testing must be accurate and reflect the overall loan portfolio characteristics as well as covering the crucial risk factors that are relevant or that affect the loan portfolio of the financial institutions.

Information on Credit Risk Factors

13. Financial institutions must obtain up-to-date information on the borrowers and are capable diagnosis for the use of analyzing risks and stress testing. They must also be able to measure the exposure of individual borrower and of the aggregate loan portfolio. For example, the use of an internal rating system that is consistent and reliable will facilitate the forecast of the PD and LGD as well as the possible loss of each borrower, the EL and UL of the loan portfolio of the financial institutions.

Information on Market Risk Factors

14. Financial institutions must obtain accurate and timely information on market risk factors such as interest rates, exchange rates, securities prices, etc. since such information is necessary for the assessment of losses upon default or failure to comply with the stipulated agreement in particular where it relates to obligation of the counter-party to deliver an asset or repay the financial institutions.

Information on Other Risk Factors

15. Financial institutions should study information and trends of the changes in the social, economic, industrial and political environments, and anomalies in the financial market, etc. including volatilities of risk factors, dependencies of various factors such as credit risk components/factors. Moreover, they must study the changes of the transition matrix, etc. in order to create scenarios. Financial institutions should consult internal and external experts although forecasting stress situation is difficult. They however should try to identify likely or possible events as much as possible.

Creating Scenarios for Testing

16. To create scenarios, financial institutions should consult various experts, both internal and external, for example money market trader, relationship manager, outlooks of various institutions regarding estimates on the changes of risk factors and trend of the changes in the behavioral of the customers resulting from changes of risk factors. Furthermore, the management should understand, gives importance to and support every steps of the testing procedures.

17. Financial institutions must create scenarios to test the impact from the changes in the environment on the risk exposure of their counter-parties and credit portfolio such as changes of the economic factor, shortage of crude oil, financial crisis or natural disaster, etc.

18. In the case where financial institutions set up scenarios using shocking the macroeconomic variables such as the gross domestic products, interest rates, exchange rates, etc. Financial institutions may add relationship between risk factors or correlation matrix such as between interest rate and exchange rate.

Risk factor/Component Shocks and Impacts

19. In creating scenarios, financial institutions shall conduct shocks on various factors as follows:
    19.1. risk factors within a single grouping that affect the borrowers, for example within a group, there may be such risk factors as interest rate and exchange rate, financial institutions must shock both risk factors together to ensure that every significant risk factor is shocked entirely;
    19.2. risk components/factors such as probability of default, percentage of loss given default, etc.

20. In deriving the impact on loan portfolios from scenarios, financial institutions must take into consideration the correlations between industries in the loan portfolios since same direction correlation between industries that is material will increase loss.

21. In the case where it is expected that the counter-party in any country or region shall be affected from such risk factors as war, politics, etc., financial institutions must reduce the level of confidence of every single counter-party in such country or region. Then possible loss to the loan portfolio shall be computed.

22. Financial institutions must take into account country risk which affects the borrowers within such country or those invest in such country as well.

Testing Assumptions used in the Risk Models

23. In calculating pre-settlement risks, if financial institutions use models such as VaR, they must also test the assumptions used the said models to ensure that they are accurate and reasonable.

24. Financial institutions may extend holding period in stress testing since in such situation, financial instruments such as derivatives, etc. may have lower liquidity than normal.

25. In setting assumptions regarding correlations under stress, caution should be taken that the correlations between risk factors may differ from normal or move in opposite directions from normal situation (breakdown or reversal).

Stress Level of each Risk Factor to be Stipulated in the Risk Models

26. Financial institution should select maximum stress level of such risk factor that ever occurs in 1 recent business cycle since selecting stress level within shorter period may not cover all events that reflect the previous stress situations.

27. In the case where financial institutions choose judgment in setting stress level, the management should be certain that the prescribed level is no less severe than possible incidence.

Stress Testing Reports

28. Financial institutions must report the stress testing outcomes to its management to aid in the policy decision making and remedial directives. The reports must contain details and adequate clarity in specifying scenarios, possible loss, strategy and guidelines in risk management as well as mitigation plans and risk control upon stress situation.

29. Financial institutions shall submit self-prepared reports of the details of credit stress testing or stress testing under the Financial Sector Assessment Program (FSAP) as stipulated by the Bank of Thailand to the Supervision Group of the Bank of Thailand as shall be duly notified.

Assessment of the Suitability of Stress Testing

30. Financial institutions shall oversee, review and improve stress testing to commensurate with the components of the changing loan portfolio and surrounding factors to ensure coverage and stringency of stress testing. Under the normal situation, review may be conducted at least once a year and with increased frequency upon greater market volatility in order to obtain information of use to control risks or withstanding possible losses promptly.

Assessment Guidelines for Examiners

31. Examiners shall assess the stress testing of the financial institution on the following areas.
    31.1. Testing policy
    31.2. Roles and responsibilities of management and relevant persons
    31.3. Plans, assumptions and procedures for testing
    31.4. Testing assessment and reporting

32. Stress testing policy of the financial institution shall be assessed if
    32.1. there is clarity and if it is appropriate with the structure and complexity of the loan portfolio of the financial institution;
    32.2. the risk exposure and acceptable risk are stipulated to commensurate with the capital status of the financial institution;
    32.3 stress testing is established with, at the minimum, details of risk tolerance, conditions, scope of testing, crucial testing assumptions, testing frequency, reports of testing and contingency plan to withstand against stress situation.

33. The testing of financial institution shall be assessed if
    33.1. management is knowledgeable, understands and lends support to the testing;
    33.2. the testing fully incorporates risk factors corresponding to the characteristics, status of the loan portfolio and material circumstances;
    33.3. consideration is given to large move of each risk factor;
    33.4. scenarios are regularly reviewed;
    33.5. clear contingency plans are prepared and operable;
    33.6. testing reports contain adequate details to enable management to use them in their decision making and to conduct measures to withstand against stress situation;
    33.7. every process of the testing procedures and contingency plans are precisely documented.

34. Additional testing of the financial institution shall be assessed. Examples [of additional testing] are:
    34.1. shortening or extending of holding period;
    34.2. reducing, increasing or forecasting the exposure at default (EAD);
    34.3. reducing or increasing market risk factors such as interest rate that is being used to derive impact on credit risk;
    34.4. adjusting the correlation of the market risk factor being used to derive impact on credit risk.

35. Roles and responsibilities of the management of the financial institution shall be assessed if:
    35.1. management understands and have visions regarding credit risk management tools by inquiries and examining related documents that demonstrate the actions taken by the management and progress or impediments as well as remedies;
    35.2. management values and participates in the testing, for example in the formulating policies, contributing comments or suggestions by examining the agenda, minutes and related documents of meetings;
    35.3 management specifically appoints persons responsible for the testing, prescribes details of duties, directives as well as allocating appropriate resources; this may be assessed from budgets and stipulation of the details under the action plan including inquiry with the staff who prepared the budgets, if there is material difference between the budget proposal and the approved budget.

36. Stress testing plans of the financial institution shall be assessed if:
    36.1. the financial institution appropriately assigns levels of authority in approving the testing plans whereby it is to be granted by the decision makers, responsible for units directly related to the testing;
    36.2. procedures for testing plan are comprehensive, precise and practicable;
    36.3 setting up of scenarios, parameters and testing format are clear and appropriate when compared to the structure and complexity of the loan portfolio of the financial institution;
    36.4. regularity and testing time as well as test reporting should commensurate with the business environment of the financial institution. For example, if the testing is set to be held once a year, however the economy is in the downturn or is highly volatile and/or [the financial institution] has several risky business and/or has borrower groups that are sensitive to the changes of the environment, the financial institution should conduct testing more frequently in order to evaluate the possible impact. Nonetheless, if the loan portfolio or sub-portfolio has little movement and are not quite sensitive to the environment, such frequency may be reduced, etc.

37. Scenarios used in the testing of the financial institution shall be assessed if:
    37.1. management and related units participate in the formulation of scenarios by examining from minutes, agenda and supporting documents of related meetings;
    37.2. scenarios are probable by examining the historical events and future trends;
    37.3 it has reasons and evidence supporting the analysis and decision in selecting risk factors and in prescribing scenarios;

37.4. procedures and techniques for analyzing risk factors of the financial institution conform to the accepted academic principles and/or employ statistics in testing of material risk factors being used and/or apply historical or empirical information, such as creating graphs to examine the relationship, by inquiries and assessment of documents of the financial institution;

37.5. risk factors used in the testing include ones that materially affect the quality of the loan portfolio of the financial institution;

37.6. multi-factors scenario is appropriate to be used in the testing as there is likelihood of occurrence and is severe enough to cause material losses.

37.7. the financial institution takes into account risk concentrations of the loan portfolio arisen from extending loans concentrating in some groups of borrowers or some business lines;

37.8. the financial institution takes into account correlation/dependency between market risk factors and credit risk factors/components, between various industries and between borrowers in the loan portfolio; however, the financial institution may consider that it is equivalent to +1 for the sake of simplicity;

37.9. the financial institution takes into account historical change behavior of the correlation under normal and unusual circumstances whereby under unusual/stress situation, the correlation between risk factors may alter or reverse from that under normal situation.

38. Internal rating system which is a tool to aid testing shall be assessed if:

38.1. granularity/ buckets of the rating or number of grading must be adequately numerous and able to distinctively differentiate the level of quality of the borrowers;

38.2. rating criteria shall be clear and able to reflect the quality of the borrower comprehensively in quantity-wise and quality-wise;

38.3 the financial institution prepares procedures for presentations and trainings to enable the users of the rating criteria and related persons to understand fully and able to apply them properly;

38.4. the financial institution prepares quality control procedures to enable compliance with prescribed criteria regularly and comprehensively by making inquiries on quality control methods and random test of the rating of borrowers' quality by various sections related to credit administration to ensure that they are under similar standards.

39. Risk management system of the financial institution shall be assessed to determine if:

39.1. the financial institution possesses procedures for overseeing and collecting of information of the defaults of borrowers' in different grade and have techniques in estimating PD, LGD and EAD;

39.2. the progress of in collecting of information to estimate the PD and LGD of the financial institution under the stipulated operating plans;

39.3 techniques and process of mapping the PD of external rating institutions is suitable with the characteristics and conditions of the loan portfolio of the financial institution;

39.4. the PD employed is able to reflect probable losses of the loan portfolio of the financial institution;

39.5. the appropriateness of pre-settlement risk computation technique compared to the complexity and volume of the activities of financial derivatives. For example, if financial derivatives are sophisticated and are of high volume, the financial institution should derive the potential future exposure. However, if the loan portfolio is uncomplicated and of low volume, the risk conversion factor may be used in accordance with the notification of the Bank of Thailand which is to be duly issued.

40. The calculation of risk exposure of the financial institution shall be assessed. In the case where the risk exposure to every borrower is not possible, calculation which covers enough borrowers to reflect the aggregate picture of the loan portfolio of the financial institution may be made. The assessment shall include consistency and standards used in the calculation of exposure to each borrower.

41. Preparation of information of the financial institution shall be assessed if:

41.1. the information covers all exposure and risk components/factors;

41.2. the information is sufficient and up-to-date, whereby the information related to risk factors should span at least 1 business cycle and should extent over actual stress situation;

41.3. the random method of selecting information picks adequately dispersed information and the information being used reflects the overall characteristics of the loan portfolio.

42. Market risk factor information used in testing shall be assessed if:

42.1. the financial institution completely tests material market risk factors by taking into consideration the impact on the obligor bucket/loan portfolio;

42.2. the financial institution has considered the risks prior to delivery.

43. It is to be assessed if the financial institution employs other important risk factor information, in addition to credit and market risk factors that affect the loan portfolio, for the testing as well as assessing complete impacts that may affect the financial institution.

44. The testing of risk factors of the financial institution shall be assessed if:

44.1. the testing format of the financial institution is appropriate, whereby testing of stress situation should normally cover material factors, by examining effects arisen from those factors concurrently (multi-factors stress testing);

44.2. in some cases the financial institution may have limitations and needs to conduct single factor stress testing or sensitivity test, examiners should consider the reasons and necessity of the financial institution as well as examining and monitoring the progress of the plan with the time frame to comply with Clause 44.1.;

44.3. examiners must study the rationale of the technique for deriving impact from changes of macro shock to the micro changes, i.e. when the GDP, interest rates, exchange rate, etc. change, how would the PD and LGD be affected, in particular where the quantitative technique is not employed;

44.4. the financial institution should examine the possible effects on the borrowers from both credit and market risks, for example in the case where it grants THB loan to non-resident whose income is in a foreign currency, if such currency devalue against THB until the debt repayment capability of the borrower is affected; hence, when shocking risk factors such as exchange rate between THB and such currency, the effects on the debt repayment capability of the borrower must also be examined;

44.5. the financial institution should select the highest level of stress ever occur during the one previous business cycle, if there is insufficient information, length of the period may be reconsidered such as 5 or 10 years, etc., however, it must be certain that such level of stress is probable; for the financial institution selected to stipulate the stress level by basing on judgment, examiners must evaluate if it studies, possesses information indicating previous stress situations and compares environment of the past with that expected to occur in future in order to evaluate the effects that may be applied for the modification of the scenarios without having to refer to historical stress situations only.

44.6. Testing for large borrowers' groups, for example corporate loans, project financing, etc., the financial institution may conduct testing by examining individual obligor or other methods compatible with existing tools and information; for retail loans such as consumer's loans, hire-purchase loans, housing loans, credit card loans, etc. may be testing by portfolio;

44.7. In the case where the financial institution has an internal rating system, a model to derive the PD and LGD, and conducts stress testing by shock at the PD and LGD directly, examiners should evaluate the reasonableness and setting of assumptions for shock, in particular for the case that is based on judgment instead of historical information;

44.8. In the case where the financial institution has an internal rating system but not a model to derive PD or LGD, if it conducts stress testing by reducing obligor's quality in various grades, examiners should evaluate the reasonableness of the quality reduction and examine if the financial institution has taken into account the collateral value in conservative testing;

44.9. In the case where the financial institution does not have an internal rating system and conducts stress testing by assessing borrowers' debt repayment capability from analyzing financial statements, examiners should assess if:

44.9.1. testing techniques and parameters commensurate with the characteristics and complexity of loan portfolio and cover enough number of borrowers to reflect the overall picture of the portfolio;

44.9.2. correlation between borrowers within the same portfolio is assumed to equal to +1;

44.9.3. reasonable and probable assumptions are set for assessing level of severity of risk factor impacts to the borrower's financial statements and in the case where the financial institution sets assumptions based on historical events, it should have back up references such as historical losses, etc. by comparing the difference between past environment to that of the future and it may adjust losses and reduce collateral value under conservative principle.

45. Concepts and information the financial institution uses to derive the correlation matrix shall be assessed for their appropriateness by examining the number of data, period or duration selected and when the correlation matrix is obtained, how the financial institution applies to the testing.

46. Stress testing frequency shall be assessed. If the financial institution conducts less than once a year, reasons shall be evaluated as well.

47. Testing reports of the financial institution shall be assessed if:

47.1. there are complete details of important issues;

47.2. suggestions are made related to decisions on the remedy to the management of the financial institution to facilitate the formulation of policies and supporting plan that are practical.

48. Plans, measures to mitigate or withstand losses of the financial institution shall be assessed by examining its capability in resolving problems and the practicality. A sound plan should have an objective, operating procedures, clearly assigned responsibility and authority and it is notified and discussed such that related persons are fully aware, understand and are able to put into practice. Such shall include modification to fit the present condition and to resolve the exact issues.

49. The financial institution shall arrange to have a system to monitor changes in the environment and components of portfolio, reviews of employed scenarios and reviews of suitability of the portfolio components periodically.

50. Usage of stress testing outcomes shall be assessed if:
    50.1. the management pays attention to the testing outcomes, monitors as well as uses them to make appropriate improvement and rectification;
    50.2. the financial institution makes appropriate improvement and rectification from previous examinations, for example in selecting information, various risk factors including calculation of various statistics.

Guidelines for
Market Risk Stress Testing

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Guidelines for Market Risk Stress Testing

Objectives

1. This is provided as guidelines for financial institutions in conducting market risk stress testing on asset, liability and off-balance sheet item portfolios by setting appropriate and sufficient stress scenarios in order to enable the management to stipulate measures to mitigate or withstand possible losses within tolerance level such as adjusting portfolios, increasing capital to withstand losses or other undertaking, etc. It is also intended as guidance for examiners in auditing and assessing market risk stress testing of the financial institutions.

Definitions

2. Stress situation shall mean atypical situation which may occur and cause severe impact.

3. Market stress testing shall mean simulation of probable scenarios attributable to changes of market factors, such as securities prices, interest rates or exchange rates resulting from unusual or stress situation affecting asset, liability and off-balance sheet portfolios which may incur severe losses to the financial institution.

Guidelines

Policies and Responsibilities of Related Persons

4. Financial institutions shall establish market risk stress testing policies ensuring that they cover and are commensurate with the characteristics, volume, complexity and risks of transactions and products whereby the policies must be clear and practicable.

5. Financial institutions shall clearly define responsibilities of management and related persons in market risk stress testing.

6. Every financial institution shall conduct stress testing regardless of which market risk model it employs be it, value-at-risk (VaR) model or not. It is to find out of the related risks to which VaR model does not extend. In the case where a financial institution does not use VaR model, it may use other type of tools for the testing, for example gap or duration and conducts testing in both the trading and

banking books with the exception of testing under the Financial Sector Assessment Program (FSAP) which shall conduct testing in the trading book only. The classification into trading and banking books shall be as defined in the circular of the Bank of Thailand No.: ThorPorTor. SorNorSor. (21) Wor. 2378/2546 Re: Principles for Supervision of Market Risk of Financial Institutions and Related Reports dated 30 December 2003.

7. Financial institutions shall establish warning signal, procedures and process for when the testing outcomes reach the stipulated caution level as well as preparing contingency plan to mitigate or withstand any possible losses.

Roles and Responsibilities of Management

8. Management must understand, give importance to and participate in:
   - 8.1. formulating scenarios and applying testing outcomes in management;
   - 8.2. establishing guidelines in formulating scenarios, procedures and process for stress testing and delegating clear authority to related persons;
   - 8.3. reviewing process for testing scenarios regularly to comply with the changes of policies and risk tolerance level;
   - 8.4. establishing procedures and methods for mitigating or withstanding any possible risks and clearly defining [scope of] responsibilities.

Stipulation of Scenarios

9. Financial institutions shall simulate scenarios that display movements of market risk factors that are materially abnormal and probable although the likelihood is low. Stress scenarios shall cover every material risk factor that may incur abnormal profit or loss for asset, liability and off-balance sheet portfolios with both linear and non-linear product characteristics such as options and products with embedded options. In addition to examining the effects from market risk, they should examine credit risk, liquidity risk and operational risk that also affect the market risk.

10. Simulation of scenarios based on only historical data may not be sufficient. Financial institutions need to take into account events that had never occurred. Otherwise, it may cause the risk assessment to be inconsistent with the actual. Such may be accomplished by requesting opinions from experts (subjective approach or using tools/models (systematic approach). Experts may consist of related persons from various departments or from internal and external analysis establishment that is knowledgeable, understands and has related experience.

11. Scenarios must be consistent with the existed risks which may differs at each financial institution since the structure, categories and characteristics of assets,

liabilities and off-balance sheet items are different. Financial institutions should set scenarios by taking into account of important assumptions used in risk models such as VaR model under unusual/stress situation that is inconsistent with the normal situation.

12. Correlations between various risk factors must be taken into account in setting scenarios. Otherwise, it may cause in accurate risk assessment. Nonetheless, high value correlations should be used in testing, namely close to 1 (where the position is long/long or short/short) or -1(where the position is long/short or short/long). Alternately historical correlation may be used but caution must be exercised that the said correlation is still usable under unusual/stress market situation. If correlation under past stress situation is unobtainable, the value may be set to equal 1 or -1 under conservative principle.

13. In setting scenarios, the changes of liquidity in the market must also be taken into account. It may cause the financial institution to fail to close or mitigate its own risk exposure due to inability to find any counter-party to trade with or it becomes necessary to buy at a higher price and sell at a lower price (spread is widen upon illiquidity) or unable to trade, hence loss is incurred from such an event.

14. Credit risk must be taken into account in setting scenarios. For example, pre-settlement risk that will duly affect market risk since if the counter-party defaults, the financial institution may have to close its exposure with market price and incurs losses.

15. Financial institutions should set standardized scenarios for ongoing monitoring changes of risk exposure and should review the standard scenarios upon material changes of level of volatility of risk, changes of correlations between factors or changes of strategy, business policies or management of asset, liability and off-balance sheet portfolios including changes of the structure of such portfolios.

Frequency of Testing and Reports

16. Financial institutions shall conduct regular stress testing. Frequency of the testing should be consistent with the changes of the asset, liability and off-balance sheet portfolios. Testing should be conducted at least once every quarter for trading book and where market is highly volatile or under stress situation, testing must be more frequent. In addition, financial institutions must submit such testing outcomes to the Supervision Group of the Bank of Thailand as shall be duly prescribed.

17. Financial institutions shall report outcome of the stress testing to the management regularly and timely to control risks within the acceptable level or find other

appropriate measures. Moreover, they shall also document issues enquired by the management and various suggestion in the testing outcome report which denotes participation of the management in the testing process.

18. Financial institutions shall prepare plans to manage expected loss by establishing procedures and process to control or reduce risk to within an acceptable level such as adjust portfolios and/or stipulated other measures such as increase capital charge to withstand possible losses or other actions as appropriate.

Assessment Guidelines for Examiners

19. Examiners shall assess market stress testing of the financial institution covering the following topics.
    19.1. Policies and Responsibilities of Related Persons
    19.2. Roles and Responsibilities of Management
    19.3. Stipulation of Scenarios
    19.4. Frequency of Testing and Reports

    Details of the assessment in each topic are as follows.

20. Policies and responsibilities of related persons of the financial institution shall be assessed if:
    20.1. stipulated stress testing policies cover and are commensurate with the characteristics, volume and complexity of activities as well as existing risks;
    20.2. policies consist of the following topics: stress testing plan, monitoring of outcomes, reporting of outcomes, approval authority related to plan execution, persons related to and are responsible for stress testing, setting of scenarios to be used in testing, testing frequency which should be consistent with market volatility or alteration of the portfolio of the financial institution, usage of outcomes and preparation of contingency plan, etc.
    20.3. the financial institution conducts market stress testing with parameters beyond those prescribed in the Principles for Supervision of Market Risk of Financial Institutions under the circular no.: ThorPorTor. SorNorSor. (21) Wor. 2378/2546 dated: 30 December 2003, which requires financial institutions to conduct stress testing where the volume of the trading book exceeds the threshold and where risk models are used to derive market risk and capital maintenance, whereby the objective is for financial institutions to conduct stress testing to compensate the limitations of risk models. However, the objective of the guidelines herewith is for financial institutions to be aware of the risk and possible losses in order to plan supporting measures/means such as setting risk limits, adjusting portfolios,

etc. Therefore, every financial institution is required to conduct stress testing in both trading(regardless of threshold) and banking books and regardless of whether risk models are used or not.

20.4. the financial institution lays down a warning system which may be hard or soft limit/ management action triggers of the loss level acceptable to the financial institution as well as setting procedures and processes to be taken when testing outcome reaches stipulated trigger level in order to enable timely response to the situation and to mitigate or withstand possible losses.

21. Roles and responsibilities of management of the financial institution shall be assessed if:

21.1. senior management prescribes market stress testing policies;

21.2. senior management monitors outcomes of stress testing and takes actions to control risks of the financial institution;

21.3. senior management regularly reviews outcomes of stress testing and important assumptions being used;

21.4. senior management establishes timely remedial measures;

21.5. senior management submits outcomes of stress testing and results of related actions to the board of the directors.

22. It shall be assessed if the board of directors and senior management of the financial institution understand the importance and various limitations of the stress testing and evaluate the capability of the financial institution to withstand any possible losses.

23. It shall be assessed if the management clearly stipulates procedures, methods, authority and responsibilities for decision making and guidelines for setting scenarios to be used in the testing as well as procedures and measures to mitigate or limit risks in writing and communicates such to all relevant persons. Examples [of mitigation measures] are hedging or reducing the size of the portfolio, etc.

24. Scenarios shall be assessed if they have any tendency to incur materially severe loss to the portfolios.

25. Market risk scenarios of the financial institution shall be assessed to determine if:

25.1. they cover all important market risk factors which are interest rates, exchange rates and securities prices, where the interest rates used in the testing will vary with maturity of the assets, liabilities and off-balance sheet items; as such it is to select interest rate with the same time to maturity and type of interest rates that is consistent with the type of such assets, liabilities and off-balance sheet items;

25.2. the financial institution takes into account the relationships between various risk factors such as relationship between interest rate and exchange rate; since considering only the changes of a single risk factor, it may distort the risk picture or the possible impacts may not reflect the actual situation which causes loss assessment to be lower than what it should be;

25.3. In the case where there is a support system, the financial institution prepares stress testing by varying the changes of short-term, medium-term and long-term interest rates.

26. Scenarios stipulated by the financial institution shall be assessed.

26.1. Compatibility with the nature of existing risks which vary with the characteristics of portfolios should be evaluated. Stress testing should not be limit to assumptions which set the higher price volatility only. For example, portfolio of some types of options (non-linear) products such as barrier/straddle options, the worst situation could arise from a minute change of the price underlying asset. Such is opposite from the case of linear products where the greater the changes, the higher the loss. Therefore, in stipulating scenarios, there must be an understanding of the relationship between movement of market/economic situations and values of derivatives and various financial instruments, effects of market liquidity, credit worthiness of the counter-party and collateral value, etc.

26.2. Scenarios prescribed may have different assumptions from those stipulated in the normal calculation of VaR. For example, assumptions related to volatility or correlation used in the VaR calculation may be inapplicable in the case where the market is highly volatile or under stress. Therefore, it is necessary to assess if the financial institution takes into account appropriateness of assumptions that are being used.

27. Scenarios stipulated by the financial institution shall be assessed if it covers abnormal changes of market risk factors that are probable in order to enable the management of the financial institution to recognize possible losses incurred in unusual circumstances. Simulation of scenarios using historical stress situations will help management to recognize the severe losses that may occur more clearly since they were actual occurrences. Examples are Black Monday when worldwide stock prices dropped in October 1987, extraordinary high interest rates in the U.S. in 1994, Asian financial crisis in 1997 and emerging market debt crisis in September 1998.

28. Stipulation of correlations between various risk factors used in scenarios of the financial institution shall be assessed if it takes into account the change in market situation under stress. Historical events indicate the connection between various stock markets around the world such as the volatility of market which starts in Asia, may move to Eastern Europe and Latin America. It is believed that

relationship between various markets will intensify during lack of confidence/ lack of liquidity situation. Therefore, during market turmoil non-portfolio diversification benefits are usually assumed i.e. it is assumed that the correlations between risk factors in various markets move in the same direction which is closer or equal to 1 or -1.

29. It shall be assessed that the financial institution has taken into consideration other risks which may affect market risks as follows.
    29.1. Liquidity risk which reflects the bid-ask spread. In the lack of liquidity situation, the offer price will be higher while the bid price is low; hence, actual traded price is normally low. In prescribing simulated scenarios, highest spread in 1 recent business cycle may be used. However, if the situation is stable, highest spread of the business cycle may not be necessary. The rationale of the financial institution shall be examined concurrently.
    29.2. Credit risk shall be examined from credit spread.
    29.3. Operational risk shall be examined by stipulating scenarios such as malfunction of the information technology system or the payment system. Assumptions used and estimates of risk must be reasonable and covers all crucial factors. If the financial institution makes reference to historical loss volume, examiners must review verity of such losses.

30. It shall be assessed that in stipulating simulated scenarios, in addition to considering the effects from liquidity risk under unusual/stress situation, it also takes into account the chronological changes of market situation or changes during various intervals such as if several day elapses while the financial institution is unable to close or reduce risk exposure or if it can, it is at substantial loss. Stipulating scenarios by keeping in mind of such factors will help producing more prudent scenarios.

31. It shall be assessed that stipulation of scenarios of the financial institution already takes into account credit risk that may affect market risk such as where counter-party defaults or fail to comply with the agreement; even though the transaction is already hedged against market risk, market risk may still be instigated. Examples are as follows.
    31.1. A financial institution enters into a forward foreign exchange purchase contact with A and sells a forward exchange contract with B which is a full amount hedging contract. Subsequently A defaults on delivery causing the financial institution to buy foreign currency at the high market price to deliver to B, thus incurring a loss from the change of market price.
    31.2. If a financial institution mark to market at the stress interest/exchange rate and it turns out that it is the party with a gain, the counter-party that has to bear the loss may default. From the previous example, if party A defaults

due to having to bear the loss, it will cause a position that was once deemed as squared or hedged to become an open position once again. In stress testing, VaR may be calculated without including such default items in order to distinguish the effect of credit risk to market risk.

32. Scenarios of the financial institution shall be assessed if in addition to reflecting historical events, they also take into account future probable events since worst historical events may not be the worst future event and in using simulation of historical events without consideration to the present or expected situations as well as existing characteristics of asset, liability and off-balance sheet portfolios may cause the assessment to deviate from the actual situation of the financial institution.

33. It shall be assessed if the financial institution self stipulates the scenarios to agree with the characteristics of the portfolios of each financial institution except standard scenarios prescribed under the Supervisory Guidelines on Market Risk of the Bank of Thailand which has 2 scenarios. One is the historical perspective and the other is the forward looking perspective which the Bank of Thailand shall duly prescribe as testing standards for every financial institutions. It is to facilitate compiling of outcomes and analysis of the effects of the whole financial institution system under one scenario.

34. Scenarios using opinions from experts and judgment of the financial institution shall be assessed to determine if opinions are recruited from related officers from every department such as from trading room, risk management department, analysis section, etc. It is for the reason that different duties and responsibilities will produce more diverse perspectives. Alternately opinions may be sought from internal or external experts who are proficient in different fields. For example, some may be proficient in macro-economics, some in micro-economics or in specific characteristics of each country or region or in various industries, etc.

35. It shall be assessed if the financial institution stipulates standard scenarios to measure and monitor risk exposure and to regularly review the said scenarios and/or upon material changes of the environment.

36. Frequency of testing and outcome reports of the financial institution shall be assessed:
    36.1. if stress testing is conducted regularly and outcome is reported to the management. In the cases where the portfolio has rather big changes or movement or the market is highly volatile, testing should be more frequent and outcomes should be reported to the management.
    36.2. if the financial institution benefit from utilizing the testing outcomes in establishing procedures and measures to mitigate risk to the tolerance level

and/or to be prepared for the probable risks. In addition there is an oversight of the compliance with the prescribed procedures and measures.