

**National Bank of the Republic of Macedonia  
Supervisory Policy Manual**

**Title:** M-2 Risk Management

**Date:** **FINAL**

**Purpose:** Explanation and requirements of sound risk management.

**Issue Type:** Guidance

**Supersedes Previous Issue:** None

**Application:** All Licensed Institutions and BSD personnel

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**1. Risk Management**

**1.1. Introduction**

- 1.1.1. Risk, simply defined, is the possibility of a loss. Risk management is the establishment of controls to minimize the possibility of a loss. Risk is present in the products, functions, activities and people of a financial institution. Risk is inherent in the assets and liabilities it acquires, the markets it trades, and the systems/controls it adopts. Risk is embedded in the financial instruments an institution buys and incurs from the counterparties with which it deals. Finally, financial products continue to evolve, creating new types of risks. This makes it imperative for control principles and techniques used to manage risks to maintain the same pace of evolution. Studies consistently highlight that losses are the result of inadequate management oversight and the weakness of an institution's "control culture." Such weaknesses include an absence of functional segregation of duties, lack of or the failure of internal control systems, over-leverage and just bad decision-making.
- 1.1.2. An effective risk management system is a critical component of management and a foundation for the safe and sound operation of financial organizations. It ensures that the goals and objectives of shareholders and the Supervisory Board (Board) are met. Additionally, it ensures that the institution will achieve long-term profitability targets, preserve and properly allocate its capital resources to viable activities, and maintain reliable financial and managerial reporting. An effective risk management system also helps to ensure that the institution complies with laws and regulations as well as policies, plans, internal rules and procedures, and thereby decreasing the risk of unexpected losses or damage to the institution's reputation.
- 1.1.3. It is important to recognize that risk management is an activity critical to an institution's success and that the responsibility for managing the institution's risk is spread across all business units and functions. Risk management is a *process* that is part of internal controls, which itself is a process affected by the Board, Board of Directors (Directors) and all levels of personnel. The process is not solely made up of procedures or policies performed at a certain point in time, but rather continually operating at all levels within the institution. The Board and Directors are responsible for establishing and communicating, in writing and in action, the appropriate culture to facilitate effective risk management and for monitoring its effectiveness on an ongoing basis. However, each individual within the institution must participate in the process.
- 1.1.4. Risk management is a continuous process of analyzing the situation and environment where risks occur, and making management decisions with regard to what impacts the risks themselves and the institution's exposure to such risks. Risk management decisions may call for the avoidance of risk; its minimization, including through mitigation factors and/or transfer of risk to other parties (e.g., through derivative instruments or insurance); and the establishment of exposure limits. Risk management takes place at the level of the organization where risk originates, and at the highest management levels. At the level of the Board, risk management is performed with the help of independent reviews and controls.

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**1.2. Comprehensive Risk Management**

1.2.1. A risk management system, to be comprehensive, must be a reliable process of identification, measurement, control and monitoring of all types of risk at all levels of the organization, and resolves the conflicting objectives between the need to generate income and the need to minimize risks. In developing and implementing a comprehensive risk management system, the Board and Directors should:

- Implement a transparent organizational structure and effective control mechanisms;
- Ensure that risks are taken in line with shareholders' expectations, the institution's strategic plan, and regulatory requirements;
- Establish throughout the institution a common understanding of its corporate culture as it pertains to risk management;
- Allocate the resources needed to create and maintain an effective, comprehensive and balanced risk management system;
- Represent in systemized documentary form the organizational structure and control mechanisms, and provide proper access to these documents for participants in the risk management process;
- Harmonize the organizational structure and business process control systems with the corresponding systems of subsidiaries and other organizations under the institution's control, so that the controllable and sound activity of the institution itself is not damaged;
- Ensure that conflicts of interest are avoided at all levels of the institution;
- Analyze risks taking into account the possibility of extreme circumstances (stress scenarios) on the basis of which the institution must identify appropriate emergency actions, usually in the form of contingency planning;
- Implement procedures and measures to prevent stress situations that may occur because of certain internal factors;
- Develop procedures and measures to monitor the adequacy of the institution's capital;
- Clearly formulate the institution's policies pertaining to risk control and conducting business in accordance with sound financial practices;
- Ensure a systematic analysis of risks in order to identify, measure, control and monitor all risks;
- Develop and implement internal controls that ensure proper compliance with the requirements of laws and regulations, fulfillment of contractual and other obligations, proper adherence to policies and procedures, rules and standards established by these policies, and appropriate business conduct;
- Create an independent risk management unit, if appropriate, that has the powers, resources, experience and corporate status not to have any barriers in obtaining access to the necessary information to develop meaningful and timely reports and recommendations to management; and
- Create and support an internal audit function that covers all activities and all subdivisions of the institution, AND is independent from the institution's operational subdivisions and separated from day-to-day internal control processes.

1.2.2. An institution's failure to establish a risk management process that adequately identifies, measures, monitors, and controls the risks involved in its various products and lines of

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business is considered unsafe and unsound conduct. Principles of sound risk management apply to the entire spectrum of risks facing an institution including, but not limited to:

- Credit
- Liquidity
- Market
- Operational
- Information Technology
- Legal
- Strategic

In practice, an institution's business activities present various combinations and concentrations of these risks depending on the nature and scope of the particular activity.

1.2.3. Adequate risk management programs vary considerably in sophistication, depending on the size and complexity of the financial organization and the level of risk that it accepts. For smaller institutions engaged solely in traditional financial activities and whose Board and Directors are actively involved in the details of day-to-day operations, relatively basic risk management systems may be adequate. In such institutions, these systems may consist only of written policies addressing material areas of operations, basic internal control systems, only the regulatory required committee structure, and a limited set of management and Board reports.

1.2.4. Large institutions, however, will require far more elaborate and formal risk management systems in order to address their broader and typically more complex range of financial activities, and to provide Board members and Directors with the information they need to monitor and direct day-to-day activities. The risk management processes of large organizations would typically contain detailed guidelines that set specific prudential limits on the principal types of risks relevant to their activities. Furthermore, because of the diversity of their activities and the possible geographic dispersion of their operations, these institutions will require timely and relatively more sophisticated reporting systems in order to manage their risks properly. These reporting systems, in turn, should comprise an adequate array of reports that provide the levels of detail about risk exposures that are relevant to the duties and responsibilities of individual managers and Board members. Such extensive systems of large institutions will naturally require frequent monitoring and testing by independent control areas and internal, as well as external, auditors to ensure the integrity of information used by senior officials. The risk management systems or units of such institutions must also be sufficiently independent of business lines in order to ensure an adequate separation of duties and the avoidance of conflicts of interest.

## **2. Risk Management Structure**

### **2.1. Four Elements of a Sound Risk Management System**

2.1.1. While risk management systems vary among financial institutions, there are four basic elements contributing to a sound risk management environment.

- Active Supervisory Board and Board of Directors oversight;
- Adequate policies, procedures, and limits;

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- Adequate risk measurement, monitoring, and management information systems; and
- Comprehensive internal controls, including an effective audit function.

**2.2. Supervisory Board and Board of Directors Oversight**

2.2.1. The Board has ultimate responsibility for the level of risk taken by the institution.

Accordingly, the Board should approve the institution's overall business strategies and significant policies, including those related to managing and taking risks. The Board should also ensure that senior managers are fully capable of managing the activities that the institution conducts. While the Board is responsible for understanding the nature of the risks significant to the institution and for ensuring that management takes the steps necessary to identify, measure, monitor, and control these risks, the level of technical knowledge required of Board members may vary depending on the particular circumstances at the institution.

2.2.2. Board members of large organizations that conduct a broad range of technically complex activities, for example, cannot be expected to understand the full details of their institution's activities or the precise ways risks are measured and controlled. They should, however, have a clear understanding of the types of risks to which their institution is exposed and should receive reports that identify the size and significance of the risks in terms that are meaningful to them. In fulfilling this responsibility, Board members should take steps to develop an appropriate understanding of the risks their institution face, possibly through briefings from auditors and experts external to the organization. Using this knowledge and information, Board members should provide clear guidance regarding the level of exposures acceptable to the institution and have the responsibility to ensure that senior managers implement the procedures and controls necessary to comply with adopted policies.

2.2.3. Board members of institutions that conduct more traditional and less complicated business activities may require significantly less knowledge of complex financial transactions or capital markets. They may, however, be more involved in the day-to-day activities and decision-making of the institution than are their counterparts at larger organizations and should have a level of knowledge commensurate with the nature of their involvement.

2.2.4. Directors are responsible for implementing strategies in a manner that limits risks associated with each strategy and that ensures compliance with laws and regulations on both a long-term and day-to-day basis. Accordingly, management should be fully involved in the activities of the institution and possess sufficient knowledge of all major business lines to ensure that appropriate policies, controls, and risk monitoring systems are in place and that accountability and lines of authority are clearly delineated. Directors are also responsible for establishing and communicating a strong awareness of and need for effective internal controls and high ethical standards. Meeting these responsibilities requires Directors to have a thorough understanding of banking and financial market activities and detailed knowledge of the activities their institution conducts, including the nature of internal controls necessary to limit the related risks.

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2.2.5. The quality of Board and Directors oversight is evaluated in relation to the following elements:

- The Board and Directors have identified and have a clear understanding of the types of risk inherent in business lines, and they have taken appropriate steps to ensure continued awareness of any changes in the levels of risk;
- The Board has reviewed and approved appropriate policies to limit risks inherent in the institution's lending, investing, and other significant activities or products;
- The Board and Directors are knowledgeable about, and use adequate record keeping and reporting systems to measure and monitor, the major sources of risk to the organization.
- The Board periodically reviews and approves risk exposure limits to conform with any changes in the institution's strategies and activities, and ensures that the proper infrastructure and internal controls are in place;
- Directors ensure that its lines of business are managed and staffed by personnel with knowledge, experience, and expertise consistent with the nature and scope of the institution's activities;
- Directors ensure that the depth of staff resources is sufficient to operate and manage soundly the institution's activities and that its employees have the integrity, ethical values, and competence that are consistent with a prudent management philosophy and operating style;
- Management at all levels provides adequate supervision of the day-to-day activities of employees, including the supervision of senior officers or heads of business lines.
- Directors are able to respond to risks that may arise from changes and innovations in the competitive/market environment; and
- Before embarking on new activities or introducing products new to the institution, Directors identify and review all risks associated with the activity or product and ensure that the infrastructure and internal controls necessary to manage the related risks are in place.

**2.3. Policies, Procedures and Limit Structure**

2.3.1. An institution's Board and Directors should tailor their risk management policies and procedures to the types of risks that arise from the activities the institution conducts. Once the risks are properly identified, the institution's policies and its more fully articulated procedures provide detailed guidance for the day-to-day implementation of broad business strategies, and include limits designed to shield the institution from excessive and imprudent risks.

2.3.2. While all institutions should have policies and procedures that address their significant activities and risks, their coverage and level of detail will vary. A smaller, less complex institution that has effective management that is heavily involved in day-to-day operations generally would be expected to have only basic policies addressing the significant areas of operations and setting forth a limited set of requirements and procedures. In a larger institution, where senior managers must rely on widely-dispersed staffs to implement strategies in an extended range of potentially complex businesses, far more detailed policies and related procedures would be expected. In either case, however, senior managers are expected to ensure that policies and procedures address the

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material areas of risk to the institution and that such policies are modified when necessary to respond to significant changes in the institution's activities or market conditions.

2.3.3. The following key factors are to be considered in evaluating the adequacy of policies, procedures and limits:

- Policies, procedures and limits are properly documented, provide for adequate identification, measurement, monitoring, and control of the risks posed by all significant activities, and reviewed and approved by management at the appropriate level;
- Policies, procedures, and limits are consistent with management's experience level, the institution's stated goals and objectives, and the overall financial strength of the institution;
- Policies clearly delineate accountability and lines of authority for each activity and product area;
- Policies provide for the review of new activities to ensure that the infrastructures necessary to identify, monitor, and control risks associated with the activities are in place before they are initiated; and
- Compliance monitoring procedures exist that internally, by an independent function, check for adherence to all policies, procedures and limits within the institution.

**2.4. Risk Measurement, Monitoring, and Management Reporting Systems**

2.4.1. Effective risk monitoring requires institutions to identify and measure all material risk exposures. Consequently, risk monitoring activities must be supported by information systems that provide the Board and senior managers with timely reports on the financial condition, operating performance, and risk exposure of the entire organization. Additionally, information systems must provide regular and sufficiently detailed reports for line managers engaged in the day-to-day management of the institution's activities.

2.4.2. The sophistication of risk monitoring and management information systems should be consistent with the complexity and diversity of the institution's operations. Accordingly, smaller and less complicated institutions may require only a limited set of Board and management reports to support risk monitoring activities. These reports include, for example, daily balance sheets and income statements, a watch list for potentially troubled loans, a report for past due loans, a simple interest rate risk report, and similar items. Larger, more complicated institutions, however, would be expected to have much more comprehensive reporting and monitoring systems that allow, for example, for more frequent reporting, tighter monitoring of complex business activities, and the aggregation of risks on a fully consolidated basis across all business lines and activities.

2.4.3. Institutions of all sizes are expected to have risk monitoring and management information systems in place that provide the Board and Directors with a clear understanding of the institution's positions and risk exposures.

2.4.4. The following factors should be considered in assessing the effectiveness of risk measurement, monitoring and management reporting systems:

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- The adequacy, on a historical basis, of risk monitoring practices and reports addressing all material risks of the organization;
- The adequacy and appropriateness of the key assumptions, data sources and procedures used to measure and monitor risk, including the adequacy of analysis, documentation and reliability testing of the system on a continuing basis;
- Consideration of any material changes in the institution's lines of business or products that might require changes in the measuring and monitoring systems;
- Consideration of any changes in the information technology or management information system environment that have significantly changed the production process for reports or the assumptions on which reports are based;
- The consistency of management information reports and other forms of communication in monitoring all meaningful exposures; checking compliance with established limits, goals or objectives; and comparing actual with expected performance; and
- The adequacy, accuracy and timeliness of reports to the Board and Directors, and whether such reports contain sufficient information for them to identify any adverse trends and to fully evaluate the level of risk.

**2.5. Internal Controls and Comprehensive Audits**

- 2.5.1. An institution's internal control structure is critical to its safe and sound functioning and to its risk management system, in particular. Establishing and maintaining an effective system of controls, including the enforcement of official lines of authority and the appropriate separation of duties is one of management's more important responsibilities.
- 2.5.2. Appropriate segregation of duties is a fundamental and essential element of a sound risk management and internal control system. Failure to implement and maintain adequate separation of duties can constitute an unsafe and unsound practice, and possibly lead to serious losses or otherwise compromise the financial integrity of the institution. Serious lapses or deficiencies in internal controls, including inadequate segregation of duties, may warrant supervisory action.
- 2.5.3. When properly structured, a system of internal controls promotes effective operations and reliable financial and regulatory reporting, safeguards assets, and helps to ensure compliance with relevant laws, regulations, and institutional policies. Internal controls are tested by an independent internal auditor who reports directly to the institution's Board and/or Audit Committee. Given the importance of appropriate internal controls to institutions of all sizes and risk profiles, the results of audits or reviews, whether conducted by an internal auditor or other independent units, should be adequately documented, as should management's responses.
- 2.5.4. The following factors should be considered in evaluating the adequacy of the internal control environment:
- The appropriateness of the system of internal controls in relation to the type and level of risks posed by the nature and scope of the institution's business activities and products;



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- The institution's organizational structure establishes clear lines of authority and responsibility for monitoring compliance with policies, procedures and limits;
- Reporting lines provide for sufficient independence of the control functions from the business lines, as well as adequate segregation of duties throughout the organization;
- The official organizational structure reflects actual operating practices;
- Financial, operational, and regulatory reports are reliable, accurate, and timely, and wherever applicable, exceptions are noted and promptly investigated;
- Adequate procedures exist for ensuring compliance with applicable laws, regulations, and internal policies and procedures;
- The internal audit or other control and review procedures are effective, independent and objective in providing adequate coverage of the institution's operations;
- Internal controls and information systems are adequately tested and reviewed;
- The coverage, procedures, findings and management responses to audits and review tests are adequately documented;
- Identified material weaknesses are given appropriate and timely high-level attention and management's actions to correct material deficiencies are objectively verified and reviewed; and
- The institution's Board and Audit Committee review the effectiveness of internal audits; and other accounting and control activities on a regular basis.

**2.6. Compliance Function**

2.6.1. The compliance function plays an important role with respect to a sound risk management system. The role of the compliance function, among other things, is to ensure that the risk management system or processes adopted are in compliance with the relevant statutory provisions and regulatory requirements. A compliance function can be defined as the identification and monitoring of risks an institution may suffer as a result of its failure to comply with laws, regulations and rules. The organization and responsibilities of the compliance function should be properly documented. Directors are responsible for establishing a permanent and effective compliance function, including establishing a system ensuring that compliance policies are adequately implemented. The Board is responsible for overseeing the management of the institution's compliance risk and should approve the institution's compliance policy, including a formal document establishing a permanent and effective compliance function. An effective compliance function is staffed by an appropriate number of competent individuals who are sufficiently independent of the business units and have a direct reporting line to a designated committee or senior manager.

**2.7. Business Continuity Planning**

2.7.1. Each institution should have in place contingency and business continuity plans that address the nature, scale and complexity of its business, and ensure that the institution can continue to function and meet its regulatory obligations in the event of an unforeseen interruption. These plans should be regularly updated and tested to ensure continued effectiveness.

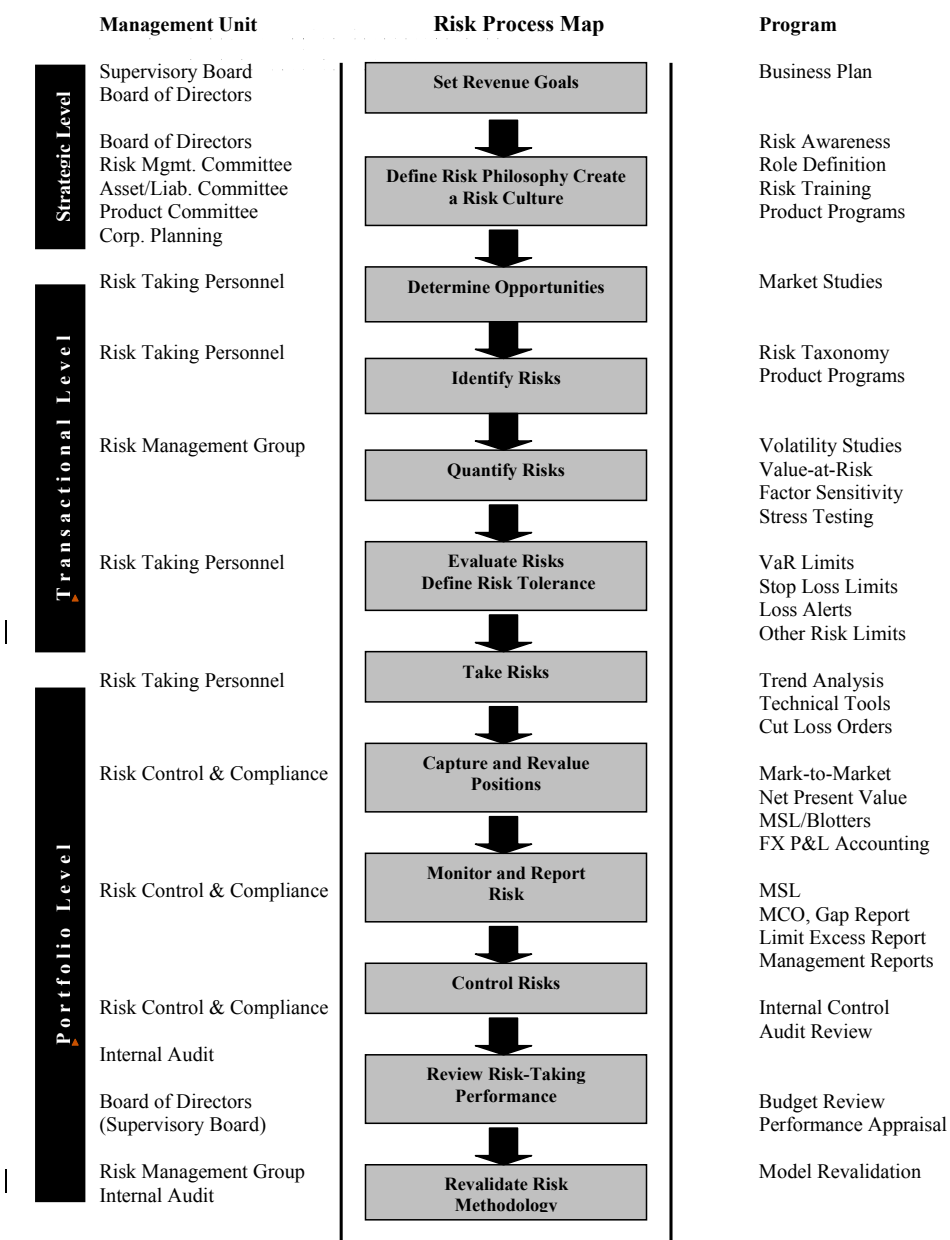
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**3. Risk Management Process**

**3.1. Risk Process Map**

- 3.1.1. Risk management is not a simple concept and as such, it can only be defined by describing the total process. The Risk Process Map depicted below is reflective of best practices and will be the foundation of this discussion on Risk Management Processes. Regardless if an institution exactly follows the sample Risk Process Map and the underlying corporate structure, all fundamental risk management processes should possess a complete and coherent risk management plan that is performed at three different levels: the strategic level, the transaction level and the portfolio level.
- 3.1.2. The first level provides a macro perspective. It starts with the basic reward/risk trade-off analysis where the business plan, through the budget process relates the amount of risks to be taken to achieve the desired revenue goals. The risk approval process should be consistent with the budget approval process.
- 3.1.3. The next stage does not originate from metrics and models but from a cultural change that defines the institution's philosophy on risk - creation of a culture that lives with and accepts RISK as a financial variable. This process emanates from and is a prime responsibility of the Board and Directors. They establish the risk culture and the risk management organization and incorporate the risk process as an essential part of the corporate strategic plan.
- 3.1.4. Institutionalizing a risk management culture requires organizational changes for the institution to deal directly with risks. Based on the example of the Risk Management Map (below), the institution should set up a Risk Management Committee to establish the risk culture and to set the tone for all institutional risk-related activities. Risk policies should be clearly formulated and written. This requires a top-down process involving senior managers to recognize the potential impact of market swings and changes in the overall market environment.
- 3.1.5. By contrast, the second (transaction) level and the third (portfolio) level look at the specifics - the risk concepts, trading tools, analytical models, statistical methodologies, historical studies and market analysis which are requisites of a coherent risk management system. These stages constitute the essence of the risk process. It involves establishing core competencies of the institution in identifying, measuring, limiting, assuming, managing, controlling and monitoring risks. It starts with risk identification covering the entire spectrum of risk-sensitive positions and ends with assessing the risk-taking activities through performance metrics, which serve as a rational basis for future business plans.
- 3.1.6. The investigation, analysis, and evaluation performed by Risk Taking Personnel, the Risk Management Group and the Risk Control & Compliance function constitute the essential day-to-day activities of risk management, which are:
- Business/Profit Opportunity Determination
  - Risk Identification
  - Risk Measurement
  - Position/Portfolio Capture and Valuation
  - Risk Evaluation, Reporting and Control

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Risk Policies and Procedures	Organization	Limits Structure	Systems and Technology	Reports	Risk Modeling
Risk Management Infrastructure					

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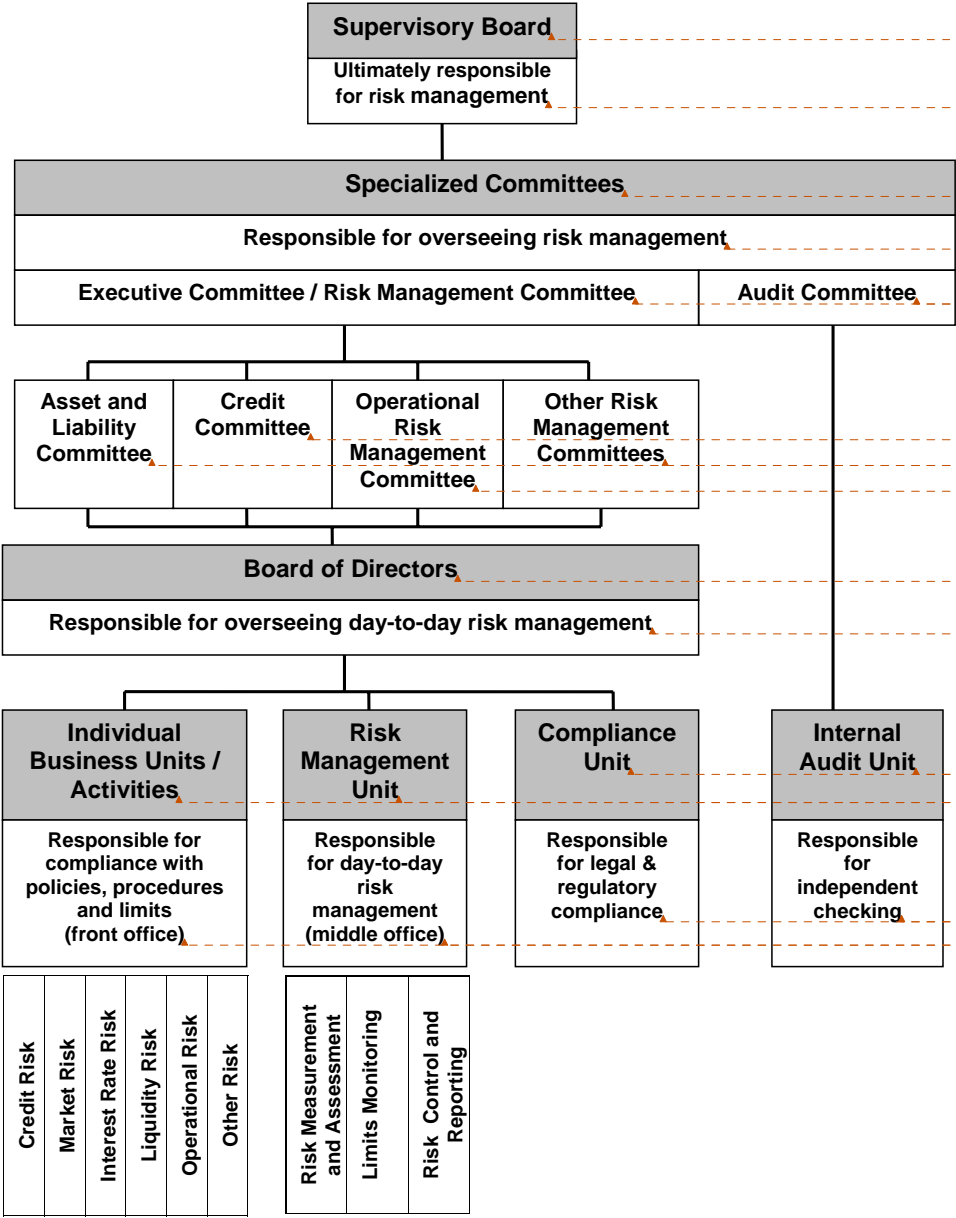
- 3.1.7. Risk Taking Personnel start the day-to-day risk process by determining financial opportunities, which normally involve risk. Once opportunities are identified, Risk Taking Personnel identify, analyze and quantify risk in light of its potential effect on a position/portfolio. This includes an assessment of the capability of the existing system to support the risk-taking.
- 3.1.8. When a risk is assumed by Risk Taking Personnel, attendant processes of reporting and control, risk evaluation, and portfolio management are initiated - activities that require interaction among Risk Taking Personnel, the Risk Management Group, and Risk Control & Compliance functions.
- 3.1.9. Senior business managers evaluate performance from a risk-adjusted perspective and make adjustments to overall business strategy. Performance is measured relative to risk-free or “with-risk” benchmarks and/or target hurdles of return. The Risk Management Group assists in the quantification of performance measures, but does not evaluate performance.
- 3.1.10. All three levels form the critical and integral components of the risk process. Statistics and studies will not be effective unless supported by precise corporate and written rules.

**3.2. Risk Organization**

- 3.2.1. Risk management is a top-down process in the institution’s organization that starts with the Board. Through the Risk Management Committee, senior managers are actively involved in planning, approving, reviewing, and assessing all risks involved. The Risk Management Committee directly oversees the Risk Management Group and the Risk Control & Compliance functions.



**Elements of a Sound Risk Management System**



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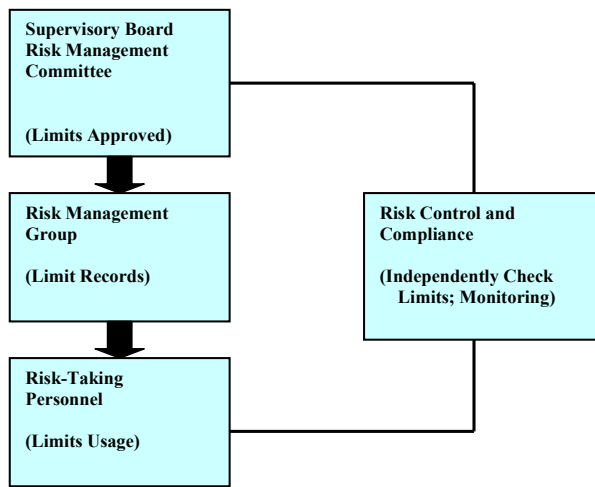
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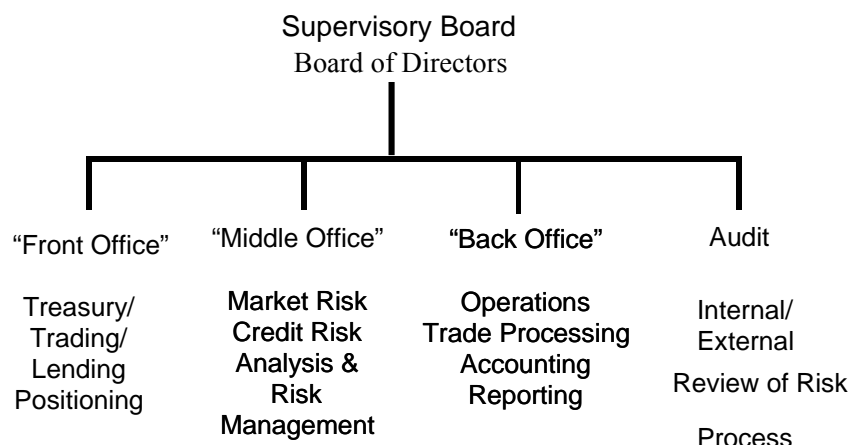
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- 3.2.2. To assess risks and gain approval for various risk limits, three primary functions are directly involved in the risk process: the Risk Taking Personnel, the Risk Management Group function and the Risk Control & Compliance function.
- 3.2.3. Risk Taking Personnel initiate and are directly accountable for all risks taken; risks that are duly and appropriately authorized by the Risk Management Committee after approval from the Board.
- 3.2.4. The general role of the Risk Management Group is to help Risk Taking Personnel identify whether the institution or a unit of the institution has the resources to pursue a business opportunity. The Risk Management Group is a separate and independent function that has no risk-taking accountability and serves more as a liaison to help Risk Taking Personnel obtain approval.
- 3.2.5. The Risk Control & Compliance function performs the important day-to-day oversight of actual risks against approved limits and reporting these to management. The three functions comprise a system of checks and balances for the risk process as outlined below.



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3.2.6. The overall risk organization inclusive of all units involved are shown in the following chart:



**3.3. Organizational Responsibilities** (The following provides insight to the responsibilities of the organizational bodies depicted in the above example:)

3.3.1. *Supervisory Board* - As discussed above, the Board maintains ultimate accountability for risks taken within the institution. The Board approves and periodically reviews the institution's overall tolerance for risk as well as business strategies, policies and risk philosophy. The Board is tasked with understanding the major risks faced by the institution and setting the firm-wide risk limits. The Board will have final approval for all limit allocations, additional approvals, and other recommendations of the Risk Management Committee. Additional, responsibilities of the Board are:

- Approve the organizational structure and ensure that its senior managers monitor the effectiveness of the risk control and overall internal control system.
- Appoint its own top-level committees, i.e., Risk Management Committee, Audit Committee, etc.
- Promote the highest standards of ethics and integrity in words and action.
- Lead in disseminating the institution's risk philosophy and control culture throughout the organization.
- Avoid policies and practices that generate incentives or temptations for inappropriate actions.

3.3.2. *Risk Management Committee and Chief Risk Officer* - The Risk Management Committee headed by the Chief Risk Officer is responsible for the creation and oversight of the institution's corporate risk policy. The committee is conceivably comprised of selected Board members and senior managers from major business units that have an additional

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independent reporting line to the Chief Risk Officer, who chairs Risk Management Committee meetings. Independence is critical to the committee's role of ensuring risks are properly monitored and managed - and adds another check and balance to the risk process. The Risk Management Committee has the responsibility to:

- Recommend for approval by the Board corporate policies and guidelines for risk measurement, management and reporting.
- Review and recommend for approval by the Board the system of risk limits; this implies allocation of capital to various business units and active involvement in annual budget and planning processes.
- Monitor the timely and accurate reporting of risks by business lines and activities.
- Evaluate the magnitude, direction and distribution of risks across the institution and its subsidiaries from a portfolio perspective.
- Analyze and confirm that the risk infrastructure satisfies corporate policies and is consistent with current technology and techniques.
- Promote the continuous development of risk programs and infrastructure, understanding this to be an evolutionary and dynamic process.
- Ensure that business units provide for ongoing review and validation of the adequacy and soundness of policies, assumptions and practices.
- Create and promote a risk culture that requires and encourages the highest standards of ethical behavior by risk managers and Risk Taking Personnel.
- Encourage the professional development and training of staff engaged in both risk activities and risk-taking activities.

3.3.3. *Asset and Liability Committee* - The Asset and Liability Committee could either be a Board or Directors committee and may have the same members as the Risk Management Committee. In this light, significant risk responsibilities under Asset Liability Management, are listed below:

- Ensure that at all times the institution and all its legal vehicles maintain adequate liquidity, sufficient capital and the appropriate funding to meet all business requirements and comply with all regulatory requirements.
- Build a stable funding structure by managing the long-term profiles of the institution's asset and liability maturities (referred to as the structural gap).
- Manage the balance sheet and ensure that strategies are in accordance with adequate liquidity, capital and diversified funding.
- Diversify the funding of each legal vehicle of the institution by source, maturity, instrument (which includes alternative instruments like asset sales), and currency.
- Establish asset/liability pricing policies consistent with the strategies for the balance sheet.
- Establish policy on all issues that affect capital, funding or liquidity.
- Ensure that the responsible institutional unit has the necessary support to effectively carry out the responsibilities above.

3.3.4. *Risk Management Group* - The Risk Management Group (or Risk Management Unit) is an independent business function within the institution that has the responsibility to:



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- Identify, analyze and measure risks from the institution's trading, position-taking, lending, borrowing, and other transactional activities.
- Assist Risk Taking Personnel in the development of risk reduction strategies.
- Analyze exposures and recommend limits to the Risk Management Committee.
- Establish standards to monitor and report compliance with limits.
- Set product development guidelines and include new exposures within the current framework.
- Draft product manuals that accomplish the risk identification objective.
- Ensure that systems output adequately measure all risks; build risk identification reports and value-at-risk calculators for each risk-taking activity.
- Perform scenario analyses ("stress testing") on strategic portfolios - analyses that examine the risk posture of the business given dynamic or extreme market environments.
- Recommend enhancements to the risk limits structure.
- Review and document each model used by the front and back offices for valuation and hedging, including making recommendations for enhancements.
- Oversee the collection and construction of historical databases (e.g., rates, actual positions, etc.) required by the risk analysis and measurement methodology.

3.3.5. *Risk Taking Personnel* - Risk Taking Personnel refer to all personnel who have the ability and have been given the authority to commit the institution to financial transactions and inherently expose the institution to risks. The control of risks by personnel who over the years have proven integrity, discipline and skill is an essential part of the institution's risk system—and highlights the human component of risk management. Risk Taking Personnel, who operate within designated units and specified limits, are the institution's "front-line" in risk. They are responsible for identifying opportunities for return (e.g., yield-enhancement, cost reduction, fees, etc.), taking the commensurate risk positions and actively monitoring, evaluating and adjusting those positions. Because of the considerable discretion inherent in their activity, Risk Taking Personnel have the responsibility to:

- Know, understand, and fully commit themselves to all of the institution's risk policies and procedures, and to be thoroughly familiar with all product manuals and institutional standards as well as all pertinent regulations that apply to their risk-taking activity.
- Know the risks assumed in their activities; and the precise amount, nature and application of risk limits delegated to them to control those risks.
- Conduct their risk-taking activities within limits at all times; immediately reporting inadvertent excesses to line managers or business unit heads.
- Understand the risk profile of the managed position/portfolio, and to scan and determine market opportunities within the context of the institution's overall strategy and risk tolerance.
- Identify types of risks created in any new products and activities they plan and the impacts on associated market, liquidity or credit limits; initiate product proposals for Product Committee deliberation.

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- Assist managers and credit officers in their assessment of the risk entity and the risk entity's shareholders and management (e.g., determining customer "suitability" to a transaction).
- Maintain relations and uphold the image of the institution with all customers and counterparties.

3.3.6. *Business Unit Heads / Line Managers* - Business Unit Heads and Line Managers have the responsibility for the on-site monitoring and supervision of Risk Taking Personnel. These senior officers normally have risk-taking experience and an understanding of markets, instruments, counterparties/customers and trading practices.

3.3.7. *Product Committee* - The Product Committee plays a crucial role in the risk identification portion of the risk process and in dispersing risk responsibility throughout the institution. Senior officers from different areas form this committee. With diverse lines of expertise and perspectives, they ensure the institution has the ability to manage, and maintain the appropriate infrastructure to support, all risk-taking activities giving special emphasis on new products. The Product Committee has the responsibility to:

- Review proposals to ensure that Risk Taking Personnel or designated product sponsors have properly identified and analyzed the relevant risks with sign-offs from involved departments.
- Review existing products and report status to the Risk Management Committee
- Analyze, evaluate and approve the following product attributes: Market, Interest Rate, Liquidity and Credit Risk; Operations; Accounting; Control and Compliance; Audit; Legal; and Systems & Technology issues for new activities/products.

3.3.8. *Risk Control & Compliance Function* - Risk Control & Compliance is again a separate function from risk-taking, is the third leg of the risk control system of checks and balances. These duties may be done by the Operations, Accounting, Financial Control and Audit Units, but are delineated here from the perspective of their place in the risk process. From the Risk Control & Compliance function, these units have the responsibility to:

- Perform the daily mark-to-market valuation for all of the institution's risk positions using independent data sources, and compare these positions to limits; perform cost allocations; perform reporting for accrual portfolios, etc.
- Compare and reconcile all positions and profit and loss estimates by Risk Taking Personnel to the general ledger and control balances, and official records maintained separately from risk-taking units; including investigation and immediate correction of transaction processing errors.
- Ensure compliance with internal limits and report all credit limit and market limit excesses to appropriate Business Unit Heads, Directors and the Board.
- Serve as official, up-to-date and accurate data source for all financial reports; generate consistent, timely and precise reporting of risk sensitivities and performance against limits to line and senior managers.

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- Generate verified daily and month-to-date profit and loss reports (provided to Business Unit Heads, Risk Taking Personnel, etc.) as well as all other management and regulatory reports (e.g., failed settlements).
- For trading activities; administer, follow-up and review all incoming and outgoing confirmations of trades; verify that transaction rates are reasonable and priced at market.
- Ensure that proper accounting, operations and technology systems are in place to support risk-taking activities at all times; actively assist in the planning, designing and testing of new systems or system improvements that support new risk-taking activities.
- Understand and validate all pricing and valuation models, as well as ascertaining independent validation if needed.

3.3.9. *Legal Function* - The institution requires either internal or external legal opinions to ensure that all documentation related to transactions is enforceable. Specifically, the Legal function has the responsibility to:

- Review all documents for completeness and enforceability under respective legal jurisdictions.
- Ensure contracting entities have legal capacity or are duly empowered to contract with the institution.
- Review and render opinions on tax and other regulatory implications of transactions.
- Establish procedures for safeguarding of original documentation.
- Review contracts periodically for continued statutory validity or need for modification.
- Advise Risk Taking Personnel on the: (1) legal aspects of enforceable commitments during a negotiation process; (2) appropriate governing law and jurisdiction for agreements; (3) development and documentation of terms for transactions involving collateral, guarantees, syndication, multi-office transactions, and any third party support; and, (4) documentation of waivers and amendments to the original documents.
- Review and approve standard form letters used in order not to construe unintentional commitments on the institution's behalf

3.3.10. *Internal Audit* - The Internal Audit Department is an essential part of the risk management system that takes the lead in the ongoing monitoring of the internal control process and providing an independent assessment of system integrity. The Board forms a Board level Audit Committee, which is responsible for overseeing the activities of, and serves as a direct link to, the institution's internal audit department and engages and serves as the primary contact for external auditors. An Audit Committee however will not take away the duties of the full Board, which alone is legally empowered to take decisions. The internal audit function has the responsibility to:

- Review compliance and performance of the Risk Management and Risk Control & Compliance functions.
- Review and ensure compliance by Risk Taking Personnel with policies and procedures.

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- Review for internal control deficiencies or ineffectively controlled risks and report these in a timely manner to the Board.
- Conduct follow-up reviews and immediately report to the Board of identified deficiencies that remain uncorrected.
- Review and ensure that existing policies and procedures remain relevant and adequate for the institution's activities

**4. Risk Management Assessment**

**4.1.** The NBRM places considerable weight on the assessment of the risk management system in the development of an institution's Risk Profile and when rating "Management" under the CAMEL rating system. Additionally, the quality of risk management is a major factor in determining aggregate risk for each of the seven risk categories. For NBRM supervision purposes, the quality of an institution's risk management system is assessed as Strong, Acceptable or Weak; and reflects findings within all four elements of sound risk management described above. An institution's risk management system is rated:

**4.1.1. Strong** when management effectively identifies and controls all major types of risk posed by the institution's activities, including those from new products and changing market conditions. The Board and Directors are active participants in managing risk and ensure that appropriate policies and limits exist, and the Board understands, reviews, and approves them. Policies and limits are supported by risk monitoring procedures, reports, and management information systems that provide management and the Board with the necessary information and analysis to make timely and appropriate responses to changing conditions.

Internal controls and audit procedures are sufficiently comprehensive and appropriate to the size and activities of the institution. There are few noted exceptions to the institution's established policies and procedures, and none are material. Management effectively and accurately monitors the condition of the institution consistent with standards of safety and soundness and in accordance with internal and supervisory policies and practices. Risk management is considered fully effective to identify, measure, monitor, and control risks to the institution.

**4.1.2. Acceptable** when the institution's risk management systems, although largely effective, may be lacking to some modest degree. It reflects an ability to cope successfully with existing and foreseeable exposure that may arise in carrying out the institution's business plan. While the institution may have some minor risk management weaknesses, these problems have been recognized and are being addressed. Overall, Board and Directors oversight, policies and limits, risk monitoring procedures, reports, and management information systems are considered effective in maintaining a safe and sound institution. Risks are generally being controlled in a manner that does not require more than normal supervisory attention.

Internal controls may display modest weaknesses or deficiencies, but they are correctable in the normal course of business. There may be a need for improvement, but the

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weaknesses noted should not have a significant effect on the safety and soundness of the institution.

- 4.1.3. **Weak** when risk management systems are lacking in important ways and, therefore, are a cause for more than normal supervisory attention. The internal control system may be lacking in important respects, particularly as indicated by continued control exceptions or by the failure to adhere to written policies and procedures. The deficiencies associated in these systems could have adverse effects on the safety and soundness of the institution or could lead to a material misstatement of its financial statements if corrective actions are not taken.

## **5. Risk Management Measurement**

### **5.1. Risk Measurement**

- 5.1.1. Effective risk management is essential for an institution's survival, enabling management to allocate resources to business units based on the trade-off between risk and revenue potential (return). At the core of modern finance is this link between risk and return, and these risk-return decisions are supported by quantitative risk measurements. Hence such quantification becomes relevant in normal day-to-day operations. Risk measurement attempts to answer the following four questions:

- How much can be lost?
- Can the institution absorb a significant loss without becoming insolvent?
- Is the return high enough to take the risk?
- How can the risk be reduced without significantly reducing the return?

- 5.1.2. The financial industry employs several methods of quantifying the various risks. These risk measurement models are designed to measure potential losses due to adverse changes, either in the prices of financial instruments or the financial environment. While valuable tools to the risk manager, risk models should not be viewed as black boxes that produce magic numbers. Risk methodologies should be clear, and risk managers should understand the key parameters and fundamental assumptions of each approach. Risk managers should not be lulled into a false sense of security through complicated mathematical formulas. There is no single correct answer to risk, and risk methodologies are constantly being refined and new approaches invented. This means that risk managers must continually question assumptions, search for new approaches for measuring risk, and keep abreast of the latest research. It's the risk manager—not just numbers—that makes risks transparent.

- 5.1.3. There are a variety of techniques used in quantifying (measuring) risks. Below are descriptions of some of the more common methods of measuring risks.

- 5.1.3.1. **Value at Risk (VaR)** - Value at Risk (VaR) estimates the potential loss that could result from holding a position for a specified period of time at a given level of statistical confidence. (See Appendix A for a discussion of the various elements of the mathematical determination of VaR.) VaR is usually calculated at a 95% or 99% confidence level, over various holding periods. That is: *VaR is the maximum loss which can occur with X% confidence over a holding period of n days*. Stated another way, when using a 99% confidence level, VaR calculates the level of loss

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that is so bad that there is only a 1 in 100 chance of there being a loss worse than the calculated VaR.

- 5.1.3.2. There are three principle methods for estimating VaR: Parametric VaR, Historical Simulation VaR, and Monte Carlo Simulation VaR - each with advantages and disadvantages.
- 5.1.3.3. *Parametric VaR*: Parametric VaR is also known as Linear VaR, Variance-Covariance VaR, Greek-Normal VaR, Delta Normal VaR, or Delta-Gamma VaR. The approach is parametric in that it assumes that the probability distribution is normal and then requires calculation of the variance and covariance parameters. The approach is linear in that changes in instrument values are assumed to be linear with respect to changes in risk factors.
- 5.1.3.4. The overall Parametric VaR approach defines the set of risk factors that will be sufficient to calculate the value of the portfolio and then finds the sensitivity of each instrument in the portfolio to each risk factor. It uses historical data on the risk factors to calculate the standard deviation of the changes and correlations between them. Then it estimates the standard deviation of the value of the portfolio by multiplying the sensitivities by the standard deviations, taking into account all correlations. Finally, it assumes that the loss distribution is normally disturbed, and therefore, approximates the 99% VaR as 2.32 times the standard deviation of the value of the portfolio.
- 5.1.3.5. Parametric VaR is attractive in that it is fast and not terribly demanding of computational resources. However, Parametric VaR has a number of weaknesses. It gives a poor description of nonlinear risks, and it gives a poor description of extreme tail events, such as crises, because it assumes that the risk factors have a normal distribution. Additionally, Parametric VaR uses a covariance matrix, and this implicitly assumes that the correlations between risk factors are stable and constant over time.
- 5.1.3.6. *Historical Simulation VaR*: Conceptually, historical simulation is the simplest of VaR techniques, but it takes significantly more time to run than Parametric VaR. The Historical Simulation VaR approach takes the market data for the last 250 days and calculates the percent change for each risk factor on each day. Each percentage change is then multiplied by today's market values to present 250 scenarios for tomorrow's values. For each of these scenarios, the portfolio is valued using full, nonlinear pricing models. The third worst day is then selected as being the 99% VaR.
- 5.1.3.7. The disadvantages of Historical Simulation VaR are due to the use of historical data in such raw form. The result is often dominated by a single, recent, specific crisis, and it is very difficult to test other assumptions. The effect of this is that Historical Simulation VaR is strongly backward-looking. There can also be an unpleasant "window effect." When 250 days have passed since the crisis, the crisis

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observation drops out of the window for historical data and the reported VaR suddenly drops from one day to the next. This often causes mistrust in the VaR because analysts know there has been no significant change in the risk of operations, and yet the quantification of the risk has changed dramatically.

- 5.1.3.8. *Monte Carlo Simulation VaR*: Monte Carlo Simulation VaR estimates VaR by randomly creating many scenarios for future rates, using nonlinear pricing models to estimate the change in value for each scenario, and then calculating VaR according to the worst losses.
- 5.1.3.9. The Monte Carlo Simulation VaR uses full pricing models and can therefore capture the effects of nonlinearities. Additionally, it can generate an infinite number of scenarios and therefore test many possible future outcomes. However, from the risk manager's viewpoint, the main problem with the Monte Carlo Simulation VaR is the cost and the time it takes to obtain reliable estimates. The calculation can take 1000 times longer than Parametric VaR because the potential price of the portfolio has to be calculated thousands of times. And unlike Historical Simulation VaR, it typically requires the assumption that the risk factors have a normal or log-normal distribution.
- 5.1.3.10. It is important to realize that all three approaches for measuring VaR are limited by a fundamental assumption: that future risk can be predicted from the historical distribution of returns. The parametric approach assumes normally distributed returns, which implies that parametric VaR is only meant to describe “bad” losses on a “normally bad” day. While Monte Carlo simulation offers a way to address the “fat tail”<sup>1</sup> problem by allowing a variety of distributional assumptions, volatility and correlation forecasts are still based on statistical fitting of historical returns. While historical simulation performs no statistical fitting, it implicitly assumes that the exact distribution of past returns forecasts future return distributions. This implies that all three approaches are vulnerable to sudden changes in market behavior.
- 5.1.3.11. **Earnings at Risk (EAR)** - Earnings-at-Risk (EAR) is a measure of likely earnings volatility for accrual portfolios. It is most often used in measuring interest rate risk and is calculated as the change in income over the next 12 months, given current exposures that will result from potential changes in interest rates. Unlike VaR, EAR reflects the risk exposure of future accounting income and this is not necessarily the same as exposure to changes in market or economic value.
- 5.1.3.12. **Gap Analysis** - Gap analysis is primarily used to measure liquidity risk and interest rate sensitivity. A liability Gap occurs when more liabilities than assets mature or are subject to interest rate changes during a given time period. Conversely, an asset-sensitive position arises when more assets than liabilities mature or are subject

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<sup>1</sup> “Fat Tails”, also known as **leptokurtosis**, is the situation where there are more occurrences far from the mean than predicted by a standard normal distribution.

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to rate changes. A Gap analysis can be used globally (all assets and liabilities) or at operational levels (e.g., retail banking, wholesale banking, etc.)

- 5.1.3.13. Gap reports, inherently, are accurate only for the day on which they are prepared. Therefore, it is essential that institutions have the capability to produce detailed computerized reports daily, thus allowing a variety of computerized management summaries to be generated as needed. Securities, loans, deposits, and future contracts, as well as commitments to take or place deposits and commitments to buy or sell securities, should be reflected in the periods in which they are scheduled for rollover or interest adjustment. In most instances, an additional report reflecting those items at final maturity is desirable in analyzing the institution's medium and longer-term dependence on money market funding sources.
- 5.1.3.14. **Stress Testing** - Stress testing examines the impact that abnormally large swings in market factors and periods of prolonged inactivity might have on portfolios. The stress-testing program is designed to identify key risks and ensure that the institution's capital can easily absorb potential losses from abnormal events. A standard set of stress tests can be performed daily, weekly, monthly, etc., and/or when specific market conditions develop.
- 5.1.3.15. Stress testing is valuable because historical analysis of markets shows that returns have "fat tails," where extreme market moves (i.e., beyond 99% confidence) occur far more frequently than a normal distribution would suggest. Although the discipline of risk management has improved considerably, classical events like natural disasters, wars, and political coups still lie beyond statistical forecasting. Therefore, regular stress testing is increasingly viewed as indispensable by risk managers and supervisors. Stress tests should enhance transparency by exploring a range of potential low-probability events when VaR bands are dramatically exceeded. Stress testing combined with VaR gives a more comprehensive risk picture.
- 5.1.3.16. Stress tests can be framed around two central questions:
1. **How much** could be lost if a stress scenario occurs?
  2. **What event** could cause a loss greater than a pre-defined threshold amount?
- 5.1.3.17. The first question is commonly asked in a top-down approach for stress testing. For example, Directors may ask how much could be lost in a major move in interest rates. The second question is best asked at the business level. After scenarios are collected from individual risk takers, cross-institutional analysis can be done to see if events are diversified or exacerbated. For example, a stress scenario of Euro vs. USD depreciation might be ruled as unimportant due to generally offsetting sensitivities (or no-significant reported sensitivities), while a major interest rate move scenario could be identified as relevant because many risk-taking units expressed a similar concern. This approach could therefore be viewed as a bottom-up search for relevant stress scenarios.



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5.1.3.18. The major issue with stress tests is how to create and use them. To be meaningful, stress tests should tie back into the decision-making process. Corporate-level stress test results should be discussed in a regular forum by risk monitors, senior managers, and risk takers. Just as for VaR limits, institutions should have a set of stress loss limits by risk type and risk taking unit. Stress testing should be performed at multiple levels of the micro, macro, and strategic risk pyramid with different frequencies. At the Directors level, stress results should guide the institution's appetite for aggregate risk taking and influence the internal capital allocation process. At the business level, stress tests may trigger discussions on how best to unwind or hedge a position. The goal of stress testing is to uncover potential concentrations and make risks more transparent.

5.1.3.19. A key question in developing every stress scenario is whether current risk parameters will hold or break down. For example, will observed correlations hold or increase, or could there be a sudden shift in market behavior? In stress testing, asking the right question (e.g., what could happen), is just as important as providing answers (e.g., what losses would be under those conditions).

5.1.3.20. There are four major approaches for generating stress scenarios. The first uses historical scenarios and the second shocks market conditions to examine portfolio sensitivities and concentrations. The third approach considers hypothetical future scenarios, based on current market conditions. The fourth approach searches for stress scenarios by analyzing portfolio vulnerabilities.

5.1.3.21. **Sensitivity Analysis** - Sensitivity analysis assesses the impact of market changes (interest rates, foreign exchange rates, etc.) on current earnings and on the economic value of assets and liabilities. It is often applied globally to the major currencies within the institution's operations. EaR is one form of sensitivity analysis.

5.1.3.22. **Simulation Modeling** - Simulation models enable the institution to assess market impact under a variety of scenarios over time. The models incorporate assumptions about growth, planned business mix, changes in market conditions (e.g., interest rates, foreign exchange rates, equity prices, and commodity prices), shape of yield curves, embedded product options and other factors. The resulting change in value is the loss estimate. Simulation modeling under various scenarios is particularly important for managing risk in deposit, lending and investment products. It should be emphasized that meaningful scenario analysis is dependent on having valuation models that are accurate over a wide range of input parameters, a characteristic that is shared to a considerable extent by value-at-risk models.

## **5.2. Back Testing**

5.2.1. Models are designed to reflect reality. Back tests compare realized results with model generated risk measures, both to evaluate a new model and to reassess the accuracy of existing models. Although no single methodology for back testing has been established, institutions using internal VaR models must back test their models on a regular basis. Institutions generally back test risk models on a monthly or quarterly basis to verify

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accuracy. In these tests, they observe whether trading results fall within pre-specified confidence bands as predicted by VaR models. If the model performs poorly, they probe further to find the cause (e.g., check integrity of position and market data, model parameters, methodology, etc.).

## **6. Risk Management Reporting**

### **6.1. Introduction**

6.1.1. Properly designed reports are the most important supervisory tools available to the Board and Directors, and essential for risk takers and analysts. In general, risk managers use risk reports to quantify sources of risk across the institution, analyze the risk/return results of business lines, and monitor risk limits and regulatory capital usage. There is an important organizational hierarchy to risk reporting, in that significant exposures must be channeled up from the frontline risk taker to the Board and Directors. Information should be customized for different levels of the institution, highlighting relevant dimensions of risk and identifying the risk taking units. To produce relevant risk reports, risk managers and risk takers must have access to reliable sources of information and market data.

6.1.2. Since reporting is an integral component of the risk communication process, risk reports should be timely, accurate and concise; highlight portfolio risk concentrations; and include a written commentary. While risk measurement is often based on mathematical calculations (e.g., VaR, Stress testing, etc.), a true measure of the quantity of risk can not be determined without taking into consideration many other factors. The reports detailed below are intended to give the reviewer a broad picture of the quantity of risk. The following is a list of risk management reports that are used to quantify risks.

### **6.2. Credit Risk**

- Risk Rating report – summarizes the total Denar amount of loans in each risk rating category, often by division or product. These reports are especially useful for monitoring risk-rating trends.
- Problem Loan report – identifies problem or watch credits, and quantify the institution's potential loss on each significant problem credit.
- Rating Migration report – shows how loan ratings have changed over time. At a base date, each loan is categorized by risk rating, with ratings periodically updated (generally quarterly). This format enables the analyst to observe changes in the risk ratings and provides a view of portfolio quality over time.
- Past Due and Non-accrual report – shows seriously delinquent borrowers and tells the percent of loans past due by loan category.
- Renegotiated and Restructured Loan report – identifies loans whose original terms or structure have been modified, usually due to financial stress of the borrower.
- Other Real Estate Owned report – details efforts to dispose of each piece of other real estate owned and shows if appraisals are current for all parcels.
- Exception report – lists exceptions to loan policies, procedures, and underwriting standards. The reports should include the trend in number and Denar amount of loans approved that are exceptions to policy as well as the percentage of loans that are exceptions to policy to total loans.

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- Concentration report – shows lending concentrations by type of loan, industry, regions, etc.
- Independent Review report – evaluates (independent from risk takers) the risk in credit portfolios. Reviews are conducted by independent third-parties, e.g., Risk Assessment Group, Internal or External Auditors, Independent Loan Review Unit, consultants, etc.
- Distribution of Credit Ratings report – shows credit ratings (by major rating services) for all investment and corporate securities, including the percent of the portfolio in each rating category. This report provides useful information on the overall credit quality of the investment and securities portfolio(s).
- Adjusted Historical Cost report – shows the historical cost for each security/investment relative to its current market value.
- Purchases and Sales report - indicates the type of security/investment, its par value, maturity date, rate, yield, cost and sales prices, and any profit or loss. For purchases, risk-focused information would reflect value sensitivity, i.e., how much the security's value would change for a specified change in market yields and any applicable policy limits. A pre-purchase analysis should identify such value sensitivity.
- Adequacy of the reserves for loan impairment report – details the following information:
  - Management's quarterly evaluation of the adequacy of reserves for loan impairment prepared, at a minimum, as of regulatory reporting dates.
  - Charge-off and recovery experience.
  - Reconciliation of the reserves for loan impairment for the current period and previous year-end.
  - Any independent analysis of impaired loans.

**6.3. Liquidity Risk**

- Liquidity Risk report – shows the level and trend of the institution's liquidity risk by a variety of appropriate measures, e.g., maturity Gap, volatility coverage, etc. The report should indicate how much liquidity risk the institution is assuming, whether management is complying with risk limits, and whether management's strategies are consistent with the Board's expressed risk tolerance.
- Funds Provider report – lists large funds providers and identifies funding concentrations.
- Projected Needs and Sources report – projects future liquidity needs for prescribed timeframes and compares these projections to the sources of available funds.
- Funds Availability report – takes the amount of borrowing capacity remaining under established lines of credit. This report indicates the amount of borrowed funds the institution can realize given its financial condition and qualifying collateral.
- Cash Flow or Funding Gap report – reflects the quantity of cash available within each of a series of selected time periods compared to the quantity of cash required within the same time periods.
- Funding Concentration report – reflects significant funding from a single source or from multiple sources possessing common credit or rate sensitivity.
- Contingency Funding Plan (CFP) – may incorporate the funding gap report or be considered an outgrowth of it. The CFP forecasts funding needs and funding sources under varying market scenarios resulting in rapid liability erosion or excessive asset growth.

#### 6.4. Market Risk

##### *Interest Rate risk:*

- Gap (or Re-pricing) report – Calculates the difference between rate-sensitive assets and rate-sensitive liabilities at various intervals or time periods.
- Simulation Models – measures interest rate risk arising from current and future business scenarios.
- Economic Value Sensitivity Models – captures the interest rate risk of the institution's business mix across the spectrum of maturities. These models generally compute the present value of the institution's assets, liabilities, and off-balance sheet accounts under alternative interest rate scenarios and the sensitivity of that value to changes in interest rates.

##### *Foreign Exchange Risk*

- Position report – shows the institution's current balance sheet and off-balance sheet positions in domestic currency and for each foreign currency. Position reports should include all foreign currency balance sheet items and future contracts as well as after-hour and holdover transactions, with the exception of fixed assets and equity investments. The following information should be captured in position reports:
  - Net overnight positions by currency, including domestic currency;
  - Outstanding contracts by settlement date and currency;
  - Outstanding contracts with counterparties;
  - Total value of outstanding contracts, spot and forward;
  - Profit and loss, totals and comparison to previous day's;
  - Market value of off-balance sheet products;
  - Aggregate dealing limits: by dealing room, region, country, global; and
  - Valuation of option contracts.
- Gap or Maturity report – shows the institution's liquidity in each foreign currency, i.e., foreign currency assets, liabilities and exchange contracts.
- Exception report – shows excesses to position limits, gap limits, and customer trading and settlement limits. This report must be generated immediately upon the creation of excesses. Excesses over any established limits should conform to overall policy guidelines and should receive prior approval by the responsible supervisory officers. If prior approval is not possible, evidence of subsequent management concurrence or disagreement as well as any corrective action should be available for audit review and management records.

##### *Price Risk*

- Credit Risk Exposure report - identifies current credit exposures for all individual counterparties, which is the net value of all contracts, assuming the institution has a legally enforceable netting agreement. The Board should require management to obtain netting agreements since netting, like collateral, reduces credit risks. Such reports should also indicate credit limits and collateral requirements, as well as identify any credit concentrations.
- Trends in Usage report - tracks the notional amount of contracts over time, by type of contract (futures, interest rate swaps, caps, floors, etc.) and by market risk factor (interest rates, equity prices, commodities, etc.).
- Compliance report - details compliance with all Board-approved policies and limits.

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- Stress Testing report – shows the results of any stress tests and augments the institution's risk measurement process by altering market variables to determine which scenarios may pose significant risk to the trading portfolio(s). Reports to the Board should include the major assumptions used in each scenario.
- Impact report - shows the accounting impact on the institution's income statement from its hedging and trading activities.

**6.5. Operational Risk**

- Timeliness and Accuracy report – shows frequency of errors, deadline failures, delivery failures, etc.
- New/lost Business report—identifies key characteristics of new clients and provides information on closed accounts. The Board should be aware of potential systemic reasons for account closings, including customer service problems, product deficiencies (including sub par performance), mishandling of accounts, and operational errors.
- Processing report – shows the total number of transactions and amounts handled per day, month, and year.
- Loss report – shows the number and amount of loss events occurring over a set period.
- Compliance report – shows the existence, number, reasons and nature of violations of administrative and accounting control procedures. Such reports could also include number of data entry errors, collateral management failures, incomplete legal documentation, unapproved access given to client accounts, and vendor disputes.
- Audit report – provides copies of audit reports issued during the quarter or summaries of audits conducted and significant issues noted, discusses significant accounting issues or regulatory issuances pertaining to audit or controls, and provides information about audit staffing, independence, and training.
- Audit Status report – shows the progress of meeting the annual audit plan or schedule, including any adjustments to the plan or schedule; and activity reports on audits completed, in process, and deferred or cancelled.

**6.6. Information Technology Risk**

- Budget report – shows actual vs. budgeted costs of data processing operations.
- Exception report – shows frequency of attempted or actual unauthorized access, hardware and software failures, telecommunications problems, utility outages, patent and copy right violations, etc.
- Compliance report – shows frequency of security and data integrity breaches, data entry errors, and policy and procedural violations.

**6.7. Legal Risk**

- Litigation report – shows the volume, potential Denar exposure (including cost of litigation), and nature of pending or threatened litigation.
- Compliance report – details the number and significance of violations or noncompliance with laws and regulations (especially those subject to fines and penalties), contractual obligations, and prescribed standards. Significance is determined by an analysis of the frequency, Denar amount, and nature of noncompliance. The analysis should incorporate both current and historical perspectives.

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- Fraud report – details employee theft, insider trading on an employee’s own account, intentional misreporting of positions, robbery, forgery, check kiting and damage from computer hacking.
- Employ Practices and Workplace Safety report – details workers compensation claims, violations of employee health and safety rules, and discrimination claims.
- Insurance report – shows amount of insurance coverage (and claims) carried by the institution for various insurable activities.
- Customer Opinion report – shows the results of customer surveys, and complaints by customers and others.
- High-risk Accounts report – shows exposure to money laundering activities and details accounts held by currency exchangers and dealers, money transmitters, businesses engaged in check-cashing, casinos, car or boat dealerships, travel agencies, non-governmental organizations and charities, senior foreign political persons, and entities from foreign countries known as drug trafficking or money-laundering havens. High volumes of cash, wire transfers, or official checks are also indicators of high-risk accounts.
- Fiduciary Audit report - contains conclusions on the effectiveness of the institution’s internal controls and operating practices in performing trust and fiduciary operations.

**6.8. Strategic Risk**

- Tracking reports – shows actual cost/benefits of strategic decisions compared to the initial underlying assumptions used in strategic planning (i.e., growth assumptions, viability of new or existing markets, human resource requirements, risk exposure inherent in expanded credit risk initiatives, etc.).
- Budget and Variance report – shows actual vs. budgeted cost/income of the implementation of strategic initiatives. Such reports may capture information by product line, by business unit, or for asset management activities as a whole. The supporting information should enable the Board to evaluate the success of business strategies as well as management’s performance.

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**Appendix A - Value at Risk**

Value at Risk (VaR) is calculated within a given confidence interval and seeks to measure the possible losses from a position or portfolio under “normal” circumstances. Hence, a basic understanding of statistical probability is needed to fully appreciate the meaning and use of VaR.

The definition of normality is critical and is essentially a statistical concept that varies by institution and by risk management systems. Put simply, however, the most commonly used VaR models assume that the prices of assets in the financial markets follow a normal distribution. A distribution is described as *normal* if there is a high probability that any observation from the population sample will have a value that is close to the mean (average), and a low probability of having a value that is far from the mean. This probability distribution, or standard normal distribution, allows for the determination of confidence levels which are statements about the probability of future events.

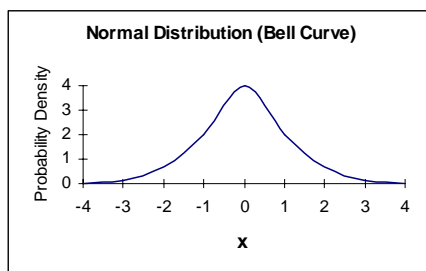
A normal distribution, and the resulting confidence levels, evolves around the determination of a standard deviation, which reflects how close each sample item is to the mean of the data set. Thus confidence levels and standard deviations, derived from the statistical concept of normal distributions, are both used in the VaR calculation. Below is a brief discussion of normal distribution, confidence levels and standard deviations. Also provided is an example of a simple VaR calculation. The following notations are used throughout the discussion:

**x** = one value in the set of data  
**n** = the number of values x in the set of data  
**μ** = the mean (average) of all values x in the set of data  
**V** = Variance  
**N** = the number of deviations-from-the mean  
**σ** = standard deviation  
**CL** = confidence level  
**CMV** = current market value  
**VaR** = Value at Risk

**Normal Distribution**

A normal distribution of data means that most of the items in a set of data are close to the "average," or mean, while relatively few items tend to one extreme or the other (the tails). Many kinds of financial data are approximated well using statistical tests assuming a normal distribution. Most of these tests work well even if the distribution is only approximately normal, at least if the distribution does not deviate greatly from normality. Normal distributions are symmetric with values more concentrated in the middle than in the tails. A normal distribution has a bell-curved shape as shown below.

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For Value at Risk (VaR) calculations, the horizontal axis (or x-axis) is the measured value in question, and the vertical axis (or y-axis) is the probability density (representing the probability of a value in question falling in a specific range). Given the current market value of an investment and the standard deviation of the return on the investment (based on historical data), the possible range of actual future values can be found.

**Confidence Level (CL)**

From a statistical perspective based on normal distribution theories, there is an 84.1% probability (or confidence level) that the actual future value will be either one standard deviation above or one standard deviation below the current market value, or  $\pm 1$  standard deviation. It also works out that there is a 97.7% chance the actual future value will be within  $\pm 2$  standard deviations and there is a 99.9% chance the actual future value will be within  $\pm 3$  standard deviations. Statistics also says there is always some small chance the actual value can be any number of standard deviations from the current market value but usually the actual future value will be within 3 standard deviations of the current market value. Normally, confidence levels of 95% and 99% (which works out to  $\pm 1.64$  and  $\pm 2.32$  standard deviations, respectively) are used in VaR calculations. Thus the standard deviation is a very concise and powerful way of conveying the amount of uncertainty in future values. The smaller the standard deviation is, the less the uncertainty.

There is nothing magical about confidence levels. In choosing confidence levels, institutions should consider worst-case loss amounts that are large enough to be material, but that occur frequently enough to be observable. Some maintain that using a higher level of confidence, such as 99.9%, would be more conservative. One might also reason, however, that a higher confidence level can lead to a false sense of security. A 99.9% VaR will not be understood as well or taken as seriously by risk takers and managers because losses will rarely exceed that level. Furthermore, due to fat-tailed market returns, a high confidence level VaR is difficult to model and verify statistically. VaR models tend to lose accuracy after the 95% mark and certainly beyond 99%.

**Standard Deviation**

The **standard deviation** ( $\sigma$ ) is a statistic that tells how tightly all the various data values are clustered around the mean in a set of data. When the values are pretty tightly bunched together and the bell-shaped curve (Normal Distribution) is steep, the standard deviation is small. When the values are



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spread apart and the bell-shaped curve is relatively flat, the standard deviation is relatively large. To calculate the standard deviation, the concepts of mean and variance must first be explored.

**Mean:** The arithmetic **mean** ( $\mu$ ) is what is commonly called the average. The mean is the sum of all the data values ( $x$ ) divided by the number ( $n$ ) of data values. The formula is:

$$\mu = (x_{01} + x_{02} + x_{03} + \dots + x_n) / n$$

or

$$\mu = \Sigma x / n$$

**Variance:** The **variance** ( $V$ ) is a measure of the amount by which a data value varies from the mean. To obtain the variance, one must start by subtracting the mean from each data value. Since there will be about as many items above the mean as below the mean, the resulting list of numbers will have about as many positive values as negative values. (In fact, this list of deviations-from-mean must itself average to zero!) Square each deviation, and proceed to find the average of the squared-deviations. (Squaring each deviation-from-mean makes them all positive numbers and avoids negatives reducing the variance.) However, in finding the average squared deviation, divide by the number ( $N$ ) of deviations-from-mean minus 1 ( $N-1$ ) rather than  $N$ . (The division of  $N-1$  ensures that the expected value of the sample variance equals the variance of the underlying distribution.) Thus the variance is equal to **standard deviation squared** ( $\sigma^2$ ). The formula is:

$$\text{Variance} = \frac{(\text{item}_{01} - \text{mean})^2 + (\text{item}_{02} - \text{mean})^2 + \dots + (\text{item}_N - \text{mean})^2}{\text{Number of deviations-from-mean minus one}} = \text{standard deviation squared}$$

or

$$V = \frac{(x_{01} - \mu)^2 + (x_{02} - \mu)^2 + (x_{03} - \mu)^2 + \dots + (x_N - \mu)^2}{N-1} = \sigma^2$$

or

$$V = \Sigma (x - \mu)^2 / N-1 = \sigma^2$$

To determine the **standard deviation**, simply take the square root of the variance. Because squaring each deviation-from-mean (to avoid negative numbers) makes the final answer very large, un-squaring the variance (by taking the square root) makes the standard deviation a much more useful number.

The formula is:

Standard deviation = the square root of the variance

or

$$\sigma = \sqrt{V}$$

### **Simple VaR calculation:**

As mentioned in Section 5.1.3.1, Value at Risk (VaR) estimates the potential loss that could result from holding a position for a specified period of time at a given level of statistical confidence.

To calculate the VaR for a single asset, we would calculate the standard deviation of its returns, using its historical volatility. If a 95% confidence level is required, meaning we wish to have 5% of the observations in the left-hand tail of the normal distribution, then the observations in that area are 1.64

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standard deviations away from the mean. We would then apply these results to the current market value of the asset. The VaR formula is:

$$\text{Value at Risk} = (\text{Confidence Level}) * (\text{standard deviation}) * (\text{Current Market Value})$$

Consider the following data in determining the VaR for a Euro bond, calculated using one year's historical observations.

Current Market Value (CMV):	€10 million
Average return ( $\mu$ ):	7.35%
Standard deviation ( $\sigma$ ):	1.99%
Confidence level (CL):	95% (or 1.64 standard deviations)

Using the simple formula stated above:

$$\begin{aligned}\text{VaR} &= (\text{CL}) * (\sigma) * (\text{CMV}) \\ \text{or} \\ \text{VaR} &= (1.64) * (.0199) * (\text{€}10,000,000) \\ \text{or} \\ \text{VaR} &= (.0322636) * (\text{€}10,000,000) \\ \text{or} \\ \text{VaR} &= \text{€}336,360\end{aligned}$$

This figure (€336,360) is the maximum loss that may be sustained over one year for 95% of the time.

In the example, first find the mean (average) return of a Euro Bond, by calculating and then adding the returns for every day of the past year, and dividing by 365 days. The example mean return equals 7.35%. Next find the standard deviation by taking the square root of the variance. The variance is calculated by finding the average of the squared differences of each daily return minus the mean. The entire process goes something like this:

$x$  = daily return  
 $\text{CL}$  = Confidence Level = 95% or 1.64 standard deviations  
 $\text{CMV}$  = €10,000,000

$$\text{Average (mean) Return } (\mu) = \frac{x_{01} + x_{02} + x_{03} + \dots + x_{365}}{365 \text{ days}} = 7.35\%$$

$$\text{Variance } (V) = \frac{(x_{01} - .0735)^2 + (x_{02} - .0735)^2 + (x_{03} - .0735)^2 + \dots + (x_{365} - .0735)^2}{365-1} = .00039601$$

$$\text{Standard deviation } (\sigma) = \sqrt{V} = \sqrt{.00039601} = .0199$$

$$\text{VaR} = 1.64 * .0199 * \text{€}10,000,000 = \text{€}326,360$$