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This book is dedicated to my wife Abeer Sanad and my two sons Hossam and Ali.
M. M

This book is dedicated to my family and friends.
A. S

My dedication is to Val, my brightest light at the end of the tunnel.
D. E

With much love and thanks to our best doctors, Professor Olfat Kamel, Said El Khouly, Mostafa Hodieb, and Olfat Shatta.

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PREFACE

Managing Risk is not a new issue; it has been addressed for a relatively long time in different contexts, especially in financial services, but it has become a focus in recent years. Professional bodies and regulators in various fields have been interested in developing frameworks that govern risk management on a sound scientific basis. The banking industry's share has been particularly significant since the last three years of the last century. This interest has increased since the beginning of the century, which has witnessed a development in terms of the number and quality of the Basel Committee's decisions regarding the management of various types of risks in the competitive banking environment. These publications influenced practitioners and researchers who were interested in examining and criticizing the standards issued and addressing their shortcomings by linking risk management with related disciplines such as performance appraisal and strategic management.

The 2007-2009 global financial crisis highlighted many shortcomings in risk management practices within the banking industry, which was reflected in Basel Committee's interest in developing its long-standing decisions, known as Basel III. This approach addressed new types of risks not previously applied, as well as improved the quality and value of the Bank's capital base and did not rely entirely on financial risk measures.

This book goes beyond the boundaries of the traditional risk management framework set by the Basel committee. Addressing new types of risks and inspired the essence of this unique work of Enterprise Risk Scorecard in designing the Banking Balanced Risk Scorecard (BBRSC), which encompasses financial risks (market, credit, operational and liquidity), as well as non-financial risks including: internal process, which represent the operational risk included in the Basel framework, in addition to customer, learning, and growth, which represent new types of risks addressed by the banking industry.

BRBSC is a framework that governs the process of identifying and measuring the key indicators of potential risk categories, across and beyond Basel requirements that affect the bank and manage these risks to be within

its risk appetite in order to maximize both stakeholder value and competitive advantage, and it is consistent in this way with the recent trends that address risk management as an active, strategic, and integral process that encompasses both the measurement and the mitigation of risk, with the ultimate goal of maximizing the value of a bank while minimizing bank failure.

This book focuses on enhancing the effectiveness of Bank value by developing risk management to be viewed as a third leg of shareholder value creation along with revenue growth and productivity. A three-level hierarchy of risks and the risk indicator scorecard were introduced, a parallel to the strategy scorecard that Kaplan and Norton conceived two decades ago. In addition to providing dimensions of (BRBS) framework and its measures to maximize Bank value, the book decomposes economic value add to measure the benefit of shareholder value and Tobin's Q to measure the benefit of other stakeholder value, while using the market share indicator as a proxy for measuring competitive advantage.

In addition to the banking risk balanced scorecard, the authors introduce one of the important aspects within climate risk at the internal level, named organization's carbon footprint card, to translate the efforts to harmonize environmental preservation and pollution control with corporate activities, to support the economy and contribute to the betterment of society as a whole.

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CHAPTER 1

INTEGRATED RISK MANAGEMENT FRAMEWORK FOR BANKS

Abstract

In this chapter, we provide an overview of the integrated risk management framework. We set out the first milestone for managing risks scientifically, so we define and analyze the various types of risks inherent in banking activities. We distinguish between types of risks related to the banking industry that a bank faces when pursuing its strategic or operational objectives.

Key Words: Credit Risk, Market Risk, Operational Risk, Customer Risk, Liquidity Emerging Risk, Legal and regulatory risk, Reputational Risk.

1.1 Risk types

The integrated risk management framework encompasses traditional key risks, such as the following:

- **Credit Risk,** the most important type in the banking industry, can be defined as losses in the event of default of borrowers, the deterioration of borrower credit quality, or the decline in the counterparty's credit standing.
- is the risk of earnings loss arising from changes in interest rates, foreign exchange rates, equity prices, commodity prices, and their implied volatilities. The risks subject to this requirement are: the risks of interest rate-related instruments and equities in the trading book; foreign exchange risk, and commodities risk throughout the bank.
- **Operational Risk** is defined as the risk of direct or indirect loss resulting from inadequate or failed internal processes, people and systems, or external events.
- **Liquidity Risk** can be defined as the risks that demand for

repayment outstrips the capacity to raise new liabilities or liquefy assets. It can also refer to the bank's inability to: cover financial commitments when due; and/or liquidate assets in an orderly manner due to market disruptions, inadequate market depth, and/or wider bid-ask spreads.

As well as in this chapter, we go beyond the most undated regulatory risk management framework (Basel III and Basel IV), as fundamental changes in financial markets, increasing globalization, and deregulation have had a large impact on the magnitude and nature of the risks confronting banks (a summary of Basel III and Basel IV frameworks are illustrated in the book appendix).

The integrated framework encompasses other types of risks such as

- **Learning and Progress Risk** arises when the capability of the bank to progress and learn, which represents direct ties with a firm's value, is linked to its strategy and the maximum acceptable level of risk in light of its knowledge about market and return risks**.**
- **Customer risk refers** to the risk of a bank's overall customer portfolio. The risk of losing these customers.
- **Legal and regulatory risks arise** from potential breaches of applicable laws and regulatory requirements, unenforceability of contracts, lawsuits, or adverse judgments that may lead to potential losses, disruption in business, or otherwise resulting in financial and reputational risks.
- **Reputational Risk** is the risk arising from negative perceptions on the part of customers, counterparts, shareholders, investors, debt holders, market analysts, other relevant key stakeholders or regulators that can adversely affect a bank's ability to maintain existing, or establish new, business relationships and continued access to sources of funding.
- **Strategic Risk** is the risk of current or prospective impact on the Group's earnings and capital, arising from changes in the environment in which the Group operates and from adverse strategic decisions, improper implementation of decisions, or lack of responsiveness to industry, economy, or technological changes.

Risk management is crucial for acquiring and maintaining the competitive advantage; thus, an integrated risk management framework has become the core of banking management in recent years.

1.2 Integrated Risk Management Framework

Banks face various risks inherent to the banking industry. These include:

Figure 1/1: Various Types of Banking Risk

1.2.1 Credit Risk Management

Is there a risk of financial loss due to failure of the Group's borrowers or counterparts to fulfill their contractual obligations to repay their loans or to settle their financial commitments. The Group's credit risk exposures arise primarily from lending, investments, and trading activities.

Credit risk is paramount in the banking industry. The Basel committee defined the potential that a bank borrower or counterparty will fail to meet its obligation in accordance with agreed terms (BCBS, 1988). In other words, credit risk can be defined by the losses in the event of default of a borrower, the deterioration of borrower credit quality, or the decline in the counterparty's credit standing. Several factors affect credit risk, but the major risk components are: probability of default (PD), loss given default (LGD), and exposure at default (EAD).

There are several aspects of credit risk, the most common two: credit default risk and credit spread risk. The default risk is measured as the probability that defaults occurred during a given period. Counterparty risk refers to the possibility that a trading counterparty will fail to pay if it loses money on a

deal. Settlement risk occurs when a bank fails to settle its side of the trade.

Basel committee distinguish between two broad approaches; the standardized approach, which relies on the credit assessment provided by external credit rating agencies, and the internal rating-based approach, which relies on the bank's own credit assessment. In general, banks use several tools or approaches to quantify credit risk. The most common are: credit value at risk, the ratio of non-performing loans to the total portfolio, and the ratio of doubtful loan provision to the total portfolio.

Credit risk has gained considerable momentum due to increased competition in the field and the challenges of the current financial crisis. Credit risk is one of the main risks faced by commercial banks and affects their ability to operate sustainably.

Banks assume credit risk when they act as intermediaries of funds, and credit risk management lies at the heart of commercial banking.

Studies of banking crises show that poor loan quality is the most frequent factor affecting bank failure. The credit risk management process of a bank is believed to be a good indicator of the quality of a bank's loan portfolio.

Credit risk emerged as a significant risk management issue during the 1990s. In increasingly competitive markets, banks began taking on greater credit risk during this period.

The Bank of International Settlement (BIS) defined credit risk as the risk that a counterparty will not settle an obligation for full value, either when due or at any time after that. In exchange for value systems, risk is generally defined as replacement risk and principal risk.

Credit risk covers all risks related to a borrower not fulfilling his obligations on time. Even if assets are exactly matched by liabilities of the same maturity, interest rate conditions, and currency, the only remaining balance sheet risk is credit risk.

There are two main types of credit risk that a portfolio or position is exposed to: credit default risk and credit spread risk.

Credit default risk is the risk that an issuer of debt, obligor, is unable to meet its financial obligations. Where an obligor defaults, an investor generally incurs a loss equal to the amount owed by the obligor less any recovery amount that the investor recovers as a result of foreclosure, liquidation, or

restructuring of the defaulted obligor. All portfolios having credit exposure exhibit credit default risk. The credit default risk magnitude is described by a firm's credit rating. The credit rating is announced after a formal analysis of the borrower. This analysis is undertaken by rating agencies. The most well-known rating agencies are Fitch Ratings, Moody's, and Standard & Poor's. To assess the analysis several issues are analyzed. Among these issues there are: the balance sheet position and expected cash flows and revenues, quality of management, company's ability to meet scheduled interest and principal, and an outlook of the industry as a whole.

The credit spread is the excess premium over the government or the risk-free rate required by the market for taking on a certain assumed credit exposure.

It is important to note that a higher credit rating indicates a smaller spread of credit. Thus, the credit spread risk is the risk of financial loss resulting from changes in the level of credit spreads used in the marking-to-market of fixed income products. Changes in observed credit spreads affect the portfolio value and can lead to losses for traders or underperformance for portfolio managers.

The discussion of credit risk management is primarily focused on loan portfolios. Bank supervisors place considerable importance on the formal policies laid down by the board of directors and implemented or administered by management. This requires a bank to adopt a sound system to manage credit risk. A lending policy should outline the scope and allocation of a bank's credit facilities and the manner in which a credit portfolio is managed, as well as how loans are originated, appraised, supervised, and collected. A good lending policy is not overly restrictive but allows for the presentation of loans to the board that officers believe are worthy of consideration but do not fall within the parameters of written guidelines.

A good lending policy should include at least the following considerations:

a. A limit on the total loan portfolio is usually expressed relative to deposits, capital, or total assets. In setting such a limit, factors such as credit demand, deposits volatility, and credit risks should be considered.

b. The bank's business market should be clearly established and matched with its market knowledge and managerial and staff experience. Bank officers should be fully aware of specific geographical limitations when lending, an aspect that is particularly relevant for new banks.

c. A lending policy should stimulate portfolio diversification and strike a balance between maximum yield and minimum risk.

Concentration limits usually refer to the maximum permitted exposure to a single client and/or sector of economic activity (e.g., Agriculture, steel, or textiles).

d. The types of loans and other credit instruments that the bank intends to offer to clients should be specified within the policy, as well as guidelines for specific loans. Decisions about credit instruments should be based on the expertise of lending officers, the deposit structure of a bank, and anticipated credit demand. The types of credit that have resulted in abnormal losses should be controlled by senior management or avoided completely.

e. The maximum maturity for each type of credit should be established within the policy, and loans should be granted with a realistic repayment schedule. Maturity scheduling should be determined in relation to the anticipated repayment source, loan purpose, and collateral useful life.

f. Rates on various loan types must be sufficient to cover the costs of funds, loan supervision, administration (including general overhead), and possible losses. At the same time, they should provide a reasonable profit margin. Rates should be periodically reviewed and adjusted to reflect changes in costs or competitive factors. Guidelines for other relevant procedures, such as determining fees on commitments or penalty interest rates, are also an element of pricing policy. Where applicable, a lending policy should also contain a schedule of down payment requirements.

g. A lending policy should be included in the open margin requirements for all types of securities accepted as collateral. Margin requirements should be related to the marketability of securities. A lending policy should also assign responsibility and establish a schedule for periodic collateral pricing.

Sound credit risk management is built on a good-quality portfolio of performing assets. The loan pricing must reflect the risk. A good selection strategy avoids high losses. Credit scoring is a credit risk management technique that analyzes the borrower’s risk.

In its early stages, credit scores were assigned to each customer to indicate their risk level. A good credit scoring model must be highly discriminative: high scores reflect almost no risk, and low scores correspond to very high risk. The more discriminative the scoring system, the better are the customers ranked from high to low risk.

In the past, credit scoring has focused on measuring the risk that no customer would fulfill his/her financial obligations and run into payment debts. More recently, credit scoring has evolved to include loss and exposure risk. Scoring techniques are now used throughout the entire life cycle of a credit as a decision support tool or automated decision algorithm for large customer bases.

Increasing competition, electronic sale channels, and recent banking regulations has been important catalysts for the application of automated scoring systems.

Any analysis should include an overview of what products have been lent, to whom, and for how long. The first requirement is to whom to lend. This is usually based on customer request. A model loan request would be in terms of filing all the information required in a printed loan application form that elicits information on the amount of loan, purpose of the loan, repayment, and collateral. Information on the organization of the business (proprietorship, partnership, company (private or public), trade/industry area, and other banking relationships) is required.

The early success of application scorecards drew the attention of academics and researchers to develop advanced statistical and machine-learning techniques that can be applied to several explanatory variables or characteristics. The application scorecard then assigns sub-scores to each value of these characteristics. These sub-scores are determined based on the relationship between the values of the characteristics and default behavior and are aggregated into an overall application score that reflects the total default risk posed by the customer.

Banks can reduce credit risk as follows:

- Increasing credit standards to reject risky loans.
- Collateral and guarantees are obtained.
- Ensuring compliance with loan agreement.
- Transfer credit risk by selling standardized loans.
- Transfer risk of changing interest rates by hedging in financial futures, options or by using swaps.
- Synthetic loans are created through hedge and interest rate futures to convert a floating rate loan into a fixed rate loan.
- Making loans to various firms whose returns are not perfectly positively correlated

1.2.2 Market Risk Management

Is there a risk of earnings loss due to changes in interest rates, foreign exchange rates, equity prices, commodity prices, and their implied volatilities.

Market risk was defined as the risk of loss of on- and off-balance sheet positions arising from movements in market prices. The risks subject to this requirement are: the risks of interest rate-related instruments and equities in the trading book; foreign exchange risk, and commodities risk throughout the bank.

Interest Rate risk is the potential negative impact on net interest income and refers to the vulnerability of an institution's financial condition to the movement of interest rates, which affects earnings, the value of assets, liabilities, off–balance sheet items, and cash flows.

Equity risk arises from adverse deviations in the mark-to-market value of equity positions. Any decline in value will therefore result in a market loss for the corresponding period equal to the difference between the beginning and the end mark-to-market value.

Foreign exchange risk is the risk of holding or taking positions in foreign currencies, including gold. Currency risk results from changes in exchange rates and originates in mismatches between the value of assets and liabilities denominated in different currencies.

Commodity risk is the risk of holding or taking positions in commodities, including precious metals, but excludes gold.

Market risk can be quantified using several tools; the most common approach is the value at risk (VaR), which represents the maximum expected loss during severe adverse market fluctuations during the holding period with a certain confidence level. The value at risk can be calculated for the entire trading portfolio as well as for each market risk factor (interest rate Value at risk, foreign exchange value at risk, equity value at risk), or by instrument (bonds, shares…). Some other measures can be applied by the bank such as the change in net interest income and profits from foreign exchange transactions.

The Bank for International Settlement defines market risk as "the risk of losses in on- Furthermore, off-balance-sheet positions arising from movements in market prices." In this regard, the main factors contributing

to market risk are equity, interest rate, foreign exchange rate, and commodity risk. The total market risk is the sum of all risk factors. Market risk can impact a company's business in many ways. Exposure to market risk may arise because of the bank taking deliberate speculative positions or may come from the bank's market-making, dealer, and other activities.

For example, operating margins can be eroded due to rising raw material prices or depreciating currencies in countries where a company has foreign sales (direct market risk impact). Changes in the market environment may eventually force companies to change their strategies.

To adjust the prices of their products or services, potentially altering sales volumes or competitiveness, depending on the positioning and market exposures of the company's competitors (the indirect impact of market risk on business results). Some organizations may be paid to take market risks (e.g., financial organizations), but most seek to manage the impact of market risk on financial results.

Given the increasing involvement of banks in investment and trading activities combined with the high volatility of the market environment, timely and accurate measurement of market risk is necessary. The trading activities require highly skilled analytical support. Traders must use technical analysis to gauge market movements and opportunities.

A fundamental analysis of securities classes and market behavior is also needed for a trader to be able to anticipate price movements and position the portfolio accordingly. Ex post, analysis is also important to understand how market movements have affected profit and loss.

Currency risk

The relaxation of exchange controls and the liberalization of cross-border capital movements have fueled tremendous growth in international financial markets. The volume and growth of global FX trading have far exceeded the growth of international and capital flows and have contributed to greater exchange rate volatility and therefore currency risk.

Currency risk results from changes in exchange rates and originates in mismatches between the values of assets and liabilities denominated in different currencies. This mismatch may cause a bank to experience losses as a result of adverse exchange rate movements when the bank has an open on- or off-balance sheet position in an individual foreign currency. In recent years, a market environment with freely floating exchange rates has become

a global norm. This has opened the door to speculative trading opportunities and increased currency risk. For example, in the case of a net long position in foreign currency, domestic currency depreciation will result in a net gain for a bank, and appreciation will result in a loss. Under a net short position, exchange rate movements will have the opposite effect.

Fluctuations in the domestic currency's value, creating currency risk, are normally motivated by macroeconomic factors manifested over long periods. Among the factors affecting these fluctuations are the volume and direction of a country's trade and capital flows. However, fluctuations are also influenced by expected or unexpected political events, changed expectations on the part of market participants, or speculation-based currency trading may also give rise to currency changes. These factors affect the supply and demand for currency and therefore the movement of the exchange rate in the currency market.

A bank has a net position in a foreign currency and is exposed to currency risk when its assets and liabilities are not equal in a given currency. Banks should have written policies to govern their activities in foreign currencies and limit their exposure to currency risk and therefore to potential incurred losses.

In principle, limits are established on the basis of the nature of currency risk and the type of business by which that risk is incurred.

In a banking context, risk arises from any transaction or business decision that contains uncertainty about the result. Because virtually every bank's transactions are associated with some level of uncertainty, nearly every transaction contributes to the overall risk of a bank. All of the risks enumerated in this chapter and many more lead to possible fluctuations in the bank's income statement or profitability and hence the value of the bank. As a general rule, event risk has a much larger impact on a company's cash flows and value than continuous risk.

Interest rate risk

The net interest income (the difference between interest income and interest expense) is the main determinant of banks' profitability.

It is determined by interest rates gained on assets and paid for funds, and the volume of funds. Consequently, changes in interest rates affect net interest income. Interest rate risk is the potential negative impact on net interest income and refers to the vulnerability of the bank's financial

condition to interest rate movements. Changes in interest rates affect earnings, the value of assets, off-balance sheet items, and cash flows. Therefore, the objective of interest rate risk management is to maintain earnings, improve the ability to absorb potential losses, and ensure the adequacy of the compensation received for the risk taken and affect the risk return trade-off.

All financial institutions face interest rate risk. Changes in interest rates affect both bank earnings and expenses and the economic value of its assets and liabilities. The effects of these changes are reflected in the bank's capital and income.

Bank regulators and supervisors place great emphasis on evaluating bank interest rate risk management. These have begun to grow in importance since the implementation of market risk-based capital charges recommended by the Basel Committee. Interest rate risk management comprises various policies, actions, and techniques that banks use to reduce the risk of a reduction in net equity because of adverse interest rate changes.

Complementary to interest rate risk are other re-pricing risks and yield curve risk. Any occasion on which interest rates are to be reset, either due to maturity or due to floating rate resets, is called a re-pricing. The date on which it occurs is called the re-pricing date. Re-pricing risk is when there are fluctuations in interest rates that expose the bank's income and the underlying value of its instruments to fluctuations, and hence the risk that arises from timing differences in the maturity of fixed rates and the re-pricing of the floating rates of bank assets, liabilities, and off-balance sheet positions. Re-pricing mismatches expose a bank also to risk deriving from changes in the slope and shape of the yield curve.

The yield curve graphically represents the relationship between time and maturity and yield to maturity for a given risk class of securities. This snapshot shows the term structure of interest rates in the market. The yield to maturity is the average annual rate earned by an investor who holds securities until maturity. Typically, yield curves slope upwards as interest rates rise as the tenor of the security increases. The yield curve shifts with a change in the generalized perception of interest rates. The slope of the yield curve tends to be influenced by monetary policy. Yield curve risk is when a shift in the yield curve adversely affects a bank's income or underlying economic value. An increase in interest rates not only triggers an increase in interest earned and paid by banks and a decrease in the market value of fixed-rate assets and liabilities. Usually, such a change also causes a decline

in demand liabilities and call loans. In effect, when market rates increase, account holders usually find it more convenient to transfer funds to more profitable investment types. At the same time, the bank's debtors (be they firms or individuals) tend to cut down on the use of credit lines because of the higher cost of these services. Nonetheless, interest rate risk pertains to all positions in the bank's assets and liabilities portfolio (namely, the banking book). To measure this risk, the bank must consider all interest-earning and interest-bearing financial instruments and contracts on both sides of the balance sheet, as well as any derivatives whose value depends on market interest rates.

1.2.3 Liquidity Risk

Refers to the bank's inability to:

1. Cover financial commitments when due;
2. Liquidate assets sequentially due to market disruptions, inadequate market depth, and/or wider bid-ask spreads.

Liquidity Risk was defined as the risks that demand for repayment outstrips the capacity to raise new liabilities or liquefy assets.

The evaluation of whether or not a bank is sufficiently liquid depends on the behavior of cash flows under different conditions. Accordingly, for proper liquidity risk management, the ability to readily convert assets into cash and access other sources of funding in the event of liquidity shortage is essential. Liquidity risk management must therefore involve various scenarios: the going concern (ordinary scenario), bank's liquidity crisis, and general market crisis.

The Basel committee introduced a global liquidity standard that includes a 30-day liquidity processing (liquidity Coverage Ratio) requirement underpinned by a longer-term structural liquidity ratio (Net Stable Fund Ratio).

However, Egyptian banks have not yet applied the two ratios required by Basel III. Egyptian banks rely on traditional liquidity ratio analysis to analyze their liquidity risks. The most common liquidity ratios include: the ratio of liquid assets to deposits and stable funding, the ratio of net loans to total assets, and the ratio of net loans to deposits and stable funding.

The liquidity of a bank may be defined as its ability to meet anticipated and contingent cash needs. Cash needs arise from withdrawal of deposits, liabilities maturities, and loan disbursals. The requirement for cash is met by increases in deposits and borrowings, loan repayments, investment maturity, and asset sale. Inadequate liquidity can lead to unexpected cash shortfalls that must be covered at an inordinate cost, which reduces profitability. This can lead to liquidity insolvency for a bank without being capital insolvent.

Bank liquidity management policies should comprise a risk management structure, a liquidity management and funding strategy, a set of limits to liquidity risk exposures, and a set of procedures for liquidity planning under alternative scenarios, including crisis situations. Liquidity is necessary for banks to compensate for the expected and unexpected balance sheet fluctuations and to provide funds for growth. A bank has adequate liquidity potential when it can obtain the funds it needs promptly and at reasonable cost. The price of liquidity is a function of market conditions and the market's perception of the inherent riskiness of the borrowing institution.

The importance of liquidity transcends the individual institution because a liquidity shortfall at a single institution can have system-wide repercussions. It is in the nature of a bank to transform the term of its liabilities into different maturity on the asset side of its balance sheet.

Liquidity risks are normally managed by a bank's asset-liability management committee (ALCO), which must therefore have a thorough understanding of the interrelationship between liquidity and other market and credit risk exposures on the balance sheet.

Forecasting possible future events is essential for liquidity planning and risk management. The evaluation of whether or not a bank is sufficiently liquid depends on the behavior of cash flows under different conditions. Liquidity risk management must therefore involve various scenarios.

The first scenario, also called "going concern" is ordinarily applied to the management of a bank's use of deposits. This scenario establishes a benchmark for balance sheet–related cash flows during the normal business course. The second scenario is related to a bank's liquidity when a significant part of its liabilities cannot be rolled over or replaced. Furthermore, last but not least, the third scenario is related to general market crises. In this case, liquidity affects the entire banking system. Liquidity

management under this scenario is predicated on credit quality, with significant differences in funding access existing among banks.

The ability to readily convert assets into cash and access other sources of funding in the event of a liquidity shortage is essential. Diversified liabilities and funding sources usually indicate that a bank has well-developed liquidity management. The level of diversification can be judged by instrument type, fund provider type, and geographical market.

1.2.4 Operational Risk

Operational Risk was defined as the risk of direct or indirect loss resulting from inadequate or failed internal processes, people and systems, or external events. The severe operational failures that affected some financial institutions such as: NatWest, Allied Irish Bank and LTCM, increased the importance and emphasis of operational risk within banks.

Operational risk can be viewed as the risk associated with the problems of accurately processing, settling, and taking or making deliveries on trades in exchange for cash.

Operational risk is an innovation proposed by Basel II, as it includes non-financial aspects (traditional and emerging) in the regulatory risk framework. Some researchers' opinions.

Some authors consider operational risk associated with problems with accurately processing, settling, and taking or making deliveries on trades in exchange for cash. However, operational risk has a variety of meanings within the banking industry; therefore, for internal purposes, banks may choose to adopt their own definitions of operational risk. This internal definition should respect the individual situation of every bank, such as its size, sophistication, nature and complexity of its activities, in an economic manner, considering the full range of material operational risks facing the bank and capturing the most significant causes of severe operational losses.

The Basel Committee provides a detailed three-level classification of the losses that expose the bank to operational losses (Internal fraud, External fraud, employment practices and workplace safety, clients, products and business practices, damage to physical assets, business disruption and system failures and execution and delivery process management).

Basel II sets three approaches for calculating the capital charge of operational risk: the basic indicator approach (BIA), Standardized Approach (SA) and

the advanced measurement approach (AMA). According to BIA, the operational risk capital charge is equal to 15% of average gross income over three years, SA is not so different from BIA, instead of the gross income of the whole bank, the average gross income of each business line as identified by Basel committee is multiplied by risk factor, ranging from 12% to18%, assigned for each business line (12%-18%), the third approach, AMA, relies on using the risk factors related to operational risk: probability of event PE, loss given Event LGE, and the exposure indicator EI in calculating the operational value at risk .

Although operational risk is by itself not a new concept, it has by far not received the same amount of attention as credit and market risk. Operational risk becomes a major constraint because involves taking appropriate measures to ensure qualitative transactions without processing errors to deliver the best services to customers. Fundamental changes in financial markets, increasing globalization and deregulation, and corporate restructuring significantly affected the magnitude and nature of operational risks confronting banks. Following severe operational failures resulting in the restructuring of affected financial institutions (e.g. Natwest, Allied Irish Bank, LTCM) or in the sale of the entity (e.g. Barings), the emphasis on operational risk within banks has increased, leading regulators, auditors, and rating agencies to expand their focus to include operational risks as a separate entity besides market and credit risk.

Operational risk was for the first time treated as a self-contained regulatory issue in the “Operational Risk Management” document published by the Basel Committee on Banking Supervision in 1998. “The New Basel Capital Accord” was first formulated in a proposal in 1999, released in 2001, and became effective in 2007; within the framework, operational risk was integrated in Pillar 1, which implies its inclusion in the calculation of a bank’s overall capital charge. In addition to revising the minimum capital standards already covering credit and market risk, Basel II sets a new minimum capital standard for operational risk. While requiring capital to protect against operational risk losses, the new framework encourages banks to improve their risk management techniques to reduce operational risk exposure and mitigate losses resulting from operational failures. The new capital accord provides incentives to banks that demonstrate strengthened risk management practices and reduced risk exposures.

Management of operational risk is not a new practice; it has always been important for banks to try to prevent fraud, maintain the integrity of internal controls, reduce errors in transaction processing, and so on to preserve the

best quality services for their customers, but also because errors can lead to huge losses. However, the view of operational risk management as a comprehensive practice comparable to the management of credit and market risk is relatively new. In the past, banks relied almost exclusively on internal control mechanisms within business lines, supplemented by audit functions, to manage Operational risk. While these remain important, specific structures and processes aimed at managing operational risk have recently emerged.

Following the widespread recognition of the importance of operational risk in banking and the knowledge that operational risk exhibits characteristics fundamentally different from those of other risks, an increasing amount of academic research has been conducted on this issue.

The literature reviews the development of operational risk in general; approaches to measure and manage operational risk are presented.

Most research on operational risk in the recent past has focused either on the quality of quantitative measurement methods of operational risk exposure or theoretical models of economic incentives for the management and insurance of operational risk.

Only little attention has been devoted to statistical issues of coherent and consistent operational risk reporting and measurement within and across banks, and operational risk reporting remains an unexplored topic in academic research.

The literature assumes that the correlation among risk types is zero, that is, all risk types are completely independent of each other.

Some authors use publicly available data to quantify operational risk and prove that capital charges for operational risk often exceed those for market risk. Other studies present study cases on measuring operational risk and demonstrate that for a production unit of a bank with well-defined workflows, operational risk can be defined and modeled unambiguously.

Although quantitative models in operational risk management have become more common in the last two decades, the measurement of operational risk is not a trivial exercise. Today's turbulent financial markets, growing regulatory environments, and increasingly complex financial systems have led risk managers to realize the importance of measuring and managing Operational Risk.