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FACULTY OF ECONOMIC

DOCTORAL DISSERTATION

Yousef Padganeh

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UNIVERSITY OF MISKOLC
SCHOOL OF ENTERPRISE THEORY AND PRACTICE
FACULTY OF ECONOMIC

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Operational Risk Capital Management within Banks according to Basel II

(Loss Distribution Approach: Analysis and Risk Professional Perspectives**)**

DOCTORAL DISSERATION

Supervisor: Dr. Sandor Bozsik

Miskolc, 2012

DOI: 10.14750/ME.2013.037

DECLARATION

I Yousef Padganeh, confirm that this work submitted for the degree of PhD in Economic and in area of risk management is my own and is expressed in my own words. Any uses made within it of the works of other authors in any form (e.g. ideas, equations, figures, text, tables) are properly acknowledged. A full list of the references employed has been included.

Signed: Yousef Padganeh

Date: November 2012

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Acknowledgments

Thanks God

This study would not have been possible without the support and assistance of a number of people and organizations. I would like to express my gratitude to my supervisor, Dr. Sandor Bozsik, thoughtful suggestions and continual prodding during the course of this study.

Thanks to my wife, Shokoofeh who has been a great source of strength to me all through my work. Special thanks to my colleagues at Commercial Bank International; have given me invaluable support, during the course of research.

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ABSTRACT

This research intends to throw light on the Basel committee's standards with regards to operational risk, analysis of both the academic and banker's opinion, analysis of various methods to calculate capital charges, their effectiveness. Also, this research aims to seek the risk expertise opinion on operational risk management and their preferred model using advanced approaches through questionnaires.

It was found out that, Loss Distribution Approach "LDA" is an improved mechanism for determining and working on operational risk, operational risk is one of the biggest risks for banks, banks have suitable capability for handling operational risk, data management and technology can help in reduction of operational risk. It was also found out that recommendation from agencies like Basel Advanced Measurement Approach "AMA" are taken seriously by banks and adhered to.

In spite of several researches and recommendations from various risk professionals[I.e. Toshihiko Mori, and Eiji Harada (2001), Padraic Walsh (2003), ITWG (2003), Klugman et al. (2004), Jos´eAparicio, and Eser Keskiner (2004), Fitch (2004), M.R.A. Bakker(2004), Chartis (2005), Bank of Japan (2005), KabirDutta, and Jason Perry (2007), and Basel Committee)], it was found that; there is no strong evidence to say that LDA is the most appropriate method in quantifying operational risk data.

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CHAPTER I
Introduction

Basel II Accord defines operational risk as the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events. Operational risk was not a serious challenge before high-profile cases started to change the landscape. In the past, regulators mainly focused on market and credit risks simply because losses experienced in those sectors were significant. What this brought to the fore was close regulatory control and they could go to any length to make sure implementation of a risk management framework in order to avoid any fallout.

This research intends to throw light on the Basel committee's standards with regards to operational risk, analysis of both the academic and banker's opinion, analysis of various methods to calculate capital charges, their effectiveness. Also, this research aims to seek the risk expertise opinion on operational risk management and their preferred model under advanced approaches through questionnaires.

Under the Advanced Measurement Approach (AMA) methodology, financial institutions are required to develop their own internal measurement methods that estimate the expected and unexpected operational losses based on the combined use of internal and relevant external data. Moreover, the approach should be comparable to internal rating approaches used for credit risk at one year holding period and 99.9th percentile confidence interval. And the bank should demonstrate that the approach is robust to capture potentially severe 'tail' loss events.

The key purpose of choosing the right economic capital methodology is to ensure that it covers all material sources of risk. This requirement is a precondition for providing reliable risk estimates for capital management and risk-based performance measurement. Since operational losses are an important source of risk, the quantification of operational risk (OR) has to be part of the bank's economic capital calculation. Regulatory capital requirements under Pillar I of the Basel II Accord (2006) has given a strong additional incentive for the development of a quantitative OR methodology.

One of the popular methods under the AMA is the loss distribution approach (LDA). Under the LDA, banks quantify the frequency and severity of operational risk

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losses distribution for each risk cell (business line/event type) over a 1-year time horizon. The 5 key steps towards implementation of LDA are as follows (Figure 1.1):

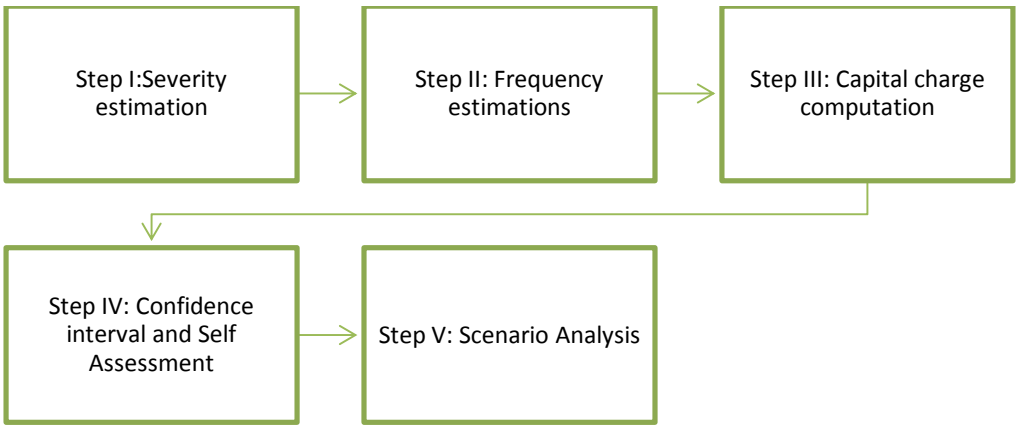

Figure 1.1: Key steps toward LDA , Source: Jos´e Aparicio, and Eser Keskiner (2004).

The main objective of an LDA model is to provide realistic risk estimates for the bank and its business units based on loss distribution that accurately reflect the underlying data. In addition to this, saving capital by moving to advanced methods and deploying the sophisticated measurement tools is another motive for banks. The LDA is the one of the most advanced methods envisaged so far and I believe was the most exhilarating area for further research according to Jos´e Aparicio, and Eser Keskiner (2004).

According to Bank of Japan (2005), the most commonly used operational risk quantification method is known as the "loss distribution approach." This approach has been exhaustively studied by actuaries, mathematicians, and statisticians well before the concept of operational risk came into existence, and given the characteristics and challenges of the data, we can resolve many issues by using an LDA approach (Kabir Dutta, and Jason Perry, 2007).

At present most banks use a combination of two AMA approaches to measure operational risk (Chalupka, Teply (2008):

- The loss distribution approach (LDA), which is a quantitative statistical method used in analyzing historical loss data.
- The scorecard approach, which focuses on qualitative risk management in a financial institution.

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Loss Distribution Approach seems to be one of the approaches in quantifying operational risk losses and calculation of capital charges. It is clearly preferred by several researchers and banking industry professionals in the last decade.

Table 1.1 shows advantages and disadvantages of using the LDA:

Advantages	Disadvantages
a) A popular method under the AMA, b) A powerful tool to quantify operational risk loss data c) Covers Severity and Frequency of losses, d) Enable to optimize risk transfer options, e) Lower amount of Capital charges, f) More risk sensitive than other approaches, g) Provides a framework for addressing extreme outcomes, h) Successfully implemented in Insurance, i) One of the most important methodologies suggested by Basel II Committee.	a) Backward looking approach , b) Only rely of loss data, c) Require substantial data Management, d) Underestimate the necessary capital charge when only when calibrated only on internal data, and e) Very sophisticated model where some of the banks face with difficulties in implementation.

Table 1.1- LDA Advantages and Disadvantages – Developed based on K.Dutta, and J. Perry, 2007

This dissertation consists of five main chapters those are; (a) Introduction, (b) Problem Statement, (c) Literature Review, (d) Methodology Assessment and Data Analysis, and (e) Conclusions and recommendations.

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CHAPTER II
Problem Statement

2.1. Introduction

The methodology section details the research design and approach employed in the current study. This is an endeavor to elucidate and justify the most appropriate research design for apprehending the research problem, the means used for data collection and the techniques used for data analysis.

The research is intensively based on the collection of primary data collection which is discussed in later sections of this chapter. The use of the questionnaire was used in order to minimize any biases. Since all risk professionals answered the same set of questionnaires, there was no pressure exerted by the presence of a middle-man or an interviewer.

2.2. Rationale of the research

Within banks and other financial institutions there is now an increasing pressure to manage operational risk. Apart from regulatory requirements, this pressure is also due to the increasing sophistication of financial products and systems. Increasing dependency of financial systems on Information technology has made banks more vulnerable towards cyber-attacks, system failures and fraud. Moreover, as discussed in the introduction, there are inevitable risks which threaten the stability of the banks.

A key element of Operational Risk Management is to measure the size and scope of the firm's risk exposures to allocate an amount of capital to safeguard the bank. However, so far there is no clear established or single approach to measure operational risk on a firm – wide basis. Instead, there are several methods used. This research evaluates various approaches suggested by Basel II Accords and concentrates specifically on the Loss Distribution Approach (LDA) under the Advanced Measurement Approach (Figure 2.1).

2.3. Research method

The research lays the background with quoting the findings of research made by others to find out the differences between Basel I and Basel II Accords and their implications on the financial establishments around the world. Furthermore, it will

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explore how banks are dealing with their operational risk management and the kind of calculation methods they are using to arrive at the capital charge. Since most of the discussions are based on research conducted by experts on the field of operational risk and opinion of risk professionals, it is possible to say the research method is a qualitative and quantitative based. A questionnaire is also prepared to collect data from risk professionals and various banks regarding their view on operational risk management approaches used and roadblocks faced by them.

2.4. Research objectives

Implementing an advanced methodology in operational risk management requires lots of effort in risk governance, data collection, data quality, expertise and also robust system infrastructures.

The key objective of this dissertation is to assess various methods in computing operational risk capital charges with focus on Advanced Measurement Approach (AMA). Most importantly, the objective is to seek the opinion of Risk experts / practitioners in Operational Risk Management and their most preferable method under advanced measurement approach. There is particular focus in the questionnaire on whether the Loss Distribution Approach is an improved mechanism under Advanced Measurements approach or not.

By reviewing similar research conducted in the past and through seeking the risk professional's opinion, the objectives of this research will be achieved.

2.5. Research Framework

The researcher has developed a questionnaire in order to collect quantitative and qualitative data. The questionnaire is in English medium. The researcher drafted the questionnaire with close-ended questions using a 5 Point Likert Scale. The purpose of using the Likert Scale was to give more choices to respondents and therefore capture more accurate responses. The ranking was given by the respondents for each statement and further analysis was conducted on the basis of those rankings. The questionnaire comprised of 48 questions which included, demographic details of respondents as well as the perception of operations risk and role of Basel II in the banking environment. Out of 48 questions, some of them had sub-questions also to cover up as many concepts as

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possible. In order to support the objectives of this research, seven hypotheses were made as shown below (table 2.1):

(**H_0** = Null Hypothesis and **H_A** = Alternate Hypothesis**)**

No.	Description
H_1	**H_0:** There is no significant difference among different age groups regarding LDA is an improved mechanism for determining and working on operational risk. **H_A:** There is a significant difference among different age groups regarding LDA is an improved mechanism for determining and working on operational risk.
H_2	**H_0:** There is no significant difference in grading between different types of banks regarding operational risk. **H_A:** There is a significant difference in grading between different types of banks regarding operational risk.
H_3	**H_0:** There is no significant difference in grading between different types of banks and their capability for handling operational risk. **H_A:** There is a significant difference in grading between different types of banks and their capability for handling operational risk.
H_4	**H_0:** There is no significant difference between different types of banks and their data management technology. **H_A:** There is a significant difference between different types of banks and their data management technology.
H_5	**H_0:** There is no significant difference between different types of banks in acceptance of recommendation from agencies like AMA. **H_A:** There is a significant difference between different types of banks in acceptance of recommendation from agencies like AMA.
H_6	**H_0:** Quantifying operational risk cannot prevent banks from financial losses. **H_A:** Quantifying operational risk can prevent banks from financial losses.
H_7	**H_0:** LDA is not the most appropriate method to quantify operational risk data. **H_A:** LDA is the most appropriate method to quantify operational risk data.

Table 2.1: Hypotheses - author's own work

All hypotheses are tested by using one way ANOVA method and Pearson correlation test was applied using SPSS. The data collection tool is the designed

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questionnaire, which consisted of forty eight questions. The collection was through questions of closed ended type. Univariate and Bivariate (Cross Tabs) methods are used to analyze the practitioner's responses.

2.6. Scope and limitation of research

Scope of this research is limited to UAE banking system. The population will be Risk Professionals who work in the UAE Banking System and total of n= 100 bankers will complete the questionnaire. The survey was conducted in the year 2011.

According to the annual report of the Central Bank of UAE (2010), the number of locally incorporated commercial banks stood at 23 during 2010, while the number of their branches increased from 674 at the end of December 2009 to 732 at the end of December 2010 although the number of their electronic/customer service units remained at 26.In 2010, two licenses were granted to wholesale banks, Deutsche Bank AG and Industrial & Commercial Bank of China. In addition, two investment banks operate in the country, Arab Emirates Invest Bank and HSBC Financial Services (Middle East) Limited.

The number of Gulf Cooperation Council "GCC" banks in 2010 remained at 6, in addition to one branch while, the number of other foreign banks remained unchanged at 22, while the number of branches increased from 81 at the end of 2009 to 82 at the end of 2010 and the number of their electronic/customer service units increased from 43 to 50. (See table 2.2)

	2009	**2010**			
National Banks	**December**	**March**	**June**	**September**	**December**
Head Offices	24	23	23	23	23
Branches	674	687	698	707	732
Electronic/Customer Service Units	26	25	26	25	26
Cash Offices	71	73	77	84	86
GCC Banks					
Main Branches	6	6	6	6	6
Additional Branches	1	1	1	1	1
Other Foreign Banks					
Main Branches	22	22	22	22	22
Additional Branches	81	81	81	82	82
Electronic/Customer Service	43	45	47	49	50

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Units					
Cash offices	1	1	1	1	1
Number of ATMs	3,599	3,354	3,450	3,549	3,758
AED = UAE Dirham - 1USD = 3.6725 AED					

Table 2.2: UAE Banking System - **Source**: Central Bank of UAE – Annual Report 2010

The total assets of banks operating in the UAE (net of provisions for bad and doubtful loans and interest in suspense) increased by 5.7% from AED of 1,519.0 billion (≈ USD 414 billion) at the end of 2009 to AED 1,605.6 billion (≈ USD 437 billion) at the end of 2010.Bank deposits increased from AED 982.6 billion (≈ USD 268 billion) at the end of 2009 to AED 1,049.6billion (≈ USD 286 billion)at the end of 2010; recording an increase of 6.8% during 2010 according to CBUAE 2010 annual report.

The main limitations for this thesis are as follow:

a) Historical data – UAE banks recently started the collection of loss data.
b) Confidentiality of Data – Most of the banks in this region do not like to share their information in regards to operational risk loss data.
c) Sizes of the UAE banks - Most of the UAE banks are medium or small sized but with low number of branches and operations compared to top banks in the world.
d) Cost and Time - It is costly to do the research in this part of the world without any financial support.

The United Arab Emirates is the financial hub for the Middle East with multinational financial practitioners. However, these limitations are common to all such studies that heavily rely on case research for their data collection. Nevertheless, this will not deter the resolution of the researcher to complete the case study and to accomplish the stated research goals.

In the next page, figure 2.1 shows the scope of the research and the place of Loss Distribution Approach "LDA" among other capital management approaches under AMA.

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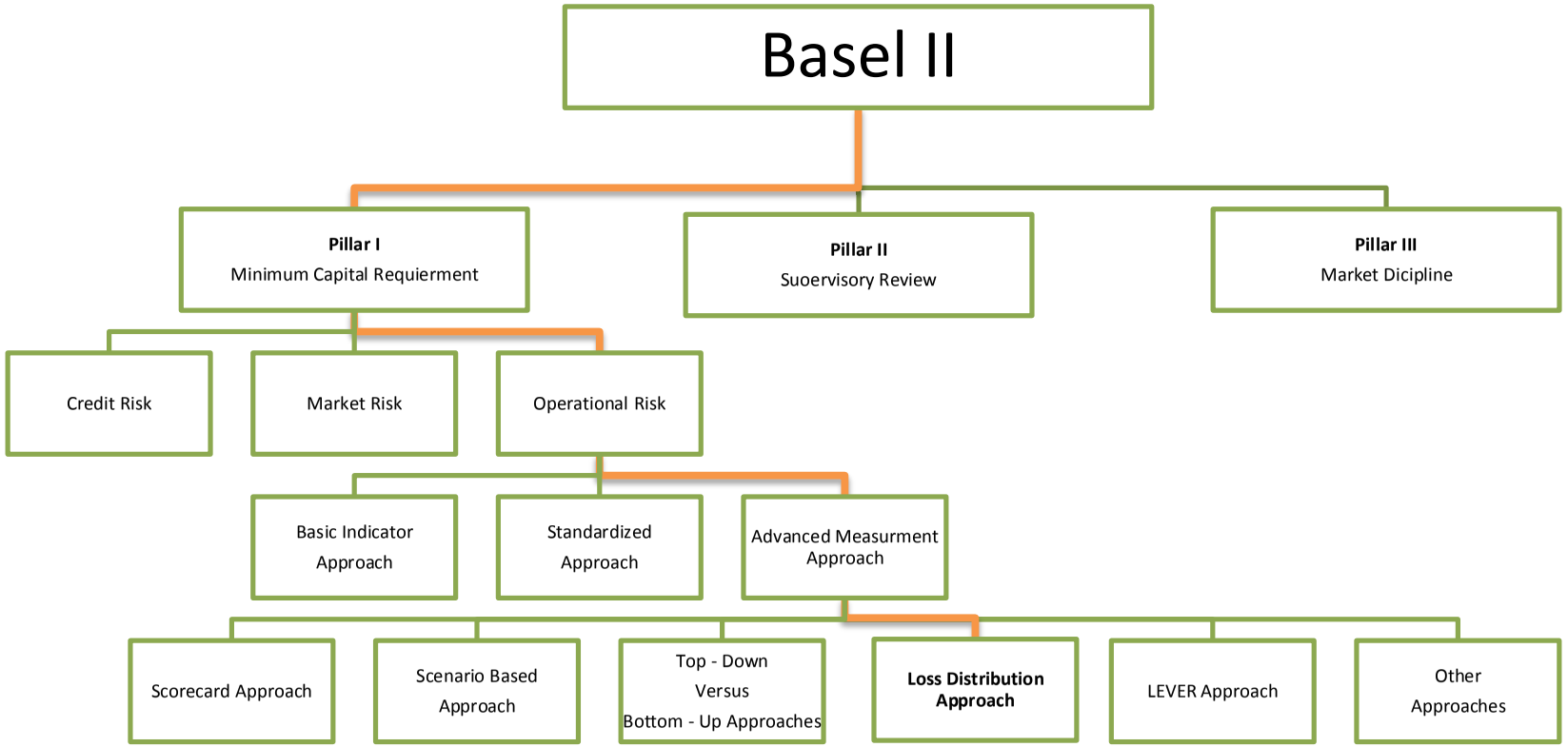

Figure 2.1: Scope of the Research: Loss Distribution Approach (LDA) under Advance Measurement Approach (AMA) – Source: author's own work

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CHAPTER III

Literature Review

3.1. Introduction

The review of the literature starts with an overview of Basel I, Basel II, and also Basel III followed by a deep analysis of methods used for the purpose of operational risk capital calculation. Further, increasing importance of operational risk in context of banks has been discussed taking various banking models and their approaches to manage operational risk in consideration.

3.2. Basel Committee in Banking

The Basel Committee was established at the end of 1974, by central bank Governors of the G-10 countries, as the Committee on Banking Regulations and Supervisory Practices, in the aftermath of serious disturbances in international currency and banking markets (The Banking Association-SA 2005).The countries from which committee's members come from are Belgium, Canada, France, Germany, Italy, Japan, Luxemburg, The Netherlands, Spain, Sweden, Switzerland, United Kingdom, and United States. Below figure shows the key elements of the Basel Committee. Figure 3.1 shows history and key elements of Basel accords.

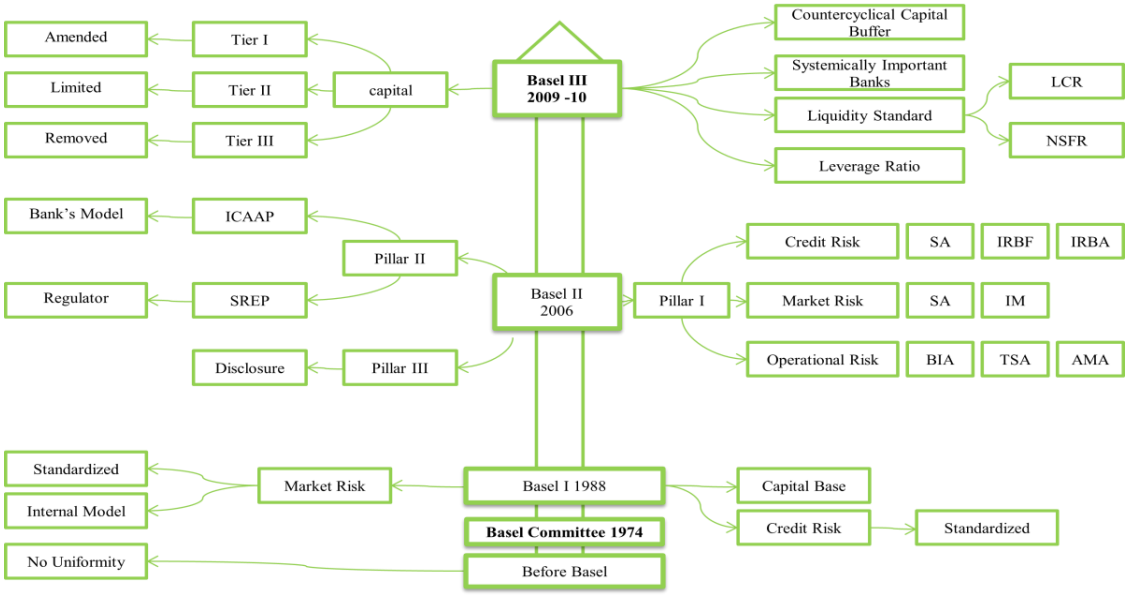

Figure 3.1: Basel committee history and key elements (Developed based on BCBS No. 4(1988), 24(1996), 128(2006), 189(2010) - Source: author's own work

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3.2.1. Basel I

Toward the end of the '80s the Basel Committee came out with their first framework of banking supervision which is generally referred to as BASEL I. This framework took mainly capital risk in consideration and gave guidelines on capital adequacy.

Basel I recommended banks to set aside eight percent of the capital spent on loans using single matrix system (Lanka Rating Agency Ltd 2006). In real terms, this means that if a bank sanctions a loan of hundred million to an entity then it must set aside eight million as its own funds.

To quantify the risk associated with financial instruments, it was distinguished between creditors (sovereigns, banks and companies) and their geographical location. By using this approach, government risks in the Organization of Economic Co-operation & Development (OECD) area were not weighed, whereas, at the other extreme, all corporate were weighed at 100%.

Basel I faced criticism as its approach was biased towards financial system of G-10 countries and considered too narrow to ensure financial stability for international financial system. Balin maintains that due to the 'one fit all' and absoluteness of Basel I's risk weightings, banks found ways to "wiggle" around Basel I's standards to put more risk on their loan books than what was intended by the framers of the Basel Accord (Balin 2008). These factors led the Basel Committee to come up with a new framework. In a very simple word Basel I was a free size T Shirt which fit all.

3.2.2. Basel II

Basel II is commonly used term for the new framework which will supersede the present Basel I Accord. According to Basel Committee on Banking supervision (2004), Basel II utilizes three mutually reinforcing pillars (see figure 3.2) as follows:

1. Minimum Capital Requirements;
2. Supervisory Review; and
3. Market Discipline

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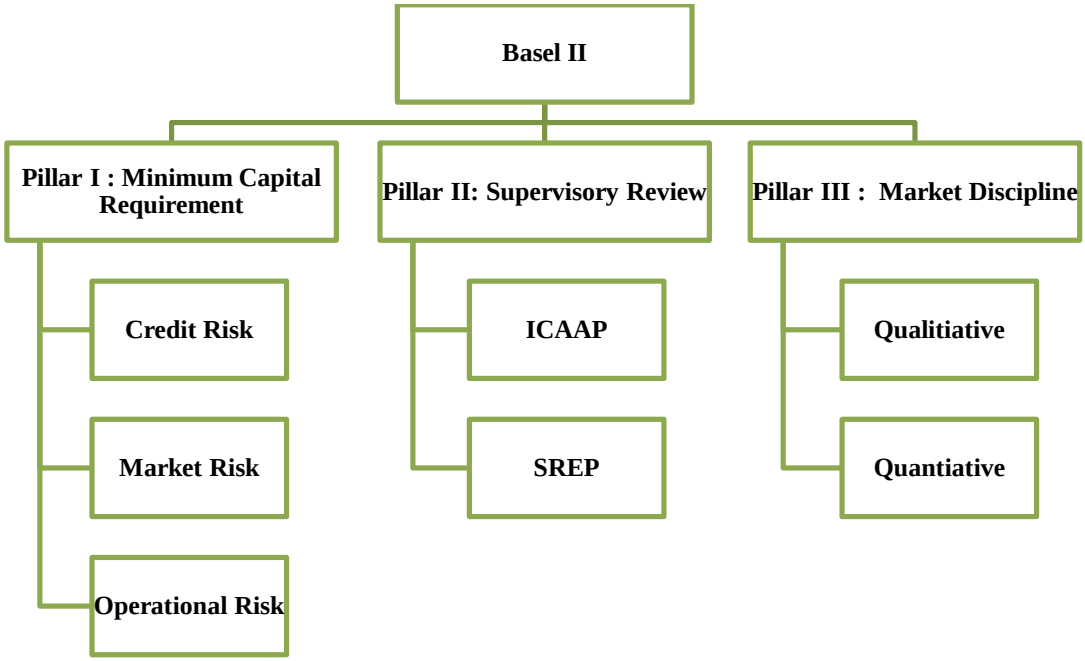

Figure 3.2: Three Pillars of Basel II, developed based on BCBS 128 (2006)

The four principle objectives behind Basel II are:

a) To promote soundness and stability of the global banking and financial system
b) To enhance competitive equality
c) To provide a more competitive approach to addressing risks and promote the best practices in risk management
d) To provide a more widely applicable approach to the capital assessment process

3.2.3. Difference between Basel I and Basel II

Basel I was one of the most important advances in international banking supervision. Market changes and increased sophistication in risk-management techniques rendered the initial framework obsolete. The New Basel Accord differs from Basel I along with a number of dimensions**.** Since, the scope of this research is restricted to capital adequacy only; I will discuss changes the different capital calculation methodologies. In general, the framework is structured to be more risk-sensitive than its predecessors, treating exposures very unequally depending on their characteristics. Basel I explicitly covered only two types of risks in the definition of risk weighed assets: (1)

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credit risk and (2) market risk. Other risks were presumed to be covered implicitly in the treatments of these two major risks.

In Basel II the definition of risk-weighted assets is modified. Basel II approach for calculating risk-weighted assets provides improved bank assessments of risk making, resulting in more meaningful capital ratios. Pillar 'I' is modifying the definition of risk-weighted assets in Basel II and has two primary elements: (1) substantive changes to the treatment of credit risk relative to Basel I and (2) the introduction of an explicit treatment of operational risk resulting in a capital measure of operational risk. Hence, Operational Risk has been considered as a separate risk for which capital charge calculation should be done.

Now, I will evaluate the importance of operational risk and the different approaches used by the banks today. Furthermore, we will delve into the quantitative models proposed by the Basel II Committee to calculate capital charge for Operational Risk.

3.2.4 Basel III

The Basel Committee on Banking Supervision seeks to promote and strengthen supervisory and risk management practices globally more and more. The new regime is more risk sensitive to Basel II accord and banks need to be ready for these changes (Figure 3.4).

At its 12th September 2010 meeting, the Group of Governors and Heads of Supervision, the oversight body of the Basel Committee on Banking Supervision ("BCBS"), announced a substantial strengthening of existing capital requirements and fully endorsed the agreements it reached on 26th of July 2010. These capital reforms, together with the introduction of a global liquidity standard, deliver on the core of the global financial reform agenda and the Seoul G20 Leaders summit in November 2010.

According to BCBS179 (2010), the Committee's package of reforms will increase the minimum common equity requirement from 2% to 4.5% by 2015.In addition, banks will be required to hold a capital conservation buffer of 2.5% to withstand future periods of stress bringing the total common equity requirements to 7%. This reinforces the stronger definition of capital agreed by Governors and Heads of Supervision in July 2010

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and the higher capital requirements for trading, derivatives and securitization activities to be introduced at the end of 2011 as agreed.

3.2.4.1. Common Equity

Under the agreements reached, the minimum requirement for common equity, the highest form of loss absorbing capital, will be raised from the current 2% level, before the application of regulatory adjustments, to 4.5% after the application of stricter adjustments. This will be phased in by 1st January 2015. The Tier 1 capital requirement, which includes common equity and other qualifying financial instruments based on stricter criteria, will increase from 4% to 6% over the same period.

3.2.4.2. Capital Conservation Buffer

The Group of Governors and Heads of Supervision have also agreed that the capital conservation buffer above the regulatory minimum requirements will be calibrated at 2.5% and be met with common equity, after the application of deductions. The purpose of the conservation buffer is to ensure that banks maintain a buffer of capital that can be used to absorb losses during periods of financial and economic stress. While banks are allowed to draw on the buffer during such periods of stress, the closer their regulatory capital ratios approach the minimum requirement & the greater the constraints on earnings distribution.

This framework will reinforce the objective of sound supervision and bank governance and address the collective capital problem that has prevented some banks from curtailing distributions such as discretionary bonuses and high dividends, even in the face of deteriorating capital positions.

3.2.4.3. Countercyclical buffer

A countercyclical buffer within a range of 0% – 2.5% of common equity or other fully loss absorbing capital will be implemented according to national discretions according to BCBS179 (2010). The purpose of the countercyclical buffer is to achieve the broader macro prudential goal of protecting the banking sector from periods of excess aggregate credit growth. For any given country, this buffer will only be in effect when there is excess credit growth in the economy that is resulting in a system wide build up of risk. The countercyclical buffer, when in effect, would be introduced as an extension of the conservation buffer range.

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3.2.4.4. Leverage Ratio

These capital requirements are supplemented by a non-risk-based leverage ratio that will serve as a backstop to the risk-based measures described above. In July, Governors and Heads of Supervision agreed to test a minimum Tier 1 leverage ratio of 3% during the parallel run period. Based on the results of the parallel run period, any final adjustments would be carried out in the first half of 2017 with a view to migrating to a Pillar 1 treatment on 1 January 2018 based on appropriate review and calibration.

3.2.4.5. Systemically Important Banks

Systemically important banks should have loss absorbing capacity beyond the standards announced today and work continues on this issue in the Financial Stability Board and relevant Basel Committee work streams. According to the BCBS P11912 (2010), Basel Committee and the FSB are developing a well integrated approach to systemically important financial institutions which could include combinations of capital surcharges, contingent capital and bail-in debt. The Governors and Heads of Supervision endorse the aim to strengthen the loss absorbency of non-common Tier 1 and Tier 2 capital instruments.

3.2.4.6. Transition arrangements

Since the beginning of the crisis, banks have already undertaken substantial efforts to raise their capital levels. However, preliminary results of the Committee's comprehensive quantitative impact study has shown that as of the end of 2009, large banks will need to aggregate a significant amount of additional capital to meet these new requirements. Smaller banks, which are particularly important for lending to the SME sector already, meet these higher capital standards. The Governors and Heads of Supervision also agreed on transitional arrangements for implementing the new standards. These will help warrant the banking sector to meet the higher capital standards through reasonable earnings retention and increased capital rising, while still supporting lending to the economy.

According to BCBS179 (2010) and Basel II Compliance Professionals Association "BCPA" (2010) the transitional arrangements (Appendix III) include:

1. National implementation by member countries will begin on 1st January 2013. Member countries must translate the rules into national laws and regulations

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before this date. As of 1st January 2013, banks will be required to meet the following new minimum capital requirements in relation to Total Risk-Weighted Assets (RWA's): (A)-3.5% common equity/ Total Risk Weighted Assets; (B) - 4.5% Tier 1 capital/ Total Risk Weighted Assets, and (C) - 8.0% total capital/ Total Risk Weighted Assets.

2. The regulatory adjustments (i.e. deductions and prudential filters), including amounts above the aggregate 15% limit for investments in financial institutions, mortgage servicing rights, and deferred tax assets from timing differences, would be fully deducted from common equity by 1st January 2018.

3. In particular, the regulatory adjustments will begin at 20% of the required deductions from common equity on 1st January 2014, 40% on 1st January 2015, 60% on 1st January 2016, 80% on 1st January 2017, and reach 100% on 1st January 2018. During this transition period, the remainder will not be deducted from common equity & will continue to be subject to existing national treatments.

4. The capital conservation buffer will be phased in between 1st January 2016 and year end 2018 becoming fully effective on 1st January 2019. It will start at 0.625% of TRWA's on 1 January 2016 and increase each subsequent year by an additional 0.625 percentage points, to reach its final level of 2.5% of TRWA's on 1st January 2019.

5. Banks that already meet the minimum ratio requirements during the transition period but remain below the 7% common equity target (minimum plus conservation buffer) should maintain prudent earnings retention policies with a view to meeting the conservation buffer as soon as reasonably possible.

6. Existing public sector capital injections will be grandfathered until 1st January 2018. Capital instruments that no longer qualify as non-common equity Tier 1 capital or Tier 2 capital will be phased out over a 10 year horizon beginning 1 January 2013. Fixing the base at the nominal amount of such instruments outstanding on 1st January 2013, their recognition will be capped at 90% from 1st January 2013, with the cap reducing by 10 percentage points in each subsequent year. In addition, instruments with an incentive to be redeemed will be phased out at their effective maturity date.

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7. Capital instruments that do not meet the criteria for inclusion in common equity Tier 1 will be excluded from common equity Tier 1 as of 1 January 2013. However, instruments meeting the following three conditions will be phased out over the same horizon described in the previous bullet point:

- They are issued by a non-joint stock company;
- They are treated as equity under the prevailing accounting standards; and
- They receive unlimited recognition as part of Tier 1 capital under current national banking law.

8. Only those instruments issued before the date of this press release should qualify for the above transition arrangements. Phase-in arrangements for the leverage ratio were announced in the 26th of July 2010 press release of the Group of Governors and Heads of Supervision. That is, the supervisory monitoring period will commence 1st January 2011; the parallel run period will commence 1st January 2013 and run until 1st January 2017; and disclosure of the leverage ratio and its components will start 1st January 2015.

Based on the results of the parallel run period, any final adjustments will be carried out in the first half of 2017 with a view to migrating to a Pillar 1 treatment on 1st January 2018 based on appropriate review and calibration. After an observation period beginning in 2011, the liquidity coverage ratio (LCR) will be introduced on 1st January 2015. The revised net stable funding ratio (NSFR) will move to a minimum standard by 1st January 2018.

The Committee and National supervisors will put in place rigorous reporting processes to monitor the ratios during the transition period and will continue to review the implications of these standards on financial markets, credit extension and economic growth, addressing unintended consequences as necessary. The proposed Basel III regime have some very useful elements – notably the support for a leverage ratio, a capital buffer and the proposal to deal with pro cyclicality through dynamic provisioning based on expected losses. (Adrian Blundell-Wignall and Paul Atkinson. 2010)

On the other hand, it is likely that while the new accord may make banks sounder, the proposed counter-cyclical capital buffer may impose slow credit growth and increase the pricing strategies as banks must now hold excess capital during periods when it is not

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imposed, thus restricting long-term credit availability. This in turn will affect credit growth across the economy & the risk attitude of the banks will become risk averse.

Furthermore, Basel III's (Appendix III) narrower definition of common equity further increases capital requirements by removing certain items that are currently counted as part of capital. The Basel III accord will also reduce returns on capital by requiring that more capital be held per risk-weighted dollar of lending i.e. the introduction of a liquidity coverage ratio will force banks to carry increased amounts of low-yielding, highly liquid assets. Basel III framework will not have any impact on Operational Risk Capital Charges and is having minor impact in regards to Operational Risk Management compared to credit risk and liquidity.

In conclusion, I personally feel that the Basel III regime advantages will out way disadvantages in a long run and will improve the stability of banking System.

3.3.Operational Risk

3.3.1. Introduction and Definition of Operational Risk

BCBS (2006) has defined Operational risk as the risk of loss resulting from inadequate or failed internal processes, people and system or from external events. This definition includes legal risk, but excludes strategic and reputation risk. The definition is actually based on breakdown of four causes of operational risk event i.e., people, processes, systems and external events.

Nystrom .K. and Skoglund .J. (2003) states that operational risk is not unique for financial institutions. Firms with heavy production processes like the car industry and firms with the complex IT systems have long been involved in operational risk managements. Within banks and other financial institutions there is now an increasing need to manage operational risk.

Financial institutions have developed more efficient risk management systems in order to carry out risk management and reallocation tasks effectively. The basic component of risk management systems is to identify the firm's 'risk', assess their magnitude, procedures to mitigate risks and setting aside capital for potential and unforeseen losses.

Publication by Bank of Japan (Mori 2001) has a slightly different outlook about operational risk in financial institutions of Japan. Operational risk does not necessarily

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inflict a direct loss or profit to the firm it is applied to and whatever such firm generates does not decline outright. Instead, it is possible to suffer loss(s) through deterioration of reputation. It is also possible that third party suffer the loss such as customers and/or other financial institutions. Because of these reasons, identifying operational risk, as well as the loss that may occur when the risk materializes is not easy to extrapolate. An interesting aspect to highlight is the possibility to classify operational losses in two categories, where the first one is small-scale problem that could occur when there is clerical error, such as what could occur while paying a customer or while remitting small sums at the request of customers. Minor computer glitches could also fall into this category. The other category is not frequent but when it occurs the consequence could be severe and the cause could be large-scale fraud that could originate from within or outside. In the case of investment banks it is possible that an unauthorized trading could take place for example in Barings Bank which resulted in bankruptcy of the institution. This is in addition to the known disasters such as natural catastrophes, terrorist attack, and the like.

Islamic banking refers to a system of banking or banking activity that is consistent with the principles of Islamic law (Sharia) and its practical application through the development of Islamic economics. In addition to Basel II's definition of operational risk, Islamic banks' operational risk is associated with the losses resulting from Shari'ah non-compliance and the failure in fiduciary responsibilities.

The Islamic Financial Services Board (IFSB) considers non-compliance risk to be a significant portion of operational risk. According to IFSB guidelines, Shari'ah non-compliance risk arises from Islamic banks' failure to comply with the Shari'ah rules and principles determined by its Shari'ah board or the relevant body in the jurisdiction in which the Islamic bank operates. The failure to comply with such principle results in the transaction being cancelled, and hence the income or loss cannot be recognized.

Moreover, IFSB states that fiduciary risk is the risk that arises from Islamic banks' failure to perform in accordance with explicit and implicit standards applicable to their fiduciary responsibilities. Therefore, a failure in maintaining fiduciary responsibilities will result in the deterioration of Islamic banks' reputation. Reputational damage could eventually cause a withdrawal of funds which would result in a liquidity

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crisis. It could also make customers stop requesting finance from Islamic banks, triggering a downturn in profitability (Izhar 2010).

3.3.2. Need of operational risk to be included in Basel II

Operational risk had been in existence for as long as financial establishments were around. Deregulation and globalization of financial services into the picture, coupled with the advancement of financial technology, evolving nature of the financial business scene, and the introduction of numerous delivery channels has made it crucial for institution to pay attention to the operational risk involved, so that some kind of contingency plan can be introduced in advance.

Operational risk could be the outcome of risks stemming from people in charge, process applied, systems in place, and external events. The kind of risk that originates from people could stem from management failure; including there could be organizational or human resource failures. Factors such as lack of proper training, inadequate control, a dysfunctional human resources department, or other internal or external factors could make it difficult to arrive at the appropriate capital charge.

When looking at how the process functions, a breakdown could stem from violating established processes, failure to follow procedures or processes strictly, or from not having a clear picture or a map of the applicable business lines. A system risk could also be the outcome of disruption or system failure due to technical or other problems, whose source could be internal or external. The range of external events could also be wide where citing disaster, terrorism, vandalism, or certain events that affect various areas of the operation would be enough.

It is possible to look at certain areas that are becoming increasingly sources of operational risks, and these highlighted areas are:

1. Heavy reliance on technology, which is becoming very common in the banking industry and where a globally integrated system has become the norm, could introduce a system failure risk shifting the manual risk to automated risk,.
2. The proliferating of more advanced products in the marketplace.
3. The advancing of e-banking could expose financial institutions to new risks such as frauds that could originate internally or externally, as well as security

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system failure since there are sources that breach internal security to benefit themselves.

4. Acquisition, mergers, and consolidation, at a large scale can put a strain on existing systems.

Perhaps one of the most significant examples of a bank's operational risk, which is called a 'loss event', is the 1.3 billion dollar loss of the Barings Bank. This loss event was caused by one trader, Nick Leeson, who took unauthorized speculative positions in futures and options on an unused error account and started losing money which accumulated and resulted in the bank's bankruptcy in 1995.

Among others, this incident was a provocation for the Basel Committee to include operational risk in Basel II. Developing a framework to measure and quantify operational risk became a must and also to regulate capital. In order to accomplish this, Basel II Accord states that institutions should be in a position to collect risk loss data and be able to assess the risk involved and then apply their findings into a framework that it calls risk exposure. Institutions are free to incorporate a degree of conservatism in their assessment so that the quantification process will not lack in robustness. This is because, to arrive at the minimum regulatory capital requirement they have to rely on the existing internal process, on the required data capture, the prevalent risk and the analytical framework that is in place.

3.4.Operational Risk Management

Operational risk management has its own elements, as its main goal is to ensure that there is an effective framework and measurement mechanism in place. The framework has two main needs to satisfy: It should introduce a mechanism where implementing operational risk policies would be possible firm-wide whilst undertaking a comprehensive process of data capturing and measuring mechanisms to assess the kind of risk exposure the firm is dealing with. Another important point to note is that there is no single framework that fits all institutions. As long as the framework can reflect what is involved that would be enough since the reality is that the risk management techniques are still evolving, as they have to catch up with new technological introductions.

Nevertheless, there are key elements that have to be prevalent in the framework in order for it to be effective (Figure 3.3). There is a need for policies and procedures that

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will clearly spell out what direction the involved institution will take, as far as managing its operational risk effectively as concerned. The risk managing process should be able to identify risks and measure them using the appropriate tools. After assessing the exposure level, risk elements need to be monitored and controlled.

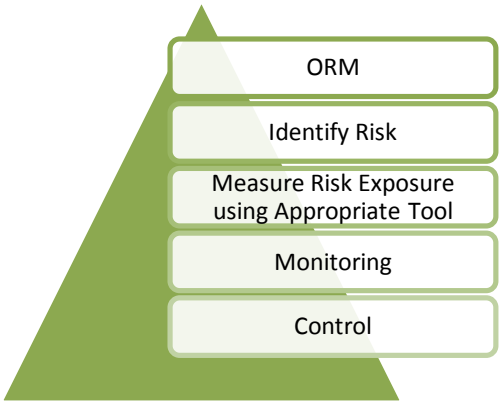

Figure 3.3: Key Elements of Operational Risk Management Framework - **Source:** Holmquist 2004

The identifying responsibility lies with the management that should have appropriate staff in place ensuring that proper methods are applied and efforts invested towards reporting loss events in order to ensure the management is aware of the prevalent risks. In addition, there is a need to work on a process that will mitigate the exposure. Normally, the procedure should be firm-wide and it should summarize the prevalent exposure, the loss experiences encountered, and the applicable business environment in accordance to assessment made (Holmquist 2004).

Usually, the compilation should take place at least once in every quarter. It is also important that, whatever the finding is, it should be brought to the attention of the board as well as the management as often as possible, since these groups' job is to know exactly, what is the stand of the firm that they are in charge of.

Throughout this process, it is important to take regulatory requirements into consideration and the whole process should meet a minimum or an exceeding level of regulatory standards. The reason is that whenever there is a sound control mechanism in place, it will put the management in a position to safeguard and allocate the firm's resources efficiently. Moreover, reports generated are more reliable for stakeholders who can now make sound decisions. It is also beneficial for firms to have such proper compliance of laws and regulations. Other benefits of a sound framework include

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bringing down the incidence of human mistakes, as well as any irregularities in the system are easily spotted and traced to make the necessary corrections.

3.4.1. How Operational Risk Management Applies to Other Jurisdictions

Now we will try to evaluate how operational risk management can be applied to Japan and Islamic Financial institutions.

3.4.1.1.Case of Japan

For Japanese financial institutions there is a need to quantify operational risks. It is possible to accomplish that by identifying the operational risk profile, paying attention to specific section periodically, and by quantifying the prevalent risks. It is also possible to compare risk amounts sections or business category wise; by introducing time-series analysis. Another possibility is to secure a capital buffer zone that enables absorbing operational risks for the whole establishment.

The assessment output will eliminate extraordinary expenses encountered when extraordinary operational risks materialize. Also, prioritizing could add to the effectiveness of the risk management process by dealing directly with areas identified as posing a higher level of risk than others. Yet, since it is not possible to quantify risk, simply because it is a cost incentive processes, operations such as collecting loss data could come up with quantitative models, and arranging the framework of risk assessment depends on each establishment that could come up with tailor-made method that fits their individual case.

According to a study a group in Japan(Study Group 2006) which identifies several technical caveats using the Loss Distribution Method (LDM), which is also the most commonly used operational risk quantification method. What the approach specially does is, it estimates how frequent and severe the loss is by doing scenario analysis and by relying on the internal historical loss data and then estimates the amount of the risk based on its distribution.

The technical caveat of this method is that it mostly focuses on a few technical shortcomings that could surface through the process that will not impair the outcome to any significant extent. It is also possible to revise quantitative results by using qualitative factors that could refine some of the unstable quantitative findings so that they will be useful as a measurement tool. But there is still an apprehension that the operational risk

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quantification is still in its developmental phase and it might not be the perfect tool for operational risk, as it will be for other risks (Currie 2005).

Another method mentioned to assess operation risk is control self-assessments, where it is possible to identify existing inherent risks and the controls are in place of risk. Once that is accomplished, it is possible to share the finding firm-wide and accordingly, this could enable firms to engage in automated risk management. It is also possible to use key risk indicators where it is possible to identify indicators that can enable an early detection of prevalent risk. By keeping a close tab on these indicators it might be possible to take preemptive actions if risk materializes.

3.4.1.2. Operation Risk Management in Islamic Banks

In accordance to the definition of Operational risk in Islamic banks, it aims at: firstly, ensure that their financial products are Shari'ah-compliant, and secondly, effectively maintain their fiduciary roles. To a greater extent, operational risk management in Islamic banking requires more thorough understanding of the sources of operational risks from which the loss could occur. In addition to Shari'ah non-compliance risk and fiduciary risk, other elements of operational risk exposures in Islamic banks could also appear, such as people risk, technology risk, and legal risk.

The dimension of people risk in Islamic banks is understandably wider than in conventional ones since Islamic banks' personnel are required to be well-versed both in conventional banking products and Islamic finance requirements. There is a dire need for the Islamic banking industry to be populated with a new breed of innovators, risk managers, regulators and supervisors, who have the right blend of knowledge of finance and the understanding of the Shari'ah.

In the current state of play, people risk can substantially contribute to operational risk, one of the main reasons being the lack of people who are adequately trained in modern financial transactions as well as 'fiqh al-muamalat' (Islamic law relating to financial transactions). In most cases, Islamic banks hire Shari'ah scholars who hardly understand the complexity of modern financial transactions. On the other hand, it is also very difficult to find financial economists who are knowledgeable in applied 'fiqh al-muamalat'.

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In an advanced financial industry, an Islamic bank's operations are very dependent on its technology. Its success greatly depends on its ability to assemble increasingly rich databases and make timely decisions in anticipation of client demands and industry changes. The advanced use of information technology (IT) has also brought a new facet to the current competition within the Islamic banking industry. Increasingly, the success of an Islamic bank's business is determined by the ability to capitalize on the use of its technology in different ways. Inability to keep up with these developments means that an Islamic bank is likely to fall behind its competitors. Therefore, every Islamic bank must be committed to an ongoing process of upgrading, enhancing and testing its technology, to effectively meet sophisticated client requirements, market and regulatory changes, and evolving needs for information and knowledge management within an organization (Izhar 2010).

3.4.2. Operational Risk Identification and Measurement

Most banks still consider that measuring operational risk is at very early stage, with only a few having formal measurement systems and several others actively considering how to measure operational risk. The existing methodologies are relatively simple and experimental, although a few banks seem to have made considerable progress in developing more advanced techniques for allocating capital with regards to operational risk. Presently the below following approaches are used by the institutions to identify operational risk.

3.4.2.1. Top-Down and Bottom-Up Approaches

Operational risk measurement is still a developing art form. Besides just adding the economic capital numbers or assuming multivariate normality, the top-down and the bottom-up approaches have emerged recently as more sophisticated methods for measuring risk. Some take Top – Down approach, which estimates risk based on firm – wide data. These models are easier to apply but it is neither sensitive to the accrual nor to the implementation to the business approach.

In contrast, Bottom – Up approach provides a structural model that is much more useful to understand the causes of operational risk. Bottom – Up models involve the mapping of workflows at the business unit level, which is used to identify the potential failures and associated losses.

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3.4.2.2.The Balanced Scorecard Approach

Balanced Scorecard approach to strategic management was developed in the early 1990's by Drs. Robert Kaplan (Harvard Business School) and David Norton. They named this system as the 'Balanced Scorecard'. Recognizing some of the weaknesses and vagueness of previous management approaches, the balanced scorecard approach provides a clear prescription as to what companies should measure in order to 'balance' the financial perspective.

The balanced scorecard is a ***management system*** (not only a measurement system) that enables organizations to clarify their vision and strategy and translate them into action (see figure 3.4). It provides feedback around both the internal business processes and external outcomes in order to continuously improve strategic performance and results. When fully deployed, the balanced scorecard transforms strategic planning from an academic exercise into the nerve center of an enterprise.

Kaplan and Norton describe the innovation of the balanced scorecard as follows:"The balanced scorecard retains traditional financial measures. But financial measures tell the story of past events, an adequate story for industrial age companies for which investments in long-term capabilities and customer relationships were not critical for success. These financial measures are inadequate, however, for guiding and evaluating the journey that information age companies must make to create future value through investment in customers, suppliers, employees, processes, technology, and innovation."

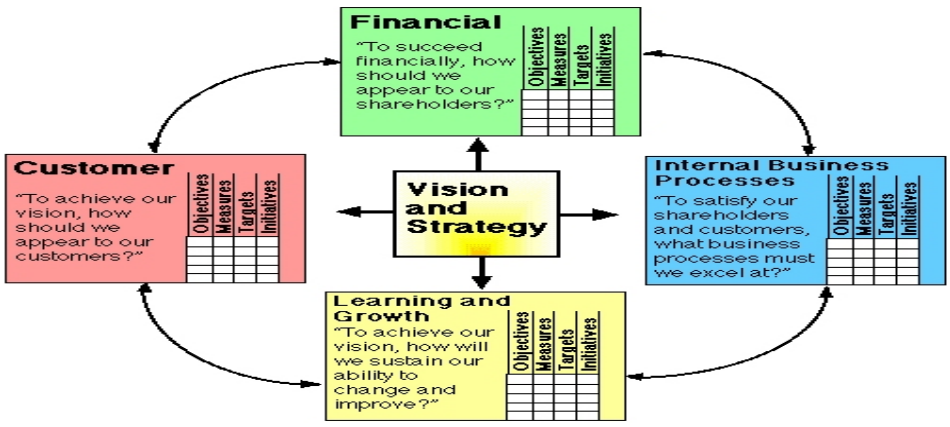

Figure 3.4: Balanced Scorecard Approach - **Source:** gtwebmarque.com

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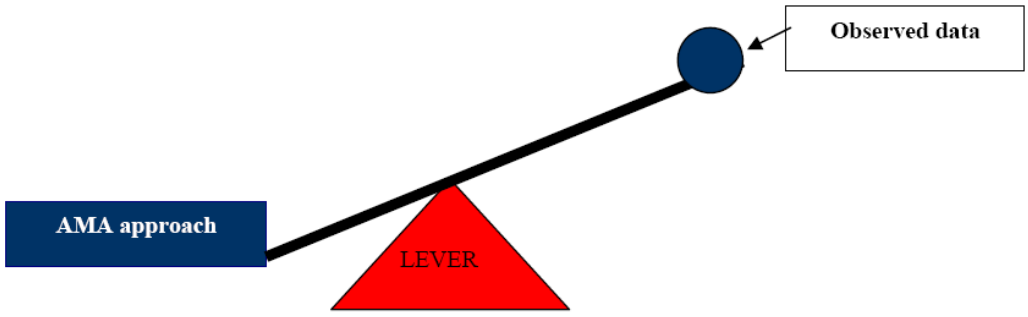
3.4.2.3.The Scenario Based Approach

Scenario is a high level description of artificial task whose subjects might be asked to engage in for evaluation. Scenario Based Approach prepares scenario packages, exercising different aspects of collaboration across a range of domains. Issued for; Functional design, System demos, and Evaluation (heuristic, lab-based and real-world). A scenario package consists of: Overview and task breakdown, Materials for experimenter(s), Materials for subjects, Scripts for repeatable execution, and Metrics for scenario and sub-tasks.

3.4.2.4. The LEVER Approach

The LEVER method stands for Loss Estimation by Validating Experts in Risk. The idea of LEVER is that the method uses the scarce and lost data, which can be both internal and external and leverage it to fulfill the Advanced Measurement Approach (AMA) according Basel II (See Figure 3.5).



Source: M.R.A Baker, page 29

Figure 3.5: Schematic representation of the LEVER concept, Source: M.R.A Baker (2004)

3.5. AMA as Risk Management Approach and Its Subsets

Advanced Measurement Approach (AMA) seems to be best suited for calculating operational risks. AMA approach is better suited than others simply because it could enable institutions to have the needed flexibility to come up with the appropriate risk measurement system that works best with the kind of activity they are in, the kind of business environment they have and with the kind of internal controls they have in place. This is in addition to its being the recommendation of the Basil Committee as one of the three best approaches to measure operational risks. I will discuss this assumption with the

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help of literature based on discussions by study groups and financial institutions in various countries.

One such literature is "Supervisory Guidance on Operational Risk Advanced Measurement Approaches for Regulatory Capital" that was made available by the Federal Deposit Insurance Corporation for U.S. Banks in the years 2003 (FDIC 2003). According to the guidelines, AMA operational risk framework could be different from one institution to the other. However, there are three elements that have to be prevalent for the AMA to be effective. It should be a firm-wide operational risk management similar to what was made as a requirement in the Basle II Accord. The lines of business management should have an effective testing and verification function that will show the involved risk exposure and how effective the introduced mechanisms mitigate it. (FRBNY 2003).

The firm-wide operational risk management in most cases are delegated to the management in big institutions, where it is important to set the roles and the accountability procedures. As it is applicable to any business, both the management and the board of directors have to make sure the operational risk framework is in line with the available resources. Nevertheless, the board of directors has the responsibility of ascertaining that the management is capable of handling the responsibility, as well as is accountable for what would ensue. They also ensure reporting methods are adequate in such a way that it enables them to make sound assessments. The guideline requires them to have a clear understanding of the different kind of prevalent operational risks, as well as the involved risks that have to be considered as they have to be managed individually if that is applicable. It is of paramount importance for the board to review vital reports on the nature of material risks in the institution, as well as any strategic implication they present. Enhancing the operational risk framework, as well as ascertaining that there is compliance with required disclosures is also a responsibility of the board. Overall, the board as well as the management jointly needs to develop an effective risk management processes that will make the undertaking effective (Tschoegl 2004).

In order to introduce an effective operational risk management in any institution there are certain responsibilities that both board members and the management needs to observe. It is very important to have a clear assessment of what the operational risk

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exposure would be and to identify what the concerned institution tolerance level for risk is, since it differs from one institution to the other.

Other issues that pertain to assessing operational risks such as identifying the senior managers who can assume responsibilities, monitoring and what kind of risk profile is prevalent. This is to make sure that it is at an acceptable level that could be backed by adequate capital that is at the disposal of the involved institution. Furthermore, introducing a sound risk management technique will facilitate the spotting, measuring, monitoring and putting operational risk under effective control, should be part of the procedures from the outset.

As it is customary, the management's job is to spot the operational risks and implement policies and procedures that are workable and identifiable by the various business sections of each institution. It will always the senior management's job to develop effective methods in creating interconnectivity among those involved, where everyone would be made aware of their particular responsibilities they are accountable for.

The operational risk management process introduced has to be appropriate to what, that particular institution is doing. It is the management's job to identify what AMA requires as a testing and verification function, to carry out a sound and a timely assessment and to ascertain the operational risk frame. The frame introduced should be workable, effective and firm-wide. Another responsibility the management has to contend with is to ascertain appropriate number of staff with necessary skills who can carry out the operational risk function that are included on the operational risk framework.

To further strengthen the AMA framework, the supervisory standards requires the introduction of an independent operation risk management function in order to make sure that the application of the function, the other processes, procedures is carried out firm-wide. In addition, this function has to be in a position to report any loss data directly to the board, as well as the management team and communicate the kind of progress the institution is making, as far as implementing sound operational risk objectives, goals and risk tolerances are concerned.

The function also has to be responsible for reviewing and reporting any losses that will be encountered related to external factors such as market changes, environmental

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changes that may introduce new risks, introduction of different business lines, products or systems. Finally, the function should have the capability of compiling data and reporting the findings to the board and management.

When it comes to operational risk policies and procedures, it is important that each institution has such policies and procedures in place to spell out exactly what needs to be identified, measured, monitored, and what kind of operational risks have to be avoided. The identifying and measuring aspect of the process mostly deals with the assessments of the exposure a given institution deals with.

3.5.1. AMA Requirements

In this regard the AMA requires appropriate data of internal and external loss data events from financial and similar kind of institutions. Adequate assessment of the environment, control mechanisms, outcome showing proper operational risk management and measurement framework in place are all part of the requirements. The supervisors should have a clear understanding of an event, risk exposure and if the required regulatory standards have been met.

Overall, the requirement could be stringent when looking at what both the internal and operational risk loss event data should include. There is a requirement that the institution should have at least five years of internal operational risk loss data at its disposal so that it is able to map the losses to the seven-loss-event type category. There has to be a policy that ensures adding operational risk losses to the loss event database. Similarly, every loss event data should be categorized according to its classification to make the findings more streamlined. The same also applies to external data where institutions should have polices that obliges them to use external data in their operational risk framework and the management has to be aware of it so that it will contribute to the better understanding of the industry as a whole.

Other elements such as business environment and internal control factors need to be assessed simply because they indicate whether the control is stable or not, which would mean the exposure could be dependent on such factors where if the control is stable and fits the business environment, the risk exposure could be low. A scenario analysis, which is a process of relying on expert advice and opinion, as to what the effect of operational losses will be, can be part of the data input when it is not possible to obtain

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sufficient data using the other assessments. Sometimes, relying on external data could be scenario analysis.

Risk quantification is estimating what the operational risk of a given institution would be in a given year and the accuracy level has to be as high as possible. The procedure applied to arrive at the outcome of risk quantification should include all the factors that make up a proper operational risk analysis framework.

Key elements in risk quantification are the frequency and severity of the loss data since they will enable firms to use the Aggregate Loss Distribution (ALD) model so that they would know how much capital they should put aside in order to introduce soundness in their operations. The use of ALD has become popular as firms have started to combine and weigh various inputs using various methods.

There are situations where scenario analysis could play a major role and some firms incorporate it into their analytical framework in order to supplement what they captured as internal data. All depends on what they lack for example; firms that have adequate internal data do not have to use scenario analysis or external data. On the other hand, there are others who prefer to use the bottom-up or top-down approach depending on what they want to accomplish. Firms must be able to explain their rationale behind the chosen method and therefore justify if it is the 'best' in terms of weighing the qualitative and quantitative elements involved. This means the accounting of the method chosen is appropriate and is required, and when there is uncertainty it is possible to make a conservative estimate and state that had been the case.

3.5.2. Other Important Factors while considering AMA

When it comes to risk mitigation, institutions can transfer the risk using certain products such as insurance, where the allowed amount is 20 percent of the overall operational risk exposure. This can be supported by the collected loss data. There are certain requirements that have to be in place in order to incorporate the policy into a firm's adjustment for risk mitigation, which is not different from any sound insurance policy arrangement. The major factors looked at are the ability of the insurer to meet payment obligation on time as it is important to know what would be involved in case a claim is disputed, and there could also be a concern about what would happen if a policy is cancelled before maturity (Federal Reserve Board 2007).

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The data maintenance that is applicable is also crucial since it is required to be effective for firms that are dealing with advanced data management practices. Firms have to be able to manipulate data in such a way that it will be possible to track events from start to finish. There has to be a capability to work on the data to modify it according to the needs that will arise. In fact, there has to be a policy in place that dictates how to deliver data, how to store and retain it, and how it is accessible in order to verify its integrity.

Testing and verification is the last process on the list and it addresses the institution's need to verify the accuracy of the data, as well as the appropriateness of the framework that is in place and the various results obtained. Usually, the audit department of an institution (either internal or external) carries out the verification process where the only requirement is that members have to be qualified.

3.5.3. Discussion on AMA and LDA approach according to ITWG

A group called the Industry Technical Working Group (ITWG) founded in 2000 had presented an exhaustive literature on what LDA based AMA would accomplish (New York Federal 2003).

They have structured the paper around the known four basic elements of AMA, which are internal data, external data, scenario analysis, and factors that reflect what a business environ and internal control should be like. Accordingly, the group recognizes that the elements fit into two groups: the first group is made up of internal and external data and what takes to capture such data and the second one is how to model the process and the integrating of the scenario analysis, what the business environment is, and the internal control system that is in place.

The group had focused its work on emerging best practices, as far as capturing and integrating loss data is concerned based in what has become practical in the real world and should be part of every establishment (APEC). Accordingly, the most crucial element in LDA-based AMA approach is loss data, simply because it is the best risk indicator, as well as it could reflect the unique risk history of any institution that is doing the assessment. If there is a shortcoming in using loss data according to the group, it is a backwards-looking method where it would fail to reflect what takes place in the environment in real-time. What worsens it is that the lack of sufficient data to enable

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assessing the kind of loss in the future. Such a shortcoming can be mitigated by introducing a statistical modeling as mentioned earlier, as well as by bringing most AMA elements together and rallying them to see what the result will be (Koker).

The group that is made up of practitioners from financial institutions believes the crucial element to conduct an effective AMA risk assessment approach is to rely on loss data in spite of the fact that they have some downsides that will get a boost by using external loss data. While relying on the two elements of AMA, as to what kind of operational risk capital will be needed, the way to go about doing that would be to use statistics and actuarial modeling techniques. LDA stipulates that any loss a firm encounters reflects what the underlying risk exposure for the firm is. It is important to know the stance the group is taking simply because they are with the belief that, as long as a firm is well managed, there is no reason why it would not have what the group calls a well-established risk culture. It is not only that, the prevalence of such culture will enable it to minimize the operational losses.

What the group labels as operational loss; is the amount charged to the Profit and Loss statement net of recoveries based as per GAAP when there is a loss event. According to the group, these accounting methods will enable those involved to introduce some consistency in their reporting. In order to do that, it is important to come up with a category where it is possible to place every loss event data of the business activities. After collecting the loss data it is then sorted and depending on the model used and then the loss severity and frequency distributions must be carried out separately whilst using LDA. 'Monte Carlo' simulation model can be used, where it integrates each loss type to the kind of business activity it relates to, as well as to the time horizon. The fact that the Basel Committee has a special matrix to be adhered to will make their job easier, as all they have to do is to categorize the data according to the matrix and confirm that there was proper loss-accounting throughout the operation.

Here, it is possible to introduce a curve to see what the underlying pattern for the loss occurrences will be. This curve will be important to extrapolate the amount of total losses incurred and what the minimum capital requirement will be. It is possible to choose some of the available statistical techniques to be certain that the distribution is within range. Although in reality it is difficult to come up with the best distribution fit to

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the tail of the data on the curve, as there is scarcity of low frequency highly impact operation loss data, according to the group. Furthermore, paying attention to the pattern of the tail is important simply because that is what the required capital will be based on.

The whole idea of this process is to determine the horizon of losses the firm would encounter in a given year so that it can derive a percentile. If it is high, it would mean the amount of the capital the firm holds to protect it also could be high. The percentile usually will be 99.9 percent while the time horizon is one year, as this is what the Basel third consultative proposals (CP3) requires the banks to apply and except that the percentile could be similar to what the banks apply to their credit and market risk assessments. As capital is required to cover only unexpected losses, to arrive at the amount all it takes is to read what the total loss amount on the curve is and subtract the mean to arrive at the capital required.

Another key point to take into consideration is the relationship between the risks in each of the business lines and risk type combination simply because since there will be diversification, the required capital would be less than the sum of the whole parts. What this means is that a firm has to use the available standard statistical techniques to arrive at total losses for a given year for all the available business lines and loss event types. After that it will be possible to allocate capital to protect the firm from losses that it wants to protect itself. To accomplish this, the requirement is three to five years loss data as stipulated by the Basel Committee.

3.5.4. Internal Loss Data Collection

When it comes to collecting data, as long as the process serves the final purpose well, each institution could chose to make certain criteria a priority, similar to what ITWG financial institutions are doing, which does not have to be the industry's standard. A key issue to look at is the data collection threshold wherein after a certain point it may not be productive to collect loss data which is again determined according to the need of each institution.

Other issues include distinguishing between categorization of the loss data and the process of data collection. There is what ITWG calls as 'near misses' events that would have not been detected without applying some kind of a random checking technique. Since checks are random, the possibility that similar errors would go undetected is high.

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The concern is the random check is not an effective controlling process unless applied to each transaction, which might not be practical. Due to complication of the problems and to address them effectively, ITWG has highlighted 'near misses' in procedures applied to assess operational loss risks and anyone looking at the reports can tell there could be error that is undetectable.

Another similar occurrence that falls under the ITWG category is "Boundary Losses". Such losses are credit or market risk losses in nature, but have come around due to operational error. The Basel Committee has made it mandatory to collect credit-related operational losses if the AMA based operational risk assessing method is used (Fontnouvelle 2006). The only exception is that they should not be included in capital modeling, as they serve informational purpose only and it is always possible to report the occurrence already as a credit loss event. Therefore, since there is a lack of clear guidance as to what to do with such loss events, it is up to each institution to come up with a policy how to deal with them.

There are also definitional issues according to ITWG, where it will be difficult to determine certain transactions, as operational losses for data collection purposes. To clear up such a problem what to consider as loss event is when it occurred by error only. Any other expenses incurred for other purposes should reflect their direct nature and get a treatment accordingly. Under the threshold losses are also difficult to deal with according ITWG simply because there has to be a decision to collect or not to collect them. If the decision is not to collect them, the involved institutions might find it difficult to satisfy regulators' questions regarding provisions for expected losses, as they are not going to be included. Timing also might be crucial and each institution might have to come up with its own policy as it is difficult when exactly to recognize events. Normally, it is possible to do that when a reserve is set aside for it, or when it is written off. Hence, introducing policies could mitigate such problems.

How to collect data is also an issue raised by ITWG, simply because the traditional accounting and audit method might not do the job effectively if institutions are big and are operating around the globe. The solution for this problem is to come up with a centralized input process where categorizing it is possible according to the existing need and area of operation. One good example is to come up with geographical clusters

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if the institution has a large number of branches. This enables validation of input data prior to reports preparation. An alternative solution also would be using decentralized data processing systems where data is integrated through the prevalent accounting systems. Using these accounting methods, minimal mistakes would occur because it is mandatory that books balance. Therefore, there will be no need to reconcile the loss event database with the financial statements since the data would have been already been incorporated.

3.5.5. More Issues to Look at in AMA

A few other issues ITWG highlights about loss data collection are security, discoverability, impact of taxes on the magnitude of the reported loss, completeness, and consistent classification by event categories and lines of business. The security issue such as hacking requires encrypting the data. Extending various access rights to various groups also can monitor access. All that has to be avoided in a scenario like this is to make sure the whole process will not become cumbersome. The discoverability issue borders banks fear is the loss data falling in the wrong hands that would want to harm the bank. They may want to come up with restricting guidelines on how the data is prepared and the handling of sensitive information. The tax concern focuses on the need of grossing up the loss when it is not tax deductible, so that it will be in line with other operational losses.

The completeness is related to the Basel Committee guidelines introduced wherein regulators must ensure firms using AMA have complete data. This could be difficult for some firms according to ITWG as firms are coming up with a standalone operational loss data collection system instead of the one that is extracted from the existing accounting system. This is proven difficult simply because the reconciliation process is difficult, as operational losses are recorded in various accounts that will be difficult to track. The suggestion here is to come up with more structured ledgers distinguishing those that can be reconciled from those that cannot, so that it would be possible to minimize the problem. The consistent classification by event categories and business lines issue highlights the difficulty that exists in the process of classifying events in a hierarchy. The suggested solutions are staff training and introduction of decentralization in data collection.

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3.5.6. Sourcing External Data

Among the challenges in collecting internal loss data, there are findings about data insufficiency in some business lines and risk event types. That has led firms to look at external data to supplement their AMA model. There are various sources for external data collection that includes a firm's own effort to collect data, procuring data from vendors, and obtaining data form an industry data pools. External data are not a reliable source as there are various problems related to them.

First of all, collecting such data is time consuming, as well as there could be information gaps. If the data source is media reporting there could be biases to deal with. In addition, such reports do not have a clear estimate of the cost that will be involved and if there is an estimate, it might not be reliable for accuracy purposes. On the other hand, relying on an industry group's data could fall short in the line of business and might not be the best choice because of the inadequacy of the highlighted risk.

One recommended source for external data are vendors who know exactly what is needed and they can tailor-make their findings to the needs of firms that are trying to implement them in their AMA model. The other sources that are reliable are industry data pools such as GOLD (Global Operational Risk Loss Data) and ORX (Operational Risk Data Exchange) simply because they are knowledgeable in the field and can tailor-make the data accordingly. The way pools work is, they gather data from the members of the particular industry; they anonymize it, and redistribute it among interested users. Such data can be more reliable and can satisfy the integrity required in association with the business type and event type better than others.

Firms also recognize what their particular risk profile is and they will not find it difficult to scale data from such sources to their exact need. In order to make such arrangements effective there might be a need to collect exposure indictors quarterly or monthly and they could either be size indicators or risk environment indicators.

ITWG believes that whatever approach is used data sharing efforts could be complex and challenging. Firms that wish to qualify for AMA will have to make sure that the data they are using is complete, accurate, and covers what is required.

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3.5.7. Challenges of implementing AMA

Overall, there are a number of challenges that needs to be dealt with in order to introduce a risk operation framework based on AMA. The first key challenge is the completeness and accuracy of data which is vital for banks whilst they are in process of introducing an effective risk operation framework that meets the AMA guidelines.

The other challenge is setting the data thresholds although it does not have an impact on the capital assessment but as long as the banks have sufficient loss data to support their decision on what kind of capital to put aside and what the nature of the distribution would be. The only problem that might arise is when the threshold affects the size of the available data, which will directly impact the kind of capital to be assigned for the estimated loss. One solution for this problem is to pass the 'goodness of fit' test in order to ensure that the threshold will not affect the final decision.

ITWG suggests two solutions for this problem, and the first one is to put the loss distribution below the threshold. Doing that will enable firms to comply with the CP3 requirements and demonstrates that there is nothing lacking from the measurement applied to assess the expected loss exposure. Accordingly, the other method is to truncate the losses at the chosen threshold that will demonstrate the measure covers the required distance. Even if the CP3 requires $10,000 or more limits, there is no reason why each institution cannot come up with its own threshold simply because it reflects the cost-benefit analysis of the collection that could be set by each institution according to its needs. It does not necessarily have to affect the creditability of capital estimates, as it is possible to avoid such pitfalls by using one of the above mentioned methods.

3.5.8. Incorporating External Data

Incorporating External Data could be carried out in various forms and has advantages such as completing an incomplete internal loss data, modifying the parameters introduced in the expected or unexpected internal loss data, which will in turn enhance the quality and creditability of scenarios. It can also be used for validation and benchmarking internal data outcome.

The most important aspect of external data is its relevancy and scalability. Relevancy of data is the external data obtained to integrate with an existing internal loss data needs to have some kind of relevance, where a data that is applicable to a different

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line of business that is nonexistent in the acquiring firm will end up distorting the findings instead of relieving the constraints that were created by insufficient internal data. Therefore, even if data pertaining to an industry such as banks is available from outside sources, there must be a policy on how to streamline this data so that it would fit into what the acquiring firm is doing.

Scalability strictly deals with the data size where the final findings could be distorted if it is integrated with what is collected internally. This is applicable for bigger firms with wider exposures and lines of business. One way to get around this problem is to start identifying with peer groups that have similar size and lines of business and avoid data from other sources. Alternatively, it might be possible to regret the data in such a way that it will be possible to see the correlation between size, frequency, and severity of losses occurred and the size involved.

3.5.9. Scenario Analysis

ITWG defines Scenario Analysis as forecasting operational losses and events and what bring them about based on the knowledge of business experts. It is possible to use such a process to introduce insight into risks and mitigations that would help in calculating the required capital charge with a certain amount of reliability.

One identified shortcoming is its subjectivity and the introduction of techniques that increase the repetition rate. ITWG states that even if scenario analysis has qualitative as well as quantitative aspects, the research presented would deal only with risk measuring use of the aspect. Accordingly, three types of data scenarios macro analysis:- These are supplementing insufficient loss data, avail forward-looking elements in the capital assessment process, and introduce stress to test the capital charge assessments.

Supplementing insufficient data is the main reason of using scenario analysis that enables to generate a more complete frequency and severity. The combination here is interesting where there could be three kinds of losses identified. The first one is expected losses that will introduce an optimistic scenario, unexpected serious losses that will introduce a pessimistic scenario, and the unexpected worst-case losses that introduce catastrophic scenarios as discussed (Boudoukh 1995). The findings gathered in the case of scenarios is the opinion obtained from experts as well as risk managers, whatever the

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encounter kind may be. The key as indicated is that it is important to draw a list of possible operational risks. At the same time the severity and frequency could fluctuate between the three levels.

3.6.Difficulty of What Kind of Model to Choose

Literature presented by Kabir Dutta and Jason Perry in January 2007 discusses problems institutions are facing while choosing their models. In order to arrive at the exact amount of capital, they should put aside an amount of capital to fend off any operational loss event that would occur in a given time span (U of ULM). Various techniques can cause a problem where there will be inconsistency on what firms could arrive at as their risk exposure.

Research findings show that it is possible for the same set of firms to arrive at different outcomes in assessing their risk exposures by using different techniques. Furthermore, they stated that it is possible to dismiss some of the models as inadequate, either in their statistical outcome or their logical grounds.

In spite of these drawbacks, firms have also found out that some techniques provide consistent and plausible outcomes for various institutions that are deemed different in their business lines and structure. The last finding is important because it is possible to infer that modeling operational risks to demonstrate that there could be some irregularity in loss data among institutions.

The researchers claimed that they conducted an experiment to find out the outcome of using various approaches based on Loss Data Collection Exercise (LDCE) on various financial establishments. The seven institutions they used to conduct the experiment had various business types, as well as asset size. The method they used to measure operational risk was LDA which they claimed had advantages due to the amount of data that was available, with a caveat of grouping together dissimilar losses.

LDA components are frequency, severity, and the aggregate loss distribution which makes the approach effective and easy. Those institutions understood that there will be a shortfall in most of the simple methods in analyzing the data. Nevertheless, they applied three techniques which they called: parametric distribution fitting, extreme value theory, and capital estimation that uses non-parametric empirical sampling.

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In all the techniques they applied, the focus was to arrive at an estimate in the following performance measures (Figure 3.6):

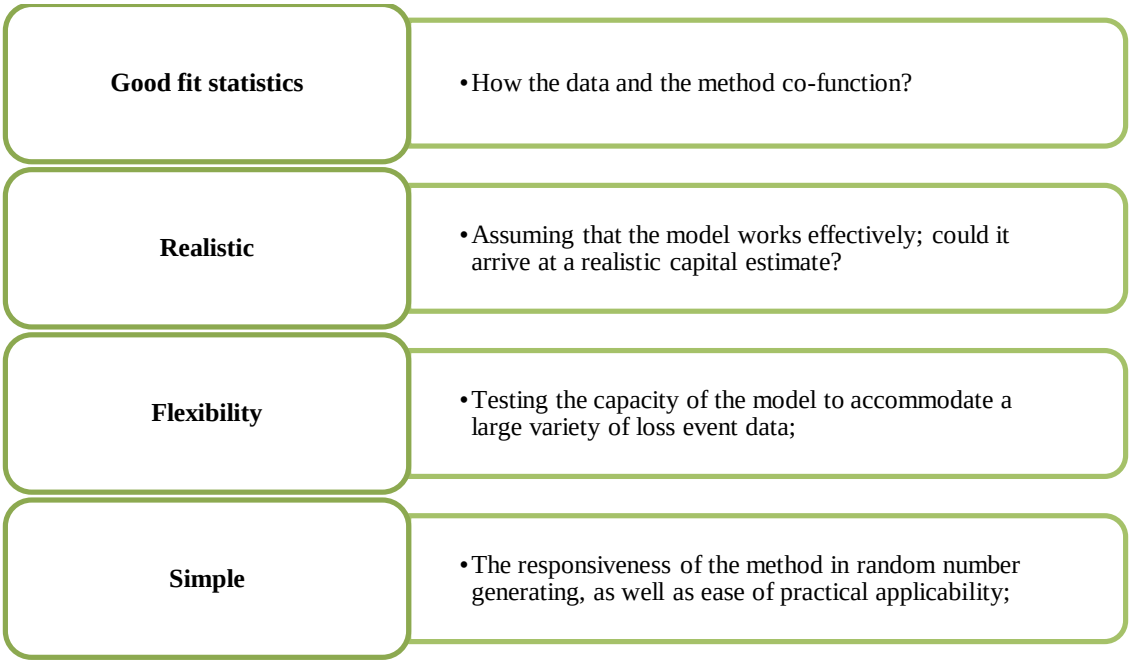

Figure 3.6: Performance measurements - Source: author's own work

They stressed that 'goodness-of-fit' tests are necessary as they enable segregating techniques expected to introduce cross institution dispersion in the process of arriving at the capital charge required. Their preference of measuring was comparing the 'Quantil – Quantile' plot among various establishments and they had found the g-and-h distribution and the Q-Q plot as good fit.

The rest of the models they experimented such as extreme value theory had shot into unrealistic ranges sometimes surpassing 100 percent of asset size. This demonstrates that they cannot model high losses accurately. What they zeroed on is that they were able to defy other researches who claimed it is not possible to come up with a model that can find a single distribution point that fits both the body and the tail of operational loss data. Their conclusion was that there is enough empirical evidence that proves the method used was effective most of the time and whenever it was ineffective, the difference was nominal.

The whole drive was to come up with effective methods to measure operational losses and it is becoming very crucial since the financial establishments are suffering sizable operational losses. It was Froot (2003) who was able to declare that operational

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risk is capable of introducing non-liquidity that will lead the financial system into a risk of a tailspin as mentioned in the literature. What this means is the need to fend off such calamity is high and that had led the Basel II Capital Accord to require every financial institution to start using AMA in assessing their operational risk exposure. Countries other than the U.S. use similar and simpler techniques such as Basic Indicators or Standardized Approaches. The amount of capital charge for everyone involved remains to be eight percent of enterprise-level gross revenue (Hull 2006).

Another problem highlighted in using the LDA, is a recent introduction in an environment where institutions were not at ease with their internal data. It is only recently, the loss event data availability problem across the board started improving. Researchers claim that there had been other researchers such as Moscadelli (Moscadelli 2004) and de Fontnouvell et al. (Fontnouvell 2004) who experimented with operational data loss in recent years. Their focus was to come up with a method to measure loss event data appropriately as discussed in the literature.

According to them, their stand is not different from various researchers who claim that there has to be a sound technique to assess the exact capital charge requirements. This literature demonstrates various methods and shows that there is a concern in using many techniques leading to the ideal capital charge estimation cover for operational risk losses.

3.7. Outcome of Sessions Held in Japan

Another literature is about a study made by the Advancement of Operational Risk Management of five sessions held through March 2006 and the group wants to disseminate the outcome of the session so that some institutions might use the finding to advance their operational risk management (Bank of Japan 2006). At the same time, the literature is essential in shedding light on how various regions of the world are dealing with operational risk and what kind of advancement they have made in parallel to what is happening in other geographical regions. The discussion held on December 22, 2005 had focused on selecting the type of distribution for risk quantification. As it is common among institutions, here also the preferred method used is Loss Distribution Approach (LDA) where the assessment focuses on the frequency and the severity of the losses by

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arriving at how much money the loss event would cost the involved entities, in this case financial establishments in Japan.

The session recognized that there is no convergence to what it calls a de facto practical standard approach, as far as the amount of the loss event is concerned. The same applies when it comes to validating what kind of parameters to use. Although, there was is an argument of whether using these techniques will deliver a similar capital charge amount across similar institutions.

This literature explains that the distribution method used will determine what kind of capital charge must be put aside and it could vary from one case to the other. Accordingly, the reasons that contribute to the convergence are as follows:

- There is no method that can identify the risk event at the quality of process level, the high and low frequency level, and the tail event that do not take place often.
- It is possible that the loss data captured by financial firms might fall short of representing the actual risk profile by relying on numbers, genre of samples, and the time span the observation was applied.

3.8. Lack of Adequate Data is the Main Culprit

The literature concedes the fact that a chosen distribution method should fit the data type. This is a decisive factor in making a sound estimation, bearing in mind some considerations. The point raised here is it is common to encounter similar problems everywhere, where the loss event data available will not always be adequate; hence, it necessitates picking a distribution method based on that. If the internal data is found to be inadequate other sources should be considered such as scenario data, etc and the methods used have to be streamlined in such a way that they will not introduce instability that will render defective data for quantification purposes.

The suggestion is to bear in mind that information on the superiority of individual approaches is currently limited. Since the nature of the quality of the data is questionable across the board, each establishment should come up with a method that fits the kind of data that it is available to capture.

Here, the stance is that no matter what is involved there will always be insufficiencies of loss data captured by financial institutions which needs to be supplemented by other sources such as scenario approach or external data. Furthermore,

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whether relying on is in order to make up for the insufficiency of internal data, scenario, or external data, the condition to consider requires basing upon the quantification method of the implementation. What to look at is not different from what is covered so far such that it is important to identify the scenario data that will meet the optimal quantification needs. There has to be some comparison between external data, and the scenario to ensure the best method that meets the quantification needs. There must also be a certain degree of comprehensiveness.

Setting of the distribution parameters that fits the prevalent frequency and severity of loss distribution. The other problem highlighted is the need to pressurize management on whether the distribution method chosen is effective and if it will add to the complication of choosing parameters. Here, what is important is that it is enough for the management or board to grasp the characteristic of the mode where there is no need for them to comprehend the details of the model.

Financial institutions in Japan are using both Basic Indicator Approach and The Standardized Approach to compare between the final capital charge amount arrived at by using these two methods.

3.9 Risk Classes

An introduction on "risk classes" was made during the session held in January, 26th, 2006. The individual units are made up of event type and business lines in conjunction with causes of losses, legal entities, and the need to find out if converging of the whole data together is possible. The reason for that is the class setting and the impending of dependencies among the various risk types affect the result of risk quantification. The example given in this literature to support this outlook shows that by adding the risks allocated to each class, there will be a tendency in the aggregated risk to go higher.

3.10.Fitch Ratings

Fitch Ratings (2004), a rating company, presented the overall effect of the Basel II implementation in assessing operational risks in the banking industry around the world. According to Fitch's finding based on a survey made among users of AMA, the amount of capital charges was lower than that of those using the Standardized or Basic Indicators approaches. The genre of the participants was 15 percent from around the globe, 24

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percent from North America, and 61 percent from Europe. But the various outcomes according to Fitch do not reflect the diversification effect that could lower the capital charges arrived at using AMA, as well as it does not reflect the home/host principles introduced by Basel II Committee as a requirement for regulators to enable diversification recognition benefits.

One more key finding is that the if the AMA is going to introduce any kind of incentive for the banking industry it would have to generate lower capital charges than the other approaches and contribute to diversification. Furthermore, Basel II recommends each financial institution to use its own discretion while developing a method or model in order to arrive at a risk exposure level that is relevant to the involved institution. The same is applicable to countries where they have to use their own discretion in validating and approving the effectiveness of the models used. There is a concern, however, about uniformity and consistency among international banks where there is derailing competitiveness. The concerns outlined by Fitch are directly concerning diversification, handling of expected losses, and the use of incurrence to mitigate capital charges.

Other findings include recognition of a sophistication level that is required in order to bring the available tools together and employ them effectively to arrive at appropriate capital charges. The bringing together of internal and external data and integrating it with structured scenarios had also been a challenge. Other concerns highlighted by the participants were the involvement of high level judgment value t and the heavy reliance on expert's opinion could end up manipulating the models.

Fitch believes that there is lack of an open environment as the findings indicate the overall environment had been rigid and judgmental. The issues Fitch wanted to address when conducting the survey was:

a) To determine the kind of process the establishments had gone through to come up with an effective operational risk framework;
b) To identify what the issues and challenges facing banks in their efforts to introduce an effective operational risk framework;

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c) Asses what kind of preparation banks had made to meet the Basel II regulatory requirements, as well as how they had positioned themselves to the prevalent competition;

Fitch also approached more than 50 banks and most of them participated at varying degrees, although there were times some of the questions went unanswered simply because of confidentiality reasons. The findings reveal that there is a high level of convergence to what Basel II termed as 'operational risk'. Other findings include strategic, business, and reputational risks which are excluded from Basel II because of the difficulties faced in quantifying them. Fitch also highlighted that banks address these issues as operational risks or independently by using qualitative measuring methods to capture them.

3.11.The Most Preferred Methods

Among the banks surveyed, most of them claimed that they were combining the available methods in order to identify risks. Accordingly, 65 percent of the banks surveyed are using self-assessment, 32 percent were using key risk indicators, 37 percent were using risk mapping and the remaining 10 percent combined scorecards in their methods. While conducting self-assessments, the banks relied on the bottom-up approach getting insights from line managers on the kind of risks they face. The risk indicators were useful for measuring risks from a top-level perspective where it had been possible to drill down to trouble spots. The top-down and bottom-up approaches were useful in capturing all events as their application is firm-wide, while the final decision will be made by top management making it effective in arriving at the appropriate capital charges, although there are still more approaches (IMF).

The structure and culture of the organizations surveyed was in such a way that either the board or senior management have the controlling lever or it is possible to vest the responsibility to a single executive such as a financial officer (Oliver Wyman Consulting). In addition, most of the firms had a conceptualized operation function overseeing the operational risk function which is responsible for developing methods, policies, tools, and software in some cases to facilitate the process of identifying and capturing loss events. Respondents supported other areas such as including business line management in assessing risk management as effective. In most of the banks surveyed,

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management is playing a significant role in the risk-assessment process. When it comes to the culture and openness, it is only a few banks that claimed creating such an environment would be beneficial to risk assessment. Other banks have not seen the importance of creating a culture where staff will be encouraged to talk about risk that worries them. Fitch's stand on the issue is that people have to be encouraged to come forward with risks whenever they spot them, as it will give a boost to a worst-case situation, especially in scenario testing.

Loss data collection is key step in arriving at the appropriate risk capital. However, the survey indicated that banks are at various levels when it comes to the quality, time covered, and the level of the data collected. The findings reveal 43 percent of the survey participants had collected at least 1-2 years of data for certain business lines and for others between 2-3 years. The remaining 13 percent had collected one year or less data. What this means according to Fitch is a sizeable number of the banks are doing a good job although most of them worry about the quality of the data they collect and they point out the overlapping with other business lines such as credit and market could result in double counting of loss events.

Other areas such as thresholds and "near-misses" also pose problems as they vary according to individual banks. The banks worry about the implication of setting high threshold limits since low-level losses would not be included and to remedy this problem some of them have chosen to factor such low level losses as a cost of doing business instead of risk. The problem with "near-misses" is the difficulty in measuring them accurately. Other problem cited in the survey was since process level managers are required to use their discretion in the case of near misses; the end result could vary and could void consistency.

Another Fitch finding is that 75 percent of the banks who participated in the survey want to become eligible for the AMA and most of them could qualify by the 2007 implementation date. The banks involved in the survey are big banks resulting in an outcome that does not reflect the progress the smaller banks are making. Some of the capital charges shown by the participants reveal that it would be higher than what could have been if the earlier standardized approach had been used. The only time the AMA might result in lowering capital charges might be if diversification benefits are

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recognized. This had led Fitch to extrapolate that somehow AMA techniques should manage to arrive at a lower capital charge in order to bring advantages for the banks. Some of the banks also have planned to use a loss distribution approach to arrive at their appropriate capital charge and they can accomplish that by creating expected and unexpected losses by employing a loss distribution method (Rachev 2006).

A problem cited is most of the participating banks have only collected data for less than five years and the quality of such data had been questioned making it difficult to come up with a reliable operational loss estimation. Because of the fact that banks might be interested to know what the tail of the distribution would be they have no choice other than introducing other techniques, as well as supplementing their internal data from outside sources.

External data had a major role to play among the banks surveyed and they have used it for the following purposes: to augment their internal data, as a validating tool for assumed distribution, and to help them analyze scenario data. Scalability had been identified as one of the major challenges for the banks when they try to integrate external data. The better use of external data is when used for validation purposes according to the findings. Scenario analysis had been popular among the banks participated in the survey simply because it takes into account the environment of the institution using it and it is forward looking approach. According to Fitch's findings, the problem lies with its subjective nature where cultural issues could impede its effective application.

Overall, Fitch's survey ascertains that many banks are striving to make Basel II AMA their main tool to assess their operational risks and arrive at the most appropriate capital charge. They are showing a steady progress; where in the near future most of the surveyed banks would meet the regulatory requirements. What this brings to the fore is the consistency and relevancy levels augmented where there will be uniformity in what most banks around the world would do. This in turn would contribute to the data capturing process, since the reliability of data obtained in the future would be very high.

3.12. Methodologies for calculation of Capital Chargers

This section describes various methodologies used in the calculation of operational risk capital charges and also in the analysis of the feedback received from

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the risk professionals in the United Arab Emirates. These methodologies are mainly recommended by Basel committee and industry practitioners in the last decade.

Basel Committee on Banking Supervision has announced following three main approaches to the banks for their capital charges calculation.

a) Basic Indicator Approach
b) Standardized Approach
c) Advanced Measurement Approach.

Based on quantitative calculation, the Basic Indicator approach is the simplest one and Advanced Measurement Approach is a highly sophisticated approach (see figure 3.7).

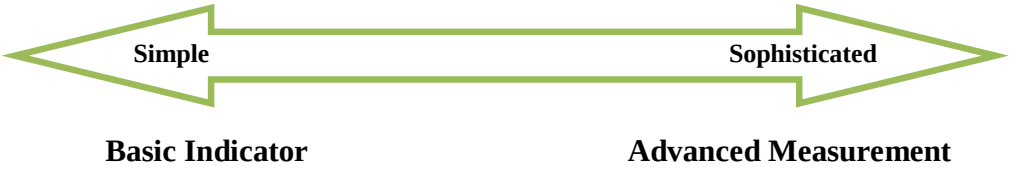

Figure 3.7: Increasing sophistication of quantitative approach, developed based on BCBS 128(2006)

3.12.1. Basic Indicator Approach

Banks using the Basic Indicator Approach must hold capital for operational risk equal to average over the previous three years of a fixed percentage (donated alpha) of positive annual gross income. Figures for any year in which annual gross income is negative or zero, should be excluded from both the numerator and denominator while average income calculation.

The capital charge may be expressed as follows:

Amount for operational risk (KBIA) = [∑(GI1….. n x α)]/3

KBIA = the capital charge under the Basic Indicator Approach

GI = Annual gross income, where positive, over the previous years

N = Number of the previous three years for which gross income is positive

α = 15% which is set by the committee, relating the industry wide level of required capital to industry wide level of the indictor.

Definition of Gross Income

Gross income defined as net interest income plus net non-interest income. It is intended that this measure should:

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a) Be gross of any provisions (e.g. for un paid interest)
b) Be gross of any operating expenses, including fees paid to outsource service providers
c) Exclude realized profit/losses from the sale of securities in the banking book
d) Exclude extraordinary or irregular items as well as income derived from insurance.

Example: Calculation of operational risk under basic indicator approach

Gross Income (2002) = 269,818

Gross Income (2003) = 447,619

Gross Income (2004) = 521,033

α = 15%

KBIA = [∑(GI_1…. GIn) x α]/ 3

KBIA = [(269,818 x 15%) + (447,619 x 15%) + (521,033 x 15%)]/ 3

Capital Charges (**KBIA) =** [40,473 + 67,149 + 78,145] / 3 = 61,192

Total Risk Weighted **KBIA =** 61,192 * 8 = 489,536

The BIA is the simplest approach to calculate operational risk charges and heavily rely on gross incomes. This approach is preferred for small bank without any international activities. The BIA is carrying an alpha factor of 15% which is constant and generic to all lines of business.

3.12.2. The Standardized Approach

In the Standardized Approach, Bank's activities are divided into eight business lines: corporate, finance, trading and sales, retail banking, commercial banking, payment and settlement, agency services, asset management and retail brokerage.

Within each business line, gross income is a broad indicator that serves as proxy for the scale of business operations and thus the likely scale of operational risk exposure within each of these business lines. The capital charge of each business line is calculates by multiplying gross income by a factor (denoted beta) assigned to that business line. Beta serves as proxy for the industry – wide relationship between the operational risk loss experience for given business line and the aggregate level of gross income for the business line.

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It should be noted that in the Standardized Approach gross income is measured for each business line, not the whole institution, i.e. in corporate finance, the indicator is the gross income generated in the corporate finance business line.

The total capital charge is calculated as the three – year average of the simple summation of the regulatory capital charges across each of the business line in each year. In any given year, negative capital charges (resulting from negative gross income) in any business line must offset positive capital charges in other business line without limit. However, where the aggregate capital charge across all business line within a given year is negative, then the input to the numerator for the year will be zero.

The total capital charge may be expressed as (see table 4.1. for calculation):

$$K_{TSA} = \{\sum YEARS_{1-3} \max[GI_{1-8} x ß_{1-8}]\}/3$$

Where:

KTSA = the capital charge under Standardized Approach

GI1-8= Annual gross income in a given year, as defined above in the Basic Indicator Approach, for the each of the eight night business lines

β 1-8= A fixed percentage, set by the committee, relating the level of required capital to the level of the gross income for each of the eight business lines(See Table3.4)

No.	Business Lines	ß Factors
1	Corporate Finance (ß1)	18%
2	Trading and Sales (ß 2)	18%
3	Retail Banking (ß 3)	12%
4	Commercial Banking (ß 4)	15%
5	Payment and Settlement (ß 5)	18%
6	Agency Services (ß 6)	15%
7	Asset Management (ß 7)	12%
8	Retail Brokerage (ß 8)	12%

Table3.1: The values of each business lines β - **Source:** Bank for International Settlement, BCBS 128, 2006

The Standardized Approach is more comprehensive and risk sensitive compared to the BIA. Bank activities are divided into 8 lines of business and each of them is carrying a beta factor.

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Operational Risk, Standardized Approach							
Business Lines	**Gross Income**			**Three Years Average**	**Beta Factor**	**Capital Charge**	**Risk Weighted Assets**
	2004	**2005**	**2006**				
Corporate Finance	130,489	136457	152918	139,955	18%	25,192	201,535
Trading and Sales	5,220	5453	6115	5,596	18%	1,007	8,058
Payment and Settlement	26,098	27291	30584	27,991	18%	5,038	40,307
Commercial Banking	104,391	109162	122334	111,962	15%	16,794	134,355
Agency Services	234,881	245614	275251	251,915	15%	37,787	302,298
Retail Brokerage	20,878	21833	24467	22,393	12%	2,687	21,497
Retail Banking	-	0	0	-	12%	-	-
Asset Management	-	0	0	-	12%	-	-
Total	**521,957**	**545,810**	**611,669**	**559,812**		**88,506**	**708,050**

Table 3.2: Operational Risk: Standardized Approach based calculation, BCBS 128, 2006

Table 3.2 shows the calculation of Operational Risk Capital Charges according to the Standardized Approach. This result of this model shows that capital charges under this method is depending on business line activity and value of beta factor.

The Retail Banking, Retail Brokerage and Asset Management are having the lowest beta and Corporate Finance, Trading & Sales, and Payment & Settlement the highest beta factor. This indicates that Retail Banking, Retail Brokerage, and Asset Management Business lines need lower amount of capital to cover their operational risk under the Standardized Approach.

In this approach Banks must accomplish qualitative criteria as suggested by Basel Committee or National Discretions.

3.12.3. How Advanced Measurement Approaches is different?

As one can see, the gross income is the basis for calculating a capital charge in both the Basic Indicator and Standardized Approaches. In practice, these two approaches are used by most of the banks to calculate the operational risk capital charges, compared to the Advanced Measurement Approach.

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This approach charges the least amount of capital; also this approach is comparatively more sophisticated. However, going by the sophistication of the AMA from the cost perspective it will be wrong to conclude that it is the 'best approach', for some banks considering the fact that only large banks have the financial power to implement this approach. The AMA, however, offers the greatest possibility to reduce capital requirements. It includes three approaches, namely the Internal Measurement Approach (IMA), the scorecard approach and the Loss Distribution Approach. Read Chapter 5 for more details about the AMA Approach.

The Advanced measurement approach is the most sophisticated one currently available, presented by the Basel Committee. Under the Advanced Measurement Approaches, the calculation of the regulatory capital requirements for operational risk is based on a bank's internal risk measurement system. A bank must satisfy several criteria set out by the committee before they are permitted to use the Advanced Measurement Approach (AMA).

However, within these criteria, banks are not provided with specification on distributional assumptions to generate the operational risk measure. So, banks are flexible to use any distribution to calculate the potential losses. Furthermore, through the application of these approaches several types of trade activities and events are distinguished. These trade activities, which are referred to as eight business lines in paragraph 4.2, can be subdivided into sections. Within these sections several activities are grouped together.

The mapping process is one of the requirements which is set out by the Basel Committee. Huge amount of data is collected using AMA methods which differentiates it from other methods. Also, banks develop several methods to analyze the data to determine a reasonable amount of regulatory capital. There are currently three sub methods available for the Advanced Measurement Approach.

3.13. Various Subsets of AMA

As we can see from the figure 3.8 Advanced Measurement Approach (AMA) has three broad categories. These are: the Internal Measurement Approach, Scorecard Approach, and Loss Distribution Approach. The financial establishments have to identify which approach would lead to a lower capital charge alongside being accepted

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by the regulating bodies as a sound system. It is not easy to say why each one of them would have a specific benefit to those who implement them. It is possible each one of those methods brings different benefits such as arriving at the lowest possible capital charge which is both realistic and appropriate.

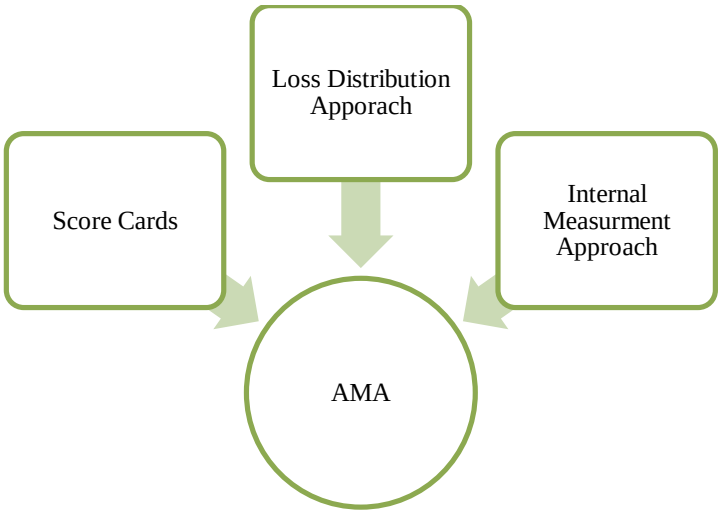

Figure 3.8: Three methods of calculating Advanced Measurement Approach - Source: author's own work

3.13.1. Features of the Internal Measurement Approach (IMA)

One of the features of IMA is it is risk sensitive and it is possible for banks to compare its implication among themselves. What this means is each bank could retain its discretion to use its own internal loss data to reflect its own risk profile while at the same time it is possible to create some kind of uniformity as to how to calculate the capital charge. This can be accomplished a panel compromised of supervisors from all banks involved.

When banks use the IMA to calculate the operational risk they would start by estimating the Expected Loss Amount (ELA) for the cell they have prepared in the matrix of each business lines and event types. This can be achieved by using an Exposure Indicator (EI) for each business line and by estimating the Probability of Loss Event (PE) and Loss Given Event (LGE) for the combination of the chosen business lines and loss event types. Hence, what will create ELA is the summation of EI, PE, and LGE. To calculate the capital required for each business line and event type the ELA is multiplied by a gamma factor, which can vary across the various business lines, but should be the same across firms if there is a drive to create across-the-board-uniformity. Another

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proposal is using Risk Profile Index (RPI) to capture the loss distribution of the individual banks involved and the final capital charge would be the summation of all the products involved.

While using IMA, banks are encouraged to come up with a business line categorization system. The reason being collecting loss data by business lines will be easier. The regulation set out by Basel II has its own business line categories, yet banks can use their own category by mapping out their own business involvement into standardized business lines. IMA is similar to the other methods as it uses its own loss data to arrive at the ELA using EI, PE, and LGE. The element Exposure Indicator (EI) is another proxy for operational risk exposure that is prevalent. The EI for the calculation should be chosen carefully since it will be applied to all business lines. The expected loss ratio is what is going to accrue as an expected loss amount to the exposure indicator.

It is possible to decompose ELA into EI, PE, and LGE. One key issue here is certain events do not require a transaction amount attached to them, a good example is a natural disaster. Hence, it is possible to directly arrive at the ELA rather decomposing it into PE and LGE. The requirement dictates that when a bank is estimating the PE and LGE of its available business lines and the correlated event type combination, the primary source should be the internal loss data. When it comes to standardizing the process and arriving at a parameter, supervisors introduce methods that c excludes certain data in order to maintain a safety buffer.

The recommendation is to include external data or to make the assessment forward looking. As it is applicable in the other models whenever there is lack of adequate internal loss data, the IMA model can be used as external data and supervisors can then use standardized rules to incorporate the same with whatever is available from within. The following examples show the capital charge calculation process using the Internal Measurement Approach (see tables 3.6, 3.7, and 3.8.):

Names	Top – Down Approach: (**Allocation a certain proportion of current capital to op. risk)**		Bottom - Up Approach: **(Estimate operational risk based on actual internal loss data)**		
	Basic Indicator	Standardized	**Internal Measurement**	Loss Distribution	Modeling Approach

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	Approach	Approach	**Approach**	Approach	
Business Lines and Risk Types	Single Business line	Multiple business line	Multiple business lines and events types		
		Standardized by supervisors		Bank discretion	
Structure	∑ { Coefficient * Indicators }				
Parameters	One exposure indicator (EI)	Multiple EIs by business line		Estimates Operational VAR based on frequency and severity distributions	
			PE, LGE, PRI		
	Standardized by Supervisors				

Table 3.3: Internal Measurement Approach - Operational Risk - **Source:** BOJ (Bank of Japan, 2005)

Table 3.3 shows a clear picture of the most preferred methods in calculation of capital charges by the Bank of Japan (2005). This table classifies capital calculation approaches belonging to two categories viz.: (a) -Top – Down, and (b) Bottom – Up approaches. LDA is considered as a Bottom – Up approach.

Table 3.4 shows the calculation of capital charges using IMA method. The key differences in this approach as it consider the Gamma factor in each Business line as compared to the Standardized Approach in the capital charges calculation.

Business Line	Description	Event type A	Event type B	Event type C	Event type D	Total
Business Line A	Expected loss (=EI*PE*LGE)	8	10	6	6	30
	Gamma Factor	5	2	5	10	
	RPI	1.0	1.0	1.6	0.7	
	Capital Charge	40	20	48	42	**150**
Business Line B						**100**
Total						**600**

Table 3.4: IMA for 2 business line -Expected loss - **Source:** BOJ (Bank of Japan, 2005)

Table 3.5 shows the different line of business in financial institution.

Investment Banking	Corporate Finance
	Trading & Sales
Banking	Retail Banking
	Commercial Banking
	Payment & Settlement
	Agency Services
	Asset Management

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Others	Retail Brokerage
	(Insurance)

Table 3.5: Lines for different financial institutions under IMA - **Source:** BOJ (Bank of Japan, 2005)

It is also possible to employ the following simple formulas to calculate the ELA using IMA; banks should provide EI, PE, and LGE.

ELA(i,j) = EI(i,j) * ELR(i,j)

= EI(i,j) * PE(i,j) * LGE(i,j)

Where:

EI: Exposure Indicator

ELR: Expected Loss Ratio

PE: Probability of loss Event

LGE: Loss Given Event

It is also possible to use numbers as follows to show the relationship of the parameters (see table 3.6).

Description	Transaction				Losses		
	Number		Amount		Number		Amount
Transaction and Losses	1	x	20		1	x	10
	1	x	30				
	1	x	10				
Total	**3**		**60**		**1**		**10**
Average			**20**				
Gross Income			**3**				
Assets Size			**600**				
Number of accounts			**6**				

Table 3.6: IMA Calculation Source: BOJ (Bank of Japan, 2005)

Defining EI based on "flow" of business activities could be as follows:

(Case 1) • Example of business lines: Payment and settlement, etc

• Example of definition of parameters:

EI = volume of transactions = 60

PE = the number of loss events / the number of transactions = 1 / 3

LGE = average loss amount per event / average volume per transaction = 10/20

• Then, EI * PE * LGE = 60 * 1/3 * 10/20 = 10 = total loss amount

(Case 2) defining EI based on "revenue" of business activities

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• Example of business lines: Investment banking, etc.

• Example of definition of parameters:

EI = gross income = 3

PE = the number of loss events / the number of transactions = 1 / 3

LGE = average loss amount per event / average gross income per transaction = 10/1

• Then, EI * PE * LGE = 3 * 1/3 * 10/1 = 10 = total loss amount

(Case 3) defining EI based on "outstanding balance" of business activities:

• Example of business lines: Asset management, etc

• Example of definition of parameters:

EI = value of assets under management = 600

PE = the number of loss events / the number of accounts = 1 / 6

LGE =average loss amount per event / average asset value per account = 10/100

• Then, EI * PE * LGE = 600 * 1/6 * 10/100 = 10 = total loss amount

Key element to look at while incorporating external data in a simple formula could look as follows:

PE = W * PE (internal) + (1-W) * PE (industry).

The W represents the weighting factor used and it supervises who should specify it. A minimum level requirement is necessary in the IMA for the calculation of the PE and LGE in order to arrive at a conservative estimate of capital charges. On the contrary, those who prefer to use the scorecard approach decide to do so because there is no tool in the other models that incorporates the basement mechanism if there had been an improvement in risk management system.

This deems true because the historical mean of PE and LGE cannot predict what the future of PE and LGE is going to look like. Hence, in the case of IMA there is a quality adjustment to be incorporated while trying to arrive at the capital charges. It is the supervisors who much discuss this with the industry so that it will not be absent from the assessment process (Bank of Japan).

3.13.2. Scorecard Approach

Those who support the scorecard approach as the better choice claim that it would provide a more complete and accurate measurement of what kind of operational risks would be prevalent in a given firm .They also claim that this particular method gives

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better incentives and tool managers can use to reduce their losses, and also introduce a more practical and flexible implementation path (Chorafas 2004). Accordingly, those who chose scorecard over the other methods claim that they have seen a substantial benefit, as well as introduce what they call a strong "risk culture" as they have seen higher return on shareholders' interests.

What is at stake here is a sizeable amount that could be garnered by simply using AMA that is allowed to use 75 percent of what is arrived at as capital charges than using the Standardized Approach that calculates the operational risk on the 15 percent of a given bank's operating capital. The future of the floor is not certain where there is a possibility that it would either be reduced or eliminated as the regulators become more confident with the model banks use. Big banks can reduce their capital charges at least by three percent using any of the AMA methods which can then be translated into several millions of dollars.

Consequently, until new advanced operational risk measuring models come to the fore, using the AMA approach still avails advantages. One of the advantages of using AMA is firms could have at least three methods to choose from if they want to put AMA into practice.

The Internal Modeling Approach discussed above uses losses incurred in the business lines by relying on the average past losses experienced which is then multiplied by a gamma factor in order to arrive at the capital charges. The Loss Distribution Approach (LDA) works by introducing statistical distribution in the available historical loss data and arrives at the capital requirement to cover operational risks, through making numerous comparisons shown on the third section of this paper.

The scorecard approach discussed in this section uses the same method of analyzing historical loss data and uses quantitative indicators for quantifying future operational risks. It bases its assumption on internal factors that do not have anything to do directly with loss data history, such as the kind of staff turnover that is prevalent, the kind of failure causality the system encounters, and what kind of environment is in place. Consequently, it is up to each bank to decide which one would enable it to arrive at a lesser capital charge, whilst satisfying the regulators' requirements.

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Those who support the scorecard approach as the 'best' method claim that it can measure operational risks better than the other approaches, as it relies on forward-looking risk indicators, in addition to assessing the environment qualitatively. It also has a better capability in incentivizing managers to reduce risks. For banks that cannot put their hands on adequate historical loss data can use the scorecard method to arrive correctly at the required capital charges. It is also easier to make adjustments using thus approach when the requirements of the regulators change and as banks evolve in the future.

Below is a table that will demonstrate how scorecard is much better in giving estimates of future losses based on whatever historical data is available by making a simple comparison with the other models (see table 3.7).

Types of data included in different AMA Models			
Model	**Historical Loss Data**	**Quantitative Risk Indicators**	**Qualitative Control Assess**
Internal Modeling Approach	✔		
Loss Distribution Approach	✔		
Scorecard Approach	✔	✔	✔

Table 3.7: Types of data in AMA model - **Source:** PA Consulting (2004)

This shows that the scorecard can take the assessments a notch further and includes quantitative risk indicators as well as qualitative control assessments. Relying heavily on historical data can lead to a failure by not being able to predict losses that may occur in the future. Whereas the scorecard depends on the quantitative as well as qualitative risk indicators that enable it to assess losses beforehand.

Fallouts of this method include failure to adapt to changes in the external environment due to the use of historical data. This means reaction to any losses by tightening controls so that they do not occur again. Furthermore, banks may have introduced new products, markets, technologies etc with that will not be reflected in the historical data

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This is a strong argument that the opponents cited in the score card mechanism actually address such issues while measuring the premises and security risks. They claim that it is possible to examine where the crime rate stands in a given community and the kind of measures the bank introduced. While doing the assessment, if the scorecard method encounters any changes it could immediately introduce it into the prediction, whereas the historical data users will take them years to encounter this incident and whatever they introduce would not be effective.

The scorecard method attaches the different weights to each of the risk drivers. The scorecard is also subjective because it is not possible to know what each factor could be and what key role each one them can play. The supporters of the scorecard using also historical data admit that one way to find the relationship of the factors used in such events and business lines is by testing trends over many years.

Nevertheless, there are factors that indicate what the operational risk in the short term will be which is missing from the other methods. A good example cited is when staff turnover is high which may lead to inexperienced staff running sensitive tasks. Hence, using both IMA and LDA will not be effective as they are anchored in the past and do not have mechanisms yet that will enable them to look at what is happening in the immediate future. However, it is possible to defy this claim by highlighting the fact that scenario analysis is part of the LDA framework. This means that experts can provide their recommendations and then incorporate the same into the LDA model that gives it robustness.

Scorecard supporters also experienced stronger incentives and better tools for managers to deal with operational risks. Accordingly, the point again stresses that the other methods' use of historical data pattern in assessing the risks could take many years and any kind of reduction introduced could not result in an immediate lower capital charge allocation.

This could result in depriving managers to integrate into their assessment short-term changes in staff, systems, or processes. As a result, scorecards are different as they create an immediate linkage between measures that mitigate risks and that will lead to capital charge reductions. The implication of such an understanding is that there is no need to wait for many years in order to introduce a change in the environment.

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These measures are part of the LDA and will be defied in the next section. The model incorporates expert's advice and suggestions in ways wherein the capital charge calculated will include these current problems and trends. Yet, the fact that scorecard allows managers to take measures according to the findings might be one of its advantages, because the incentive to make managers take immediate measures to reduce risk might be absent from both methods as they are both heavily reliant on historical loss data.

This is considered a shortage of the scenario analysis method. Furthermore, the scorecard proponents claim that tools available in the method can make big differences since managers do not have to wait for years to introduce measures that will mitigate risks. Both methods do not have a mechanism that will makes mangers take immediate measures to reduce risk.The "what-if" question where the presumption is to enable managers to take immediate action on their findings if there is a need to introduce measures that will mitigate risks. The capability is also available in the scenario analysis of LDA and it is up to managers to evaluate which method will be effective since AMA is open for decision makers of those in charge where the only requirement is to meet the regulator's requirement.

The scorecard approach is a two throng capability where on one hand it calculates accurately the capital charge and on the other it introduces changes for what may happen in the future. Another advantage highlighted is the ease and flexibility while implementing the model. It is neither expensive, unnecessarily difficult, nor, time consuming when compared with the other two methods.

The table below shows comparatively why the other AMA models (see table 3.8) fall short and are difficult to implement. Even if all methods require data, the data scorecard method is dependent upon is not historical (can go back up to five years), instead it is data well-run banks keep as part of their current operations.

Implementation factors in different AMA models

Model	**Implementation factors**				
	Time	**Cost**	**Need for loss data**	**Need for resources**	**Management buy-in**
Internal Modeling Approach	Medium	Low to medium	Large	Small	Low

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Loss Distribution Approach	Long	Medium to high	Very large	Medium	Very low
Scorecard Approach	Short to medium	Medium to high	Medium	Large	High

Table 3.8: Implementation factors in AMA model - **Source:** PA Consulting (2004)

Furthermore, when looking at the time and the cost involved, scorecard methods are less expensive for the banks that implement it. However, when looking at the work process the scorecard might involve more staff than the other two models. The other two models can be handled by a centralized team that is made up of fewer staff since the major task is in collecting data. Scorecard method involves not only many experts, but also all business units' participation in constructing the scorecard. This involves a huge number of people.

In spite of all this, the main advantage highlighted is what is labeled as "management buy-in" where there is a failure in the part of the management to understand or trust the statistical model applied in both IMA and LDA approaches. It is also not possible to visualize how it will enable the management team to run their business effectively so that things will be different for the coming years as both systems are focusing on the amount of capital charge involved.

If the bank brings it down, it means they have done a good job. What the scorecard approach brings to the fore is its common sense approach, inputs that are easily recognizable, and an immediate feedback that requires action. This makes it better suited for most banks. The following table demonstrates the scorecard approach in terms of adapting to changing conditions (see table 3.9).

Response of AMA models to changes in environment		
Type of change	**Loss history-based approach (IMA /LDA)**	**Scorecard approach**
New Business Line (eg by acquisition)	Need to collect loss history for this business - may take years if this is not immediately available	Scorecards can be applied immediately if basic data available - should take only weeks / months
New type of risk (eg e-commerce related)	Need to collect loss history for this risk - may take years if this is not immediately available	New scorecard can be developed in weeks / months based on common sense and available data
Additional Data Source	Can be incorporated if data is loss	Can be incorporated, whatever the

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identified	history	type of data
More advanced Model Developed (eg causal modeling)	Advanced model can replace loss data approach for one or more business lines	Advanced model can replace scorecard approach for one or more business lines

Table 3.9: Response to AMA models - **Source:** PA Consulting

Even if scorecard model is as new as the other AMA approaches, it has been in use by some banks for some time now and the findings are:

- It was possible to reduce risk and losses identified using the scorecard model that proved profitable;
- The introduction of a much fortified risk management culture where top-bottom involvement was enhanced;
- To be in a position to introduce a better risk control environment that leads to better returns in stock markets;

3.14. Key steps in modeling Loss Distribution Approach

According to Carol (2003) there is currently no standard or regulatory approved methodology for the LDA. The steps in a typical approach are summarized in figure 3.8. The first step is determining the rules and parameters and by completing this step we design and establish a clear structure, rules and responsibilities, and develop a comprehensive guideline. Then, bank has to assemble and validate input data. In the third step and once the input into the model has been sufficiently vetted and understood, the severity, frequency and aggregate distributions can be constructed.

One of the key parts of these steps is collection process which covered multiple sources of data across different risk categories. Some events had to be manually input into the database, others were collected in spreadsheets, and some were retrieved as feeds from existing bank systems. Once the data were collected, they had to be validated. To verify the accuracy of the aggregation process into the central database, the number of data points entered was checked against the number from each source, the total amount in the database was compared to the total amount from each source, and a search was performed to eliminate duplicates. Other steps are equally important in modeling LDA.

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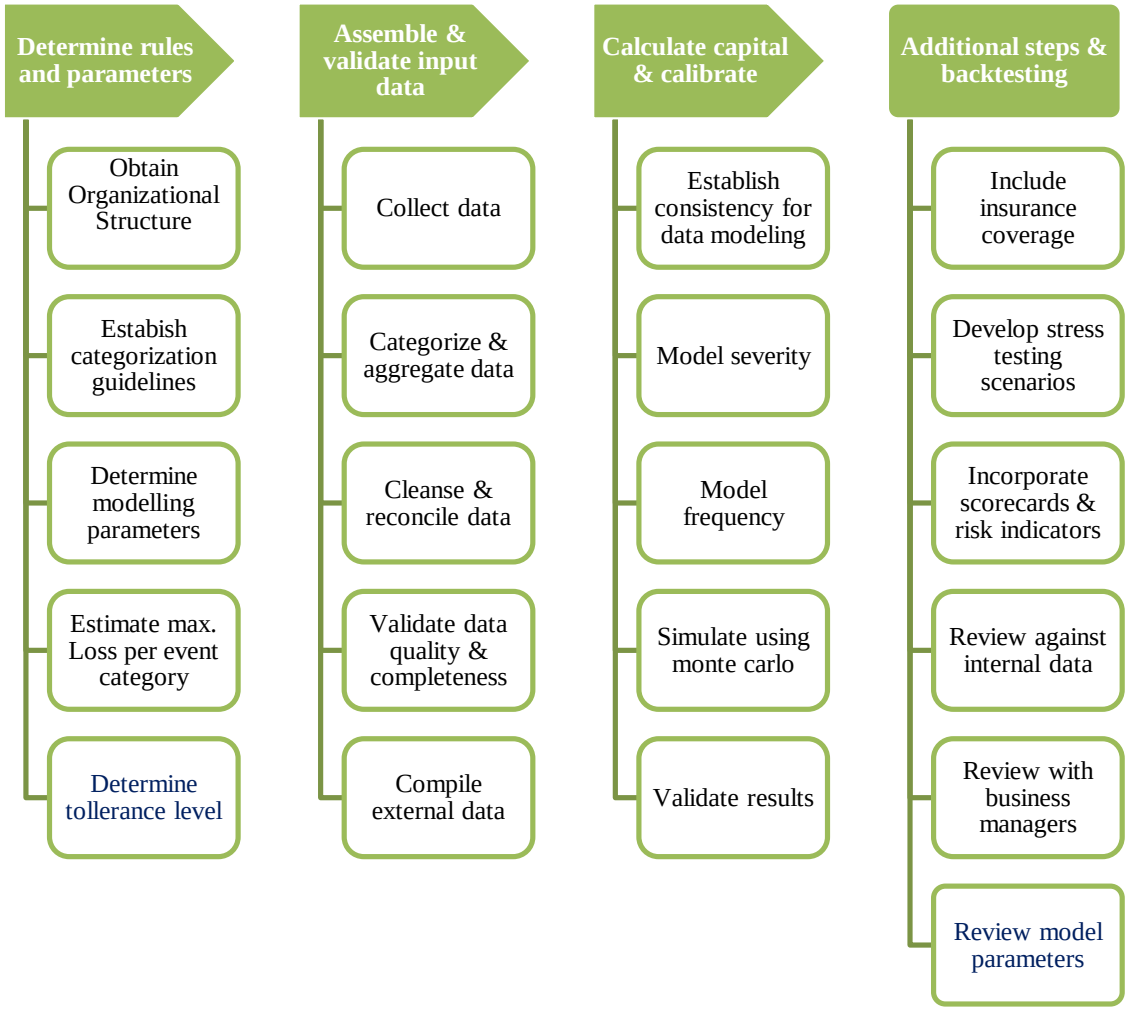

Figure: 3.9: Enhanced typical approach to building an LDA model (*Carol Alexander etl, 2003)*

3.15. Summary

Operational risk was not a serious challenge before high-profile cases started changing the landscape. The major focus was on the kind of risk that is prevalent in the market and credit sectors because the losses experienced in those sectors were significant. What this brought to the fore was regulatory control that requires observation to avoid fallout since the regulators could go to any length to make sure the implementation is according based on their requirements.

Since financial establishments had to adhere to these rules, without considering any of the merits that will percolate their way by simply doing their job systematically, they had to find effective and economical means to implement the so called ‘regulations’.

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That was when it became obvious that operational risk also requires some kind of a comprehensive and structured approach in order to predict what kind of capital charge it will bring around, as well as mitigating or avoiding the risks. It was not an easy task to bring this obligatory undertaking to fruition from the time banks started to give special consideration to operation risk management and is still grappling with the challenge. To make things worse the regulators who came up with Basel I and Basel II Accords have a deadline in place and banks would have to start implementing the regulations on a firm-wide basis.

The process is not getting considerable help from system's technology because no one is able to come up with a solution that will make the risk assessment process more manageable than it is now. This demonstrates that there is some learning curve for those in charge of software designing, which will take time even if everyone is optimistic to see a positive result in three to five years time.

Some of the reasons for that could be due to the high level of expectations from prevalent systems that disseminates the right kind of information in the existing culture and it is not difficult to see how challenging that will be to integrate with any kind of IT system. Collecting and sorting out loss data might also be difficult to automate. Then comes the measuring process followed by the presentation to the board of directors, as well as the management team. Here, the number of groups that want to see the final tally will be high and could include various committees that include regulators, the audit team, as well as owners of businesses might want to know what the final outcome is. To make things complicated the system might have to allow those who are in charge, mostly managers, to track any improvements and that might involve people, systems, process, environment etc., so that they will be in a position to take measures to reduce or eliminate risks.

Until there is a technology that will accomplish all of this, the capital charge calculation will be tedious, as the other alternative is to use the available formulae and statistics that take time. It is not only time, the accuracy level that might not be where everyone wants it to be, although with high diligence it is possible to arrive at the best approximation of what the capital charge would be.

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In spite of the prevalent problems, the focus would shift to the overall performance of a given financial establishment that must show reliable outcomes for the stakeholders. It is not possible to attain such performance unless there is means of communicating the direction in which the business will be talking to those in charge of the various business lines in a given firm. There is also another worry, which is the direction the firm will be taking in the future as far as competitiveness, profitability, and risk reduction or elimination is concerned. When that is visualized and some effort is undergone to implement it, there is another need, which is what the Basel II Accord is trying to accomplish. As far as the efforts to introduce some kind of a global accord among financial establishments are concerned, where all of them if possible would share similar values in the future.

That does not necessarily mean compromising competitiveness at any level, although a synergy to work together to reduce risk is the experts' recommendation. This will make it possible across the board to bring down the size of the capital charges that every bank puts aside on yearly basis and that are not generating any income. Consequently, until the prevalent problems are dealt with, where an advanced technology gives the industry and those in charge some kind of a break, while at the same time it promises to put more revenue in the pockets of the stakeholders, the existing system would have to continue to do what it is doing currently. The major focus should be on releasing some of the capital that is locked away without availing any benefits.

Finally, LDA is one of the preferred approaches to quantify operational risk losses and calculate capital charges under AMA by several researchers (Appendix IV) and banking industry professionals in the last decade.

In conclusion, despite of a few disadvantages highlighted above, LDA has considerable advantages outweigh the disadvantages and it is one of the 'preferred' approach by Basel Committee and other professional bodies. Moving from simple approaches like Basic Indicator to advanced approaches like LDA under AMA save considerable amount of capital. Thus the risk weighted assets related to Operational Risk will be lower than simple / conservative approaches.

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Chapter IV
Data Analysis and Hypothesis Testing

Banking industry is faced with different risks, which pose serious threat to the success of banking entities in the industry if not carefully managed. Operational risk is one of the risks that banks are faced with in the banking industry. Banking institutions are normally are exposed to financial losses related but not limited to conspiracies like embezzlement and loan fraud and mistakes related to regulation breach and computer failure. Such risk can lead to great losses hence the need to ensure risk management.

This research was to investigate the quantifying of operational risk within banks according to Basel II. Quantitative research approach was employed whereby closed ended questionnaires were employed in the research to collect primary data from respondents. Respondents that participated in this research served in management positions such as chief risk officer, risk manager, operational risk manager, operational risk analyst and operational risk officer. The total number of respondents that participated in the research is 100. The survey was conducted in 2011 and limited to UAE Banks only.

4.1.Data Analysis and Hypotheses testing

This study expects to provide recommendations on operational risk management and using Loss Distribution Approach “LDA” approach under Advanced Measurement Approach “AMA” to calculate capital charges. To analyze the collected information different methods such as Univariate and Bivariate (Cross Tabs) analysis is used.

Hypothesis testing is the basic from of statistical inference. Its objective is to determine whether or not sample data support a belief (i.e hypothesis) about the population (s) from which the sample(s) is drawn. One-way analysis of variance is used to test the difference between the means of the groups of variables (multiple testing). In research, the tests were used to make inferences relating to the dimensions sub-groups and their tendency to make any distinction to the safety status. This is done at the 0.05 level of significance. Variable normality and Homogeneity is an important condition for one-way ANOVA (Analysis Of Variance), because like all parametric procedures, one-

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way ANOVA assumes 'normality'. In addition to above A Pearson correlation test was applied using SPSS to two hypotheses.

4.2. Univariate statistics

Univariate method for analyzing data on a single variable at a time has been used in this section.

Table 4.1 illustrates that about 41% of the participants were of the age 21-30 Years.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	21-30 years	41	41.0	41.0	41.0
	31-40 years	32	32.0	32.0	73.0
	40 years and above	27	27.0	27.0	100.0
	Total	100	100.0	100.0	

Table 4.1: Age

Table 4.2 illustrates that about 82% of the participants were Males.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	82	82.0	82.0	82.0
	Female	18	18.0	18.0	100.0
	Total	100	100.0	100.0	

Table 4.2: Gender

Table 4.3 illustrates that about 45% of the participant's qualification is Post-graduate degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Senior Secondary	2	2.0	2.0	2.0
	Graduate	38	38.0	38.0	40.0
	Post-graduate	45	45.0	45.0	85.0
	Masters	7	7.0	7.0	92.0
	Other	8	8.0	8.0	100.0
	Total	100	100.0	100.0	

Table 4.3: Qualification

Table 4.4 illustrates that about 32% of the participants were Operational Risk Managers.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Chief Risk Officer	11	11.0	11.0	11.0
	Risk Manager	30	30.0	30.0	41.0
	Operational Risk Manager	32	32.0	32.0	73.0
	Operational Risk Analyst	18	18.0	18.0	91.0
	Operational Risk Officer	9	9.0	9.0	100.0
	Total	100	100.0	100.0	

Table 4.4: Your Current Position

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Table 4.5 illustrates that about 42% of the participants had experience of three to five years in Risk Management.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than three years	30	30.0	30.0	30.0
	Three years to Five years	42	42.0	42.0	72.0
	Five to Ten years	26	26.0	26.0	98.0
	More than Ten years	2	2.0	2.0	100.0
	Total	100	100.0	100.0	

Table 4.5: Experience in Risk Management

Table 4.6 illustrates that about 49% of the participants were representing retail type of bank.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Retail	49	49.0	49.0	49.0
	Commercial	45	45.0	45.0	94.0
	Investment	4	4.0	4.0	98.0
	Merchant	2	2.0	2.0	100.0
	Total	100	100.0	100.0	

Table 4.6: Indicate the type of bank that you are representing

Your bank's current approach towards operational risk management.

Table 4.7 illustrates that about 39% of the participant's rate that credit risk is to a lesser degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
	Not at all	0	0	0	0
	To a lesser degree	39	39.0	39.0	39.0
Valid	To a fair degree	33	33.0	33.0	72.0
	To a high degree	27	27.0	27.0	99.0
	Totally	1	1.0	1.0	100.0
	Total	100	100.0	100.0	

Table 4.7: Credit risk

Table 4.8 illustrates that about 36% of the participant's rate that Market risk is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	6	6.0	6.0	6.0
	To a lesser degree	32	32.0	32.0	38.0
	To a fair degree	36	36.0	36.0	74.0
	To a high degree	20	20.0	20.0	94.0
	Totally	6	6.0	6.0	100.0
	Total	100	100.0	100.0	

Table 4.8: Market risk

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Table 4.9 illustrates that about 30% of the participant's rate that liquidity risk is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	10	10.0	10.0	10.0
	To a lesser degree	29	29.0	29.0	39.0
	To a fair degree	30	30.0	30.0	69.0
	To a high degree	29	29.0	29.0	98.0
	Totally	2	2.0	2.0	100.0
	Total	100	100.0	100.0	

Table 4.9: Liquidity risk

Table 4.10 illustrates that about 38% of the participant's rate that interest rate risk is to a lesser degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	0	0.0	0.0	0.0
	To a lesser degree	38	38.0	38.0	38.0
	To a fair degree	33	33.0	33.0	71.0
	To a high degree	27	27.0	27.0	98.0
	Totally	2	2.0	2.0	100.0
	Total	100	100.0	100.0	

Table 4.10: Interest rate risk

Table 4.11 illustrates that about 32% of the participant's rate that country risk is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	6	6.0	6.0	6.0
	To a lesser degree	23	23.0	23.0	29.0
	To a fair degree	32	32.0	32.0	61.0
	To a high degree	26	26.0	26.0	87.0
	Totally	13	13.0	13.0	100.0
	Total	100	100.0	100.0	

Table 4.11: Country risk

Table 4.12 illustrates that about 28% of the participant's rate that reputation risk is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	9	9.0	9.0	9.0
	To a lesser degree	25	25.0	25.0	34.0
	To a fair degree	28	28.0	28.0	62.0
	To a high degree	22	22.0	22.0	84.0
	Totally	16	16.0	16.0	100.0
	Total	100	100.0	100.0	

Table 4.12: Reputation risk

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Table 4.13 illustrates that about 32% of the participant's rate that legal risk is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	6	6.0	6.0	6.0
	To a lesser degree	22	22.0	22.0	28.0
	To a fair degree	32	32.0	32.0	60.0
	To a high degree	26	26.0	26.0	86.0
	Totally	14	14.0	14.0	100.0
	Total	100	100.0	100.0	

Table 4.13: Legal risk

Table 4.14 illustrates that about 31% of the participant's rate that operational risk is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	12	12.0	12.0	12.0
	To a lesser degree	18	18.0	18.0	30.0
	To a fair degree	31	31.0	31.0	61.0
	To a high degree	30	30.0	30.0	91.0
	Totally	9	9.0	9.0	100.0
	Total	100	100.0	100.0	

Table 4.14: Operational risk

To what degree has your organization implemented the following as primary factors of operational risk?

Table 4.15 illustrates that about 35% of the participant's rate that people is to a high degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	0	0.0	0.0	0.0
	To a lesser degree	34	34.0	34.0	34.0
	To a fair degree	29	29.0	29.0	63.0
	To a high degree	35	35.0	35.0	98.0
	Totally	2	2.0	2.0	100.0
	Total	100	100.0	100.0	

Table 4.15: People

Table 4.16 illustrates that about 33% of the participant's rate that processes is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	5	5.0	5.0	5.0
	To a lesser degree	22	22.0	22.0	27.0
	To a fair degree	33	33.0	33.0	60.0
	To a high degree	27	27.0	27.0	87.0
	Totally	13	13.0	13.0	100.0
	Total	100	100.0	100.0	

Table 4.16: Processes

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Table 4.17 illustrates that about 29% of the participant's rate that system is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	18	18.0	18.0	18.0
	To a lesser degree	21	21.0	21.0	39.0
	To a fair degree	29	29.0	29.0	68.0
	To a high degree	23	23.0	23.0	91.0
	Totally	9	9.0	9.0	100.0
	Total	100	100.0	100.0	

Table 4.17: Systems

Table 4.18 illustrates that about 39% of the participant's rate that External factors (e.g. natural disasters, fraud, political pressures etc.) is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	20	20.0	20.0	20.0
	To a lesser degree	26	26.0	26.0	46.0
	To a fair degree	28	28.0	28.0	74.0
	To a high degree	20	20.0	20.0	94.0
	Totally	6	6.0	6.0	100.0
	Total	100	100.0	100.0	

Table 4.18: External factors (e.g. natural disasters, fraud, political pressures etc.)

To what degree has your organisation recognized the following people exposures as an important part of operational risk?

Table 4.19 illustrates that about 32% of the participant's rate that Incompetence is to a high degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	3	3.0	3.0	3.0
	To a lesser degree	31	31.0	31.0	34.0
	To a fair degree	30	30.0	30.0	64.0
	To a high degree	32	32.0	32.0	96.0
	Totally	4	4.0	4.0	100.0
	Total	100	100.0	100.0	

Table 4.19: Incompetence

Table 4.20 illustrates that about 29% of the participant's rate that Negligence is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	10	10.0	10.0	10.0
	To a lesser degree	25	25.0	25.0	35.0
	To a fair degree	29	29.0	29.0	64.0
	To a high degree	20	20.0	20.0	84.0
	Totally	16	16.0	16.0	100.0
	Total	100	100.0	100.0	

Table 4.20: Negligence

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Table 4.21 illustrates that about 32% of the participant's rate that human error is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	5	5.0	5.0	5.0
	To a lesser degree	22	22.0	22.0	27.0
	To a fair degree	32	32.0	32.0	59.0
	To a high degree	26	26.0	26.0	85.0
	Totally	15	15.0	15.0	100.0
	Total	100	100.0	100.0	

Table 4.21: Human error

Table 4.22 illustrates that about 32% of the participant's rate that low morale is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	12	12.0	12.0	12.0
	To a lesser degree	18	18.0	18.0	30.0
	To a fair degree	32	32.0	32.0	62.0
	To a high degree	30	30.0	30.0	92.0
	Totally	8	8.0	8.0	100.0
	Total	100	100.0	100.0	

Table 4.22: Low morale

Table 4.23 illustrates that about 36% of the participant's rate that high staff turnover is to a lesser degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	1	1.0	1.0	1.0
	To a lesser degree	36	36.0	36.0	37.0
	To a fair degree	29	29.0	29.0	66.0
	To a high degree	33	33.0	33.0	99.0
	Totally	1	1.0	1.0	100.0
	Total	100	100.0	100.0	

Table 4.23: High staff turnover

Table 4.24 illustrates that about 35% of the participant's rate that Fraudulent/criminal activities by employees is to a lesser degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	1	1.0	1.0	1.0
	To a lesser degree	35	35.0	35.0	36.0
	To a fair degree	29	29.0	29.0	65.0
	To a high degree	34	34.0	34.0	99.0
	Totally	1	1.0	1.0	100.0
	Total	100	100.0	100.0	

Table 4.24: Fraudulent/criminal activities by employees

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To what degree has your organisation recognized the following process exposures as an important part of operational risk?

Table 4.25 illustrates that about 38% of the participant's rate that Errors in procedure/methodologies is to a lesser degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	25	25.0	25.0	25.0
	To a lesser degree	38	38.0	38.0	63.0
	To a fair degree	16	16.0	16.0	79.0
	To a high degree	16	16.0	16.0	95.0
	Totally	5	5.0	5.0	100.0
	Total	100	100.0	100.0	

Table 4.25: Errors in procedure/methodologies

Table 4.26 illustrates that about 31% of the participant's rate that Execution error is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	0	0.0	0.0	0.0
	To a lesser degree	25	25.0	25.0	25.0
	To a fair degree	31	31.0	31.0	56.0
	To a high degree	21	21.0	21.0	77.0
	Totally	23	23.0	23.0	100.0
	Total	100	100.0	100.0	

Table 4.26: Execution errors

Table 4.27 illustrates that about 32% of the participant's rate that Documentation errors is to a high degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	12	12.0	12.0	12.0
	To a lesser degree	13	13.0	13.0	25.0
	To a fair degree	24	24.0	24.0	49.0
	To a high degree	32	32.0	32.0	81.0
	Totally	19	19.0	19.0	100.0
	Total	100	100.0	100.0	

Table 4.27: Documentation errors

Table 4.28 illustrates that about 35% of the participant's rate that Product complexity is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	6	6.0	6.0	6.0
	To a lesser degree	23	23.0	23.0	29.0
	To a fair degree	35	35.0	35.0	64.0
	To a high degree	24	24.0	24.0	88.0
	Totally	12	12.0	12.0	100.0
	Total	100	100.0	100.0	

Table 4.28: Product complexity

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Table 4.29 illustrates that about 35% of the participant's rate that Security risk is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	7	7.0	7.0	7.0
	To a lesser degree	18	18.0	18.0	25.0
	To a fair degree	35	35.0	35.0	60.0
	To a high degree	24	24.0	24.0	84.0
	Totally	16	16.0	16.0	100.0
	Total	100	100.0	100.0	

Table 4.29: Security risks

To what degree has your organisation recognized the following system exposures as an important part of operational risk?

Table 4.30 illustrates that about 29% of the participant's rate that System infiltration is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	12	12.0	12.0	12.0
	To a lesser degree	16	16.0	16.0	28.0
	To a fair degree	29	29.0	29.0	57.0
	To a high degree	27	27.0	27.0	84.0
	Totally	16	16.0	16.0	100.0
	Total	100	100.0	100.0	

Table 4.30: System infiltration

Table 4.31 illustrates that about 29% of the participant's rate that System failures is to a lesser & fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	24	24.0	24.0	24.0
	To a lesser degree	29	29.0	29.0	53.0
	To a fair degree	29	29.0	29.0	82.0
	To a high degree	14	14.0	14.0	96.0
	Totally	4	4.0	4.0	100.0
	Total	100	100.0	100.0	

Table 4.31: System failures

Table 4.32 illustrates that about 35% of the participant's rate that fraud is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	2	2.0	2.0	2.0
	To a lesser degree	18	18.0	18.0	20.0
	To a fair degree	35	35.0	35.0	55.0
	To a high degree	29	29.0	29.0	84.0
	Totally	16	16.0	16.0	100.0
	Total	100	100.0	100.0	

Table 4.32: Fraud

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Table 4.33 illustrates that about 39% of the participant's rate that Programming errors is to a lesser degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	3	3.0	3.0	3.0
	To a lesser degree	21	21.0	21.0	24.0
	To a fair degree	34	34.0	34.0	58.0
	To a high degree	27	27.0	27.0	85.0
	Totally	15	15.0	15.0	100.0
	Total	100	100.0	100.0	

Table 4.33: Programming errors

Table 4.34 illustrates that about 35% of the participant's rate that information risk is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	2	2.0	2.0	2.0
	To a lesser degree	18	18.0	18.0	20.0
	To a fair degree	35	35.0	35.0	55.0
	To a high degree	24	24.0	24.0	79.0
	Totally	21	21.0	21.0	100.0
	Total	100	100.0	100.0	

Table 4.34: Information risk

Table 4.35 illustrates that about 37% of the participant's rate that telecommunication risk is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	8	8.0	8.0	8.0
	To a lesser degree	10	10.0	10.0	18.0
	To a fair degree	37	37.0	37.0	55.0
	To a high degree	33	33.0	33.0	88.0
	Totally	12	12.0	12.0	100.0
	Total	100	100.0	100.0	

Table 4.35: Telecommunication risk

Table 4.36 illustrates that about 33% of the participant's rate that obsolescence of systems is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	8	8.0	8.0	8.0
	To a lesser degree	21	21.0	21.0	29.0
	To a fair degree	33	33.0	33.0	62.0
	To a high degree	22	22.0	22.0	84.0
	Totally	16	16.0	16.0	100.0
	Total	100	100.0	100.0	

Table 4.36: Obsolescence of systems

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Table 4.37 illustrates that about 38% of the participant's rate that their organizations recognize the important of implementing a formal risk management process to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	5	5.0	5.0	5.0
	To a lesser degree	16	16.0	16.0	21.0
	To a fair degree	38	38.0	38.0	59.0
	To a high degree	29	29.0	29.0	88.0
	Totally	12	12.0	12.0	100.0
	Total	100	100.0	100.0	

Table 4.37: To what degree does your organization recognize the important of implementing a formal risk management process?

Table 4.38 illustrates that about 36% of the participant's rate that their organization adopted a specific definition for operational risk is to a fair degree. Following bar graph also shows taller bar for the same.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	0	0.0	0.0	0.0
	To a lesser degree	19	19.0	19.0	19.0
	To a fair degree	36	36.0	36.0	55.0
	To a high degree	29	29.0	29.0	84.0
	Totally	16	16.0	16.0	100.0
	Total	100	100.0	100.0	

Table 4.38: To what degree has your organization adopted a specific definition for operational risk?

Table 4.39 illustrates that about 33% of the participant's rate that risk identification is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	8	8.0	8.0	8.0
	To a lesser degree	18	18.0	18.0	26.0
	To a fair degree	35	35.0	35.0	61.0
	To a high degree	27	27.0	27.0	88.0
	Totally	12	12.0	12.0	100.0
	Total	100	100.0	100.0	

Table 4.39: Risk identification

Table 4.40 illustrates that about 27% of the participant's rate that risk evaluation is to a fair degree.

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		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	10	10.0	10.0	10.0
	To a lesser degree	19	19.0	19.0	29.0
	To a fair degree	27	27.0	27.0	56.0
	To a high degree	24	24.0	24.0	80.0
	Totally	20	20.0	20.0	100.0
	Total	100	100.0	100.0	

Table 4.40: Risk evaluation

Table 4.41 illustrates that about 33% of the participant's rate that risk control is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	1	1.0	1.0	1.0
	To a lesser degree	30	30.0	30.0	31.0
	To a fair degree	34	34.0	34.0	65.0
	To a high degree	20	20.0	20.0	85.0
	Totally	15	15.0	15.0	100.0
	Total	100	100.0	100.0	

Table 4.41: Risk control

Table 4.42 illustrates that about 32% of the participant's rate that risk financing is to a high degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	0	0.0	0.0	0.0
	To a lesser degree	19	19.0	19.0	19.0
	To a fair degree	26	26.0	26.0	45.0
	To a high degree	32	32.0	32.0	77.0
	Totally	23	23.0	23.0	100.0
	Total	100	100.0	100.0	

Table 4.42: Risk financing

Table 4.43 illustrates that about 34% of the participant's rate that their organization recognizes the importance of aligning an operational risk management process with its strategy and objectives is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	5	5.0	5.0	5.0
	To a lesser degree	30	30.0	30.0	35.0
	To a fair degree	34	34.0	34.0	69.0
	To a high degree	18	18.0	18.0	87.0
	Totally	13	13.0	13.0	100.0
	Total	100	100.0	100.0	

Table 4.43: To what degree does your organization recognize the importance of aligning an operational risk management process with its strategy and objectives?

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Table 4.44 illustrates that about 33% of the participant's rate that their organization involve internal audit to manage operational risk is to a high degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	1	1.0	1.0	1.0
	To a lesser degree	20	20.0	20.0	21.0
	To a fair degree	24	24.0	24.0	45.0
	To a high degree	33	33.0	33.0	78.0
	Totally	22	22.0	22.0	100.0
	Total	100	100.0	100.0	

Table 4.44: To what degree does your organization involve internal audit to manage operational risk?

Table 4.45 illustrates that about 36% of the participant's rate that their organization involved business managers in an operational risk management processes to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	0.	0.0	0.0	0.0
	To a lesser degree	30	30.0	30.0	30.0
	To a fair degree	36	36.0	36.0	66.0
	To a high degree	22	22.0	22.0	88.0
	Totally	12	12.0	12.0	100.0
	Total	100	100.0	100.0	

Table 4.45: To what degree has your organization involved business managers in an operational risk management process?

Table 4.46 illustrates that about 33% of the participant's rate that Operational risk is defined as the risk of loss resulting from inadequate of failed internal processes, people and system or from external events is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	10	10.0	10.0	10.0
	To a lesser degree	19	19.0	19.0	29.0
	To a fair degree	33	33.0	33.0	62.0
	To a high degree	25	25.0	25.0	87.0
	Totally	13	13.0	13.0	100.0
	Total	100	100.0	100.0	

Table 4.46: Operational risk is defined as the risk of loss resulting from inadequate of failed internal processes, people and system or from external events.

Table 4.47 illustrates that about 39% of the participant's rate that LDA is a statistical/actuarial approach for computing aggregate loss distributions is to a fair degree.

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		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	1	1.0	1.0	1.0
	To a lesser degree	9	9.0	9.0	10.0
	To a fair degree	39	39.0	39.0	49.0
	To a high degree	35	35.0	35.0	84.0
	Totally	16	16.0	16.0	100.0
	Total	100	100.0	100.0	

Table 4.47: LDA is a statistical/actuarial approach for computing aggregate loss distributions

Table 4.48 illustrates that about 38% of the participant's rate that LDA is better than the other methods to quantify operational risk while using AMA is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	3	3.0	3.0	3.0
	To a lesser degree	9	9.0	9.0	12.0
	To a fair degree	38	38.0	38.0	50.0
	To a high degree	36	36.0	36.0	86.0
	Totally	14	14.0	14.0	100.0
	Total	100	100.0	100.0	

Table 4.48: LDA is better than the other methods to quantify operational risk while using AMA.

Table 4.49 illustrates that about 33% of the participant's rate that the bank uses LDA to identify and estimate frequency and severity of losses is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	33	33.0	33.0	33.0
	To a lesser degree	34	34.0	34.0	67.0
	To a fair degree	19	19.0	19.0	86.0
	To a high degree	8	8.0	8.0	94.0
	Totally	6	6.0	6.0	100.0
	Total	100	100.0	100.0	

Table 4.49: The bank uses LDA to identify and estimate frequency and severity of losses?

Table 4.50 illustrates that about 35% of the participant's rate that the bank uses the methods available through LDA to check data completeness of loss data among the participating members is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	22	22.0	22.0	22.0
	To a lesser degree	49	49.0	49.0	71.0
	To a fair degree	18	18.0	18.0	89.0
	To a high degree	5	5.0	5.0	94.0
	Totally	6	6.0	6.0	100.0
	Total	100	100.0	100.0	

Table 4.50: The bank uses the methods available through LDA to check data completeness of loss data among the participating members?

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Table 4.51 illustrates that about 36% of the participant's rate there is an effective tracking method at the bank that works well with LDA is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	45	45.0	45.0	45.0
	To a lesser degree	26	26.0	26.0	71.0
	To a fair degree	15	15.0	15.0	86.0
	To a high degree	8	8.0	8.0	94.0
	Totally	6	6.0	6.0	100.0
	Total	100	100.0	100.0	

Table 4.51: There is an effective tracking method at the bank that works well with LDA

Table 4.52 illustrates that about 32% of the participant's rate that the collected data works with LDA and this tells you your data collection method is effective is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	27	27.0	27.0	27.0
	To a lesser degree	49	49.0	49.0	76.0
	To a fair degree	18	18.0	18.0	94.0
	To a high degree	4	4.0	4.0	98.0
	Totally	2	2.0	2.0	100.0
	Total	100	100.0	100.0	

Table 4.52: The collected data works with LDA and this tells you your data collection method is effective

Table 4.53 illustrates that about 39% of the participant's rate that there are differences I notice across different business lines at our bank and other similar institutions is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	1	1.0	1.0	1.0
	To a lesser degree	9	9.0	9.0	10.0
	To a fair degree	39	39.0	39.0	49.0
	To a high degree	35	35.0	35.0	84.0
	Totally	16	16.0	16.0	100.0
	Total	100	100.0	100.0	

Table 4.53: There are differences I notice across different business lines at our bank and other similar institutions

Table 4.54 illustrates that about 38% of the participant's rate that arriving at the appropriate threshold to capture operational loss and near misses is very important is to a fair degree.

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		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	3	3.0	3.0	3.0
	To a lesser degree	9	9.0	9.0	12.0
	To a fair degree	38	38.0	38.0	50.0
	To a high degree	36	36.0	36.0	86.0
	Totally	14	14.0	14.0	100.0
	Total	100	100.0	100.0	

Table 4.54: Arriving at the appropriate threshold to capture operational loss and near misses is very important.

Table 4.55 illustrates that about 33% of the participant's rate that the Operational events across the various business lines at your bank are handled according to what AMA recommends is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	3	3.0	3.0	3.0
	To a lesser degree	19	19.0	19.0	22.0
	To a fair degree	33	33.0	33.0	55.0
	To a high degree	24	24.0	24.0	79.0
	Totally	21	21.0	21.0	100.0
	Total	100	100.0	100.0	

Table 4.55: Operational events across the various business lines at your bank are handled according to what AMA recommends

Table 4.56 illustrates that about 35% of the participant's rate that the ratio of supervisors to staff at your bank is correct is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	4	4.0	4.0	4.0
	To a lesser degree	22	22.0	22.0	26.0
	To a fair degree	35	35.0	35.0	61.0
	To a high degree	22	22.0	22.0	83.0
	Totally	17	17.0	17.0	100.0
	Total	100	100.0	100.0	

Table 4.56: The ratio of supervisors to staff at your bank is correct.

Table 4.57 illustrates that about 36% of the participant's rate that the bank has a unit that handles confidential client information is to a fair degree. It is worth to mention 34% of the participant's rate the bank has a unit to handles confidential information is to a higher degree.

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		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	6	6.0	6.0	6.0
	To a lesser degree	8	8.0	8.0	14.0
	To a fair degree	36	36.0	36.0	50.0
	To a high degree	34	34.0	34.0	84.0
	Totally	16	16.0	16.0	100.0
	Total	100	100.0	100.0	

Table 4.57: Your bank has a unit that handles confidential client information.

Table 4.58 illustrates that about 32% of the participant's rate that the bank defines operational risk according to what AMA recommends is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	12	12.0	12.0	12.0
	To a lesser degree	28	28.0	28.0	40.0
	To a fair degree	32	32.0	32.0	72.0
	To a high degree	17	17.0	17.0	89.0
	Totally	11	11.0	11.0	100.0
	Total	100	100.0	100.0	

Table 4.58: Your bank defines operational risk according to what AMA recommends.

Table 4.59 illustrates that about 39% of the participant's rate that the bank's pursuing of quantification of operational risk as a positive measure is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	1	1.0	1.0	1.0
	To a lesser degree	9	9.0	9.0	10.0
	To a fair degree	39	39.0	39.0	49.0
	To a high degree	35	35.0	35.0	84.0
	Totally	16	16.0	16.0	100.0
	Total	100	100.0	100.0	

Table 4.59: You justify your bank's pursuing of quantification of operational risk as a positive measure.

Table 4.60 illustrates that about 38% of the participant's rate that there is going to be a loss at your bank, it would be because of inadequate or failed internal process is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	3	3.0	3.0	3.0
	To a lesser degree	9	9.0	9.0	12.0
	To a fair degree	38	38.0	38.0	50.0
	To a high degree	36	36.0	36.0	86.0
	Totally	14	14.0	14.0	100.0
	Total	100	100.0	100.0	

Table 4.60: If there is going to be a loss at your bank, it would be because of inadequate or failed internal process.

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Table 4.61 illustrates that about 32% of the participant's rate that there is going to be a loss at your bank, it would be because of people or system failure is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	12	12.0	12.0	12.0
	To a lesser degree	28	28.0	28.0	40.0
	To a fair degree	32	32.0	32.0	72.0
	To a high degree	17	17.0	17.0	89.0
	Totally	11	11.0	11.0	100.0
	Total	100	100.0	100.0	

Table 4.61: If there is going to be a loss at your bank, it would be because of people or system failure.

Table 4.62 illustrates that about 40% of the participant's rate that there is going to be fraud at your bank, it would be internal is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	1	1.0	1.0	1.0
	To a lesser degree	9	9.0	9.0	10.0
	To a fair degree	40	40.0	40.0	50.0
	To a high degree	35	35.0	35.0	85.0
	Totally	15	15.0	15.0	100.0
	Total	100	100.0	100.0	

Table 4.62: If there is going to be fraud at your bank, it would be internal.

Table 4.63 illustrates that about 42% of the participant's rate that the bank gathers more than one year's data is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	2	2.0	2.0	2.0
	To a lesser degree	6	6.0	6.0	8.0
	To a fair degree	42	42.0	42.0	50.0
	To a high degree	37	37.0	37.0	87.0
	Totally	13	13.0	13.0	100.0
	Total	100	100.0	100.0	

Table 4. 63: The bank gathers more than one year's data.

Table 4.64 illustrates that about 36% of the participant's rate that the bank has the ability to withstand business disruption is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	5	5.0	5.0	5.0
	To a lesser degree	9	9.0	9.0	14.0
	To a fair degree	36	36.0	36.0	50.0
	To a high degree	32	32.0	32.0	82.0
	Totally	18	18.0	18.0	100.0
	Total	100	100.0	100.0	

Table 4.64: Your bank has the ability to withstand business disruption.

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Table 4.65 illustrates that about 35% of the participant's rate that the model extreme events at your bank according to what AMA recommends are to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	26	26.0	26.0	26.0
	To a lesser degree	44	44.0	44.0	70.0
	To a fair degree	14	14.0	14.0	84.0
	To a high degree	6	6.0	6.0	90.0
	Totally	10	10.0	10.0	100.0
	Total	100	100.0	100.0	

Table 4.65: You model extreme events at your bank according to what AMA recommends.

Table 4.66 illustrates that about 31% of the participant's rate that there are technologies you incorporate in your decision making process that enables your bank to reduce risk is to a high degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	2	2.0	2.0	2.0
	To a lesser degree	14	14.0	14.0	16.0
	To a fair degree	28	28.0	28.0	44.0
	To a high degree	31	31.0	31.0	75.0
	Totally	25	25.0	25.0	100.0
	Total	100	100.0	100.0	

Table 4.66: There are technologies you incorporate in your decision making process that enables your bank to reduce risk

Table 4.67 illustrates that about 39% of the participant's rate that the bank promote sound internal policies and control procedures is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	0	0.0	0.0	0.0
	To a lesser degree	11	11.0	11.0	11.0
	To a fair degree	39	39.0	39.0	50.0
	To a high degree	30	30.0	30.0	80.0
	Totally	20	20.0	20.0	100.0
	Total	100	100.0	100.0	

Table 4.67: You promote sound internal policies and control procedures.

Table 4.68 illustrates that about 35% of the participant's rate that the bank motivate investment in operational risk infrastructure to reduce operational risk at your bank is to a fair degree.

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		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	4	4.0	4.0	4.0
	To a lesser degree	22	22.0	22.0	26.0
	To a fair degree	35	35.0	35.0	61.0
	To a high degree	22	22.0	22.0	83.0
	Totally	17	17.0	17.0	100.0
	Total	100	100.0	100.0	

Table 4.68: You motivate investment in operational risk infrastructure to reduce operational risk at your bank.

Table 4.69 illustrates that about 36% of the participant's rate that the bank relies on internal data, external data, and scenario analysis is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	6	6.0	6.0	6.0
	To a lesser degree	8	8.0	8.0	14.0
	To a fair degree	36	36.0	36.0	50.0
	To a high degree	34	34.0	34.0	84.0
	Totally	16	16.0	16.0	100.0
	Total	100	100.0	100.0	

Table 4. 69: Your bank relies on internal data, external data, and scenario analysis.

Table 4.70 illustrates that about 32% of the participant's rate that the bank has adequate insurance coverage or loss mitigation processes in place is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	12	12.0	12.0	12.0
	To a lesser degree	28	28.0	28.0	40.0
	To a fair degree	32	32.0	32.0	72.0
	To a high degree	17	17.0	17.0	89.0
	Totally	11	11.0	11.0	100.0
	Total	100	100.0	100.0	

Table 4.70: Your bank has adequate insurance coverage or loss mitigation processes in place.

Table 4.71 illustrates that about 39% of the participant's rate that the bank handles frequency distribution and severity distribution according to what AMA recommends is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	34	34.0	34.0	34.0
	To a lesser degree	26	26.0	26.0	60.0
	To a fair degree	13	13.0	13.0	73.0
	To a high degree	18	18.0	18.0	91.0
	Totally	9	9.0	9.0	100.0
	Total	100	100.0	100.0	

Table 4.71: Your bank handles frequency distribution and severity distribution according to what AMA recommends.

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Table 4.72 illustrates that about 32% of the participant's rate that the bank run statistical simulation to produce a loss distribution is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	12	12.0	12.0	12.0
	To a lesser degree	28	28.0	28.0	40.0
	To a fair degree	32	32.0	32.0	72.0
	To a high degree	17	17.0	17.0	89.0
	Totally	11	11.0	11.0	100.0
	Total	100	100.0	100.0	

Table 4.72: You run statistical simulation to produce a loss distribution.

Table 4.73 illustrates that about 40% of the participant's rate that you rely on KRIs while calculating the cost of operational risk at your bank is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	1	1.0	1.0	1.0
	To a lesser degree	9	9.0	9.0	10.0
	To a fair degree	40	40.0	40.0	50.0
	To a high degree	35	35.0	35.0	85.0
	Totally	15	15.0	15.0	100.0
	Total	100	100.0	100.0	

Table 4.73: You rely on KRIs while calculating the cost of operational risk at your bank.

Table 4.74 illustrates that about 42% of the participant's rate that the bank you belong to any group of banks, capital flows among the members freely is to a fair degree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	2	2.0	2.0	2.0
	To a lesser degree	6	6.0	6.0	8.0
	To a fair degree	42	42.0	42.0	50.0
	To a high degree	37	37.0	37.0	87.0
	Totally	13	13.0	13.0	100.0
	Total	100	100.0	100.0	

Table 4.74: If you belong to any group of banks, capital flows among the members freely.

Table 4.75 illustrates that about 36% of the participant's rate that Risk indicators play a role in your monitoring and gathering of internal, external, current and historical data is to a fair degree.

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		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	5	5.0	5.0	5.0
	To a lesser degree	9	9.0	9.0	14.0
	To a fair degree	36	36.0	36.0	50.0
	To a high degree	32	32.0	32.0	82.0
	Totally	18	18.0	18.0	100.0
	Total	100	100.0	100.0	

Table 4.75: Risk indicators play a role in your monitoring and gathering of internal, external, current and historical data

4.3. Bivariate statistics

In addition to univariate analysis a bivariate analysis has been done. Bivariate Statistical procedures used to describe the relationship between two variables. The primary focus is on the extent to which they covary, or vary together. Bivariate descriptive statistics involves simultaneously analyzing (comparing) two variables to determine if there is a relationship between the variables. This has been done with special focus on LDA.

From the following table (4.76) we can observe that 41.5% of the respondents who were aged between 21 – 30 years graded to a fair degree, 40.6% of the respondents of 31 – 40 years and 40 years and above age group graded to a high degree for LDA is a statistical/actuarial approach for computing aggregate loss distributions. The more the age of experts, the more they support LDA as actuarial approach for computing loss distributions.

		Age Group			Total
		21-30	31-40	+40	
LDA is a statistical/actuarial approach for computing aggregate loss distributions	Not at all	2.4%			1.0%
	To a lesser degree	12.2%	9.4%	3.7%	9.0%
	To a fair degree	41.5%	34.4%	40.7%	39.0%
	To a high degree	26.8%	40.6%	40.7%	35.0%
	Totally	17.1%	15.6%	14.8%	16.0%
Total		100.0%	100.0%	100.0%	100.0%

Table 4.76: LDA is a statistical/actuarial approach for computing aggregate loss distributions * Age Crosstabulation (% within Age)

From the following table (4.77) we can observe that 39.0% of the respondents who were aged between 21 – 30 years and 31 – 40 years graded to a lesser degree, 48.1% of the respondents who were 40 years and above age group graded not at all for the bank uses LDA to identify and estimate frequency and severity of losses. The more the age of

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experts, the less they support LDA to identify and estimate frequency and severity of losses.

		Age Group			Total
		21-30	31-40	+40	
LDA is better than the other methods to quantify operational risk while using AMA.	Not at all	31.7%	21.9%	48.1%	33.0%
	To a lesser degree	39.0%	40.6%	18.5%	34.0%
	To a fair degree	14.6%	25.0%	18.5%	19.0%
	To a high degree	9.8%	6.3%	7.4%	8.0%
	Totally	4.9%	6.3%	7.4%	6.0%
Total		100.0%	100.0%	100.0%	100.0%

Table 4.77: LDA is better than the other methods to quantify operational risk while using AMA. * Age Crosstabulation (% within Age)

From the following table (4.78) we can observe that 41.5% of the respondents who were aged between 21 – 30 years graded the credit risk as to a fair degree, 40.6% of the respondents of 31 – 40 years and 40 years and above age group graded credit risk as to a high degree for the bank uses the methods available through LDA to check data completeness of loss data among the participating members. The more the age of experts, the less the experts support LDA to identify and estimate frequency and severity of losses.

		Age Group			Total
		21-30	31-40	+40	
The bank uses LDA to identify and estimate frequency and severity of losses?	Not at all	29.3%	18.8%	14.8%	22.0%
	To a lesser degree	51.2%	50.0%	44.4%	49.0%
	To a fair degree	9.8%	18.8%	29.6%	18.0%
	To a high degree	7.3%	3.1%	3.7%	5.0%
	Totally	2.4%	9.4%	7.4%	6.0%
Total		100.0%	100.0%	100.0%	100.0%

Table 4.78: The bank uses LDA to identify and estimate frequency and severity of losses? * Age Crosstabulation (% within Age)

From the following table (4.79) we can observe that 46.3% of the respondents aged between 21 – 30 years, 50.0% of the 31-40 years age-group and 37.0% of those who were aged 40 years or more graded as not at all for there is an effective tracking method at the bank that works well with LDA. The more the age of experts, the less the experts support LDA to check data completeness.

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		Age Group			Total
		21-30	31-40	+40	
The bank uses the methods available through LDA to check data completeness of loss data among the participating members?	Not at all	46.3%	50.0%	37.0%	45.0%
	To a lesser degree	29.3%	21.9%	25.9%	26.0%
	To a fair degree	12.2%	15.6%	18.5%	15.0%
	To a high degree	4.9%	12.5%	7.4%	8.0%
	Totally	7.3%		11.1%	6.0%
Total		100.0%	100.0%	100.0%	100.0%

Table 4.79: The bank uses the methods available through LDA to check data completeness of loss data among the participating members? * Age Crosstabulation (% within Age)

From the following table (4.80) we can observe that 53.7%, 56.3% and 33.3% of the respondents who were aged between 21 – 30 years, 31 – 40 years and 40 years and above graded as to a lesser degree respectively for the collected data works with LDA and this tells you your data collection method is effective. The more the age of experts, the less the experts support effective tracking method at the bank that works well with LDA.

		Age Group			Total
		21-30	31-40	+40	
There is an effective tracking method at the bank that works well with LDA	Not at all	24.4%	25.0%	33.3%	27.0%
	To a lesser degree	53.7%	56.3%	33.3%	49.0%
	To a fair degree	14.6%	15.6%	25.9%	18.0%
	To a high degree	4.9%	3.1%	3.7%	4.0%
	Totally	2.4%		3.7%	2.0%
Total		100.0%	100.0%	100.0%	100.0%

Table 4.80: There is an effective tracking method at the bank that works well with LDA * Age Crosstabulation (% within Age)

From the following table (4.81) we can observe that 37.8% of the male and 44.4% of the respondents graded as to a fair degree for LDA is a statistical/actuarial approach for computing aggregate loss distributions. The more the male experts, the more they support LDA as a statistical / actuarial approach.

		Gender		Total
		Male	Female	
LDA is a statistical/actuarial approach for computing aggregate loss distributions	Not at all	1.2%		1.0%
	To a lesser degree	11.0%		9.0%
	To a fair degree	37.8%	44.4%	39.0%
	To a high degree	35.4%	33.3%	35.0%
	Totally	14.6%	22.2%	16.0%
Total		100.0%	100.0%	100.0%

Table 4.81: LDA is a statistical/actuarial approach for computing aggregate loss distributions * Gender Crosstabulation(% within Gender)

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From the following table (4.82) we can observe that 34.1% of the male and 33.3% of the female respondents graded to a lesser degree for the bank uses to identify and estimate frequency and severity of losses. The more the female experts, the more they support LDA to identify and estimate frequency and severity of losses.

		Gender		Total
		Male	Female	
The bank uses LDA to identify and estimate frequency and severity of losses?	Not at all	24.4%	11.1%	22.0%
	To a lesser degree	56.1%	16.7%	49.0%
	To a fair degree	14.6%	33.3%	18.0%
	To a high degree	1.2%	22.2%	5.0%
	Totally	3.7%	16.7%	6.0%
Total		100.0%	100.0%	100.0%

Table 4.82: The bank uses LDA to identify and estimate frequency and severity of losses? * Gender Crosstabulation (% within Gender)

From the following table (4.83) we can observe that 56.1% of the male respondents graded as to a lesser degree and 33.3% of the female respondents graded as to a fair degree for the bank uses the methods available through LDA to check data completeness of loss data among the participating members. The more the female experts, the more they support LDA to check data completeness of loss data among the participant members.

		Gender		Total
		Male	Female	
The bank uses the methods available through LDA to check data completeness of loss data among the participating members?	Not at all	50.0%	22.2%	45.0%
	To a lesser degree	25.6%	27.8%	26.0%
	To a fair degree	12.2%	27.8%	15.0%
	To a high degree	8.5%	5.6%	8.0%
	Totally	3.7%	16.7%	6.0%
Total		100.0%	100.0%	100.0%

Table 4.83: The bank uses the methods available through LDA to check data completeness of loss data among the participating members? * Gender Crosstabulation (% within Gender)

From the following table (4.84) we can observe that 50.0% of the male respondents graded as not at all and 27.8% of the females graded as to a fair degree for there is an effective tracking method at the bank that works well with LDA. The more the male experts, the less they support LDA as an effective tracking method works well at the bank.

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		Gender		Total
		Male	Female	
There is an effective tracking method at the bank that works well with LDA	Not at all	26.8%	27.8%	27.0%
	To a lesser degree	53.7%	27.8%	49.0%
	To a fair degree	14.6%	33.3%	18.0%
	To a high degree	3.7%	5.6%	4.0%
	Totally	1.2%	5.6%	2.0%
Total		100.0%	100.0%	100.0%

Table 4.84: There is an effective tracking method at the bank that works well with LDA * Gender Crosstabulation (% within Gender)

From the following table (4.85) we can observe that 53.7% of the males and 27.8% of the female respondents graded as to a fair degree for the collected data works with LDA and this tells you your data collection method is effective. The more the female experts, the more they support LDA which tell them their data collection method is effective.

		Gender		Total
		Male	Female	
The collected data works with LDA and this tells you your data collection method is effective	Not at all	1.2%		1.0%
	To a lesser degree	11.0%		9.0%
	To a fair degree	37.8%	44.4%	39.0%
	To a high degree	35.4%	33.3%	35.0%
	Totally	14.6%	22.2%	16.0%
Total		100.0%	100.0%	100.0%

Table 4.85: The collected data works with LDA and this tells you your data collection method is effective * Gender Crosstabulation (% within Gender)

From the following table (4.86) we can observe that 50.0% of the senior secondary, 40.0%, 57.1% of the masters graded as to a fair degree, 40.0% of the post graduates and 50.0% of the others graded as to a high degree for LDA is a statistical/actuarial approach for computing aggregate loss distributions. The more the qualification experts, the more they support LDA as a statistical / actuarial approach.

		Qualification					Total
		Senior Secondary	Graduate	Post-graduate	Masters	Other	
LDA is a statistical/actuarial approach for computing aggregate loss distributions	Not at all			2.2%			1.0%
	To a lesser degree		13.2%	6.7%		12.5%	9.0%
	To a fair degree	50.0%	44.7%	33.3%	57.1%	25.0%	39.0%
	To a high degree	50.0%	23.7%	40.0%	42.9%	50.0%	35.0%
	Totally		18.4%	17.8%		12.5%	16.0%
Total		100.0%	100.0%	100.0%	100.0%	100.0%	100.0 %

Table 4.86: LDA is a statistical/actuarial approach for computing aggregate loss distributions * qualification Crosstabulation (% within Qualification)

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From the following table (4.87) we can observe that 50.0% of the senior secondary, 28.9% of the graduates, 37.8% of the post graduates graded as not all, 57.1% of the masters and 37.5% of the others for the bank uses LDA to identify and estimate frequency and severity of losses. The more the qualification experts, the less they support LDA to identify and estimate frequency and severity of losses.

		Qualification					Total
		Senior Secondary	Graduate	Post-graduate	Masters	Other	
The bank uses LDA to identify and estimate frequency and severity of losses?	Not at all	50.0%	21.1%	26.7%		12.5%	22.0%
	To a lesser degree		47.4%	51.1%	57.1%	50.0%	49.0%
	To a fair degree	50.0%	15.8%	13.3%	42.9%	25.0%	18.0%
	To a high degree		7.9%	2.2%		12.5%	5.0%
	Totally		7.9%	6.7%			6.0%
Total		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4.87: The bank uses LDA to identify and estimate frequency and severity of losses? * Qualification Crosstabulation (% within Qualification)

From the following table (4.88) we can observe that 50.0% of the senior secondary graded as not at all, 47.4% of graduates, 51.1% of post graduates, 57.1% of the masters and 50.0% of the others graded to a lesser degree for the bank uses the methods available through LDA to check data completeness of loss data among the participating members. The more the qualification experts, the more they support LDA to check data completeness of loss data among the participating members.

		Qualification					Total
		Senior Secondary	Graduate	Post-graduate	Masters	Other	
The bank uses the methods available through LDA to check data completeness of loss data among the participating members?	Not at all		52.6%	46.7%	28.6%	25.0%	45.0%
	To a lesser degree		21.1%	31.1%	14.3%	37.5%	26.0%
	To a fair degree	50.0%	13.2%	8.9%	42.9%	25.0%	15.0%
	To a high degree	50.0%	5.3%	6.7%	14.3%	12.5%	8.0%
	Totally		7.9%	6.7%			6.0%
Total		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4.88: The bank uses the methods available through LDA to check data completeness of loss data among the participating members? * Qualification Crosstabulation (% within Qualification)

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From the following table (4.89) we can observe that 50.0% of the senior secondary graded as to a fair degree, 52.6% of the graduates, 46.7% of the post graduates graded as not at all, 42.9% of the masters graded as to a fair degree and 37.5% of the others graded as to lesser degree for there is an effective method tracking method at the bank that works well with LDA. The more the qualification experts, the less they support LDA as an effective tracking method at the bank that works well.

		Qualification					Total
		Senior Secondary	Graduate	Post-graduate	Masters	Other	
There is an effective tracking method at the bank that works well with LDA	Not at all		26.3%	33.3%	14.3%	12.5%	27.0%
	To a lesser degree		52.6%	48.9%	42.9%	50.0%	49.0%
	To a fair degree	100.0%	13.2%	15.6%	28.6%	25.0%	18.0%
	To a high degree		5.3%		14.3%	12.5%	4.0%
	Totally		2.6%	2.2%			2.0%
Total		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4.89: There is an effective tracking method at the bank that works well with LDA * Qualification Crosstabulation (% within Qualification)

From the following table (4.90) we can observe that all of the senior secondary respondents graded as to a fair degree and 52.6% of the graduates, 48.9% of the post graduates, 42.9% of the post graduates, 42.9% of the masters and 50.0% of the others graded as to a lesser degree for the collected data works with LDA and this tells their data collection method is effective. The more the qualification experts, the more they support LDA tells them their data collection method is effective.

		Qualification					Total
		Senior Secondary	Graduate	Post-graduate	Masters	Other	
The collected data works with LDA and this tells you your data collection method is effective	Not at all			2.2%			1.0%
	To a lesser degree		13.2%	6.7%		12.5%	9.0%
	To a fair degree	50.0%	44.7%	33.3%	57.1%	25.0%	39.0%
	To a high degree	50.0%	23.7%	40.0%	42.9%	50.0%	35.0%
	Totally		18.4%	17.8%		12.5%	16.0%
Total		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4.90: The collected data works with LDA and this tells you your data collection method is effective * Qualification Crosstabulation (% within Qualification)

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From the following table (4.91) we can observe that 36.4% of the chief risk officer, 33.3% of the risk managers, 50.0% of the operational risk managers graded to a higher degree and 61.1% of the operational risk analyst 66.7% of the operational risk officers graded to fair degree for LDA is a statistical/actuarial approach for computing aggregate loss distributions. The higher the position experts, the more they support LDA as a statistical / actuarial approach.

		Your Current Position					Total
		CRO	RM	ORM	ORA	ORO	
LDA is a statistical/actuarial approach for computing aggregate loss distributions	Not at all			3.1%			1.0%
	To a lesser degree	9.1%	13.3%	6.3%		22.2%	9.0%
	To a fair degree	27.3%	33.3%	28.1%	61.1%	66.7%	39.0%
	To a high degree	36.4%	33.3%	50.0%	22.2%	11.1%	35.0%
	Totally	27.3%	20.0%	12.5%	16.7%		16.0%
Total		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4.91: LDA is a statistical/actuarial approach for computing aggregate loss distributions * Your Current Position Crosstabulation (% within Your Current Position)

From the following table (4.92) we can observe that 45.5% of the chief risk officer, 38.9% of the operational risk analyst graded as not at all and 33.3% of the risk managers graded as not at all and 66.7% of the operational risk officers graded to fair degree for the bank uses LDA to identify and estimate frequency and severity of losses. The higher the position experts, the lesser they supported LDA to identify and estimate frequency and severity of losses.

		Your Current Position					Total
		CRO	RM	ORM	ORA	ORO	
The bank uses LDA to identify and estimate frequency and severity of losses?	Not at all	45.5%	20.0%	15.6%	22.2%	22.2%	22.0%
	To a lesser degree	36.4%	43.3%	56.3%	55.6%	44.4%	49.0%
	To a fair degree	9.1%	23.3%	15.6%	11.1%	33.3%	18.0%
	To a high degree	9.1%	3.3%	6.3%	5.6%		5.0%
	Totally		10.0%	6.3%	5.6%		6.0%
Total		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4.92: The bank uses LDA to identify and estimate frequency and severity of losses? * Your Current Position Crosstabulation (% within Your Current Position)

From the following table (4.93) we can observe that 45.5% of the chief risk officer and 43.3% of the risk managers, 56.3% of the operational risk managers, 55.6% of the operational risk analyst 44.4% of the operational risk officers graded to lesser degree for the bank uses the methods available through LDA to check data, completeness of loss

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data among the participating members. The higher the position experts, the lesser they support LDA to check data completeness of loss data among the participating members.

		Your Current Position					Total
		CRO	RM	ORM	ORA	ORO	
The bank uses the methods available through LDA to check data completeness of loss data among the participating members?	Not at all	36.4%	36.7%	43.8%	55.6%	66.7%	45.0%
	To a lesser degree	27.3%	30.0%	37.5%	5.6%	11.1%	26.0%
	To a fair degree		13.3%	9.4%	33.3%	22.2%	15.0%
	To a high degree	27.3%	6.7%	6.3%	5.6%		8.0%
	Totally	9.1%	13.3%	3.1%			6.0%
Total		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4.93: The bank uses the methods available through LDA to check data completeness of loss data among the participating members? * Your Current Position Crosstabulation (% within Your Current Position)

From the following table (4.94) we can observe that 36.4% of the chief risk officer, 36.7% of the risk managers, 43.8% of the operational risk managers, 55.6% of the operational risk analyst and 66.7% of the operational risk officers graded as not at all for there is an effective tracking method at the bank that works well with LDA. The higher the position experts, the more they support LDA as a effective tracking method at the bank.

		Your Current Position					Total
		CRO	RM	ORM	ORA	ORO	
There is an effective tracking method at the bank that works well with LDA	Not at all	54.5%	30.0%	21.9%	16.7%	22.2%	27.0%
	To a lesser degree	27.3%	40.0%	59.4%	61.1%	44.4%	49.0%
	To a fair degree	18.2%	23.3%	15.6%	11.1%	22.2%	18.0%
	To a high degree			3.1%	11.1%	11.1%	4.0%
	Totally		6.7%				2.0%
Total		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4.94: There is an effective tracking method at the bank that works well with LDA * Your Current Position Crosstabulation (% within Your Current Position)

From the following table (4.95) we can observe that 54.5% of the chief risk officer graded as not all and 40.0% of the risk managers, 59.4% of the operational risk managers, 61.1% of the operational risk analyst, 44.4% of the operational risk officers graded as to a lesser degree for the collected data works with LDA and this tells their data collection method is effective. The higher the position experts, the more they support LDA which tells them their data collection method is effective.

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		Your Current Position					Total
		CRO	RM	ORM	ORA	ORO	
The collected data works with LDA and this tells you your data collection method is effective	Not at all			3.1%			1.0%
	To a lesser degree	9.1%	13.3%	6.3%		22.2%	9.0%
	To a fair degree	27.3%	33.3%	28.1%	61.1%	66.7%	39.0%
	To a high degree	36.4%	33.3%	50.0%	22.2%	11.1%	35.0%
	Totally	27.3%	20.0%	12.5%	16.7%		16.0%
Total		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4.95: The collected data works with LDA and this tells you your data collection method is effective * Your Current Position Crosstabulation (% within Your Current Position)

From the following table (4.96) we can observe that 36.7% experienced for less than three years, 40.5% with experience of three to five years, 42.3% with experience of five to ten years graded as to a fair degree and 50.0% experienced for more than ten years graded as to a higher degree for LDA is a statistical / actuarial approach for computing aggregate loss distributions.

The higher the duration of experience of experts, the more they support LDA as a statistical / actuarial approach.

		Experience in Risk Management				Total
		CRO	RM	ORM	ORA	
LDA is a statistical/actuarial approach for computing aggregate loss distributions	Not at all			3.8%		1.0%
	To a lesser degree	16.7%	4.8%	7.7%		9.0%
	To a fair degree	36.7%	40.5%	42.3%		39.0%
	To a high degree	30.0%	35.7%	38.5%	50.0%	35.0%
	Totally	16.7%	19.0%	7.7%	50.0%	16.0%
Total		100.0%	100.0%	100.0%	100.0%	100.0%

Table 4.96: LDA is a statistical/actuarial approach for computing aggregate loss distributions * Experience in Risk Management Crosstabulation (% within Experience in Risk Management)

From the following table (4.97) we can observe that 30.0% experienced for less than three years and 35.7% with experience of three to five years graded as to a lesser degree, 46.2% with experience of five to ten years graded as not at all and all those who experienced for more than ten years graded as to a lesser degree for the bank uses LDA to identify and estimate frequency and severity of losses.

The higher the duration of experience of experts, the lesser they support LDA to identify and estimate frequency and severity of losses.

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		Experience in Risk Management				Total
		Less than three years	Three years to Five years	Five to Ten years	More than Ten years	
The bank uses LDA to identify and estimate frequency and severity of losses?	Not at all	20.0%	28.6%	15.4%		22.0%
	To a lesser degree	63.3%	42.9%	38.5%	100.0%	49.0%
	To a fair degree	13.3%	11.9%	34.6%		18.0%
	To a high degree		9.5%	3.8%		5.0%
	Totally	3.3%	7.1%	7.7%		6.0%
Total		100.0%	100.0%	100.0%	100.0%	100.0%

Table 4.97: The bank uses LDA to identify and estimate frequency and severity of losses? * Experience in Risk Management Crosstabulation (% within Experience in Risk Management)

From the following table (4.98) we can observe that 63.3% experienced for less than three years, 42.9% with experience of three to five years, 38.5% with experience of five to ten years and 100.0% experienced for more than ten years graded as to a lesser degree for the bank uses the methods available through LDA to check data completeness of lost data among the participating members. The higher the duration of experience of experts, the lesser they support LDA to check data completeness of loss data among participating members.

		Experience in Risk Management				Total
		Less than three years	Three years to Five years	Five to Ten years	More than Ten years	
The bank uses the methods available through LDA to check data completeness of loss data among the participating members?	Not at all	43.3%	59.5%	26.9%		45.0%
	To a lesser degree	40.0%	11.9%	34.6%		26.0%
	To a fair degree	6.7%	11.9%	30.8%		15.0%
	To a high degree	3.3%	9.5%	7.7%	50.0%	8.0%
	Totally	6.7%	7.1%		50.0%	6.0%
Total		100.0%	100.0%	100.0%	100.0%	100.0%

Table 4.98: The bank uses the methods available through LDA to check data completeness of loss data among the participating members? * Experience in Risk Management Crosstabulation (% within Experience in Risk Management)

From the following table (4.99) we can observe that 43.3% experienced for less than three years and 59.5% with experience of three to five years graded as not at all, 34.8% with experience of five to ten years graded as to a lesser degree and 50.0% experienced for more than ten years graded as to a higher degree for there is an effective tracking method at the bank that works well with LDA. The higher the duration of

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experience of experts, the lesser they support LDA as effective tracking method at the bank that works well.

		Experience in Risk Management				Total
		Less than three years	Three years to Five years	Five to Ten years	More than Ten years	
There is an effective tracking method at the bank that works well with LDA	Not at all	33.3%	33.3%	11.5%		27.0%
	To a lesser degree	40.0%	52.4%	50.0%	100.0%	49.0%
	To a fair degree	16.7%	9.5%	34.6%		18.0%
	To a high degree	6.7%	2.4%	3.8%		4.0%
	Totally	3.3%	2.4%			2.0%
Total		100.0%	100.0%	100.0%	100.0%	100.0%

Table 4.99: There is an effective tracking method at the bank that works well with LDA * Experience in Risk Management Crosstabulation (% within Experience in Risk Management)

From the following table (4.100) we can observe that 40.0% experienced for less than three years, 52.4% with experience of three to five years, 50.0% with experience of five to ten years and 100.0% experienced for more than ten years graded as to a lesser degree for the collected data works with LDA and this tells them that their data collection method is effective. The higher the duration of experience of experts, the higher they support LDA tells them their data collection method is effective.

		Experience in Risk Management				Total
		Less than three years	Three years to Five years	Five to Ten years	More than Ten years	
The collected data works with LDA and this tells you your data collection method is effective	Not at all			3.8%		1.0%
	To a lesser degree	16.7%	4.8%	7.7%		9.0%
	To a fair degree	36.7%	40.5%	42.3%		39.0%
	To a high degree	30.0%	35.7%	38.5%	50.0%	35.0%
	Totally	16.7%	19.0%	7.7%	50.0%	16.0%
Total		100.0%	100.0%	100.0%	100.0%	100.0%

Table 4.100: The collected data works with LDA and this tells you your data collection method is effective * Experience in Risk Management Crosstabulation (% within Experience in Risk Management)

From the following table (4.101)we can observe that 42.9% of the respondents working in retail banks and 40.5% working in commercial banks graded as to a fair degree, 50.0% each working in investment and merchant banks graded as to a higher degree for LDA is a statistical approach for computing aggregated loss distributions.

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		Indicate the type of bank that you are representing				Total
		Retail	Commercial	Investment	Merchant	
LDA is a statistical/actuarial approach for computing aggregate loss distributions	Not at all		2.2%			1.0%
	To a lesser degree	4.1%	13.3%		50.0%	9.0%
	To a fair degree	42.9%	37.8%	25.0%		39.0%
	To a high degree	36.7%	31.1%	50.0%	50.0%	35.0%
	Totally	16.3%	15.6%	25.0%		16.0%
Total		100.0%	100.0%	100.0%	100.0%	100.0%

Table 4.101: LDA is a statistical/actuarial approach for computing aggregate loss distributions * Indicate the type of bank that you are representing Crosstabulation (% within Indicate the type of bank that you are representing)

From the following table (4.102) we can observe that 30.6% of the respondents working in retail banks, 40.0% working in commercial banks, 25% from investment banks graded as to a lesser degree and 50.0% working in merchant banks graded as to a fair degree for the bank uses LDA to identify and estimate frequency and severity of losses.

		Indicate the type of bank that you are representing				Total
		Retail	Commercial	Investment	Merchant	
The bank uses LDA to identify and estimate frequency and severity of losses?	Not at all	16.3%	26.7%	50.0%		22.0%
	To a lesser degree	44.9%	55.6%	25.0%	50.0%	49.0%
	To a fair degree	26.5%	8.9%	25.0%		18.0%
	To a high degree	4.1%	4.4%		50.0%	5.0%
	Totally	8.2%	4.4%			6.0%
Total		100.0%	100.0%	100.0%	100.0%	100.0%

Table 4.102: The bank uses LDA to identify and estimate frequency and severity of losses? * Indicate the type of bank that you are representing Crosstabulation (% within Indicate the type of bank that you are representing)

From the following table (4.103) we can observe that 44.9% of the respondents working in retail banks and 55.6% working in commercial banks, 50.0% each working in merchant banks graded as to a lesser degree for the bank uses the methods available through LDA to check data completeness of loss data among the participating members.

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		Indicate the type of bank that you are representing				Total
		Retail	Commercial	Investment	Merchant	
The bank uses the methods available through LDA to check data completeness of loss data among the participating members?	Not at all	42.9%	48.9%	25.0%	50.0%	45.0%
	To a lesser degree	22.4%	31.1%		50.0%	26.0%
	To a fair degree	18.4%	11.1%	25.0%		15.0%
	To a high degree	8.2%	4.4%	50.0%		8.0%
	Totally	8.2%	4.4%			6.0%
Total		100.0%	100.0%	100.0%	100.0%	100.0%

Table 4. 103: The bank uses the methods available through LDA to check data completeness of loss data among the participating members? * Indicate the type of bank that you are representing Crosstabulation (% within Indicate the type of bank that you are representing)

From the following table (4.104) we can observe that 42.9% of the respondents working in retail banks, 48.9% working in commercial banks, 50.0% working in merchant banks graded as not at all for there is an effective tracking method at the bank that works well with LDA.

		Indicate the type of bank that you are representing				Total
		Retail	Commercial	Investment	Merchant	
There is an effective tracking method at the bank that works well with LDA	Not at all	26.5%	26.7%	25.0%	50.0%	27.0%
	To a lesser degree	42.9%	57.8%	25.0%	50.0%	49.0%
	To a fair degree	22.4%	11.1%	50.0%		18.0%
	To a high degree	6.1%	2.2%			4.0%
	Totally	2.0%	2.2%			2.0%
Total		100.0%	100.0%	100.0%	100.0%	100.0%

Table 4.104: There is an effective tracking method at the bank that works well with LDA * Indicate the type of bank that you are representing Crosstabulation (% within Indicate the type of bank that you are representing)

From the following table (4.105) we can observe that 42.9% of the respondents working in retail banks, 57.8% working in commercial banks and 50.0% working in merchant banks graded as to a lesser degree for the collected data works with LDA and this tells them that their data collection method is effective.

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		Indicate the type of bank that you are representing				Total
		Retail	Commercial	Investment	Merchant	
The collected data works with LDA and this tells you your data collection method is effective	Not at all		2.2%			1.0%
	To a lesser degree	4.1%	13.3%		50.0%	9.0%
	To a fair degree	42.9%	37.8%	25.0%		39.0%
	To a high degree	36.7%	31.1%	50.0%	50.0%	35.0%
	Totally	16.3%	15.6%	25.0%		16.0%
Total		100.0%	100.0%	100.0%	100.0%	100.0%

Table 4.105: The collected data works with LDA and this tells you your data collection method is effective * Indicate the type of bank that you are representing Crosstabulation (% within Indicate the type of bank that you are representing)

4.4. Testing of Hypothesis – ANOVA and Pearson correlation test

One-way analysis of variance is used to test the difference between the means of the groups of variables (multiple testing). In research, the tests were used to make inferences relating to the dimensions sub-groups and their tendency to make any distinction to the safety status.

This is done at the 0.05 level of significance. Variable normality and Homogeneity is an important condition for one-way ANOVA, because like all parametric procedures, one-way ANOVA assumes 'normality'. Also, one-way ANOVA determines whether a variable is differentially expressed in any of the conditions tested. In addition to above a Pearson correlation test was applied using SPSS to two hypotheses (i.e. HVI and HVII). Below is the hypotheses analysis and testing:

Hypothesis Number I:

- **Null Hypothesis (H_0):** There is no significant difference among different age groups regarding LDA is an improved mechanism for determining and working on operational risk.
- **Alternate Hypothesis (H_A):** There is a significant difference among different age groups regarding LDA is an improved mechanism for determining and working on operational risk.

In order to determine whether there is a significant difference among different age groups regarding LDA is an improved mechanism for determining and working on operational risk, a kruskal – wallis test was applied using SPSS.

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H I- Ranks			
	Age	N	Mean Rank
LDA is better than the other methods to quantify operational risk while using AMA.	21-30 years	41	49.95
	31-40 years	32	55.23
	40 years and above	27	45.72
	Total	100	

HI- Test Statistics [a,b]	
	LDA is better than the other methods to quantify operational risk while using AMA.
Chi-square	1.743
df	2
Asymp. Sig.	.418
a. Kruskal Wallis Test - b. Grouping Variable: Age	

Table 4.106- H_1: Ranks and test statistics

From the table above we can observe that the value of chi square statistic is 1.743 and its corresponding p value is 0.418>0.05. Since the p value is more than 0.05 we can conclude that there is no significant difference among different age groups regarding LDA is an improved mechanism for determining and working on operational risk. We fail to reach significance; thus the decision is to retain the null hypothesis.

Hypothesis Number II:

- **Null Hypothesis (H_0):** There is no significant difference in grading between different types of banks regarding operational risk.
- **Alternate Hypothesis (H_A):** There is a significant difference in grading between different types of banks regarding operational risk.

In order to determine whether there is a significant difference in grading between different types of banks regarding operational risk, a kruskal – wallis test was applied using SPSS.

H II- Ranks				
	Indicate the type of bank that you are representing		N	Mean Rank
Operational risk	Dimension 1	Retail	49	51.47
		Commercial	45	50.01
		Investment	4	56.25
		Merchant	2	26.25
		Total	100	
H II- Test Statistics [a,b]				

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	Operational risk
Chi-square	1.735
df	3
Asymp. Sig.	.629
a. Kruskal Wallis Test - b. Grouping Variable: Indicate the type of bank that you are representing	

Table 4.107- H_2: Ranks and test statistics

From the table above we can observe that the value of chi square statistic is 1.735 and its corresponding p value is 0.629>0.05. Since the p value is more than 0.05 we can conclude that there is no significant difference in grading between different types of banks regarding operational risk. We fail to reach significance; thus the decision is to retain the null hypothesis.

Hypothesis Number III:

- **Null Hypothesis (H_0):** There is no significant difference in grading between different types of banks and their capability for handling operational risk.
- **Alternate Hypothesis (H_A):** There is a significant difference in grading between different types of banks and their capability for handling operational risk.

In order to determine whether there is a significant difference in grading between different types of banks and their capability for handling operational risk, a kruskal – wall is test was applied using SPSS.

H III- Ranks				
	Indicate the type of bank that you are representing		N	Mean Rank
To what degree does your organisation recognize the importance of aligning an operational risk management process with its strategy and objectives?	Dimension 1	Retail	49	47.58
		Commercial	45	54.64
		Investment	4	38.63
		Merchant	2	52.50
		Total	100	

H III- Test Statistics [a,b]	
	To what degree does your organisation recognize the importance of aligning an operational risk management process with its strategy and objectives?
Chi-square	2.262
df	3
Asymp. Sig.	.520
a. Kruskal Wallis Test - b. Grouping Variable: Indicate the type of bank that you are representing	

Table 4.108- H_3: Ranks and test statistics

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From the table above we can observe that the value of chi square statistic is 2.262 and its corresponding p value is 0.520>0.05. Since the p value is more than 0.05 we can conclude that there is no significant difference in grading between different types of banks and their capability for handling operational risk. A one way analysis of variance of applied using SPSS in order test this hypothesis. We fail to reach significance; thus the decision is to retain the null hypothesis.

Hypothesis Number IV

- **Null Hypothesis (H_0):** There is no significant difference between different types of banks and their data management technology.
- **Alternate Hypothesis (H_A):** There is a significant difference between different types of banks and their data management technology.

In order to determine whether there is a significant difference between different types of banks and their data management technology, a kruskal – wallis test was applied using SPSS.

H IV- Ranks				
	Indicate the type of bank that you are representing		N	Mean Rank
Your bank relies on internal data, external data, and scenario analysis.	Dimension 1	Retail	49	51.05
		Commercial	45	50.61
		Investment	4	50.00
		Merchant	2	35.50
		Total	100	

H IV- Test Statistics [a,b]	
	Your bank relies on internal data, external data, and scenario analysis.
Chi-square	.609
df	3
Asymp. Sig.	.894

a. Kruskal Wallis Test - b. Grouping Variable: Indicate the type of bank that you are representing

Table 4.109- H_4: Ranks and test statistics

From the table above we can observe that we can observe that the value of chi square statistic is 0.609 and its corresponding p value is 0.893>0.05. Since the p value is more than 0.05 we can conclude that there is no significant difference between different types of banks and their data management technology. We fail to reach significance; thus the decision is to retain the null hypothesis.

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Hypothesis Number V:

- **Null Hypothesis (H_0):** There is no significant difference between different types of banks in acceptance of recommendation from agencies like AMA.
- **Alternate Hypothesis (H_A):** There is a significant difference between different types of banks in acceptance of recommendation from agencies like AMA.

In order to determine whether there is a significant difference between different types of banks in acceptance of recommendation from agencies like AMA, a kruskal – wallis test was applied using SPSS.

H V- Ranks				
	Indicate the type of bank that you are representing		N	Mean Rank
Your bank defines operational risk according to what AMA recommends.	Dimension 1	Retail	49	51.59
		Commercial	45	49.06
		Investment	4	53.63
		Merchant	2	50.00
		Total	100	

H V- Test Statistics [a,b]	
	Your bank defines operational risk according to what AMA recommends.
Chi-square	.244
df	3
Asymp. Sig.	.970
a. Kruskal Wallis Test - b. Grouping Variable: Indicate the type of bank that you are representing	

Table 4.110- H_5: Ranks and test statistics

From the table above we can observe that we can observe that the value of chi square statistic is 0.244 and its corresponding p value is 0.970>0.05. Since the p value is more than 0.05 we can conclude that there is no significant difference between different types of banks in acceptance of recommendation from agencies like AMA. We fail to reach significance; thus the decision is to retain the null hypothesis.

Hypothesis Number VI:

- **Null Hypothesis (H_0):** Quantifying operational risk cannot prevent banks from financial losses.
- **Alternate Hypothesis (H_A):** Quantifying operational risk can prevent banks from financial losses.

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A Pearson correlation test was applied using SPSS to assess whether quantifying operational risk can prevent financial losses.

H VI - Correlations			
		Operational risk	Risk financing
Operational risk	Pearson Correlation	1	.079
	Sig. (2-tailed)		.433
	N	100	100
Risk financing	Pearson Correlation	.079	1
	Sig. (2-tailed)	.433	
	N	100	100

Table 4.111- H_6: Ranks and test statistics

From the table above we can observe that the correlation coefficient is 0.079 and its corresponding p value is 0.433>0.05. Since the p value is more than 0.05, null hypotheses can be accepted and quantifying operational risk cannot prevent banks from financial losses. We fail to reach significance; thus the decision is to retain the null hypothesis.

Hypothesis Number VII:

- **Null Hypothesis (H_0):** LDA is not the most appropriate method to quantify operational risk data.
- **Alternate Hypothesis (H_A):** LDA is the most appropriate method to quantify operational risk data.

A Pearson correlation test was applied using SPSS to assess whether LDA is the most appropriate method to quantify the operational risk data.

H VII - Correlations			
		Operational risk	LDA is better than the other methods to quantify operational risk while using AMA.
Operational risk	Pearson Correlation	1	.172
	Sig. (2-tailed)		.088
	N	100	100
LDA is better than the other methods to quantify operational risk while using AMA.	Pearson Correlation	.172	1
	Sig. (2-tailed)	.088	
	N	100	100

Table 4.112- H_7: Ranks and test statistics

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From the table above we can observe that the correlation coefficient is 0.172 and its corresponding p value is 0.088>0.05. Since the p value is more than 0.05, null hypotheses can be accepted and LDA is not the most appropriate method to quantify operational risk data. We fail to reach significance; thus the decision is to retain the null hypothesis.

There results of hypotheses show that all the null hypotheses were accepted.

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CHAPTER V
Conclusions and Recommendations

5.1. Conclusions

The purpose of this research was to study the computing operational risk capital charges using different methodologies within banks according to Basel II with special focus on LDA. There are a lot of risks that banking organizations go through on a daily basis. The study therefore sought to assess various methods for quantifying operational risk loss data and compute required capital charges within a bank when historical data loss data is limited.

To achieve the objectives of this research, in addition to qualitative approach a quantitative research approach was employed where managers working in different banking organization of entities participated in the research. It was established that the risk types in banks include credit risk, market risk, liquidity risk interest rate risk, country risk, reputation risk, legal risk and operational risk.

Factors of operational risk as found in the study include people, processes, systems and external factors like political pressure, natural disasters and fraud among others. There are also a number of exposures that were found to be part of operational risk. The exposures include people exposure, systems exposures and systems exposures.

Operational risk resulting from people is as a result of incompetence, negligence, human error, low morale, high staff turnover and fraudulent activities of bank employees. Concerning process exposures, it was established that process exposures leading to operational risk include errors in procedure/methodologies, execution errors, documentation errors, product complexity and security risk. System infiltration, system failures, fraud, programming errors, information risk, telecommunication risk and obsolescence of systems were found to be system exposures leading to operational risk.

Implementation of a formal risk management process is critical to averting the threats that area associated with operational risk. In addition, it is also very important to align operational risk management process with its strategy and objectives because such approach would ensure success in operational risk management. The study established

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that entities put in place a separate operational risk management structure in order to deal with risk effectively.

It was established that arriving at the appropriate threshold to capture operational loss and near misses is very important and that operational events across the various business lines in banks are handled according to what AMA recommends.

It is important to ensure that the ratio of supervisors to staff in a bank is correct in order to curb operational risk that could result from lack of proper supervision of employees. Many banks have a unit that handles confidential client information and they tend to define operational risk according to what AMA recommends.

Majority of respondents justify their bank's pursuing of quantification of operational risk as a positive measure and they unanimously agreed that if there to be a loss at their bank, it would be because of inadequate or failed internal process.

Putting in place internal process in the banks to deal will all sorts of risk is therefore quite necessary in trying to contain risk especially operational risk. Promoting sound internal policies and control procedures is effective in managing operational risk in the banking industry.

The management fraternity can therefore play a very significant role in motivating investment in operational risk infrastructure to reduce operational risk at the bank. Many banking institutions according to this study rely on KRIs while calculating the cost of operational risk at the bank and that risk indicators play a role in monitoring and gathering of internal, external, current and historical data.

Concerning the hypotheses, it was found out that, LDA is an improved mechanism but not the only preferred model for determining and working on operational risk, operational risk is one of the biggest risks for banks, bank has suitable capability for handling operational risk, data management and technology can help in reduction of operational risk.

It was also found out that recommendation from agencies like AMA are taken seriously by banks and adhered to. Experience of the respondents on the subject of the study, which is quantifying operational risk within banks according to Basel II was instrumental in ensuring accuracy of the data collected. The same applies to the age and academic qualification of the respondents.

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Based on the literature review, data analysis and hypotheses testing researcher is in a position to state the following theses (table 5.1):

No.	Thesis statement
Thesis I	There is a significant difference in agreement among different age groups regarding LDA is an improved mechanism for determining and working on operational risk. That means the senior and junior bankers have a different view on LDA. Most of the young and well qualified bankers preferred risk modeling.
Thesis II	There is a significant difference in grading between different types of banks regarding operational risk. Risk is a mainly derived by Board of Director and it is a top down approach. The stronger risk culture /knowledge among Board member the stronger risk management framework and activity in a bank.
Thesis III	There is a significant difference in grading between types of Banks and their capability for handling operational risk. This is highly depending on the availability of risk infrastructure including human resources.
Thesis IV	There is a significant difference between different types of banks and their Data management technology.
Thesis V	There is a significant difference between the types of banks in acceptance of recommendation from agencies like AMA. This is highly depending on readiness of the banks around the globe in regards to implementation of AMA.
Thesis VI	Quantifying operational risk cannot prevent banks from financial losses. That means banks should not be rely on data quantifying to prevent them from the financial loss but also there must be a comprehensive risk management framework.
Thesis VII	LDA is not the only appropriate methods to quantify operational risk data. In spite of several researches and recommendation from various risk professionals [Toshihiko Mori, and Eiji Harada (2001), Padraic Walsh (2003), ITWG (2003), Klugman et al. (2004), Jos´eAparicio, and Eser Keskiner (2004), Fitch (2004), M.R.A. Bakker(2004), Chartis (2005), Bank of Japan (2005), Kabir Dutta, and Jason Perry (2007), and Basel Committee)] there is no strong evidence to say that LDA is the most appropriate model in quantifying operational risk data.

Table 5.1: Theses statements - author's own work

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5.2. Further Recommendation

Quantifying operational risk within banks according to Basel II is a very important subject, whose finding can be quite important to different players in the banking industry.

However, due to the nature of risk and the risk they pose to banking organization, future scholars should consider conducting research to ascertain the impact of information technology in operational risk management. Such study would present important information that would provide the effectiveness of ICT in operational risk management. In addition, further research should also be conducted to establish factors affecting operational risk in the banking industry in their order of priority. This can be important in trying to manage and reduce operational risk in the banking industry.

5.3. Limitations

The study was carried out successfully but it was characterized by a number of limitations, which include time, inadequate financial resources and geographical limitations. The research was limited geographically because data had to be collected from specific locations, which could not represents the opinion of others in different parts of the country. Therefore, the research could have been conducted in many different locations in order to gather information that is more representative.

However, due to geographical limitation among other limitations, it was not possible. In addition, the research was expected to be completed within specified time limit. The time available for the study could not allow extensive research on the subject. Lastly, the research was limited by financial resources, which in one way or another hindered the research in the sense that the operations and activities of the research were to be designed within the limit of the financial resources available and since the resources were not adequate for extensive research, the research had to be limited accordingly. Research has several activities and operation, which involve a lot of logistics, all of which require resources to facilitate.

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Annexure I - Definition of Terms

ANOVA: Analysis of variance (ANOVA) is a collection of statistical models, and their associated procedures, in which the observed variance in a particular variable is partitioned into components attributable to different sources of variation

Bank for International Settlement (BIS): An international organization that fosters international monetary and financial cooperation and serves as a bank for central banks.

Basel II: An international accord on bank capital requirements to replace the earlier 1988 Basel Accord.

Basel Committee: An international committee that has played a leading role in standardizing bank regulations across jurisdictions.

Business Risk: Exposure to uncertainty in economic value that cannot be marked-to-market.

Capital: A firm's value—assets minus liabilities

Capital Charge: Capital required to support a given business line or transaction.

Credit Exposure: The potential for loss in the event of a default

Credit Risk: Risk due to uncertainty in a counter party's ability to meet its obligations.

Default: A default is considered to have occurred with regard to particular obligor when either or both of the two following events have taken place.

- The bank considers that the obligor is unlikely to pay its credit obligations to the banking group in full, without resorting by the bank to action such as realizing security (if held).
- The obligor is past due more than 90 days on any material credit obligation to the banking group.

Default Probability: The likelihood that counter party will default on an obligation.

Economic Capital: Capital held for economic (as opposed to regulatory) purposes.

Frequency: The member of observations in a given statistical category.

Key Risk Indicator (KRI): A Key Risk Indicator is an operational or financial variable that provides a reliable basis for estimating the loss corresponding to the risk.

Legal Risk: Risk from uncertainty due to legal actions or uncertainty in the applicability or interpretation of contracts, laws or regulations.

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Liquidity: Term used in various senses, all relating to availability of, access to, or convertibility into cash.

Loss Given Default (LGD): The fraction of credit exposure that will not be **recovered in the event of default on a specified obligation.**

Market Risk: Exposure to the uncertain market value of a portfolio

Measure: An operation for assigning a number to something.

Measurement: A number obtained from applying a measure.

Obligor:A counterparty that poses credit risk.

Operational Risk: Risk of loss resulting from inadequate or failed internal processes, people and systems, or from external events.

Quality: Quality is defined as "the totality of features and characteristics that bear on its ability to satisfy stated or implied needs". (ISO 9000:2000).

Regulatory Capital: Capital held in accordance with statutory or regulatory requirements.

Risk: Risk is the combination of severity and frequency of potential loss over a given time horizon.

Risk Mapping: In this process, various business units, organizational functions or process flow are mapped by risk type. This exercise can reveal areas of weakness and help priorities subsequent management action.

Risk Measure: An operation for quantifying a risk

Severity: Loss expressed as a percentage of the loan equivalent exposure. Represents the sum of principal loss, cost of carry and administrative costs

Threshold/Limits: Typically tied to risk indicators, threshold levels (or changes) in key indicators, when exceeded, alert management to areas of potential problems.

Tier I Capital: Core capital under the Basel Accords

Tire II Capital: Supplementary capital under the Basel Accords

Tire III Capital: Capital applicable only to market risk under the Basel Accords

VaR: Value at Risk

Unexpected Loss: A risk metric related to the second moment of a portfolio's losses due to default over a specified horizon.

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Appendix II - Questionnaire

1. Age:

- ☐ <18 years
- ☐ 18-24 years
- ☐ 25-34 years
- ☐ 35-40 years
- ☐ 40-60 years

2. Gender:

- ☐ Male
- ☐ Female

3. Qualification:

- ☐ Senior Secondary
- ☐ Graduate
- ☐ Post-graduate
- ☐ Masters
- ☐ other

4. Your Current Position:

- ☐ Chief Risk Officer
- ☐ Risk Manager
- ☐ Operational Risk Manager
- ☐ Operational Risk Analyst
- ☐ Operational Risk Officer

5. Experience in Risk Management

- ☐ Less than one year
- ☐ One year to three years
- ☐ Three to five years
- ☐ More than five years

6. Indicate the type of bank that you are representing:

- ☐ Retail
- ☐ Commercial

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☐ Investment

☐ Merchant

☐ All of the above

Please answer the following questions by indicating your answer with (x) in the applicable box according to the following scale:

1- Not at all
2- To a lesser degree
3- To a fair degree
4- To a high degree
5- Totally

Your bank's current approach towards operational risk management.

To what degree would you rate the following as primary risk types within your organization?

7. To what degree would you rate the following as primary risk types within your organization?						
7.1.	Credit risk	1	2	3	4	5
7.2.	Market risk	1	2	3	4	5
7.3.	Liquidity risk	1	2	3	4	5
7.4.	Interest rate risk	1	2	3	4	5
7.5.	Country risk	1	2	3	4	5
7.6.	Reputation risk	1	2	3	4	5
7.7.	Legal risk	1	2	3	4	5
7.8.	Operational risk	1	2	3	4	5
8. To what degree has your organization implemented the following as primary factors of operational risk?						
8.1.	People	1	2	3	4	5
8.2.	Processes	1	2	3	4	5
8.3.	Systems	1	2	3	4	5
8.4.	External factors (e.g. natural disasters, fraud, political pressures etc.)	1	2	3	4	5

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9. To what degree has your organization recognized the following people exposures as an important part of operational risk?						
9.1.	Incompetence	1	2	3	4	5
9.2.	Negligence	1	2	3	4	5
9.3.	Human error	1	2	3	4	5
9.4.	Low morale	1	2	3	4	5
9.5.	High staff turnover	1	2	3	4	5
9.6.	Fraudulent/criminal activities by employees	1	2	3	4	5
10. To what degree has your organization recognized the following process exposures as an important part of operational risk?						
10.1.	Errors in procedure/methodologies	1	2	3	4	5
10.2.	Execution errors	1	2	3	4	5
10.3.	Documentation errors	1	2	3	4	5
10.4.	Product complexity	1	2	3	4	5
10.5.	Security risks	1	2	3	4	5
11. To what degree has your organization recognized the following system exposures as an important part of operational risk?						
11.1.	System infiltration	1	2	3	4	5
11.2.	System failures	1	2	3	4	5
11.3.	Fraud	1	2	3	4	5
11.4.	Programming errors	1	2	3	4	5
11.5.	Information risk	1	2	3	4	5
11.6	Telecommunication risk	1	2	3	4	5
11.7.	Obsolescence of systems	1	2	3	4	5
12. To what degree does your organization recognize the important of implementing a formal risk management process?		1	2	3	4	5
13. To what degree has your organization adopted a specific definition for operational		1	2	3	4	5

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risk?						
14. To what degree has our organization recognized the following as important elements of an operational risk management process?						
14.1.	Risk identification	1	2	3	4	5
14.2.	Risk evaluation	1	2	3	4	5
14.3.	Risk control	1	2	3	4	5
14.4.	Risk financing	1	2	3	4	5
15. To what degree does your organization recognize the importance of aligning an operational risk management process with its strategy and objectives?		1	2	3	4	5
16. To what degree has your organization established a separate operational risk management structure?		1	2	3	4	5
17. To what degree does your organization involve internal audit to manage operational risk?		1	2	3	4	5
18. To what degree has your organization involved business managers in an operational risk management process?		1	2	3	4	5
19. Operational risk is defined as the risk of loss resulting from inadequate of failed internal processes, people and system or from external events.		1	2	3	4	5
20. LDA is a statistical/actuarial approach for computing aggregate loss distributions		1	2	3	4	5
21. LDA is better than the other methods to quantify operational risk while using AMA.		1	2	3	4	5
22. The bank uses LDA to identify and estimate frequency and severity of losses?		1	2	3	4	5

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23. The bank uses the methods available through LDA to check data completeness of loss data among the participating members?	1	2	3	4	5
24. There is an effective tracking method at the bank that works well with LDA	1	2	3	4	5
25. The collected data works with LDA and this tells you your data collection method is effective	1	2	3	4	5
26. There are differences I notice across different business lines at our bank and other similar institutions	1	2	3	4	5
27. Arriving at the appropriate threshold to capture operational loss and near misses is very important.	1	2	3	4	5
28. Operational events across the various business lines at your bank are handled according to what AMA recommends	1	2	3	4	5
29. The ratio of supervisors to staff at your bank is correct.	1	2	3	4	5
30. Your bank has a unit that handles confidential client information.	1	2	3	4	5
31. Your bank defines operational risk according to what AMA recommends.	1	2	3	4	5
32. You justify your bank's pursuing of quantification of operational risk as a positive measure.	1	2	3	4	5
33. If there is going to be a loss at your bank, it would be because of inadequate or failed internal process.	1	2	3	4	5
34. If there is going to be a loss at your bank, it	1	2	3	4	5

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would be because of people or system failure.					
35. If there is going to be fraud at your bank, it would be internal.	1	2	3	4	5
36. The bank gathers more than one year's data.	1	2	3	4	5
37. Your bank has the ability to withstand business disruption.	1	2	3	4	5
38. You model extreme events at your bank according to what AMA recommends.	1	2	3	4	5
39. There are technologies you incorporate in your decision making process that enables your bank to reduce risk	1	2	3	4	5
40. You promote sound internal policies and control procedures.	1	2	3	4	5
41. You motivate investment in operational risk infrastructure to reduce operational risk at your bank.	1	2	3	4	5
42. Your bank relies on internal data, external data, and scenario analysis.	1	2	3	4	5
43. Your bank has adequate insurance coverage or loss mitigation processes in place.	1	2	3	4	5
44. Your bank handles frequency distribution and severity distribution according to what AMA recommends.	1	2	3	4	5
45. You run statistical simulation to produce a loss distribution.	1	2	3	4	5
46. You rely on KRIs while calculating the cost of operational risk at your bank.	1	2	3	4	5
47. If you belong to any group of banks, capital flows among the members freely.	1	2	3	4	5

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48. Risk indicators play a role in your monitoring and gathering of internal, external, current and historical data	1 2 3 4 5

Appendix III – Basel III Framework and Structure

Basel III - Phase - in arrangements (Shading indicates transition periods) **(All dates are as of January)**									
	2011	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**As of Jan 1st 2019**
Leverage Ratio	Supervisory monitoring		Parallel run- 1 Jan 2013 - 1 Jan 2017 Disclosures starts 1 Jan 2015					Migration to Pillar I	
Minimum Common Equity Capital Ratio			3.50%	4.00%	4.50%	4.50%	4.50%	4.50%	4.50%
Capital Conservation Buffer						0.63%	1.25%	1.875%	2.50%
Minimum Common Equity Capital plus capital conservation buffer			3.50%	4.00%	4.50%	5.125%	5.75%	6.38%	7%
Phase in of deductions From CET1(Including amounts exceeding the limit for DTA's ,MSR's and financials)				20%	40%	60%	80%	100%	100%
Minimum Tier 1 Capital			4.50%	5.50%	6.00%	6.00%	6.00%	6.00%	6.00%
Minimum Total Capital			8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Minimum Total Capital plus conservation buffer			8.0%	8.0%	8.0%	8.63%	9.125%	9.875%	10.50%
Capital instruments that no longer qualify as non core Tier 1 Capital or Tier 2 capital			Phased out over a 10 year horizon beginning in 2013						
Liquidity Coverage Ratio	Observation period begins				Introduce Minimum Standard				
Net Stable Funding Ratio		Observation period begins						Introduce Minimum Standard	
Source: Basel Committee on Banking Supervision - Ref:P11912 - 12-09-2010 & BCBS179 - October 2010									

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Basel III - Calibration of the Capital Framework Capital requirements and buffers (all numbers in percent)			
	Common Equity (after deductions)	**Tier 1 Capital**	**Total Capital**
Minimum	4.5	6	8
Conservation buffer	2.5		
Minimum plus conservation buffer	**7**	**8.5**	**10.5**
Countercyclical buffer range*	0 - 2.5		
* Common equity or other fully loss absorbing capital			
Source: Basel Committee on Banking Supervision - Ref:P11912 - September 2010 & BCBS179 - October 2010			
Basel III - Calibration of the Capital Framework			

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Comparison of Basel II and Basel III		
Description	**Basel II**	**BASEL III**
The Tier 1 capital requirement ratio = 6% Core Teir 1 Capital Ratio = 4.5% Core Tier 1 Capital Ratio before 2013 must be 2% & by 2015 must be 4.5%	Tier 1 capital = 4% , Core tier 1 capital ratio 2%	Tier 1 capital ratio = 6% i.e. Core Tier 1 capital ratio = will be increased from 2% - 4.5% by 2015
Capital conservation buffer above the regulatory minimum requirement be calibrated at 2.5% and be met with common equity, after the application of deductions.	No Capital conservation buffer	2.5% on top of Tier 1 capital - total common equity requirements = 7%
A countercyclical buffer within a range of 0% - 2.5% of common equity or other fully loss absorbing capital will be introduced & implemented according to national circumstances.	No Countercyclical buffer	0%-2.5% of common equity or other absorbing capital.
As of 1 January 2013, banks will be required to meet the following new minimum requirements in relation to risk-weighted assets (TRWAs): - 3.5% common equity/ TRWAs; - 4.5% Tier 1 capital/ TRWAs, and - 8.0% total capital/ TRWAs.	Partially	Fully
The total capital requirement remains at the existing level of 8.0% and so does not need to be phased in.	8%	8%
Tier 3 capital will be eliminated & phased out by Basel III.	28.5% to 250% of tier 1 capital	Tier 3 capital will be phased out
Capital for systemically important banks	-	Are being developed by FSB & Basel Committee to ensure loss absorbing capacity beyond existing standards
Source: Basel Committee on Banking Supervision - Ref:P11912 - September 2010 & BCBS179 - October 2010		

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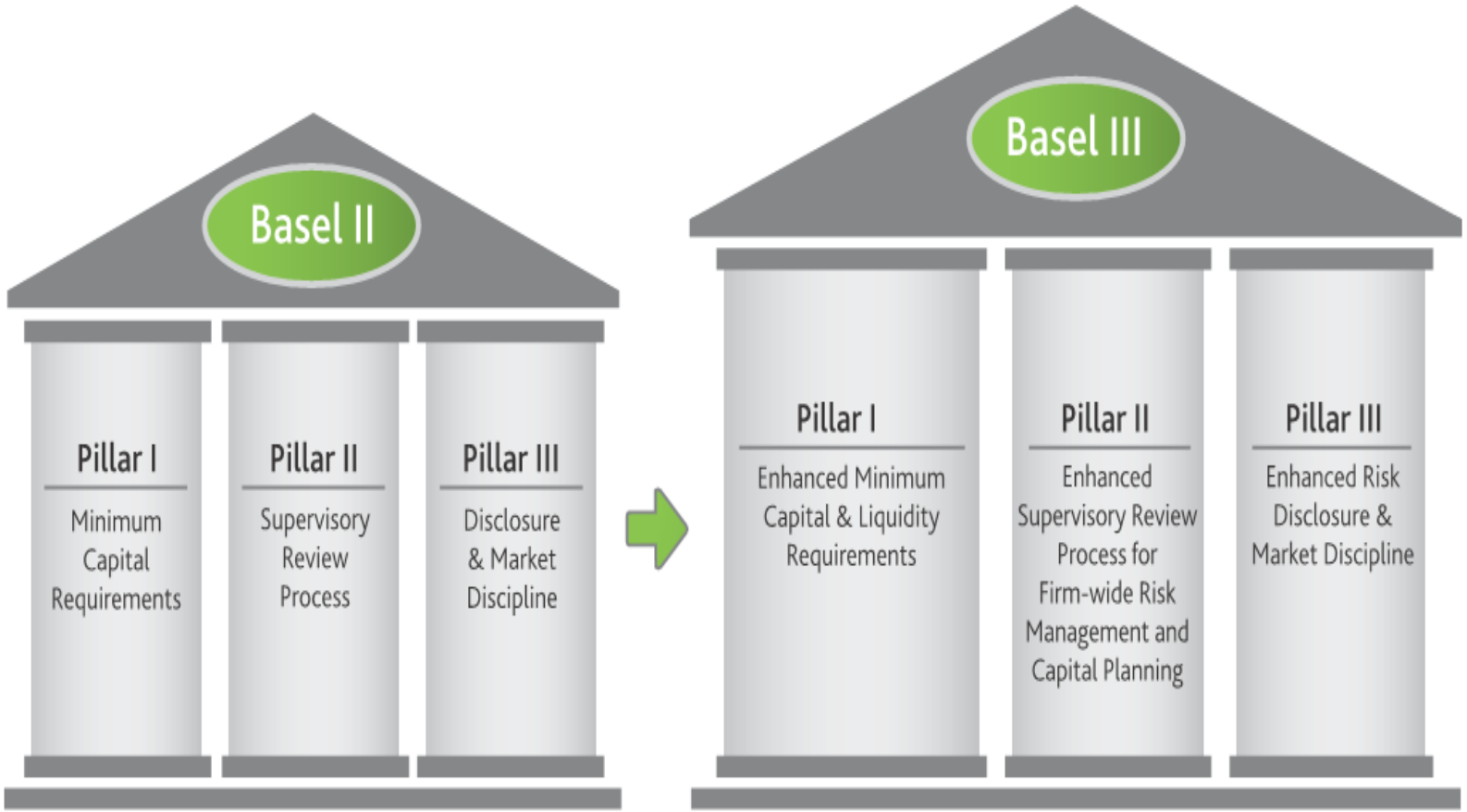

Basel III strengthens the three Basel II pillars, especially pillar 1 with enhanced minimum capital and liquidity requirements.

Source: www.moodysanalytics.com (March, 2011)

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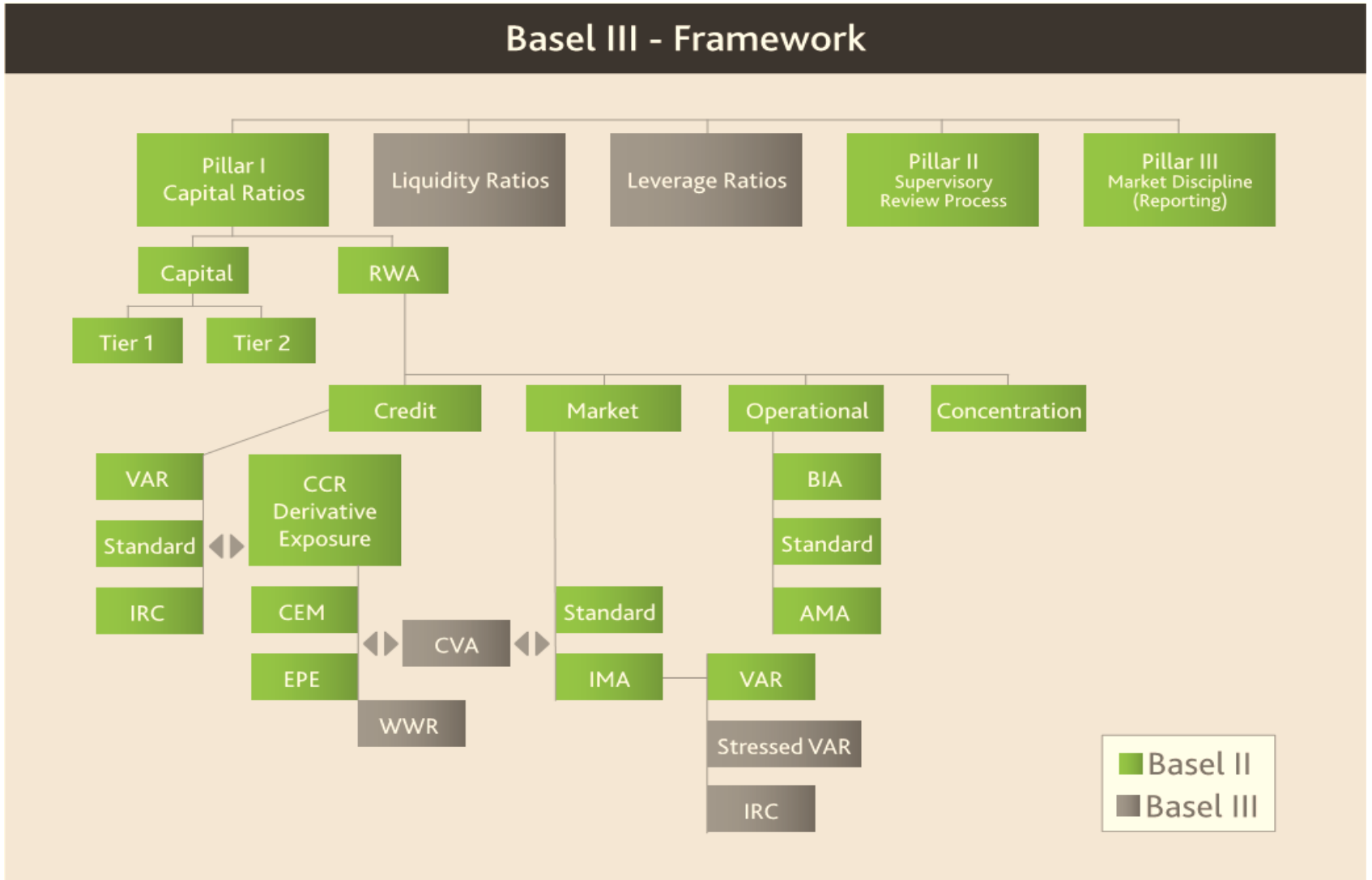

Source: www.moodysanalytics.com (March, 2011)

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Appendix IV - AMA and use of LDA

Appendix IV shows the most important quotes from various practitioners in financial industry in regards to LDA during 2001 to 2007.

No.	AMA and use of LDA
1	Toshihiko Mori, and Eiji Harada (2001), The last approach [LDA]is considered as a future option[To calculate capital under AMA]
2	Padraic Walsh (2003), The loss distribution approach is theoretically the most robust method developed to date.
3	Padraic Walsh (2003), The loss distribution approach provides a framework for addressing extreme outcomes.
4	ITWG (2003), The Industry Technical Working Group shares a common view that loss data should really be the foundation of an LDA-based AMA approach.
5	Klugman et al. (2004) , [LDA] is a good source for various loss models.
6	Jos´eAparicio, and EserKeskiner (2004), This is the most advanced method [LDA] envisaged so far and we believe the most exciting area for further research
7	Fitch (2004), The vast majority of banks hoping to adopt AMA plan to use a loss distribution approach to their capital charge.
8	M.R.A. Bakker(2004), The Loss Distribution Approach (LDA) uses frequency and severity distributions based on operational losses to quantify operational risk and is at this moment one of the most used and discussed (see for instance Cruz (2002) and Frachot, Georges, and Roncalli (2001)) approach under the AMAs to measure operational risks.
9	Chartis (2005), In annual Chartis Customer Survey of over 130 financial institutions 58% of respondents indicated that they will be using a combination of the LDA (Loss Distribution Approach) and COSO approach (Committee of Sponsoring Organisations of the Treadway Commission)
10	Bank of Japan (2005), The most commonly used operational risk quantification method is known as the “loss distribution approach.”
11	Kabir Dutta, and Jason Perry (2007), Given the characteristics and challenges of the data, we can resolve many issues by using an LDA approach
12	Kabir Dutta, and Jason Perry(2007), The LDA has been exhaustively studied by actuaries, mathematicians, and statisticians well before the concept of operational risk came into existence

Source: author’s own work