

An Investigation of the Extent of Adoption of Enterprise Risk Management (ERM) by Banks in Zimbabwe

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Abstract

The purpose of this paper is “to determine the degree of adoption of enterprise risk management practices among banks in Zimbabwe. A mixed method approach was used in this study. The population of the study comprised of 18 commercial banks operating in Zimbabwe. Purposive or convenience sampling was used to select respondents for the study. The respondents consisted of chief risk officer/risk managers and compliance officers of the commercial banks. The data required for this study was collected from both sources i.e. primary and secondary sources. Primary data was collected through the use of a questionnaire while secondary data was obtained from published annual reports of banks, monetary policy statements, risk management guidelines and Reserve Bank annual bank supervision reports and regulations. Correlation analysis using SPSS v16 was undertaken to measure the strength and direction of a linear association that exists between the variables, while Chi-square statistic was used to test the research hypotheses. The findings reveal that all the four variables namely portfolio view of risk across the enterprise; risk aggregation and consolidation; integration of ERM into strategy and operations; and aggregated bank-wide risk reporting are positively correlated to each other. This implies banks that are more likely to implement or adapt, for example, the principle of portfolio view of risk are more likely, for example, to consider the principle of aggregated ERM (bank-wide) reporting. The results of this study have proven that banks consider the principle of Portfolio View of Risks as the highest important principle when implementing ERM. The main value of this paper is to provide a comprehensive understanding of the extent to which banks have adopted the principles of ERM.

Key words: risk embedding, Capital adequacy, risk aggregation, portfolio.

1. Introduction

Mikes (2005) pointed out trends in corporate reporting and governance in the UK and the world over has increased the importance of risk management. In the mid-1990s a series of corporate failures in the financial sector, for example the collapse of Barrings and later Enron and Worldcom saw risk management being embraced by many banking institutions and emerging as a financial discipline that offered a means of controlling risks. However, during this period the focus was on managing the various risks independently i.e. silo based.

The global financial crisis of 2007 and various bank failures in different jurisdictions underscored the need for banks to move away from a silo based risk management approach to a holistic or integrated approach known as enterprise risk management (ERM).

The goal of ERM is to help companies better understand the risks they face so that they can reduce exposure and loss, improve overall corporate stewardship and reputation, and maximize stakeholder value. According to Bukky Olajide (2008) ERM offers a robust framework to assess and analyse risk holistically, identifying areas of concern in advance and proactively develop measures to deal with them.

According to RBZ (2006) the importance of ERM in Zimbabwean banking sector cannot be over-emphasized. Banks face a myriad of risks which are interdependent and mitigating one type of risk may create additional or heighten an existing risk. It is therefore crucial that risks are managed in an integrated way so that inter/intra risk diversifications and correlations can be exploited.

As a result the concept of ERM is now on the agenda of most banks' board meetings. However, despite the growing importance of ERM the extent of its adoption by Zimbabwean banks is relatively unknown. This paper seeks to investigate and determine the extent to which banks have adopted ERM practices.

2. Literature Review

2.1 Definition of Enterprise Risk Management (ERM)

The Casualty Actuarial Society who describes ERM as: "... the discipline by which an organization in any industry assesses, controls, exploits, finances and monitors risk from all sources for the purposes of increasing the organization's short- and long-term value to its stakeholders."

There is no generally accepted common approach to the concept of enterprise risk management. A number of ERM frameworks, each of which describe an approach for identifying, analyzing, responding to, and monitoring risks and opportunities, within the internal and external environment facing the enterprise have been developed and are being used. While they may vary in name, industry and region, they share a common theme: the identification, prioritisation and quantification of risk holistically or across the entire enterprise to help firms effectively manage their exposure.

The most commonly used ERM frameworks are Casualty Actuarial Society (CAS) ERM framework (2003), COSO ERM Integrated Framework (2004), KPMG ERM framework, CPA Australia (2001) and the ISO 31000 Enterprise Risk Management framework.

A study of the various ERM frameworks mentioned above reveals that all share the following critical characteristics:

- Risk aggregation and consolidation (KPMG & Basel 11)
- Portfolio view of risk across the enterprise (Segal 2011)

- integration of ERM into strategy and operations [Mikes 2005 & Jing Ai et al(2003)]
- Aggregated bank-wide risk reporting (ANZ ERM Standard)
- A process ongoing and flowing through an entity (COSO)
- Inclusion of all risk categories (CPA)

The above characteristics form part of the principles of ERM which are not found in the traditional ‘silo’ based risk management approach.

Previous research [(MacDonagh, M (2009) *Jalal, A & AlBayati F,S & AlBuainain N, R: (2011)* have concentrated on steps in the risk management process as indicators of the adoption of ERM by companies. *Jalal, A & AlBayati F,S & AlBuainain N, R: (2011)* researched on the relationship between four concepts namely Risk Assessment, Communication, Monitoring and Control and the adoption of enterprise risk management.

However, this approach by *Jalal et al (2011)* has weaknesses in that the ERM framework, according to *Andersen and Schroder (2010)*, retain the conventional risk management cycle comprised by risk identification, risk analysis, risk evaluation and risk responses as central elements. Therefore variables studied by *Jalal et al (2011)* as indicators of adoption of ERM (*i.e. Risk Assessment, Communication, Monitoring and Control*) are also inherent in the traditional silo based risk management approach.

In this regard the study is going to focus on the following dimensions /variables that are unique to ERM when viewed in relation to the conventional/ traditional risk management:

- portfolio view of risk across the enterprise
- risk aggregation and consolidation
- integration of ERM into strategy and operations
- Aggregated bank-wide risk reporting.

Existence of the above variables in banks will be taken, in this research, as proxies for adoption of enterprise risk management by banks.

This research is going to build on the existing knowledge by assessing the level of ERM adoption by banks through evaluating the extent of implementation or consideration of the above principles and ascertain whether the results indicate full implementation, partial implementation or non-implementation of ERM.

2.2 Risk Aggregation and Consolidation

With the rise of risk management as a distinct discipline in bank management, the issue of risk aggregation has only recently become an area of study. [*Rosenberg & Schuermann (2004)*]

An appropriate risk aggregation framework is fundamental for adequate enterprise risk management. Its main objective is to provide appropriate risk information to the relevant management to steer the business. *Alviniussen and Jankensgård (2009)* noted that the risk aggregation that takes place in ERM allows management to assess interdependencies between its various risk exposures and to take this information into account when developing risk mitigation strategies.

According to *Rosenberg and Schuermann (2004)* the goal of integrated risk management in a financial institution is to measure and manage risk and capital across a range of diverse business activities. This requires an approach for aggregating risk types (market, credit, and operational) whose distributional shapes vary considerably.

The Basel Committee on Banking Supervision highlighted that risk aggregation provides necessary information that enables effective group-wide or enterprise-wide risk management, as well as a wide variety of other key business decisions and business processes.

MacDonagh, M (2009), noted that companies adopting ERM rely heavily on quantitative analysts to produce a single numerical figure for a bank's enterprisewide risk exposure. In the banking sector economic capital and Value at Risk models provide metrics along which all risk types can be measured. According to Mikes (2005) economic capital as the common denominator for the measurable risk types creates a consistent and comprehensive framework or at least the appearance of it which risks can be compared and aggregated enterprise wide.

2.3 Portfolio View of Risk

Alviniussen and Jankensgård (2009) argued that ERM traces some of its intellectual roots to Portfolio Theory, which expresses the idea that risks should be measured and managed on a portfolio basis, and that the risk of the portfolio should be balanced against potential rewards.

According to the *COSO Framework (2004)* ERM requires an entity to take a portfolio view of risk. In this regard management develops a portfolio view from two perspectives namely business unit level and entity level. The portfolio view of risk stems from the realization that:

- Some risks are complex: mitigating a risk in one department may create a more significant risk in another department;
- When divisions or departments focus on their own risks separately it can lead to solutions that may seem reasonable on their own, but that are not appropriate in face of the totality of the bank's risk profile.
- Hedging all risks is expensive in both economic and policy terms. If the same risk is hedged across several departments we may be unnecessarily compounding the expense;
- Many risks are linked by the same source of risk
- There is need to understand interrelated impacts of risks

Pooser and McCullough (2012) in their study entitled, 'ERM Determinants, uses and effects on firm' studied the behavior of firms that have implemented ERM and concluded that managing risk jointly (portfolio view) is the most significance of the ERM principles adopted by firms.

2.4 Embedding of ERM into strategic and management practices

Good ERM needs to go well beyond the narrow confines of the core risk processes. *Brodeur and others (2010)* highlighted three core processes where risk considerations need to be integrated and where the board plays a key role: strategic planning, capital allocation and financing.

Successful ERM programs fit risk tools and processes into existing management practices and strategic planning processes. This can be done by aligning risk assessments with business unit and functional objectives to promote thinking about risk from both operating and strategic perspectives.

According to *Mehta (2010)* the extent to which ERM principles and practices are integrated into management decision making is determined by the degree to which management decision-making has a risk component and the depth to which risk awareness is 'embedded' or 'systematized' in day to day operations.

In support of the above view, the survey by KPMG (2011) found out that firms with strong ERM processes have a culture that integrates risk into strategic planning.

2.5 Aggregated Bank-wide Risk Reporting

One of the key tools to implement aggregated ERM reporting in an organization is the “ERM dashboard” (Remko). This is further supported by MacDonagh, M: (2009) who noted that a central tenet of the right approach to ERM reporting is the use of management dashboards.

One common challenge is that management does not actually understand the expectations of the board with respect to risk reports. Brodner and others (2010) noted that the board report should be part of an integrated system in which business unit reports are aggregated into a company level risk report.

The Conference Board article on the Role of US Boards in ERM further stated that the design of board reports on risk begins with a clear understanding of what information the board and the committees need to understand and what they are expected to do with the information. According to Segal (2011) there are two types of ERM information routinely provided to maintain an appropriate level of enterprise exposure namely exposure information and key risk indicators (KRIs). Exposure information and the corresponding thresholds as well as KRIs are routinely reported to the board of directors, management and the ERM team in support of maintaining an appropriate level of risk exposure to appetite.

3. Research Objectives And Methodology

The major aim of this research is to determine the degree of adoption of enterprise risk management practices among banks in Zimbabwe.

This objective will be pursued through investigating the extent to which banks’ have applied ERM principles in their risk management frameworks.

The approach used for this study a mixed method which according to Creswell (2002) is a procedure for collecting, analysing and mixing both qualitative and quantitative data at some stage of the research process within a single study to understand a research problem more completely.

The population of the study comprised of 18 commercial banks operating in Zimbabwe. Purposive or convenience sampling was used to select respondents for the study. The respondents consisted of chief risk officer/risk managers and compliance officers of the commercial banks.

The data required for this study was collected from both sources i.e. primary and secondary sources. The instruments used were the survey questionnaire and desk review. Primary data was collected through the use of a questionnaire while secondary data was obtained from published annual reports of banks, monetary policy statements, risk management guidelines and Reserve Bank annual bank supervision reports and regulations.

Correlation analysis and One-Sample t-test using SPSS v16 was undertaken to measure the strength and direction of a linear association that exists between the variables, while Chi-square statistic was used to test the research hypotheses.

3.1 Reliability and Validity

In order to test the validity of the questionnaire to ensure that it actually measures what it purports to measure, a pilot study on 10 asset (investment) management companies, was conducted. The respondents or population for the pilot study were not part of the main study.

To test the reliability of the research instrument (questionnaire), the completed questionnaires for the pilot study were used to calculate the reliability coefficient alpha (Cronbach's alpha) score for each question in the questionnaire using SPSS v16.0 package. The overall Cronbach's Alpha is 0.755, which is very high and indicates strong internal consistency among the thirty one questions in the questionnaire.

After testing for validity and reliability, the questionnaire was distributed to the targeted respondents i.e. the chief risk officers/heads of risk of the 18 commercial banks. A total of 14 completed questionnaires were received back translating to a response rate of 77.78%. According to Yusof and Aspinwall (2000), a response rate of 20 to 25% is normal for mailed questionnaires.

4. Findings And Analysis

The aim of this section is to address the research objective pertaining to the determination of the degree of adoption of ERM principles among banks in Zimbabwe. An analysis of the level of implementation of ERM principles and resultant inferences on the extent of adoption of ERM is conducted using the results of correlation analysis and One Sample T-TEST. The section concludes with an interpretation of the results of hypotheses testing which were done using Chi-Square tests.

4.1 Correlation Analysis

The Pearson product-moment correlation coefficient is a measure of the strength and direction of a linear association that exists between two variables. Table 4.1 illustrates the correlation output where each variable was tested against selected variables.

In respect of the direction of the linear association, the results show that all the variables are positively correlated to each other. This implies banks who are more likely to implement or adapt, for example, the principle of portfolio view of risk are more likely, for example, to consider the principle of aggregated ERM (bank-wide) reporting as evidenced by the result $r(12)=0.589$, $p=0.027$.

To test the strength of correlation, Pallant's interpretation was utilized. Pallant (2007) proposed that correlations results can be interpreted as indicated below:

- $r = 0.10$ to 0.29 small correlation
- $r = 0.30$ to 0.49 medium correlation
- $r = 0.50$ to 1.00 high correlation.

Based on Pallant's interpretations, the above the results indicate that there is high positive correlation between the variable portfolio view of risk and adoption of ERM [$r(12)=0.577$, $p<0.05$] as well between the variable ERM reporting and adoption of ERM [$r(12)=0.571$, $p<0.05$.] It can therefore be concluded that the above sets of variables are related and there is a significant correlation between them.

While the results indicate positive relationship between embedding (integration) of risk into strategic planning and adoption of ERM [$r(12)=0.525$, $p=0.54<0.05$] and Risk Aggregation & Quantification and ERM adoption [$r(12)=0.482$, $p=0.081>0.05$], the strength of the correlation between these sets of variables was not significant as indicated by the p-values which are more than 0.05.

4.2 One-Sample T-Testing

In respect of extent of implementation of ERM principles, the one-sample t-test results show that embedding (integrating) risk, portfolio view of risk and ERM (Bank-wide) reporting have sample means above the population mean with p-values of .000 respectively, which is below 0.05. This means the respective population mean and the sample mean for the three variables respectively are significantly different.

Risk aggregation and quantification has a p-value of .106 with a t-statistic of 1.737 with 13 degrees of freedom. Since the p-value is more than 0.05, it can be concluded (in the case of risk aggregation and quantification) the population mean and the sample mean are not significantly different from one another. Tables 4.2 and 4.3 show the one sample statistics.

4.3 Hypothesis Testing

The hypotheses were tested statistically using the Chi-square test as a test statistic based on a 0.05 level of significance (i.e. at a confidence level of 95%) and a degree of freedom of 13. The four (4) hypothesis tested in this study are analyzed hereunder.

Hypothesis 1: Integration (embedding) of risk into strategy planning and operations is a significant consideration in the implementation of ERM by Zimbabwean banks.

The hypothesis was represented statistically as follows:

H₀: Integration (embedding) of risk into strategy planning and operations is not a significant consideration in the implementation of ERM by Zimbabwean banks.

H₁: Integration (embedding) of risk into strategy planning and operations is a significant consideration in the implementation of ERM by Zimbabwean banks.

Table 4.4 shows that Chi-square calculated value (χ^2) of 15.06 is more than the Chi-square table value (χ^2) of 9.488. This means the null hypothesis is rejected and the alternative hypothesis which states that banks in Zimbabwe consider integration (embedding) of risk into strategic planning and operations when implementing ERM is accepted.

The one sample t-test p-value of $.000 < .05$ for this factor further buttress the chi-square test results. This implies that integration (embedding) risk into strategic planning and operations is an important consideration that should be implemented as part of the process of adopting ERM. It has been identified in literature [Mikes (2005), Jin et al (2003), Brodeur et al (2010) and Mehta (2010)] that a critical principle in ERM is the embedding of risk into the operations of the organization. In other words risk should permeate the entire organization.

The study noted that banks in Zimbabwe that have fully or partially implemented ERM use performance measures such as RAROC or RORAC which take into risk into account. The measures are used in strategic and capital planning. Based on this analysis it can be concluded that risk has been incorporated into the bank's decision making processes and performance measurement systems used in banks are aligned to risk. This is an essential part of risk embedding.

Based on the above analysis the hypothesis that banks in Zimbabwe consider integration (embedding) of risk into strategic planning and operations when implementing ERM is confirmed.

Hypothesis 2: Risk aggregation and quantification is a significant consideration in the implementation of ERM by Zimbabwean banks.

The hypothesis was represented statistically as follows:

H0: Risk aggregation and quantification is not a significant consideration in the implementation of ERM by Zimbabwean banks.

H1: Risk aggregation and quantification is a significant consideration in the implementation of ERM by Zimbabwean banks.

Table 4.5 shows that Chi-square calculated value (χ^2) of 9.57 is more than the Chi-square table value (χ^2) of 9.488. This means the null hypothesis is rejected and the alternative hypothesis which states that that banks do not consider risk aggregation and quantification when implementing ERM is accepted.

However, the results of the chi-square test contradict those of the one sample t-test. It is observed from the one sample t-test that banks do not consider risk aggregation and quantification when implementing ERM as $p\text{-value} = 0.106 > 0.05$.

Literature review [Alviniussen & Jankensgard (2009), COSO (2004), Rosenberg & Schuermann (2009), MacDonagh (2009) and Mikes (2005)] however, noted that one of the central tenets of enterprise risk management is the aggregation of risk across the organization. In fact risk aggregation is one element that makes the ERM approach different from the silo based risk management approach. A research by KPMG (2011) noted that most firms surveyed were facing challenges in aggregating and quantifying risks.

Risk aggregation by banks in Zimbabwe has mainly been qualitative and subjective using a risk matrix. This could be attributed to absence of robust information technology systems for quantifying, aggregating and reporting on risks in a majority of banks as well as the absence of a single metric encompassing all the risks facing the organization. It is anticipated that the implementation of Basel II particularly the Internal Capital Adequacy Assessment Process (ICAAP) will enable banks to aggregate non-quantifiable risks like reputational risk, strategy risks etc.

The importance risk aggregation and quantification is summed up by the adage '*if you cannot measure it, you cannot manage it*'. (KPMG (2011))

The hypothesis is confirmed.

Hypothesis 3: Portfolio view of risk is a significant consideration in the implementation of ERM by Zimbabwean banks.

The hypothesis was represented statistically as follows:

H0: Portfolio view of risk is not a significant consideration in the implementation of ERM by Zimbabwean banks.

H1: Portfolio view of risk is a significant consideration in the implementation of ERM by Zimbabwean banks.

Table 4.6 shows that Chi-square calculated value (χ^2) of 18.14 is more than the Chi-square table value (χ^2) of 9.488. This means the null hypothesis is rejected and the alternative hypothesis which states that banks in Zimbabwe consider portfolio view of risk when implementing ERM is accepted.

In addition the one sample t-test p-value of $.000 < .05$ for the Portfolio View of Risk variable corroborates and confirms the chi-square test results. Literature identified that as part of the ERM framework, all the different categories of risks facing an organization should be management in the form of a portfolio where risk correlations and diversifications are taken into account. This is also (just like risk aggregation) is another element that distinguishes ERM from the traditional silo based risk management approach. The results of the study are consistent with the opinions/views of Alvinussen & Jankensgard (2009), KPMG (2001) and COSO (2004) on the importance of having a portfolio view of risk as part of the ERM process.

The study noted that a number of banks in Zimbabwe have put in place structures that enable them to have a portfolio view of risks. Among these structures is the centralization of the risk management function which provides an overall view of the bank's risk situation. In addition banks measure on a monthly the potential overall impacts of the portfolio of risk in line with the requirements of the RBZ Risk Management Guideline of 2006 which require banks to measure the impact of risks from two perspectives namely from earnings perspective and from an economic value perspective.

The hypothesis that 'banks in Zimbabwe consider portfolio view of risk when implementing ERM' is confirmed.

Hypothesis 4: ERM (aggregated bank-wide) reporting is a significant consideration in the implementation of ERM by Zimbabwean banks.

The hypothesis was represented statistically as follows:

H0: ERM (aggregated bank-wide) reporting is not a significant consideration in the implementation of ERM by Zimbabwean banks.

H1: ERM (aggregated bank-wide) reporting is a significant consideration in the implementation of ERM by Zimbabwean banks.

Table 4.7 shows that Chi-square calculated value (χ^2) of 13.46 is more than the Chi-square table value (χ^2) of 9.488. This means the null hypothesis is rejected and the alternative hypothesis which states that banks in Zimbabwe consider ERM (bank-wide reporting) when implementing ERM is accepted.

The results of the Chi-square test are further corroborated by the one sample t-test p-value of $.000 < .05$ and the computed mean value of above 4 for respondents which fall within the five point Likert Scale for respondents in agreement with statements in questions 31-33 that relate to ERM.

The above results tend to maintain the assertion that it is critical that banks should consider bank-wide reporting as part of ERM implementation. According to most respondents banks in Zimbabwe have implemented bank wide risk indicators which are tracked on a monthly basis and reported in bank-wide risk reports which capture all significant risk exposures across the bank. This is consistent with international best practice as recommended by the Basel Committee on Banking Supervision which requires banks to have reports that consolidate various risks and report on an enterprise-wide basis.

Further, the results agree with the identified literature [MacDonagh (2009), Remko (2008) and Basel Committee on Banking Supervision (2006)] which postulated that implementation of ERM (bank-wide) reporting is a critical component in the adoption of ERM. The bank-wide reporting framework provides information to enable stakeholders in the bank to understand risk from an enterprise-wide perspective.

Based on the above analysis, the hypothesis that banks in Zimbabwe consider ERM (bank-wide reporting) when implementing ERM' is supported. Bank-wide risk reporting is the avenue for comprehensively communicating risk exposures as well as providing an overall view of the bank's risk position. The implication of its absence is that the board and senior management is unable to provide oversight on the bank's operations, risk management activities and exposures. Thus bank-wide risk reporting is a critical component in any risk management system and explains the reasons why it is an important consideration for banks in Zimbabwe when implementing ERM.

5. Conclusion

This study makes a noteworthy contribution and addition to the rapidly growing literature on enterprise risk management. Previous researchers have used either single proxies or frameworks such as COSO when evaluating extent of ERM adoption. Risk management consultants use what are known ERM maturity models and analysis to evaluate the level of implementation of enterprise risk management. This study is different in that it provides a new perspective to the analysis of the extent of adoption of ERM. This research has utilised the degree to which banks have implemented ERM principles namely Portfolio View of Risks, Risk Quantification & Aggregation, Embedding of Risk and ERM Aggregated Reporting as a basis for measuring the extent of adoption of ERM.

The extent of implementation of Enterprise risk management practices in the banking sector is considered to be moderate as the majority of banks have either fully or substantially implemented ERM.

The results of the study have proven that banks consider the principle of Portfolio View of Risks as the highest important principle when implementing ERM followed by the integration of risk into operations. It is important that risks are viewed in the form of a portfolio rather than in silos so that inter-risk diversifications and correlations can be understood. Further, there is need to integrate risk into a bank's day to day operations and processes so that a risk culture is ingrained in the organization. However, to succeed, the above principles need to be implemented jointly with other principles (i.e. aggregated bank-wide reporting and risk aggregation and quantification) as revealed in the study so that benefits of ERM can be fully realised.

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6. Tables

Table 4.1 Correlations

		Extent of ERM Adoption	Embedding of Risk	Risk Aggregation	Portfolio View of Risk	ERM Reporting
Extent of ERM Adoption	Pearson Correlation	1	.525	.482	.577*	.571*
	Sig. (2-tailed)		.054	.081	.031	.033
	N	14	14	14	14	14
Embedding of Risk	Pearson Correlation	.525	1	.392	.412	.387
	Sig. (2-tailed)	.054		.166	.143	.171
	N	14	14	14	14	14
Risk Aggregation	Pearson Correlation	.482	.392	1	.440	.044
	Sig. (2-tailed)	.081	.166		.115	.881
	N	14	14	14	14	14
Portfolio View of Risk	Pearson Correlation	.577*	.412	.440	1	.589*
	Sig. (2-tailed)	.031	.143	.115		.027
	N	14	14	14	14	14
ERM Reporting	Pearson Correlation	.571*	.387	.044	.589*	1
	Sig. (2-tailed)	.033	.171	.881	.027	
	N	14	14	14	14	14

*. Correlation is significant at the 0.05 level (2-tailed).

(Source: Author, SPSS V16.0)

Table 4.2 Results - One-Sample Statistics (Extent of adoption of ERM Principles)

	N	Mean	Std. Deviation	Std. Error Mean
Embedding of Risk	14	4.0000	.63549	.16984
Risk Aggregation	14	3.2386	.51399	.13737
Portfolio View of Risk	14	4.2571	.41084	.10980
ERM Reporting	14	3.9529	.52184	.13947

Source: Author, SPSS V16.0

Table 4.3 Results - One-Sample Test (Extent of adoption of ERM principles)

	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Embedding of Risk	5.888	13	.000	1.00000	.6331	1.3669
Risk Aggregation	1.737	13	.106	.23857	-.0582	.5353
Portfolio View of Risk	11.449	13	.000	1.25714	1.0199	1.4944
ERM Reporting	6.832	13	.000	.95286	.6516	1.2542

Source: Author, SPSS V16.0

Table 4.4 Chi-Square results for Integration (Embedding) of Risk

Observed	Expected	O1-E1	(O1-E1) ²	(O1-E1) ² /E1
3.75	2.8	0.95	0.90	0.32
8	2.8	5.20	27.04	9.66
1.75	2.8	-1.05	1.10	0.39
0.5	2.8	-2.30	5.29	1.89
0	2.8	-2.80	7.84	2.80
				15.06
Degree of freedom n – 1				4

Level of significance	5%
Critical value X2 0.05 at 4 degree of freedom	9.488
Chi-square calculated	15.06

Table 4.5 Chi-Square results for Risk Aggregation and Quantification

Observed	Expected	O1-E1	(O1-E1) ²	(O1-E1) ² /E1
0.33	2.8	-2.47	6.08	2.17
6.00	2.8	3.20	10.24	3.66
4.33	2.8	1.53	2.35	0.84
3.33	2.8	0.53	0.28	0.10
0.00	2.8	-2.80	7.84	2.80
				9.57
Degree of freedom n – 1				4
Level of significance				5%
Critical value X2 0.05 at 4 degree of freedom				9.488
Chi-square calculated				9.57

Table 4.6 Chi-Square results for Portfolio View of Risks

Observed	Expected	O1-E1	(O1-E1) ²	(O1-E1) ² /E1
5	2.8	2.2	4.84	1.73
8	2.8	5.2	27.04	9.66
1	2.8	-1.8	3.24	1.16
0	2.8	-2.8	7.84	2.80
0	2.8	-2.8	7.84	2.80
				18.14
Degree of freedom n – 1				4
Level of significance				5%
Critical value X2 0.05 at 4 degree of freedom				9.488
Chi-square calculated				18.14

Table 4.7 Chi-Square results for ERM (Bank-wide) Reporting

Observed	Expected	O1-E1	(O1-E1) ²	(O1-E1) ² /E1
3.00	2.8	0.20	0.04	0.01
7.67	2.8	4.87	23.68	8.46
3.00	2.8	0.20	0.04	0.01
0.33	2.8	-2.47	6.08	2.17
0	2.8	-2.80	7.84	2.80
				13.46
Degree of freedom n – 1				4
Level of significance				5%
Critical value X ² 0.05 at 4 degree of freedom				9.488
Chi-square calculated				13.46