
RISK MANAGEMENT TOOLS PRACTICED IN TUNISIAN COMMERCIAL BANKS

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Abstract:

The main purpose of this study is to explore the current risk management practices and techniques used by Tunisian banks. A questionnaire was developed and surveyed to 16 commercial banks operating in Tunisia. This paper attempts to ascertain the perceptions of Tunisian bankers about the importance of transparency and public disclosure and the understanding of the bank's risk profile. Among others, the results indicate that the Tunisian bankers are aware of the importance and the role of effective risk management in reducing costs and improving bank performance. Furthermore, the Tunisian banks have implemented some effective risk strategies and risk management frameworks. In addition, the credit risk exposure methods are still underused by the Tunisian banks. Similarly, collateral and guarantees continue to be the most commonly used risk mitigation methods to provide support to credit facilities in Tunisian banks. The paper discusses and analyses the current practices in risk management of Tunisian banks. It identifies the tools and methods used in managing credit risk, market risk, liquidity risk and operational risk by Tunisian banks. No previous research had examined tools practiced in risk management by Tunisian banks.

Key words: *Tunisian banks, risk management, risk management practices*

1. Introduction

Risk is an uncertain future events that could influence the achievement of objectives. Uncertainty includes events caused by ambiguity or a lack of information. It includes both negative and positive impacts on objectives. Although all businesses face uncertainty, financial institutions incur certain types of risks given the nature of its activities (Khan et Ahmed 2001). In the financial sector, the risk is a major component.

Financial activity is subject to internal and external environmental factors, so a high degree of uncertainty, in other words, a high degree of risk. This became evident during the last decade in the light of technological developments where the vast world converges and becomes a small village sharing an open economy and therefore becomes subject to the internationalization of risks (Kayed et Mohamed (2009). Several methods are used to classify the risk. The first is to distinguish between financial risk and business risk. The business risk is related to the activity of the company itself. It focuses on the factors affecting the product and / or the market. Financial risk refers to potential losses in the financial markets caused by fluctuations in financial variables (Jarion and Khoury 1996). It is associated to leverage leading to the risk that the debts and obligations are not consistent with the elements of the assets (Gleason 2000). Another way is to decompose the risk on systematic risk and unsystematic risk. Systematic risk is linked to the market or the state of the economy in general, while unsystematic risk is associated with a property or a specific company. Although unsystematic risk can be mitigated by diversifying the portfolio, systematic risk does not improve diversification. However, parts of the systematic risk can be reduced through mitigation techniques and risk transfer.

In today's fast-moving business environment, banks are exposed to a large number of risks: credit risk, liquidity risk, market risk, operational risk, interest rate exchange risk, etc. Due to such exposure to various risks, efficient risk management is required. Managing risk is one of the basic tasks to be done, once it has been identified and known. Shafiq and Nasr (2010), argue that managing a risk in advance is far better than waiting for its occurrence. The focus of good risk management is the identification and treatment of risks. Its objective is to add maximum sustainable value to all the activities of the organization IRM (2002).

Risk management in the financial sector is very critical that all sectors of the economy. As the main objective of the institution is to maximize revenues and offer the maximum value to the shareholder. Therefore risk management is essential to achieve the goal of wealth maximization Al-Tamimi and Al-Mazrooei (2007).

The global financial crisis was characterized by market volatility, a lack of liquidity in many financial markets and enhanced systemic risk. This trouble has underscored the critical importance of risk management. Many institutions are rethinking their risk management governance models. An active role was undertaken in providing oversight of risk management, establishing the risk management policy and framework and approving the institution's risk appetite.

The main reason to adopt risk management does not mean to minimize risk; in fact, its purpose is to optimize the risk- reward trade off and to avoid probable failure in the future.

Risk management as a technical discipline has become a standard area of business practice in recent years. Robust risk management practices in the banking sector are important for both financial stability and economic development. The development of adequate capacity to measure and manage risks is also important for banks to effectively perform their roles in financing economic activities, most especially

the task of continuously providing credit to a large number of enterprises whose activities underpin economic growth.

Risk management is the identification, assessment, and prioritization of risks followed by coordinated and economical application of resources to minimize, monitor, and control the probability and/or impact of unfortunate events or to maximize the realization of opportunities.

Tunisian banks continue their efforts at the initiative of the supervisory authorities, in order to be able to apply the guidelines of Basel II. In addition, the application of prudential arrangements inspired by the Basel Committee will aim to improve the culture of risk in Tunisian banks and promotion of rules and practices of good governance, including the following deficiencies in management of risks. Prudential rules currently applied by credit institutions are lagging behind compared to international standards. Work has been undertaken within the BCT (Central Bank of Tunisia) in January 2008 for the preparation of legislation and regulations necessary for the implementation of Basel II in the Tunisian banking sector.

However, credit institutions cannot create far prerequisites for successful implementation of Basel II in terms of improving the banking environment at the implementation of an internal control system strengthening governance and transparency. In fact, the revolution of 14 January 2011 has highlighted the shortcomings of the banking sector particularly in terms of the division and the hedging of risks. The Tunisian revolution crazy economic life of the country and has affected investor confidence. Before the freezing of the credit market, companies were faced with impairment of solvency. This state of affairs required the intervention of the Central Bank of Tunisia by injecting the necessary liquidity on the money market worth 3 billion dinars for the benefit of local banks. Despite a major effort to sanitation for the year 2010, the rate of NPLs remains relatively high compared to fellow countries in the MENA region (11.94% at December 2010). Moreover, the strong loan growth (19% in 2010) correlated with a less pronounced increase in equity (11% at December 2010) has affected the solvency of some banks in the market (or a sectoral solvency ratio of 11.94% at December 2010).

To this end, Tunisian banks should put in place a robust framework that ensures permanently, better management to cope with any situation of stress. Credit institutions should be aware that the formalization of processes and systems, whether risk management or risk improvement is needed to facilitate strategic decisions and prepare for the unexpected.

The present paper discusses and analyses the current practices in risk management of Tunisian banks. It identifies the tools and methods used in managing credit risk, market risk, liquidity risk and operational risk by Tunisian banks. This is the first published attempt to investigate empirically the risk management practices of banks operating in Tunisia. The paper commences by presenting the relevant literature on issues pertaining to risk management practices in section 2. The third section focuses on methodology along with research questions and hypotheses. Section 4

provides the main empirical findings and discusses the results. Finally, the summary and conclusion of the research are advanced in section 5.

2. Literature review

Risk management in Banks attracted several researchers; within the last few years, a number of studies have provided the discipline into the practice of risk management within the corporate and banking sector. The following is an attempt to summarize the main conclusions of some selected studies.

Al-Tamimi and Al-Mazrooei (2007) compare risk management practices and techniques in dealing with different types of risk in national and foreign banks in UAE using a questionnaire split into two parts. The first part covers the issue related to understanding risk and risk management, risk assessment and analysis, risk identification, risk monitoring, risk management practices and credit risk analysis. While, the second part of the questionnaire focuses on the methods of risk identification in addition to risks faced by banks in UAE. The study shows that the most important types of risk facing the UAE commercial banks are foreign exchange risk, followed by credit risk, then operating risk. The study found also that the UAE banks are somewhat efficient in managing risk, risk identification, risk assessment and analysis are the most influencing variables in risk management practices. Finally, the results indicate that there is a significant difference between the UAE national and foreign banks in the practice of risk assessment and analysis, and in risk monitoring and controlling.

Al-Tamimi (2002) examines the degree to which the UAE commercial banks use risk management techniques in dealing with different types of risk. The study found that the UAE commercial banks were mainly facing credit risk. The study also indicates that inspection by branch managers and financial statement analysis were the main methods used in risk identification. The main techniques used in risk management according to this study were establishing standards, credit score, credit worthiness analysis, risk rating and collateral. Besides the study highlights the willingness of the UAE commercial banks to use the most sophisticated risk management techniques, and recommended the adoption of a conservative credit policy.

Alam and Masukujjaman (2011) diagnose the risk management practices of some selected commercial banks operating in Bangladesh; types of risk facing a bank, procedure and techniques used to minimize the risk. The study reveals that credit risk, market risk and operational risk are the major risks to the bankers which are managed through three layers of management system. The Board of Directors performs the responsibility of the main risk oversight, the Executive Committee monitors risk and the Audit Committee oversees all the activities of banking operations. Regarding use of risk management techniques, it is found that internal rating system and risk adjusted rate of return on capital are relatively more important techniques used by banks in Bangladesh.

Al-Tamimi (2008) studies the relationship among the readiness of implementing Basel II Accord and resources needed for its implementation in UAE banks. Results of the research revealed that UAE banks are ready for the implementation of Basel II. No significant difference was found in the level of Basel II Accord's preparation between the UAE national and foreign banks. It was concluded that there was a significant difference in the level of the UAE banks Basel II based on employees education level. The results supported the importance of training and education level needed for the implementation of Basel II Accord. The relationship between readiness and anticipated cost of implementation was also not confirmed.

Hassan (2009) examines risk management practices of Islamic banks of Brunei Darussalam using a similar methodology to Al-Tamimi and Al-Mazrooei (2007). The study found that the three most important types of risk that Islamic banks in Brunei Darussalam face are the foreign-exchange risk followed by the credit risk and then the operational risk. Concerning the most important methods used by Islamic bankers in risk identification, the results reveal that inspection by *Shari'ah* supervisors, executive and supervisory staff, audit and physical inspection, financial statement analysis and risk survey are the most significant factors of risk identification. It also finds that, Islamic banks in Brunei Darussalam are reasonably efficient in risk assessing and analysis, risk management, risk identification and less efficient in credit risk management.

Khalid and Amjad (2012) conducted a research on the risk management in Islamic banking in Pakistan. The authors use the same model suggested by Al-Tamimi and Al-Mazrooei (2007) of risk management practices. The results indicate that Islamic banks are somewhat reasonably efficient in managing risk where understanding risk and risk management risk monitoring and credit risk analysis, are the most influencing variables in risk management practices.

Another line of research has been focused on the comparison between the practice of risk management in Islamic banks and conventional banks. Hassan (2011) provided a comparative study of Bank's Risk Management of Islamic and conventional banks in the Middle East region. The study aims to identify the most important types of risk facing the Islamic banks and conventional banks in the Middle East. The multi-regression model and ANOVA test prove that there is a positive relationship between risk management practices and understanding risk, risk management, risk identification, risk assessment and analysis, risk monitoring, risk, and credit risk analysis in Islamic banks and Conventional banks.

Hussain and Al-Ajmi (2012) conducted a comparative analysis on risk management practices between the Islamic and conventional banking system in Bahrain. The new modified dummy variable bank type has been used to make the optimum comparison. The deduction of the study was understanding of risk and risk management, risk identification, risk assessment analysis, risk monitoring, credit risk analysis have a positive and significant effect on risk management practices in Islamic and conventional banking of Bahrain. The comparative study indicates that the levels of risks faced by Islamic banks are found to be significantly higher than those faced by

conventional banks. Similarly, country, liquidity, and operational, residual, and settlement risks are found to be higher in Islamic banks than in conventional banks. These findings are attributable to differences in the products of both types of banks that lead to unique risks to Islamic banks.

Nazir et al (2012) explore the current risk management practices that are adopted by commercial and Islamic banks in Pakistan. The data has been collected from the questionnaire to generalize the finding of comparative analysis. A regression model was used to elaborate the results which showed that Pakistani banks are efficient in credit risk analysis, risk monitoring and understanding the risk in the most significant variables of risk management. Moreover the findings of the research revealed that there is significant difference in risk management practices of the Islamic and conventional banks of Pakistan.

3. Research methodology

3.1. Propositions

The above literature of the previous studies figured out the risk management practices adopted by the financial institutions from all over the world in different types of banks. These studies reveal that there are different types of risk faced by different types of the bank. The current study is conducted to explore the risk management practices. It is an attempt to identify the tools and methods used in managing credit risk, market risk, liquidity risk and operational risk in Tunisian banks. This study addresses the following research questions by employing a methodology based on work of Tafri et al. (2011). Nine propositions were developed to achieve this goal.

Proposition 1: Tunisian banks establish their appropriate risk management environment

Proposition 2: Tunisian banks largely use the credit risk exposure techniques.

Proposition 3: Tunisian banks extensively use stress testing for risk factors affecting the credit portfolio.

Proposition 4: Tunisian banks extensively use the traditional credit risk mitigation tools.

Proposition 5: Tunisian banks do not extensively use VaR for market risk.

Proposition 6: Tunisian banks do not use the stress testing results.

Proposition 7: Tunisian banks have implemented some aspects and methodologies of operational risk management.

Proposition 8: In response to liquidity environment, Tunisian banks have made changes and have implemented some procedures and instruments to manage liquidity risk.

Proposition 9: Tunisian banks perceive the role of transparency and market discipline and encourage the disclosure of risk information.

3.2. Instrument

This study covers 16 Tunisian banks using a questionnaire survey to obtain the perceptions of risk managers about some of the issues associated with risk management in the context of conventional banks. These issues are related to the nature of risks, risk measurement and risk management techniques in conventional banks.

The questionnaire was developed with reference to works of, Tafri et al. (2011), Khan and Ahmed (2001), Deloitte and Touche LLP (2004, 2007, 2009 and 2011), KPMG (2004). The questionnaire consists of closed-ended questions and five-point scale questions.

Section I of the questionnaire ascertains the perceptions of risk managers about the risk management system and process. Sections II, III, VI and V seek questions relating to tools and techniques used in managing credit risk, market risk, operational risk and liquidity risk respectively. Section IV is intended to point out the importance of market discipline in Tunisian banks.

3.3. Sample and data collection

The Tunisian banking landscape includes twenty-nine bank centred around the Central Bank of Tunisia. These banks are divided into 18 universal banks, 11 are listed on the Stock Exchange Tunisia, eight banks offshore, two investment banks and one Islamic bank. The Tunisian banking sector occupies a significant place in the economy. Financial services contribute approximately 3% of GDP.

Tunisian banking system is highly fragmented and split between four major banks managing 51% of sector assets and 11 small banks sharing the remaining 15% of total assets. Universal banks are classified into four categories:

- Public Banks (BNA, STB, BH, BTS).
- Private Banks (BIAT, BT, Amen Bank, CITI Bank).
- Banks with foreign majority ownership (UIB,UBCI,Attijari Bank, ABC,BTK,ATB).
- Banks with mixed capital (BTE, BTL, STUSIB BANK, TQB)

The sample includes 16 national conventional banks. The questionnaire was handed over to risk managers in Tunisian banks, it was self-administered. A total of 16 responses were received, all banks have completely responded to the questionnaire. Hence, a response rate of nearly 88.9% was achieved. The questionnaire survey was conducted during the month of October-November 2012. The data was subsequently analysed using descriptive statistics, one sample t-test and Friedman test.

4. Research findings

This section presents the findings obtained from the questionnaire survey. These results will be exposed in six sub-sections: some aspects of establishing a risk

management environment, credit risk management, market risk management, operational risk management, liquidity risk management and transparency and market discipline.

4.1. Risk management system and process

Risk management is a central part of any organization’s strategic management. It is the process whereby organizations methodically address the risks related to their activities with the goal of achieving sustained benefit within each activity and across the portfolio of all activities. The requirement for enhanced risk management has forced banks to adopt adequate practices and techniques. Table 1 reports some aspects of establishing a risk management environment in Tunisian banks. It shows that more than 60% have introduced a formal risk management system, while less than 38% of the banks do not have such risk management system. Similarly, the Table shows that more than 68% of the banks have set up a committee that is responsible for identifying, monitoring, and controlling different types of risks, while less than 31% of the banks are yet to set up such a committee. Furthermore, the results show that 62.5% of the banks have internal auditors responsible for reviewing and identifying the risk management analysis systems, guidelines and risk reporting. These findings support proposition 1 initially claiming that the Tunisian banks established some appropriate risk management environment This practices was adopted essentially by the private banks and banks with foreign majority ownership.

Regarding the bankers’ perception about risk management techniques and efficacy, the results indicate that there is unanimity view that managing risk is an important driver of the performance and success of banks. Similarly, majority of the banks’ managers believe that the application of risk management techniques reduces costs and expected losses.

Table 1: Establishing appropriate risk management environment

	Yes	No
Do you have a formal Risk management system in place in your institution?	62.5	37.5
Is there a committee/section responsible for identifying, monitoring, and controlling different risks?	68.75	31.25
Is the internal Auditor responsible for reviewing and identifying the risk management analysis systems, guidelines and risk reporting?	62.5	37.5
Do you think that Managing risk is important to the performance and success of the bank?	100	0
Do you believe that the application of risk management techniques reduces costs and expected losses average?	93.8	6.3

Economic capital reflects an institution’s actual risk profile and hence is an important tool for allocating capital and for assessing risk-adjusted performance (DELOITTE 2011). Some institutions calculate economic capital on an enterprise basis, without making separate calculations for individual risk types. While, larger institutions understand the economic capital associated with each of the major risk types they face. Table 2 sheds some light on the economic capital calculation by universal Tunisian banks for different types of risks. The frequencies seem to indicate that majority of the banks calculate capital requirement for credit and liquidity risk i.e. 81.3% and 62.5 respectively, while lesser banks calculate economic capital requirement for market risk, interest rate risk and operational risk, 56.3%, 37.5% and 31.3% respectively. These reduced results indicate that economic capital is not widely used suggesting that Tunisian banks do not give importance to the economic capital framework. It seems that risk coverage under the economic capital framework is not comprehensive by Tunisian banks.

Table 2: Economic capital calculation for risk types

Risk type	Responses (%)				
	YES	Not, but currently Being developed	No, but plan to	No, and no plan to	Mean
Interest risk rate	37.5	31.3	25	6.3	2
Credit risk	81.3	18.8	0	0	1.19
Market risk	56.3	12.5	31.3	0	1.75
Operational risk	31.3	31.3	37.5	0	2.06
Liquidity risk	62.5	12.5	18.8	6.3	1.69

Table 3: One sample t-test for economic capital calculation

	Test Value = 2.5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Interest risk rate	-2.070	15	.056	-.500	-1.01	.01
Credit risk	-13.024	15	.000	-1.313	-1.53	-1.10
Market risk	-3.223	15	.006	-.750	-1.25	-.25
Operational risk	-2.049	15	.058	-.438	-.89	.02
Liquidity risk	-3.204	15	.006	-.813	-1.35	-.27

These initial results are further checked for significance through one sample t-test. The results in Table 2 indicate that the Tunisian banks have implemented or are in the midst of implementing mechanisms for economic capital calculation for credit risk, market risk and liquidity risk, as shown by the significance level of the t-test in Table 3. While for interest rate risk and operational risk, the Tunisian banks have not applied such procedure. This is further confirmed through the Friedman test in Table 4 which shows that the ranking is significant, and ranks operational and interest rate risks as the highest two values, while credit risk is last. It is worth mentioning that the Friedman test is more accurate and reliable compared to the simple mean values because it controls experimental variability between subjects which increases the accuracy of the test. Furthermore, the results are not affected by the common variability in rows, since the test ranks the values in each row. Thus, when the Friedman test amounts to a significant p-value, the mean rank will be used to rank the items in question.

Table 4: Friedman test for economic capital calculation

Ranks	
	Mean Rank
Interest risk rate	3.38
Credit risk	2.13
Market risk	2.91
Operational risk	3.69
Liquidity risk	2.91

4.2. Credit risk management

Credit risk is the oldest and biggest risk that bank face. Credit risk arises because bank borrowers and other counterparties may not be willing or able to fulfil their contractual obligations. This concept and the features of a sound credit risk management process are discussed in the Basel II. The main objective of the framework is to further strengthen the soundness and stability of the international banking system via better risk management, by bringing regulatory capital requirements more in line with current bank good practices.

The cornerstone of credit risk management is the establishment of a framework that defines corporate priorities, loan approval process, and credit risk rating system; risk adjusted pricing system, loan-review mechanism and comprehensive reporting system (David 1997).

For credit risk, more than half of the institutions were using the standardized approach (84.6 percent), roughly 44.4 percent of institutions were employing the foundation approach and 14.3 percent were choosing the advanced measurement approach.

In many institutions, credit risk management function has extended its focus to include both issuer and counterparty risk as a result of write-down (losses) in their investment and trading portfolios. When it comes to measuring counterparty/issuer

credit exposures, most institutions relied on traditional methodologies. For assessing underlying and issuer credit risk, the most common approach used seems to be the probability of default techniques, followed by the loss given default, exposure at default, then lastly principal/notional approach, as shown by the mean values in Table 5. Nevertheless, as the Friedman test in Table 6 shows, there are no differences in ranking between the below mentioned credit risk measurement methods.

Table 5: Frequency of responses for the assessing and underlying credit risk

	No plan to use	Do not use	Plan to use	Somewhat used	Extensively used	Mean
Principal/notional	43.8	18.8	12.5	6.3	18.8	2.38
Probability of default	18.8	12.5	25	25	18.8	3.13
Loss given default	31.3	12.5	25	6.3	25	2.81
Exposure at default	31.3	18.8	18.8	18.8	12.5	2.63

Table 6: Friedman test for assessment of underlying credit risk

Ranks	
	Mean Rank
Principal/notional	2.25
Probability of default	2.75
Loss given default	2.56
Exposure at default	2.44

In measuring counterparty credit risk, the surveyed institutions use the three methods indifferently as shown by the Friedman test in Table 8, though Table 7 shows a slight difference in mean values. The three methods being the principal/notional approach, assessment of potential counterparty/issuer exposure by simulation and the sum of potential exposure for individual transactions. This funding suggests that Tunisian banks are still underusing the credit risk exposure methods. Therefore, proposition 2 is rejected.

Table 7: Frequency of responses for measuring counterparty credit exposure

	1	2	3	4	5	Mean
Principal/notional	50	6.2	18.8		25	2.44
Assessing potential counterparty/issuer exposure by	31.3	6.3	31.3	18.8	12.5	2.75

simulation						
Sum of potential exposure for individual transaction	50	6.3	18.8	12.5	12.5	2.31

Table 8: Friedman test for measurement of counterparty risk

Ranks	
	Mean Rank
Principal/notional	2.06
Assessing potential counterparty/issuer exposure by simulation	2.06
Sum of potential exposure for individual transaction	1.88

Given the volatility and turbulence of financial markets, stress testing become an important method that tests the flexibility of the institutions vis-à-vis adverse economic and market conditions that helps identify the potential impact of extreme yet plausible events or movements on the value of a portfolio. It is a complementary tool to make measures to cope with plausible adverse events. Stress testing credit risk is an essential element of the Basel II framework.

The mean values in Table 9 indicate that the most used stress testing approach for risk factors affecting the credit portfolio is Default rates by underlying factors such as obligator/sector/rating/geography/vintage (a mean value of 3), followed by correlation (a mean value of 2.67), while the last is the recovery rates (a mean of 2.27). Nevertheless, Friedman test shows a non-significant p-value, which means that practically, the banks use these stress testing techniques indifferently; in other words they do not have a specific preference for any of them as shown in Table 10 below. These low means depict that the Tunisian banks do not employ the tools which help them to prepare to potential systemic risks by assessing the potential impact of extreme and rare events. Therefore Tunisian banks must devote increased efforts to credit risk analysis. This funding rejects the third proposition.

Table 9: Frequency of responses for the type of the stress testing used for risk factors affecting the credit portfolio

	1	2	3	4	5	Mean
Default rates by underlying factors such as obligator/sector/rating/geography/vintage	20	20	20	20	20	3
Recovery rates	33.3	33.3	13.3	13.3	6.7	2.27
Interest rate changes	37.5	18.8	18.8	18.8	6.3	2.38
Correlation	26.7	26.7	20	6.7	20	2.67
Spreads by underlying name	35.7	28.6	14.3	14.3	7.1	2.29
Do not have stress tests specially designed for risks affecting the credit portfolio	40	20	13.3	0	26.7	2.53

Table 10: Friedman test ranks for stress testing tools

Ranks	
	Mean Rank
Default rates by underlying factors such as obligator/sector/rating/geography/vintage	4.08
Recovery rates	3.33
Interest rate changes	3.50
Correlation	3.79
Spreads by underlying name	3.17
Do not have stress tests specially designed for risks affecting the credit portfolio	3.13

Risk managers were asked which tools their institutions used in credit risk mitigation. The results in Table 11 indicate that most of the Tunisian banks continue to rely on traditional methods to mitigate credit risk such as collateral (a very high mean value of 4.56) and guarantees (a mean value of 4.33). Some of the more complex tools for credit risk mitigation were used by relatively few Tunisian banks. For example only a mean of 1.56 institutions reported using asset securitization vehicles, and a mean of 1.5 for the use of credit derivative instruments.

Table 11: Frequency of responses to the practice of credit risk mitigation tools

	1	2	3	4	5	Mean
Collateral	0	6.3	6.3	12.5	75	4.56
Guarantees	13.3	0	0	13.3	73.3	4.33
On balance sheet netting	37.5	18.8	0	25	18.8	2.69
Off balance sheet netting	37.5	31.3	12.5	12.5	6.3	2.19
Syndication and participation (whole loan sale)	56.3	25	6.3	12.5	0	1.75
Credit insurance programs	50	25	12.5	6.3	6.3	1.94
Asset securitization vehicles (CBO, CLO, CDO)	75	6.3	12.5	0	6.3	1.56
Credit derivatives	75	12.5	6.3	0	6.3	1.50

Interestingly, the Friedman test shows a significant p-value, which means that the ranking of the credit risk mitigation tools usage is significant. . The full ranking is shown in Table 12 below. The first tool is collateral, followed by guarantees, on balance sheet netting, off balance sheet netting, credit insurance programs, syndication and participation, asset securitisation vehicles, then lastly the credit derivatives instruments. This result supports the proposition 4 i.e. Tunisian banks use more traditional methods of credit risk mitigation than sophisticated methods.

Table 12: Friedman test ranking for credit risk mitigation tools

Ranks	
	Mean Rank
Collateral	6.90
Guarantees	6.47
On balance sheet netting	4.73
Off balance sheet netting	4.23
Syndication and participation (whole loan sale)	3.60
Credit insurance programs	3.80
Asset securitization vehicles (CBO, CLO, CDO)	3.17
Credit derivatives	3.10

4.4 Market risk management

In implementing Basle II, several institutions were employing a range of approaches to comply. For market risk, Table 13 shows that 53.3% of institutions were using the 1988 risk weighted assets method, 38.5% were using the more advanced internal models method, while 35.7% were employing the standardized measurement approach.

Table 13: Frequency of responses for market risk approaches

	Yes	No
Internals models approach	38.5	61.5
Standardized measurement approach	35.7	64.3
1988 risk weighted assets	53.3	46.7

In managing market risk in the wake of the turmoil in the financial markets, Basle Committee on Banking Supervision proposed in 1995 allowing banks to calculate their capital requirement for market risk with their own value at risk models, using certain parameters provided by the committee. VaR is a measure of the worst expected loss that a firm may suffer over a period of time that has been specified by the user, under normal market conditions and a specified level of confidence.

Value at risk has been considered as the long accepted methodology for assessing market risk; it has been widely used for banks' trading portfolios and for risk management purposes. In this current survey, market VaR is not extensively used by Tunisian banks as shown in Table 14, whereby only 31.1% of institutions were using VaR. Furthermore, the results show that the Tunisian banks use VaR to cover foreign exchange (a mean of 3.40), fixed income (a mean of 2.80), equities, credit derivatives and asset backed securities (a mean of 2.20), and commodities (a mean of 2). Thus, suggesting the validation of the proposition 5. It is noteworthy that the Friedman test in Table 15 shows that this ranking is not significant; this means that the banks use VaR indifferently for the above purposes.

Table 14: Frequency of responses for the level of usage of market risk VAR

	1	2	3	4	5	Mean
Fixed income	20	20	20	40	0	2.80
Foreign exchange	0	20	40	20	20	3.40
Equity	40	20	20	20	0	2.20
Asset-backed securities	40	20	20	20	0	2.20
Credit derivatives	40	20	20	20	0	2.20
Commodity	50	16.7	16.7	16.7	0	2.00

Table 15: Friedman test for the level of usage of market risk VAR

Ranks	
	Mean Rank
Fixed income	3.90
Foreign exchange	4.30
Equity	3.20
Asset-backed securities	3.20
Credit derivatives	3.20
Commodity	3.20

Besides VaR is useful, institutions employ other tools such as stress tests and scenario analysis to assess market risk. Basel Committee states that stress testing supply a complementary and independent risk perspective to other risk management tools like value-at-risk. Stress test must complement risk management practices based on complex and quantitative models. It allows of possible events by considering potential large moves in market prices, volatility, leverage and time needed to liquidate assets.

Table 16 summarises the frequency of responses for the usage of stress tests by Tunisian banks. Among the survey participants, the stress tests were used for reporting to senior management (a mean of 3.27), setting limits (a mean of 3.20), reporting to the board of directors (a mean of 3.07), understanding the institution’s risk profile (a mean of 3), to trigger further analysis (a mean of 2.80), to conduct strategic planning (a mean of 2.75), and in response to enquiries from rating agencies and regulators (a mean of 2.53). This ranking is further checked through the Friedman test which shows a significant p-value and more or less similar results with the mean values ranking as shown in Table 17. Hence, proposition 6 is rejected.

Table 16: Frequency of responses for the level of usage of stress testing results

	1	2	3	4	5	Mean
Report to senior management	20	13.3	13.3	26.7	26.7	3.27
Report to the board of directors	20	13.3	20	33.3	13.3	3.07
Understand the institution’s risk profile	21.4	7.1	35.7	21.4	14.3	3.00

In response to enquiries from rating agencies and regulators	26.7	20	40	0	13.3	2.53
Trigger further analysis	26.7	13.3	26.7	20	13.3	2.80
Set limits	13.3	20	20	26.7	20	3.20
Conduct strategic planning	18.8	31.3	18.8	18.8	12.5	2.75

Table 17: Friedman test for the level of usage of stress testing results

Ranks	
	Mean Rank
Report to senior management	4.75
Report to the board of directors	4.32
Understand the institution's risk profile	4.00
In response to enquiries from rating agencies and regulators	3.07
Trigger further analysis	3.61
Set limits	4.43
Conduct strategic planning	3.82

4.3. Operational risk management

Basle Committee believes that operational risk is a significant risk for banks and that they must hold capital to protect against losses arising. Basel II includes two simple approaches for operational risk (Basic Indicator and Standardized approach) for banks less exposed to operational risk. These approaches require banks to hold operational risk capital charge calculated as a fixed percentage of a measure of risk determined. Hence, Basle Committee gives banks unprecedented flexibility to develop approach to calculate the capital requirement for operational risk corresponding to their business profile and underlying risks: the advanced measurement approach. Institutions may use their own method to assess their exposure to operational risk.

Table 18 indicates that 8.3% of surveyed Tunisian banks reported following the basic indicator for calculating capital requirements for operational risk while 50% have chosen the standardized/alternative standardized approach and 25% have adopted the advanced measurement approach.

Table18: Frequency of responses for economic capital calculation

	Yes	No
Advanced measurement approach	25	75
Basic indicator	8.3	91.7
Standardized/alternative standardized approach	50	50

When asked about the implementation of aspects of operational risk management, as Table 19 shows, the Tunisian banks are found to use identifying risk

type (a mean of 3.19), at a level of gathering relevant data and Standardizing documentation of processes and controls (a mean of 3.13), roll-out of a formal operational risk training program (a mean of 2.69), creating metrics for monitoring each type of operational risk (a mean of 2.56), and developing methodologies to quantify risks (a mean of 2.31). The above ranking was further tested through Friedman test which shows a significant p-value of 0.005. The Friedman test in Table 20 below shows similar ranking.

Table 19: Frequency of responses for the progress of implementing operational risk management

	1	2	3	4	5	Mean
Identifying risk type	37.5	0	12.5	6.3	43.8	3.19
Gathering relevant data	31.3	0	18.8	25	25	3.13
Developing methodologies to quantify risks	50	0	18.8	31.3	0	2.31
Standardizing documentation of processes and controls	31.3	0	18.8	25	25	3.13
Roll-out of a formal operational risk training program	37.5	6.3	18.8	25	12.5	2.69
Creating metrics for monitoring each type of operational risk	37.5	0	31.3	31.3	0	2.56

Table 20: Friedman test for the progress of implementing operational risk management

Ranks	
	Mean Rank
Identifying risk type	4.19
Gathering relevant data	3.91
Developing methodologies to quantify risks	2.78
Standardizing documentation of processes and controls	3.75
Roll-out of a formal operational risk training program	3.31
Creating metrics for monitoring each type of operational risk	3.06

To mitigate operational risk, banks developed different tools and practices. From Table 21, it can be seen that the most used tools are: Internal audit results/scores (a mean of 2.81), risk mapping (a mean of 2.63), key risk indicator and internal loss event database (a mean of 2.56), risk assessment techniques (a mean of 2.50), external loss event analysis (a mean of 2.44), Causal event analysis (a mean of 2.13), Balanced scorecard (a mean of 2.06), Scenario analysis (a mean of 2) and finally, Six Sigma and TQM techniques (a mean of 1.50). This ranking is further checked through the Friedman test which shows a significant value 0.002.

Table 21: Frequency of responses for operational risk mitigation tools

	1	2	3	4	5	Mean
Risk assessment techniques	37.5	12.5	18.8	25	6.3	2.50
Key risk indicators	37.5	6.3	25	25	6.3	2.56
Internal loss event database	37.5	6.3	25	25	6.3	2.56
Scenario analysis	50	18.8	18.8	6.3	6.3	2.00
Causal event analysis	53.3	13.3	13.3	6.7	13.3	2.13
External loss event analysis	43.8	6.3	18.8	25	6.3	2.44
Internal audit results/scores	37.5	6.3	12.5	25	18.8	2.81
Balanced scorecard	50	12.5	25	6.3	6.3	2.06
Risk mapping	43.8	6.3	12.5	18.8	18.8	2.63
Six Sigma	68.8	18.8	6.3	6.3	0	1.50
TQM techniques	56.3	37.5	6.3	0	0	1.50

The Friedman test results in Table 22 show slightly different results, whereby the main tool for mitigating operational risk by the Tunisian banks is risk mapping followed by internal audit results and score, internal loss event database, key risk indicators, external loss event analysis, risk assessment techniques, causal event analysis, scenario analysis, balanced scorecard, Six Sigma and finally TQM techniques. Thus, by referring to the Friedman test results, the proposition 7 which states that Tunisian banks have implemented some aspects and methodologies of operational risk management is supported.

Table 22: Frequency of responses for operational risk mitigation tools

Ranks	
	Mean Rank
Risk assessment techniques	6.30
Key risk indicators	6.40
Internal loss event database	6.50
Scenario analysis	5.70
Causal event analysis	5.87
External loss event analysis	6.33
Internal audit results/scores	7.17
Balanced scorecard	5.63
Risk mapping	7.27
Six Sigma	4.53
TQM techniques	4.30

4.4. Liquidity risk management

Liquidity risk is one of the major risks faced by financial intermediaries and banks in particular. It involves the inability to fund increases in assets, manage

unplanned changes in funding sources and to meet obligations when required, without incurring additional costs or inducing a cash flow crisis. Recent global financial crisis exposed major weaknesses in the functioning of the global financial system. The difficulties experienced by some banks were due to lapses in basic principles of liquidity risk management. In response, as the foundation of its liquidity framework, the Committee of Basle in 2008 published *Principles for Sound Liquidity Risk Management and Supervision*. The objective of the reform is to strengthen global capital and liquidity regulations with the goal of promoting a more resilient banking sector, and to accumulate an adequate cushion of high-quality liquid assets to enable an institution to survive. Many institutions concentrated on liquidity risk management policies, tools and procedures.

Table 23 shows that the most common responses to the changed liquidity environment by Tunisian banks are strengthening their liquidity risk management function (a mean of 3.88), diversifying funding sources (a mean of 3.60), improving treasury and ALM systems (a mean of 3.47), improving liquidity management policy (a mean of 3.44), decreasing position limits (a mean of 3.13), maintaining liquid asset portfolio (a mean of 2.94), integrating treasury function with risk management function (a mean of 2.73), revising contingency funding plan (a mean of 2.47) and enhancing liquidity stress testing (a mean of 2.25). The Friedman test in Table 24 shows a significant p-value indicating that the ranking itself is significant. The ranking given by the Friedman test is more or less similar to the one given above.

Table 23: Frequency of responses regarding the usage of tools in managing liquidity risk

	1	2	3	4	5	Mean
Strengthen liquidity risk management function	6.3	6.3	18.8	31.3	37.5	3.88
Policy	25	6.3	0	37.5	31.3	3.44
Revise contingency funding plan (CFP)	40	20	13.3	6.7	20	2.47
Diversified funding sources	6.7	20	6.7	40	26.7	3.60
Decrease position limits (liquidity risk tolerance)	13.3	26.7	0	53.3	6.7	3.13
Treasury and ALM systems	20	6.7	13.3	26.7	33.3	3.47
Integrate treasury function with risk management function	20	26.7	26.7	13.3	13.3	2.73
Enhance liquidity stress testing	43.8	18.8	12.5	18.8	6.3	2.25
Maintain liquid asset portfolios	31.3	6.3	12.5	37.5	12.5	2.94

Table 24: Friedman test for the usage of tools in managing liquidity risk

Ranks	
	Mean Rank
Strengthen liquidity risk management function	6.50
Policy	5.62
Revise contingency funding plan (CFP)	4.19
Diversified funding sources	5.81
Decrease position limits (liquidity risk tolerance)	5.23
Treasury and ALM systems	5.62
Integrate treasury function with risk management function	3.81
Enhance liquidity stress testing	3.15
Maintain liquid asset portfolios	5.08

Banks should practice effective and sound liquidity risk management. To this end, it should put in place a robust framework that ensures that a bank has sufficient liquid assets to meet liabilities that fall due in the short term and to meet any unexpected demands for funds by its depositors or creditors. The effectiveness of a bank’s liquidity risk management will determine the extent to which the institution may be subject to cash flow crisis and additional costs.

Table 25 exhibits procedures and practices used to manage liquidity risk in Tunisian banks. It can be seen that 62.5% of institutions analyse type of deposits, tenor, etc. for financing purposes, 86.7% of institutions analyse the type of depositors, withdrawing factors, 40% of the institutions retain profits and allocate for risk investment reserves, 68.8% finance short term projects with more funds available in short term deposits, and finance monitoring and evaluation (75%), with 56.3% prefer liquid, profitable, and highly returnable economic sectors and 56.3% preferring small and medium enterprises with low record of non performing financing. 68.8% of the respondents cooperate and communicate with entrepreneurs. Some other procedures and practices useful to manage liquidity are less employed e.g. concentrating financing on short term debt based financing (31.3%). Therefore proposition 8 is supported.

Table 25: Frequency of responses about procedures/practices used to manage liquidity risk

	Yes	No
Analysing type of deposits, tenor, etc. for financing purposes	62.5	37.5
Analysing type of depositors, withdrawing factor, etc.	86.7	13.3
Retaining profit and allocation for risk investment reserves	40	60
Preferring liquid, profitable, and highly returnable economic sectors	56.3	43.8
Concentrating financing on short-term debt based financing.	31.3	68.8
Financing short-term projects with more funds available in short-term deposits.	68.8	31.3
Cooperation and communication with entrepreneurs.	68.8	31.3
Financing monitoring and evaluation.	75	25

Preferring SME (small and medium enterprises) which have low record of non-performing financing (NPF)	56.3	43.8
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After setting up the liquidity management process, studying the causes of liquidity risk, and applying some techniques for mitigation, banks prepare financing strategies in the form of liquid financial instruments with an effective diversification of sources and tenors of investments. Some liquid financial instruments can be used as sources of bank liquidity to solve the predictable irregular demand for liquidity.

The mean values shown in Table 26 indicate that the instruments mostly used in Tunisian banks are funds in central banks (100%), money market instruments (56.3%), emergency liquidity facility from the central bank or the government (50%), cash reserves and funds in other Tunisian banks (31.3% each).

Table 26: Frequency of responses regarding the instrument used for managing liquidity risk

	Yes	No
Cash reserves	31.3	18.8
Funds in the central bank	100	0
Funds in other banks	31.3	68.8
Using emergency liquidity facility from central Bank /government	50	50
Using the money market instruments	56.3	43.8

4.5. Transparency and market discipline

The goal of achieving transparency has become more challenging in recent years as banks' activities have become more complex and dynamic. Basle Committee define transparency as public disclosure of reliable and timely information that keeps market participants better informed about the way a bank is managed and governed. Transparency enables users of information to make an accurate assessment of a bank's financial condition and performance, business activities, risk profile and risk management practices (Basel Committee on Banking Supervision [BCBS], 1998). Pillar 3 of Basle II for enhancing transparency in banking postulate that that market discipline can be strengthened and therefore banks' excessive risk taking reduced by greater disclosure. In the context where banks control their risk, enhancing transparency may be beneficial at best in that transparency may force banks to behave more prudently.

Table 27 reports the perceptions of Tunisian banks about market discipline and transparency. In fact, 93.85 of the respondents agreed that transparency is essential for achieving market discipline, 92.9% of surveyed institutions report that an effective disclosure permits the market participants to have better understanding of the banks' risk profile. 86.7% of institutions believe that enhanced public disclosure allows markets discipline to work earlier and more effectively. 80% of institutions consider that

market discipline based on adequate public disclosure encourages banks to maintain sound risk management systems and practices. In addition, 71.4 of establishments affirm that public disclosure can reinforce specific supervisory measures designed to encourage banks to behave prudently. 75% was recorded to the statement that transparency in financial reports on risks allows to more accurately assessment of a bank's financial strength and performance. Also, 78.6 of asked Tunisian banks perceive that more risk information is disclosed in the annual report of Tunisian banks, more market participants are allowed to monitor the banks. Furthermore, 56.3% of respondents agree that greater risk disclosure encourages new investments in Tunisian banks. Therefore proposition 9 is supported.

Table 27: Perceptions of the issue of market discipline and transparency in Tunisian banks

	Yes	No
Transparency is essential for achieving market discipline	93.8	6.3
Effective disclosure permits that market participants have better understanding of the banks' risk profile	92.9	7.1
Enhanced public disclosure allows market discipline to work earlier and more effectively	86.7	13.3
Market discipline based on adequate public disclosure encourages banks to maintain sound risk management systems and practices	80	20
Transparency in financial reports on risks allows to more accurately assess a banks' financial strength and performance	75	25
Public disclosure can reinforce specific supervisory measures designed to encourage banks to behave prudently	71.4	28.6
Greater risk disclosure encourages new investments in banks	56.3	43.8
The more risk information disclosed in the annual report of banks, allows market participant to monitor the banks	78.6	21.4
If the performance of the bank is great, the bank tend to disclose more information to the market on its risks and risk management practices	75	25

5. Conclusion

In today's fast-moving business environment, risk management becomes a standard area of business practices. It is a key factor in assessing the future performance and condition of a bank and the effectiveness of management.

Many institutions are taking a more active role in providing oversight of risk management as well as establishing the risk management policy and framework and approving their risk appetite.

This study provides a picture of the state of risk management in 16 Tunisian banks.

The main results of this study are:

- Tunisian bankers are aware of the importance and the role of effective risk management in reducing costs and improving bank performance
- Tunisian banks have implemented some effective risk strategies and effective risk management frameworks (infrastructure, process and policies);
- Tunisian banks do not use widely the economic capital for different risk types
- Tunisian banks are still low in terms of credit risk exposure methods
- Collateral and guarantees continue to be the most commonly used risk mitigation methods to provide support to credit facilities in Tunisian banks.
- Market VaR is not extensively used by Tunisian banks.
- Tunisian banks implement some aspects and methodologies of operational risk management.
- Analysing liquidity risk management shows that Tunisian banks are strengthening their liquidity risk management and employing several liquid instruments.
- Tunisian banks apprehend the role of transparency and market discipline and encourage the disclosure of risk information with reference to Basel II.

Finally, in financial institutions, risk management should be an endless and developing process which should address methodically all the risks surrounding the organization's activities past, present and future.

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