AN ANALYSIS OF THE RELATION BETWEEN ENTERPRISE RISK MANAGEMENT (ERM) INFORMATION DISCLOSURE AND TRADITIONAL RISK MEASURES IN THE US BANKING SECTOR

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Abstract

The purpose of this article is to validate the quality and the relevance of enterprise risk management (ERM) information disclosure by analyzing the relation between the different dimensions of ERM disclosed in the annual report and the traditional measures of risk in the US banking sector. We use content analysis to measure ERM dimensions and a correlation analysis to document the links between risk exposure, consequences, and strategies (Aebi, Sabato, & Schimd, 2012), and the traditional measures of risk (Schnatterly, Clark, Howe, & DeVaughn, 2019) disclosed in the annual reports from 2006 to 2009. We then separately make the analysis for the period before and after the crisis to identify any effect of the crisis on ERM information's ability to predict and reflect the banking sector's traditional risk (Maingot, Quon, & Zéghal, 2018). Our results reveal the overall validity of ERM information in assessing traditional risk measures through a significant correlation between ERM exposure, consequences and strategies, and most of the traditional measures of risk. Finally, we confirmed the relevance and the robustness of our results through a portfolio analysis approach. This research sheds new light on the relevance of ERM information by introducing a new framework and a new methodology for assessing the validity of this information within the banking sector, where risk management plays a vital role. The results are potentially useful for banks regulators as well as for producers and users of the information on banking risks.

Keywords: ERM, Traditional Risk Measures, US Banking Sector, Financial Crisis

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1. INTRODUCTION

Since the 2007 financial crisis in the United States occurred, risk management in the banking sector is featured, given the fact that the highs and lows impacted the banking sector as a viable industry (Vaidyula & Kavala, 2014; Maingot, Quon, & Zéghal, 2018). With the enormous repercussions worldwide,

we can all appreciate the importance of risk management for organizations and the severe consequences when there is a lack of diligence. Banks play a crucial role in the economy's sustainability and its growth. Naturally, in the aftermath of the crisis, the investors had lost faith in the banking industry (Brownlees, Chabot, Ghysels, & Kurz, 2020). In order to rebuild its reputation, like many organizations, financial institutions had and still have the obligation of responding to the demands and requests for better risk disclosure, since it is vital to the future health of the world's financial system (Financial Stability Board, 2012; Schnatterly, Clark, Howe, & DeVaughn, 2019). To avoid other financial disasters, regulation towards risk management in the banking sector has been significantly strengthened. Many regulators with different scales of authority have elaborated specific requirements relating to risk management practices, and disclosures and many organizations (national and international) have come up with best practices guidelines or integrated frameworks.

The Basel Accords are recommendations on banking laws and regulations issued by the Basel Committee on Banking Supervision (BCBS). The BCBS is the primary global standard setter for the prudential regulation of banks and provides a forum for cooperation on banking supervisory matters; its mandate is to strengthen the regulation, supervision, and practices of banks worldwide with the purpose of enhancing financial stability (BCBS, 2017). With two primary objectives, ensuring that banks have sufficient amount of high-quality capital to cover risk exposures and enhancing the quality of markets with transparency in capital reporting, Basel III has introduced detailed mandatory regulatory requirements to enhance the risk management process in the banking sector (Agarwal, Lucca, Seru, & Trebbi, 2014).

Since the period prior to the crisis, many ratios such as the level of capital ratio, liquidity ratio, return on assets and asset growth (quality of the assets held) ratios, financial instruments-to-total assets ratio and many others have been used as good indicators for traditional risk management. Regulators require certain industries to maintain minimal levels for some relevant ratios.

Most financial institutions, even in the absence of certain regulatory requirements, would rather go above and beyond by adopting certain frameworks of risk management (Danielsson, 2002). The Securities and Exchange Commission (SEC) mentions the Committee of Sponsoring Organizations of the Treadway Commission (COSO) as a fine tool to meet requirements in terms of ERM. The COSO II is a reference that integrates and aligns the strategic, operational, and reporting and conformity objectives related to ERM in US banks. This has a variety of positive impacts by increasing public trust and creating value for institutions. Different risk management approaches have evolved through time (Bogodistov & Wohlgemuth, 2017; Gouiaa, 2018). Enterprise risk management (ERM) is an extension of traditional risk management measures used by banks before the financial crisis.

The main objective of this research is to assess the relevance ERM information by assessing the relation between traditional risk measures and their respective risk measures which resulted from the ERM system. Although ERM still covers all the traditional measures, including ratio requirements, this study seeks to validate ERM risk disclosure in terms of exposure levels, consequences and strategic risk management for the US banking sector. In order to achieve that, we seek to examine the relation between traditional measures of risk and ERM levels of risk. This examination will be performed through statistical analyses of correlation between each of the traditional measures of risk and the respective measures resulting from the disclosure of information on ERM. The evaluation of the quality and relevance of risk management disclosure is essential to assess the usefulness of information for decision-makers and the extent to which it fulfills its role as one of the solutions to agency problem and information asymmetry (Gouiaa & Zéghal, 2014).

Risk disclosure must provide information that allows external users to assess the risks about the firm's future economic performance (Dobler, 2005; Linsley & Shrives, 2006; Gouiaa & Zéghal, 2014), and help to evaluate the distribution of the company's future cash flow. A good risk communication policy helps investors assess the quality and prospective volatility of corporate earnings and cash flow. Good risk information also allows investors to assess a company's resistance and ability to respond to uncertain events. So it is important to provide investors with information not only as to the nature of each risk and the likelihood of its occurrence (risk exposure) but also as to its impact on the company once it is materialized (consequences). Investors are also interested in the level of risk tolerance. They want to know the actions or measures taken to identify and mitigate risk (risk management).

We found a significant correlation between the three dimensions of enterprise risk management and traditional measures of risk. The results reveal a strong relation between the level of credit risk, liquidity risk, interest rate risk, market risk, and economic risk and traditional measures of risk (market to book ratio and Beta as a proxy systemic risk) exposure for banks over the entire study period. These results show that the information on risk exposures published in the annual reports of the largest US banks reflects the reality of the banks' risk situation. We found also that the information on the risks published in the banks' annual reports over the period following the crisis better reflects the reality of the banks' risk exposure. The correlation analysis for the entire study period shows that there is a significant link between the traditional measures of market risk and systematic risk and the consequence of each of these risks. The correlation between risk management levels and traditional measures of risk shows that there is a significant link between credit risk management and traditional measures of systematic and liquidity risks. These results reveal the overall validity of ERM dimensions in assessing US bank-related risk.

This article is organized as follows. The second section presents the regulatory and theoretical framework of our research and the hypotheses to be tested. Methodological aspects are the topic of the third section, while the fourth section is devoted to the presentation and analysis of results. In the final section, we review the main results and contributions of this study.

2. THEORETICAL BACKGROUND AND RESEARCH HYPOTHESES

Since this paper will be using pre- and post-financial crisis risk disclosures (based on the ERM approach) to compare traditional risk management to today's ERM levels of risks, it is very important to understand what the requirements are in terms of disclosure. The theoretical framework of risk management, in terms of the traditional management approach, risk measures as well as ERM integrated approach, will then be analyzed.

2.1. Regulatory framework for risk disclosure

The BCBS has published many versions of the Basel Accords. Many criticized Basel II, first published in 2004, stating that its narrow focus on micro-prudential regulations contributed to the banking industry's procyclicality, which played a major role in the past crisis (de Larosière, Balcerowicz, Issing, Masera, McCarthy, Nyberg, Pérez, & Ruding, 2009; Danisman & Demirel, 2019). More specifically, while Basel II limited risk-taking linked to credit through capital adequacy requirements, the systemic (market) risk of the total banking industry was largely ignored. Naturally, when Lehman Brothers, the fourth largest investment bank in the world, collapsed, in September 2008, the lack of macro-prudential regulations contributed to the crisis.

Today's applicable version of the Basel Accords, namely Basel III, is divided into 3 sections: capital, liquidity and large exposures. The strategy of Basel III is to enhance the quality and level of capital in the banking system, complete the micro-prudential regulations by limiting the chances of systemic risks and improved risk coverage by introducing counter-cyclical capital (Danisman & Demirel, 2019; Brownlees et al., 2020). Post-crisis regulatory reforms, such as Basel III in various countries and the Dodd-Frank Act in the United States (US), were put in place to preserve stability in the banking and to avoid any further "too big to fail" crisis (Vives, 2016). However, regardless of the Basel III modifications, over the past years, banks could seek guidance from many associations and professional organizations that have elaborated many repositories like *the ISO 31000 – Risk Management* (ISO), *The Orange Book: Management of Risk-Principles and Concepts* (UK), *The Professional Risk Managers' Handbook* (PRIMA) and the *Enterprise Risk Management – Integrated Framework* (COSO II) outlining exemplary enterprise risk management (ERM) practices.

As for regulation on the elaboration of annual reports on internal controls in the United States, the Disclosure Controls and Procedures (DCP) states that the use of a recognized repository is mandatory. The Securities and Exchange Commission (SEC) mentions the COSO as a fine tool to meet the mentioned repository requirements. Indirectly, US banks are influenced to use the COSO II by the SEC. The framework is a tridimensional reference model that integrates and aligns the strategic, operational, reporting and conformity objectives related to ERM in US banks and allows them to implement favourable accounting risk measures. With its accounting-based design, the COSO II is recommended and recognized as a leading model in ERM; US banks and all corporations throughout the country are reassured in meeting regulation requirements (Gendron, 2016). With two primary objectives, ensuring that banks have sufficient high-quality capital to cover risk exposures and enhancing the quality of markets with transparency in capital reporting, Basel III has introduced detailed mandatory regulatory requirements to enhance the risk management process in the banking sector (Agarwal et al., 2014).

Basel III capital requirements

Section 62 of Basel III states that banks have to publicly provide quarterly disclosures in specified templates regarding their ERM. As for invariable qualitative information, the section states that it may only be disclosed in annual reports. Any changes, along with their consequence, must be disclosed as soon as possible. The public can be informed throughout the banks' website or normal management disclosure reports. Banks have to adopt a formal disclosure policy associated with ERM, internal controls and procedures. A senior officer must validate the compliance of the disclosure with the requirements in the enacted policy. When information is left out of normal disclosure practices, banks must briefly explain why they are not complying with the policy.

According to section 63 of Basel III, since January 2015, banks have the obligation of making their disclosures publicly available throughout specified templates for at least three years prior to the date. Banks have general qualitative disclosure requirements according to which they have to describe their risk management objectives and policies for each separate risk area, including strategies and processes, structure and organization of the relevant risk management function, scope and nature of the risk reporting and/or measurement systems, policies for hedging and/or mitigating risk, and strategies and processes for monitoring the continuing effectiveness of hedges/mitigates (Agarwal et al., 2014).

According to the Basel III requirements, at each quarter, a bank must disclose its common equity, total capital ratios, total risk-weighted assets (RWAs), regulatory capital ratios during any transition period, and reconciliation of regulatory capital elements as they relate to the balance sheet. In January 2015, the BCBS published *the Revised Pillar 3 Disclosure Requirements* (Standards). The document is divided into nine parts: a guide for disclosure of Pillar 3 information, an overview of risk management and RWA, linkages between financial statements and regulatory exposures, credit risk, counterparty credit risk, securitization, market risk, operational risk, and interest rate risk in the banking book. This paper relies on bank disclosures related to these parts, which will be used to compare the effectiveness of three dimensional ERM with traditional measures of risk. In other words, ERM data is accessible due to the above requirements.

Basel III liquidity requirements

Two important ratios on liquidity are outlined in Basel III: when it comes to liquidity coverage ratio (LCR), Basel III requires banks to have sufficient liquid assets to withstand a 30-day period of a stressed funding scenario (BCBS, 2015). The longer-term, structural net stable funding ratio (NSFR) covers the entire balance sheet and provides incentives for banks to use stable sources of funding by addressing liquidity mismatches (BCBS, 2015).

Basel III large exposure (market risk)

This part is mostly for global systemically important banks (G-SIBs). The objective of the Basel Committee is to understand qualitative and quantitative elements in regards to systemic risk. Basel II wants a large exposure regime established to mitigate systemic risk arising from inter-linkages across financial institutions and concentrated exposures (BCBS, 2015).

2.2. Traditional measures of risk for banks

Risk management is an approach that originally focuses on eliminating threats and losses and refers to individual risks as if they did not interact. Consequently, risks in this type of management are not treated as a whole and are also managed by different responsible departments where risks are adapted to each strategy, level of profitability, product and price, and to relation with management (Cican, 2014). Managers rely on a specific set of indicators pertaining to different markets enabling them to evaluate the importance of risk exposure. When it comes to banks, five risks were mainly assessed:

1. Solvency adequacy – Credit risk: The objective of this particular indicator is to determine if a bank has sufficient funds in order to honor its commitments. The regulation does require banks to have a minimal level of adequate funds and elaborates ways of calculating if a financial institution has a targeted amount of capital. Different formulas do exist, such as the Cooke and the McDonough ratios. Essentially the important variables are to divide a bank's own funds by a percentage of its assets adjusted according to different risks (credit risk, market risk, etc.). The equivalent should be higher than a certain determined percentage established by the regulators (Basel). Capital adequacy informs us on the risk of a credit portfolio. Credit risk is an important risk in the banking sector since it can lead to bankruptcy and financial crisis. Credit risk can be defined as the uncertainty toward the possibility of a bank's client to not honor his or her obligations (Distinguin, Roulet, & Tarazi, 2013).

2. Liquidity risk: According to the Basel Committee on Banking Supervision (2006), liquidity translates into a bank's capacity to fund increases in assets and meet obligations as they come due, without incurring great losses. The fundamental role of banks involves the transformation of liquid deposit liabilities into illiquid assets (such as loans), making banks inherently vulnerable to liquidity risk (Armstrong & Caldwell, 2008). Good levels of liquidity ensure that a bank has the ability to continue to fulfill its fundamental role (Armstrong & Caldwell, 2008).

3. Market (systemic) risk: Systemic risk affects not only a single entity, but many entities in a chosen market. It is an event where bad news being released about a financial institution, or even its failure, leads sequentially to significant adverse effects on one or more other financial institutions (De Bandt & Hartmann, 2000). It is also defined as stress in financial institutions on a high enough scale to cause significant macroeconomic damage (Borio, Furfine, & Lowe, 2000). According to BCBS (2006), market risk is defined as the risk of loss arising from price volatility in the market. Systemic risk can be defined as a sudden and generally unexpected event that disturbs financial markets and prevents them from efficiently channeling capital to the best investment opportunities (Mishkin, Bordes, Hautcoeur, & Lacoue-Labarthe, 2004). When it comes to banks, there are three main aspects that can contribute to market risk. First off, foreign exchange risk represents the adverse consequences of exchange rate volatility on value. From there, interest rate risk represents the adverse consequences of the volatility of interest rates on market value. Finally, lies the risk of a change in the price of shares and commodities.

Banks and other financial institutions are important sources of capital. This is why their failure, especially in large numbers, leads to an increase in the cost of capital. The classic example of systemic risk in this context is the "bank run", in which the inability of a bank to meet withdrawal demands causes bankruptcy and the failure of other banks (Diamond & Dybvig, 1983; van Oordt & Zhou, 2019). Consequently, it is imperative for banks to have better risk management practices (Birge & Júdice, 2013) compared to non-financial firms (van Oordt & Zhou, 2019).

There are many factors to take into consideration when it comes to calculating market risk. In order to measure market risk, numerous studies used the ratio between the market value of a bank's shares and its accounting book value (Linsley, Shrives, & Crumpton, 2006; Aebi, Sabato, & Schimd, 2012). The Beta coefficient is also a systematic risk indicator (Lajili & Zéghal, 2005; Linsley & Shrives, 2006).

4. Securitization risk: Securitization for banks is the process of transforming debts into negotiable securities. The advantage of securitization is that it allows banks to eliminate the risks of non-reimbursements from their clients and it also provides immediate capital. Banks can then grant more credit. Unfortunately, the abuse of securitization can lead to a complete failure in the financial system, which is why it's important to manage this risk (Boyd & Gertler, 1994).

5. Quality of assets held: According to Grier (2007), "low-quality assets are the main cause of bank failure". The largest category of assets for financial institutions is the credit portfolio. Naturally, this means the risk of loss on bad debts becomes the biggest risk for banks. According to Shrieves and Dahl (1992), measuring the quality of a credit portfolio generally implies provisions for credit losses (loan loss reserve), non-accrued loans, etc. Nevertheless, these measures reflect the quality

of a credit portfolio with a certain delay. For example, the provision for credit losses reflects credit decisions (historical data) made in previous years. In addition, leaders can exercise discretion on these measures.

2.3. Enterprise risk management (ERM)

The major difference between the traditional risk management approach and ERM is that, instead of treating every risk in different silos, ERM, along with the COSO, makes managers go through the process of establishing links between risks and assessing every risk according to its impact (consequences) and probability in order to finally have a list of prioritized risks. Once this is done, managers can understand the risks involved in their industry and benefit from either opportunities or threats that may arise by working on an appropriate response (eliminate, transfer, accept or reduce) to different risk exposures.

Today, even with this new approach to risk management, five major risks, which had been addressed through traditional risk management, are still on the top of the priority list. If the same risks are still highlighted with this new approach, is ERM actually useful? Is ERM valid if it has the same outcome as the traditional approach, especially given the fact that traditional measures were less time-consuming and more cost-effective?

Like many listed corporations, financial institutions use the COSO (Committee of Sponsoring Organizations of the Treadway Commission) II as a framework to drive their initiatives in risk management beyond the Basel norms and regulatory compliances. With its accounting conception, the COSO II is recommended and recognized as a leading model in ERM; US banks and all corporations of the country are reassured to meet regulation requirements (Gendron, 2016). The referential provides banks with help regarding their business values and allows them to meet regulatory compliance requirements. ERM summarizes risk management as an integrated, comprehensive and strategic system that facilitates strategic planning and contributes to the correlation between risk and profitability (Cican, 2014; Maingot et al., 2018).

The COSO's information and communication line enables information exchange related to the multiple aspects of banks' ERM practices. It ensures that all members of an organization are aware of their responsibilities. An effective transfer of ERM information requires a set of specific channels to every function of a bank related to different stakeholders. Banks must communicate all of their pertinent risk management activities through their annual reports.

According to COSO (2005), the ERM framework helps management in dealing with uncertainty and associated risk and opportunity, enhancing the capacity to build value by aligning appetite for risk and strategy, enhancing risk response decisions, reducing operational surprises and losses, identifying and managing multiple and cross-enterprise risks, seizing opportunities and improving deployment of capital (Mourouzidou-Damtsa, Milidonis, & Stathopoulos, 2019). The COSO ERM – Integrated Framework is a multidirectional, iterative process in which components can influence one another (COSO, 2005).

The COSO II model was initially based on the Sarbanes Oxley Act (SOA), whose primary objective is enforcing standards to ensure that financial statements are reasonably accurate for companies that are publicly trading on American stock markets. Such an Act is due to the collapse of Enron back in 2002. Sarbanes Oxley principles are all about informing shareholders on the state of a company so that educated decisions can be made on the price at which buying or selling shares. As for ERM, it's about understanding threats and opportunities that may arise and making decisions according to an organizational culture impacting the performance of the company (Chen, Tsao, Hsieh, & Hu, 2019). The collapse of Enron is due to a lack of regulations in enforcing the legitimacy of financial statements. The relevance of the evolved risk management approach can be questioned. This study will validate if whether or not ERM is a valid approach compared to traditional measures of risk.

2.4. Research objectives and hypotheses

Risk analysis and risk management in banking companies are an important component of their business model. Traditionally, banking risks have involved financial information mainly related to capital structure, liquidity, financial instruments, the profitability of assets and others. All these measures come from the banks' financial system; therefore, they are relatively objective and verifiable, however, they have the weakness of being analyzed in isolation.

The ERM system compensates for this weakness by replacing solo analysis with an integrated system encompassing all the company risks. Basically, the approach consists of analyzing risks according to three dimensions: the levels of exposure to risks, the consequences and ultimately strategic management. However, unlike traditional measures of risk, ERM analysis can suffer from a certain potential degree of subjectivity and an absence of verifiability which can question their reliability and relevance.

The analysis of ERM information has been subject to a wide range of academic research. Despite the variety of this research, there is no framework for analyzing the qualitative information on risk management disclosed in the annual reports of the companies. This gap is due to the nature of the information on risk and risk management, which is qualitative and narrative, thus difficult to measure objectively (Leuz, Nanda, & Wysocki, 2003). ERM is not a completely different approach compared to traditional risk management; it's simply an extension of the latter. For some, it's an improved version of risk management, created by expanding the scope of traditional measures (Cican, 2014). On the contrary, some of the empirical research suggests that using ERM does not really increase a company's profit and productivity. For others, ERM is overly biased and is an exaggeration of risk management practices (McShane, Nair, & Rustambekov, 2011). Our results will shed new light on the relevance of ERM information by introducing a new framework and a new methodology for assessing the validity of this information in the banking sector.

The main objective of this research is to assess the relevance ERM information by assessing the

relation between traditional risk measures and their respective risk measures which resulted from the ERM system.

More specifically we anticipate that ERM dimensions (exposure, consequences, and management) are valid and act as an added value to traditional measures of risk. Consequently, we will try to verify the following general hypothesis. There is a significant relation between traditional measures of risk and ERM levels of risk. To verify this hypothesis, we will proceed with three sub-hypotheses:

Hypothesis 1 (H1): there is a significant relation between the traditional measures of risk and ERM levels of risk based on risk exposure.

Hypothesis 2 (H2): there is a significant relation between the traditional measures of risk and ERM levels of risk based on risk consequence.

Hypothesis 3 (H3): there is a significant relation between the traditional measures of risk and ERM levels of risk based on risk management.

3. RESEARCH METHODOLOGY

In this study, we analyze the relation between the ERM levels of risk for the three dimensions (risk exposure, risk consequence, and risk management) and the traditional measures of bank-related risk in the annual reports of US banks for the years 2006, 2007, 2008 and 2009. Previous research aimed at validating ERM information has proceeded with several frames and methodologies including the analysis of content and determinants of disclosure (Lajili & Zéghal, 2005), the reaction of the stock market and the relationship with capital market risk measures (Kleffner, Lee, & McGannon, 2003), relationships with financial and accounting performance measures (Dia & Zeghal, 2012), links with governance indicators (Sobel & Reding, 2005).

Our sample comprises the 59 biggest US banks as per the 2010 Federal Deposit Insurance Corporation (FDIC) classification. Our empirical analysis will focus on the 2006-2009 period, split into two sub-periods, the first sub-period being 2006-2007 and covering the financial crisis, and the second sub-period being 2008-2009 and covering the post-financial crisis. The choice of these periods allows us to verify whether the changes in the banking environment that resulted from the financial crisis will have an impact on the risk measures and their relevance.

To measure the ERM levels of risk, we followed a content analysis approach in evaluating the levels of risk exposure, consequence and risk management using the risk map (see Table 1) developed and used by AICPA and CICA (1999).

Table 1. Categorization of risk exposure, consequence and management

Risk exposure	*Code*	*Risk consequence*	*Code*	*Risk management*	*Code*
Rare	1	Insignificant	1	Accept risk	1
Improbable	2	Minor	2	Reduce risk	2
Possible	3	Moderate	3	Transfer risk	3
Probable	4	Major	4	Avoid risk	4
Certain	5	Catastrophic	5		

We analyzed the main bank-related risk according to the risk map to see how risk exposure changes from rare to certain, how risk consequence changes from insignificant to catastrophic and how risk management changes from the acceptance of the risk to its avoidance through the years of investigation. The main financial risks are credit risk, liquidity risk, interest rate risk, exchange risk, and equity risk. Business-related risks include systemic risk, market risk and economic risk (Maingot, Quon, & Zéghal, 2014; Lajili & Zéghal, 2005; Dia & Zéghal, 2012). To measure the levels of traditional bank-related risk, we used the proxies in Table 2 that show the sources of data, measures, and codes attributed to each proxy.

Table 2. Traditional measures of risk in the banking sector

Variables	*Measures*	*Codes*	*Sources*
Credit risk	Tier one capital ratio	TIER1CAP	FDIC
	Non-performing loan/total loan	NPLTL	Annual report (10-K)
Liquidity risk	Total loans/total deposits	LIQUID	FDIC
Market risk	Market to book ratio	MTB	Bloomberg
Systematic risk	Beta	BETA	Bloomberg
Securitization	On-balance sheet securities to total assets	SEC	FDIC
Off-balance sheet activities	Off-balance sheet assets = on-balance sheet assets * [non-interest income/(interest income - interest expenses - share of provisions allocated to the loan book)] OFFB = Ao/Ab. Where: Ao = Off-balance sheet assets, and Ab = On-balance sheet assets	OFFB	FDIC

4. RESULTS ANALYSIS AND DISCUSSION

4.1. Descriptive statistics

4.1.1. Descriptive statistics – Traditional measures of risk

Table 3 presents the descriptive statistics for traditional levels of risk within our sample for the period before and after the financial crisis. We note that there is an increase in the majority of average levels of risk, particularly credit, market, systemic and security risks. On the other hand, there is a decrease in liquidity risk after the crisis.

Table 3. Levels of risk before and after the crisis

Variables	*Years*	*Min*	*Max*	*Mean*	*Median*	*SD*	*N*
TIER1CAP	2006/2007	0.062	0.373	0.108	0.097	0.048	117
	2008/2009	0.064	0.213	0.114	0.108	0.032	115
NPLTL	2006/2007	0.000	8.981	0.159	0.004	1.011	102
	2008/2009	0.0003	15.416	0.268	0.019	1.692	102
LIQUID	2006/2007	0.0447	2.711	0.985	0.991	0.391	117
	2008/2009	0.0792	2.875	0.905	0.932	0.373	116
MTB	2006/2007	0.5783	7.947	2.069	1.855	1.153	106
	2008/2009	0.1257	4.607	1.236	1.119	0.734	106
BETA	2006/2007	0.7025	1.593	1.013	0.992	0.179	116
	2008/2009	0.5989	2.537	1.305	1.255	0.383	116
SEC	2006/2007	0.0000	0.742	0.188	0.157	0.147	117
	2008/2009	0.0000	0.640	0.194	0.163	0.132	116
OFF to ON	2006/2007	0.0102	11.704	0.871	0.491	1.386	115
	2008/2009	0.0086	276.973	5.248	0.753	28.723	97

Notes: The total number of observations does not add up to the total number of disclosing firms (59 per year in the sample) in the tests above because some companies have missing observations on these variables in the database used (FDIC). TIER1CAP: ratio between a bank's core equity capital and its total risk-weighted assets (credit risk); NPLTL: non-performing loan/total loan (credit risk); LIQUID: total loan/total deposit (liquidity risk); MTB: market to book value (market risk); BETA: Beta factor (systematic risk); SEC: total securities/total assets (risks related to on-balance sheet securitization activities); OFF to ON: off to on-balance sheet ratio = non-interest income/(interest income – interest expenses – share of provisions allocated to the loan book (risks related to off-balance sheet activities).

To verify whether or not the variations observed in the levels of risk are significant, we move on to the analysis of the mean difference in risks before and after the crisis. Table 4 shows that credit risk (as measured by TIER1CAP) and systematic risk increased significantly after the crisis, while liquidity risk, as measured by the ratio between total loan and total deposit, and market risk decreased significantly after the crisis. The paired t-test presented in Table 4 shows that the changes are insignificant for risks related to securitization activities and risks related to the quality of assets held.

Table 4. Mean difference test: Traditional measures of risk before and after the crisis

	Before the crisis	*After the crisis*	*Changes*	*T*	*P-value*	*N*
TIER1CAP	0.106	0.114	0.008	2.663	0.009**	114
NPLTL	0.161	0.273	0.112	0.728	0.468	99
LIQUID	0.986	0.905	-0.080	-3.899	0.000**	115
MTB	2.074	1.231	-0.843	-10.556	0.000**	103
BETA	1.013	1.305	0.292	8.620	0.000**	115
SEC	0.188	0.194	0.006	0.627	0.532	115
OFF to ON	0.742	4.860	4.118	1.430	0.156	95

Notes: TIER1CAP: ratio of a bank's core equity capital to its total risk-weighted assets (credit risk); NPLTL: non-performing loan/total loan (credit risk); LIQUID: total loan/total deposit (liquidity risk); MTB: market to book value (market risk); BETA: Beta factor (systematic risk); SEC: total securities/total assets (risks related to on-balance sheet securitization activities); OFF to ON: off to on-balance sheet ratio = non-interest income/(interest income – interest expenses – share of provisions allocated to the loan book (risks related to off-balance sheet activities).

*** The mean difference is significant at the 0.01 level.*

4.1.2. Descriptive statistics – ERM levels of risk

Table 5 presents the descriptive statistics for the ERM dimensions of our sample for the period before and after the financial crisis. It summarizes the average levels of risk exposure, consequence and risk management before and after the crisis.

Table 5. Analysis of banks' risk exposure, consequence, and management before and after the crisis

Risks	*Years*	*Risk exposure*			*Risk consequence*			*Risk management*		
		Mean	*St.d*	*N*	*Mean*	*St.d*	*N*	*Mean*	*St.d*	*N*
Financial risks	2006/2007	3.235	.519	118	3.086	.470	118	2.525	.198	118
	2008/2009	3.879	.377	118	3.6	.346	118	2.578	.193	118
Credit	2006/2007	3.424	.709	118	3.356	.620	118	2.373	0.486	118
	2008/2009	4.322	.537	118	3.949	.221	118	2.534	0.501	118
Liquidity	2006/2007	3.119	.786	118	2.991	.722	118	2.025	0.158	118
	2008/2009	3.924	.839	118	3.686	.636	118	2.025	0.158	118
Interest rate	2006/2007	3.432	.591	118	3.178	.533	118	2.983	0.129	118
	2008/2009	4.034	.432	118	3.678	.469	118	2.983	0.129	118
Foreign exchange	2006/2007	2.747	.824	79	2.649	.855	77	2.937	0.351	64
	2008/2009	2.941	.917	85	2.783	.938	83	2.941	0.340	68
Equity	2006/2007	3.187	.403	16	3.062	.574	16	3.00	0.000	14
	2008/2009	4	.471	19	3.684	.477	19	3.00	0.000	17
Strategic risks	2006/2007	3.467	.502	118	3.315	.403	118	2.302	.135	118
	2008/2009	4.337	.379	118	3.848	.221	118	2.268	.079	118
Systemic	2006/2007	4	0	3	3.333	.577	3	NA	NA	0
	2008/2009	4.200	.403	60	3.932	.253	59	NA	NA	0
Market	2006/2007	3.500	.663	118	3.288	.586	118	2.949	0.221	118
	2008/2009	4.500	.624	118	3.864	.344	118	2.949	0.221	118
Economic	2006/2007	3.524	.624	103	3.398	.530	103	2.030	0.172	99
	2008/2009	4.627	.503	118	3.974	.205	118	2.000	0.000	110

Generally, the average level of risk exposure for all types of risk increases from the period before the crisis to the period after the crisis, which means that US banks are more exposed to risk after the crisis. The mean of risk consequence increases, demonstrating that the consequence following the crisis tends to be more severe in comparison with the period before the crisis. However, as for risk management, there were very few changes from 2006/2007 to 2008/2009, mainly in credit risk, foreign exchange risk and economic risk.

The results show that the majority of traditional measures of risk have increased after the crisis. Similarly, the ERM levels of risks have increased after the crisis. These results confirm the validity of the ERM levels of risks based on three-dimensional ERM. The information disclosed by US banks on ERM is therefore valid, thus reliable information for investors and shareholders.

4.2. Analysis of the relation between ERM levels of risk and traditional measures of risk

4.2.1. Analysis of the relation between risk exposure and traditional measures of risk

The correlation between the variables measuring risk exposure and the variables measuring banking risk are presented in Table 6. The correlation analysis is carried out initially for the entire study period ranging from 2006 to 2009 and thereafter for the period before the crisis and for the period after the crisis. This analysis allows us to find out if the level of exposure of each type of banking risk is consistent with the traditional measures of risk. It makes it possible to study whether the information published by the banks concerning their risk exposure is reflected in the traditional measures for banking risk and whether the crisis has affected this level of coherence.

Table 6. Analysis of the relation between levels of risk exposure and traditional measures of banking risk

	Cdt	*Liqt*	*Intretrt*	*Exchg*	*Eqt*	*Systmc*	*Markt*	*Eco*
Pearson correlation for the entire period								
TIER1CAP	-.009	.111	.081	-.042	.514**	.229	.021	.128
NPLTL	.117	.060	.177*	-.008	.627**	-.084	.126	.114
LIQUID	-.030	.016	-.035	-.016	-.305	-.347**	-.013	.037
MTB	-.355**	-.146*	-.295**	.080	-.494**	.030	-.328**	-.338**
BETA	.366**	.225**	.351**	.082	.598**	-.139	.421**	.384**
SEC	-.069	.034	.014	-.304**	-.253	.347**	-.086	-.078
OFF to ON	.051	.063	.052	.144	.185	-.069	.135*	.123
Pearson correlation for the period before the crisis								
TIER1CAP	.017	.015	.074	-.086	-.259	.[c]	-.014	.029
NPLTL	.043	.094	.194	.055	.627*	.[c]	.153	.162
LIQUID	.086	.049	.061	.004	-.042	.[c]	.120	.026
MTB	-.141	.077	-.089	.195	-.082	.[c]	-.106	-.109
BETA	.136	.063	.062	-.174	.478	.[c]	.196*	.250*
SEC	-.046	.029	.011	-.329**	-.777**	.[c]	-.100	-.035
OFF to ON	-.152	.022	-.126	.289*	-.180	.[c]	.029	-.105
Pearson correlation for the period after the crisis								
TIER1CAP	-.196*	.200*	.007	.002	.562**	.211	-.052	.152
NPLTL	.175	.019	.202*	-.049	.[c]	-.088	.120	.112
LIQUID	-.031	.091	-.034	-.006	-.413	-.360**	.006	.243**
MTB	-.214*	-.031	-.138	.126	-.274	.063	-.097	-.053
BETA	.204*	.037	.271**	.097	.280	-.155	.246**	.126
SEC	-.171	.024	-.008	-.293**	-.292	.343**	-.161	-.265**
OFF to ON	-.010	.025	.002	.179	.010	-.081	.128	.114

Notes: TIER1CAP: ratio between a bank's core equity capital and its total risk-weighted assets (credit risk); NPLTL: non-performing loan/total loan (credit risk); LIQUID: total loan/total deposit (liquidity risk); MTB: market to book value (market risk); BETA: Beta factor (systematic risk); SEC: total securities/total assets (risks related to on-balance sheet securitization activities); OFF to ON: off to on-balance sheet ratio = non-interest income/(interest income – interest expenses – share of provisions allocated to the loan book (risks related to off-balance sheet activities); Cdt: credit risk; Liqt: liquidity risk; Intretrt: interest rate risk; Exchg: exchange rate risk; Equity: equity risk; Systmc: systemic risk; Markt: market risk; Eco: economic risk.

*** The correlation is significant at the 0.01 level (2-tailed). * The correlation is significant at the 0.05 level (2-tailed).*

[c] Cannot be computed because at least one of the variables is constant.

Table 6 highlights a significant relation between the level of risk exposure related to credit, liquidity, interest rate, market, equity, and economic risks and the levels of market risk as measured by MTB and systemic risk, thus by Beta, for the entire study period. These results show that the information on risk exposure disclosed in the annual reports of the largest US banks reflects the reality of the banks' risk situation and therefore confirms our first research hypothesis (*H1*): *there is a significant relation between the traditional measures of risk and ERM levels of risk based on risk exposure.*

This relation virtually disappears when we conduct our analysis for the period before the crisis. Nevertheless, after the crisis, the significance of the correlation with market risk measures and systematic risk reappears for credit risk, interest rate, and market risk. Moreover, prior to the crisis, there was no correlation between bank systemic risk exposure and the levels of traditional measures of risk. After the crisis, this correlation appears and is significant when considering liquidity risk and risks related to securitization activities. The results show that the information on risks published in the banks' annual reports in the post-crisis period better reflects the reality of the banks' risk exposure. This shows that the quality of information published after the crisis has increased.

4.2.2. Analysis of the relation between risk consequence and the traditional measures of risk

The correlation between the variables measuring the consequence of the banks' risk and the variables measuring traditional banking risks are presented in Table 7. This analysis allows us to find out if the measures of banking risk consequence as published in the banks' annual reports are consistent with the traditional measures of banking risks.

The correlation analysis for the entire study period shows that there is a significant relation between the traditional measures of market risk and systematic risk and the credit, liquidity, interest rate, market risk, and economic risk consequence. Specifically, we find that the level of credit risk measured by the ratio between bad debts and total claims is positively associated with the equity risk consequence. This means that the higher the credit risk, the greater the equity risk consequence.

Table 7. Analysis of the relation between the risk consequence and the traditional measures of banking risk

	Cdt	*Liqt*	*Intretrt*	*Exchg*	*Eqt*	*Systmc*	*Markt*	*Eco*
Pearson correlation for the entire period								
TIER1CAP	-.023	-.025	.056	-.090	.098	.108	-.008	.020
NPLTL	.056	.056	.067	.018	.544**	.031	.050	.048
LIQUID	-.067	-.009	.051	-.003	-.369*	.187	-.122	-.076
MTB	-.287**	-.151*	-.292**	.099	-.479**	.020	-.196**	-.267**
BETA	.293**	.167*	.334**	.088	.327	-.250	.219**	.328**
SEC	.028	.069	-.045	-.301**	-.166	.377**	.047	.027
OFF to ON	.064	.092	.121	.162	.315	.061	-.034	.072
Pearson correlation for the period before the crisis								
TIER1CAP	-.043	-.108	.090	-.168	-.603*	.347	-.023	-.109
NPLTL	.060	.129	.088	.079	.613*	.[c]	.123	.055
LIQUID	-.034	.062	.087	-.002	-.085	.533	-.044	-.117
MTB	-.112	.041	-.057	.129	-.330	-.830	-.007	-.062
BETA	.069	.035	.122	-.070	.470	-.778	.087	.180
SEC	.082	.026	.086	-.274*	-.803**	.809	.129	.101
OFF to ON	-.127	.082	.074	.335**	.077	-.458	-.053	.029
Pearson correlation for the period after the crisis								
TIER1CAP	-.148	.013	-.107	.005	.016	.027	-.082	.107
NPLTL	.039	-.016	.037	-.018	.124	.032	-.022	.026
LIQUID	.017	.020	.216*	.016	-.545*	.165	-.132	.090
MTB	-.020	.027	-.061	.215	-.255	.212	.010	-.020
BETA	.167	-.080	.173	.098	-.191	-.309*	.000	.157
SEC	-.129	.118	-.290**	-.340**	.119	.288*	-.073	-.156
OFF to ON	.041	.069	.054	.211	.264	.041	-.142	.037

Notes: TIER1CAP: ratio of a bank's core equity capital to its total risk-weighted assets (credit risk); NPLTL: non-performing loan/total loan (credit risk); LIQUID: total loan/total deposit (liquidity risk); MTB: market to book value (market risk); BETA: Beta factor (systematic risk); SEC: total securities/total assets (risks related to on-balance sheet securitization activities); OFF to ON: off to on-balance sheet ratio = non-interest income/(interest income – interest expenses – share of provisions allocated to the loan book (risks related to off-balance sheet activities). Cdt: credit risk; Liqt: liquidity risk; Intretrt: interest rate risk; Exchg: exchange rate risk; Equity: equity risk; Systmc: systemic risk; Markt: market risk; Eco: economic risk.

*** The correlation is significant at the 0.01 level (2-tailed). * The correlation is significant at the 0.05 level (2-tailed).*

[c] Cannot be computed because at least one of the variables is constant.

We also noticed that a change in the risk related to the banks' securitization activities is reflected by a change in the exchange rate risk and systemic risk consequences. These relations are less present when the correlation analysis is done separately for the period before the crisis and for the period after the crisis.

To understand how the risk consequence as published in the banks' annual report reflects the levels of traditional banking risk measured by the accounting and market proxies, we focused on the relation between these two broad groups of variables. We found that the level of credit risk measured by the ratio between the non-performing loan and the total loan is positively associated with the equity risk consequence. This means that the higher the credit risk, the greater the risk consequence associated with equities. Similarly, the MTB ratio is negatively associated with credit, liquidity, interest rate, market risk, and economic risk consequences. This further means the higher the market risk, the greater the credit, liquidity, interest rate, market risk, and economic risk consequences. Finally, the BETA factor is positively and significantly correlated to credit, liquidity, interest rate, market risk, and economic risk consequences. This ultimately means that high systematic risks are reflected in major credit, liquidity, interest rate, market, and economic risk consequences. Therefore, we can conclude that banks publish information on risk consequence that reflects the traditional measures of banking risk, thus that our second research hypothesis (*H2*) is confirmed.

4.2.3. Analysis of the relation between risk management strategies and the traditional measures of risk

This section is based on the same approach as the previous sections in analyzing the degree of coherence between ERM dimensions and the levels of traditional banking risk. The correlations of variables measuring risk management and the variables measuring the levels of banking risks are presented in Table 8.

Table 8. Analysis of the relation between risk management strategies and the traditional measures of banking risk

	Cdt	*Liqt*	*Intretrt*	*Exchg*	*Eqt*	*Systmc*	*Markt*	*Eco*
Pearson correlation for the entire period								
TIER1CAP	-.059	.113	-.086	-.031	-.220	.[c]	-.329**	-.039
NPLTL	.062	-.027	-.030	.028	.173	.[c]	.020	.059
LIQUID	-.162*	.002	-.045	-.033	.174	.[c]	-.121	-.041
MTB	-.198**	-.035	-.133	.113	.[c]	.[c]	.[c]	.010
BETA	.230**	-.065	.106	-.216*	.123	.[c]	.033	-.062
SEC	-.043	.101	-.001	-.128	-.527**	.[c]	.024	.066
OFF to ON	-.037	-.020	-.008	.021	.186	.[c]	.017	-.017
Pearson correlation for the period before the crisis								
TIER1CAP	-.064	.181	-.326**	.001	.[c]	.[c]	-.155	-.119
NPLTL	.094	-.027	.022	.038	.[c]	.[c]	.038	.251*
LIQUID	-.131	.056	-.130	-.068	.[c]	.[c]	-.026	.057
MTB	-.083	-.069	.[c]	.117	.[c]	.[c]	.123	-.056
BETA	.041	-.072	.065	-.520**	.[c]	.[c]	-.026	-.010
SEC	.004	.077	.017	-.114	.[c]	.[c]	.067	-.113
OFF to ON	.030	-.049	.079	.098	.[c]	.[c]	.060	-.050
Pearson correlation for the period after the crisis								
TIER1CAP	-.088	.016	-.352**	-.087	-.183	.[c]	-.106	.033
NPLTL	.041	-.030	.020	.023	.391	.[c]	.040	-.017
LIQUID	-.166	-.056	-.114	.004	.170	.[c]	.031	-.112
MTB	-.289**	-.020	.[c]	.169	.[c]	.[c]	.148	.[c]
BETA	.267**	-.095	.027	-.160	.304	.[c]	-.058	-.078
SEC	-.103	.127	.030	-.150	-.631**	.[c]	-.012	.203*
OFF to ON	-.087	-.028	.018	.[c]	.294	.[c]	.034	-.018

Notes: TIER1CAP: ratio between a bank's core equity capital and its total risk-weighted assets (credit risk); NPLTL: non-performing loan/total loan (credit risk); LIQUID: total loan/total deposit (liquidity risk); MTB: market to book value (market risk); BETA: Beta factor (systematic risk); SEC: total securities/total assets (risks related to on-balance sheet securitization activities); OFF to ON: off to on-balance sheet ratio = non-interest income/(interest income – interest expenses – share of provisions allocated to the loan book (risks related to off-balance sheet activities). Cdt: credit risk; Liqt: liquidity risk; Intretrt: interest rate risk; Exchg: exchange rate risk; Equity: equity risk; Systmc: systemic risk; Markt: market risk; Eco: economic risk.

*** The correlation is significant at the 0.01 level (2-tailed). * The correlation is significant at the 0.05 level (2-tailed).*

[c] Cannot be computed because at least one of the variables is constant.

The correlation between risk management measures and the levels of banking risks shows that there is a significant relation between credit risk management and the levels of market and liquidity risk. This relation disappears before the crisis and reappears after the crisis for the levels of market and systematic risk.

This implies that banks' response to market and systemic risks is reflected in a change in their credit risk management strategies and this response is more intense after the crisis. Moreover, a change in the risks related to securitization activities leads to a change in the management of equity risk and economic risk for the period after the crisis. Therefore, the response of banks to credit, market, systemic and securitization activities through a change in risk management strategy is more intense in the period after the crisis. These findings confirm consequently our third research hypothesis (*H3*).

As a result of the different correlation analyses, we can conclude that there is a significant relation between integrated risk management (ERM) of the largest US banks and the traditional measures of banking risks and therefore that our general research hypothesis is confirmed.

4.3. ERM information robustness testing: A portfolio analysis approach

The objective of the following analysis is to test the validity of ERM information and traditional risks information in providing coherent decisions within the framework of a portfolio approach for investor's decisions. We seek to verify here whether the portfolio classification, according to the traditional measures of risk, would be consistent with the classification according to the corresponding ERM measure. The corroboration is done using the portfolio theory which states that investors choose an optimal portfolio in common sense (Reilly, 1985).

Our approach includes three stages (Zéghal & Meloche, 1992). First off, we gathered (10 portfolios representing an average risk measure of 21 observations each) and ranked portfolios according to the traditional measures of risk. From there, we ranked the portfolios according to the dimensions of the corresponding ERM levels of risk. Finally, we reviewed the consistency between the traditional measures' rankings and ERM rankings using Spearman's rank correlation coefficient.

To verify the validity of ERM dimensions in assessing credit, liquidity and market risks[1], we estimated the Spearman correlations existing between the ranks obtained for portfolios based on the three-dimensional ERM and the corresponding ranks based on traditional measures of risk, for the combined period 2006 to 2009 (results were non-significant when the pre- and post-crisis periods are taken separately).

The results of our analyses appear in Tables 9, 10 and 11, with the different portfolio rankings, the Spearman coefficients and their level of significance.

[1] These three risks (credit, liquidity and market risk) were selected for this robustness analysis because they have generally shown significant results in the previous correlation analyses.

Table 9. Credit risk and portfolio rankings according to traditional and ERM measures

Traditional credit risk		*ERM_credit risk*					
NPLTL 06-09	*Ranking*	*Risk exposure*	*Ranking*	*Risk consequences*	*Ranking*	*Risk management*	*Ranking*
1,973	1	4,286	2	3,762	4	2,333	6
0,034	2	4,381	1	3,905	1	2,619	1
0,023	3	4,190	4	3,905	1	2,381	5
0,015	4	4,286	2	3,905	1	2,333	6
0,011	5	3,905	6	3,762	4	2,571	2
0,008	6	4,048	5	3,762	4	2,476	3
0,006	7	3,619	7	3,714	7	2,238	9
0,004	8	3,476	8	3,286	9	2,429	4
0,003	9	3,095	10	3,190	10	2,286	8
0,001	10	3,429	9	3,381	8	2,190	10
Spearman ranking correlation		0,947**		0,837**		0,353	
Significance level		0,000		0,003		0,317	

*Notes: ** The correlation is significant at the 0.01 level (2-tailed). * The correlation is significant at the 0.05 level (2-tailed). With NPLTL 06-09: non-performing loan/total loan (credit risk) for the period 2006 to 2009.*

The results of the credit risk analysis in portfolio rankings, which appear in Table 9, show two strong and significant coefficients out of the three ERM dimensions. These results lead us to conclude that there is a positive relation between the assessment of the level of exposure and the credit risk consequence and the traditional measure for the same risk. It is then reasonable to argue that ERM credit risk measures can replace and/or supplement traditional measures for this type of risk. These results confirm and corroborate the results of the correlation analysis between traditional credit risk measures and the ERM dimensions related to this very risk. This result once again confirms the validity of ERM measures, based on the disclosure of information on the level of risk exposure and consequence, in the assessment of credit risks.

We note, however, that there is no significant correlation between portfolio rankings based on the traditional measure of credit risk and those that are based on ERM credit risk management level. This result can be explained by the notion of appetite for risk. In fact, when the appetite for risk is high, managers accept high risks often associated with higher returns, which affects the significance of the correlation between the ERM measure of credit risk management and the accounting ratio for measuring the same risk. Moreover, traditional risk measures do not have a certain conceptual content related to the strategic management of these risks. Therefore, the risk exposure, the risk consequence and the combined effect of both are really important.

The results of the portfolio rankings analysis based on the liquidity risk, as shown in Table 10, show two strong and significant positive coefficients for the level of liquidity risk exposure and consequence. These results allow us to conclude that there is a positive relation between the assessment of the level of liquidity risk exposure and consequence and the traditional measure of the same risk. It is then reasonable to argue that ERM liquidity risk measures may replace and/or supplement the traditional accounting measures for this type of risk. As was the case with ERM credit risk management, we found the same insignificant result for the ERM liquidity risk management which could again be explained by the investors' appetite for risk.

Table10. Liquidity risk and portfolio rankings according to traditional and ERM measures

Traditional liquidity risk		*ERM_liquidity risk*					
TLTD_LIQ 06-09	*Ranking*	*Risk exposure*	*Ranking*	*Risk consequence*	*Ranking*	*Risk management*	*Ranking*
1,708	1	3,667	3	3,381	3	2,048	2
1,247	2	3,952	1	3,667	1	2,000	5
1,123	3	3,571	5	3,238	8	2,000	5
1,070	4	3,762	2	3,524	2	2,000	5
1,023	5	3,619	4	3,286	6	2,048	2
0,977	6	3,429	6	3,333	4	2,095	1
0,931	7	3,381	7	3,286	6	2,000	5
0,873	8	3,286	8	3,238	8	2,048	2
0,790	9	3,286	8	3,333	4	2,000	5
0,673	10	3,095	10	3,000	10	2,000	5
Spearman ranking correlation		0,912**		0,606*		0,111	
Significance level		0,000		0,064		0,76	

*Notes: ** The correlation is significant at the 0.01 level (2-tailed). * The correlation is significant at the 0.05 level (2-tailed). With TLTD_LIQ 06-09: total loans/total deposits (liquidity risk) for the period 2006 to 2009.*

The results of the portfolio rankings analysis based on market risk, which appear in Table 11, show two strong and significant negative coefficients out of the three ERM dimensions. These results allow us to conclude that there is a negative relation between the assessment of the level of market risk exposure and consequence and the accounting measure for the same risk. It is then reasonable to argue that ERM market risk measures can replace and/or supplement traditional measures for this type of risk. These results confirm and corroborate the results of the correlation analysis between traditional market risk measures and the ERM dimensions related to this very risk. This result once again confirms the validity of ERM levels of risk, based on the disclosure of information on the level of risk exposure and consequence, in the assessment of market risks.

Table11. Market risk and portfolio rankings according to traditional and ERM measures

Traditional market risk		*ERM_market risk*					
MTB 06-09	*Ranking*	*Risk exposure*	*Ranking*	*Risk consequence*	*Ranking*	*Risk management*	*Ranking*
3,983	1	3,571	8	3,429	7	3,000	1
2,381	2	3,571	8	3,238	10	3,000	1
2,099	3	3,476	10	3,333	9	2,952	6
1,819	4	3,905	6	3,476	6	3,000	1
1,574	5	4,095	4	3,619	4	3,000	1
1,430	6	4,095	4	3,524	5	2,952	6
1,217	7	3,810	7	3,381	8	2,952	6
1,120	8	4,286	2	3,857	1	2,905	9
0,882	9	4,286	2	3,714	3	2,905	9
0,611	10	4,762	1	3,857	1	3,000	1
Spearman ranking correlation		-0,881**		-0,784**		0,487	
Significance level		0,001		0,007		0,154	

*Notes: ** The correlation is significant at the 0.01 level (2-tailed). * The correlation is significant at the 0.05 level (2-tailed). With MTB 06-09: Market to book value (market risk) for the period 2006 to 2009.*

The results found show that there is an overall significant relation between credit, liquidity and market risk measures based on accounting and market data and those that are based on ERM dimensions, specifically those that are related to the level of exposure and the risk consequence. It is then reasonable to argue that ERM levels of risk are effective and reliable measures and that they can replace or supplement traditional risk measures. The ERM system compensates for the traditional banking risks weakness of being analyzed in isolation, by replacing solo analysis with an integrated system encompassing all the company risks. These results, therefore, confirm our general research hypothesis and validate ERM risk disclosure in terms of exposure levels, consequences and strategic risk management for the US banking sector.

5. SUMMARY AND CONCLUSION

Recently, increasing research attention has been directed to risk management driven by growing complexities in the business world, with the objective of promoting transparency and improving disclosure quality. This article presents a new approach in analyzing the quality and the relevance of risk disclosure by analyzing the relation between the dimensions of enterprise risk management as disclosed in the annual reports of US banks and the levels of traditional bank-related risk.

Although ERM still covers all the traditional measures, including ratio requirements, the main objective of this research has been to attempt to assess the validity of risk measures from ERM in terms of levels of exposure, consequence and strategic risk management for the US banking sector. The evaluation of the quality and relevance of risk management disclosure is essential to assess the usefulness of information for decision-makers and the extent to which it fulfills its role as one of the solutions to agency problem and information asymmetry. This study has aimed to determine if whether or not today's ERM system is a valid approach compared to traditional risk management.

The validation was done by examining the statistical correlation between traditional risk measures in the banking sector and ERM levels of risks that were approximated from the risk management information disclosed in banks annual reports in terms of levels of risk exposure and consequence, and, finally, of strategic management of risks. We analyzed the correlation between the dimensions of ERM disclosure and the traditional measures of bank-related risk in the annual reports of US banks for the years 2006 to 2009. Our sample has comprised the 59 biggest US banks as per the 2010 Federal Deposit Insurance Corporation (FDIC) classification. We also corroborated the validity of ERM levels of risk in assessing credit, liquidity and market risks by estimating the Spearman correlation existing between the ranks attributed to portfolios based on the three-dimensional ERM and the corresponding ranks based on traditional risk measures.

We found a significant correlation between the three dimensions of integrated risk management and traditional risk measures. The results reveal a strong relation between the level of credit risk, liquidity risk, interest rate risk, market risk, and economic risk and traditional measures of risk (market to book ratio and Beta as a proxy systemic risk) exposure for banks for the entire period. These results show that the information on risk exposure published in the annual reports of the largest US banks reflects the reality of the banks' risk situation. We found also that the information on the risks published in the banks' annual reports over the period following the crisis better reflects the reality of the banks' risk exposure. Similar results were found regarding the two other dimensions of ERM approach, namely risk consequence and risk management. These results reveal the overall validity of ERM dimensions in assessing US bank-related risk, therefore confirming our general research hypothesis and the three sub-hypotheses.

These results of the robustness analysis, using the portfolio theory, allow us to corroborate the significant relation between the assessment of the level of credit, liquidity and market risk exposure and consequence, and the traditional measures for the same risks (significant similarity in portfolio rankings). The correlation coefficients were found to be high and significant as for the three main risks related to banks, namely credit, liquidity and market risks. There is thus a strong indication that it is possible to make portfolio selections and risk level rankings using ERM dimensions that are coherent in regard to decisions of the same nature-based on traditional measures of risk, at least for US banks and in the described framework. Of course, more validation within different frameworks is needed before stronger assertions are warranted.

Nonetheless, our study implies that the ERM dimensions disclosed in the annual reports of US

banks are likely to produce measures of risk that are relatively coherent in regard to the measures produced using accounting and market data. The major role of ERM disclosure, that of assisting investors in their decisions, is once again supported here. Any added confidence in disclosure related to risk exposure, risk consequence, and risk management is a welcome development, and crucially so, in a context where a decision is needed and where, as it is often the case, traditional ratios as risk measures are limited.

The results of this research are potentially important for regulators of banking systems as well as for producers and users of the information on banking risks, allowing them to assess their level of reliability and possibly their decision-making relevance. Future research could verify the validity and relevance of the risk information from the two traditional risk models and ERM in other decision models to see if they lead to the same types of decisions or different decisions.

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