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Market risk disclosure in banking: an empirical analysis on four global systemically important European banks

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Abstract Market risk reporting in banking has assumed such importance during the last decade. The purpose of this paper is to provide a methodology to evaluate the qualitative and quantitative profiles of the market risk disclosure in banking. We propose a hybrid methodology to assess whether or not banks are able to provide a satisfactory degree of information about the market risks they are exposed to. In this paper, we conduct an empirical research of market risk disclosure on a sample of four global systemically important European banks. The paper provides evidences that banks differ in their market risk reporting models, even though they are subject to similar regulatory requirements and accounting standards. The paper also generates some useful insights for further research.

Keywords Market risk · Risk reporting · Risk disclosure · Banking · Financial regulation · Risk management

JEL Classification G01 · G2 · G18 · G21 · G24 · G28 · G32

Although the paper has been written jointly by the two authors, it is possible to identify the contribution of each one as follows. Abstract and sections 1 and 2 have been written by Enzo Scannella. Sections 3, 4, and 5 have been written jointly by Enzo Scannella and Salvatore Polizzi. The data were analyzed jointly by the two Authors. All the figures and tables were prepared jointly by the two authors.

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Introduction

The financial crisis has highlighted the strategic importance of a correct and effective market risk reporting in banking for the efficiency of financial markets and the overall financial stability. During the financial crisis, stakeholders suffered from important limitations and distortions in risk perception of banks and other financial institutions. Bank risk disclosure plays a pivotal role in strengthening the market discipline and building trust in stakeholder relationships. Providing a clear and understandable information on bank risk exposure is indispensable for stakeholders to acquire an adequate knowledge about the ability of a bank management to create value in the banking business. It is necessary that an adequate flow of information about bank risk exposures does not remain within the boundaries of a banking firm or a financial authority, but it should be made available to all stakeholders and, in a wider view, to the financial markets.

The growing complexity of banking, especially those of larger dimensions, multi-business, and multinationals, reduces the ability for outside stakeholders to assess and evaluate the prudent, safe, and sound banking practices [1, 2]. The presence of huge asymmetric information makes it difficult for outside stakeholders to monitor and evaluate the levels of risk assumed by bank managers [3, 4]. Investors today are more sensitive to the complexity and opacity of banks' risk profiles. In this perspective, investors and other stakeholders are demanding better access to information on risk exposures in banking industry [5–8]. Banks are subject to a stronger market discipline, and the enhancement of the bank risk disclosures will contribute to a broader financial stability. Adequate and effective transparency of banks' risk profiles also strengthens confidence in the banking industry by reducing the uncertainty in the assessment of banks [9, 10].

The topic of this paper is market risk reporting in banking. Market risk has taken over the last years a growing importance in banking and the disclosure of such risks also struggles because of limitations in their measurement techniques [11]. Market risk is the risk of losses in on- and off-balance sheet positions arising from movements in market prices. An understanding of a bank's market risk position is facilitated through disclosure of information not only on its accounting policies and practices in each relevant area where market risk exposures arise (i.e., lending, trading, fund raising, investments), but also on market risk measurements, risk management strategies, and practices. The final goal of market risk reporting should be disclosing a satisfactory amount of qualitative and quantitative information for both shareholders and stakeholders. The disclosure to the market of such kind of information allows stakeholders to properly assess the bank's risk exposure profile with respect to market risk specifically [12, 13].

The main purpose of this paper is to provide a methodology to evaluate the qualitative and quantitative profiles of market risk disclosure in banking. Such methodology, based on a hybrid scoring approach, aims to assess whether or not banks are able to provide a satisfactory degree of information about the market risks they are exposed to. In this paper, we make an empirical study of market risk disclosure on a sample of four global systemically important European banks. This paper, therefore, investigates the quality of market risk disclosure by banks especially in light of the obligations arising under Pillar 3 of the New Basel Capital Accord [14] and the international accounting standards IAS/IFRS.

The structure of this paper is as follows. "A trade-off problem in the bank market risk disclosure: an accounting and regulatory perspective" section introduces market risk disclosure in banking. It aims to frame the specific nature of market risk and provide a regulatory and accounting perspective of market risk in banking. "Market risk disclosure in banking: an empirical study on four global systemically important European banks" section provides a hybrid methodology to evaluate the qualitative and quantitative market risk disclosure in banking. The research is conducted on a sample of four global systemically important European banks. "Results and discussion" section analyses and discusses the main results of the empirical research on market risk disclosure in banking. "Conclusions" section concludes.

A trade-off problem in the bank market risk disclosure: an accounting and regulatory perspective

The market risk is one of the most important risks in the economics of banking. It is defined by the Basel Committee on Banking Supervision [15] as "the risk of losses in on- and off-balance sheet positions arising from movements in market prices." This definition has been incorporated into the New Bank Capital Accord [14]. Therefore, it indicates the market value fluctuation of an instrument or portfolio of financial instruments. So, this kind of risk is related to the fluctuations of the following four variables: interest rates, exchange rates, share prices, and commodity prices. However, the definition provided by the rules of prudential supervision is limited; market risk, in fact, is closely related to the dynamics of the value of the trading portfolio and the variability of the value of exposures in currencies other than the euro and commodities. Adverse events that may lead to negative economic effects related to market risks are referred to the variability of prices of financial instruments, and this variability is connected to the nature of the determining factors that are related to the mismatch in efficiency compared to market rates and to reliability of the issuer. In both cases, it is usual to detect the variation of the overall price as effect produced by the occurrence of market risks [16–18].

Market risk in banking has assumed such importance during the last decades. It has become increasingly important to measure, manage, assess, and disclose the impact of market risk in the economics of banking. The growing securitization of financial systems, volatility of financial markets, internationalization of banking activity, financial uncertainty, size of banks, and their trading portfolios are increasingly important factors to be reflected in market risk disclosure.

The market risk disclosure can be defined as the publication made by the bank of reliable and timely information that enables users of that information to make an accurate assessment of a bank's financial condition and performance, business activities, risk profile and risk management practices in banking business [19]. The disclosure of reliable and updated information regarding bank's market risk exposures is the prerequisite to trigger the sequence of conditions that allows financial markets to fulfill their role of discipline effectively. In this perspective of analysis, there are essentially two trade-off problems to be considered in dealing with market risk disclosure in banking. The first one is the trade-off between transparency and confidentiality. It implies that there are some pieces of information that are kept confidential within the boundary of a bank to avoid speculative attacks or predatory behavior of stakeholders. The second trade-off problem is between shareholders needs of information and the tendency of banks to hide information. It is, in other words, the trade-off between the right of stakeholders of knowing whether the market risks their bank is exposed to are tolerable or not and the interest of a bank to avoid disclosing details on market risk exposures in order to not undermine its competitive position. From the economic efficiency point of view, all the information about market risk in banking should be publicly available, but from the bank competitiveness point of view there is a need to keep confidential information. In addition, information on market risk exposures may be hidden by banks for other reasons. Banks may exploit this situation, hiding information that stakeholders need [20–22]. This is the main reason why financial regulation imposes some minimum disclosure standards and transparency constraints in an attempt to balance the before mentioned trade-off. The problem is even more complicated by the fact that banks managers may have incentives to avoid regulatory constraints and accounting rules. In brief, it is not easy to find a perfect match between advantages and disadvantages of market risk disclosure in banking [23–25]. For this reason, this a crucial topic which deserves a great attention by scholars and regulators.

In this perspective of analysis, the effectiveness of market risk disclosure in banking is strictly related to some qualitative characteristics of information that banks have to disclose to enable stakeholders to understand a bank's business model and its risks, and the resultant effects on its performance and financial position. First of all such information should be relevant to the decision making process of stakeholders (*relevance*). Information is relevant when it helps stakeholders assess the expected risks and returns of investments, and it has to show sufficient details to enable them to understand the nature and extent of a bank's market risks exposures, its risk appetite, the manner in which it manages its market risks, including stress conditions. It is not always true that the more information a bank discloses, the better off is the potential investor. Sometimes, some pieces of information make users confused. This is the reason why it is necessary to disclose all the information necessary for users to take their decisions, but only the necessary ones must be disclosed, not superfluous ones. What is important is the significance of the information for a proper assessment of risk profiles inherent in various banking activities.

To be relevant, information also needs to be timely (*timeliness*), it should be provided with sufficient frequency using appropriate media to provide a meaningful picture of a bank's financial and economic position. The bank should release to the market all relevant and important risk-based information at the same time (e.g., Annual report, Pillar 3 disclosures). Equally important are regular updates of financial information; stakeholders need more frequent updates than just the Annual report. Theoretically speaking, according to this principle, the information should be available to users before that they make economic decisions, in order to make them influenced by the new information.

Information should also be reliable (*reliability*) in the sense that it has to reflect the economic substance of events and transactions, and not merely their legal form, be verifiable, neutral, prudent, and complete in all material respects. In some instances, mainly for forward-looking information, banks may have to balance relevance and reliability. Moreover, given the fact that banks rapidly change their market risk profiles, timeliness is critical for reliability.

Another qualitative characteristic of information is related to the concept of *materiality*. Information is material if its omission or misstatement could change or influence the decision or assessment of a stakeholder relying on that information. Accordingly, banks should avoid disclosing immaterial or redundant information that does not add value to the existing one or reduce uncertainty among users.

A particularly important aspect for market risk reporting in banking is the degree of *comparability* over time (for the same bank in different years, i.e., for time-series data) and over space (for different banks in the same year, i.e., for cross-sectional data), to provide meaningful comparisons of market risk profiles between different banks, including across different national regulatory regimes. The comparability across time and space has been recently enhanced by the process of harmonization of the accounting languages that has started with the international accounting standards IAS/IFRS and the worldwide spread of basic measures of market risk, such as Value at Risk [26–28]. Such market risk profile comparison both over time and space level is of particular importance in building stakeholders' understanding and confidence. Analysts and investors can use Value at Risk disclosures, for instance, to compare the risk profiles of banks' trading portfolios. The comparability is affected by the fulfillment of the consistency principle. Changes in risk practices, measurement methodologies, accounting, and regulatory requirements may noticeably attenuate the information comparability across time and space [29].

Another important qualitative characteristic is the *comprehensibility* of the information; it has to be presented as clearly as possible, to make it easy to understand, with an appropriate balance between qualitative and quantitative information. A narrative explanation of the main implications of a bank's market risk profiles is necessary in order to benefit not only sophisticated users but also less specialized ones. Descriptions and terms should fairly represent the substance of a bank's activities, operations, processes, procedures, and how a bank identifies, measures, and manages market risk. The market risk reporting should be well organized, so that key information is prioritized and easy to find, and completed with main underlying assumptions and sensitivity or scenario analysis, to demonstrate the effect on selected risk exposures or metrics of variations in the main underlying assumptions. Such information comprehensiveness enables stakeholders to obtain an understanding of a bank's market risk position and market risk management operations.

Briefly, banks should find an appropriate balance among such qualitative characteristics of information in order to provide a faithful and an effective market risk disclosure to stakeholders. In addition, appropriate market risk management processes and methodologies, a constant internal auditing activity, a well-defined internal reporting systems and responsibility frameworks at business unit levels are all principles that contribute to the effectiveness of market risk disclosure in banking.

The regulatory framework concerning market risk reporting in banking can be split up into two parts: the requirements of the International Accounting Standards IAS/IFRS and the requirements of the Basel capital adequacy regulation. Most European banks have to prepare their financial statements according to international accounting standards IAS/IFRS and their related interpretations SIC/IFRIC. Their main role is to enhance the comparability across space (between different banks in the same year) and over time (for the same bank in two different time periods) of banks' financial statement. Unfortunately, it is very difficult getting a satisfactory level of comparability across space because national regulations are different from each other because each country has its own needs, IAS/IFRS do not lead to a real process of standardization. It is more correct talking about harmonization, because IAS/IFRS just set some minimum requirements and not a detailed regulation to be followed by every bank. Some useful requirements about the information banks have to disclose through their financial statements are contained in a very important document issued by the International Accounting Standard Boards in 2010, and it is the "Conceptual Framework for IFRS" [30]. It lists some useful qualitative characteristics that banks' financial statements must have. These qualitative features are extremely important for market risk reporting purposes [31–34].

Banks disclose many useful pieces of information about market risk in the financial statement, and particularly the Notes to the account [35, 36]. The part which discloses the most valuable pieces of information about market risk is the "part E." In fact, the hedging policies are crucial for assessing whether a bank is really protected against market risk. At first glance, the Notes to the account may seem quite similar to the Annual report. So, it is important to clarify that the notes are characterized by a quantitative approach that tries to integrate what is written on balance sheet and income statement, whereas the Annual report outlines some qualitative aspects that the notes do not and cannot consider, because of their different structure.

The Basel capital adequacy regulation provides a set of requirements for banks. Their main objective is making the event of a bank bankruptcy less likely [37–39]. In order to pursuit such aim, the Basel Committee for Banking Supervision created a three-pillar regulatory framework. Analyzing briefly the main requirements of this pillar is fundamental to understand the constraints the banks are subject to, with respect to market risk reporting. The first pillar outlines the methodologies to be applied for calculating the minimum capital requirements. Pillar 2 is about the supervisory review process. It is a piece of regulation which could be able to overcome many inefficiencies that stem from banking regulation. In fact, they are much quicker than regulators and they are fundamental when there is a need of quick little adjustments in the regulation. Pillar 2 recognizes that market risk faced by a bank also depends on qualitative aspects, such as organizational structure, internal control systems, and risk management practices. The qualitative analysis of the market risk in banking is put at the center of the internal capital adequacy assessment process (ICAAP) and the supervisory review and evaluation process (SREP). There is a strong interlinking between ICAAP and SREP in banking. The third pillar represents a very important piece of regulation for market risk reporting. It aims to remove obstacles that prevent market discipline, and inform the market about a bank's market risk exposure. In fact, the main aspect of this pillar is the requirement for banks to disclose a better information about the risks they face and the ways they allocate the capital necessary to deal with stressed market conditions. In particular, this pillar requires banks to prepare a Pillar 3 disclosure report, which is an extremely important document for market risk reporting purposes, because it gives the banks the possibility to disclose a wide range of information on market risk, both from a quantitative (numerical) and a quantitative (narrative) point of view. It creates a "market" in which banks compete, in trying to disclose as detailed information as possible for their potential investors. This could be crucial for allowing them to take rational and conscious economic decisions.

Briefly, the market discipline of Pillar 3 addresses the issues of transparency in banking. Some of the most important pieces of information are the following: nature of capital held; regulatory capital requirements; the conditions and characteristics of each capital instrument issued by the bank; capital requirements for each type of risk; the general structure of the risk management function and risk management policies implemented by the bank, nature of banks' risk exposures. Compared to the past, the new financial regulation requires banks to achieve further disclosure standards, but this might not be sufficient to achieve the objective for which the greater disclosure has been requested, that is, the drive for an effective market discipline [40–43].

Market risk disclosure in banking: an empirical study on four global systemically important European banks

In this section, the paper aims to analyze the methodology we propose to evaluate the qualitative and quantitative market risk disclosure in banking. First of all, it is important to set the boundaries of the analysis. Most of the scholars analyze only annual reports, from either a quantitative or a qualitative point of view. Nevertheless, it seems that many other pieces of information could be analyzed considering other documents. For these reasons, the content analysis of this paper focuses on the three most important documents: Annual report, Notes to the account, and Pillar 3 report. The Annual report is analyzed both from a qualitative and a quantitative point of view, whereas the Pillar 3 disclosure report and the Notes to the account are analyzed just from a qualitative point of view, because it is quite difficult to identify quantitative indicators to evaluate these two documents. In particular, about the Notes to the account, the main focus is on "Part E." Nevertheless, also other parts are taken into account, whenever they disclose useful information about market risk.

The main limit of the content analysis is that it is characterized by the subjective evaluation of the author [44, 45]. In order to partially overcome this limit, the scoring rule is split up into two parts: a quantitative part which is not influenced by any subjective evaluation and a qualitative part which considers the aspects that the other part of the metric cannot take into account. The first part could be defined as a "quantitative part." We have chosen 15 indicators. For each indicator, the bank can get either "1" or "0." The number 1 means that the bank is disclosing that information in a satisfactory way and 0 means that the information is not disclosed in a satisfactory way or it is not disclosed at all. Of course, many indicators could be chosen, but it is important to exclude the ones that are mandatory in this first part of the metric. In fact, everyone can be sure that the mandatory information will be disclosed in one of the bank's documents and almost everyone would get a 1 in this aspect; therefore, it would be useless doing something like this now. Obviously, this way of reasoning will be reversed in the second part of the scoring rule, in which also some pieces of mandatory information will be analyzed from a qualitative point of view. The indicators chosen are the following: Market risk definition; Value at Risk (VAR) definition; Expected Shortfall (ES) definition; Back testing definition; Average VAR; Average ES; VAR at the end of the year; Limitations of VAR; Limitations of ES; Explanation of the VAR model used; Explanation of back testing models used; Presence of graph about annual VAR fluctuations; Stress testing explanations; Stress testing results; Market risk level of aggregation reported. The last indicator will return a 1 if at least two of the following market risk level of aggregation will be reported (also in this case in an at least satisfactory way): Aggregation for type of financial instrument; Aggregation at portfolio level; Aggregation at country level; Aggregation for type of market risk determinant; Aggregation for each company of the group.

With respect to the "qualitative part" of the scoring rule, we have decided to assign a mark from "0" to "5" to each document that will be analyzed, according to the following scheme:

0 point: severe lack of information disclosure;
1 point: very poor information disclosure;
2 points: unsatisfactory information disclosure;
3 points: satisfactory information disclosure;
4 points: good information disclosure;
5 points: excellent information disclosure.

The qualitative mark will be assigned taking into account the degree of completeness and comprehensibility of the information of the quantitative indicators and, most important, the qualitative characteristics outlined in the Conceptual Framework for IAS/IFRS. The three qualitative marks will be summed; therefore, with respect to this qualitative part, the partial maximum score a bank can get is 15. This score will be summed to the quantitative score. Hence, the final maximum grade a bank can get is 30.

A crucial consideration in this aspect is the fact that in the qualitative part of the methodology, both qualitative and quantitative information are considered. In fact, the quantitative part cannot consider all quantitative data disclosed by banks; it just considers the aforementioned 15 indicators. Therefore, it is important to avoid confusion. The quantitative part of the methodology deals with just a small subset of the quantitative data and it includes also qualitative data (such as the definition of market risk, the definition of VAR and so on), whereas the qualitative part of the metric deals with both qualitative and quantitative data that are not considered in the first part of the metric, and it also evaluates the ease of understanding of the reports. In sum, qualitative marks are not always marks on qualitative disclosure and quantitative marks are not always marks on quantitative disclosure. See Beretta and Bozzolan [46] to dispute the idea that the quantity of disclosure is a sound proxy for the quality of disclosure.

In order to better appreciate the methodology we propose in this paper to evaluate bank's market risk reporting, we compare it to other methodologies proposed by scholars. The relevant literature on evaluating risk reporting models in banking can be split up into two different approaches. According to the first one, which is the most adopted [47–50], a purely quantitative approach is sufficient. They identify some indicators that should be able to capture all the information necessary to evaluate banks in risk reporting. In particular, they use a binary evaluation: Each indicator can provide either "0" or "1." The number "0" means that the information is not disclosed, whereas "1" means that the information is disclosed, it does not matter if in a good or in a bad way. This is the main limit of this kind of metric. In fact, it does not provide any evaluation about the degree of completeness and comprehensibility of the information disclosed by the bank. It is not able to capture any important qualitative aspect of the disclosure, even if they are valuable for the users of the financial statement. For this reason, a purely quantitative approach was discarded in the empirical analysis of this paper [51–53].

The second approach is completely different, and there are much less contributions. It is based upon a qualitative approach that is able to consider many qualitative characteristics of the information provided by banks' financial statements, such as its relevance, the degree of completeness, comprehensibility, and so forth. Moreover, qualitative approaches are also able to take into account numerical assets contained into the financial statements. Unfortunately, qualitative approaches are characterized by a severe drawback: The evaluation is influenced by the subjectivity of the author. This is the reason why this approach is not so utilized by many scholars. Nevertheless, this approach has some interesting points of strength, and with some adjustments, it could be a very useful tool for market risk reporting evaluation purposes. These considerations are fundamental for the creation of the methodology we propose in this paper.

The sample of this research is made up by the largest banks groups for degree of market capitalization of the four largest European countries for number of inhabitants and for nominal annual GDP. These countries are Germany, France, Italy, and Spain. Their biggest banks groups are the following: Banco Santander, BNP Paribas, Deutsche Bank, and Unicredit (Table 1).

This technique of clustering seems to be the most appropriate. In fact, the banks that are going to be analyzed have many characteristics in common: This will be helpful during the content analysis. The common characteristics of these banks are the following: They are all global systemically important banks (G-SIBs); they have a market capitalization greater than 15 billion euro; each of them is the most important bank in its own country; their sizes call for "too big to fail" policy; all of them operate at international level; all of them are listed on regulated markets.

Table 1 Sample of the empirical research

Bank	Country	Market capitalization[a] (data in billion euro)
Banco Santander	Spain	57.10
BNP Paribas	France	56.81
Deutsche Bank	Germany	22.54
Unicredit	Italy	15.42

[a] These data are available on the Web sites of the stock markets in which these banks are listed

The evaluation period runs from 2012 to 2015. The effort is in trying to understand whether or not each bank is characterized by a good level of comparability over time (for the same bank over different years) and a good level of comparability across space (between different banks in the same year). Therefore, the analysis takes into account both cross-sectional data and time-series data. This methodology allows to capture a much higher degree of information than a purely historical or cross-sectional approach.

Results and discussion

This section of the paper aims to analyze the main results of the empirical study we conducted to evaluate the market risk disclosure in banking. Since the beginning of the evaluation period, Banco Santander has been characterized by a very good disclosure of information from a quantitative point of view. Moreover, this bank was able to get an improvement in the quantitative information disclosure year by year, with the exception of 2014 in which there are some aspects not perfectly clear and easy to understand (for instance, there is a translation mistake in the section about stress testing of the Annual report [54–57]). Also the qualitative information is characterized by some improvements. They have become, year after year, more precise and clear in the reporting of the information. Excluding year 2014, Banco Santander got non-decreasing marks in both the qualitative and quantitative score. Particularly large is the increase in the mark from 2014 to 2015 (Tables 2, 3, 4). The reporting activity of Banco Santander in 2015 is the best. It is extremely precise, complete, and full of useful details. Particularly valuable is the information about derivatives and hedging activities they disclose in the Notes to the account [58–61]. Unfortunately, as this evaluation suggests, the reporting model of this bank is an ongoing one, characterized by some changes year after year (Fig. 1). For this reason, the comparability over time of this bank is not that good. To be precise, it is not fault of Banco Santander. This situation is made even worse by the regulatory requirement changes during the evaluation period

Table 2 Banco Santander: results of the quantitative analysis. *Sources*: Banco Santander, *Annual Report*, 2012, 2013, 2014, 2015

Banco Santander (year)	2012	2013	2014	2015
Quantitative part				
Market risk definition	0	0	1	1
VAR definition	1	1	1	1
ES definition	0	0	1	1
Back testing definition	1	1	0	1
Average VAR	1	1	1	1
Average ES	0	1	1	1
VAR at the end of the year	1	1	1	1
Limitations of VAR	1	0	1	1
Limitations of ES	0	0	0	0
Explanation of the VAR model used	1	1	1	1
Explanation of back testing models used	1	1	0	1
Presence of graph about annual VAR fluctuations	1	1	1	1
Stress testing explanations	1	1	1	1
Stress testing results	1	1	0	1
Market risk level of aggregation reported	1	1	1	1
Total "quantitative" score	11	11	11	14

Table 3 Banco Santander: results of the qualitative analysis. *Sources*: Banco Santander, *Annual Report*, 2012, 2013, 2014, 2015; Banco Santander, *Financial Statements and Directors' Report*, 2012, 2013, 2014, 2015 (Notes to the account); Banco Santander, *Pillar III Disclosures*, 2012, 2013, 2014, 2015

Banco Santander (year)	2012	2013	2014	2015
Qualitative part				
Annual report mark	3.5	4	3.5	5
Document Basel 2 Pillar 3 mark	4	4	3	4
Notes to the account mark	4	4.5	5	4.5
Total "qualitative" score	11.5	12.5	11.5	13.5

Table 4 Banco Santander: final evaluation

Final total score	22.5	23.5	22.5	27.5

[62–65]. Nevertheless, Banco Santander puts an appreciable effort in providing a very good risk reporting: Without any doubt, it is the best market risk reporting model analyzed in this research in almost all the points of view.

BNP Paribas reporting model is characterized by a balance situation between qualitative and quantitative disclosures. The information disclosure is satisfactory in both of the two perspectives. However, making an overall evaluation, BNP Pariba's market risk reporting model is much worse than Banco Santander, in each year of the evaluation period. There are some important omissions in the documents of this bank, underlined also by the quantitative part of the metric, in which, excluding 2014, it is the worse bank of the four that have been analyzed. Moreover, the evolution over time of its marks is quite floating. The overall mark is unchanged from 2012 to 2013, in 2014 there is a good improvement of 3.5 points, and in 2015 the mark is lowered by 1.5 points, vanishing some improvements made in the previous year. The other banks were characterized by good improvements in 2015; therefore, it cannot be fault of regulation changes. It was BNP Paribas that overlooked some important aspects in 2015. The expectation is to observe an improvement of the market risk reporting over time, but for BNP Paribas it is not the case (Tables 5, 6, 7). Even if it is the worse bank in 2013 and 2015, the reporting activity of this bank is characterized by some points of strength, such as a very good back testing model [66–69]. In the future, it could be able to overcome the limits of its document and become better in market risk reporting. About the comparability over time of this bank, also in this case it is far from being satisfactory (Fig. 2). However, BNP Paribas is not characterized by dramatic changes in the reporting model; this leads to a slight increase in the comparability over time. Nevertheless, also in this case, it is not satisfactory. Potential investors are looking for something more and something different than the information disclosed. Nevertheless, the information disclosure about market risk is not unsatisfactory.

Deutsche Bank is characterized by the fact that its market risk reporting is good from a qualitative point of

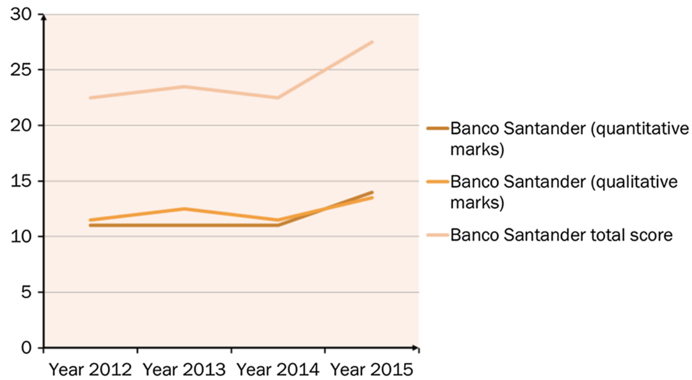

Fig. 1 Banco Santander: results of the quantitative and qualitative analysis. An overall evaluation

Table 5 BNP Paribas: results of the quantitative analysis. *Sources*: BNP Paribas, *Registration Document and Annual Financial Report*, 2012, 2013, 2014, 2015 (it includes the Annual Report, the Notes to the account, and the Pillar III Disclosures)

BNP Paribas (year)	2012	2013	2014	2015
Quantitative part				
Market risk definition	1	1	1	1
VAR definition	1	1	1	1
ES definition	0	0	1	0
Back testing definition	1	1	1	1
Average VAR	1	1	1	1
Average ES	0	0	0	0
VAR at the end of the year	1	1	1	1
Limitations of VAR	0	0	0	0
Limitations of ES	0	0	0	0
Explanation of the VAR model used	1	1	1	1
Explanation of back testing models used	0	0	1	1
Presence of graph about annual VAR fluctuations	1	1	1	1
Stress testing explanations	1	1	1	1
Stress testing results	0	0	0	0
Market risk level of aggregation reported	1	1	1	1
Total "quantitative" score	9	9	11	10

Table 6 BNP Paribas: results of the qualitative analysis. *Sources*: BNP Paribas, *Registration Document and Annual Financial Report*, 2012, 2013, 2014, 2015 (It includes the Annual Report, the Notes to the account, and the Pillar III Disclosures)

BNP Paribas (year)	2012	2013	2014	2015
Qualitative part				
Annual report mark	3	2.5	4	3
Document Basel 2 pillar 3 mark	2.5	3	3.5	3.5
Notes to the account mark	3.5	3.5	3	3.5
Total score qualitative part	9	9	10.5	10

Table 7 BNP Paribas: final evaluation

Final total score	18	18	21.5	20

view, but unsatisfactory from a quantitative point of view. Deutsche Bank's risk report is very good in definitions, description of the macroeconomic and regulatory environment and so forth [70–73]. But, these pieces of information might be taken also by other sources such as textbooks, newspaper, and internet. The really important information is disclosed in a bad way by Deutsche Bank, and there are also some severe omissions (particularly evident is the lack of quantitative disclosure about derivatives and hedging activity). The reporting model is unchanged until 2014. From 2012 to 2014, there is an improvement in the score, but it is mainly due to not very important information (such as definitions and explanation

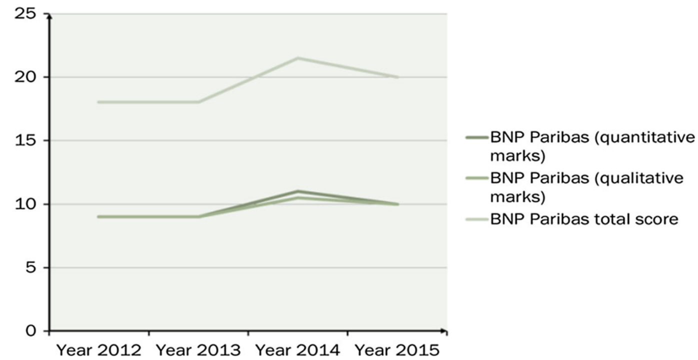

Fig. 2 BNP Paribas: results of the quantitative and qualitative analysis. An overall evaluation

Table 8 Deutsche Bank: results of the quantitative analysis. *Sources*: Deutsche Bank, *Annual Review*, 2012, 2013, 2014, 2015 (it includes the Annual Report and the Notes to the account)

Deutsche Bank (year)	2012	2013	2014	2015
Quantitative part				
Market risk definition	0	1	1	1
VAR definition	1	1	1	1
ES definition	0	0	0	0
Back testing definition	1	1	1	0
Average VAR	1	1	1	1
Average ES	0	0	1	0
VAR at the end of the year	0	1	1	1
Limitations of VAR	1	1	1	1
Limitations of ES	0	0	0	0
Explanation of the VAR model used	1	1	1	1
Explanation of back testing models used	1	1	1	1
Presence of graph about annual VAR fluctuations	1	1	1	1
Stress testing explanations	1	1	1	1
Stress testing results	0	1	1	1
Market risk level of aggregation reported	1	0	1	1
Total "quantitative" score	9	11	13	11

of the models utilized). The situation changed in 2015. Even if the mark is even worse than the one of the previous year, the risk reporting model has changed in a good way. There is an interesting improvement in quantitative information. The lowered mark is due to a lack of definitions about back testing, not very important omissions. In practice, it seems that the methodology adopted, in the Deutsche Bank case, is characterized by a bias which made the score of this bank too high in years 2012, 2013, and 2014 and too low in 2015. Nevertheless, notwithstanding the marks, in the last year analyzed, Deutsche Bank used a better approach for market risk reporting (Tables 8, 9, 10) [74–77]. It could be a good basis for a very good market risk reporting in the future. About the comparability over time of this bank, it is clear that, with respect to the first three years, they are characterized by an almost satisfactory comparability, but the last year spoils everything about this type of comparability (Fig. 3). However, this change in perspective was very important and in general it is a good news for investors. The trade-off between comparability over time and comparability across space was solved, in 2015, in favor of the latter. This is a good thing, and moreover, this is exactly what investors really need.

The market risk reporting model adopted by Unicredit is completely different than the one adopted by the other banks analyzed in this research. In fact, in the Annual report [78–81], they do not disclose any type of information about the risks the group is exposed to. Each year, they put a reference in which they say that the information about risks is reported in the section "E" of the Notes to the

Table 9 Deutsche Bank: results of the qualitative analysis. *Sources*: Deutsche Bank, *Annual Review*, 2012, 2013, 2014, 2015 (it includes the Annual Report and the Notes to the account); Deutsche Bank, *Financial Report*, 2012, 2013, 2014, 2015 (it includes the Pillar III Disclosures)

Deutsche Bank (year)	2012	2013	2014	2015
Qualitative part				
Annual report mark	2.5	3	4	3.5
Document Basel 2 pillar 3 mark	4	4	3	4
Notes to the account mark	2	2	2	3
Total "qualitative" score	8.5	9	9	10.5

Table 10 Deutsche Bank: final evaluation

Final total score	17.5	20	22	21.5

Table 11 Unicredit: results of the quantitative analysis. *Sources*: Unicredit, *Relazioni e Bilancio*, 2012, 2013, 2014, 2015 (it includes the Annual report and the Notes to the account)

Unicredit (year)	2012	2013	2014	2015
Quantitative part				
Market risk definition	1	1	1	1
VAR definition	1	1	1	1
ES definition	1	1	1	1
Back testing definition	1	1	0	1
Average VAR	1	1	0	1
Average ES	0	0	0	0
VAR at the end of the year	1	1	1	1
Limitations of VAR	1	1	1	1
Limitations of ES	0	0	0	1
Explanation of the VAR model used	1	1	1	1
Explanation of back testing models used	1	1	1	1
Presence of graph about annual VAR fluctuations	1	1	0	1
Stress testing explanations	1	1	1	1
Stress testing results	1	1	1	1
Market risk level of aggregation reported	0	0	1	1
Total "quantitative" score	12	12	10	14

account. Indeed, the information reported in the notes is extremely good, almost excellent. Therefore, in each year, the mark of the Annual report is very low (always strictly less than 2) and the one of the Notes to the account is very high (always greater or equal to 4). However, it is not a good thing the fact that they do not exploit such an important document for market risk disclosure purposes. About the Pillar 3 report, it is also very good, each year [82–85]. Because of this strange structure of their market risk reporting model, a slight change in the methodology was necessary to evaluate Unicredit in a fair and proper way. So, the quantitative mark was assigned looking at the information reported in both the Annual report and the Notes to the account (Tables 11, 12). Even if this change in the methodology was made ad hoc for Unicredit, probably this is not exactly appropriated for evaluating Unicredit. In particular, the marks assigned to it are probably too low. Of course, the methodology utilized is not perfect, but Unicredit reporting documents are characterized by these peculiarities that make this bank quite difficult to evaluate. Nevertheless, this strange reporting model makes this bank difficult to compare with the other banks. Therefore, the comparability across space of this bank with the other banks is not satisfactory; the other banks are characterized by a certain degree of homogeneity, but this one is completely different. This is not a good news for investors. However, it must be noticed that the market risk reporting of this bank, in general, is better than the ones adopted by Deutsche Bank and BNP Paribas (excluding 2014 in which

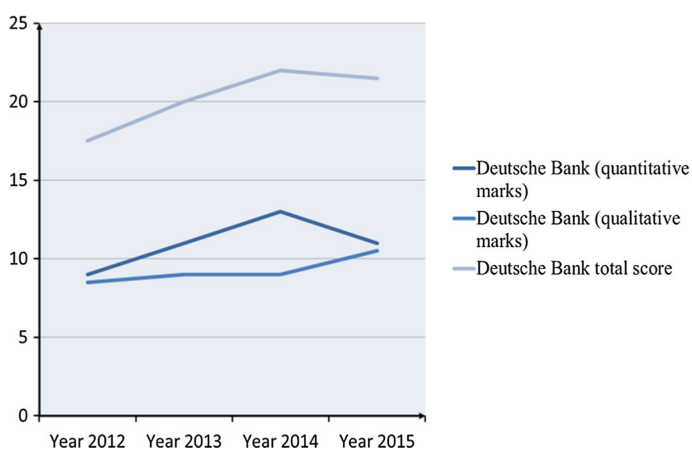

Fig. 3 Deutsche Bank: results of the quantitative and qualitative analysis. An overall evaluation

Table 12 Unicredit: results of the qualitative analysis. *Sources*: Unicredit, *Relazioni e Bilancio*, 2012, 2013, 2014, 2015 (it includes the Annual report and the Notes to the account); Unicredit, *Terzo Pilastro di Basilea 2. Informativa al Pubblico*, 2012, 2013, 2014, 2015 (it includes the Pillar III Disclosures)

Unicredit (year)	2012	2013	2014	2015
Qualitative part				
Annual report mark	1	1	1.5	1.5
Document Basel 2 Pillar 3 mark	4.5	5	4.5	5
Notes to the account mark	4	4	4	4.5
Total "qualitative" score	9.5	10	10	11

Table 13 Unicredit: final evaluation

Final total score	21.5	22	20	25

there are some drawbacks, especially in the quantitative part). This bank is potentially able to make a very good reporting: If it changes the distribution of the information in the three documents analyzed, the gap with Banco Santander will be reduced a lot. With respect to the comparability over time, this group is characterized by the highest level of comparability in this aspect. There are not relevant changes in the reporting activity from 2012 to 2015, and this enhances the comparability over time (Table 13; Fig. 4). This kind of comparability is reached at the expenses of the comparability across space, which is the most important type of comparability for potential investors. Therefore, some changes in Unicredit's market risk reporting model are necessary, but potentially, it is extremely good, almost as good as the one of Banco Santander.

Making an overall evaluation of the sample, for the reasons explained in the previous paragraphs, Banco Santander is the best of the sample in market risk reporting because of its excellent quantitative disclosure and its good narrative explanations (Fig. 5). Unicredit is the second best bank because, even if the distribution of the information in the three documents is not good, their reporting model is almost as good as the one of Banco Santander. Deutsche bank is slightly better that BNP Paribas, also because its risk reporting model is characterized by some important improvements, especially from a quantitative point of view

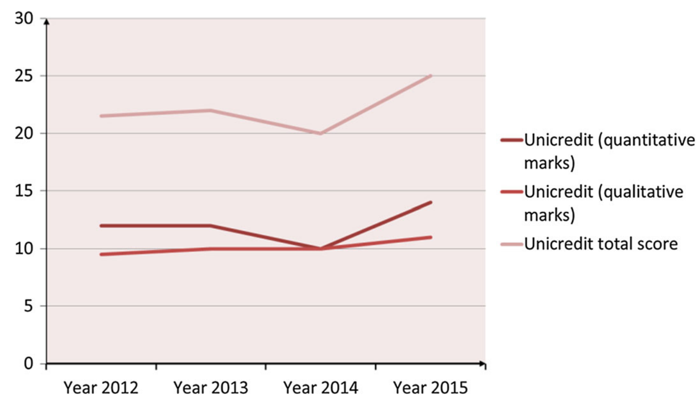

Fig. 4 Unicredit: results of the quantitative and qualitative analysis. An overall evaluation

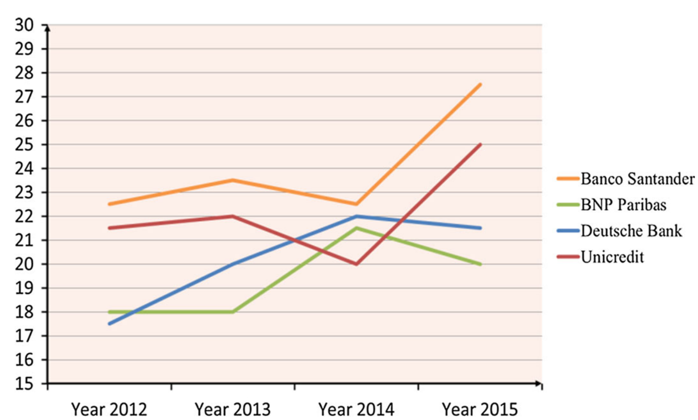

Fig. 5 Final results for the whole sample during the whole evaluation period

in 2015. Nevertheless, the market risk reporting of BNP Paribas is satisfactory and it is characterized by some points of strength (such as a good back testing model).

Conclusions

Banking industry has made significant progress over the past years in identifying, measuring, and disclosing market risk. Banking regulation, international accounting standards, and financial market constraints have been pressuring banks to increase the quality and quantity of market risk disclosure to stakeholders. This empirical research outlines some important aspects with reference to market risk reporting in banking. Even though banks are subject to similar regulatory requirements and accounting standards, they can still have several important differences in their market risk reporting models. Some banks prefer to disclose mainly quantitative data, like Banco Santander. This type of information might be the most valuable for potential investors. Other banks are more focused on qualitative disclosure, like Deutsche Bank. And it seems that this risk reporting model cannot be adopted for a proper market risk reporting. Some banks adopt a more balanced approach, like BNP Paribas, but they need some improvements because of some omissions and a lack of information that is easy to read and understand. There are also some banks (like Unicredit, in this empirical research) that do not exploit some documents for their market risk disclosure. This could make the comparability across space much more difficult to get. Nevertheless, some improvements in this kind of comparability can be observed in the evaluation period of this analysis, which is from 2012 to 2015. They are just four years, but it seems that the reporting model of these four banks is getting closer over time. Banco Santander has improved its qualitative disclosure and, in 2015, Deutsche Bank has improved its quantitative disclosure, whereas BNP Paribas was already characterized by a good balance between the two types of information. The only exception is Unicredit, whose reporting model is quite different than the others. Therefore, some improvements were made during the evaluation period, also from a regulatory point of view. These improvements lead to a better comparability across space, but the comparability over time of the financial statements of these banks suffers because of these continuous changes. Ongoing changes in the regulatory requirements are absolutely necessary, for making more difficult for banks to find loopholes in the regulation. This is the reason why potential investors should not care too much about this type of comparability, which is almost impossible to reach. In this analysis, a certain degree of comparability over time was observed just for BNP Paribas and Unicredit. But, indeed, it is not a good thing. These banks were characterized by some peculiarities in their reporting activity, as it was already explained. It is much better, the evolution over time of Banco Santander, that has been able to modify its reporting model in order to get a better disclosure about market risk. This is what really matters for potential investors.

It is important to underline the fact that this empirical research suffers from some limitations that characterize any type of content analysis. First of all, the evaluation interval is quite short. Some changes in the reporting models were observed, but it would be interesting to enlarge the evaluation period, in order to understand whether or not the changes observed during these few years are representative of the changes occurred over a larger period of time. It is not unlikely that some improvements could be vanished from one year to another (indeed, this is what happened for BNP Paribas in 2015, for instance). The sample size might be enlarged as well.

Moreover, the fact that the methodology is split up into two parts should attenuate the problem that the content analysis is too much affected by the subjective considerations of the author. In fact, the quantitative part of the methodology is absolutely objective, but it is not able to capture many quantitative aspects disclosed by banks, as well as qualitative ones. The second part of the methodology is very useful to capture these elements that are not considered by the first part. With this approach, the drawbacks of both a pure quantitative and qualitative analysis are diminished. Of course, this hybrid methodology is characterized by both of these problems, but they are not so evident and severe as a pure approach. Of course, some changes in this hybrid methodology are still necessary. But understanding the correct changes is not an easy task. It would be necessary to evaluate more banks over a longer evaluation interval to understand which are the true limitations of this methodology and the changes to be imposed in order to make it a better tool for evaluating market risk reporting in banking. Further researches could be able to overcome these limitations. Nevertheless, this empirical research was important to understand the ways big European banks deal with market risk reporting, and how they can improve it. Following the path of this empirical analysis, increasing the sample size and the time interval are good ways to make it a better analysis. But the most important aspect is avoiding to keep unchanged the methodology. Once that its drawbacks are identified, it is necessary to change the structure of the methodology and start again the analysis. Risk reporting regulation (especially with reference to market risk) and risk reporting itself are an ongoing process. Also for these reasons, the evolution over time of our hybrid methodology must be an ongoing process too. But it was impossible to make such a demanding analysis here. Nevertheless, the results of this empirical analysis could stimulate further research in this field.

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