The determinants of risk reporting during the period of adoption of Basel II Accord: evidence from the Portuguese commercial banks

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Abstract

Purpose – The purpose of this paper to analyze the risk reporting practices and its determinants of commercial banks during the period of the adoption of the Basel II Accord in Portugal.

Design/methodology/approach – The paper conducts a content analysis of the risk and risk management sections included in the management reports and the notes of the annual reports of Portuguese commercial banks, for the years 2007, 2010 and 2013.

Findings – Findings show that theoretical frameworks underpinned in agency and legitimacy theories continue to provide valid explanations for risk reporting by Portuguese banks. More specifically, findings indicate that agency costs, public visibility and reputation are crucial drivers of risk reporting. Findings also indicate that younger banks with lower risk management skills use risk reporting either as an informational process or as a channel to manage organizational legitimacy.

Research limitations/implications – The content analysis does not allow readily for in-depth qualitative inquiry. The coding instrument is subject to coder bias. Information about risk can be provided in sources other than annual reports. Additionally, not all banks disclose information on corporate governance-related variables that could also influence risk reporting.

Originality/value – The current research setting has never been studied hitherto. In this sense, this study seems to be of great relevance given the scarcity of literature on the subject in Portugal.

Keywords Disclosure of risk, Base accord, Banking, Risk reports, Financial sector

Paper type Research paper

1. Introduction

In Portugal, the Basel II Accord became mandatory in 2007 onward (Decree-Law No. 103/2007 and Decree-Law No. 104/2017). The first year of adoption was 2007. The last year of adoption was 2013. From 2014 onward, the Basel III Accord became mandatory for the Portuguese credit institutions (Decree-Law No. 157/2014). The present study investigates a particular aspect of risk reporting by Portuguese commercial banks over the period of 2007, 2010 and 2013: the determinants of risk reporting during the period of adoption of Basel II Accord.

This research objective is motivated by four main aspects. First, inadequate reporting has been implicated in many episodes of financial distress and unexpected corporate failures in the past decades: for example, in the collapses of Enron and Worldcom in the USA, and H1H Insurance in Australia; in the financial plight of Northern Rock in the UK; and the operational

risk management failure of Societé Générale in France. The importance of monitoring the risk exposures and the risk management practices of business entities have been highlighted in the post-mortems following the financial implosion of several major investment banks (Bear Stearns, Lehman Brothers, Merrill Lunch), the ensuring effects on other firms (such as American Insurance Group) and on the global economy (Ball, 2009). In the aftermath of the 2008 financial crisis some of the G20 efforts to reinforce confidence in financial stability have included amendments to IFRS 7 and revisions to the Basel Accords. IFRS 7 amendments include fair value issues and liquidity risk information. Basel revisions included higher capital requirements and the reinforcement of Pillars 2 and 3. However, literature has indicated that no single set of accounting regulations results in more extensive levels of disclosure and in an improved quality of risk reporting (Woods *et al.*, 2008; Savvides and Savvidou, 2012). This suggests that amending risk reporting regulations to create a successful outcome is a complex matter (Oliveira *et al.*, 2011a). Since the 2008 financial crisis (and because of the G20 agenda of regulatory reform) several regulatory institutions have announced their intention to improve disclosure transparency as an attempt to restore the lost confidence in the financial system. However, research has not been consistent regarding the impact of regulation on the quality improvement of risk reporting. Some studies indicate that regulation did not improve the levels of risk reporting, nor its quality (Woods *et al.*, 2008; Bischof, 2009). But Miihkinen (2012) provides evidence of the opposite. Some recent studies reveal that even during or after the recent GFC risk reporting continues to be treated in a non-homogeneous way (Lombardi *et al.*, 2016), with no differences in terms of its quality. It is largely non-financial, historical, qualitative and focused on good news (Ntim *et al.*, 2013; Greco, 2012; Oliveira *et al.*, 2018).

Second, research studies on risk reporting practices by banks are limited and focused on the following matters: (1) risk reporting practices (Bischof, 2009; Frolov, 2007; Linsley *et al.*, 2006; Maffei *et al.*, 2014; Oliveira *et al.*, 2011a; Woods *et al.*, 2008; Savvides and Savvidou, 2012; Ismail *et al.*, 2013; Hassan, 2014); (2) motivations for risk reporting (Helbok and Wagner, 2006; Linsley *et al.*, 2006; Linsley and Kajüter, 2008; Oliveira *et al.*, 2011b, 2013; Barakat and Hussainey, 2013). But the few studies on the risk reporting practices after risk reporting reforms (such as Basel II Accord) are focused on operational risk disclosures (Barakat and Hussainey, 2013) or on the narrative risk disclosures of Italian banks required by Pillar 3 of Basel II Accord (Maffei *et al.*, 2014). As far as we know, the present study is the first one analyzing the risk reporting practices of Portuguese banks during the period of adoption of Basel II Accord.

Third, research on risk reporting of Portuguese firms is also scant and limited to nonfinancial firms (Oliveira *et al.*, 2011c, 2018) and finance firms (Oliveira *et al.*, 2011a, b, 2013). Additionally, the few studies on risk reporting practices by Portuguese finance firms are focused on periods prior to both the 2008 financial crisis and the adoption of the Basel II Accord, which became mandatory in 2007 onwards until 2013. Moreover, the Portuguese banking system show a higher degree of public visibility and consumer orientation since 2006 compared to European common-law countries (European Central Bank, 2010). Consequently, it is crucial to properly assess the evolution of risk reporting practices of Portuguese commercial banks during the period of adoption of Basel II Accord and assess if motivations for risk reporting detected in prior literature (Oliveira *et al.*, 2011b, 2013) remained the same during this period.

The present study tries to address these voids by answering the following research question: what are the determinants of risk reporting practices by Portuguese commercial banks during the period of adoption of Basel II Accord?

Main findings indicate that the risk reporting differences found across the years of analysis are not statistically significant. However, the results indicate that disclosures in 2013 were higher than those in 2007. Findings show that theoretical frameworks underpinned in

agency and legitimacy theory continue to provide valid explanations for risk reporting by Portuguese banks. More specifically, findings indicate that agency costs, public visibility and reputation are crucial drivers of risk reporting. Findings also indicate that younger banks with lower risk management skills use risk reporting either as an informational process or as a channel to manage organizational legitimacy.

This study contributes both to theory and practice. First, this study contributes to prior literature by extending the work of Oliveira *et al.* (2011a, b, 2013). Based on legitimacy theory and resources-based perspectives, these studies explored the risk reporting practices (Oliveira *et al.*, 2011a) and managers' motivations for risk reporting (Oliveira *et al.*, 2013) of all Portuguese credit institutions. More specifically, Oliveira *et al.* (2011b) focused on managers' motivation for voluntary operational risk reporting by Portuguese commercial banks. All these studies are focused on periods of analysis prior to the 2008 financial crisis and the adoption of risk-based regulations (such as the Basel II Accord). The present study extends this literature by exploring both the evolution of risk reporting (which includes not only operational risks but also risk management objectives and policies, liquidity risk, credit risk, market risk and capital adequacy) by Portuguese commercial banks and their determinants during the period of adoption of the Basel II Accord. Second, this study is particularly important to managers (potential economic advantages they can have from strategically manage the amount of risk reporting), investors (to better inform their investment decision-making) and regulators/standard setters (identification of failures and gaps in risk regulations).

In the following sections we present the regulatory background, the literature review and hypotheses. Next, we explain the research design and results. We finalize with the conclusions, limitations ad suggestions for further studies.

2. Regulatory framework
2.1 International regulatory background
In recent decades, we have witnessed the accelerated development of international trade and the globalization of the financial industry. Stiglitz (2002) considers that the globalization of the financial industry is a process in which capital markets are interconnected, both nationally and internationally, giving rise to the standardization of the world's financial market. Stiglitz (2002, p. 59) recalls that in the global sphere there is no regulatory body that is accountable to the populations of all countries, which supervises the process of globalization in the same way that the national states guide the process of nationalization. This lack of regulation, in the author's opinion, generates what can be defined as "a global management without global government," in which some institutions dominate, such as the World Bank, the International Monetary Fund and the World Trade Organization.

However, financial institutions (such as banks) must be accountable to their main stakeholders (such as depositors) mainly to build trust and confidence in the financial market and ensure market liquidity. But regulations in the financial sector are quite complex, as they are formulated by a number of different bodies (Woods *et al.*, 2008): the Bank for International Settlements, the International Accounting Standards Board and the national banking supervisors/accounting standards setters. When institutions operate at a global level, they must comply with multiple jurisdictional requirements. In that case, the basic rules of regulation are established in the reports of the Bank for International Settlements (known as the Basel Accords).

The Basel Committee on Banking Supervision (BCBS) was established in 1962 with the objective of maintain the stability of the financial system by establishing guidelines for the market. As a precaution against credit risk, the Basel I Accord was issued in 1988, imposing minimum capital requirements to commercial banks. Under Basel I banks that operate

internationally must maintain capital (Tier 1 and Tier 2) equal to at least 8% of their risk-weighted assets.

The Basel II Accord, published in 2004, is based on a set of guiding principles, the objective of which is to establish procedures so that financial institutions can identify and measure all risks (such as credit, market and operational risks) and assess the adequacy of their internal capital in relation to their risk profile, as well as their strategy and business plan, in order to ensure the existence of sufficient own funds to offset the adverse effects of all the risks inherent to the activities carried out. To achieve this goal, the Basel II agreement proposes the following risk assessment methods to determine minimum capital requirements: credit risk (internal ratings and standard method); market risk (internal and standard model method); operational risk (standard, advanced measurement and basic indicator methods).

Basel II structures banking regulation in three pillars: Pillar I (measurement of the minimum capital requirements); Pillar II (Monitoring and prevention through a supervisory review and evaluation process); and Pillar III (disclosure and transparency to improve market discipline). Pillar I was established to make the prudential framework created by Basel I more sensitive to risks, changing the rules for the calculation of minimum capital requirements. Pillar II sets out the supervisory process concept, which combines a set of principles essentially intended to reinforce the interaction between institutions and supervisors. Pillar III introduced requirements for the disclosure of information by institutions to the public (such as customers, counterparts, investors, analysts) regarding solvency and other items describing the respective risk profiles, to ensure effective market discipline.

In the wake of the Lehman Brothers collapse of 2008 and the ensuing financial crisis, the BCBS decided to update and strengthen the Accords. The BCBS considered poor governance and risk management, inappropriate incentive structures, and an overleveraged banking industry as reasons for the collapse. In November 2010, an agreement was reached regarding the overall design of the capital and liquidity reform package. This agreement is now known as Basel III Accord.

For this purpose, it introduced a stricter definition of regulatory capital (own funds), defined for the first-time harmonized liquidity requirements at international level, by means of two new metrics – one short-term (liquidity coverage ratio) and the other medium-term (net stable funding ratio) – and added to the list of prudential measures a prudential requirement complementary to the capital adequacy ratio based on risk-weighted assets, translated into a forecast of the leverage ratio. It also introduced capital buffer requirements, of both a structural and countercyclical nature to strengthen the resilience of institutions and promote the internalization of potential costs for the financial system.

2.2 The regulatory background in Portugal

The Portuguese banks are supervised by accounting rules, reporting requirements imposed by the Portuguese Central Bank (*Banco de Portugal*), the Portuguese Firms Code (*Código das Sociedades Comerciais*), and by the Portuguese Stock Exchange Committee (*Comissão de Mercado dos Valores Mobiliários* – in case banks have securities traded on a stock exchange regulated market – regarding risk-related corporate governance disclosures.

According to article 65° of the Portuguese Firms Code and article 245° of the Portuguese Stock Exchange Code, banks need to disclose in their management reports information about "company's financial risk management objectives and policies, including the hedging policies of each main categories of expected transactions for which hedging accounting is used and the company's exposure to price, credit, liquidity and cash flow risks, when materially relevant for the evaluation of assets and liabilities, financial position and earnings in relation to the use of financial instruments." They also must include information on the main elements of their internal control and risk management system implemented that help assuring the financial reporting.

Consistent with Regulation (EU) No 1606/2002 of the European Commission and instructions issued by the Portuguese Central Bank, from 2006 onwards, all banks are required to adopt the International Accounting Standards/International Financial Reporting Standards.

Portuguese banks have also to comply with Basel agreements requirements. These agreements must first be adopted by the European Union (through Regulations or Directives) and only then can be applied by financial institutions. The Basel II Accord was implemented in the European Union in 2006 and 2007 through Directives 2006/48/EC and 2006/49/EC. These Directives became mandatory in Portugal in 2007 onwards (Decree-Law 103/2007 and Decree-Law 104/2007). The Basel III Accord was implemented in the European Union by Regulation (EU) No 575/2013 and Directive 2013/36/UE of the European Parliament and of the Council of June 26 (known as the Capital Requirements Regulation – CRR – and Capital Requirements Directive – CRD IV, respectively). In Portugal, the CRD IV was transposed through the Decree-Law No 157/2014 of 23 October 2014 and became mandatory in 2014 onwards.

3. Literature review and hypotheses
3.1 Prior research on risk reporting by banks
Research studies of risk reporting practices by banks are limited and focused on the following matters:

(1) Risk reporting practices (Bischof, 2009; Frolov, 2007; Linsley *et al.*, 2006; Maffei *et al.*, 2014; Oliveira *et al.*, 2011a; Woods *et al.*, 2008; Savvides and Savvidou, 2012; Ismail *et al.*, 2013; Hassan, 2014).

(2) Motivations for risk reporting (Helbok and Wagner, 2006; Linsley *et al.*, 2006; Linsley and Kajüter, 2008; Oliveira *et al.*, 2011b, 2013; Barakat and Hussainey, 2013).

Oliveira *et al.* (2011a) present an extensive literature review on risk reporting practices by banks. Findings indicate a lack of transparency in periods prior to the adoption of IFRS 7 (Frolov, 2007; Linsley *et al.*, 2006; Woods *et al.*, 2008), and this has persisted since the first year of adoption of IFRS 7 (Bischof, 2009). Among Portuguese credit-granting institutions, Oliveira *et al.* (2011a) found that risk reporting deficiencies were due to comparability problems across the banking sector, inability to understand narratives, failure of narratives to explain numerical disclosures and suboptimal levels of mandatory risk reporting.

Despite Oliveira *et al.*'s (2011a) conclusion that the lack of transparency found among firms in the banking sector would persist after the adoption of the G20 recommendations, some studies on risk reporting of banks during and after the 2008/2009 financial crisis are focused on operational risk disclosures (Barakat and Hussainey, 2013) or on the comparison of narrative risk disclosures included in the notes to financial statement and public report required by Pillar 3 of Basel II Accord (Maffei *et al.*, 2014).

Research about motivations for risk reporting by finance firms continue to be under-researched. Agency theory has been used to explain the incentives for risk reporting. Theoretically, risk reporting is crucial in reducing information asymmetries between shareholders and managers. One way to foster risk reporting is through the implementation of monitoring systems intertwined with corporate governance characteristics (Oliveira *et al.*, 2011c). Helbok and Wagner (2006) used a framework based on agency theory, signaling theory and political cost theory to explain voluntary operational risk disclosures by banks. They found that outsiders may perceive the impact of an operational loss event to be higher for financial institutions which are lower capitalized and less profitable. Barakat and Hussainey (2013) used a framework based on agency theory, management entrenchment

theory and organization-society theories (legitimacy theory, resource dependency theory and stakeholder theory) to explain operational risk disclosures by banks. Findings indicate that banks with a higher proportion of outside board directors, lower executive ownership, concentrated outside non-governmental ownership, and more active audit committees, and with less stringent entry to banking requirements present higher levels of operational risk disclosures. Moreover, powerful and independent bank supervisors can serve as effective outside monitors and influential stakeholders to mitigate the incentives for entrenched bank executives to withhold voluntary operational risk disclosures.

The present study focuses on Portuguese commercial banks. The Portuguese banking industry reflects a highly concentrated ownership structure, with reduced agency conflicts (Gulamhussen and Guerreiro, 2009). Oliveira *et al.* (2011b, 2013) drawing on the institutional and organizational perspectives of legitimacy theory and resources-based perspective found that risk reporting by Portuguese banks were motivated by two reasons: first, to fulfill institutional pressures to assure the effectiveness of market discipline; and second, to manage stakeholders' perceptions of a corporation's reputation. However, these studies relate to periods prior to the adoption of Basel II accord. The present study extends this literature by examining if under the same theoretical framework (agency and legitimacy theories) the determinants of risk reporting of Portuguese commercial banks remain the same during the period of adoption of Basel II Accord. As far as we know, a study like this one has never been performed hitherto.

3.2 Development of hypotheses

3.2.1 Size. There is a great consensus among studies that consider the existence of a significant relationship between the size of the firm and the level of disclosure (Raffounier, 1995; Wallace *et al.*, 1994; Ahmed and Courtis, 1999; Cooke, 1989). Consistent with agency theory assumptions, larger firms are more complex, riskier and face greater conflicts of interest between the managers and investors. Studies show that the increase in disclosure reduces asymmetric information (Brüggen *et al.*, 2009; García-Meca *et al.*, 2005), and as the agency costs increase with the size of the firm, disclosure is a way to reduce conflicts and control costs (Chow and Wong-Boren, 1987). Therefore, information on risk exposures and risk management activities to mitigate them are crucial to reduce agency costs. Moreover, another stream of literature argues that larger firms are more publicly visible and more easily monitorized by their relevant stakeholders. Therefore, to manage stakeholders' perception about firm's reputation, publicly visible firms are pressured to legitimize themselves through a risk reporting channel and satisfy stakeholder's expectations.

H1. The level of risk disclosure is positively associated with bank's size.

3.2.2 Listing profile. Consistent with agency theory, listed firms are more complex than unlisted firms, mainly due to a wider range of investors and a greater need to implement monitoring systems capable of reducing the conflicts of interest (Cooke, 1989; Lopes and Rodrigues, 2007). These firms face greater levels of agency costs. On the other hand, listed firms are more publicly visible than unlisted firms. Consequently, they are subject to greater stakeholder's monitoring (Branco and Rodrigues, 2006; Oliveira *et al.*, 2006). Consequently, these firms report more risk information to reduce agency costs and manage their legitimacy needs. Thus, it is expected that these firms report more risk information to reduce agency costs and manage their legitimacy needs related to their stakeholder's expectations.

H2. The level of risk disclosure is positively associated with bank's listing profile.

3.2.3 Age. Literature contends that older firms hold a greater reputation nearby their relevant stakeholders. Theoretically, older firms have a greater and deep knowledge of their business

models (Fobrun and Van Riel, 1997). Additionally, they are more consolidated firms with robust risk management systems in place. This turns them more trustworthy to stakeholders (Oliveira *et al.*, 2011b). Thus, it is expected that older firms use risk reporting to manage this public reputation.

According to Owusu-Ansah (1998), there is a greater propensity on the part of older firms to disclose more information in order to maintain their high competitive level, proving that the seniority of the company has a statistically significant positive effect on mandatory disclosure in Zimbabwe. Al-Shammari *et al.* (2008) also concluded that seniority is a determining factor in explaining mandatory disclosure practices. However, the conclusions of Al-Akra *et al.* (2010), Mutawwa (2010) and Juhmani (2012) showed that seniority is not related to the disclosure index.

H3. The level of risk disclosure is associated with bank's age.

3.2.4 Level of confidence of depositors. According to Sabaté and Puente (2003, p. 281) there is a "close link between stakeholders' confidence and the level of deposits." The higher the confidence, the higher the level of deposits attracted to the bank (Sanchez-Ballesta and Bernal Llórens, 2010). The level of reputation should be supported by a high level of risk reporting transparency. It is expected that trustworthy banks use this channel (risk reporting) to build and manage depositors' trust on their risk management reputation. This would reduce potential bank runs that would jeopardize bank's liquidity risk (Sabaté and Puente, 2003; Oliveira *et al.*, 2011b). This gives rise to hypothesis 4.

H4. The level of risk disclosure is positively associated with the level of confidence of the depositors.

3.2.5 Risk management skills. Consistent with the functional perspective of Merton (1995), the central function of banks is risk management. Their businesses are designed around this functional concept to generate skills of bearing and managing risks on behalf of their stakeholders (Saunders *et al.*, 1990). These risk management skills are properly developed and implemented effectively (such as efficient risk management systems, risk management committees, risk manager officers, or even well trained and certified risk managers) impact positively on firms' long-term value creation (Ali and Luft, 2002). Excellence in risk management skills fosters the adoption of sound risk management systems. Effective risk management systems improve public corporate reputation about their abilities to manage risks, which will enhance the trustworthiness of banks (Oliveira *et al.*, 2011b) and enhances organizational performance (Rasid *et al.*, 2014) Thus, we contend that better risk management skills boosts the implementation of effective risk management structures that would help improving risk reporting transparency, bank's public reputation in dealing with risks, and minimize solvency risks in the long term (Nahar *et al.*, 2016).

However, we can also contend that banks with lower levels of risk management skills have incentives to disclose more risk information to better explain their risk management performance and outcomes. Banks with lower levels of risk management skills are more salient to relevant stakeholders and exposed to their scrutiny. Through an informational process they increase risk reporting to contextualize and better explain these outcomes, risk exposures, and mitigation strategies that demand greater detail, description and explanation. This substantive risk reporting increment will legitimate themselves before stakeholders (Aerts, 2005).

Another theoretical argument is grounded on institutional legitimacy assumptions (DiMaggio and Powell, 1983). Through processes of institutional isomorphism, to survive, achieve stability and organizational legitimacy, banks with lower levels of risk management skills can engage in mimetic behaviors. Acting this way they will imitate organizational structures, activities and routines from those banks with a higher reputation in risk

management skills. They will signal these structures, procedures, routines as legitimate. Even knowing that this behavior can be purely symbolic, rather than substantive. More specifically, decoupled from the substantive structures of risk management, which are consequently illegitimate (Abraham and Shrives, 2014).

H5. The level of risk disclosure is associated with bank's risk management skills.

3.2.6 Ownership structure. Jensen and Meckling (1976) demonstrated the relationship between agency theory and ownership concentration. Portuguese banks have highly concentrated equity structures (Gulamhussen and Guerreiro, 2009). Thus, they experience low agency costs related to conflicts between owners and managers, reducing their opportunistic behavior and risk reporting needs (Jensen and Meckling, 1976). However, in case of management entrenchment, moral hazard arises, information asymmetries increase, as well as risk reporting needs (Morck *et al.*, 1988; Oliveira *et al.*, 2011c). There is a lack of unanimity in the relationship between ownership structure and compliance with disclosure requirements (Hossain *et al.*, 1994; Haniffa and Cooke, 2002). McKinnon and Dalimunth (1993) consider that there is no level of voluntary disclosure that could be related to the ownership structure in several Australian firms. Consequently, any specific predicted signal is expected between risk reporting and ownership structure.

H6. The level of risk disclosure is associated with the bank's ownership concentration.

3.2.7 Profitability. Profits have been used to assess the public visibility of firm and found to be associated with disclosure (Branco and Rodrigues, 2008). Profitable firms are more public visible and in a better position to invest in robust risk management systems. This will boost risk reporting transparency, mainly to signal their public reputation in dealing with risk exposures (Linsley *et al.*, 2006). However, the implementation of sound risk management systems may have a negative impact on firm's profitability. It can increase direct compliance costs, such as implementing information systems, increasing management monitoring efforts, and organizational processes that are costly and with little benefit for the firm (Verrecchia, 1983, 1990). Thus, any specific predicted signal is expected between risk reporting and profitability.

Prior literature corroborates these theoretical assumptions. There is no consensus among studies regarding the association between profitability and disclosure. Setyadi *et al.* (2009) and Ballas and Tzovas (2010) concluded that there is a positive association between both items. However, Wallace *et al.* (1994), Tower *et al.* (1999), Al-Shammari *et al.* (2008), Mutawwa (2010), Al-Akra *et al.* (2010) and Juhmani (2012) did not find an association between profitability and the level of disclosure. Wallace and Naser (1995) concluded that there is a negative association between the two variables. Miihkinen (2012) provides evidence that profitability (measured by return on assets ratio) is negatively associated with the quality of risk reporting. Oliveira *et al.* (2011c) did not find any evidence of a relationship between risk reporting and profitability.

H7. The level of risk disclosure is associated with bank's profitability.

4. Research design
4.1 Sample definition
The Portuguese finance industry is composed by credit institutions and financial firms. Decree-Law 298/92 defines credit institutions as firms whose business is to receive deposits or other repayable funds from the public and to grant credits for its own accounts. Financial firms are not credit institutions. Banks are credit institutions that can be classified as commercial or investment banks. Commercial banks deal with checking, savings, and money

market accounts. They accept deposits and perform lending activities. Investment banks raise capital, trade securities, and manage mergers and acquisitions (Oliveira *et al.*, 2011a).

In Portugal, the population (per year) of commercial banks is composed by the Mutual Agricultural Credit Banks and the Other Commercial Banks (Table 1). The present study focuses on the Other Commercial Banks. Therefore, we removed all the Mutual Agricultural Credit Banks for the following two reasons: (1) first, these two groups of commercial banks present differences in their business models; and (2) we focus on the Other Commercial Banks because of their high public visibility and consumer orientation (Branco *et al.*, 2008). Thus, from a population of 123 commercial banks with annual reports published in the Portuguese Central Bank database [1] as on December 31, 2015, we drew a sample of 23 Other Commercial Banks that consistently have their annual reports in this database. We extracted the annual reports of these 23 Other Commercial banks from the years of the period of analysis: 2007, 2010 and 2013. Consequently, the final balanced sample comprises all the Portuguese Other Commercial Banks totaling 69 firm-year observations (Table 1).

Prior literature on risk reporting of Portuguese credit institutions focuses on risk reporting practices and their determinants, prior to the adoption of Basel II Accord (Oliveira *et al.*, 2011a, b, 2013). Rather than studying the impact of the adoption of the Basel II Accord on risk reporting, the present study focuses on the analysis of the determinants of risk reporting practices of Portuguese commercial banks during the period of adoption of the Basel II Accord in Portugal. Therefore, we focus on a specific period of analysis (2007, 2010, and 2013) for three main reasons. First, in Portugal, the Basel II Accord became mandatory in 2007 onwards (Decree-law No 103/2007 and Decree-law No 104/2007). The first year of adoption was 2007. Second, the last year of adoption of the Basel II Accord in Portugal was 2013. In 2014 onwards, the Basel III Accord became mandatory for the Portuguese credit institutions (Decree-law No. 157/2014). And finally, between 2007–2013, in Portugal and in the Euro area, we had two recessionary cycles: (a) 2008/2009 – associated with the global financial crisis; and (b) 2011/2012 – associated with the sovereign debt crisis in several European economies, such as Portugal, in which the International Monetary Fund had to intervene. Prior literature on risk reporting documents that investor's needs for risk reporting are more pronounced during periods of economic downturns (Miihkinen, 2013).

Table 2 indicates the evolution of the Gross Domestic Product (GDP) annual growth rate across 9 years. This data corroborates that the years 2008/2009 and 2011/2011 correspond to two recessionary periods in Portugal and in the Eurozone/World economies as well. To avoid any bias related to different economic incentives and motivations for risk reporting promoted by these periods of economic downturns we focus our analysis in those years not associated with recessionary cycles such as 2007, 2010 and 2013 (Table 2). Thus, the period of analysis chosen (2007, 2010 and 2013) is relevant to assess the risk disclosures of Portuguese

| | Number of banks | | | |
	2007	2010	2013	Total
Commercial banks				
Mutual agricultural credit banks	100	100	100	300
Other commercial banks	23	23	23	69
Total commercial banks	123	123	123	169
Mutual agricultural credit banks	−100	−100	−100	−300
Final sample	23	23	23	69

Note(s): Consistent with Decree-Law 298/92, Commercial Banks deal with checking, savings and money market, accept deposits, and perform lending accounts. They are divided into Mutual Agricultural Credit Banks, and Other Commercial Banks

Table 1.
Sample selection

Commercial banks and compare them with prior literature that had studied the risk reporting practices of Portuguese Commercial banks prior to the adoption of Base II Accord.

4.2 Dependent variable

The risk and risk management sections of both the management report and the notes were hand collected and subject to a content analysis process to develop a disclosure index. The content analysis was performed manually and contemplated several steps.

First, we developed an appropriate coding scheme that embraces the development a list of risk disclosure items and the selection of a specific coding unit. Based on Oliveira *et al.* (2013) we developed a list of risk disclosure items in accordance with the following regulation: International Accounting Standard (IAS) 1 (*Presentation of Financial Information–Statements*), IAS 30 (*Disclosures in the Financial Statements of Banks and Similar Financial Institutions*), IAS 32 (*Financial Instruments: Presentation*), International Financial Reporting Standards (IFRS) 7 (*Financial Instruments: Disclosures*) and the third pillar of Basel II. Following Oliveira *et al.* (2013) we used six risk categories: "risk management objectives and policies (RMOP)," "operational risk (OR)," "liquidity risk (LR)," "credit risk (CR)," "market risk (MR)" and "capital structure and capital adequacy (CSCA)" (Appendix 1). For each one of these six categories, we developed a list of 88 disclosure items (Appendix 2 Table A1). After codification, these disclosure items will be used to build the disclosure index.

Consistent with Beretta and Bozzolan (2004), Linsley *et al.* (2006) and Maffei *et al.* (2014), we selected a specific coding unit: a binary coding scheme. Although Milne and Adler (1999) argue that phrases are much more reliable than any other unit of analysis as a basis for coding, a binary coding system has been chosen to "gain an overall appreciation of the scale and standards of disclosure" (Woods *et al.*, 2008, p. 23). Using this coding unit, we assign "disclosure = 1" if the item is disclosed and "no-disclosure = 0" otherwise.

Second, we developed assessment procedures. Following Cooke (1992), before reading the documents subject to content analysis we established the following decision rule: the procedures used must not penalize non-disclosure in case a given item was not relevant to the company.

Finally, we performed the analysis and codification of the risk and risk management sections. All authors performed the content analysis of all the documents. To ensure the replicability and reliability of the coding instrument we computed an inter-coder reliability test. The Scott's pi test equals 91%, which is an acceptable level of inter-coder reliability (Lombard *et al.*, 2002).

Consistent with Cooke (1992), a risk disclosure index (RDI) was built for company j in year t:

$$\mathrm{RDI}_{jt} = \frac{\sum_{i=1}^{njt} x_{ijt}}{n_j}, 0 \leq \mathrm{RDI}_{jt} \leq 1$$

where *njt* is the number of relevant disclosure items for company j in year t ($njt \leq 88$) and $x_{ijt} = 1$ if the relevant disclosure item i is disclosed and 0 otherwise.

Countries	2006	2007	2008	2009	2010	2011	2012	2013	2014
Portugal	1.6	2.5	0.3	−3.1	1.7	−1.7	−4.1	−0.9	0.8
Euro area	3.2	3	0.4	−4.5	2.2	1.7	−0.9	−0.2	1.4
World	4.5	4.4	2	−1.3	4.5	3.3	2.7	2.9	3.1
Source(s): World Bank, World Development Indicators (https://databank.worldbank.org)									

Table 2.
Gross domestic product (GDP) annual growth rate (%)

A risk disclosure index was also calculated for each risk category considered:

$$\text{RDI}_{jkt} = \frac{\sum_{i=1}^{njkt} x_{ijkt}}{n_{jk}}, 0 \leq \text{RDI}_{jkt} \leq 1$$

where $njkt$ is the number of relevant disclosure items for company j in year t for each of the k risk categories involved (RMOP $\leq$ 9; OR $\leq$ 7; LR $\leq$ 17; CR $\leq$ 8; MR $\leq$ 25; CSCA $\leq$ 22) and $x_{ijkt} = 1$ if the relevant disclosure item i is disclosed and 0 if not.

4.3 Estimation model

This study aims to investigate the determinants of the risk information disclosed by Portuguese commercial banks. For this purpose, the following estimation OLS regression model was constructed:

$$\text{RDI}_{jt} = \alpha_0 + \beta_1 \text{Size}_{jt} + \beta_2 \text{Listing Profile}_{jt} + \beta_3 \text{Age}_{jt}$$
$$+ \beta_4 \text{Level of confidence of depositors}_{jt} + \beta_5 \text{Risk Managemen Skills}_{jt}$$
$$+ \beta_6 \text{Ownership Structure}_{jt} + \beta_7 \text{Profitability}_{jt} + \beta_8 \text{Profit Growth}_{jt}$$
$$+ \beta_9 \text{Auditing Firm}_{jt} + \beta_{10} \text{Business Risk}_{jt} + \beta_{11} Y2010_{jt} + \beta_{12} Y2013_{jt} \ldots + \mu_{jt}$$
$$(1)$$

where $t = \{2007, 2010, 2013\}$ and $j = 1, 2, \ldots, n$ (n = balanced sample).

All the independent and control variables were hand-collected and extracted from the annual reports of the commercial banks included in the sample. Table 3 lists the independent and control variables, their measurement and expected sign.

Size was measured by total assets (Branco and Rodrigues, 2008). This proxy will capture both the levels of agency costs and public visibility. Literature indicates that larger firms are more complex, riskier, and have higher agency costs (Oliveira *et al.*, 2006). However, another

Variables	Measurement	Expected signal	References
Size	Total assets in million euros	+	Branco and Rodrigues (2008)
Listing profile	Dummy = 1 if the bank is listed on a stock exchange regulated market and 0 otherwise	+	Oliveira *et al.* (2006)
Age	Number of years since inception	?	Hamid (2004)
Level of confidence of depositors	Total of deposits to total of assets	+	Sánchez-Ballesta and Bernal Lloréns (2010)
Risk management skills	TIER 1 ratio	+	Sensarma and Jayadev (2009)
Ownership concentration	Shareholdings higher than 2%	?	Deumes and Knechel (2008)
Profitability	Return on assets (ROA) = earnings before interest and taxes (EBIT) to total assets	?	Helbok and Wagner (2006), Miihkinen (2012)
Profit growth	$(\text{EBIT}_t - \text{EBIT}_{t-1})/\text{EBIT}_{t-1}$	?	Oliveira *et al.* (2013)
Business risk	5-year standard deviation of EBIT, in million euros	?	Elshandidy and Neri (2015), Linsley and Shrives (2006)
Auditing firm	Dummy = 1 if the auditing firm is a Big4 and 0 otherwise	?	Mokhatar and Mellet (2013)

Table 3.
Definition of the independent and control variables, measurement and expected sign

piece of literature argues that larger firms are more publicly visible and more easily scrutinized by their relevant stakeholders (Oliveira *et al.*, 2011b, 2013).

Listing profile was measured by a dummy variable that assumes "1" if the bank is listed in a stock exchange regulated market, and "0" otherwise (Oliveira *et al.*, 2006). This proxy will capture both the levels of agency costs and public visibility. Listed firms have higher agency costs than unlisted firms (Lopes and Rodrigues, 2007) associated with the implementation of monitoring systems (Cooke, 1989). But, listed firms are also more exposed to their relevant stakeholders monitoring because there are more publicly visible (Branco and Rodrigues, 2006; Oliveira *et al.*, 2006, 2011a, 2013).

Age was measured by the number of years since inception (Hamid, 2004). This proxy will capture company's reputation associated with increased knowledge of their business models (Fobrun and Van Riel, 1997) and robust risk management systems (Oliveira *et al.*, 2011b).

Level of confidence of depositors was measured by the ratio total deposits to total assets (Sánchez-Ballesta and Bernal Llórens, 2010; Oliveira *et al.*, 2011b). This proxy will capture the level of trust between depositors (the primary stakeholders) and commercial banks. Trustworthy banks tend to have a wider range of depositors.

Risk management skills was measured by Tier 1 ratio (Sensarma and Jayadev, 2009). Tier 1 ratio is one of the capital adequacy ratios required by the Basel II Accord. The capital adequacy ratio is a measure of how much capital a bank holds on reserve to handle a certain amount of losses, before being at risk for becoming insolvent. The higher a bank's capital adequacy ratio, the more likely it can withstand a financial downturn or other unforeseen losses. Best risk management skills foster the implementation of effective risk management systems that would help achieve better capital adequacy ratios, such as the TIER 1 ratio (Sensarma and Jayadev, 2009; Oliveira *et al.*, 2011b).

Ownership structure was measured by the percentage of shareholdings greater than 2% (Deumes and Knechel, 2008).

Profitability was measured by return on assets (ROA) ratio, calculated as earnings before interest and taxes (EBIT) to total assets (Helbock and Wagner, 2006; Miihkinen, 2012; Oliveira *et al.*, 2011b). This proxy will capture both the levels of public visibility and the likelihood of investing in sound risk management systems capable of providing transparent risk reporting.

Consistent with previous literature we considered the following control variables: profit growth (Oliveira *et al.*, 2013; Sensarma and Jayadev, 2009), auditing firm (Mokhatar and Mellet, 2013; Oliveira *et al.*, 2011c) and business risk (Linsley and Shrives, 2006; Miihkinen, 2012; Elshandidy and Neri, 2015; Oliveira *et al.*, 2018). *Profit growth* was measured by the profit growth rate: $(EBIT_t - EBIT_{t-1})/EBIT_{t-1}$ (Oliveira *et al.*, 2013). Profit growth rate will capture potential incentives managers may have to behave opportunistically towards short-term value creation to maximize their own utility. This behavior is associated with misleading reporting to deters investors' attention, with severe consequences in terms of firms' long-term value destroying (Benson and Davidson, 2010).

Auditing firm was measured by a dummy variable that assumes "1" if the auditing firm is a Big4 and "0" otherwise. This dummy variable will capture the high-quality auditing firms (Oliveira *et al.*, 2011c) with international affiliations (Mokhatar and Mellet, 2013). To safeguard their public reputation of high-quality auditing firms, it is expected that firms audited by them would report more risk information. Prior literature also concludes that banks tend to exert greater efforts towards high-quality auditing processes because they reduce bank-specific risk and systemic risk exposures (Li *et al.*, 2018).

High-risk firms disclose more risk information to explain better the risk exposures and the risk management efforts to mitigate them (Elshandidy and Neri, 2015). However, another theoretical argument states that high-risk firms may be reluctant to properly inform on their risk exposure, mainly to manage their own reputation in the short-term, because of the public

visibility this high-risk profile brings. Moreover, low-risk firms may have incentives to disclose more information to signal the soundness of their risk management systems and therefore legitimize themselves to their relevant stakeholders (Linsley and Shrives, 2006). Business risk is the risk associated with firm's assets and the nature of the products it produces and sells. It represents earnings volatility. Therefore, business risk was measured by the 5-year standard deviation of EBIT (Graham *et al.*, 2015).

5. Results
5.1 Descriptive analysis
Table 4 shows the percentage of banks that meet a specific disclosure criterion.

5.1.1 Panel A – risk management objectives and policies. We identified risk management objectives and policies in almost every item in the table, having thus a high percentage value. However, this value tends to decrease in those associated with accounting (accounting policies; notes on the financing of financial assets; and existence of cross-references). The existence of cross-references has a quite low value. It should also be noted that almost every item showed an increase over the three periods analyzed, apart from the existence of cross-references, which still shows a percentage fall, despite the low value.

5.1.2 Panel B – operational risk. A considerable growth was observed in all the disclosure items analyzed. However, both the risk exposure item and the items related to Basel II were below thirty per cent, showing that banks give little importance to the existing guidelines. These results are in line with those presented by Oliveira *et al.* (2011a). According to the author, the voluntary disclosure of information was observed in 2006, but in the years 2010 and 2013 it became mandatory, although information was disclosed in the form of a narrative, which tends to be imprecise, perhaps because the institutions are still afraid of causing damage to their reputation.

5.1.3 Panel C – liquidity risk. Regarding liquidity risk, there has been an improvement in its definition and description. However, data relating to the clarification of the maturity concept have been decreasing. Regarding the maturity concept applied to other isolated groups, the percentages are between 8 and 13%. Perhaps for this reason the figures for financing policies are still not very significant, although there is greater concern with their disclosure. However, the key performance indicator for the last year, 2013, shows only a value of 17%.

5.1.4 Panel D – Credit risk. Regarding credit risk, we can point out that almost every item showed a sign of growth, although this growth was moderate. In terms of credit risk, the disclosure of mandatory risk information (which includes information on the size of credit risk exposure, description of credit risk and control structure and management policies, as well as the size of impaired and devalued assets) was provided by most institutions in the years analyzed, thus contributing to ensure the comparability of the information provided and confirming the research conducted by Oliveira *et al.* (2011a) and PriceWaterhouseCoopers (2008).

5.1.5 Panel E–market risk. Regarding the definitions and descriptions of market risk, the values presented are satisfactory; however, if we look at the results with more detail, the values have a sharp fall, when compared to definitions or descriptions, and some show zero percentage (0%). Oliveira *et al.* (2011a) had already observed that only some institutions use financial measures, such as VAR, stress tests, backtests and sensitivity analysis. However, this type of measure has been more widely used over the years, except for the sensitivity analysis, which, in our study, shows a percentage decrease in disclosure. As Oliveira *et al.* (2011a) found out, stress tests and backtests are essential to assess the reliability of VAR monetary values and help define the risk profile more precisely.

5.1.6 Panel F–capital structure and adequacy. In terms of capital structure and capital adequacy, the values presented are low when compared with other items. However, most of the items have improved, mainly the disclosure of the Tier I ratio, which is the only one

		2007	2010	2013
Panel A: Risk management objectives and policies				
1	Identified risk key	83%	87%	87%
2	Generic risks identified	88%	92%	92%
3	Other definitions	71%	75%	75%
	Understanding risk disclosure			
4	–Definition of nuclear risks	83%	88%	83%
5	–Description of global control structures	79%	83%	83%
6	–Measures used to monitor different risk management categories	75%	79%	79%
7	Accounting policies	46%	46%	50%
	Risk section in the management report			
8	–Notes on the financing of financial assets	50%	54%	54%
9	–Existence of cross-references	25%	21%	17%
Panel B: Operational risk				
10	Definition of operational risk	46%	71%	67%
11	Description of operational risk and control structure	46%	71%	75%
12	Description of operational risk and management policies	46%	71%	75%
13	Operational risk exposure	21%	29%	29%
	Clarification of financial assets on the adaptation of risk information systems to comply with the Basel II agreement			
14	–Adaptation of information technology in accordance with the Basel II Accord	17%	29%	29%
15	–Adaptation completed	8%	13%	13%
16	–Collection of incidents to measure capital requirement	13%	17%	21%
Panel C: Liquidity risk				
17	Definition of liquidity risk	71%	75%	75%
18	Description of liquidity risk and control structure	79%	88%	88%
19	Description of liquidity risk and risk management policies	83%	88%	88%
	Liquidity risk exposure			
	Analysis of lack of liquidity through tables			
	State of clarification of the concept of maturity			
20	–Remaining period to redemption date	63%	54%	50%
21	–Residual duration	71%	58%	50%
22	–Maturity	71%	58%	50%
23	–Liquidity failure	50%	46%	42%
24	–Approximate maturity time	42%	42%	42%
25	–Other isolated maturity groups	17%	13%	17%
	Clarified concepts of maturity of the financial assets defined for other isolated maturity groups			
26	–Remaining period until the reimbursement date	13%	8%	13%
27	–Residual duration	13%	8%	13%
28	–Maturity	13%	8%	13%
29	–Lack of liquidity	8%	8%	8%
30	Approximate maturity time for other isolated groups	8%	8%	8%
31	Clear alignment between the liquidity gap table and funding policies	25%	33%	38%
32	Clear discussion of funding policies	38%	50%	54%
33	Key performance indicator	8%	17%	17%
Panel D: Credit risk				
34	Definition of credit risk	83%	79%	75%
35	Description of credit risk and control structure	88%	92%	92%
36	Description of credit risk and management policies	92%	96%	96%
37	Size of exposure to credit risk	75%	88%	88%
38	Size of depreciated or impaired assets	38%	54%	46%

Table 4.
Percentage of banks
that disclose risk
information

		2007	2010	2013
	Collateral size (other improvements made)			
39	–Single current quantity	25%	33%	38%
40	–Discussion of values	33%	33%	38%
41	Credit risk quality	54%	54%	54%
Panel E: Market risk				
	Definition of market risk			
42	–Market risk	79%	79%	79%
43	–Interest rate risk	58%	63%	58%
44	–Currency risk	38%	42%	46%
45	Description of market risk and control structure	71%	71%	75%
46	Description of market risk and risk management policies	71%	71%	75%
	Exposure to market risk			
	–Exposure to foreign exchange risk			
47	–Net balance sheet positions by currency	50%	54%	50%
48	–Short- and long-term positions by currency	38%	42%	38%
	–Exposure to interest rate risk			
49	–Narrative information of interest rate risk exposure	71%	71%	63%
50	–Presentation of a gap revaluation table	33%	38%	38%
	–Analysis of risk value			
51	–Description of VaR assumptions and parameters	50%	50%	54%
52	–VaR values	42%	46%	42%
	Stress tests			
53	–Generic description	38%	54%	50%
54	–Details of the models used	13%	21%	21%
55	–Results (only values)	13%	25%	13%
56	–Results (by risk factor)	0%	8%	4%
	Backtest			
57	–Generic description	29%	25%	21%
58	–Details of the models used	8%	13%	13%
59	–Results (only values)	0%	4%	4%
60	–Results (with discussion of graphs)	0%	4%	4%
61	–Results (without discussion of graphs)	0%	0%	0%
	Sensitive analysis			
62	–Description of the assumptions and parameters of sensitive analysis	17%	8%	8%
	–Results of sensitive analysis			
63	–Only values	8%	8%	13%
64	–Values by country and maturity	4%	0%	4%
65	–Values for net worth, profit and loss	4%	0%	4%
66	–Values by market risk categories	0%	4%	4%
Panel F: Capital structure and adequacy				
	Capital structure			
67	–Accounting structure	67%	54%	54%
68	–Quantity of Tier 1	25%	17%	38%
69	–Quantity of Tier 2	21%	13%	25%
70	–Quantity of Tier 3	0%	0%	0%
71	–Total eligible capital	42%	42%	42%
	Capital adequacy			
72	–Discussion of the capital adequacy approach	17%	25%	29%
73	–Capital requirements for credit risk	4%	4%	8%
74	–Capital requirements for market risk	4%	4%	4%
75	–Capital requirements for operational risk	0%	4%	4%
	–Total capital ratio			
76	–Capital ratio only	29%	33%	38%

(*continued*)

Table 4.

		2007	2010	2013
77	–Evolution per year	21%	25%	33%
78	–Impact of IAS/IFRS	13%	13%	21%
79	–Tier 1 capital ratio	29%	46%	58%
80	–Tier 2 capital ratio	13%	21%	25%
81	–Total capital ratio according to Basel II requirements	4%	8%	8%
82	Clarification of compliance with all prudential requirements	0%	0%	0%
83	Clarification of non-compliance with all prudential requirements	0%	0%	0%
	Adaptation to comply with Basel II requirements			
84	–Single declaration	17%	33%	38%
85	–Description of all measures taken	8%	13%	8%
	Approaches to be adopted for capital adequacy under Basel II			
86	–Credit risk	13%	17%	21%
87	–Market risk	4%	13%	13%
88	–Operational risk	8%	13%	25%

Note(s): The data at the right indicate the percentage of bank that disclosed a specific risk information item in that year

The number at the left correspond to the number of the disclosure item (from a total of 88 disclosure items)

Table 4.

presented in 2013, with values above 50% (58%), in addition to the accounting structure (54%), contrary to the study conducted by Oliveira *et al.* (2011a), which states that financial institutions disclose information to legitimize their position with customers. In our study, we found out that disclosure of capital structure and capital adequacy is poorly used, which may be explained by the fact that the years under analysis are years of economic and financial crisis and, as such, it is counterproductive to disclose certain values as they do not favor the image of the institution.

Table 5 shows the results of the descriptive statistical analysis, both for the dependent variables and the independent variables used in this study.

The "*risk disclosure index*" variable, the target variable of this study, obtained an average percentage of 38.4%, as can be seen in Table 5, and shows therefore a level of compliance of less than 50%, so the disclosure level of compliance is considered low. The disclosure index ranges from a maximum of 60.2% to a minimum of 1.1%. However, the trend of the data falls very close to the average since the standard deviation is 12.8%.

Regarding "*risk management and policy objectives*," there is a good average level of disclosure of 70.9. However, the oscillation varies between a maximum of 100% and a minimum of 0%, with some institutions not disclosing any of the objectives analyzed in their report, and others disclosing all items.

Regarding the variables "*operational risk*" (40%), "*liquidity risk*" (40.8%) and "*market risk*" (32.2%), there is a lower average for disclosure. "*Credit risk*" shows an average of 67%. In terms of oscillation, it is between a maximum of 100% and a minimum of 0% except for "*market risk*", which has a maximum of 60%.

The "*capital structure and capital adequacy*" is the variable that presents one of the lowest average rates of disclosure (19.4%), and the oscillation is presented with a maximum of 59.1% and a minimum of 0%.

The "age" variable indicates that, on average, banks have 36 years of existence, including reports from institutions with a maximum of 173 years of existence.

The "level of confidence of depositors" shows an average ratio of 0.365, with a minimum value of 0 and a maximum value of 2.822, showing thus that some institutions do not have any deposits, while for other deposits are more than double their assets.

	Measurement	N	Minimum	Percentile 25	Maximum	Percentile 75	Mean	Std. Deviation
Risk disclosure index	Index	69	0.011	0.296	0.602	0.483	0.384	0.128
Risk management objectives and policies	Index	69	0.000	0.611	1.000	0.889	0.709	0.209
Operational risk	Index	69	0.000	0.000	1.000	0.571	0.400	0.324
Liquidity risk	Index	69	0.000	0.235	1.000	0.588	0.408	0.230
Credit risk	Index	69	0.000	0.500	1.000	0.875	0.670	0.239
Market risk	Index	69	0.000	0.200	0.600	0.400	0.322	0.155
Capital structure and capital adequacy	Index	69	0.000	0.046	0.591	0.296	0.194	0.158
Size	Meuros	69	2.266	41.438	116551.000	1826.535	5930.520	21189.632
Age	Number	69	0.000	12.500	173.000	26.000	36.449	47.292
Level of confidence of depositors	Ratio	69	0.000	0.052	2.822	0.493	0.365	0.402
Risk management skills	Ratio	69	0.001	0.090	0.842	0.170	0.158	0.129
Ownership structure	Percentage	69	0.000	0.799	1.000	1.000	0.837	0.307
Profitability	Ratio	69	−0.057	0.001	0.076	0.013	0.006	0.019
Profit growth	Ratio	69	−9.103	−0.527	68.595	0.526	0.837	8.438
Business risk	Meuros	69	0.363	3.533	497.408	57.499	56.755	104.743

	Measurement		N	Percentage
Auditing firm	Dummy	= 1	68	98.60%
		= 0	1	1.40%
Listing profile	Dummy	= 1	15	78.3%
		= 0	54	21.7%

Note(s): Definition of variables: Risk Management Objectives and Policies (risk identification and definitions, risk management policies, and whether there was a comprehensive risk report); Operational Risk (the risk of loss resulting from inadequate internal processes, people and systems, from external events, or from the adaptation of information systems to the Basel II requirements); Liquidity risk (the risk that a firm will be unable to efficiently meet expected and unexpected current and future cash flow and collateral needs without affecting its daily operations or financial condition. Indicated by the amount of liquidity risk exposure and discussion of funding policies); Credit Risk (the potential that a bank borrower or counterparty will fail to meet its obligations in accordance with agreed terms. Indicated by the amount of credit risk exposure, past due and impaired assets, collateral held, and credit risk quality); Market Risk (the risk of losses in on-balance sheet and off-balance sheet positions arising from movements in market prices. Indicated by the amount of market risk exposure and internal/external risk measurement models. Risks subject to this requirement pertain to interest rate-related instruments and equities in the trading book; foreign exchange risk and commodities risk throughout the bank); Capital Adequacy (the measure of a bank's financial strength and stability. Indicated by capital structure and amounts of Tier 1, 2 and 3; capital adequacy for different types of risk exposure and capital ratios; and capital adequacy approaches adopted under Basel II); Size (total assets in million euros); Age (number of years since inception); Level of confidence of depositors (total of deposits to total assets); Risk management skills (TIER 1 ratio); Ownership concentration (shareholdings higher than 2%); Profitability (EBIT to total assets); Profit growth ((EBIT$_t$−EBIT$_{t-1}$)/EBIT$_{t-1}$); Business risk (5-year standard deviation of EBIT in million euros); Auditing firm (dummy = 1 if auditing firm is a Big4; 0 otherwise); Listing profile (dummy = 1 if company is listed on a regulated exchange market; 0 otherwise)

Regarding "risk management skills," the Tier 1 ratio (minimum level of capital that institutions must have as a function of the capital requirements arising from the risks associated with their activity) shows an average of 15.8%, an acceptable value in view of the requirements of the Bank of Portugal. However, the oscillation observed, with a standard deviation of 12.9%, a maximum of 84.2% and a minimum of 0.01%, shows that there are institutions with a value lower than desirable.

The "ownership structure" is expressive in its average value of 83.7%, and there are institutions whose total capital is distributed to investors with a value higher than 2%, whereas others do not have any concentration of capital.

Banks present on average a "profitability" of 0.60%, varying between a minimum of −5.7% and a maximum of 7.6%. Thus, the low levels found reflect the impact of the recessionary cycles occurred during the period of analysis.

"Profit growth" presents a mean value of 83.7% and "business risks" are relatively high (mean value = 56.755 Meuros).

Around 15% of the firm-year observations correspond to commercial banks listed in regulated stock exchange regulated markets (5 commercial banks per year). Almost all firms are audited by BIG 4 auditing firms.

5.2 Bivariate analysis

Table 6 shows the results of the Kruskal–Wallis test and was designed to determine the differences in the risk disclosure index over the three years under analysis. The results indicate that the disclosure levels for each of the six risk categories do not show any statistically significant differences.

Table 7 presents the matrix of correlations between the dependent variable and the independent/control variables. The results in Table 7 indicate that the dependent variable "*risk disclosure index*" shows a statistically significant positive correlation with the "listing profile" (p-value < 0.01) and with the "level of confidence of depositors" (p-value < 0.05). In turn, it shows a statistically significant negative correlation with "*ownership concentration*" (p-value < 0.05). These results are consistent with the hypotheses developed. However, there is no correlation between "*risk disclosure index*" and the following independent variables: "size," "age," "risk management skills," "profitability," "profit growth," "business risk" and "auditing firm." The existence of weak correlations between the predictors indicates low levels of multicollinearity.

5.3 Multivariate analysis

Table 8 presents the results of the regression models. The OLS regression model includes year dummies (2010 and 2013) to control for potential year effects. The violation of the normality of the distribution, suggested by the Kolmogorov–Smirnov (K-S) and Shapiro–Wilk tests, for the dependent, independent, and control variables, may have relevant consequences on the inferences on these same variables, when using the regression model, which required a prior normalization of all variables, using Blom's transformation, as suggested by Cooke (1998).

The assumptions of the model were verified for outliers, autocorrelation, multicollinearity, heteroskedasticity and normal distribution of waste. To test for the existence of multicollinearity we calculated the Value Inflated Factors (VIF). Results indicate that the problem of multicollinearity is minimal (VIF < 10). Standard errors are heteroskedasticity-adjusted and clustered at the firm level. The Kolmogorov–Smirnov test (with Lillefors correction) was used to test the normality of the residuals, and the results showed that they follow a normal distribution (p-value > 0.05). Durbin–Watson statistics was used to test autocorrelation levels.

	N	2007	Mean 2010	2013	Kruskal–Wallis test	Asymp. Sig. 2-Tailed
Risk disclosure index	23	0.358	0.392	0.401	1.198	0.549
Risk management objectives and policies	23	0.691	0.720	0.715	0.066	0.967
Operational risk	23	0.292	0.447	0.460	4.038	0.133
Liquidity risk	23	0.412	0.407	0.407	0.056	0.972
Credit risk	23	0.636	0.690	0.685	0.495	0.781
Market risk	23	0.306	0.334	0.325	0.359	0.836
Capital adequacy	23	0.160	0.188	0.233	2.186	0.335

Note(s): Differences are statistically significant at: ***0.01 (2-tailed); **0.05 (2-tailed); *0.1 (2-tailed)
Definitions: Risk Management Objectives and Policies (risk identification and definitions, risk management policies, and whether there was a comprehensive risk report); Operational Risk (the risk of loss resulting from inadequate internal processes, people and systems, from external events, or from the adaptation of information systems to the Basel II requirements); Liquidity risk (the risk that a firm will be unable to efficiently meet expected and unexpected current and future cash flow and collateral needs without affecting its daily operations or financial condition. Indicated by the amount of liquidity risk exposure and discussion of funding policies); Credit Risk (the potential that a bank borrower or counterpart will fail to meet its obligations in accordance with agreed terms. Indicated by the amount of credit risk exposure, past due and impaired assets, collateral held, and credit risk quality); Market Risk (the risk of losses in on-balance sheet and off-balance sheet positions arising from movements in market prices. Indicated by the amount of market risk exposure and internal/external risk measurement models. Risks subject to this requirement pertain to interest rate-related instruments and equities in the trading book; foreign exchange risk and commodities risk throughout the bank); Capital Adequacy (the measure of a bank's financial strength and stability. Indicated by capital structure and amounts of Tier 1, 2 and 3; capital adequacy for different types of risk exposure and capital ratios; and capital adequacy approaches adopted under Basel II)

Table 6.
Mean differences in
risk disclosures
across years

Table 8 shows that model 1 is valid in global terms. The regression model is statistically significant ($F = 4.425$; p-value < 0.01). An adjusted-R^2 of 0.399 was obtained, showing that the explanatory power of the independent/control variables in the variation of the dependent variable is 39.9%.

The results in Table 8 (model 1) show that risk reporting is positively associated with "size" (p-value < 0.01), "listing profile" (p-value < 0.01) and "level of confidence of depositors" (p-value < 0.01), supporting hypotheses H1, H2 and H4.

Thus, listed financial institutions which are larger in size and have a higher level of depositor confidence disclose more risk information.

Our study corroborates the studies that consider a relationship between the "size" of the firm and the level of disclosure (Raffounier, 1995; Wallace *et al.*, 1994; Ahmed and Courtis, 1999; Cooke, 1989; García-Meca *et al.*, 2005). This relationship can be explained by the fact that disclosure serves as an instrument to reduce information asymmetries (Brüggen *et al.*, 2009; García-Meca *et al.*, 2005), as well to reduce conflicts and control agency costs (Chow and Wong-Boren, 1987). It also corroborates prior findings of Oliveira *et al.* (2011b, 2013). Larger firms are more publicly visible and therefore are more pressured to comply with disclosure requirements. Acting this way, they satisfy stakeholders' expectations.

The result obtained for the "*listing profile*" is consistent with the studies developed by Branco and Rodrigues (2006) and Oliveira *et al.* (2006). These firms disclose more risk information to reduce agency costs and manage their legitimacy needs related to greater stakeholders' scrutiny.

The result obtained for the "level of confidence of depositors" shows that there may be a close relationship between stakeholders' confidence and the level of deposits (Sabaté and Puente, 2003, p. 281). The greater the confidence, the higher the level of deposits attracted to

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Risk disclosure index	1.000										
(2) Listing profile	0.411**	1.000									
(3) Size	−0.051	−0.392**	1.000								
(4) Age	0.019	0.186	−0.114	1.000							
(5) Level of confidence of depositors	0.243*	0.322**	−0.095	0.312**	1.000						
(6) Risk management skills	0.140	0.094	0.071	−0.288*	0.043	1.000					
(7) Ownership structure	−0.302*	−0.137	0.149	0.043	−0.173	−0.166	1.000				
(8) Profitability	0.084	0.163	0.038	−0.123	0.142	0.177	−0.034	1.000			
(9) Profit growth	0.042	0.006	−0.104	−0.246*	−0.008	0.150	−0.076	0.423**	1.000		
(10) Business risk	0.181	0.066	0.016	0.656**	0.260*	−0.263*	−0.013	−0.153	−0.180	1.000	
(11) Auditing firm	0.075	−0.003	0.227*	0.076	−0.034	−0.071	−0.105	0.011	0.051	0.144	1.000

Note(s): All continuous variables were previously normalized using the Blom's transformation, as suggested by Cooke (1998)
Correlation statistically significant at a **0.01(2-ailed), *0.05(2-tailed) level
Definition of variables: Size (total assets); Age (number of years since inception); Level of confidence of depositors (total of deposits to total assets); Risk management skills (TIER 1 ratio); Ownership concentration (shareholdings higher than 2%); Profitability (EBIT to total assets); Profit growth ((EBIT$_t$ − EBIT$_{t-1}$)/EBIT$_{t-1}$); Business risk (5-year standard deviation of EBIT); Auditing firm (dummy = 1 if auditing firm is a Big4; 0 otherwise); Listing profile (dummy = 1 if company is listed on a regulated exchange market; 0 otherwise)

Table 7.
Pearson correlation matrix

| Variables | ES | Risk disclosure | |
		Model 1 Coefficients	Model 2 Coefficients
Intercept		−0.149 (−1.156)	−0.866 (−0.479)***
Size	(+)	0.284††† (3.459)	0.377††† (4.281)
Listing profile	(+)	1.421††† (6.502)	0.170††† (7.429)
Age	(?)	−0.260** (−2.122)	−0.270** (−2.080)
Level of confidence of depositors	(+)	0.186††† (2.456)	0.326†† (2.383)
Risk management skills	(?)	−0.220** (−2.434)	−0.459*** (−3.251)
Ownership structure	(?)	−0.279** (−2.601)	−0.430*** (4.208)
Profitability	(?)	−0.125 (−1.500)	−0.111 (1.054)
Profit growth	(?)	0.192** (2.535)	0.166* (1.847)
Auditing firm	(?)	−1.074*** (−3.456)	−0.411* (−1.930)
Business risk	(?)	0.157 (1.656)	0.089 (0.635)
Year fixed-effects		Yes	Yes
Firm fixed-effects		–	Yes
Model fit			
R^2 adjusted		0.399	0.669
F Statistic		4.425***	3.526***
Durbin–Watson		1.656	1.827
Normality of residuals			
- χ^2 statistic		0.435	2.266

Note(s): All continuous variables were previously normalized using the Blom's transformation, as suggested by Cooke (1998)
This table provides the unstandardized coefficients estimates of OLS regression (Model 1) and the unstandardized coefficients estimates of panel data regression fixed effects (Model 2). ES indicates the expected sign. Standard errors are heteroskedasticity-adjusted and clustered at the firm level and t-values are given in parentheses
Significance at: †††0.01(1-tailed), ††0.05(1-tailed), †0.1(1-tailed); ***0.01(2-tailed), **0.05(2-tailed), *0.1(2-tailed)
Definition of variables: Size (total assets); Age (number of years since inception); Level of confidence of depositors (total of deposits to total assets); Risk management skills (TIER 1 ratio); Ownership concentration (shareholdings higher than 2%); Profitability (EBIT to total assets); Profit growth ((EBIT$_t$−EBIT$_{t−1}$)/EBIT$_{t−1}$); Business risk (5-year standard deviation of EBIT); Auditing firm (dummy = 1 if auditing firm is a Big4; 0 otherwise); Listing profile (dummy = 1 if company is listed on a regulated stock exchange market; 0 otherwise)

Table 8.
Results of the
regression model

the bank (Sánchez-Ballesta and Bernal Llórens, 2010). Banks use risk reporting with the aim of satisfying the information needs required by the relevant stakeholders, thus ensuring a continuous flow of resources vital to the bank's liquidity through deposits.

Findings in Table 8 (Model 1) also show that risk reporting is negatively associated with "age", "risk management skills", and "ownership structure" (*p*-value < 0.05), suggesting that hypotheses H3, H5, and H6 are supported. Younger financial institutions, with more diffuse ownership structures, and lower levels of risk management skills disclose more risk information.

Findings on "age" are not in line with the results presented by Owusu-Ansah (1998), which indicate that older firms tend to disclose more information to maintain their highly competitive level, having proved that the seniority of the company has a statistically significant positive effect on mandatory disclosure in Zimbabwe. Al-Shammari *et al.* (2008) also concluded that seniority is a determining factor in explaining mandatory disclosure practices. This may be due to the specificity of the institutions addressed, namely financial institutions.

Banks with lower risk management skills disclose more risk information. This result is not consistent with Oliveira *et al.* (2011b) that found the opposite. It seems that banks with low

levels of capital adequacy ratios use risk reporting either as an informational process (Aerts, 2005) or as a mimetic isomorphic strategy (DiMaggio and Powell, 1983) to manage their organizational legitimacy before relevant stakeholders.

Unlike several studies (Hossain *et al.*, 1994; Haniffa and Cooke, 2002; McKinnon and Dalimunth, 1993), a negative relationship was found between "ownership structure" and risk reporting. According to Jensen and Meckling (1976), firms with more diffused ownership structures, have higher agency costs and information asymmetries. One way to reduce these asymmetries and agency costs is by disclosing more risk information.

Table 8 (Model 1) shows that risk reporting is not associated with "profitability" (*p*-value > 0.1). Therefore, hypothesis H7 is not supported. It seems that the levels of profits do not influence stakeholders to pressure commercial banks to disclose more risk information. This finding is consistent with prior literature (Tower *et al.*, 1999; Wallace *et al.*, 1994; Linsley *et al.*, 2006; Oliveira *et al.*, 2006, 2011b; Al-Shammari *et al.*, 2008; Al-Akra *et al.*, 2010; Mutawwa, 2010; Juhmani, 2012).

The coefficient of "business risk" is not significant. This suggests that risk reporting of commercial banks does not relate to increases or decreases in business risk. But risk reporting is associated with increases in "profit growth." It seems that risk reporting is crucial to reduce agency costs in those banks with a higher potential for manager's opportunistic behaviors to maximize value in the short-term. Additionally, the fact of being audited by a Big4 auditing firm does not increase risk reporting, which is consistent with Oliveira *et al.* (2018).

5.4 Endogeneity effects
In panel data, fixed effects are frequently used to limit selection bias (Mummolo and Peterson, 2018). Omitted variables are one of these endogeneity problems that may lead to an incorrect attribution of motivations for risk reporting. Fixed effects regression models eliminate time invariant confounding related to biased omitted variables caused by unobserved heterogeneity at both company and temporal effects (Brown *et al.*, 2011; Elshandidy and Shrives, 2016). To analyze if our previous findings (Table 8, Model 1) were subject to an endogeneity problem arising from omitted variables we ran fixed-effects panel regression (Table 8, Model 2). Findings remain unchanged. They are not driven by endogeneity effects. Results corroborate that banks' motivations for risk reporting can be explained through the lenses of agency and legitimacy theory. Banks with ownership structures more diffused disclose more risk information to reduce information asymmetries and agency costs. However, they also use risk information to manage organizational legitimacy strategically. They use risk reporting to manage their relevant stakeholders (such as depositors) expectations about their reputation. This legitimation process is used to maintain and create trust and confidence between the bank and their relevant stakeholders. More publicly visible firms (those that are larger or listed on a regulated stock exchange market) disclose more risk information because they are more closely scrutinized by their relevant stakeholders that exert pressure towards more risk reporting transparency. Younger banks with lower risk management skills disclose more risk reporting either as an informational process or as a legitimacy tool. Older banks disclose less risk information. It seems that they benefit of a certain *status* of legitimacy anchored on their good corporate reputation.

6. Conclusion
This study has sought to analyze possible determinants of risk disclosure, in accordance with IAS 1 (Presentation of financial statements), IAS 30 (Disclosures in the financial statements of banks and similar financial institutions), IAS 32 (Financial instruments: presentation), IFRS 7 (Financial instruments: disclosures) and the third pillar of Basel II, for commercial banks operating in Portugal during the period of adoption of the Basel II Accord.

Findings show an increase in disclosure in 2007, 2010 and 2013. However, none of the indicators was statistically significant, so there is no evidence that there was a significant increase in the levels of disclosure over this period. On average, commercial banks are not concerned with complying with the recommendations of the Portuguese Central Bank and this may explain the absence of evidence to identify disclosure evolution. Such results could be explained by the strong regulation of the sector, which requires the direct disclosure of risk information to the supervisor, leaving the disclosure of relevant information to other stakeholders in second place. In addition, the Portuguese banking sector is characterized by highly concentrated equity structures. Thus, agency costs are low and information asymmetries reduced, which may justify the low need to provide risk information to investors/stakeholders. Monitoring (market discipline) is crucial and results seem to indicate that the relevant stakeholders play an important role in risk reporting.

Grounded on agency theory and legitimacy theory assumptions, it seems that agency costs, public visibility and reputation continue to be crucial drivers of risk reporting of Portuguese commercial banks. Highly visible banks (assessed by size and listing status) are subject to greater stakeholders monitoring. They are also more pressured to comply with disclosure requirements, which can help satisfying stakeholders' expectations. But risk reporting is also relevant to manage agency costs and information asymmetries that may exist in highly visible banks with more dispersed ownership structures and more prone to managers' opportunistic behaviors. This risk reporting behavior helps managing stakeholders' perception on the trustworthiness of banks. Banks use this channel to build stakeholders confidence and avoid potential ban runs that could jeopardize their solvency and survival. Findings also indicate that risk reporting is used to manage bank's legitimacy, mainly in younger banks with lower risk management skills.

This study contributes to literature on risk reporting by extending the work of Oliveira *et al.* (2011a, b, 2013) because it goes beyond the analysis of the drivers of operational risk disclosure and the periods prior the adoption of Basel II Accord in Portugal. More specifically, the present study explores the determinants of risk reporting (including risk management objectives, operational risks, liquidity risks, credit risk, market risks and capital adequacy) during a period never explored hitherto among Portuguese commercial banks: the period of adoption of the Basel II Accord.

Some of the limitations of this study are associated with the that not all banks disclose information on corporate governance-related variables that could have an impact on risk reporting. Another limitation regards the period of analysis that is too short. Future studies may include more independent variables, focus on other recent periods of time, and use cross-country research setting to ascertain possible differences in disclosure levels.

Note

1. The Portuguese Central bank database is a repository of the annual reports of all Portuguese credit institutions and financial firms supervised by the Portuguese Central bank. This database includes all the annual reports from 2006 onwards.

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Appendix 1
Definition of risk categories
Risk management objectives and policies: risk identification and definitions, risk management policies, and whether there was a comprehensive risk report.

Operational risk: the risk of loss resulting from inadequate internal processes, people and systems, from external events, or from the adaptation of information systems to the Basel II requirements.

Liquidity risk: the risk that a firm will be unable to efficiently meet expected and unexpected current and future cash flow and collateral needs without affecting its daily operations or financial condition. Indicated by the amount of liquidity risk exposure and discussion of funding policies.

Credit risk: the potential that a bank borrower or counterparty will fail to meet its obligations in accordance with agreed terms. Indicated by the amount of credit risk exposure, past due and impaired assets, collateral held, and credit risk quality.

Market risk: the risk of losses in on-balance sheet and off-balance sheet positions arising from movements in market prices. Indicated by the amount of market risk exposure and internal/external risk measurement models. Risks subject to this requirement pertain to interest rate-related instruments and equities in the trading book; foreign exchange risk and commodities risk throughout the bank.

Capital structure and adequacy: the measure of a bank's financial strength and stability. Indicated by capital structure and amounts of Tier 1, 2 and 3; capital adequacy for different types of risk exposure and capital ratios; and capital adequacy approaches adopted under Basel II.

Appendix 2

Panel A: Risk management objectives and policies
1   Identified risk key
2   Generic risks identified
3   Other definitions
     Understanding risk disclosure
4   –Definition of nuclear risks
5   –Description of global control structures
6   –Measures used to monitor different risk management categories
7   Accounting policies
     Risk section in the management report
8   –Notes on the financing of financial assets
9   –Existence of cross-references

Panel B: Operational risk
10   Definition of operational risk
11   Description of operational risk and control structure
12   Description of operational risk and management policies
13   Operational risk exposure
     Clarification of financial assets on the adaptation of risk information systems to comply with the Basel II agreement
14   –Adaptation of information technology in accordance with the Basel II Accord
15   –Adaptation completed
16   –Collection of incidents to measure capital requirement

Panel C: Liquidity risk
17   Definition of liquidity risk
18   Description of liquidity risk and control structure
19   Description of liquidity risk and risk management policies
     Liquidity risk exposure
     Analysis of lack of liquidity through tables
     State of clarification of the concept of maturity

Table A1.
Bank's risk disclosure items considered in the computation of the disclosure index ("disclosure = 1"; "no-disclosure = 0")

20   –Remaining period to redemption date
21   –Residual duration
22   –Maturity
23   –Liquidity failure
24   –Approximate maturity time
25   –Other isolated maturity groups
      Clarified concepts of maturity of the financial assets defined for other isolated maturity groups
26   –Remaining period until the reimbursement date
27   –Residual duration
28   –Maturity
29   –Lack of liquidity
30   Approximate maturity time for other isolated groups
31   Clear alignment between the liquidity gap table and funding policies
32   Clear discussion of funding policies
33   Key performance indicator

Panel D: Credit risk
34   Definition of credit risk
35   Description of credit risk and control structure
36   Description of credit risk and management policies
37   Size of exposure to credit risk
38   Size of depreciated or impaired assets
      Collateral size (other improvements made)
39   –Single current quantity
40   –Discussion of values
41   Credit risk quality

Panel E: Market risk
      Definition of market risk
42   –Market risk
43   –Interest rate risk
45   –Currency risk
46   Description of market risk and control structure
47   Description of market risk and risk management policies
      Exposure to market risk
      –Exposure to foreign exchange risk
48   –Net balance sheet positions by currency
49   –Short- and long-term positions by currency
      –Exposure to interest rate risk
50   –Narrative information of interest rate risk exposure
      –Presentation of a gap revaluation table
      –Analysis of risk value
51   –Description of VaR assumptions and parameters
52   -VaR values
      Stress tests
53   –Generic description
54   –Details of the models used
55   –Results (only values)
56   –Results (by risk factor)
      Backtest
57   –Generic description
58   –Details of the models used
59   –Results (only values)
60   –Results (with discussion of graphs)
61   –Results (without discussion of graphs)
      Sensitive analysis

(*continued*)   **Table A1.**

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