Better safe than sorry. Which governance characteristics are most important in curbing banks' risk taking and driving performance?

Abstract

Conventional wisdom leads to assert that good governance may underpin bank performance while bad governance destroys stability and soundness. Using the banks in the Eurostoxx index, we run a factor analysis to synthesize 23 bank board characteristics into seven key features: independence, size, dedication, tenure, corporate governance quality, external perspective, competence and diversity. We then use a multiple regression and find that indeed some corporate governance factors curb risk taking - measured by multiple specifications of Z-Score - of banks in our sample. Conversely, the association with market performance is poorly significant. Our findings are in line with the Agency Theory and try to assess which governance variables are most relevant for regulators in containing bank risk taking.

Keywords: Corporate governance, Banks, Regulation, Banking Union, Risk taking, Performance

1. Introduction

Banks exert a strong impact on economic growth (Jens Hagendorff, Collins, & Keasey, 2007; Levine, 1999; Levine, Loayza, & Beck, 2000). Effective Corporate Governance (CG) is critical to the proper functioning of the banking sector and the economy as a whole (Caselli, 2010). Banks' safety and soundness are key to financial stability, and the manner in which they conduct their business, therefore, is central to economic health (Basel Committee on Banking Supervision, 2015). As a result, bank CG is a crucial element not only for promoting a more resilient financial system (Financial Stability Board, 2013) but also for sustaining economic growth (Organisation for Economic Co-operation and Development, 2004; 2015).

We aim at identifying which are the CG characteristics that are most important in curbing banks' excessive risk taking. Specifically, we adopt both a qualitative and quantitative approach. The latter, includes a factor analysis and a multiple regression model with the double purpose of identifying the best practices in bank CG and assessing whether they have already been recognized as crucial by the new regulatory framework.

We are aware of prior researches on corporate governance and firm performance that use factor analysis to identify synergies among different governance characteristics (Andreou, Antoniou, Horton, & Louca, 2016; Assunção, Luca, & Vasconcelos, 2017; Dima, Ionescu, & Tudoreanu, 2013; Larcker, Richardson, & Tuna, 2007; Veprauskaitė & Adams, 2013). Nonetheless, to the best of our knowledge, this is one the first attempts to combine factor analysis and multiple regression in CG literature of banks, with a deep dive in both companies and board members' characteristics. This makes further research on this topic relevant and fascinating. Additionally, the topic is contemporary since it deals with the assessment of a new regulatory framework of European financial intermediaries, and is to be analysed with an on-going concern perspective. Prior studies in this field are focused in reduce CG characteristics in an index (Assunção et al., 2017; de Araujo, Christiananta, Ellitan, & Otok, 2013; Kocmanova & Simberova, 2012; Lei & Song, 2005) or synthetize information gathered from questionnaires (Fleming & Christian Schaupp, 2012). The original detail of this methodology and the proved viability of the investigation in bank CG, paves the way to assert that CG is not important itself, but to the extent in which it prevents excessive bank risk taking and improves performance.

CG in banks is a critical topic since shortcomings in the governance of banks can result in the transmission of problems across the banking system and, if widespread, can destabilize the financial system (Levine, 2004; OECD, 2006; BCBS, 2015, EU, 2013). The recent financial crisis can be considered a wake-up call and highlighted that insufficient attention was paid to bank governance (R. B. Adams & Mehran, 2011; Ahrens, Filatotchev, & Thomsen, 2011). Indeed, both academics and practitioners claim that ineffective bank governance played a central role in the development of the crisis (R. B. Adams & Mehran, 2011; Aebi, Sabato, & Schmid, 2012; Aguilera & Jackson, 2010; Erkens, Hung, & Matos, 2012; Kirkpatrick, 2009).

These strong externalities on the economy make bank CG a fundamental issue. Therefore, a more comprehensive and deeper knowledge of specific features of bank CG is crucial in order to identify the optimal framework to conduct an efficient risk management. As a matter of fact, since the crisis, risk management function has received increasing attention due to its decisive role in curbing risk taking. Regulation calls for Boards of Directors and Committees that prevent the undertaking of excessive risk by financial institutions. Thus, it is not surprising that regulators and practitioners have responded, proposing long overdue principles of good CG (McConnel, 2012).

Following the principles, national authorities have taken several measures to improve regulatory and supervisory oversight of risk governance at financial institutions, to ensure sound risk governance through changing environments and tightening up on the roles and responsibilities of boards of directors. These measures include the development and strengthening of existing guidance and regulation, raising supervisory expectations for the risk management function, engaging more frequently with the board and management, and assessing the accuracy and usefulness of the information provided to the board to enable effective discharge of their responsibilities (FSB, 2013). Until the introduction of the new regulatory framework, standard setters and regulators focused respectively on what the board should do and must do and the necessary competences of board members as opposed to structural characteristics (BCBS, 2015; FSB, 2013; Directive 2013/36/EU or CRD IV) (Brogi, 2011). The Capital Requirements Directive (CRD IV) issued by the European Commission encloses stricter rules on capital adequacy, as well as new CG and remuneration rules. These latter are focused on the qualitative and quantitative composition of CG actors (including rules on the number of directorships held by a director of a significant institution; new rules on risk and nomination committees, board diversity), risk management, financial reporting, the responsibilities of the board and control of executive remuneration. Nonetheless, national authorities need to strengthen their ability to assess the effectiveness of a bank's risk governance and risk culture and should engage more frequently with the board and its risk and audit committees (FSB, 2013; BCBS, 2015; EC, 2013).

To sum up, bank board characteristics are a crucial factor of bank risk-taking (Rachdi & Ameur, 2011; Rachdi, Trabelsi, & Trad, 2013), thus the qualitative and quantitative composition of CG imposed by the new regulatory framework and the effects on bank risk-taking needs to be deeper analysed. Indeed, the quest for a more effective regulation related to CG mechanisms is an important aspect of the CG research over the years (Di Pietra, Gebhardt, McLeay, & Ronen, 2018). We respond to the call for a further exploration on the relation between CG and bank risk taking and contribute to the literature on this topic by also providing potential insights for policy makers and regulators. We find that Independence and Size are the most relevant CG characteristics for banks risk taking. In particular, in line with the agency theory, our results show that Independence increases the solvency of banks and Size reduces it. These findings can provide food for policy makers' and regulators thought in the definition of regulatory frameworks on bank CG. We are aware of some limitations of the analysis. We partially address endogeneity issue, which is indeed related with most of the empirical research on corporate governance (Larcker et al., 2007; P. Nguyen, Rahman, Tong, & Zhao, 2016; Wintoki, Linck, & Netter, 2012). Some concerns remain with a bias selection sample. Robustness checks show a good reliability of the analysis and the absence of multicollinearity. The paper is structured as follows. Section 2 illustrates the review of literature relevant in our investigation; Section 3 explains the methodology and shows in detail: (i) the painstaking effort in data gathering, which have been in part hand collected and in part retrieved by public and private data provider; (ii) the suitability of our dataset to the viability of the econometric models that we propose; (iii) the core steps of both factor analysis and regression model. Section 4 presents and comments the results, by also proving the robustness of the analysis with several statistic tests and indicating the shortcomings of our investigation. We conclude with Section 5, that posits relevant policy implications and tries to inspire scholars for further research.

2. Literature

There is a wide strand of literature exploring the relationship between CG and bank risk-taking from different point of views[1], as summarized in Table 1. Nonetheless, a clear and univocal consensus about the best practice is still missing. Furthermore, the literature is mainly focused on US. From a general perspective, Peni and Vähämaa (2012) find mixed results in searching for an association between better governance and risk reduction. More recently, Zagorchev and Gao (2015) show that good governance underpins risk avoiding of financial institutions.

< PLACE TABLE 1 ABOUT HERE >

An extensive strand of empirical literature shows that CG of financial intermediaries is associated with financial and market performance (R. Adams & Mehran, 2003; Caprio, Laeven, & Levine, 2007; Cooper, 2009; Cornett, Marcus, Saunders, & Tehranian, 2007; de Andres & Vallelado, 2008; Hanazaki & Horiuchi, 2003; Jiraporn & Chintrakarn, 2009; Laeven & Levine, 2009; Macey & O'Hara, 2003;

[1] Literature about the relationship between bank governance and risk taking is well reviewed and summarized by Srivastav and Hagendorff (2016).

Mishra & Nielsen, 2000; Pacini, Hillison, Marlett, & Burgess, 2005; Pathan & Faff, 2013; Sierra, Talmor, & Wallace, 2006). Moreover, several studies observe the relation between bank risk taking and the most relevant features of CG: board size, board independence, CEO duality, gender, compensation (including CEO compensation) and risk management.

Board size is one of the crucial characteristics in the effectiveness of boards' functioning (R. B. Adams & Mehran, 2011; de Andres & Vallelado, 2008; Grove, Patelli, Victoravich, & Xu, 2011; Pathan, 2009). CG literature on this aspect mainly outlined two alternative theories: the Agency Theory (Eisenberg, Sundgren, & Wells, 1998; Fama & Jensen, 1983a, 1983b; Jensen, 1993; Jensen & Meckling, 1976; Yermack, 1996) which argues a higher number of directors on board may reduce the effectiveness of the monitoring function; and the resource based view (Hillman & Dalziel, 2003; Pfeffer, 1972; Pfeffer & Salancik, 1978) claiming that larger boards may provide expertise and resources useful to deal with complex activities, supporting the advisory role of the board. With a specific focus on board size of banks, consistently with Agency Theory, Minton, Taillard, and Williamson (2014); Pathan (2009) find that bank board size of US banks is negatively related to risk-taking (measured as total risk, idiosyncratic risk and systematic risk) during the pre-crisis period. This is also consistent with the study of Faleye and Krishnan (2017) and Rachdi and Ben Ameur (2011) which find that small board are associated with better performance and less risk taking. Contrariwise, Berger, Kick, and Schaeck (2014) argue that during the recent financial crisis board size, as well as other CG characteristics of US commercial banks are not related to bank stability (measured in terms of probability of default). Grove et al. (2011); Larcker et al. (2007) and de Andres and Vallelado (2008) find a hump-shaped relationship between board size and performance. As concerns performance, Yermack (1996) finds an inverse association between board size and firm market value, confirming previous results of Jensen (1993) that argues that larger boards harm the efficiency and the effectiveness of board dynamics because of poor communication, coordination problems and low flexibility in decision-making process. Pathan and Faff (2013) find a negative relation between board size and banks' performance (measured as ROA, ROE, pre-tax operating income, net interest margin, Tobin's Q and stock return) arguing that large bank boards could reflect the presence of inefficiencies relating to organizational structure. Nonetheless, still mixed results emerge, calling for further exploration. We therefore formulate the following hypothesis:

H1: board size influences bank risk and performance

Bank CG literature also recognizes the independence of the board members as a critical aspect of the internal governance of banks. As well as for companies of other industries, banks should be managed by directors who preserve shareholders' interest (BCBS, 2015). Most of the literature in this specific field supports the Agency Theory, arguing that a higher presence of independent board members may contribute to better performance and risk-avoidance in banks (Faleye & Krishnan, 2017; García-Meca, García-Sánchez, & Martínez-Ferrero, 2015; Li & Song, 2013; Minton, Taillard, & Rohan, 2010; Pathan, 2009; Yeh, Chung, & Liu, 2011). Thus, we expect the following:

H2: board independence reduces bank risk and enhances performance

A wide strand of literature is focused on diversity, based on the perspective it that should foster independence, preserve shareholders rights, and offer different point of views during boards' meetings (García-Meca et al., 2015; Jens Hagendorff, Collins, & Keasey, 2010; D. D. L. Nguyen, Hagendorff, & Eshraghi, 2015; Owen & Temesvary, 2018; Talavera, Yin, & Zhang, 2018). Hence, we formulate the following hypothesis:

H3: board diversity (in terms of gender, age, nationality, education) reduces bank risk and enhances performance

As concerns the other features of CG in banks, there is a noteworthy lack of univocal consensus about the relationship between CG features and both bank risk-taking and performance (de Haan and Vlahu, 2016; Brogi and Lagasio, 2019; Lagasio, 2019).

Factor analysis for combining corporate governance variables is already used in prior studies which investigate performance of firms (Andreou et al., 2016; Assunção et al., 2017; Dima et al., 2013;

Larcker et al., 2007; Veprauskaitė & Adams, 2013). Felício, Rodrigues, Grove, and Greiner (2018) and Grove et al. (2011), following Larcker et al. (2007) provide some attempts for identifying the most influential CG factors respectively for performance and risk in banks. Nonetheless, both the researches assess the multiple regressions by standardized their governance variables, taking the CG factors previously identified in Larcker et al. (2007) as inputs of their analysis. As in Larcker et al. (2007) we aim at extending the previous knowledge on CG and its contribution, by considering the joint effect of different governance mechanisms on bank risk and performance, instead of looking at single CG variables.

With the aim of deeply analyzing all of the above-mentioned issues and based on the existing literature, we are going to answer the following research question:

$$Which\ governance\ variables\ are\ most\ relevant\ for\ bank\ risk\ taking\ and\ performance?$$

3. Methodology

We aim to study the relation of specific CG characteristics with bank risk taking, analyzing data from CG reports, bank financial statements and stock market data. Banks considered in the sample have different CG models (*traditional model*[2], *dualistic model*[3] and *monistic model*[4]); the distribution of CG models by banks is in Table 2. With respect to the breakdown by CG model, the most adopted model is the *monistic* one (15 banks in the sample, with aggregate Total Assets of 9 trillion euro and aggregate market capitalization of almost 400 billion euro); followed by the *dualistic* model (10 banks, with 4 trillion and 179 billion euro) and the *traditional* model (5 Italian banks, with almost 2 trillion euro and 46 billion euro, respectively). Even though we collected data for both Executive Board and

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[2] In the *traditional model* (or *horizontal two-tier model*) the Shareholders' Meeting appoints both the Board of Directors and the Board of Statutory Auditors. The Board of Directors has the management and the supervisory functions; the Board of Statutory Auditors is in charge of the control function.

[3] In the *dualistic model* (or *vertical two-tier model*) the Shareholders' Meeting appoints the Supervisory Board (which has the control and the supervisory functions), that in turn appoints the Management Board (in charge of the management function).

[4] With the *monistic model* (or *one-tier model*) the company is governed by one corporate body. The Shareholders' Meeting appoints the Board of Directors, that undertakes both management and supervisory functions and selects among its directors the Internal Audit Committee, which has the control function.

Supervisory Board, we run the econometric model using data referred to the board in which the committees are established (e.g. the board of directors for banks adopting the horizontal two-tier model and the one-tier model; the supervisory board for banks adopting the vertical two-tier model), since they are in charge of the management function and are supposed to be the most influential for bank risk taking.

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The econometric model follows a two steps procedure: (i) **Factor analysis**. Following an intensive data gathering process, we built a large database composed by more than 200 variables on market, financial statements and CG data. The sources of collected data are: BVD, Boardex, Bloomberg, banks' financial statements and CG reports. Thus, with the purpose of synthetizing all the information, we firstly run a Factor Analysis, based on a Principal Component Analysis on CG data. This process leads us to identify seven different *factors* that explain the pattern of correlations within our set of observed variables. (ii) **Linear regression**. Lastly, we run several linear regressions with an Enter method with the purpose of verifying the relation between bank CG assessment and risk taking, using the seven factors identified in step (i), among the other variables. The model also includes control variables to adjust for the state of the economy (Year) and banks size (natural logarithm of Total Assets and natural logarithm of number of employees).

3.1. Sample

The sample of the analysis is composed by the 30 Euro Area banks in the the Eurostoxx index (Table 2) all of which are significant entities supervised by the European Central Bank (ECB). Six of these banks are Systemically Important Financial Institutions (SIFIs) (Banco Santander, Banco Bilbao Vizcaya Argentaria, BNP Paribas, Deutsche Bank, Société Generale and Unicredit). The period of observation is 2008[5]-2016. The total market capitalization (as of July 2017) is 621 billion euro and the Total Assets is approximately 15 trillion Euro, representing almost 70% of Total Assets of banks

[5] Except for ABN Amro and Bankia, which starting dates are respectively 2012 and 2011.

subject to the SSM which amounted to 22 trillion euro at the end of the comprehensive assessment exercise[6] (2014). The top 5 banks in terms of Total Assets have Total Assets of almost 8 billion euro, representing more than a half the Total Assets of the total sample.

Considering the breakdown of sample by country, the top 5 countries in terms of aggregate Total Assets and total market capitalization are: Spain (5.113 trillion and 258 billion Euro – with 8 banks in the sample); France (3.434 trillion and 95 billion Euro – with 3 banks in the sample); Italy (2.153 trillion and 93 billion Euro – with 8 banks in the sample); Germany (2.070 trillion and 43 billion Euro – with 2 banks in the sample) and Netherlands (1.239 trillion and 65 billion Euro – with 2 banks in the sample). Banks in the sample are classified by business model, using the BVD variable Bank specialization, in respect of which the sample is composed by 24 Commercial banks, 3 Bank Holding Companies (BHC) and 1 Cooperative bank.

3.2. Risk and market performance measures

Bank risk is measured by the Z-Score, following the previous literature (Boyd & Graham, 1986; Boyd, Graham, & Hewitt, 1993; Boyd & Runkle, 1993; Hannan & Hanweck, 1988). It is often computed to measure the banking system stability (Lee & Hsieh, 2014) or the individual probability of default of banks (Cubillas, Fonseca, & González, 2012; Demirgüç-Kunt & Huizinga, 2010; Fiordelisi & Mare, 2014; García-Sánchez, García-Meca, & Cuadrado-Ballesteros, 2017; Hadad, Agusman, Monroe, Gasbarro, & Zumwalt, 2011; Laeven & Levine, 2009; Pathan, 2009; Williams, 2014). Z-Score refers to the degree of solvency (thus, equity is not sufficient to cover losses) of the company. More specifically, it represents the number of standard deviations that Return on Assets (ROA) has to drop before equity is depleted (García-Sánchez et al., 2017; Laeven & Levine, 2009). Considering that ROA is the ratio between Net Income and Total Assets, and naming Capital Ratio (CAR) the ratio between Equity and Total Assets, we can assume that the probability of insolvency can be explained as the probability of CAR < ROA (Demirgüç-Kunt & Huizinga, 2010; García-Sánchez et al., 2017;

[6] European Central Bank (2014), Aggregate report on the comprehensive assessment, 26th October.

Laeven & Levine, 2009). Hence, Z-Score can be computed by the ratio between the sum of ROA and CAR and standard deviation of ROA: $Z - Score = \frac{AROA_{it} + CAR_{it}}{SDAROA_i}$ where $AROA_{it}$ is the average ROA of bank i in year t; CAR_{it} is CAR of bank i in year t; and $SDAROA_i$ is the standard deviation of the average ROA for each bank, calculated over the period of observation (from 2006 to 2016). In this way, Z-Score represents the inverse of the probability of insolvency (Boyd & Graham, 1986; Boyd et al., 1993; Boyd & Runkle, 1993; García-Sánchez et al., 2017; Hannan & Hanweck, 1988). As though as to the measure of probability of default we are measuring Pr[ROA<CAR]. Thus, higher values of Z-Score represent higher level of solvency, and viceversa. Since ROA distributions is skewed and have an excess of kurtosis, we also run the model on alternative versions of Z-Score. In particular, banking institutions in countries that face specific crisis event show a ROA distribution that is left-skewed, with ROA observations that are lower than their average. For instance, Laeven and Levine (2009) and Demirgüç-Kunt and Huizinga (2010) use natural logarithm of the Z-score to reduce the skewness of the distribution. In our estimation, we chose to not consider the latter solution, since the natural logarithm cannot be applied when the numerator of ROA (Net Income) is negative, because the value of the ratio would be out of the domain of the logarithmic transformation. Indeed, in our sample there are different observations of a negative Net Income. Anolli, Beccalli, and Molyneux (2014) and de Haan and Poghosyan (2012) estimate Z-Score with an yearly risk measure that compute quarterly average and standard deviation of the variables included in the Z-Score (e.g. Net Income after taxes, Total Assets and Equity. We apply a similar solution by considering the latter variables in their levels but with yearly frequency. Hence, we use:

$$Z - Score_1 = \frac{ROA_{it} + CAR_{it}}{SDROA_i} \quad (1)$$

where ROA_{it} is the ROA of bank i in year t; CAR_{it} is CAR of bank i in year t; and $SDROA_i$ is the standard deviation of the ROA for each bank, calculated over the period of observation (from 2006 to 2016). We also apply the correction introduced by Lepetit and Strobel (2015) in order to reduce the skewness of ROA distribution:

$$p(ROA_{it} \leq CAR_{it}) \leq \frac{1}{1 + {Z_{it}}^2} < 1 \tag{2}$$

where ROA_{it} is the ROA of bank i in year *t*; CAR_{it} is CAR of bank i in year *t*; and ${Z_{it}}^2$ is the Z-Score of each bank, calculated over the period of observation (from 2006 to 2016). Other authors propose alternative variables to ROE. For instance, Goyeau and Tarazi (1992) propose a ROE based calculation of the Z-Score[7]. This is calculated as:

$$Z - Score_3 = \frac{ROE_{it} + CAR_{it}}{SDROE_i} \tag{3}$$

where ROE_{it} is the ROE of bank i in year *t*; CAR_{it} is CAR of bank i in year *t*; and $SDROE_i$ is the standard deviation of the ROE for each bank, calculated over the period of observation (from 2006 to 2016). We also tested for the average values of the ROE based specification of Z-Score.

Bouvatier, Lepetit, Rehault, and Strobel (2018) introduce the regulatory capital Z-Score, using the Regulatory Capital Ratio proving its ability to identify bank distress with the Bienaymè-Chebyshev inequality and obtaining that:

$$Z - Score_4 = \frac{CAR_{it} - TR}{SDRCAR} \tag{4}$$

where CAR_{it} is the Regulatory Capital Ratio of bank i in year *t*; TR is the regulatory threshold (that is supposed to be equal 8%); and $SDROA_i$ is the standard deviation of the ROA for each bank, calculated over the period of observation (from 2006 to 2016). Lastly, as in García-Sánchez et al. (2017) we decompose Z-Score into: Leverage Risk (5), calculated as CAR_{it} divided by $SDROA_i$; and Portfolio Risk (6) calculated as ROA_i on $SDROA_i$.

Market performance is measured by Tobin’s Q and Price to Book value (P/B). Tobin's Q is defined in literature as firm’s market value calculated as the book value of assets minus the book value of equity plus the market value of an equity (Bhagat & Bolton, 2008; de Andres & Vallelado, 2008; Singh,

[7] lately used in de Haan and Poghosyan (2012); Lee and Hsieh (2014); Lepetit, Nys, Rous, and Tarazi (2008).

Tabassum, Darwish, & Batsakis, 2018). The misalignment between market value and book value of equity is caught by the P/B. The latter is defined as the ratio between the market capitalization and the book value of shareholders' equity. If P/B is 1, the book value of common shareholders' equity equals the market value of common shareholders' equity. If P/B value is below 1 the book value of common shareholders' equity is higher than the market value of common shareholders' equity, meaning that the bank is overvalued in financial books. In this case, there are some overvalued tangible or intangible items within the bank's assets. On the other hand, if P/B is above 1 there will be some undervalued items in the asset side of the balance sheet. P/B together with Tobin's Q belongs to the market methods of measuring the value of intangible assets. Therefore, both Tobin's Q and P/B appear as relatively strong measures of the quality of work and contributions of boards of directors out of all other measures of firm performance (Kaczmarek, Kimino, & Pye, 2014).

3.3. Covariates

We use as independent variables both accounting and CG data, as resulted by the factors identification performed in step (i) of the analysis, as further illustrated. The description of the variables considered in the analysis, as well as their descriptive statistics, is reported in Table 3. We select 23 CG variables, manually gathered from banks' annual CG reports and from Boardex, and synthetize them into 7 factors. The variables selection is based on previous literature on bank CG (Bhagat & Black, 2001; de Haan & Vlahu, 2016; Larcker et al., 2007; Lei & Song, 2005). In particular, the selected variable cover 3 main aspects of CG: (i) board structure; (ii) board functioning; and external perception of CG. As for the first group of variables, we gather information about the number of directors on board and sitting on committees (respectively named as Size, Audit%, Rem%, Nom%); independence of the board as well the committees (Ind%, AuditInd%, RemInd%, NomInd%); specific characteristics of board members (Age, YBoard, Nationality, NQuoted, Edu, AVGYQuoted); the presence of a committee focused on CG (CGCommittee) and aspects related to individuals' contribution to board structure (STDRole, STDAge). The descriptive statistics show that the committee with the highest portion of board member is the audit committee (Audit% mean value is equal to 0.31, in respect of Rem% which is 0.27 and Nom% 0.29). Independent board members are on average the 60% of board, and all the committees present a higher percentage of independence (AuditInd% and RemInd% with a mean value of 80%, NomInd%at 70%). The average Age of the boards is equal to 60 years, and board members serves on board from 5 years. Almost half of the banks in the sample also have a CGCommittee. The variables related to board functioning (ii) indicate the number of board and committees' meetings (BoardMeet, AuditMeet, RemMeet, NomMeet). BoardMeet are on average 14 during the year; the committee with the highest frequency of meetings is the Audit committee (AuditMeet is on average 13), followed by the Remuneration committee (8) and Nomination committee (7). Lastly, the external perception variables (iii) are CGScore and EWRating. Since they represent structural information, CG variables, do not show so much variation over time; moreover, changes in these values usually occur when the Board of Directors is re-appointed. Most of the banks in the sample have a smallest interval of years in which the board members are subject to re-election equal to 3. Thus, we choose to consider all the CG variables lagged by 3 years in the regression model. This is also rational if we consider that the effects of CG characteristics may not be evaluated in the Annual Report date selected. Finally, this can also be favourable to avoid endogeneity biases (Cornett, McNutt, & Tehranian, 2009).

The accounting data used as covariates of our analysis are selected to measure the financial soundness and stability of the banks in our sample (NPLs/Loans, LVGRatio), their profitability (NIM, CostIncome) and to control for their size (lnTA). Lastly, we also include an instrumental country-specific variable (IRS), that is the long-term interest rate for convergence purposes with 10 years maturity, denominated in Euro (gathered from the Statistical Data Warehouse of the ECB).

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3.4. Factor analysis

The Factor analysis has several extraction methods for constructing a solution. We choose the Principal Components analysis for the extraction, in order to identify uncorrelated linear combinations of variables in our analysis. Since the variables included present heterogeneous scales, the analysis is performed on their correlations. This is an iterative procedure that starts by finding a linear combination of variables (which will be named *components* or *factors*) that explains as much variation of the original variables as possible. It continues by finding other components that account for as much of the remaining variation as possible with the constraint that they must be uncorrelated with the factors identified previously. Hence, the first factor explains maximum variance. The following factors explain progressively smaller portions of the variance and are all uncorrelated with each other. As a result, a small number of factors explain most of the variation, and can replace the original variables. In order to minimize the number of variables that have high loadings on each factor, we chose an orthogonal rotation method named Varimax. Missing values are excluded listwise. Running the factor analysis, we notice that some of the collected variables (i.e. Gender % - the portion of male directors in the board) need to be excluded in order to maintain an optimal level of statistical significance. Finally, the selected variables result in the ones reported in Table 3, with a P-Person correlation reported in Table 4. With the aim of testing the suitability of the methodology, firstly, we run two tests to detect the suitability of data for factor analysis: the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and the Barlett's Test. The first one indicates the proportion of variance among variables in the database that might be caused by underlying factors. Values higher than 0.5 indicate that factor analysis may be useful in summarizing original data, we obtain a value equal to 0.652. We also use Bartlett's test of sphericity is to test the hypothesis that the correlation matrix is an identity one, confirming that our data are suitable for factor analysis. We calculate the Total Variance explained by our model that is the amount of variance in the original variables accounted for by each factor. As shown in Table 5, the first factor explains the largest portion of variance in the original variables, and the total variance explained by our model is almost 75% of variance in the original variables, which is a good result and lead us to reduce the complexity of the data set by using these seven factors, with less than 25% loss of information. In order to compute the portion of variance explained by each variable grouped in factors, we compute the initial and the extracted values of communalities. Each variable shows a value of extraction communality higher than 0.5, which generally is the level of tolerance for significant results in the analysis.

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Once we identify the optimal number of factors, we use the Rotated Component Matrix (Table 6) to understand which are the original variables represented by each factor.

The latter shows the following composition of the seven factors:

- Factor 1: AuditInd%; RemInd%; Ind%; NomInd% (hence, this is labeled as *Independence factor*).
- Factor 2: Audit%; Rem%; ln(Size); Nom% (*Size factor*).
- Factor 3: NomMeet; BoardMeet; RemMeet; AuditMeet (*Dedication factor*).
- Factor 4: YBoard; STDRole; Age (*Tenure factor*).
- Factor 5: CGScore; EWRating; CGCommittee (*CG quality factor*).
- Factor 6: Nationality; NQuoted (*External Perspective factor*).
- Factor 7: Edu; AVGYQuoted; STDAge (*Competence and diversity factor*).

The first factor is the most relevant in terms of explained variance of the original variables and the label can be clearly applied, subsequent factors show decreasing explained variance, and the labelling is less fitting than for the previous factors.

< PLACE TABLE 6 ABOUT HERE >

3.5. Regression

We run a linear regression with year, Country and bank fixed effects, to model the value of a dependent scale variable based on its linear relationship to the predictors. We want to verify the relationship between bank risk and CG. To do so, we use different models to run the linear regression, first choosing the Enter method (to include CG variables) and then the Remove method (to exclude financial statements variables). As CG data we use the seven factors identified in step (i). Missing values (about 3.5% of the dataset) of each variable are replaced with the average value of the bank for the entire period of observation. We test the following three models are run for each of the above presented specifications of Z-Score (1-4):

a. $Z - Score_i = \beta_0 + \sum_{n=1}^{6}(\beta_n \, FINANCIALS_{ni}) + \sum_{s=1}^{7}(\beta_s \, CGFactors_{si}) + IRS_i + u_i$

b. $Z - Score_i = \beta_0 + \sum_{n=1}^{6}(\beta_n \, FINANCIALS_{ni}) + IRS_i + u_i$

c. $Z - Score_i = \beta_0 + \sum_{s=1}^{7}(\beta_s \, CGFactors_{si}) + IRS_i + u_i$

Specifically, in model a. we look for a relationship between bank risk and both financial data and CG factors; in model b. we include only financial data; in model c. we consider only CG data. We then check for consistency with the other risk and performance measures already introduced by running the same models with Leverage (4) and Portfolio risk (5) and for the two market performance measures (P/B and Tobin's Q) as dependent variables.

4. Results

Table 7 shows the results of the regression analysis. As concerns CG results, we find a high level of consistency with agency theory. The agency relationship is the engagement of an agent (manager) to preserve and safeguard principal (shareholder)'s interests on its behalf (Jensen & Meckling, 1976). Indeed, it recognizes that independence, diversity and expertise enhance CG quality and safeguard shareholders' interests, which is in line with our findings. Fama and Jensen (1983a, 1983b) and Beasley (1996) identify independence as a vital characteristic of directors to mitigate agency conflicts between management and shareholders because their role in the board permit them to perform a better critical monitoring function. Results of the analysis show that there is a positive and highly significant relationship between independence of directors - *Independence factor* - and the solvency of the bank. Indeed, as reported in Table 7 – PANEL A, we find a positive association between *Independence factor* and both *ZScore*$_2$ (beta equal to 0.00241) and *ZScore*$_3$, (0.0395) of the full model, which are statistically significant at a 5% confidence level. In model (c) – that contains only CG covariates and the control – the positive association is statistically significant with *ZScore*$_4$ (beta is 0.846, significant at 1%). The relationship is also partially confirmed in PANEL B, where we find a negative association with Portfolio risk (-0.405, at 1%); the other association are not significant. *Size factor* is negatively associated with soundness, and this result is also in line with agency theory, that support a negative association between board size and bank functioning. In the full model analysed in PANEL A, we find significant negative relationship between *Size factor* and both *ZScore*$_1$ and *ZScore*$_4$ (respectively with coefficients equal to -16.96 and -0.720). In model (c) the negative association is significant at 1% with *ZScore*$_1$ (beta equal to -16.61). These finding is strongly supported in PANEL B, where the *Size factor* is always positively associated with an increase in both Leverage risk and Portfolio risk, and also always significant at 1% level of confidence for both model (a) and (c). From an institutional perspective, standard setters and regulators tend to focus respectively on what the board should and must do and therefore underline the importance of the competences of board members as opposed to the structural characteristics of the board (BCBS, 2015; EBA, 2012). Indeed, dedication of the directors, CG quality and External perspective in our analysis are deciding factors and associated with bank soundness. These results can be clearly identified in PANEL B, where we find high consistency in the signs of the relationship between *CGFactors* and both Leverage risk and Portfolio risk. Specifically, we find that *Dedication* and *External perspective* are positively associated with risk – suggesting that a high level of commitments of directors may increase bank risk; *Tenure* is negatively associated with risk – meaning that more experienced board members tend to reduce risk; *CG Quality* and *Competence and diversity* factors reduce risk. These findings are partially confirmed in PANEL A: *CG Quality* and *Competence and diversity* factors are clearly associated with bank soundness – as suggested by the positive association with all the specifications of *ZScore*; some hesitations remain with the identification of the sign of *Dedication*, *Tenure* and *External perspective.*

As concerns the financial data, we find that the ratio between NPLs and Gross Loans is significant and is always negatively related with the dependent variable, supporting the fact that a positive value of this ratio may be associated with bank solvency and stability. Specifically, Table 7 – PANEL A show significance for betas of *NPLs/Loans* associated with *ZScore*$_3$ (-0.00475) and *ZScore*$_4$ (-0.149) of the full model and with *ZScore*$_4$ (-0.132) of model (b). In PANEL B, the relationships are confirmed by the positive association with Portfolio risk (0.0832 and 0.0912 respectively in model (a) and model (b)), both significant with a *p-value* lower than 0.01. The *LVG Ratio, NIM* and *CostIncome* reduce bank soundness, as showed in PANEL A. In particular, as concerns *NIM*, the negative association with bank soundness may be driven by the trouble period of commercial banking profitability, since banks that rely more on Net Interest Income appear to be less safe than others in preventing bank risk. Indeed, the related statistics show a negative relation between *NIM* and almost all the proposed specification of Z-Score, with a good significance of the analysis in terms of p-values. Safest banks are also the largest (as measured by *lnTA*), since the sign of the relationship is resulted to be positive and significant in PANEL A, and negative when associated with Leverage risk and Portfolio risk in PANEL B. We also find negative (positive) and significant relationship with Cost Income ratio in PANEL A (PANEL B), meaning that its increasing value variables is associated with a high level of risk in banks financial statements.

Looking at the relationship with market performance (PANEL C), we find that CG variables are poorly significant in determining bank performance. This is in line with previous academic findings (R. B. Adams, Almeida, & Ferreira, 2005; Belkhir, 2009; Brogi, 2011; Erkens et al., 2012; Simpson & Gleason, 1999 ; Staikouras, Staikouras, & Agoraki, 2007). Indeed, our results support the idea that market valuation is mainly driven by financial data. Specifically, as concerns the latter, we find that the ratio between NPLs and Gross Loans is negative associated with both P/B and Tobin's Q and it also strongly significant in model (a) and model (b). *NIM* and *CostIncome* are negatively associated with market performance, and statistically significant in model (a). As for the *CGFactors*, we find poorly significant evidence of the positive impact of *Independence* on *Tobin's Q* in model (c), and negative association with *Dedication* and *External perspective,* respectively in model (c) and model (a). Thus, supporting the sign of the relationships already identified in PANEL A and PANEL B. Indeed, when comparing the models that include both accounting and CG data respectively with accounting data only and CG variables only, we find that most of the signs of the relations are highly stable over the tested models, meaning a good accuracy of the estimation.

< PLACE TABLE 7 ABOUT HERE >

Nonetheless, as further reported in the robustness checks, we obtain more accurate and stable predictions when using both banks financial statements items and CG variables. Indeed, even though results on CG are significant, they seem to be not so very stable in every specification of Z-Score tested, meaning that CG variables cannot be considered as the only explanatory variable of the risk (of performance) of a bank, as we already expected. That is, CG is not important itself, but to the extent in which it prevents excessive bank risk-taking, as testified by an adequate structure of banks financial statements. Indeed, our results identify specific CG variables that are strongly related with bank risk taking (*Independence, Size, CG Quality, Competence and diversity*). These findings support the need for supervising bank CG and the importance of a holistic regulation in the banking system, that should include bank financial statements measures (capital requirements, liquidity requirements), risk management as well as CG assessment (Tuominen, 2018).

4.1. Robustness checks

The statistics R^2 and F (Table 7) show a good fit of the models to the variables. We find the highest value of the R^2 for $Z\text{-}Score_3$ specification, with 0.821 for the regression with both accounting and CG data (model (a)). Overall, we find higher R^2 values when running the regression on the full sample of variables (model (a)) confirming that the model is less explicative and poor when tested only on financial or CG variables, so they have to be simultaneously considered in the analysis. Specifically, the R^2 of the regression of $Z\text{-}Score_1$ in model (a) is equal to 0.758, compared with 0.609 and 0.741, respectively in model (b) and model (c). For $Z\text{-}Score_2$ we find 0.679 (vs 0.551 and 0.617); $Z\text{-}Score_3$ 0.821 (0.672 and 0.802); $Z\text{-}Score_4$ 0.427 (0.321 and 0.330). The analysis run on the decomposition of

ROA in terms of Leverage risk and Portfolio risk and on market performance, show the consistency of the above presented findings. The latter investigations show also that the bank risk mainly consists of Portfolio risk as respect to Leverage Risk. That is also useful in order to manage the endogeneity issue. Indeed, to control for endogeneity we further apply a lag of 3 years to the CG variables. Table 7 also shows the collinearity statistics, computed in order to evaluate potential biases in the model: Variance Inflation Factor (VIF). A value greater than 10 is usually considered problematic, since this statistic quantifies the level of multicollinearity and represents the portion of variance of an estimated regression coefficient that is increased because of collinearity. VIF values are well below 10 in the three models, with an average VIF of 1.93, 1.76 and 1.04 respectively. In particular, we find that all *CGFactors* in the three models have a VIF lower than 2 (the highest being *CGQuality* factor in model (a), which is equal to 1.96). Financials' VIFs are also supporting the absence of a multicollinearity issue, since they are very low, with the highest value registered by *LVG Ratio* in model (a) (3.30).

< PLACE TABLE 8 ABOUT HERE >

We also check whether the regression model has achieved its goal to explain as much variation as possible in the dependent variable while respecting the underlying assumption, by looking at the residuals and the unexplained variation. Figure 1 and Figure 2 plots the residual statistics that help us to verify that residuals are normally distributed, as they should be to determine whether the regression model is well structured. To sum up, we obtain results with a good level of significance, but different biases occur when considering CG data in the developing of the analysis, which is commonly known in the CG literature. Nevertheless, this is an additional proof that CG is not sufficient itself, but to the extent in which it prevents excessive bank risk taking, dealing with an adequate structure of banks financial statement.

< PLACE FIGURE 1 ABOUT HERE >

< PLACE FIGURE 2 ABOUT HERE >

4.2. Limitations and shortcomings

We are aware of some limitations of the analysis, mainly related to biases in sample selection and endogeneity. Indeed, our sample includes only large European banks, which make up the Eurostoxx Banks index, and this bias may limit the value of our inference. Nonetheless, the selection criteria imposed (European, large and listed banks) allow us to draw interesting suggestions for policy makers and regulators. In particular, focusing only on European banks allows us to address our findings to European authorities (and banks) only, without incur in country-specific governance practices or economic trend that may twist the identified relationships. We choose large banks because of the representativeness of the sample, given the size of the total assets. Lastly, listed banks can be also analyzed from a market performance perspective.

Endogeneity issue is related with most of the empirical research on corporate governance (Larcker et al., 2007; P. Nguyen et al., 2016; Wintoki et al., 2012). We partially address it in several ways. Firstly, we consider all the CG variables lagged by 3 years, which is one of the most adopted solution to alleviate an endogeneity problem (Bellemare, Masaki, & Pepinsky, 2017; Jean, Deng, Kim, & Yuan, 2016; Kaczmarek, 2017; León-Ledesma & Thirlwall, 2002; Papies, Ebbes, & Van Heerde, 2017; Schultz, Tan, & Walsh, 2010). This method is indeed not sufficient in avoiding an endogeneity issue, since it only moves the channel through which endogeneity biases causal estimates (Bellemare et al., 2017; León-Ledesma & Thirlwall, 2002). Thus, we further use a fixed effects estimation (Wintoki et al., 2012) with year, Country and bank fixed effects, since showing risk changes over time to changes in governance within-banks is a strong test that can be helpful in addressing endogeneity caused by time-invariant factors. However, we suggest further researches of an instrumental variable in this setting, which is extremely difficult to identify (Larcker et al., 2007). Indeed, further investigation may look for instrumental variables (correlated with the endogenous regressors, and uncorrelated with the error in the regression).

5. Conclusion

Rules come when failures occur. Regulation may impact on financial risk taking by financial intermediaries by way of the decision-making process envisaged in the various possible legal structures set forth by the law (Brogi, 2010). The literature review preliminarily conducted shows that even though policy makers attribute increasing importance to CG, and there is a growing body of rules that is going to be implemented over the next few years, there seems to be mixed evidence on the relation between board size, its composition and risk (or performance) in empirical analysis. Using the banks in the Eurostoxx index, we run a factor analysis that enables us to synthesize 23 bank board characteristics into seven key features: independence, board and committee size, dedication, tenure, CG quality, external perspective, competence and diversity. We then use a multiple regression and find that indeed CG curbs risk taking - measured by *Z-Score* - of banks in our sample. However, this does not entirely justify extremely detailed bank CG regulation. Indeed, based on our results CG does indeed impact risk-taking but regulation could focus on few, most relevant CG characteristics such as independence and size. There are some shortcomings related to the methodology used, that are partially addressed in our analysis as mentioned in the related section. Further research is suggested to overcome the identified methodological concerns as well as for looking for difference and similarities of the relationships identified in other Countries. We are aware of a general consensus among both academics and practitioners that the quality of CG depends on firm-specifics governance practices but also on the legal and political institutions in which the firm operates (Boubaker & Nguyen, 2018). Moreover, our findings reveal also that CG is not important itself, but to the extent in which it prevents excessive bank risk taking and improves performance. Indeed, our research mainly contribute to the literature that is focused on agency theory. We find that *Independence* and *Size* factors are the most relevant CG characteristics influencing banks risk taking, where *Independence* increases the solvency of banks and *Size* reduces it. These findings can provide food for policy makers' and regulators thought in the definition of regulatory frameworks on bank CG. Nonetheless, the analysis suggests that

CG variables are not sufficient in explaining bank risk and performance. We also need to include financial data to obtain more reliable results. Our findings support the need for supervising bank CG and the importance of a holistic regulation in the banking system, that should include bank financial statements measures (capital requirements, liquidity requirements), risk management as well as CG assessment (Tuominen, 2018).

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Tables and figures

Table 1. Prior literature on bank corporate governance and risk

Study	Governance measure	Risk Measure	Key findings
Board and CEO attributes			
Adams et al. (2005)	CEO characteristics and power	Standard deviation of ROA and Standard deviation of Tobin's Q	Firm performance will be more variable as decision-making power becomes more centralized in the hands of the CEO
Beltratti and Stulz (2012)	Shareholder-friendly board index collected by Institutional Shareholder Services (ISS)	Default risk (Z-score); Equity risk (idiosyncratic component of stock volatility); Leverage risk (equity minus tangible assets scaled by assets); Portfolio risk (fraction of loan write downs to assets)	Shareholder-friendly boards are positively associated with default risk, although this relationship is not entirely robust to different risk measures
Erkens et al. (2012)	Independent directors	Default risk (expected default frequency); Equity risk (stock volatility); Leverage risk (amount of equity capital raised)	No significant relationship between independent directors and default risk or equity risk. Banks with a higher fraction of independent directors reduced leverage risk by raising equity during the financial crisis.
Berger et al. (2014)	Demographics of executive directors (age, educational qualification, and gender)	Portfolio risk (asset density, loan portfolio concentration)	Portfolio risk is positively associated with younger executives and female directors. Portfolio risk is negatively associated with the fraction of directors with doctorate.
Minton et al. (2014)	Financial expertise of independent directors	Equity risk (stock volatility); Leverage risk (risk-weighted capital ratio); Portfolio risk (fraction of loans secured by real estate)	Boards consisting of higher amount of financial experts were positively associated with bank risk
International Monetary Fund (2014)	Board size Independent directors	Default risk (Z-score and distance-to-default); Equity risk (systematic component of stock volatility); Tail risk (expected shortfall, marginal expected shortfall, and systemic risk)	Higher fraction of independent directors is associated with lower bank risk, although boards that have more financial experts are associated with higher risk.
Risk Management			
Keys et al. (2009)	Risk manager power: Fraction of risk managers pay to top-5 executive pay	Portfolio risk (default rates on subprime loans)	Stronger risk management is associated with less risky subprime loan securitizations
Dam and Koetter (2012)	Bailouts expectation	Probability of distress	Safety nets in the banking industry lead to additional ris
Fahlenbrach et al. (2012)	Risk culture, as proxied by bank performance during the 1998 Russian crisis	Default risk (bank failures during the 2007–08 period)	Banks with persistent risk-taking culture performed poorly and were more likely to fail during the 2007–08 financial crisis
Ellul and Yerramilli (2013)	Strength and independence of risk management function	Tail risk (expected shortfall); Credit risk (fraction of non-performing loans)	Stronger Risk Management Index (RMI) is associated with lower tail risk exposure and better loan quality. RMI is also a strong predictor of bank tail risk exposures during the financial crisis
International Monetary Fund (2014)	Presence of risk committee	Default risk (Z-score and distance-to-default); Equity risk (systematic component of stock volatility); Tail risk (expected shortfall, marginal expected shortfall, and systemic risk)	Banks with risk committee are associated with lower risk-taking

Authors' own elaboration following Srivastav and Hagendorff (2016)

Table 2. Sample Description

Sample Description									
Bank*	Starting date	CG model	BvD Ind	Country	Bank Business Model	GSIFIs Bucket	EIU, Country Rating**	Total Assets th EUR	Market cap th EUR***
BNP	2008	Monistic	A+	Spain	Commercial	3	A	2,076,959,000	77,214,001
DBK	2008	Dualistic	A+	Germany	Commercial	3	A	1,590,546,000	31,288,878
ACA	2008	Monistic	D	France	Commercial	-	A	1,524,232,000	39,518,162
GLE	2008	Monistic	A+	France	Commercial	1	A	1,382,241,000	37,543,938
SAN	2008	Monistic	A+	Spain	Commercial	1	BBB	1,339,125,000	85,846,241
UCG	2008	Trad.	A+	Italy	Commercial	1	BB	859,532,774	35,121,432
INGA	2008	Dualistic	A+	Netherlands	BHC	-	A	845,081,000	58,589,343
BBVA	2008	Monistic	A+	Spain	Commercial	1	BBB	731,856,000	48,655,568
ISP	2008	Dualistic	A+	Italy	Commercial	-	BB	725,100,000	40,696,212
KN	2008	Monistic	D	France	Commercial	-	A	527,859,000	18,262,574
CBK	2008	Dualistic	A+	Germany	Commercial	-	A	480,450,000	11,722,067
ABN	2012	Dualistic	D	Netherlands	Commercial	-	A	394,482,000	6,446,510
CABK	2008	Monistic	B+	Spain	Commercial	-	BBB	347,927,262	24,266,695
KBC	2008	Monistic	A+	Belgium	BHC	-	A	275,200,000	28,283,590
SAB	2008	Monistic	A+	Spain	Commercial	-	BBB	212,507,719	9,693,477
EBS	2008	Dualistic	A+	Austria	BHC	-	A	208,227,070	13,880,390
BKIA	2011	Monistic	D	Spain	Commercial	-	BBB	190,167,459	11,762,072
BMPS	2008	Trad.	A+	Italy	Commercial	-	BB	153,178,466	442,158
POP	2008	Monistic	A+	Spain	Commercial	-	BBB	147,925,728	1,330,404
BIR	2008	Monistic	A+	Ireland	Commercial	-	BBB	123,129,000	7,217,010
BP	2008	Dualistic	-	Italy	Commercial	-	BB	117,411,003	1,897,228
UBI	2008	Dualistic	A+	Italy	Cooperative	-	BB	112,383,917	4,094,107
RBI	2008	Dualistic	D	Austria	Commercial	-	A	111,863,845	7,328,775
BCP	2008	Dualistic	A+	Portugal	Commercial	-	BB	71.264,811	3,600,152
MB	2008	Trad.	A+	Italy	Commercial	-	BB	69,818,605	7,472,029
BKN	2008	Monistic	A+	Spain	Commercial	-	-	67,182,467	-
EUROB	2008	Monistic	A+	Greece	Commercial	-	CCC	66,393,000	2,120,419
BPE	2008	Trad.	A+	Italy	Commercial	-	BB	64,957,028	2,077,327
ALPHA	2008	Monistic	A+	Greece	Commercial	-	CCC	64,872,266	3,380,702
PMI	2008	Trad.	-	Italy	Commercial	-	BB	51,131,039	1,573,576

*Where: BNP = BNP Paribas; DBK = Deutsche Bank AG; ACA = Credit Agricole SA; GLE = Societe Generale SA; SAN = Banco Santander SA; UCG = Unicredit SPA; INGA = ING Groep NV; BBVA = Banco Bilbao Vizcaya Argentaria SA; ISP = Intesa Sanpaolo SPA; KN = Natixis SA; CBK = Commerzbank AG; ABN = ABN Amro Group NV ; CABK = Caixabank SA; KBC = KBC Group NV; SAB = Banco Sabadell SA; EBS = Erste Group Bank AG; BKIA = Bankia SA; BMPS = Banca Monte dei Paschi di Siena; POP = Banco Popular Espanol SA; BIR = Bank of Ireland; BP = Banco Popolare Società Cooperativa; UBI = Unione di Banche Italiane; RBI = Raiffeisen Bank International AG; BCP = Banco Comercial Portugues SA; MB = Mediobanca SPA; BKN = Bankinter; EUROB = Eurobank Ergasias SA; BPE = Banca Popolare dell'Emilia Romagna SCARL; ALPHA = Alpha Bank AE; PMI = Banca Popolare di Milano SCARL.

**As of 01/05/17.

***As of 01/06/17.

Sources: Eurostoxx Index, BVD, Bloomberg and banks' Corporate Governance report data.

Table 3. Descriptive statistics

Group	Variable	Mean	Std Dev	N	Description	Source
Board structure	Ln(Size)	2.82	0.28	161	The natural logarithm of the number of Directors seating on the Board	CG reports
	Audit%	0.31	0.11	161	Portion of Directors of the Audit Committee related to Board Size	CG reports
	Rem%	0.27	0.10	161	Portion of Directors of the Remuneration Committee related to Board Size	CG reports
	Nom%	0.29	0.10	161	Portion of Directors of the Nomination Committee related to Board Size	CG reports
	Ind%	59.68	28.01	161	Portion of Independent Directors at the Annual Report Date selected	CG reports
	AuditInd%	80.44	22.55	161	Portion of Independent Directors on the Audit Committee	CG reports
	RemInd%	79.73	20.15	161	Portion of Independent Directors on the Remuneration Committee	CG reports
	NomInd%	71.94	26.38	161	Portion of Independent Directors on the Nomination Committee	CG reports
	Age	60.31	3.74	161	Current age of selected individual	Boardex
	YBoard	5.32	2.61	161	Time on Board for the individual at a selected Annual Report Date	Boardex
	Nationality	0.24	0.21	161	Portion of Directors from different countries at the Annual Report Date selected	Boardex
	NQuoted	3.41	1.64	161	Number of Quoted Boards	Boardex
	Edu	1.74	0.59	161	The number of Qualification earned of selected individual	Boardex
	AVGYQuoted	3.38	1.61	161	The Average Time that a Director sits on the Board of Quoted Companies	Boardex
	CGCommittee	0.47	0.50	161	Does the company have a CG committee?	Boardex
	STDRole	3.46	2.20	161	Standard deviation of time on Board values for all the Directors	Boardex
	STDAge	8.33	2.36	161	Standard deviation of the ages of Directors	Boardex
Board functioning	BoardMeet	13.99	6.57	161	The number of Board meetings during the year	CG reports
	AuditMeet	13.41	11.62	161	The number of meetings of the Audit Committee during the year	CG reports
	RemMeet	8.04	4.70	161	The number of meetings of the Remuneration Committee during the year	CG reports
	NomMeet	6.77	4.55	161	The number of meetings of the Nomination Committee during the year	CG reports
External perception	CGSscore	63.45	23.99	161	It reflects a company's capacity to preserve shareholders' interest	Datastream
	EWRating	73.67	28.04	161	It reflects a balanced view of a company's performance in all four areas, economic, environmental, social and CG	Datastream
Financial	Ln(TA)	19.43	1,14	176	The natural logarithm of Total Assets	BvD
	NIM	1.67	0.39	176	Net Interest Margin	BvD
	NPLs/Loans	0.04	0.66	176	The ratio between Non Performing Loans and Gross Loans	BvD
	LVG ratio	6.23	2.33	176	The ratio between Equity and Total Assets	BvD
	Cost Income	64.52	12.41	176	The Cost Income ratio	BvD
	IRS	3.62	3.14	176	Long-term interest rate for convergence purposes with 10 years maturity, denominated in Euro	ECB
CG Factors	*Independence*	-0.01	0.90	176	Independence factor computed in step (i) of the analysis	
	Size	-0.06	0.85	176	Size factor computed in step (i) of the analysis	
	Dedication	0.00	0.91	176	Dedication factor computed in step (i) of the analysis	
	Tenure	0.01	0.91	176	Tenure factor computed in step (i) of the analysis	
	CG quality	0.00	0.89	176	CG quality factor computed in step (i) of the analysis	
	External perspective	0.00	0.86	176	External perspective factor computed in step (i) of the analysis	
	Competence and diversity	0.02	0.91	176	Competence and diversity factor computed in step (i) of the analysis	

Table 5. Total Variance Explained

Component	Initial Eigenvalues Total	% of Variance	Cumulative %	Extraction Sums of Squared Loadings Total	% of Variance	Cumulative %	Rotation Sums of Squared Loadings Total	% of Variance	Cumulative %
1	3.913	17.011	17.011	3.913	17.011	17.011	3.256	14.157	14.157
2	3.548	15.424	32.436	3.548	15.424	32.436	2.910	12.654	26.811
3	3.398	14.772	47.208	3.398	14.772	47.208	2.501	10.874	37.685
4	2.082	9.051	56.259	2.082	9.051	56.259	2.428	10.559	48.244
5	1.725	7.500	63.759	1.725	7.500	63.759	2.322	10.098	58.341
6	1.458	6.339	70.097	1.458	6.339	70.097	2.010	8.738	67.080
7	1.051	4.569	74.666	1.051	4.569	74.666	1.745	7.586	74.666
8	0.930	4.045	78.711						
9	0.680	2.956	81.667						
10	0.661	2.872	84.539						
11	0.593	2.578	87.118						
12	0.480	2.086	89.204						
13	0.409	1.777	90.981						
14	0.327	1.424	92.405						
15	0.300	1.303	93.708						
16	0.283	1.230	94.938						
17	0.270	1.172	96.110						
18	0.205	0.890	97.000						
19	0.184	0.799	97.799						
20	0.168	0.731	98.530						
21	0.137	0.596	99.127						
22	0.110	0.478	99.605						
23	0.091	0.395	100.000						

The % of Variance column shows the percentage of the variance accounted for by each factor to the total variance in all of the variables. The Cumulative % column shows the portion of variance accounted for by our seven extracted factors.

Table 6. Rotated Component Matrix

Factor	Variable	1	2	3	4	5	6	7
Independence	AuditInd%	0.875						
	RemInd%	0.839						
	Ind%	0.830						
	NomInd%	0.818						
Size	Audit%		0.864					
	Rem%		0.802					
	Ln(Size)		-0.754					
	Nom%		0.673					
Dedication	NomMeet			0.805				
	BoardMeet			0.793				
	AuditMeet			0.435			-0.511	
	RemMeet			0.768				
Tenure	YBoard				0.843			
	STDRole				0.826			
	Age				0.566			
CGQuality	CGSscore					0.915		
	EWRating					0.861		
	CGCommittee					0.627	0.617	
External perspective	Nationality						0.781	
	NQuoted						0.623	0.489
Competence and diversity	Edu							0.742
	AVGYQuoted							0.610
	STDAge							0.598

Values below 0.4 are omitted. Only the highest value per variables is shown, unless for AuditMeet and CGCommittee, for which we report the two highest values to justify the choice of dimension reduction into the identified factors.

Table 4. Correlation Matrix

Correlation Matrix	YBoard	NQuoted	AVGYQuoted	Age	Edu	Nationality	STDRole	Ind%	Audit%	AuditMeet	Rem%	RemMeet	Nom%	NomMeet	Ln(Size)	BoardMeet	AuditInd%	NomInd%	RemInd%	CGCommittee	CGSscore	EWRating	STDAge
YBoard	1.00																						
NQuoted	0.08	1.00																					
AVGYQuoted	0.19	0.38	1.00																				
Age	0.50	0.13	0.51	1.00																			
Edu	0.18	0.49	0.32	0.14	1.00																		
Nationality	0.10	0.47	0.21	0.09	0.38	1.00																	
STDRole	0.66	-0.21	0.30	0.41	0.08	0.06	1.00																
Ind%	-0.14	0.02	0.02	0.05	-0.16	0.02	-0.15	1.00															
Audit%	-0.11	-0.25	-0.24	-0.25	0.03	0.14	0.06	0.22	1.00														
AuditMeet	-0.27	-0.24	-0.04	0.05	-0.22	-0.36	-0.20	0.33	-0.24	1.00													
Rem%	-0.10	-0.04	-0.20	-0.28	-0.03	0.11	-0.11	0.34	0.63	-0.21	1.00												
RemMeet	-0.02	-0.27	0.06	0.20	-0.22	-0.27	0.10	0.02	-0.25	0.55	-0.28	1.00											
Nom%	-0.20	-0.03	-0.08	-0.28	-0.12	0.02	-0.17	0.42	0.53	-0.01	0.68	-0.17	1.00										
NomMeet	0.12	-0.13	0.16	0.19	-0.21	-0.00	0.19	-0.10	-0.09	0.11	-0.10	0.58	0.01	1.00									
Ln(Size)	0.01	0.11	0.09	0.02	-0.23	-0.26	-0.06	-0.05	-0.54	0.33	-0.47	0.16	-0.30	0.04	1.00								
BoardMeet	-0.26	-0.26	0.02	0.06	-0.16	-0.23	-0.06	0.01	-0.09	0.45	-0.02	0.52	0.03	0.43	0.06	1.00							
AuditInd%	0.10	0.07	0.04	0.22	-0.10	0.10	-0.06	0.68	-0.03	0.24	0.20	0.07	0.26	0.03	-0.10	0.01	1.00						
NomInd%	0.11	-0.07	0.17	0.33	-0.02	0.07	0.17	0.58	0.21	0.08	0.22	0.12	0.18	0.07	-0.30	-0.02	0.65	1.00					
RemInd%	0.09	-0.06	0.17	0.21	-0.05	0.07	0.08	0.58	0.11	0.20	0.10	0.09	0.25	0.01	-0.11	-0.05	0.62	0.77	1.00				
CGCommittee	0.06	0.20	0.28	0.26	0.10	0.47	0.20	0.13	-0.01	-0.18	0.03	-0.15	0.04	0.04	-0.06	-0.07	0.12	0.20	0.12	1.00			
CGSscore	0.21	0.04	0.17	0.29	0.14	0.20	0.29	0.13	0.01	-0.04	0.01	-0.11	0.07	-0.13	-0.10	-0.20	0.11	0.18	0.14	0.63	1.00		
EWRating	0.20	-0.03	0.20	0.22	0.22	0.09	0.33	-0.08	0.06	-0.10	-0.07	-0.15	-0.03	-0.21	-0.05	-0.27	-0.11	0.04	0.02	0.35	0.79	1.00	
STDAge	0.04	0.11	0.29	0.15	0.10	-0.02	-0.02	-0.02	-0.26	0.37	-0.21	0.22	-0.07	0.18	0.29	0.28	0.18	-0.01	0.11	-0.16	-0.28	-0.24	1.00

Table 7. Summary of results
PANEL 1 – Z-Score specifications (1-4)

	Model (a)					Model (b)					Model (c)				
	(1)	(2)	(3)	(4)	VIF	(1)	(2)	(3)	(4)	VIF	(1)	(2)	(3)	(4)	VIF
NPLs/Loans	-1.109	-0.0000336	-0.00475*	-0.149**	2.26	-0.699	0.0000827	0.000812	-0.132**	1.53					
	(-1.72)	(-0.31)	(-2.57)	(-2.90)		(-1.04)	(0.44)	(0.31)	(-3.15)						
LVG Ratio	402.5	-0.188***	-0.0854	18.67	3.30	368.4	-0.238***	-1.794*	26.91	2.37					
	(1.55)	(-4.31)	(-0.11)	(0.90)		(1.53)	(-3.56)	(-2.00)	(1.80)						
NIM	-4.634	-0.00273	-0.0700*	-2.530**	2.77	-21.53*	-0.00473	-0.108***	-2.073***	1.64					
	(-0.47)	(-1.63)	(-2.45)	(-3.18)		(-2.24)	(-1.77)	(-3.82)	(-3.47)						
Cost Income	-0.780*	-0.0000699	-0.00129	0.00163	1.50	0.299	-0.000172	-0.000261	-0.00683	1.51					
	(-2.41)	(-1.28)	(-1.39)	(0.06)		(0.81)	(-1.67)	(-0.24)	(-0.30)						
lnTA	9.501*	-0.000244	0.0254	-0.327	2.36	-7.631	-0.000320	0.0129	-0.378	1.72					
	(2.00)	(-0.31)	(1.87)	(-0.86)		(-1.63)	(-0.25)	(0.92)	(-1.30)						
Independence	-6.323	0.00241**	0.0395**	-0.583	1.64						-4.948	0.00130	0.0220	0.846*	1.03
	(-1.37)	(3.11)	(2.99)	(-1.59)							(-1.14)	(1.69)	(1.74)	(2.33)	
Size	-16.96***	0.000979	-0.0122	-0.720*	1.31						-16.61***	0.000957	-0.00382	-0.625	1.01
	(-4.41)	(1.51)	(-1.10)	(-2.35)							(-4.31)	(1.40)	(-0.34)	(-1.94)	
Dedication	-6.557	0.00147*	0.0156	-0.923**	1.84						-9.854*	0.00197**	0.0231*	-1.218***	1.03
	(-1.53)	(2.04)	(1.27)	(-2.70)							(-2.49)	(2.80)	(2.00)	(-3.69)	
Tenure	8.743*	-0.00120	-0.0371***	0.569	1.54						7.386*	-0.00192**	-0.0454***	0.0200	1.01
	(2.35)	(-1.91)	(-3.47)	(1.91)							(2.20)	(-3.22)	(-4.64)	(0.07)	
CG quality	26.47***	0.000266	0.00566	0.606	1.96						21.83***	-0.000615	-0.00702	0.618*	1.00
	(6.19)	(0.37)	(0.46)	(1.78)							(5.84)	(-0.93)	(-0.64)	(1.98)	
External perspective	-19.23***	0.00162**	0.0264**	-0.509	1.30						-18.53***	0.00190**	0.0315***	-0.223	1.01
	(-5.92)	(2.96)	(2.84)	(-1.96)							(-5.84)	(3.37)	(3.41)	(-0.84)	
Competence and diversity	6.555	-0.000963	0.0227*	0.143	1.30						10.40**	0.00151**	0.0218*	0.279	1.06
	(1.94)	(-1.70)	(2.35)	(0.53)							(3.27)	(2.68)	(2.36)	(1.05)	
IRS	3.935	-0.000295	-0.0337***	0.0109	1.96	0.995	0.00139	-0.0326**	-0.0392	1.80	3.359	0.000750	-0.0422***	0.0465	1.13
	(1.26)	(-0.56)	(-3.77)	(0.04)		(0.29)	(1.47)	(-3.02)	(-0.18)		(1.25)	(1.57)	(-5.37)	(0.21)	
_cons	-47.00	0.0214	-0.425	16.40*		-240.0*	0.0354	0.0406	14.45*		-210.8***	-0.00292	-0.0678	6.970***	
	(-0.47)	(1.28)	(-1.49)	(2.07)		(-2.41)	(1.28)	(0.13)	(2.33)		(-11.87)	(-0.92)	(-1.31)	(4.70)	
Year F.E.	YES	YES	YES	YES		YES	YES	YES	YES		YES	YES	YES	YES	
Country F.E.	YES	YES	YES	YES		YES	YES	YES	YES		YES	YES	YES	YES	

Bank F.E.	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
N	138	138	138	138	176	176	173	176	138	138	138	138
R^2	0.758	0.679	0.821	0.427	0.609	0.551	0.672	0.321	0.741	0.617	0.802	0.330
F	17.48	12.12	25.11	4.921	14.64	11.73	17.81	5.132	19.68	11.51	27.49	4.211

t statistics in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

PANEL 2 – Leverage, Portfolio risk model

	(5)	(6)	(5)	(6)	(5)	(6)
NPLs/Loans	0.0111	0.0832***	0.00727	0.0912***		
	(1.69)	(3.88)	(1.04)	(4.55)		
LVG Ratio	-4.903	-15.29	-3934	-7839		
	(-1.85)	(-1.77)	(-1.58)	(-1.10)		
NIM	0.0304	-0.463	-0.241*	-1.234***		
	(0.30)	(-1.40)	(-2.42)	(-4.33)		
Cost Income	0.00898**	0.0113	-0.00358	0.0173		
	(2.71)	(1.05)	(-0.94)	(1.57)		
lnTA	-0.111*	-0.458**	0.0704	-0.0748		
	(-2.28)	(-2.90)	(1.45)	(-0.54)		
Independence	0.0557	-0.106			0.0364	-0.405*
	(1.19)	(-0.69)			(0.81)	(-2.48)
Size	0.182***	0.724***			0.179***	0.746***
	(4.64)	(5.66)			(4.47)	(5.16)
Dedication	0.0894*	0.467**			0.125**	0.814***
	(2.04)	(3.27)			(3.05)	(5.48)
Tenure	-0.0812*	-0.273*			-0.0712*	-0.345**
	(-2.13)	(-2.20)			(-2.05)	(-2.74)
CG quality	-0.271***	-0.531***			-0.220***	-0.508***
	(-6.19)	(-3.73)			(-5.69)	(-3.62)
External	0.205***	0.525***			0.200***	0.507***
perspective	(6.18)	(4.85)			(6.09)	(4.26)
Competence	-0.0414	0.0695			-0.0852*	-0.0667
and diversity	(-1.20)	(0.62)			(-2.59)	(-0.56)
IRS	-0.0392	0.257*	-0.00918	0.333**	-0.0293	0.258*
	(-1.23)	(2.47)	(-0.26)	(3.29)	(-1.05)	(2.56)
_cons	0.941	4.721	-2.228*	0.923	-2.109***	-4.718***
	(0.93)	(1.43)	(-2.15)	(0.31)	(-11.46)	(-7.08)
Year F.E.	YES	YES	YES	YES	YES	YES
Country F.E.	YES	YES	YES	YES	YES	YES
Bank F.E.	YES	YES	YES	YES	YES	YES
N	138	138	176	176	138	138
R^2	0.759	0.767	0.596	0.633	0.736	0.684
F	17.62	18.32	13.92	16.12	19.16	15.12

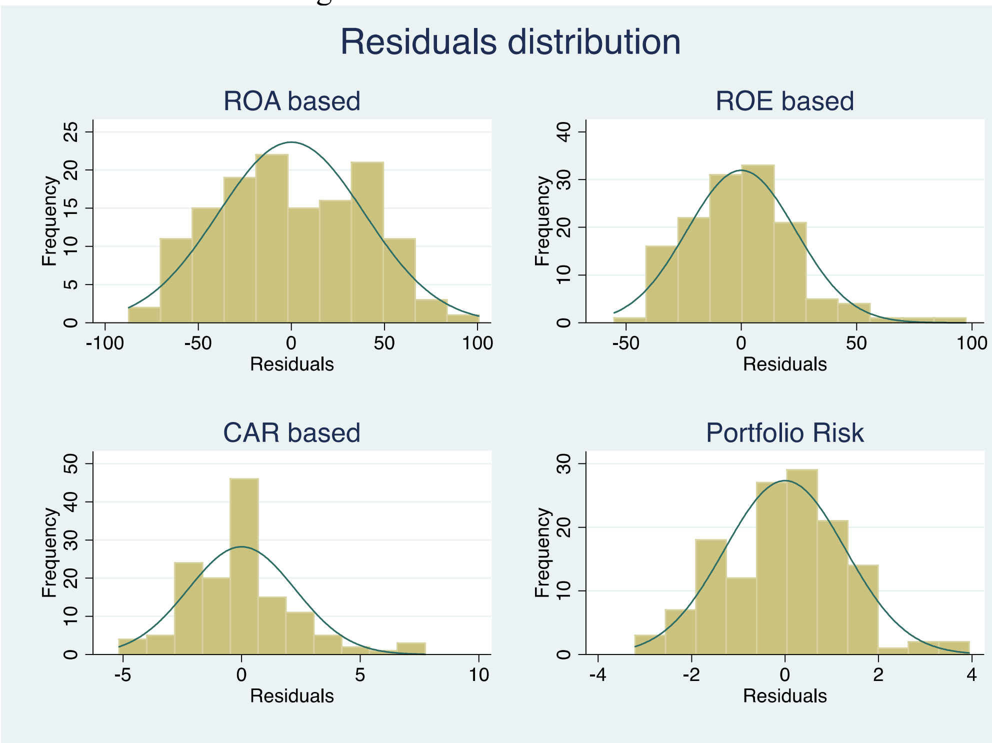
t statistics in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

PANEL 3 – Market model

	P/B	Tobin's Q	P/B	Tobin's Q	P/B	Tobin's Q
NPLs/Loans	-0.0160**	-0.000935*	-0.0173***	-0.00108***		
	(-2.71)	(-2.40)	(-4.11)	(-4.25)		
LVG Ratio	-3.324	0.402*	-1.234	0.390***		
	(-1.20)	(2.21)	(-0.79)	(4.17)		
NIM	-0.198*	-0.0135*	-0.0588	-0.00193		
	(-2.30)	(-2.37)	(-1.06)	(-0.58)		
Cost Income	-0.00585*	-0.000410*	-0.00355	-0.000253		
	(-2.12)	(-2.26)	(-1.49)	(-1.78)		
lnTA	0.00606	0.00199	0.00992	0.000635		
	(0.16)	(0.81)	(0.35)	(0.37)		
Independence	0.0718	0.00456			0.0330	0.00621**
	(1.87)	(1.78)			(0.98)	(2.66)
Size	-0.0423	-0.00355			-0.0387	-0.00109
	(-1.34)	(-1.70)			(-1.22)	(-0.49)
Dedication	-0.0256	-0.00359			-0.0722*	-0.00781**
	(-0.69)	(-1.46)			(-2.12)	(-3.22)
Tenure	0.0603	0.00454			0.0107	0.00166
	(1.73)	(1.94)			(0.37)	(0.82)
CG quality	0.0117	0.000455			-0.0142	0.00269
	(0.32)	(0.19)			(-0.48)	(1.26)
External	-0.0506*	-0.00215			-0.0141	-0.000128
perspective	(-2.02)	(-1.30)			(-0.57)	(-0.07)
Competence and	0.00534	-0.00164			0.00906	-0.000423
diversity	(0.21)	(-0.97)			(0.38)	(-0.26)
IRS	-0.00761	-0.00167	-0.0253	-0.00158	-0.0172	-0.00289
	(-0.28)	(-0.92)	(-1.20)	(-1.25)	(-0.60)	(-1.44)
_cons	2.098*	0.0658	1.557*	0.0627	0.404	0.0726***
	(2.46)	(1.14)	(2.25)	(1.51)	(1.07)	(3.70)
Year F.E.	YES	YES	YES	YES	YES	YES
Country F.E.	YES	YES	YES	YES	YES	YES
Bank F.E.	YES	YES	YES	YES	YES	YES
N	115	114	147	146	115	114
R^2	0.527	0.643	0.442	0.664	0.450	0.539
F	6.077	9.131	7.084	16.11	5.663	7.612

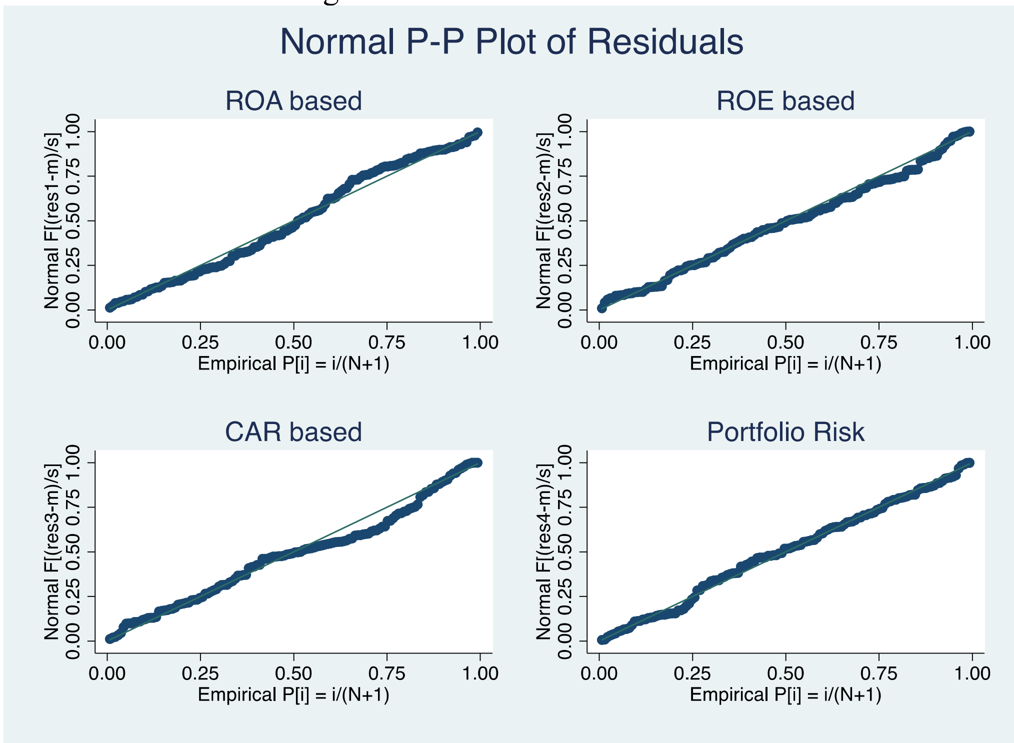
t statistics in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Figure 1. Residuals distribution



The figure above is the residuals distribution obtained by regressing the 4 different dependent variables within the three sub-models.

Figure 2. P-P Plot of Residuals



The figure above is the Normal P-P plot of residuals obtained by regressing the 4 different dependent variables within the three sub-models.