European Journal of Accounting, Finance & Business

Volume **1**/2013 ISSN 2344-102X
Issue (2)/ October 2013 ISSN-L 2344-102X

THE RISK AND THE BANKING ACTIVITY IN PORTUGAL – A PANEL DATA APPROACH

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Abstract

This study tests the Portuguese banking performance, studying which are the exposition risks of the banks and their financial robustness to shocks like the ones they have been exposed recently. The article uses data from the period 2005-2009. The idea was to capture the effects of the international liquidity crises triggered by the end of 2008 that Portugal felt very seriously. In order to do this we used a panel of 36 banks installed in Portugal at that time with data collected from the entire bank sample.

The main contributions of this article are related to the utilization of panel data analysis – fixed and random effects – applied to a sample of all the banks operating in Portugal with the exceptions of the mutual banks like Montepio Geral and the agricultural local banks (that have special characteristics) and use it to identify the explicative factors of the performance of the Portuguese banks.

In methodological terms, the article uses two panel data – a balanced and an unbalanced one – either with fixed or with random effects. The idea is to analyze the sustainability of the Portuguese banks that cross an enormous international finance turbulence since 2008.

The analyze took us to the conclusion, that among other elements, that there are bank that have a bigger exposition than others, that it is possible to identify which are the factors that are positively or negatively related to the performance or sustainability of the banking system of this EU country. The results also show that the best panel data model to study the banking performance is the fixed effect one, that the determination coefficient is very high (R2=99,9%) and highly significant in statistical terms (Prob=0.00), that indicators like the credit risk, Deposits, operative Costs, Liquidity, the banking ownership (public or private), and the years 2007 and 2009, are not significant in statistical terms, but are significant factors like capital, profit, productivity, interest rates, bank size and the year 2008, that there are positive associations between the banking

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Volume **1**/2013 ISSN 2344-102X
Issue (2)/ October 2013 ISSN-L 2344-102X

performance and the factors capital, profit, productivity and the interest rates, and a negative association between banking performance and bank size; it is also shows that these results are in accordance with the specialized literature, namely with the articles whose reference is Iannotta et al. (2007) and Athanasoglou et al. (2008), among others.

Keyword: Banking performance, banking risks, panel data, fixed effects, liquidity crisis.

JEL Classification: E50,G33

I. Introduction

There are many studies that address crisis and bank failures, and there are several authors, methods and techniques of treatment used by Iannotta, Nocera and Sironi (2006), Celick and Karatepe (2007), Yuliya Demyanyk and Yuliya Demyanyk (2009), and still Demirguç-Kunt and Detragiache (1998) and Gonzalez-Hermosillo (1999), among others, are examples of the research dedicated to this field.

The risk variable is one of the most used by several authors in their studies. The pioneering work of Altman (1968) suggested a scoring model – the "Z-Score" - to predict the risk of business failure, a model that was followed by numerous authors, many of which are cited in the surveys of P. R. Kumar and Ravi (2007) and Fethi and Pasiouras (2009). This measure or Z-score ratio is generally used in the calculations of credit rating currently applied by banks.

The method of artificial neural networks (ANN – Artificial Neural Networks)) is another of the techniques used to predict failures and banking crises (Yulia Demyanyk and Iftekhar Hasan, 2009). Celik and Karatepe (2007) used artificial neural networks, ANN, to show that the intelligence techniques used in operational research can predict bank failures and crises, using various ratios as non perdorming loans/total loans, capital/assets profits/assets and equity/assets, among others, ratios that measure the amount of capital and the bank's results, i.e., that measure the quality of loan portfolio.

According to the authors, the prediction of bank failures, can also lead through the model of early warning systems (EWS), model that was adopted by most central banks as a way of manage banking risks. Polius and Sahely (2003),applied this model using the CAMEL indicators; this method consists of the identification of ratios and indicators such

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Issue (2)/ October 2013 ISSN-L 2344-102X

as capital adequacy, asset quality, management expertise, earnings strength, banks' and sensitivity to market risk, defined according to the Federal Deposit Insurance Corporation Improvement Act of 1991 (Alejandro Gaytán and Christian A. Johnson, 2002). West (1985) used the Logit model with macroeconomic factors, financial and institutional mechanisms to measure the financial and operating characteristics of the banks, these data were extracted from reports of results or banks or other accounting data provided by them. The factors identified by the Logit model as significant variables for banking operations coincides with the variables suggested by CAMEL's model. This model (Logit) has greater appliance significance when evaluating the operating conditions.

The Discriminant Analysis, DA, is another statistical technique used in banking forecasts. This model is used with panel data and also with long series, the chosen technique for many years (Y. Demyanyk and Yuliya Y. Demyanyk, 2009). Karels and Prakash (1985) and Haslemetal (1992), are associated to these studies. This analysis requires a normal distribution of the regressors, fact that increases the likelihood of a better assessment of the results using the Logit model. The Discriminant analysis, DA, is the most widely used tool to carry cross-data and perform cross-correlations, but may not be the most appropriate for analyzing time series (Y. Demyanyk and Y. Demyanyk, 2009).

The Logit, Probit, and Discriminant Analysis, are the more robust models to verify the relationship between the different indicators and the deficiencies of the financial system. The banking indicators are used and tested over the Financial Soundness Indicators (FSI) (Worrell, 2004).The same author also notes that Demirguc-Kunt and Detragiache (1998) and Gonzalez-Hermosillo (1999) use estimation models that combine banking indicators with macroeconomic variables in situations of crisis or economic assessments of the likelihood of bank failures. Worrell (2004) also notes the difficulty of applying this methodology to individual countries where crises and bank failures are rare occurrences.

Davis and Karim (2008a) used the logistic regression (logit) with the Signal Extraction Method, EWS, and concluded that the logit model is a better predictor for banking crises than the EWS, but its ability to predict banking crises, when used alone, is relatively weak.

As Naceur (2003) says, the determinants of bank performance applied to emerging market countries have been studied by several authors from those countries, it is

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Issue (2)/ October 2013 ISSN-L 2344-102X

the case of Colombia (Barajas et al.,1999), Brazil (Afanasieff et al., 2002), Malaysia (Guru et al, 2002) and Tunisia (Ben Naceur and Goaied, 2001). The Tunisian study, using yearly data from 1980 to 1995, shows that the banks that have a better performance are the banks with higher labor productivity, banks that maintained a high level of deposits relative to total assets and that were available to reinforce equity. In the case of Malaysia, with data for the period 1986-1995, Guru et al. (2002), after considering two categories of determinants of profitability – the internal determinants, such as liquidity, capital adequacy, and management costs, and external determinants such as capital structure, bank size and the economic conditions–concluded that managing costs were highly significant to explain the profitability of the bank and that the economic factors like the interest rate linked to low profitability of the bank and inflation have a positive effect on bank performance.

Iannotti, Nocera and Sironi (2006), using data from the period 1999 to 2004 and macroeconomic accounting variables for possible differences in bank performance of the European banks, compared the banks according to their ownership of capital (public banks, private banks and mutual banks), and found empirical evidence of the superiority of private banks against the public or mutual banks, at least at the level of their performance and consequently the probability of bankruptcy risk; in addition, they concluded that profitability had a positive correlation of assets profitable returns with cost management; concerning risk, the state banks have shown a poorer credit quality and a higher risk of insolvency; they also concluded, in agreement with the literature, that on the average, the public banks are less productive and more risky than the other types of banks.

II. Methodological Framework

In line with what was made by Panayiotis, Sophocles and Matthaios (2008) and Iannotti, Nocera and Sironi (2007), we selected a panel of 36 banks operating in Portugal during the period 2005 - 2009 for studying the Portuguese bank performance.

The full model that we are going to estimate can be written as

$$Z_{it} = \beta_1 + \beta_2 K_{it} + \beta_3 R_{it} + \beta_4 D_{it} + \beta_5 X_{it} + \beta_6 G_{it} + \beta_7 L_{it} + \beta_8 B_{it} + \beta_9 Q_{it} + \beta_{10} F_{it} + \\ + \beta_{11} P_{it} + \beta_{12} S_{it} + \beta_{13} T_{it} + \beta_{14} D_{2007it} + \beta_{15} D_{2008it} + \beta_{16} D_{2009it} + \varepsilon_{it} \quad 3)$$

Where Zit is the Z-score associated to the performance of the bank i in the year t, Kit is the capital of the i-th bank in year t, Rit is the credit risk, Dit are the deposits, Xit is

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the expenditure or the operating costs, Git is the capital structure, Lit are loans, Bit is related to the fact of being or not quoted on the stock market, Fit is the profitability, Pit is the productivity of the bank, Sit is the bank size, Tit is the interest rate, and D2007it, D2008it D2009it are three dummy variables associated to years 2007, 2008 and 2009, I identifies the i.th bank (i=1,2,...,36) and t is the year (2005 to 2009). Following (Naceur, 2003) and other authors we estimate the model with the General Least Squares method, GLS.

To avoid the possible presence of collinearity among variables and reduce the variability of the values –the homogenization of the variance-we substituted the data by the natural logarithms (except the values of the dummy variables).

The selected variables are in accordance with those obtained by Panayiotis, Sophocles, and Matthaios (2008) and also with the ones of Iannotti, Nocera and Sironi (2007), we can event say that in part they are coincident, as the return on equity, for example, and in part they are complementary, as the liquidity ratio. As selected macroeconomic indicators we have interest rate; given its large variations before and after the crisis of 2008, we expect to foresee significant bank adjustments.

As Atnasasoglou et al. (2006), we are going to identify the indicators that prove to be significant in statistical terms to evaluate the performance of individual and global banks operating in Portugal.

As dependent variable we adopted the Z-score measure proposed by Altman (1968) for all banks operating in Portugal from 2005 to 2009. The Z-score variable is calculated according to expression (1) above

$$Z - score = \frac{ROA + CAP}{\sigma_{ROA}} \quad (1)$$

where ROA, CAP and σROA are, respectively, Return on Assets, the CAP is capital and the standard deviation of ROA. The Z-score is empirically associated to the probability of bank failure or of bank performance (Boyd, Nicolo and Jalal, 2006), the higher the Z-score the lower the probability of bankruptcy. This indicator can take the following values according to Boyd et al. (2006): Z<0, values corresponding to bankruptcy, Z=0, in which case the bank is about to enter a state of bankruptcy, and Z> 0 in which case the bank is healthy.

As determinants of the bank performance we use the ratio of capital, the ratio of portfolio quality, the credit and liquidity ratio, as well as other specific ratios of the

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Issue (2)/ October 2013 ISSN-L 2344-102X

banking sector. As explanatory macroeconomic factor we consider the interest rate, the capital structure, the ownership of the bank (public or private) and the situation in the stock market (quoted or not quoted on the stock market).

According to several authors, the evaluation of bank performance passes by the estimation of the return on assets instead of the return on equity. The bank performance can be measured by the Profitability variable defined as the ratio "net profits before taxes"/"return on assets (ROA)" (Athanasoglou et al., 2006). This variable was selected to measure the return on assets because it is a variable that reflects somehow the income from assets management. The values taken by this variable depend on accounting and macroeconomic factors and on the equity structure. According to the mathematical decomposition of the Z-score, this variable should be positively associated with bank performance.

One of the explanatory variables of the model is the capital, K, defined as the ratio between equity (shares, equities) and Total Assets: Capital[1]= Equities/Total Assets (K). This variable measures the share of equity or shares in total assets.

We expect that the relationship between capital (K) and profitability is positive (Athanasoglou et. al, 2006). Iannotti (2007) refers to the difficulty in interpreting this relationship given that according to the Basel Agreement if a bank has a high level of capital this can indicate that it holds riskier assets.

Another explanatory variable of the model is Credit Risk, CR, defined as the ratio 'loans loss Provisions'/'loans'. This variable is a proxy that measures the quality of the assets. According to Iannotti (2007), loans with higher risks should generate higher interest rates with the greatest impact on return on assets. If the asset quality is poor this will increase the cost of financing the bank (in case of default) so we should expect a negative impact on profit.

The productivity growth, P, is another important factor to incorporate in the model. The "Productivity Growth" = "rate of change in inflation adjusted to gross total revenue"/"personnel". The idea of including this ratio is to examine the competitive effect among banks given the globalization effect and the absence of barriers to entry in order to evaluate the productivity growth; it is expected that it contributes positively to the profitability of assets.

[1]Athanasoglou *et al.* (2008), says that the ROE is also a good variable to measure Profitability, however, the ROA (Return on Assets) is the most appropriate measure.

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Another factor to include in research is the Liquid variable, Q, or proportion of Liquid Assets in the Total Assets, i.e., Liquid =liquid assets/total assets. This ratio is interesting because it gives us information about the bank's liquidity. According to Iannotti, (2007), it is expected that this variable is negatively associated to income and charges, the type of association with the index of profitability being uncertain.

Another explanatory variable is the proportion of total loans/total assets (L). According to Iannotti et al. (2007) it is interesting to analyze this measure since there are loans that are more profitable than other types of resources. However the impact on profits is uncertain.

Another variable to include is the Deposits, D, a variable that measures the share of retail deposits in total funding from the bank, i.e., Retail Deposits = Deposits / Total Funding. As the loans and deposits have an uncertain impact on profit to the extent that they are positively related costs and negatively with income then it is expected that the deposits have a negative contribution to bank profitability.

The Gob variable, G, is a dummy variable that we use to assess the specific effect of state involvement in the assets of the bank; as it is a dummy it takes the value 1 if the ownership of the bank is public and 0 if it is private. According to Iannotti (2007), this variable is related to the efficiency of banks and usually it is lower in public banks than in private.

The Size variable, S, is related to the size of the bank and is usually measured by the natural logarithm of the real assets. The idea is to answer the questions: which is the optimal size of a bank in terms of profitability? Do the larger banks have higher returns? Is it the contrary? McAllister and McManus (1993) note, that the size of the bank can be a burden on cost because it influences negatively the profitability of the bank. Therefore the effect of the size factor on the bank performance is expected to be uncertain[2].

The List variable, B, also used by Iannotti (2007), which measures the importance of exposure of the shares admitted to listing. We will see the banks listed on the exchange market and those that are not exposed and also the importance of this exposure on the variation of the assets in the stock market.

Among the macroeconomic variables to be included in the analysis we have the Interest Rate, T, measured by the Euribor interest rate–average for 12 months. The idea of

[2] The Size variable = logarithm of real assets, is interesting in statistical terms because it can capture possible not linear relationships (Athanasoglou *et al.*, 2008).

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introducing this variable in the model has to see with the fact that it is a variable feature of the liquidity crisis in the sample period. The interest rate is not the most usual macroeconomic variable in the literature; often it is replaced by the estimated inflation rate, a rate that has a behavior similar to the long term interest rate (Athanasoglou et al., 2008). In this case, we chose to test the benchmark interest rate (Euribor 12 months) since the sample uses only annual data and macroeconomic variable that has been referred and accepted as co-responsible for the international banking crises verified in 2008.

As Iannotti et al. (2007) do, our study will also include three dummy variables, D2007, D2008, D2009, variables that are associated to the indicated years. The idea is to ascertain whether some of these variables are significant, particularly D2008 since this year is associated to the year of the international banking crisis; if we prove that none of these dummies are not significant for the Portuguese banking system, this means that this one was not sensitive to the international financial turbulence that occurred during this year.

Table 1 in the Append shows a synthesis of the variables referred, how they are measured, the notations used and the expected signals of the coefficients of the model.

In order to avoid the presence of collinearity among variables and reduce the variability of values-homogenization of the variance-we took the natural logarithms of the data values with the exception of dummy variables. To verify that the estimation model is appropriate we will use the redundant tests for fixed effects and the Hausman one (correlated random effects), for comparing the two specifications of estimation to check whether the random effects of the banks are correlated with the explanatory variables (Greene, 1997).

III. Data Sources and Sample Characteristic

The statistical data (the Annual Accounts of the banks) used in this research were extracted from the Portuguese Central Bank database. For regulatory consolidation and some weighting of each institution to risk reasons, identified by the Basel II rules, we considered annual data from 2005 until 2009.

The analysis is based on the processing of accounting information for all banks that were active in the period under review(36 banks).The analysis selected universal banks because of its competitive nature, banks that have the largest market share in Portugal. The Mutual banks like Caixa de Crédito Agrícola Mútuo and Montepio Geral

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because although they collect deposits from the economic agents, they are not classified as banks by the Portuguese Central (Bank of Portugal), although subject to certain common standards for the banks. Thus, they were excluded from our sample and analysis

These accounting data and banks' balance sheets are in the databases of the Bank of Portugal and of the Portuguese Association of Banks, and, as they are public, can be consulted in the web.

With this aim in mind we selected a balanced panel of banks – which includes all banks with regular activities during the entire period – and an unbalanced panel consisting of all banks operating in Portugal with activity only on some of the years covered by the sample.

IV. Empirical Results

IV.1. Descriptive Statistics

Table 2 in the Append presents the values of some descriptive statistics of the variables like the mean, the median, the maximum and minimum values, the standard deviation, the skewness and the kurtosis coefficients, the results of the Jarque-Bera normality test, JB, the sum of the values, the sum of squared deviations, the number of observations and the number of cross sections (banks).The JB test statistic show that with one exception (the S variable) all the others follow a normal distribution at the usual levels of significance. With two exceptions – the T and F variables – the distributions of the variables are negatively skewed. With four exceptions – the variables D, L, S, and T – all the other variables are leptokurtic.

IV.2. Parameter Estimates, Tests and Other Statistical Results

Table n. 3 in the Append presents the results of four panel data estimations – two of them with balanced panels and two others with unbalanced ones –, two using the random effects models and two others using the fixed effects models. The table also presents some indicators related to the regression quality, the DW error tests, and the F tests for assessing the goodness of fit, and, finally, the results of the application of the redundant tests and of the Hausman tests for the fixed and random effects models, respectively.

Table 4 in the Append shows the intercepts of the fixed effects models in the balanced model.

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In this formulation the intercepts vary with banks or cross-sectional units and do not vary with time. The assumptions of this model are: the uit errors are independent with zero mean and constant variance σ_u^2 for all t. Under these assumptions all the behavioral differences between banks and individual units over time are captured by the intercepts. The intercepts are included to control individual specific differences among banks. In this case the figures speak for themselves with the major national banks and some international ones presenting always positive values – between 0.17 and 0.88 (BES, BCP, BANIF, BPI, CGD, D. Bank, ITAU, etc.). – and others with weaker and dangerous values (BESI, BEST, BIG, BPINV, LBW, FINI, etc.).

IV.3. Results and Discussion

Table 3 presents a brief summary of estimation results of the panel data, fixed effects and random effects. The results show that using either the balanced panel or the unbalanced one, there is a convergence in terms of significance of the explanatory variables of bank performance in Portugal. Similarly we observe that the explanatory variables and the dependent variable relate in the same direction or sense regardless of the model elected (the fixed and the random effects models).

The results of the fixed effects model (model1) show a positive association between the bank performance and each one of the following factors: capital, profits, loans, productivity and interest rate. The results show that if capital increases by 1% then bank performance increases by 0.88% with everything else remaining unchanged (ceteris paribus assumption), i.e., the elasticity of bank performance as measured by the Z-score in relation to capital is 0,88%. Likewise, keeping everything constant, the banking performance improves bank loans by 0.025% if loans (L) increase by 1%; the bank performance improves by 0051% if profit (F) increases by 1%; bank performance increases by 0.00028% if P increases by 1%; and bank performance increases by 0.01759% if the interest rate, T, increases by 1%, respectively (always under the ceteris paribus hypothesis).These results are consistent with those provided by other studies namely the ones of Iannotti (2007) and Athanasoglou (2008).

The results also show that the dummy associated to 2008 is significant in statistical terms, this meaning that 2008 was a problematic year for the Portuguese banking system.

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The Z-score reacts negatively to the bank size or dimension; an increase of 1% in the bank size decreases the bank profitability (since the sign of the coefficient is negative).The banking performance decreases by 0.051% if the bank size increases by 1%, in accordance to what was said by other authors, namely Naceur (2003), that concluded that the coefficient associated to banking size was significant and with negative impacts on the Net Interest Margins, what suggests that bigger banks have lower profit margins.

The deposits (D), and Liquidity (L), are not significant for explaining bank performance, the same happening with the credit risk (R), thus confirming the empirical evidence found by Iannotta (2007) in his research. The costs or the operational expenses are not significant for explaining the Portuguese banking performance; this result contradicts the evidence found by Athanasoglou (2008) for Greece.

The likelihood redundant test of the individual coefficients gave a qui-square value of 28 (Prob=0.000), this value meaning that we can reject the null of equal intercepts of the individual banks; the results also confirm that the more indicated panel model to explain the banking performance in Portugal is the fixed effect model with a balanced panel. The determination coefficient is very high, 99.9%, and highly significant in statistical terms (Prob=0.00%). The value of the Durbin-Watson statistic is 1.92 this meaning that there are no autocorrelation among the first difference errors. But the errors can have a multicollinearity problem since some of explicative variables are not significant using the usual t test; however, this multicollinearity may not be very serious since the coefficients obtained and the respective signs of the coefficients are in accordance to economic theory and close to others that have been obtained for other nations by different authors.

The random effects model estimated with a balanced model of 29 banks and 127 observations gave a highly significant model with estimates and signs of the estimates similar to the ones got with the fixed effects model; the determination coefficient is still very high 97.4% and significant (Prob=0.000%); the Durbin-Watson statistic is 1,35. The Hausman test gave an observed qui-sq of 7 and a Prob. of 67.6%, rejecting the null H0 and confirming the results of the redundant test in what concerns the best adequate model to test the Portuguese banking performance: the fixed effects model.

The GOB variable, a dummy one (GOB=1 if the bank is pubic and GOB=0 elsewhere), was used to test if there are possible effects derived from the ownership of the

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bank; the results showed no empirical evidence that the public banks are less efficient in performance terms since the coefficient of the variable is not significant at the usual significance levels, thus in contradiction to what was written by some literature, namely by Iannotta (2007), that said that the public banks have lower levels of profitability, are less efficient and have lower performances.

If we use a non balanced panel – with fixed or random effects – the results do not differ significantly. The fixed effects model (model 3) show a positive association between the banking performance and its capital, profit, loan portfolio, productivity and interest rate. The results show that if we increase capital by 1% then banking performance increases by 0.89% with all the rest kept unchanged (ceteris paribus hypothesis), this meaning that the performance-capital elasticity is 0.89%. With a similar reasoning we can say that the banking Z-score performance increases by 0.029% if profitability increases by 1% with all the rest kept constant Profitability (F); increases by 0.133% if productivity (P) increases by 1%, and increases by 0.028% if the interest rate (T) increases by 1%. All these variations are estimated keeping all the other variables constant (ceteris paribus). These results are also in accordance with the ones published by the specialized literature, namely by those of Iannotta (2007) and Athanasoglou (2008), among others.

The Z-score reacts negatively to an increase in the bank size – an increase on the bank size decreases bank rentability (the coefficient is negative).The coefficient of the D2008 variable (dummy variable) is negative and significant in statistical terms what means that this year is not a typical one for the Portuguese banking system. If the size of the bank measured by the logs of the real assets(S) increases by 1% then the banking performance decreases by0.822%. This result was also found by Naceur (2003), author that found a significant coefficient for this variable and concluded that the banking size has negative impacts on the net interest margin, suggesting that greater banks have lower margins. The deposits (D), liquidity (L), and also loans (L) are not significant in the Portuguese banking performance; the same happens with the credit risk (R), as was pointed also by the Iannotta (2007) research. Contrary to the empirical evidence found by Athanasoglou (2008) for Greece, the operating costs are not significant in Portugal.

The redundant likelihood ratio test to the individual intercepts gave a qui-squared value of 34 with a Prob.=0.0000; these values mean the rejection of the null hypothesis that the coefficients (intercepts) are not equal for all the banks and this means also that the adequate panel data model to explain the Portuguese banking performance is the fixed

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effect one. The determination coefficient is 99.88% and is highly significant (since Prob=0.00%). The Durbin-Watson d statistic is now 1.68. These problems of multicollinearity among some explicative variables can be real since some of these variables continue to have no significant coefficients, including in this case loans (L). However, it could not be a serious problem since the signs and values of the coefficients are correct and similar to others obtained by other authors for different countries.

Model 4 is a random effect one estimated with a non balanced model of 35 banks and 144 observations; the estimates are also highly significant with values and signs very close to the ones of the balanced random effect model; the determination coefficient is 96.4% and significant (Prob=0.000%); the Durbin-Watson coefficient is now 1.11 (showing positive autocorrelation among the errors). The Hausman test that tests the correlation among the intercepts and the explicative variables got a qui-squared value of 6 (Prob.=48%); thus we don't reject the null and conclude, according to this test, that the most adequate model to explain banking performance in Portugal is the fixed effect model.

It is worth noting that the minimum values of the Z-score are the Portuguese banks BPP and BPN, the first of which went into liquidation, the second was nationalized by the Portuguese Government and is going to be sold.

V. Concluding Remarks and Policy Implications

The banking system has been suffering big changes in its activity, from the services and products that are offered to the clients, to the regulation process (or not) that tries to follow the development and the progressive banking activity, till the markets integration in a unique global market; banks assume an important role in the financial intermediation.

From this research we can get some conclusions related to the Portuguese banking system and their resistance to the financial disturbances occurred in 2008. The results show that the fixed effect model is the best panel data model to study the Portuguese banking performance, this conclusion being the same with the balanced or unbalanced panel data, as is shown by the redundant test for the fixed effects' model or by the Hausman test for the random effects' model. The R2=99.9% is very high and highly significant (Prob=0.00). Although there are some variables or indicators such as the Credit Risk, Deposits, Operating Costs, Liquidity, the dummy variables associated to the

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ownership of the banks and the years2007and 2009, whose coefficients are not significant the truth is that all the other remaining variables are significant in statistical terms. The estimates encountered for the parameters show that there are a positive association between the banking performance and the following set of variables: capital, profit, productivity and interest rate; the association is negative in the case of the banking size. The dummy variable related to the year 2008 is also significant in statistical terms showing that this year was a problematic year, reason why we can say that Portugal was not immune to what happened in the financial world during 2008. It is also worth noting that in general these results are consistent with the specialized literature, particularly with Iannotta et al. (2007) and Athanasoglou et al. (2008), among others. Although the tests have advised the use of the fixed-effects model if we use the random-effects model, regardless of whether it is balanced or an unbalanced panel the values of the estimated coefficients and their signs are about the same. The only difference between the balanced and unbalanced panels is that in the latter loans are no longer significant in statistical terms, what happens in the case of the random-effects' case, too.

The results of the fixed effects model, show that if the capital increase by 1%, the bank performance measured by the Z-Score, increases by 0.88% (the elasticity value) keeping all other indicators unchanged (ceteris paribus assumption). Similarly, keeping all the rest constant the performing bank increases by 0,025% if loans (L) increase by 1%, it increases by 0.051%if profitability (F)increases by 1%,and increases by 0.00028% if banking productivity (P) increases by 1%,and improves0.01759% if interest rate(T)increase also 1%(always assuming the ceteris paribus assumption).

With this study it was possible to identify the risks to which the banking system is exposed. It was possible to specify the structural factors of the Portuguese banking performance using accounting and macroeconomic data taken from the period2005 to 2009 to estimate the model with the GLS method. This period was justified by the need to capture the adverse shocks as the international financial crisis of 2008, which conducted to the bankruptcy of many banks all over the world, by changes in the banking sector, given the policy measures taken, including in Portugal, to help banks that were bankrupt.

We made a survey of all banks with resources of clients and assessed their performance rather than study the more profitable banks; although there is a positive relationship between these variables, not all banks with higher profitability have better

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performance. It is worth to remember that after the2008 financial crisis, the safety of the deposits from savers and investors has increased.

As could have been anticipated by the earlier estimation of the pooling cross-section of the 36 banks, the results suggest that the change in the Portuguese banking performance depend positively on the capital ratio, return on assets, productivity and interest rate. In contrast, the bank performance is negatively influenced by the size, a result contrary to the one of McAllister and McManus (1993) and to the expression "too-big-to-fail": indeed it is not clear in the Portuguese case, that the largest banks are necessarily those that perform better. The amount of deposits and credit risk have not proved to be significant, reason why it can be concluded that the adverse shock of the financial crisis occurred in 2008 (confirmed by the significance of the dummy variable, D2008) was cushioned by the level of capital, return on assets, productivity and gains from the interest rate rise occurred during the previous years.

This study confirmed that the minimum values taken by Z-score correspond to the year 2008 and relate to two critical banks: BPP, and BPN, the first one already went to bankruptcy and the second was nationalized and is now being sold.

As for the security of deposits it should be noted that banks with better banking performance, are banks that do a better management of risks to which they are exposed. We conclude, consistent with the already observed by the supervisors, that there is a lack of regulations and difficulties in risk assessment. In accordance to what was already seen by the regulators it is seen that there is a lack of regulation rules and there are difficulties to evaluate risk; it is hoped that the new agreement that is being prepared help to build a more stable financial system, and above all more transparent. From this new regulation and from the Basel III agreement expected for the end of2012, we expect a greater scrutiny of the items of the balance involving a more rigorous valuation of assets and liabilities as well.

Acknowledgments

Financial support from the NECE - Research Unit in Business and Economic, sponsored by the Foundation for the Development of Science and Technology (FCT), is gratefully acknowledged.

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APPEND

Table 1- Table of variables, measures, ratings and expected signs

Indicators	Measures	Notations	Expected Effect
Dependent variable			
Z-score	Measure of the bank risk	Z	……
Equity to assets			
Independent Variables/Explanatory Variables			
Specificities of the banks			
Profit	Net profits before taxes/ROA	F	Positive
Capital	Equity/assets	K	Positive
Deposits	Deposits to assets	D	?
Loans	Loans/total earnings assets	L	?
Credit risk	Loan loss provision/loans	R	Negative
Liquid	Liquid assets/total assets	Q	?
Productivity	Inflation adjusted gross total revenue/personnel	P	Positive
Operational expenses	Operation expenses/assets	X	Negative
Size	Real assets[2] in logs	S	?
Specificity of the banking services			
Gob	v. dummy (1 if public, 0 if private)	G	Negative
List	v. dummy (B=1 if the bank is quoted and B=O if not)	B	?
Macroeconomics			
Interest rate	Euribor - 12 months (average)	T	?
Years	Dummy variables for each one of the years D=1 for the year and 0 for the others	D2007, D2008, D2009	?

Source: Adapted from Athanasogu et al. (2008, p. 127).

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Table 2- DescriptiveStatistics

t	Z	K	R	D	X	G	L	B	Q	F	P	S	T
Mean	21.1362	0.091014	0.022474	0.358140	0.020288	0.072727	0.530046	0.090909	0.012153	0.007651	216.9457	12.6540	0.033467
Median	16.3660	0.062337	0.012271	0.349245	0.016058	0.00000	0.610740	0.000000	0.008518	0.006651	170.9551	12.5507	0.034368
Maximum	193.6874	0.528787	0.252031	0.914471	0.114718	1.00000	1.1394	1.00000	0.095696	0.049313	1108.0760	15.9858	0.048142
Minimum	-10.2906	-0.302133	0.00000	0.00000	0.001246	0.00000	0.001877	0.000000	0.000000	-0.062858	-127.9033	9.0013	0.016178
Std.Dev.	23.3733	0.094661	0.039722	0.257691	0.016905	0.260479	0.329406	0.288355	0.014306	0.013781	151.7554	1.5812	0.012158
Skewness	4.5088	1.5564	3.9569	0.318440	2.9006	3.2907	-0.142479	2.8461	2.6398	-1.1864	2.2331	0.305527	-0.170908
Kurtosis	30.4984	10.9556	19.5828	2.2330	14.6649	11.8284	1.5964	9.10000	12.6724	10.2774	10.5955	2.7495	1.4725
Jarque-Bera	5757.654	501.7495	2321.1060	6.8335	1166.8490	833.6276	14.1019	478.5688	834.8302	402.8115	533.7654	2.9983	16.8447
Prob.	0.00000	0.00000	0.00000	0.03282	0.00000	0.00000	0.000867	0.00000	0.00000	0.00000	0.00000	0.223318	0.00022

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Sum	3487.478	15.0172	3.7082	59.0931	3.3475	12.000	87.4576	15.0000	2.0052	1.2624	35796.0400	2087.9010	5.5221
Sum Sq.Dev.	89594.99	1.4695	0.258770	10.8904	0.046870	11.1273	17.7953	13.6364	0.033562	0.031146	3776872.0	410.0324	0.0242241
Observations	165	165	165	165	165	165	165	165	165	165	165	165	165
Cross-sections	36	36	36	36	36	36	36	36	36	36	36	36	36

Table 3- Results of the regression estimations- fixed and random effects' models, balanced and unbalanced panels data

Variable		**Model**	**(1)**	**Model**	**(2)**	**Model**	**(3)**	**Model**	**(4)**
		Coefficient	t-stat	coeff	t-stat	coeff	t-stat	coeff	t-stat
Const	C	6.051837	2.743721*	5.814613	2.323396*	2.918618	1.029034*	3.131245	1.078952*
Capital	K	0.881895	3.795786*	0.884487	3.827862*	0.898837	3.57454*	0.890643	3.485014*
Credit risk	R								
Deposits	D								
Op. Expenses	X								
Gov.	G	NA					NA		
Loans	L	0.025289	2.425011**	0.025804	2.480382**				
List	B	NA		0.865574	2.038181**		NA		
Liquid	Q								
Profitability	F	0.050712	9.985007*	0.051054	1.001504*	0.02906	6.123548*	0.028372	5.958231*
Productivity	P	0.000283	5.964797*	0.000276	5.843904*	0.13299	7.6205*	0.13961	7.911728*
Size	S	0.051864	-2.490153**	-0.044049	-2.145314**	-0.822113	-2.787092*	-1.020792	-3.342513*
Taxes	T	0.01759	2.159725**	0.017832	2.19056**	0.027815	3.171611*	0.026635	3.029398*
Dummy 2007	D7								
Dummy 2008	D8	0.021372	-2.4936**	-0.022205	-2.592746**	-0.01388	-3.439899*	-0.013161	-3.25506*
Dummy 2009	D9								
R-squared		0.999022		0.973992		0.998824		0.964013	
F-stat.		2.656681		5.523847		2.187762		6.116602	
Prob(F)		0.000000		0.000000		0.00000		0.00000	
DW stat.		1.520173		1.354153		1.681718		1.119067	
Likelihood ratio		df	Prob.			df	Prob.		

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Cross-sect		28.91	0.00000			34.103	0.00000		
Cross-Sec. Qui-sq		28	0.00000			34	0.00000		
Hausman test				Qui-sq. df	Prob			Qui-sq. df	Prob
Cross-section random				7	0.6764			6	0.0019
N. obs.		127		127		144		144	
N. banks		29		29		35		35	

a) Dummy variables (1) Balanced panel – fixed effects; (2) balanced panel – random effects; (3) unbalanced panel – fixed effects; (4) unbalanced panel – random effects.*, **, *** Significant at the levels of significance of 1%, 5% and 10%, respectively.

Table 4- Fixed effects obtained with the balanced panel model

Fixed Effects (Cross)		BEST--C	-1.041.660	BSN--C	0.008566
ABANK--C	-0.282265	BIG--C	-0.082539	BST--C	1.343.611
BAC--C	0.570006	BII--C	-0.308288	CBI--C	0.394068
BAI--C	0.465329	BINV--C	-1.777.026	CGD--C	0.754090
BANIF--C	0.747892	BMAIS--C	-1.175.871	CREDIFIN--C	-0.804760
BANIFI--C	0.206706	BPG--C	-1.128.010	DBANK--C	0.818591
BBVA--C	0.169664	BPI--C	0.692411	FINANT--C	-0.653394
BCP--C	0.637739	BPINV--C	-0.062288	FINIB--C	-0.196161
BES--C	0.881578	BPN--C	-1.842.925	ITAU--C	0.713001
BESI--C	-1.250.650	BPOP--C	0.557873	SANTCON--C	-0.064075