Factors Influencing the Profitability of EU Banks' Before and During the Financial Crisis

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Abstract

This research aims at examining the effect of credit risk on financial performance of the EU banks. Return on Asset (ROA) and Return on Equity (ROE) which are dependent variables were used as financial performance indicators. Capital Adequacy Ratio (CAR), Non-Performing Loan (NPL), Loan Loss Provision (LLP) and Loan to Debt (LTD) which are independent variables were used as credit risk indicators. This study concludes that Return on Asset and Return on Equity both has been found to have significant effect on profitability. Capital Adequacy Ratio positively impacted banks' financial performance with the exception of Non-Performing Loan and Loan Loss Provision which were found to have a negative impact on the banks' profitability. Also, Loan to Debt generally was not significant to explain EU banks' profitability. Shortly, EU banks profitability has been affected positively with better credit risk of these banks. Additionally, credit risk committees should take Inflation and Gross Domestic Product level into account. While Gross Domestic Product level had a negative impact on EU banks' profitability, Inflation had a positive effect on the EU banks' profitability.

Keywords: Credit Risk, Performance, Panel Data Regression, EU Banks, Before and During the Crisis.

Avrupa Bankalarının Kriz Öncesi ve Kriz Sonrası Kârlılığını Etkileyen Faktörler

Öz

Bu çalışmanın amacı, Avrupa bankalarının kredi risklerinin finansal performans üzerindeki etkilerini araştırmaktır. Aktif getiri oranı (ROA) ve özkaynak getiri oranı (ROE) bağımlı değişkenler olup finansal performans göstergeleri olarak kullanılmıştır.

DOI: http://dx.doi.org/10.17336/igusbd.64827
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Sermaye yeterlilik oranı (CAR), batık krediler (NPL), kredi kayıp karşılığı (LLP) ve borçların krediye oranı (LTD) ise bağımsız değişkenler olarak alınmış olup kredi risklerinin ölçümünde kullanılmıştır. Bu çalışmada, banka kârlılık göstergeleri olan ROA ve ROE her ikisinin de kredi riski ile önemli ölçüde ilişkili olduğu ortaya çıkmıştır. CAR banka performansını pozitif yönde etkilerken NPL ve LLP negatif yönde etkilemektedir. Ayrıca LTD ile banka kârlılığı arasında önemli bir ilişki bulunamamıştır. Kısaca, Avrupa'daki bankaların kârlılığının yüksek olması daha iyi bir kredi risk yönetiminden geçmektedir. Bunun yanında INF ve GDP ayrıca göz önünde bulundurulmalıdır. GDP negatif bir etkiye sahip iken INF pozitif bir etkiye sahiptir.

Anahtar Kelimeler: Kredi Risk, Performansı, Panel Data Regresyonu, EU Bankaları, Kriz Öncesi ve Sonrası.

1. Introduction

The consequences of the global economic crisis require banks to improve better credit risk strategies. Particularly, the absence of effective credit risk is one of the determinants that generated the current financial crisis. Higher capital requisites and liquidity protections are targeted by supervisory bodies. Hence, there is global increase in the cost of banking business. It is highlighted by Njanike[1] (2009) that primary cause of the banking crisis is a poor quality credit risk system. This is identified by speculative loans, sophisticated insider loans and high concentration of credit in particular sectors among others.

Both scholars and professionals emphasize credit risk as one of the important subjects of the current financial studies. Actually, directly after the current global economic crisis this debate was more highlighted. Some of the scholars acknowledge that one of the essential reasons of harsh banking trouble is inactive credit risk control. Considering the supply of credit risk as the fundamental business of every bank, credit quality is the main indication of financial trustworthiness and healthiness of banks.

There is a debate on the relation between profitability and credit risk on the finance literature and this presents a subject of high significance to finance professionals and scholars. As credit financing is the main activity of every bank (key players in the money market) this topic preserves its importance. Furthermore, the argument can be supported by the six major kinds of risk of

[1] K. Njanike, "The Impact of Effective Credit Risk Management on Bank Survival", *Annals of the University of Petrosani, Economics*, vol. 9, issue 2, 2009, pp. 173–184.

the bank theory and these risks are connected with credit policies of banks. These are portfolio risk, credit risk, credit deficiency risk, interest risk, trade union risk and operating risk. However the most significant of these risks is the credit risk, therefore it is worthwhile to give it a particular attention in financial management research.

2. Literature Review

There have been arguments on the effect of credit risk and bank's financial performance. Some researchers (Liyugi; 2007[2], Naceur and Kandil[3]; 2006, Kithinji[4]; 2010, Kolapo[5] *et al.*; 2012) amongst others have done extensive studies about the related issue. As a result of their studies mixed results have been found. While some of them found that both credit risk and bank's financial performance affects each other positively, some found that credit risk effects banks financial performance, negatively. Especially, there is significant relationship between credit risk and bank's performance (Kargi[6], 2011). The Nigeria banks were selected between the period of 2004 and 2008. This study highlights that non-performing loan and loans and advances that are major variables, determine bank's asset quality.

Kolapo, Ayeni and Ojo (2012) found that the nature and individual firms' design do not determine the effect. Also, the impact of credit risk on banks' profitability level was rearticulated (Hosna, Manzura and Juanjuan[7], 2009) and Boahene, Dasah and Agyei[8], 2012). They found that the higher

[2] Yuqi Li, "Determinants of Banks' profitability and its implication on Risk management practices: Panel Evidence from the UK in the Period 1999-2006", University of Nottingham, 2007.
[3] S. Ben-Naceur and M. Omran, "The Effects of Bank Regulations, Competition and Financial Reforms on MENA Banks' Profitability", *Economic Research Forum Working Paper No. 44,* 2008.
[4] A. M. Kithinji, "Credit Risk Management and Profitability of Commercial Banks in Kenya", School of Business, University of Nairobi, 2010.
[5] T. F. Kolapo, R. K. Ayeni and O. Oke, "Credit Risk Management and Banks Performance", *Australian Journal of Business and Management Research,* 2012.
[6] H.S. Kargi, "Credit Risk and the Performance of Nigerian Banks", AhmaduBello University, Zaria, 2011.
[7] A. Hosna, B. Manzura and S. Juanjuan, "Credit risk management and profitability in commercial banks in Sweden", School of Business Economics and Law, 2009.
[8] S. H. Boahene, J. Dasah, and S. K. Agyei, "Credit risk and profitability of selected banks in Ghana", *Research Journal of finance and accounting,* 2012.

capital requirement supports the profitability of bank, positively. Muhammed[9] *et al.* (2012) also highlighted that credit risk has a significant effect on banks' profitability.

The relationship between credit risk and bank's profitability in the UK was investigated by Liyugi (2007). The result of this research clearly showed that the profitability of the bank have been affected negatively by credit risk and liquidity. Another research has been done in 2012 by Onaolapo[10] and this research was focused on the Nigerian commercial banking sector between 2004 and 2009 for the analysing the credit risk efficiency. The result is quite interesting as it found minimum causation between performance of the bank and deposit exposure. Also, the impact of credit risk was analysed by Kithinji (2010) and the result showed that commercial banks' profit enhancement is not impacted by non-performing loan and the amount of credit. The implication is that other variables separate from credit and non-performing loans influence on profitability of banks. Kithinji (2010) result contributes the logic to take other variables, which could effect on the performance of bank into account.

Another study by Felix and Claudine[11] (2008) examined the relationship between credit risk and bank's performance. It could be taken out their findings that ROA and ROE, which are both measuring profitability, were vice versa related to non-performing loan therefore cause a decrease in profitability. Ahmad and Ariff[12] (2007) investigated the key determinants of commercial banks' credit risk on emerging economy banking systems bench marking developed economies. The result showed that regulation is significant for banking systems that offer services and multi-products. Also, in emerging economies, the quality of management is important in the cases of loan-dominant banks. An enhance loan loss provision is also considered to be an important determinant of potential credit risk. However, the research showed that credit risk in developed economy banks is less than that in emerging economy banks.

[9] Muhammed Nawaz, Shahid Munir and Shahid Ali Siddiqui, Tahseen-Ul- Ahad, Faisal Afzal, Muhammad Asif, Muhammad Ateeq, "Credit risk and the performance of Nigerian banks", *Interdisciplinary Journal of contemporary research in business*, 2012.
[10] A. R. Onaolapo, "Analysis of credit risk management efficiency in Nigerian commercial banking sector", *Far East Journal of Marketing and Management*, 2012.
[11] A. T. Felix, T. N. Claudine, "Bank Performance and Credit Risk Management", Masters Dissertation in Finance, University of Skovde, 2008.
[12] N. H. Ahmad and M. Ariff, "Multi-country Study of Bank Credit Risk Determinants", *International Journal of Banking and Finance,* 5 (1), 2007, pp. 135-152.

Even though several studies have been carried out in developing countries, especially to investigate the influence of bank's performance and capital requirement, minority of these studies explored the capital requirement and performance in other developing countries focused on capital adequacy taking credit risk in a united framework into account. At the same time, Guidara *et al.* (2010) investigated the banking regulation in Canada, and bank performance, risk and capital buffer under business cycles. This study educed that there is strong capitalization in Canadian banks. Therefore, Canadian banks were protected for global financial crisis. Another study investigating the influence of capital requirement on bank performance is conducted in Egypt (Naceur and Kandil; 2006). The findings of the study supported the findings of Guidara *et al.* (2010), which emphasize the significance of capital regulation to bank's performance. Also, another suggestion of Naceur and Kandil (2006) is that the state of the economy is a main determinant bank performance.

Additionally, Flamini[13] et al. (2009) highlighted that credit risk, higher returns on assets are related with private ownership, activity diversification and larger bank size. The result also illustrates moderate persistence in profitability. However, Athanasoglou[14] et al. (2005) investigated the influence of macroeconomic, industry and bank specific determinants of bank profitability. According to Athanasoglou et al. (2005), profitability persists to a balanced size. It demonstrates departures from completely competitive market structures which may not be that large. With exclusion of size, all banks specific determinants influence bank profitability significantly in the expected way.

On the other hand Demirguc and Huizinga[15] (1998) investigated determinants of commercial bank interest margins and profitability. Lower

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[13] V. Flamini, C. McDonald,, L. Schumacher, "The Determinants of Commercial Bank Probability in Sub-Saharan Africa" [online], IMF Working Paper, 09, 15, (2009), Available from: https://www.imf.org/external/pubs/ft/wp/2009/wp0915.pdf [Accessed: 01/01/2014].

[14] P. P. Athanasoglou, S. N. Brissimis, M. D. Delis, "Bank Specific, Industry Specific and Macroeconomic Determinants of Bank Profitability", [online], No: 25, (2005), Available from: http://www.sciencedirect.com/science/article/pii/S1042443106000473 [Accessed: 01/01/2014].

[15] A. Demirguc, H. Huizinga, "Determinants of Commercial Bank Interest Margins and Profitability: Some International Evidence", [online], 1998, Available from: http://econ.worldbank.org/external/default/main?pagePK=64210502&theSitePK=4

profits and margins are provided by a lower market concentration and a bigger bank asset to GDP ratio. In developing and developed countries the situation is different in terms of foreign banks. In developing countries one margins and profits are higher in foreign banks as opposed to domestic banks however in the developed countries domestic banks have higher margins and profits.

Generally, the research (Ravindra[16] *et al.*; 2008) investigated the influence of capital adequacy on bank's performance found out that capital adequacy improves performance. Although, the demonstrations on contemporary effect of capital adequacy on banks performance may be combined, it is possible that capital adequacy can influence on banks profit by buffering the influence on loan losses.

3. Methodology

Previous credit risk researches have mostly conducted a quantitative research with the effective and practical use of statistical analysis (Matthews[17], 2013). Two principal reasons for banks' credit risk are: to decrease loan losses (bad debts) which result from credit default and to enhance interest income (profitability) (Schuller[18], 2008).

The determinants of banks profitability and its implications on risk practices in the United Kingdom were investigated by Liyugi (2007). This study highlights regression analysis on a time series data between 1999 and 2006 using six measures of determinants of bank's profitability. Liquidity, capital and credit were used as performance's internal determinants, while interest rate, GDP growth rate and inflation rate were used as external determinants of banks profitability. Combination of six variables is used to gain one overall composite index of bank profitability and bank's performance indicator was Return on Asset (ROA).

69372&piPK=64210520&menuPK=64166093&entityID=000009265_3980429111510 [Accessed: 01/01/2014].

[16] Y. Ravindra, R. K. Vyasi, S. Manmeet, "The impact of capital adequacy requirements on performance of scheduled commercial banks", *Asian-Pacific Business Review,* 2008.

[17] K. Matthews, "Risk Management and Managerial Efficiency in Chinese Banks: A Network DEA Framework", *Omega,* Vol. 41, No. 2, 2013, pp. 207-215.

[18] B. Schuller, "Bank Performance and Credit Risk Management", University of Skovde, 2008.

Another study by Al-Khouri[19] (2011) evaluated the effect of bank's specific risk characteristics. The overall banking environment on the performance between 1998 and 2008 was analysed by using fixed effect regression.

The influence of credit risk on the profitability of Nigerian banks was assessed by Kargi (2011). The annual reports and sampled banks' accounts from 2004-2008 were used to collect financial ratios as criterion of credit risk and bank performance. Additionally, regression techniques, correlation and descriptive techniques were used to analyse the data.

The regression model is used to gather data from annual reports. Descriptive, correlation and regression methods employed to investigate whether credit risk affect banks performance in Nigeria from 2004 to 2008 by Muhammed et al (2012). This study was conducted by using same methods and period with the Kargi (2011). Both focused on Nigerian banks which are 6 banks. While ROA are used as performance indicator, non-performing loan to loan and advance and loan and advance to total deposit are used as credit risk indicators.

On the other hand, same methods which are descriptive, correlation and regression methods, employed for the impact of the credit risk in bank's financial performance in Nepal by Poudel[20] (2012), Kargi (2011) and Muhammed et al (2012). Poudel focused on the period from 2001 and 2011 because banking industry has undergone various change. 31 Nepal banks were chosen, it means this investigation has more observations and it seems more reliable than other two studies. Although Poudel's (2012) study has ROA as profitability indicator like others, independent variables which are cost per loan assets, capital adequacy ratio and default rate, are different than other's independent variables. Calculation of each year's profitability is included for the period of study, also by comparing the profitability ratio to default rate trend analysis was employed.

The effect of credit risk on the profitability of commercial banks in Kenya was examined by Kithinji (2010). Data from 2004 to 2008 were included on the amount of credit, profits and level of non-performing loans. To

[19] R. Al-Khouri, "Assessing the Risk and Performance of the GCC Banking Sector", *International Journal of Finance and Economics,* Issue 65, 2011, pp. 72-8.
[20] R. P. S. Poudel, "The impact of credit risk management in financial performance of commercial banks in Nepal", *International Journal of Arts and Commerce,* 2012.

demonstrate connection between above cited during the period of study regression model was used.

Another regression model study by Hosna, Manzura and Juanjuan (2009) re-emphasized the effect of credit risk on profitability level of four Sweden banks. Compared to the Kithinji's (2010) study, while Hosna et al (2009) uses Return of Equity as a measure of bank's performance, Kithinji (2010) uses net profit to total asset (ROTA) as a measure of bank's performance. Also, Hosna et al. (2009) uses a ratio of non-performing loans to total asset as proxy for credit risk. Due to the time period Hosna et al (2009) has a more observations and therefore more reliability.

Also, CAMEL (capital adequacy, asset quality, management efficiency and liquidity) indicators are used as independent variables; return on equity is used as a proxy for banks performance by Jackson[21] and Fredrick[22] (2011, 2010). The multiple regression model was chosen by both of them. 42 commercial banks were chosen from Kenya for period of 5 years by Fredrick (2012). The other study demonstrates that regression analysis is used for the investigation of the credit risk efficiency in Nigerian commercial banking sector from 2004 through 2009 by Onaolapo (2012). Compared to the Fredrick's (2012) study, Onaolapo's (2012) research is analysing the data for one more year and also Onaolapo (2012) has two dependent variables which are operating efficiency and deposit exposure.

In addition, regression analysis is used by Boahene et al. (2012) in order to decide whether there is a significant relationship between credit risk and profitability of Ghanaian banks.

The unbalanced panel data regression is used to roughly calculate Ben-Naceur and Omran (2008). 173 banks from Middle East and North Africa over the period 1989 and 2005 were selected and net interest margin, operating efficiency and ROA were used as bank performance indicators. Also, cross-section and time series data were combined for the three reasons. First, it is necessary to use methodology because time series dimension of variables of interest ensure prosperous information disregarded in cross-sectional studies. Second, the sample size increases with the use of panel data. Third, the issues

[21] O. Jackson, "The impact of credit risk management on financial performance of commercial banks in Kenya", University of Nairobi, 2011.
[22] O. Fredrick, "The impact of credit risk management on financial performance of commercial banks in Kenya", *DBA African Management Review,* 2010.

that are underestimated by cross-section regression are used by panel data estimation.

On the other hand, another study by Epure and Lafuente[23] (2012) employed an unbalanced panel that surrounds all state, mutual, private and corporative banks that take part in the market. Hence, the overall analysed sample consists of 663 firm-year observations for the period of 1998 and 2012. Thus, Epure and Lafuente (2012) has more realistic results than Ben-Naceur and Omran (2008), because Epure and Lafuente's (2012) research includes the period of financial crisis.

Furthermore, 389 banks in 41 Sub-Saharan Africa countries over the period 1998-2006 were examined by Flamini (2009). Also, panel data analysis was used for the examination of this study. Flamini (2009) used profitability as depended variable, size, capital, credit risk, cost management, activity mix market power and ownership as bank specific determinant, and wealth, cyclical output, inflation, fuel price, nonfuel commodity price and regulatory environment as macroeconomic determinants.

Additionally in Athanasoglou et al. (2005) an empirical framework is used to investigate bank profitability and this framework combines the traditional Structure-Conduct-Performance (SCP) hypothesis. To account for profit persistence, they apply a GMM technique to a panel of Greek banks that covers the period 1985-2001.

However, Demirguc and Huizinga (1998) examined the commercial bank interest margin and profitability with some international evidence, using bank level data for 80 countries in the 1988-1995 periods. Regression analysis was used for the examination of the study.

Furthermore, Ahmad and Ariff (2007) used cross-sectional data of individual bank balance sheet and income statements. The first focus of this study is Australia, France, Japan and the US which are developed economies. Their second focus is India, Korea, Malaysia, Mexico and Thailand which are emerging economies. Apart from being in different economic settings, the reason of choosing these countries is their operations under different market structures and banking systems. Merely, data from commercial banks were included to acquire a homogenous group of financial institutions. Non-

[23] M. Epure and I. Lafuente, "Monitoring Bank Performance in the Presence of Risk", *Barcelona GSE Working Paper Series,* No.61, 2012.

performing loan to total gross loan is used as dependent variable and nine independent variables are used differently from other researches.

Another investigation of credit risk efficiency of 34 Taiwanese commercial banks over the period 2005-2008 has done by Chen and Pan[24] (2012). With the purpose of credit risk evaluation, Chen and Pan (2012) used financial ratio and Data Envelopment Analysis (DEA). Credit risk technical efficiency (CR- TE), credit risk allocative efficiency (CR-AE), and credit risk cost efficiency (CR-CE) were the credit risk parameters of the study.

3.1 Panel Data

In financial modelling, data comprises mostly both time series and cross-sectional elements, and such a dataset would be known as a panel data or longitudinal data. Information across both time and space will be embodied by a panel data analysis. Significantly, same individuals or objects (hereafter will be called 'entities') are kept by a panel and measurement of some quantity about them is provided over time.

Econometrically, the setup we may have is as described in the following equation:

$$Y_{it} = \alpha + \beta X_{it} + U_{it} \qquad (1)$$

Where Y_{it} is the dependent variable, α is the intercept term, β is a $k \times 1$ vector of parameters to be estimated on the explanatory variables, and X_{it} is a $1 \times k$ vector of observations on the explanatory variables, $t = 1, 2, 3 \ldots\ldots T$; $i = 1, 2, 3 \ldots\ldots N$.

Mainly, there are two classes of panel estimator approaches that can be used in financial research: Fixed Effects models and Random Effects models. The simplest types of fixed effects models allow the intercept in the regression model to differ cross-sectional but not over time, while all of the slope estimates are fixed both cross-sectional and over time.

3.1.1 Fixed Effects Model

The equation (1) above can be taken, and decomposed the disturbance term, U_{it}, into an individual specific effect, μ_i and the 'remainder disturbance',

[24] K. Chen and C. Pan, "An Empirical Study of Credit Risk Efficiency of Banking Industry in Taiwan", *Web Journal of Chinese Management Review, 15 (1),* 2012, pp. *1-16.*

U_{it}, that varies over time and entities (capturing everything that is left unexplained about Y_{it}).

$$U_{it} = \mu_i + U_{it} \quad (2)$$

Therefore equation (1) could be rewritten by substituting in for U_{it} from (2) to obtain:

$$Y_{it} = \alpha + \beta X_{it} + \mu_i + U_{it} \quad (3)$$

μ_i as encapsulating all of the variables that affect Y_{it} cross-sectional but do not vary over time can be thought of. Dummy variables can calculate this model and it would be described by the least squares dummy variable (LSDV) approach:

$$Y_{it} = \beta X_{it} + \mu_1 D1_i + \mu_2 D2_i + \mu_3 D3_i + \ldots\ldots\ldots + \mu_N DN_i + U_{it} \quad (4)$$

Where $D1_i$, $D2_i$, $D3_i$ …… DN_i are dummy variables that take the value 1 for all observations on the 1, 2, 3 …… N entity and zero otherwise.

3.1.2 Time-fixed Effects Models

Instead of an entity fixed effects model there is possibility of having a time-fixed effects model. Such a model could be used where we thought that the average value of Y_{it} changes over time but not cross-sectional. Hence, with time fixed effects, the intercepts would be admitted to change in time but would be presumed to be identical across entities at each given point in time. A time-fixed effects model could be written as

$$Y_{it} = \alpha + \beta X_{it} + \lambda_t + U_{it} \quad (5)$$

Where λ_t is a time-varying intercept that captures all of the variables that affect Y_{it} and that vary over time but are constant cross-sectionally. Time variation in the intercept terms can be permitted for in completely the identical way as with entity-fixed effects. That is, a least squares dummy variable model could be calculated:

$$Y_{it} = \beta X_{it} + \lambda_1 D1_t + \lambda_2 D2_t + \lambda_3 D3_t + \ldots\ldots\ldots + \lambda_T DT_t + U_{it} \quad (6)$$

$D1_t$, denotes a dummy variable that takes the value 1 for the first time period and zero elsewhere, and so on. The only variation is that now, the dummy variables catch time variation instead of cross-sectional variation.

Lastly, it is possible to allow for both entity-fixed effects and time-fixed effects within the same model. Such as model would be termed a two-way

error component model, which would combine equation (3) and (5), and the LSDV equivalent model would contain both cross-sectional and time dummies

$$Y_{it} = \beta X_{it} + \mu_1 D1_i + \mu_2 D2_i + \mu_3 D3_i + \ldots\ldots + \mu_N DN_i + \lambda_1 D1_t + \lambda_2 D2_t + \lambda_3 D3_t + \ldots\ldots + \lambda_T DT_t + U_{it} \quad (7)$$

3.1.3 The Random Effects Model

The error components model is another name of the random effects model. As with fixed effects, the random effects approach proposes different intercept terms for each entity and again these intercepts are constant over time, with the relationship between the explanatory and explained variables assumed to be the same both cross-sectionally and temporally.

On the other hand, the random effects model examines differently because he intercepts for each cross-sectional unit are presumed to occur from a ordinary intercept α (which is the identical for all cross-sectional units and in time), plus a random variable ϵ_i that varies cross-sectionally but is constant over time. ϵ_i measures the random deviation of each entity's intercept term from the 'global' intercept term α. We can write the random effects panel model as

$$Y_{it} = \alpha + \beta X_{it} + \omega_{it}, \qquad \omega_{it} = \epsilon_i + U_{it} \quad (8)$$

Where X_{it} is still a 1 × k vector of explanatory variables, but unlike the fixed effect model, there are no dummy variables to capture to the heterogeneity (variation) in the cross-sectional dimension. Instead, this occurs via the ϵ_i terms. Note that this framework necessitates the presumptions that the new cross-sectional error term, $\epsilon_{i,}$ has zero mean, is independent of the individual observation error term (U_{it}) and has constant variance σ_{ϵ}^2 and is independent of the explanatory variables (X_{it}).

3.1.4 Actual Model

The panel data is used to take the form of:

$$P_{it}\ (ROA, ROE) = F\ (Y_{it}, Z_{it}) + e_{it}$$

Where P_{it} represents performance of bank i at time t. Y_{it} is the vector of variable characteristic of bank I at time t. Z_{it} represents features of the banks. e_{it} is the error term.

The empirical framework for the investigation of the connection between credit risk practice and banks' profitability is given as follows:

$$P_{it} = \alpha + \beta_1 CAR_{it} + \beta_2 NPL_{it} + \beta_3 LLP_{it} + \beta_4 LA_{it} + \beta_5 CONT_{i,t} + e_{it}$$

Where;

P_{it} is the probability of the bank i at tome t. Two proxies, namely ROA and ROE, are used for bank probability.

CAR_{it} is the measure of Capital Adequacy Ratio for banks i at time t.

NPL_{it} is the measure of Non-Performing Loans ratio for banks i at time t.

LLP_{it} is the measure of Loan Loss Provision ratio for banks i at time t.

LTD_{it} is the measure of Loan to Debt ratio for banks i at time t.

$CONT_{it}$ is a set of control variables for bank i at time t which are bank size (SIZE), annual GDP level (GDP level) and inflation (INF).

α is a constant

β is a vector of parameters to be estimated.

e_{it} is the error term.

3.1.5 Definitions of Variables

ROA: The ratio of net income to total assets.
ROE: The ratio of net income to shareholders' equity.
CAR: (Tier one capital + Tier two capital) / risk weighted assets.
NPL: A sum of borrowed money upon which the debtor has not made his or her scheduled payments for at least 90 days. A nonperforming loan is either in default or close to being in default. NPL is taken from Bloomberg.
LLP: An expense set aside as an allowance for bad loans (customer defaults, or terms of a loan have to be renegotiated, etc). LLP is taken from Bloomberg.
LTD: Total Loan / Total Debt
Size: Natural Logarithm of Total Assets
GDP Level: The growth ratio of GDP
INF: Inflation rates are taken from Bloomberg

3.1.6 Hypothesis

H_0: The factors have a significant and positive impact on banks' profitability.

H_1: There is a significant and negative effect between banks' profitability and factors.

3.2 Data Source

The panel data (comprising cross-sectional and time series data) for the study were obtained from the Bankscope. Bankscope is a detailed database incorporating information of financial statements, ownerships forms and ratings for over 30,000 banks around the world. The biggest advantage of using Bankscope is its trustworthy customer service and consultancy. Additionally, financial statements provided by Bankscope have been used widely by academic researchers. Hence, it can be argued that Bankscope provides strong validation.

Notes from the annual reports, balance sheets and income statements are used to derive financial information. The different EU banks reflect the cross-sectional elements and time series element is reflected in the period of the study. The primary advantage of using panel data is its allowance of overcoming the unobservable, constant, and heterogeneous characteristic of each bank included in the study are declared by Saona[25] (2011). Data on SIZE, GDP level, and INF were compiled from the Bloomberg.

3.4 Sample Selection

The sample of EU banks is selected using the Bankscope database. These banks classified according to their total assets and random sampling method. The benefit of this method is selecting the sample randomly from the sampling frame. This makes Bankscope data more suitable. By using random sampling process the selection bias is prevented. Thus it can be argued that selected sample represents the whole banks. However, more constantly dispersed selection is provided by simple random sampling through the whole banks for samples of nearly hundred cases.

[25] P. H. Saona, "Determinants of the Profitability of the US Banking Industry", *International Journal of Business and Social Science,* 2 (22), 2011, pp. 255–269.

There are two criteria for the selection of the 80 EU banks from Bankscope database. Following two conditions should be met to be selected into the sample. Firstly, the banks should be classified as private and public active banks in the EU. At the same time these banks should allow wider data availability. Secondly, annual reports for the active banks should be available.

The banks were divided into two groups. First Group of banks' total assets were between $2,500,000 million and $100,000 million. Second Group of banks' total assets were between $100,000 million and $1,000 million. All accounting data of banks are available during the last 10 years. Different EU countries were focused which are France, Germany, UK, Italy, Spain, Sweden, Denmark, Belgium, Norway, Greece, Portugal, Netherlands, Austria, Luxemburg, Ireland, Poland, Finland and Switzerland. 40 banks were selected for each group; therefore the total numbers of 80 banks are obtained. In order to have a wealth of information for the period of 2003-2007 which is pre-crisis and the period of 2008-2013 which is during the crisis were selected.

With the application of first criteria which is active EU banks, 5,685 banks are listed. Application of second criteria which is account availability the number has decreased to 4,633 banks. Hence, 80 banks were selected within these 4,633 banks using Bankscope database.

Shortly, these banks were selected according to the data accessibility. First, 4,633 banks listed from Bankscope than each bank's data checked over 11 years period from Bloomberg, annual report and Bankscope. Especially, different EU countries were considered.

Table 7: Summary of the Sample Selection

Assets ($, million)	No. of Banks	Period
2,500,000-100,000	40	2003-2007 (pre-crisis) 2008-2013 (during the crisis)
100,000-1,000	40	2003-2007 (pre-crisis) 2008-2013 (during the crisis)
Total no. of Banks	80	

4. Findings

4.1 Descriptive Statistics

Summary statistics are provided for EU banks. Table 1 gives information of various observations, means, standard deviations, minimum levels and maximum levels. The table 1 shows 852 and 849 observations out of the 880 observations of a ROA and ROE respectively. It means that out of 880 observations, 97% and 96% of observations reported an ROA and ROE respectively.

ROA and ROE were represented for 80 EU banks for the period between 2003 and 2013. ROA has mean of 0.41 with a standard deviation of 1.309. The low standard deviation of ROA demonstrates that the data points tend to be very close to the mean. While the lower ROA belonged to Banco de Valencia SA from Spain in 2012, the higher ROA belonged to Alpha Bank AE from Greece in 2013.

ROE has a high standard deviation which means the data points are spread out over a large range value. Piraeus Bank SA from Greece had a minimum ROE because of the loss net income according to the other EU banks in 2012. One year later the profitability of this bank increased and had the higher ROE compared to the other EU banks in 2013.

As the table 8 illustrates, compared to other variables of LTD, ROE and LLP presented larger standard deviation with 468.7913, 55.74827 and 45.72144 respectively. Also, 7.32 is the smallest bank size that belongs to FIH Erhvervsbank from Denmark in 2003 A/S, while 16.93 is the biggest banks size which belongs to HSBC Holding Plc from UK in 2008. Average bank size is 11.87.

There is a huge difference in the GDP level of the countries which are between $29.14 billion and $246,249 billion. The table 8 illustrates that the average GDP level is $2112.9 billion. Also, inflation is considered both positive and negative.

Table 8: Descriptive statistics

Variable	*Obs*	*Mean*	*Std. Dev.*	*Min.*	*Max.*
ROA	852	0.4140904	1.309366	-16.31	4.43
ROE	849	3.909271	55.74827	-1250.47	85.82
CAR	829	12.9244	3.366916	-5	45.5
NPL	677	5.55195	6.662237	0.01	45.86
LLP	884	19.98164	45.72144	-67.8	625.1
LTD	846	185.9699	468.7913	3.5	8726.23
SIZE	868	11.86639	1.681226	7.32	16.93
GDP Levels	198	2112.834	17463.25	29.14	246249
INF	198	1.956566	1.223362	-4.46	4.92

(Source: Stata, 2014)

4.2 Correlation Matrix

The table 9 demonstrates the correlation coefficients between the financial performance and the variables. The aim of this correlation analysis is to illustrate the variables strength and the degree of the relationship between each variable.

Table 9 Correlation Matrix

	roa	roe	car	npl	llp	ltd	size
roa	1.0000						
roe	0.6547	1.0000					
car	0.1079	0.1415	1.0000				
npl	−0.4425	−0.2308	0.0208	1.0000			
llp	−0.6905	−0.4095	−0.0059	0.5615	1.0000		
ltd	−0.0250	−0.0725	0.0422	−0.0267	0.0591	1.0000	
size	0.0498	0.0739	0.2158	−0.1294	−0.1414	−0.0462	1.0000
gdplevel	−0.0035	0.0061	0.0783	0.0152	−0.0042	−0.0182	0.0971
inf	−0.0177	−0.0680	−0.1048	−0.0992	0.0052	0.0092	−0.1400

	gdplevel	inf
gdplevel	1.0000	
inf	0.2020	1.0000

According to the table 9, there is a high correlation between ROA and LLP at 69%, ROA and ROE 65%, and NPL and LLP at 56%. Although, there is a moderate correlation between ROA and NPL 44%, and ROE and LLP at 40%, there is low correlation among the other variables.

ROA has positive correlation with the CAR and SIZE while ROE has positive correlation with CAR, SIZE and GDP level. NPL, LLP and LTD have

negatively correlated to both the two dependent variables ROA and ROE. Also, GDP level is only negatively correlated to ROA.

4.3 Analysis of the EU Banks the period of 2003-2013

The analysis of the EU banks was done according to pooled regression model and fixed effect model including the period from 2003 to 2013. Additionally, ROA and ROE have been analysed separately for the each methods.

4.3.1 The Relationship between ROA and Independent Variables

Description of the relationship between ROA and factors is provided in the following section for the period of 2003 and 2013.

Table 10: Pooled regression model - ROA

Source	SS	df	MS		Number of obs =	659
					F(7, 651) =	93.75
Model	679.646377	7	97.0923396		Prob > F =	0.0000
Residual	674.207143	651	1.03564845		R-squared =	0.5020
					Adj R-squared =	0.4967
Total	1353.85352	658	2.05752815		Root MSE =	1.0177

roa	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
car	.050858	.0120054	4.24	0.000	.0272841	.0744318
npl	-.0210228	.0072697	-2.89	0.004	-.0352977	-.006748
llp	-.0191719	.0010025	-19.12	0.000	-.0211404	-.0172034
ltd	6.40e-06	.000095	0.07	0.946	-.0001801	.0001928
size	-.0720274	.0254009	-2.84	0.005	-.121905	-.0221499
gdplevel	-8.66e-08	1.63e-06	-0.05	0.958	-3.29e-06	3.12e-06
inf	-.026135	.0341353	-0.77	0.444	-.0931635	.0408936
_cons	1.140919	.3476361	3.28	0.001	.4582953	1.823542

The results shows that the p-value of the model is lower than 5% so this result is statistically significant, F (7,651) = 93.75, p< 0.05. The regression model is a good fit of the data. The R-square value indicates that 50% of the variance in ROA can be predicted from all variables. In terms of p-value CAR, NPL, LLP and SIZE are statistically significant but LTD, INF and GDP level do not show a significant relationship with the ROA. According to t-value, LLP is the most important variable. The results of ROA on the regression illustrates that CAR is positively related to performance but NPL, LLP and size are negatively related. The parameter value shows that 1 percent increase in CAR increases ROA by 0.050858 percent. Additionally, NPL, LLP and SIZE increase 1 percent ROA decreases by 0.0210228 percent, 0.0191719 percent and 0.0720274 percent respectively. Therefore, the better bank profitability is related to lower NPL, LLP and SIZE, and higher CAR over the period of 2003 and 2013.

Table 11: Pooled regression model with country dummies – ROA

```
. xi: regress roa car npl llp ltd size i.country
i.country         _Icountry_1-18      (_Icountry_1 for coun~y==Austria omitted)

      Source |       SS       df       MS              Number of obs =     659
-------------+------------------------------           F( 22,   636) =   38.10
       Model |  769.777531    22  34.9898878           Prob > F      =  0.0000
    Residual |  584.075989   636  .918358473           R-squared     =  0.5686
-------------+------------------------------           Adj R-squared =  0.5537
       Total |  1353.85352   658  2.05752815           Root MSE      =  .95831

------------------------------------------------------------------------------
         roa |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         car |    .0464664   .0126563     3.67   0.000     .0216133    .0713195
         npl |   -.0223549   .0080904    -2.76   0.006    -.038242   -.0064678
         llp |   -.0192979   .0009972   -19.35   0.000    -.021256   -.0173397
         ltd |    .0000652   .0000913     0.71   0.475    -.0001141   .0002445
        size |   -.0149854   .0305096    -0.49   0.623    -.0748971   .0449262
  _Icountry_2 |   -1.785703   .3862596    -4.62   0.000    -2.544202   -1.027205
  _Icountry_3 |   -.6802839   .3205776    -2.12   0.034    -1.309803   -.0507653
  _Icountry_4 |   -.6918336   .4107285    -1.68   0.093    -1.498382    .1147144
  _Icountry_5 |   -.8182054    .263415    -3.11   0.002    -1.335474   -.3009371
  _Icountry_6 |   -1.126898   .3028258    -3.72   0.000    -1.721557   -.532239
  _Icountry_7 |    -.952547    .270559    -3.52   0.000    -1.483844    -.42125
  _Icountry_8 |    .1952044   .3216208     0.61   0.544    -.4363626   .8267714
  _Icountry_9 |   -.6246435   .2458217    -2.54   0.011    -1.107364   -.1419233
 _Icountry_10 |   -.5575459   .3812635    -1.46   0.144    -1.306233    .1911417
 _Icountry_11 |   -.6216576   .2908336    -2.14   0.033    -1.192768   -.0505474
 _Icountry_12 |   -.3495188   .2762933    -1.27   0.206    -.8920762   .1930386
 _Icountry_13 |    .3782708   .2754453     1.37   0.170    -.1626214    .919163
 _Icountry_14 |   -.6038177   .2707603    -2.23   0.026     -1.13551   -.0721254
 _Icountry_15 |   -.4026465   .2692242    -1.50   0.135    -.9313222   .1260293
 _Icountry_16 |   -.7942522   .2867334    -2.77   0.006    -1.357311   -.2311934
 _Icountry_17 |   -1.284547   .3837371    -3.35   0.001    -2.038092   -.5310019
 _Icountry_18 |   -.5330295   .2588333    -2.06   0.040    -1.041301   -.0247583
        _cons |    1.032091   .4472872     2.31   0.021     .1537522    1.910429
------------------------------------------------------------------------------
```

According to the table 11, less than 5% probability value means, this result is statistically significant. CAR, NPL and LLP are significant to explain ROA because the p-values of these variables are less than 5%. R-squared of 56.86% which means the model explained 56.86% variance in dependent variable ROA. In addition, the results illustrate that CAR has positive impact on bank profitability, which means the higher CAR of a bank is the higher the profitability gets. On the other hand, NPL and LLP have negative impact on the profitability.

4.3.2 The Relationship between ROE and Independent Variables

Table 12 shows the relationship between factors and ROE for the period of 2003 and 2013.

Table 12: Pooled Regression Model – ROE

Source	SS	df	MS		Number of obs =	656
					F(7, 648) =	22.21
Model	502814.032	7	71830.576		Prob > F =	0.0000
Residual	2095913.22	648	3234.43399		R-squared =	0.1935
					Adj R-squared =	0.1848
Total	2598727.26	655	3967.52253		Root MSE =	56.872

roe	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
car	2.603533	.6722036	3.87	0.000	1.283572	3.923493
npl	-.2097536	.4135109	-0.51	0.612	-1.021737	.6022296
llp	-.5168682	.0561017	-9.21	0.000	-.6270314	-.406705
ltd	-.0083978	.0053066	-1.58	0.114	-.0188179	.0020223
size	-1.023891	1.419775	-0.72	0.471	-3.811807	1.764025
gdplevel	.0000175	.0000912	0.19	0.848	-.0001616	.0001965
inf	-2.989238	1.907905	-1.57	0.118	-6.73566	.7571851
_cons	.3925408	19.43124	0.02	0.984	-37.76325	38.54833

According to result presented in table 12 above, the independent variables are statistically significant in predicting the dependent variable, because of F (7,648) = 22.21, p<0.05 so this model is suitable. The R-squared is 0.1935, meaning that approximately 20% of the variability of ROA is accounted for by the variables in the model. So that, the adjusted R-squared shows that about 19% of the variability of ROA is accounted for by the model, even after taking the number of predictor variables into consideration in the model. As regard to t-value, LLP is the most important variable. The table 12 clearly indicates that CAR and LLP coefficients are statistically significantly different from 0 because p-value is less than 5%. On the other hand, NPL, LTD, SIZE, GDP level and INF coefficients are not statistically significant. 1 percent increases in CAR increase ROA by 2.603533 percent although 1 percent decrease in LLP increase ROA by 0.5168682 percent. As a result, while LLP effects to ROE in a negative way, CAR impacts to ROE in a positive way.

Table 13: Pooled regression model with country dummies – ROE

```
. xi: regress roe car npl llp ltd size i.country
i.country         _Icountry_1-18      (_Icountry_1 for coun~y==Austria omitted)
```

Source	SS	df	MS		
Model	694356.554	22	31561.6615	Number of obs =	656
Residual	1904370.7	633	3008.48452	F(22, 633) =	10.49
				Prob > F =	0.0000
				R-squared =	0.2672
				Adj R-squared =	0.2417
Total	2598727.26	655	3967.52253	Root MSE =	54.85

roe	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
car	2.921458	.7258516	4.02	0.000	1.49609	4.346827
npl	-.1033763	.469849	-0.22	0.826	-1.026027	.819275
llp	-.5521519	.057204	-9.65	0.000	-.6644844	-.4398193
ltd	-.0048631	.005226	-0.93	0.352	-.0151255	.0053993
size	-.3058754	1.746447	-0.18	0.861	-3.735406	3.123655
_Icountry_2	-127.3074	22.11114	-5.76	0.000	-170.7274	-83.88733
_Icountry_3	-8.417437	18.35074	-0.46	0.647	-44.45313	27.61825
_Icountry_4	-9.1709	23.51332	-0.39	0.697	-55.34445	37.00265
_Icountry_5	-7.798429	15.07721	-0.52	0.605	-37.40584	21.80898
_Icountry_6	-17.66506	17.33343	-1.02	0.309	-51.70304	16.37291
_Icountry_7	-31.65834	15.56559	-2.03	0.042	-62.22478	-1.091887
_Icountry_8	22.24046	18.41243	1.21	0.228	-13.91638	58.3973
_Icountry_9	-5.921194	14.07137	-0.42	0.674	-33.55341	21.71103
_Icountry_10	-6.245497	21.82294	-0.29	0.775	-49.09962	36.60862
_Icountry_11	-10.13798	16.64664	-0.61	0.543	-42.82729	22.55134
_Icountry_12	-1.780587	15.82051	-0.11	0.910	-32.84762	29.28645
_Icountry_13	-7.98015	15.76546	-0.51	0.613	-38.93907	22.97877
_Icountry_14	-2.991081	15.49934	-0.19	0.847	-33.42742	27.44525
_Icountry_15	4.11084	15.41069	0.27	0.790	-26.15143	34.37311
_Icountry_16	-10.37036	16.41676	-0.63	0.528	-42.60826	21.86754
_Icountry_17	-28.02864	21.97006	-1.28	0.203	-71.17165	15.11437
_Icountry_18	-9.10893	14.81753	-0.61	0.539	-38.2064	19.98854
_cons	-9.546201	25.60614	-0.37	0.709	-59.82945	40.73705

According to the table 13, the p-value of the result is less than 5% and this result is nicely fitted. CAR and LLP are significant to explain ROE. R-squared of 26.72% means that, this consequence is not very convincing, as there is 74% unexplained variance. While the higher CAR means the higher profitability, the higher LLP means the lower profitability.

4.4 Analysis of Large Sized Banks During the Financial Crisis

In this section, the EU banks of group 1 have been analysed from 2008 to 2013 (during the crisis).

4.4.1 The Relationship between ROA and Independent Variables

The table 6 shows the result of random model of the ROA.

Table 14: Random model - ROA

Random-effects GLS regression — Number of obs = 230
Group variable: banks — Number of groups = 40

R-sq: within = 0.3001 — Obs per group: min = 3
between = 0.6346 — avg = 5.8
overall = 0.3687 — max = 6

corr(u_i, X) = 0 (assumed) — Wald chi2(7) = 129.64
Prob > chi2 = 0.0000

roa	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
car	.1440172	.0273496	5.27	0.000	.0904129	.1976215
npl	-.0209828	.0155081	-1.35	0.176	-.051378	.0094125
llp	-.0126555	.0022906	-5.53	0.000	-.017145	-.0081661
ltd	-.0021443	.0006065	-3.54	0.000	-.003333	-.0009557
size	-.0836132	.0627736	-1.33	0.183	-.2066471	.0394208
gdplevels	1.01e-06	2.08e-06	0.49	0.626	-3.06e-06	5.09e-06
inf	-.1187468	.0634287	-1.87	0.061	-.2430647	.0055711
_cons	.1225554	.8145161	0.15	0.880	-1.473867	1.718978
sigma_u	0					
sigma_e	1.2500697					
rho	0	(fraction of variance due to u_i)				

According to the Hausman test, the random model is fitted to explain ROA because probability is less than 5%. As observed in table 6, the overall model is significant due to the p< 5%. In terms of the p-value NPL, SIZE, GDP level and INF are not significant because the p-value of these variables are higher than 5%. CAR is related to ROA as a positive but LLP and LTD effect to ROA as a negative. There is a decrease of 0.0126555 percent and 0.0021443 percent in the ROA for every 1 % increase in LLP and LTD respectively. On the other hand, when there is an increase of 1% in CAR then there is increase in ROA by 0.1440172 percent.

4.4.2 Relationship between ROE and Independent Variables

In this section, pooled regression model has been applied to ROE.

Table 15: Pooled Regression Model - ROE

Source	SS	df	MS		
Model	958183.039	7	136883.291	Number of obs =	227
Residual	1358140.83	219	6201.55629	F(7, 219) =	22.07
				Prob > F =	0.0000
				R-squared =	0.4137
				Adj R-squared =	0.3949
Total	2316323.87	226	10249.2207	Root MSE =	78.75

roe	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
car	10.27324	1.740373	5.90	0.000	6.843214	13.70326
npl	2.13474	1.022406	2.09	0.038	.1197243	4.149755
llp	-.9645298	.1464025	-6.59	0.000	-1.253068	-.6759917
ltd	-.3353315	.038454	-8.72	0.000	-.4111188	-.2595442
size	-5.40764	3.988179	-1.36	0.177	-13.26776	2.452485
gdplevels	-.0000571	.0001319	-0.43	0.665	-.000317	.0002027
inf	-4.704479	4.024693	-1.17	0.244	-12.63657	3.227607
_cons	-6.068564	51.70787	-0.12	0.907	-107.9773	95.84016

According to the table 15, the overall regression is statistically significant, F = 22.07, p<5%. CAR, NPL, LLP and LTD are significant to describe ROE because the probabilities of these variables are less than 5%. So, it can be clearly seen that CAR and NPL have a positive relationship with ROE, although LLP and LTD have a negative relationship. The results show that 1% increase in CAR resulted with 10.27324 percent increase in LLP and 2.13474 percent increase in ROE. On the other side 0.9645298 percent and 0.3353315 percent decrease in ROE means increase in LLP and LTD by 1% respectively.

4.5 Analysis of Large Sized Banks Before Financial Crisis

In this section, the EU banks of group 1 have been analysed from 2003 to 2008 (before the crisis).

4.5.1 Relationship between ROA and Independent Variables

The relationship between ROA and factors has been examined according to the pooled regression model.

Table 16: Pooled Regression Model - ROA

Source	SS	df	MS		
Model	4.75278978	7	.678969968	Number of obs	= 124
Residual	12.5621816	116	.108294669	F(7, 116)	= 6.27
				Prob > F	= 0.0000
				R-squared	= 0.2745
				Adj R-squared	= 0.2307
Total	17.3149714	123	.140772125	Root MSE	= .32908

roa	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
car	.0028427	.0211146	0.13	0.893	-.0389774	.0446629
npl	.0054132	.0188573	0.29	0.775	-.0319362	.0427625
llp	.0143883	.0071836	2.00	0.048	.0001602	.0286163
ltd	.0002575	.0007843	0.33	0.743	-.0012958	.0018108
size	-.0559728	.0279578	-2.00	0.048	-.1113467	-.0005989
gdplevels	-.0001007	.0000436	-2.31	0.023	-.0001871	-.0000143
inf	.0599335	.0436885	1.37	0.173	-.0265971	.1464641
_cons	1.381301	.4741036	2.91	0.004	.4422787	2.320322

In terms of table 16, the probability value of this model is less than 5% so this model is fitted to explain ROA. LLP, SIZE and GDP level are significant while other variables are not significant. Also, GDP level and SIZE affect ROA negatively, while LLP impacts ROA positively. According to the results, there is an increase of 0.0143883% in the ROA for every 1 % increase in LLP. Also, for every 1% increase in SIZE and GDP level decrease ROA by .0559728% and .0001007% respectively.

4.5.2 Relationship between ROE and Independent Variables

This section shows the result of the fixed effect model of ROE.

Table 17: Fixed effect model - ROE

Fixed-effects (within) regression — Number of obs = 124
Group variable: banks — Number of groups = 34

R-sq: within = 0.1786 — Obs per group: min = 1
between = 0.0303 — avg = 3.6
overall = 0.0025 — max = 5

F(7,83) = 2.58
corr(u_i, Xb) = -0.7397 — Prob > F = 0.0187

roe	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
car	.5178356	.3518933	1.47	0.145	-.182066	1.217737
npl	-.8420279	.4873724	-1.73	0.088	-1.811392	.1273363
llp	-.4696487	.1735665	-2.71	0.008	-.8148655	-.124432
ltd	-.0517569	.0310671	-1.67	0.099	-.113548	.0100342
size	.8442287	1.137837	0.74	0.460	-1.418883	3.107341
gdplevels	.0019589	.0026416	0.74	0.460	-.0032952	.007213
inf	.102863	.7181656	0.14	0.886	-1.325539	1.531265
_cons	9.93763	13.50057	0.74	0.464	-16.91446	36.78972
sigma_u	6.6126307					
sigma_e	3.3961397					
rho	.79128431	(fraction of variance due to u_i)				

F test that all u_i=0: F(33, 83) = 5.25 — Prob > F = 0.0000

According to the Hausman test, the fixed effect model is suitable to explain ROE because the probability value is less than 5%. Table 17 shows that the p-value of the model is lower than 5% to show a statistically significant. Only the LLP is significant to describe ROE, because it has 0.008 p-value which is less than 0.05. 1% increase in LLP that means 0.4696487% decrease in ROE.

4.6 Analysis of Small Sized Banks During the Financial Crisis

This section is the analysis of the EU banks of group 2. The period of analysis includes during the crisis period from 2008 to 2013.

4.6.1 Relationship between ROA and Independent Variables

In this section, pooled regression model has been used.

Table 18: Pooled regression model - ROA

Source	SS	df	MS		
Model	487.460486	7	69.6372123	Number of obs	= 207
Residual	162.008132	199	.814111215	F(7, 199)	= 85.54
				Prob > F	= 0.0000
Total	649.468618	206	3.15276028	R-squared	= 0.7506
				Adj R-squared	= 0.7418
				Root MSE	= .90228

roa	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
car	.0125158	.020691	0.60	0.546	-.0282859	.0533175
npl	-.0378738	.0098933	-3.83	0.000	-.057383	-.0183647
llp	-.0211443	.0011064	-19.11	0.000	-.0233262	-.0189624
ltd	.0001439	.0000933	1.54	0.124	-.00004	.0003279
size	.0193751	.0487171	0.40	0.691	-.0766929	.115443
gdplevels	-.0002224	.0000686	-3.24	0.001	-.0003577	-.0000871
inf	.1041559	.0480777	2.17	0.031	.0093487	.1989631
_cons	.738058	.5851482	1.26	0.209	-.4158288	1.891945

The table 18 shows that this model is suitable for the data analysis because F = 85.54, probability is less than 5%. The model explains 75.06% of the variance in ROA. According to the table 22, CAR, LTD and SIZE are not significant which have p-value>5%, but NPL, LLP, GDP level and INF are significant that are p-value<5%. NPL, LLP and GDP level effect ROA as a negative, which means every 1% increase in NPL, LLP and GDP level 0.0378738 percent, 0.0211443 percent and 0.0002224 percent decrease in ROA is predicted respectively. There are positive relationship between INF and ROA, it means that 1% increase in INF, increase ROA by 0.1041559 percent.

4.6.2 Relationship between ROE and Independent Variables

In this section the result of the random effect model of ROE has been examined.

Table 19: Random effect model - ROE

Random-effects GLS regression — Number of obs = 207
Group variable: banks — Number of groups = 40

R-sq: within = 0.7335 — Obs per group: min = 2
between = 0.6646 — avg = 5.2
overall = 0.7420 — max = 6

Wald chi2(7) = 528.46
corr(u_i, X) = 0 (assumed) — Prob > chi2 = 0.0000

roe	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
car	.4389856	.3919298	1.12	0.263	-.3291827	1.207154
npl	-.8849988	.2170045	-4.08	0.000	-1.31032	-.4596778
llp	-.3458348	.0190744	-18.13	0.000	-.38322	-.3084497
ltd	.0021141	.0020397	1.04	0.300	-.0018836	.0061118
size	.7785438	1.49149	0.52	0.602	-2.144722	3.70181
gdplevels	-.0027794	.0021743	-1.28	0.201	-.0070409	.0014822
inf	-.1199715	.7809251	-0.15	0.878	-1.650557	1.410614
_cons	5.984608	17.4202	0.34	0.731	-28.15836	40.12757
sigma_u	11.586917					
sigma_e	12.89777					
rho	.44661535	(fraction of variance due to u_i)				

According to the Hausman test, more than 5% probability means the random effect model is suitable for the explanation of the ROE. According to the table 19, the probability value is less than 5% so the model is significant hence, this model is nicely fitted. The result shows that only NPL and LLP are significant to explain ROE because the p-value of these two variables is less than 5%. According to the t-value, most important variable is LLP. Also, these two variables have a negative relationship with the ROE. When NPL and LLP increase by 1% then there is a decrease of ROE by 0.8849988% and 0.3458348%.

4.7 Analysis of Small Sized Banks Before Financial Crisis

In this section, the EU banks of group 2 has been analysed from 2003 to 2008 (before the crisis).

4.7.1 Relationship between ROE and Independent Variables

This section provides the result of polled regression model of ROA.

Table 20: Pooled regression model – ROA

Source	SS	df	MS		
Model	9.22228876	7	1.31746982	Number of obs =	98
Residual	24.1564951	90	.268405501	F(7, 90) =	4.91
				Prob > F =	0.0001
				R-squared =	0.2763
				Adj R-squared =	0.2200
Total	33.3787838	97	.344111174	Root MSE =	.51808

roa	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
car	.0408714	.0128389	3.18	0.002	.0153647	.0663782
npl	.0334399	.0119697	2.79	0.006	.0096599	.0572199
llp	-.0130054	.0081879	-1.59	0.116	-.0292721	.0032613
ltd	.0002016	.0001449	1.39	0.168	-.0000863	.0004895
size	-.0436521	.0370666	-1.18	0.242	-.1172913	.0299871
gdplevels	-.000151	.000062	-2.44	0.017	-.0002742	-.0000278
inf	.0720578	.0776773	0.93	0.356	-.0822616	.2263772
_cons	.9224376	.5011975	1.84	0.069	-.0732787	1.918154

The model represents that the probability value is less than 5%, this model can be used to explain ROA. R-squared = 0.2763 and Adj. R-squared = 0.2200, which means that the independent variables CAR, NPL, LLP and LTD, explain 22% of the variability of the dependent variable, ROA. According to table 20, the results of CAR, NPL and GDP level are significant while LLP, LTD, SIZE and INF are not significant. Also CAR and NPL affect ROA positively. 1% increase in CAR and NPL increase ROA by 0.0408714% and 0.0334399% respectively while there is 1% increase in GDP level, ROA decreases by 0.000151%.

4.7.2 Relationship between ROE and Independent Variables

In this section, pooled regression model has been used on the ROE.

Table 21: Pooled regression model - ROE

Source	SS	df	MS		
Model	1120.95058	7	160.135796	Number of obs	= 98
Residual	3698.28627	90	41.0920696	F(7, 90)	= 3.90
				Prob > F	= 0.0009
				R-squared	= 0.2326
				Adj R-squared	= 0.1729
Total	4819.23684	97	49.682854	Root MSE	= 6.4103

roe	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
car	-.050012	.158859	-0.31	0.754	-.3656132	.2655892
npl	-.0543632	.1481045	-0.37	0.714	-.3485987	.2398722
llp	-.1695865	.1013108	-1.67	0.098	-.3708581	.0316851
ltd	-.0015615	.0017932	-0.87	0.386	-.0051239	.002001
size	1.503104	.4586335	3.28	0.001	.5919487	2.41426
gdplevels	-.0024989	.0007674	-3.26	0.002	-.0040235	-.0009743
inf	2.422152	.961119	2.52	0.013	.5127209	4.331582
_cons	-1.962818	6.201435	-0.32	0.752	-14.28305	10.35742

According to the table 21, F (7, 90) = 3.90, probability (0.0009) is less than 0.05 that indicates, overall, the applied model that predicted the dependant variable ROE is statistically significant. While SIZE, GDP level and INF are significant to predict; the ROE, CAR, NPL, LLP and LTD are not significant. In terms of result, SIZE and INF have a positive effect on the ROE while GDP level has a negative impact on the ROE. 1% increase in SIZE and INF indicates that there is a 1.503104% and 2.422152% increase in ROE. On the other hand, 1% increase in GDP level means that there is a 0.0024989% decrease in the ROE.

4.8 The Summary of the Findings

In this section the results of the study have been summarized according to the factors.

CAR effects bank performance positively for 80 EU banks over the period of 2003 and 2013. Also, the first group of banks' performance during the financial crisis and the second group of banks' performance before the financial crisis were impacted positively by CAR. The results show that there is a positive relationship between CAR and EU bank performance. The higher CAR means the higher profitability for the EU banks.

INF positively affects the second group of the banks performance, before and during the financial crisis, although it is not significant to explain profitability of the 80 EU banks and the higher asset size banks.

LLP indicates that the EU banks performance was affected negatively between the 2003 and 2013 by LLP. Also, both group of EU banks' performance were impacted negatively during the financial crisis. However,

ROA was impacted positively, while ROE was affected negatively for the first group of the EU banks before the financial crisis. Shortly, most of the observations show that the EU banks' performance was affected negatively by the LLP. The lower LLP indicates the higher profitability for the EU banks.

NPL demonstrates a negative relationship between NPL and the 80 EU banks' performance over the period of 2003 and 2013. During the financial crisis, while the first group of EU banks were affected positively by NPL, the second group of EU banks were impacted negatively. It can be concluded that there is a negative relationship between EU banks' performance although NPL has a mixed effect on the EU banks' performance. Because, the first investigation which is 80 EU banks over the period of 11 years has more observations. Therefore, this investigation is more reliable.

SIZE illustrates that there is a negative relationship between SIZE and 80 EU banks performance. Also, SIZE is not significant to predict baking profitability for the both of the groups during the financial crisis. However, the second group of banks performance were impacted positively before the financial crisis by SIZE, although the second group of bank performance affected negatively. Generally, the results show that banking SIZE effects EU banks performance negatively, it means that the small sized banks have a higher profitability compared to the higher sized banks in EU during the period of 2003 and 2013.

GDP level has a negative effect on the second group of the banks performance during and before the financial crisis. For the second group of banks, GDP level has negative impact on banks performance only in the period of before the financial crisis. On the other hand, GDP level is not so significant to describe 80 EU banks' performance during the 2003 and 2013. Finally, it can be illustrated from the results that most of time GDP level impacts banks' performance negatively.

LTD is statistically insignificant to explain 80 EU banks performance because the results show that there is a negative relationship between LTD and the first group of banks performance only during the financial crisis. However, it is not possible to find a negative effect because most of the observation indicates there is not significant to explain the profitability of the EU banks.

5. Conclusion

Empirical analyses conclude that there is a relationship between independent variables and EU banks performance. Also, the impact of independent variables on the EU banks performance before and during the financial crisis was investigated by this study. The result of this study indicates the better credit risk results in better bank performance. This result was supported by most of the prior studies. Also Capital Adequacy Ratio had a positive and most significant effect among the independent variables on the EU Banks' performance.

For instance this result has same findings with the Kargi (2011) which claims that credit risk is a significant predictor of banks performance, and there is a positive and significant relationship between CAR and banks profitability. Additionally, NPL has a negative impact on banks performance and NPL is major variable that determine asset quality of the bank. Also, these results were supported by Epure and Lafuente (2012), Felix and Claudine (2008) and Muhammed *et al.* (2012), but Kithinji (2010) found opposite finding which is NPL is not effected commercial banks' profit enhancement.

Additionally, ROA was used as EU banks performance indicator and NPL was used as proxy for credit risk in Hosna *et al. (*2009) and Boahene *et al.* (2012). So, the result of this study has a same findings with the Hosna et al. (2009) and Boahene et al. (2012) in which CAR has a positive effect on bank performance while NPL has a negative impact on bank performance.

According the this study, LLP has a negative effect on the EU banks performance and same result was found by Kolapo et al. (2012) when commercial bank in Nigeria was analysed over the period of 11 years.

On the other hand, SIZE might be an important determinant of bank performance if there are increasing returns to scale in banking. Although, SIZE could have a negative effect when banks turn into extremely large as a result of bureaucratic and other reasons. The same result was found by Naceur and Kandil (2008).

Furthermore, INF has a positive impact on banks performance because high inflation rates generally provide high loan interest rates, and therefore income rates get higher. Naceur and Kandil (2008) found that there is a positive relationship between INF and bank profitability.

Generally, GDP level is an index of economic development, hence difference between banking technology, the mix of banking opportunities and any aspect of banking regulations omitted from the regression are reflected. GDP per capita has a positive effect on bank performance (Naceur and Kandil, 2008), while GDP growth has a negative impact on banks performance (Liyugi, 2007).

5.1 Limitations of the Study

Key limitations of the study include;

Due to unavailability of information, the study didn't include all period of the data of EU banks commercial banks. Especially, some of the second group of EU banks' data were not available before financial crisis. Also, when the size of banks decreases, it becomes difficult to access data. The 80 EU banks might not reflect the real result because when EU active banks checked from Bankscope, there were 4633 banks. This research is only able to analyse nearly 2% of the all EU banks that are available in Bankscope database. Additionally, this study only covers the 11 years period of the selected banks. Although it provides an analysis to pre-crisis and during the crisis period, it might be helpful to consider the histories of the banks.

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Özet

Günümüzde kredi risk yönetimi banka kârlılığı için daha çok önemli hale gelmektedir. Kredi riski, Basel Committee on Banking Supervision (BCBS) tarafından kredi veren taraf ile alan tarafın anlaştığı şartlarda ve tarihte anlaşma şartlarının yerine getirilmemesi olasılığı olarak tanımlanmıştır (BCBS, 2010, p.13). Avrupa'daki bankaların temel gelir kaynaklarından bir tanesi verdikleri kredilerdir. Böylece kredi risk yönetimi banka kârlılığı ile bağlantı olmakta ve birbirini etkilemektedir.

Bu çalışma Avrupa'daki 80 bankanın kredi risk yönetimlerinin bu bankaların performansını 11 yıl (2003–2013) boyunca nasıl etkilediği araştırılıyor. 11 yıllık dönem (2003–2013), 5 yıl (2003 – 2007) krizden önceki dönem ve 6 yıl (2008–2013) kriz boyunca olmak üzere iki kısımdan meydana gelmektedir. Ayrıca 80 tane Avrupa bankası varlıklarının büyüklüklerine göre iki gruba ayrıldı. Aktif Getiri Oranı (ROA) ve Öz Sermaye Kârlılık Oranı (ROE)

bankaların performansını ölçerken Sermaye Yeterlilik Oranı (CAR), Ödenmeyen Kredi (NPL), Kredi Kayıp Karşılığı (LLP) ve Verilen Paranın Borca Oranı (LTD) ise kredi riski yönetimi göstergeleridir. Ek olarak Enflasyon (INF) ve Kişi Başına Düşen Milli Gelir (GDP) analizlerde kontrol için kullanılan ülke göstergeleridir. Bankaların kârlılık ve risk yönetimi arasındaki ilişkiyi test etmek için Panel Data Model kullanıldı.

Bu çalışmada, banka kârlılık göstergeleri olan ROA ve ROE her ikisinin de kredi risk yönetimi ile önemli ölçüde ilişkili olduğu ortaya çıkmıştır. CAR banka performansını pozitif yönde etkiler iken NPL ve LLP negatif yönde etkilemektedir. Ayrıca LTD ile banka kârlılığı arasında önemli bir ilişki bulunamamıştır. Kısaca, Avrupa'daki bankaların kârlılığının yüksek olması daha iyi bir kredi risk yönetiminden geçmektedir. Bunun yanında INF ve GDP ayrıca göz önünde bulundurulmalıdır. GDP negatif bir etkiye sahip iken INF pozitif bir etkiye sahiptir.