Determinants of Bank Profitability in the UK during 1999-2014: The impact of the Euro currency and the Financial Crisis

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We hereby declare that the work submitted is ours and that where we have made use of another’s work, we have attributed the source(s) according to the Regulations set in the Student’s Handbook.

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Abstract

The circulation of the EURO currency in EMU in 2002 and the global financial crises that broke out in 2008 have triggered changes in the financial institutions and their performance worldwide and mainly in Europe. This paper examines the internal and external determinants of the banks that define their performance. By creating an unbalanced panel dataset of 456 observations gained from a sample of 32 commercial, active and lived banks located in the United Kingdom, we defined the impacts of the aforementioned determinants on the two measures of bank performance: ROAA and NIM. According to our findings both, EURO currency and financial crisis had influenced negatively British banking sector. The findings are not always the expected ones and differ between the two measures of profitability, even though between the two different large-scale events. The capital strength has a significant and positive impact on bank profitability, though costs and low quality loans affect negatively bank profitability. The macroeconomic variables have volatile effects depending on the performance measure and the inserted dummy variable in our models.

Keywords: Commercial Banks, United Kingdom, Profitability, Euro Currency, Financial Crisis
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1 Introduction

The financial system can be named as the main pillar of major importance for the stability and the growth of the globalised economy on the whole. Through payment services, intermediation between savers and borrowers and insurance against risk, the well-working economy is ensured. Being more specific, banks that are the most important part of a country’s economy ensure to attain development. Due to new technologies and deregulation during 1970 and 1980, banks attempted to take advantage of new opportunities derived from the innovative and globalised financial system.

In recent years, banking sectors all over the world have faced challenges through structural and conduct deregulation mainly coming from the external environment. The competition among banks in order to achieve the best dominant position in the economy, the increasing monetary and financial integration and highlighted events, such as the financial crisis in 2008 and the establishment of the European Monetary Union (EMU) with the introduction of the EURO currency in 2002, have altered the rules of the banking sector.

The dawn of 2008 has been remarkable because the financial crisis broke out. This crisis was one of the worst since Great depression of 1930, continuing affecting many countries worldwide, especially Europe. The latest tumult on capital markets has certainly revealed the vulnerability of the globalized financial system in times of recession. The high degrees of leveraging on capital and the increasingly level of risk been undertaken in order to gain higher profits and satisfaction combined with the bad bank managers had created an increasingly growing ‘bubble’. That ‘bubble’ unavoidably burst, due to systemic risks and particularly counterparty risk, causing a global chaotic condition. The weakest financial institutions were the first to collapse and afterwards the loss of trust towards the banking sector became a domino effect worsening the tremendous instability. As Buiter (2007) has stated, ‘crisis is the product of a perfect storm bringing together a number of microeconomic and macroeconomic pathologies’. It is convinced that the impact of financial crisis differs from country to country depending mainly on their relative reliance on the bank vs. market finance (Demirguc-Kunt and Huizinga, 2000). The financial crisis and its consequences, changed the trade-off terms for the banks, made vital the structuring of more efficient models of bank managers and regulation, ensuring the less risky performance of the institution.

Moreover, not only bad events from the external environment affect the performance of banks. The introduction of the EURO currency via the European Monetary Union had a clear goal: a strong and sustainable currency that would ensure the growth and the stability of the countries taking part in the EMU and furthermore, becoming competitive enough among other global economies. However, this appeared not to be enough for that goal. Financial crisis gave birth to questions doubting whether this Union is stable, implementing the establishment of the Banking Union. Not every member state became a member of EMU. UK and Sweden are two of these countries. However, there is an impact on countries outside that Union due to the common currency, affecting one way or the other the profitability of their banks too.
For all the aforementioned reasons, it is crucial to identify the determinants of bank profitability, which show us the performance of banks. Studies on bank performance, Demirguc-Kunt and Huizinga (2000), Athanasoglou, Brissimis and Delis (2005), Spong and Sullivan (2007), Alper and Anbar (2011), Hoffman (2011), Kosmidou, Tanna and Pasiouras (2008) and many others, are focused on how banks can generate sustainable profitability and fair returns for their investors. Through profitability, banks managers fortify the institutions against unexpected losses by strengthening their capital position and improving future profitability. Furthermore, financial institutions want to preserve and create wealth which should be higher than costs of equity. The banking system has become increasingly complex. However, according to some studies such as of Buiter (2007), J. Wong, Fong, E. Wong and Choi (2007), Kumbirai and Webb (2010) and Alper and Anbar (2011), earnings, leverage, efficiency and risk-taking remain the key drivers of bank performance. In addition, the impact of major economics events such as financial crisis, financial liberalization or financial integration can be assessed through studies on bank profitability. Unfortunately, the recent crisis has shown that traditional methods of measuring bank profitability such RoE failed to distinguish the well performing banks from others in terms of sustainability of their results (ECB, 2010). As a result, alternative metrics are vital instead of maintaining old-fashioned methods. Bank profitability is important for different groups of market participants: depositors, equity/debt holders, bank managers, rating agencies, analysts and supervisors. Each of them has its own preferred set of indicators viewing performance from different angles.

Our paper focuses on the study of the determinants of bank profitability in the United Kingdom. UK has the largest banking sector among the ten largest EU economies, Japan and the USA. The rise of London during the last centuries as a financial center, gave UK a comparative advantage in international market. Over the last 40 years’ total assets have risen sharply from 100 % (1975) to 450 % (2013) of GDP (Bush, 2014). The local government through implicit subsidy enhanced this extensive growth of banking sector too. Furthermore, among large native banks there are many foreign large banks which have placed their subsidiaries and branches in UK: 150 deposit-taking foreign branches and 98 deposit-taking foreign subsidiaries that account for around 30% of UK’s GDP and are approximately around £2.75 trillion (Bush, 2014). It is really interesting knowing the determinants of banks’ profitability in a region with such a strong banking sector. The size of a bank in an indicative measure that can tell us whether affects sustainability and how vulnerable would be in cases such financial crisis or integrations. However, larger banks are not good predictors of the impacts of the recent financial crisis and may enforce higher fiscal costs on governments. Moreover, UK as a part of the EU and being a non EMU member, has gained profits from transactions in the financial and money market as a strong pillar of growth and stability, ensuring security under the umbrella of an international financial center. These transactions give further boost in the GDP, which affect from the external environment bank profitability. Studies on such a substantial case of a strong banking sector can perform accurate results referring to bank profitability.

The rest of this paper is structured as follows. Section 2 refers to the political and economic background of our analysis. Section 3 contains the literature on the determinants that may affect the performance of the banks. The measures of profitability and the determinants, internal and
external, that have been used in our analysis are exhibited in section 4. Section 5 demonstrates the data and methodology and section 6 the findings of our analysis. Finally, section 7 includes the conclusion.

2 Background

The last three decades have been remarkable for the formation of a new globalized system, rapidly evolved altering the old order in political and economic background. In late ‘90s the establishment of the EMU and later the circulation of the EURO currency began having a profound impact on the international commercial environment. UK opted for not joining the common monetary union, although had already been a member-state of the EU. However, the impacts of EMU especially on Britain’s GDP were profound. While this new formation was taking place, in many countries all over the world, developed or developing, were facing severe banking crises (Sweden 1990s, Turkey 1994, 2000, Russia 1998, Argentina 2001). Excessive global liquidity, ex-ante global saving glut and outrageous securitization were among of the pathologies of the financial system leading bubbles across globe to burst and the worst financial crisis after the Great Depression in 30s to break out. In the UK, the weaknesses in the Banks of England liquidity management, failures between the Treasury, the Bank of England and the FSA were the main contributions to the financial disarray in the United Kingdom. This study, taking into account all the aforementioned major financial events and conditions, focuses specifically on the investigation of the determinants of banks in the United Kingdom.
3 Literature Review

Financial stability is strongly related to the healthy operation of banking system. The main principles of a modern market economy are based on a stable banking sector which conditional ensures the sustainable function of the economic and financial environment all in all. Banks lubricate the gears functioning for economic operations. A stable micro- and macro-economic environment grants practical growth of savings, efficient investment decisions and as a consequence economic development. Central banks through monetary policy and appropriate monetary instrument parameters fortify banks’ stability. Moreover, in the macro-economic level, transparent fiscal policy, financial stabilization and monetary policy support should be implemented by managers and financial authorities in order banking sector to be stabilized. In addition, removing certain negative phenomena and handling properly the composition of banks’ assets, make the role of managers vital. Consequently, many authors, financial analysts and managers had tried to define the determinants of bank profitability as a prerequisite to find the right policies to be enforced.

Since the early 1990s, a great number of large banks mainly located in USA and afterwards British banks, have invested seriously in creating systems defining the determinants and measuring the profitability on the whole. The prompt purpose of such measurement systems is to cater managers for reliable ways to define the appropriate amounts of determinants such as loans, assets, risk etc. that are crucial for the sustainable growth of the financial system they are responsible for. The measurement of a financial institute’s performance is of interest not only to banks management, but to financial markets, academics, investors, depositors and bank supervisors too. Each of the aforementioned groups, view bank performance from different angles. Earnings, leverage risk-taking and efficiency are indicators for different stakeholders and market participants who seek for profit generation.

During the last three decades, the financial sector and mainly banks, has experienced major events transforming the existing market environment into a new globalized rapidly grown one. While this new background began its evolution, major events happening concurrently, distinctively revealed the weaknesses of this new financial order and its vulnerability. There had been many bank crises in the past but the worst of all broke out in our days, making crystal clear its impacts affecting us till nowadays. It was 2008 when the worst financial crisis after the Great Depression broke out. It began from USA after the collapse of Lehman Brothers and later on became global financial crisis. Its origins can be traced back to the terrible terrorist attacks of September 2001 and before that to the bursting of the dot com bubble in 2000. In addition to bad events, the good news and developments affect the performance too. Consolidations, monetary unions, such as the European Monetary Union that established the new common currency-the EURO-, and integration, new technologies and new behavior of the mass, reformed in a different way this system. All these led to new regulation systems and made the monitoring of financial institutions more than vital to ensure the stability of the economy on the whole.

There have been lots of studies trying to estimate bank performance like of Goddard, Molyneux and Wilson (2004), Heffernan and Fu (2008), Kumbirai and Webb (2010), Hoffmann (2011),
Staikouras and Wood (2011), Ongore and Kusa (2013) and many others. All of them resulted in the same outcome. Bank performance can be defined through various ways such as efficiency, productivity and profitability. The aforementioned methods are used widely, though there are some different methods. Our study deals with bank performance as a method of estimating bank performance. There is a large set of bank performance measures. The main categories to be partitioned are: traditional, market-based and economic measures of performance. In the first category can be named the following measures: cost-to-income ratio, return on equity (RoE), return on assets (RoA) and net interest margin (NIM) due to the importance of banks’ intermediation. It is important to mention that due to the recent crisis, RoE failed to define accurately bank performance and could be made distinctions between good and bad performing banks. RoE is not risk sensitive and a stand-alone performance measure therefore its use. Therefore, there should be an initial limitation of that measure. When it comes for the market-based measures, total share return, price-to-book value, price-earnings ratio and credit default swaps are the commonly used. And last but not least, related to the total return of an investment, economic value added (EVA) and risk-adjusted return on capital (RAROC) are indicators related to the economic measures of performance.

It is vital identifying the rationality of performance measurement analysis. Capital adequacy, efficiency and asset quality are considered by bank analysts to be the main elements of these measures. Thus, distinct indicators of shock absorption capacity and credit risk are regarded fundamental in assessing banks’ performance and involving risk in the analysis. On the one hand, bank analysts tend not to use market-based indicators of credit risk and liquidity indicators due to fraudulent information they provide. On the other hand, market-based indicators of profitability and valuation, cost indicators and revenues are used due to their accuracy of information they provide. Bank consultants and rating agencies differ in the way they approach that estimations. The first ones consider systemic significance of the bank and liquidity indicators not so essential for measuring banks’ performance, though rating agencies follow a more holistic approach assessing a bank overall.

Bank profitability represents the main scope of a healthy financial institution: the maximization of profit while minimizing risk. There are two kinds of determinants defining bank profitability: the internal and the external ones. In the following section of this study we analyze those two categories critically.

Empirical studies on bank profitability can divided into two categories: individual countries and cross-country analysis. In the first case of studies, analysts focus on single countries to define the performance of each country’s banking sector. Like studies of Maudos (1998), Bobakova (2003), Kumbirai and Webb (2010), Sufian (2011) and Ongore and Kusa (2013). On the other hand, there have been many studies analyzing cross-country bank systems like of Staikouras and Wood (2004), Shen, Chen, Kao and Yeh (2009) and Propst (2012).

In the first part of the literature review we exhibit academic papers related to researches made on single countries. Having used a direct measure of efficiency, Maudos (1998), defined the performance and market structure of Spanish banking system for the period 1990-1993. In this study, the efficient structure hypothesis was tested versus the collusion hypothesis in the banking system of Spain by the implication of direct measure of efficiency that was gained through
estimations of a stochastic cost frontier. Efficiency affects positively the profitability, making the author to accept the ‘modified efficient structure hypothesis. Market concentration was determined as insignificant and the traditional collusion hypothesis was consequently rejected. In addition, the outcomes had shown that market share as well, is insignificant too. As a result, bank regulatory decisions should be focused on bank efficiency instead of the impacts of changes in concentration.

Again in the European region and specifically in the Slovak Republic, Bobakova (2003) identified the determinants of Slovak commercial banks while trying to investigate problems affecting negatively the effectiveness of management of assets and liabilities. Displaying assets as the main decisive factors influencing bank profitability, she stated that the right composition of fixed and revenue generated assets have a strong impact on banks liquidity. Furthermore, it is vital using individual data for the forecast development and business policy. However, multi-criteria evaluation is a more realistic method because all basic aspects of a bank’s financial condition are taken into account. Finally, she underlined the necessity of improving the quality of bank management paid attention on ratios crucial for the profitability of the bank.

Aarma, Vainu and Vensel (2004) examined the Estonian banking system over the period 1994-2002. They carried out the analysis having used data from the income statement and the balance sheet and by applying a modified version of the DuPont financial ratio analysis, plus the matrix approach. RoA and RoE were used as measures of profitability. Over that period, those measures increased sharply due to the rise of efficiency of the banking system which has a significant and positive impact on the profitability. However, the output/input-type efficiency ratios decreased dramatically affected slightly the general efficiency of banking system.

Bank-specific, industry-specific and macroeconomic determinants of Greek commercial banks were the issue of the analysis by Athanasoglou, Brissimis and Delis (2005). An unbalanced panel of Greek commercial banks is used for the period 1985-2001. In static relationships least square methods are applied though in dynamic these methods produce inconsistent and biased estimates. Except for the size, all the other bank-specific determinants have a strong significant impact on banks’ profitability. The larger the exposure to credit risk and the higher the operating expenses are the lower the profitability of a bank. Additionally, increasing labor productivity gives rise to the profitability. Moreover, the SCP hypothesis is not certified due to the insignificancy of industry concentration as a determinant. Finally, macroeconomic variables such as cyclical output and inflation significantly affect profitability.

J. Wong, Fong, E. Wong, and Choi (2007), estimated the determinants of the performance of Hong Kong’s banks. They collected data from 38 retail banks stated in Hong Kong over the period 1991-2005. They found that market concentration and market shares of banks that are measures of market structure, are not significant determinants of banks’ performance. Additionally, cost efficiency is estimated to have a positive correlation with the profitability but a negative one with loan prices. While having a bank high level of cost efficiency, it can embellish its profitability and offer appealing prices to customers. Moreover, lower quality loan portfolios are related to less

\footnote{Income or interest on assets or on equity ratios}
profits due to operational cost that include credit risk and losses from bad management. Last but not least, macroeconomic environment is positively correlated with loan spreads and bank profitability.

Heffernan and Fu (2008), dealt with China’s banking system which has undergone continuous reform since 1978. Using data from 76 banking institutions located in China during 1999-2006 and by the appliance of Generalized Method of Moments (Hansen, 1982), interpreted the determinants of bank profitability. In their analyses, they assessed four different measures of performance EVA, NIM, ROAE and ROAA with the first two being better than the latter two which are more conventional. In addition, the type of bank plays a major role, though the size of them does not affect the profitability. The only banks with a positive EVA are the rural commercial ones, perhaps due to their effective operation as local monopolies. Off-balance-sheet activities are insignificant but efficiency has a positive impact on profitability. Furthermore, GDP and unemployment have significant impacts too.

Kumbirai and Webb (2010) invested the performance of South Africa’s commercial banks for the period 2005-2009. By the use of financial ratios, they estimated the profitability, credit quality performance and liquidity of the five largest commercial banks in the country. Furthermore, they cut the period analyzed into two semi-periods (2005-2006 and 2008-2009) in order to tell the differences in performance. The overall bank performance has been improving since 2005 up to 2007. Despite the fact that during that period the size of loan portfolios increased, there was a downward trend in nonperforming loans due to effective credit risk management policies. In the second semi-period there was a deterioration of the performance due to the negative and significant impact of illiquidity stemming from the global financial crisis and the slowing economy. However, South African banks were in a way fortified due to low leverage and limited exposure to foreign assets and remained in a sound position in away during the financial crisis.

Alper and Anbar (2011) through observations over the period 2002-2010 and by the use of a balanced dataset of 10 Turkish commercial banks during 2002-2010, defined the determinants of bank profitability. They used RoA, RoE, which both used as functions of bank-specific and macroeconomic determinants, and NIM, which depicts the difference between income and interest, as measures of bank profitability. The outcomes displayed the positive and significant effect of non-interest income and asset size on bank profitability. Notwithstanding, loans under follow-up and credit’s portfolio size affects negatively and significantly bank profitability. Moreover, when it comes to macroeconomic variables, only the real interest has a positive impact on banks’ performance. The interesting part of the study is the suggestions for the improvement of the profitability by decreasing the credit/asset ratio and increasing non-interest income and the size of the banks. By the same token, the higher the real interest the higher the profitability of the bank.

Sufian (2011) examined the profitability of the Korean banks using a wide sample of different determinants: bank specific and macroeconomic. Through an unbalanced bank level panel data set, he estimated the determinants of Korean banks’ profitability during the period 1992-2003 which is said to be a significant period for the country due to reformations in the country’s financial sector. in addition, there had been limited researches on developing countries’ banking
sectors. There are three important results taken out from that analysis. Korean banks with lower levels of liquidity tend to perform better. Secondly, overhead costs and credit risk have a negative impact whether financial and macroeconomic conditions are controlled or not. And finally, the Asian financial crisis had a negative impact on banks’ profitability.

Ongore and Kusa (2013) tried to fill the gap of the meager studies on moderating effect of ownership structure on performance of banks. They analyzed the banking system of Kenya using data from all the commercial banks of the country. Using a linear multiple regression model and Generalized Least Square on panel data they defined the determinants of Kenyan banks’ profitability. They found that except for liquidity factor, all other bank specific factors have a strong impact significantly on the performance of commercial banks. However, macroeconomic variables on the whole affect ambiguously bank performance at 5% significance level. Furthermore, decreasing role of ownership identity was insignificant referred to the financial performance of banks. Hence, board and management decisions of Kenyan commercial banks drive mainly the financial performance, while the contribution of macroeconomic factors is insignificant.

In the coming part of the literature review we present analyses referred to cross-country estimations on bank performance. Demirguc-Kunt and Huizinga (1997) tried to define the determinants of interest margins and profitability of commercial banks after having collected ban level data from 80 countries over the period 1988-1995. There is a positive correlation between capitalization and profitability but a negative one between profitability and reserves. In developed countries the impact of reserves on margins and profitability is less definite than in developing ones due to high opportunity costs because of inflation and poverty. They also found that the larger asset/GDP ratio and the lower the market concentration of a bank may lead to lower profits and margins. Additionally, any cost such corporate tax is passed fully onto customers avoiding the impact of it on bank profitability straightforward.

Again, Demirguc-Kunt and Huizinga (2000) presented that financial development and structure have an impact on bank performance by the appliance of a combined bank-level data on interest margins, profitability and other variables with data covering all OECD and many developing countries as well. The empirical results of this analysis suggest that banks in underdeveloped financial systems have higher profits. In addition, bank profits and margins in developed financial systems are statistically the same across market- and bank-based systems. Further, financial structure does have a dependent effect on bank profitability or margins which are lower when there is a great bank development. According to regressions, underdeveloped financial sectors tend to be overflowing with a less-than-competitive pricing behavior. Hence, profits are lower with a greater bank development that brings tougher competition.

Using data from the balance sheet and income statements from banks in four different EU countries, Portugal, Span, Germany and France over the period 1986-1999, Abreu and Mendes (2001) investigated profitability and interest margins of commercial banks located in the aforementioned regions. By the use of financial structure variables, macroeconomic and regulatory indicators as well as a set of bank characteristics they estimated whether those countries sharing a common bond, also share the same profitability determinants and interest margins. They performed that NIM and Pre-tax profits have different determinants when assets or equity are used on the denominator of the ratios and only the former depended variable is affected by
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Labor/Assets and crisis. Well-capitalized banks have lower funding costs and higher interest margins which means higher profitability. Though NIM reacts positively to operating costs, pre-tax profits do not operate on the same way. Specifically, less efficient banks pass those costs onto customers by charging them higher interest rates on loans or lower rates are paid on deposits. Finally, on the one hand nominal exchange rate does not affect NIM. On the other hand, inflation increases more bank costs than revenues having a negative impact on bank profitability.

Staikouras and Wood (2004) made a research on the determinants of European Bank industry profitability as a whole for the period 1994-1998. While constructing OLs and fixed effects models, they quantified the contribution of the internal and external factors to the bank performance in the European region. The appliance of cross-sectional time series led them to the outcome that factors related to bank management are not the only one having an impact on bank performance, but macroeconomic determinants too. Banks with higher equity to assets ratios, thus a greater amount of equity, are relatively more profitable because that ratio has a positive and significant impact on bank profitability. Additionally, banks having high non-loan earnings perform better than those depending more strictly on assets, which is implied by the loans to asset ratio. Moreover, provisions due to loan losses over total loans are significantly negative but the fund gaps ratio affects significantly positive the performance. Contrary to previous studies, they performed a positive and significant impact of concentration and/or market share variables on the performance of European banks. Though interest rates levels affect positively that relation, the variability of them and the growth of GDP rate have a negative impact on profitability.

Goddard, Molyneux and Wilson (2004) investigated through cross-sectional and dynamic panels selected determinant of bank profitability in the six largest European banking sectors: France, Denmark, Spain, Italy, the UK and Germany for the period 1992-1998. Despite the persistence of an increasing competition in the European financial sector on the whole, the growth of profit continuous existence. Some evidence of a significant relation between size and profitability in some of the estimators exist but it is flimsy. It was suggested that efficiency is a more important determinant of bank performance than their size. They defined that the relation between off-balance-sheet (OBS) business and profitability is positive only for the UK and neutral or even negative for other countries. Specifically, this negative relation stems from the difficulties, faced by banks that had chosen to diversify rapidly into OBS, in the maintenance of their profitability. Moreover, they found that there is a positive relation between profitability and Capital Adequacy Ratio (CAR), though that is not the expected relation stated in the theory of risk and return: a bank having a high CAR send signals that operates over-cautiously ignoring profitable trading opportunities2. Many managers perform a high CAR in order to send signals to the market that there is a source of future profitability and as a result they create a positive relation between RoE and CAR. Furthermore, they determined little evidence of the impact of ownership on profitability. Last but not least, financial and more specifically banking integration the European region, play a major role among other determinants of bank performance.

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2 CAR is interpreted difficultly due to the growth of OBS business. According to the following equations: RoE=RoA×EM (EM=equity multiplier), where RoE=profit/equity, RoA=profit/assets and EM=assets/equity=1/CAR. RoA is increased and EM reduced by the movement of assets OBS sending a misleading signal that banks at a lower level of risk earn higher return on their assets and depicting CAA as an unreliable indicator of banks' true risk profile.
Borin, Hasan and Wachtel (2004) having used data from eleven transition countries in an unbalanced panel consisted of 225 banks over the period 1996-2000, estimated the impacts of ownership and efficiency on bank performance in the aforementioned countries. The participation of foreign ownership results in more profitable and efficient banks in these 11 transition countries according to literatures they used in their investigation. By the use of only financial performance measures, they found that ownership could be misleading because RoA’s variations, as a performance measure, are deducible to year and country effects. Bank size was defined as a significant coefficient in their regression, performing that the larger the size of a bank the larger the RoA is. Country and year effects have a significant impact on variation of efficiency and they should not be excluded from the analysis. As a result, they were used in second-stage regressions. Moreover, efficiency was found to decrease nonlinearly with bank size and more cautionary policies should be enforced in the field of government-orchestrated bank consolidation because many banks in those countries are too small by international standards to be efficient. The important conclusion from that study is that the few government-owned banks are less efficient while providing services due to the hypothesis that privatized banks perform better and more efficiently. This results in a new background of necessary changes in the bank size and ownership in order higher profits to be achieved.

The sensitivity of bank Net Interest Margin and profitability to interest-rate, term-structure and credit shocks over the period 1986-2033 was the topic of the study of Hanweck and Ryu (2005). The asset size and the product-line specialization of each commercial bank define the net interest margin of each bank. Due to variations in asset composition, each bank reacts differently in order to anticipate for shocks. Generally, large and more diversified banks are less sensitive to interest-rate and term-structure shocks but more vulnerable to credit shocks. Net interest margins are affected positively by an increase in no maturing deposits and short-term assets. Furthermore, they found that banks are not able to hedge easily against interest-rate volatility because the sensitivity of net interest margin to that shock varies among different group of banks. Finally, they defined the sensitivity of RoA to interest-rate and credit shocks and performed that banks were able price actual and expected volatilities in credit risk more accurately than in the past.

Bikker and Bos (2005) introduced a general framework in order to investigate a profit maximizing bank while exposing how nine different approaches estimating efficiency and competition could be fitted into this framework. All models focus on a single variable and consequently they may suffer from identification problems. Instead there should have been a set of different variables as it is known from the theory. An eminent issue is that outcomes derived from efficiency models are difficulty validated due to lack of a sound theoretical background proving the right distribution of the efficiency terms. Furthermore, they noticed that cost-income ratio is negatively correlated with measures such revenues. Additionally, despite the fact that the Panzar-Rosse model exhibits the increasing completion over the last decades, other researches show that concentration has risen and through the upward moves of RoA and RoE completion as well. Finally, when it comes to country comparisons, due to different national conditions, the outcomes for bank performance differ indicatively and cannot be easily exported across the borders.

Spong and Sullivan (2007) provided a research on how different features of governance affect bank performance in the Midwest by the use of a randomly selected sample of state-charted banks. A comprehensive look is provided at different parts of the governance framework of those banks and
the financial determinants influencing owners and managers. The ownership of a bank stock for a hired manager is a motivation for him to achieve the best performance of the bank. Moreover, the boards of directors are probable to have a positive impact on community bank performance while managers’ wealth and financial position affect significantly the decisions made on risk policies of the financial institutions.

In 2009 Goddard, Molyneux and Wilson, applied cross-sectional regressions and a dynamic panel to investigate the dynamics of growth and profitability in saving, commercial and co-operative banks from 5 major European Union countries in the mid-1990s. Little evidence of mean-reversion in the size of banks was defined by the growth regressions. They stated that current profits are sources that can boost the future growth of the financial institutions. On the contrary, a great current expansion can have a negative impact on future profits due to managerial restraints on growth rates that a bank can expand its profits. Another important result of their analysis is that high liquidity or capital to asset ratio could constrain the profitability on average. Furthermore, there is a positive relation between concentration and profitability, but the latter is related negatively to bank-level x-inefficiency.

Chen, Kao and Yeh (2009) estimated the impact of liquidity risk on bank performance in 12 advanced economies for the period 1994-2006. Bank-specific, macroeconomic and supervisory factors are the main ones who can cause liquidity risk in the banking sector. Except for liquidity risk which is considered as an endogenous factor, in their study are included and other endogenous and exogenous factors affecting bank performance such as the financing gap, the size of the bank as a natural logarithm of bank’s total assets, owner restrictiveness, inflation and GDP. Net Interest Marin and ROAA are used as measures of bank performance. They found that liquidity risk is affected by liquid assets, supervisory, external and funding factors which on the whole results in a negative relation with ROAA. However, NIM is affected positively by liquidity risk because the higher levels of illiquid assets in loans the higher the interest income will be. It is important to state the different impact of liquidity risk in different types of economy. Specifically, in market-based financial systems, there is a negative relation between risk and bank performance, though in bank-based financial systems bank performance is not affected by liquidity risk.

The determinants of the profitability of the banking system in USA were examined by Hoffmann (2011) during the period 1995-2007 combining macroeconomic and bank specific variables through GMM system estimator. According to the efficiency-risk hypothesis the most efficient banks will opt for low levels of capital ratios, while with the franchise-value hypothesis high capital ratios will be chosen by the most efficient banks. Ignoring this non-monotonic relationship and paying attention to the single causality, we will be led to probable negative relationship between profitability and capital. Due to only small banks can take advantage of diseconomies of scales because of their size, the effective usage of new technologies will produce higher profitability rather than the size of financial institutions’ investments. Finally, apart from the endogenous factors, the macroeconomic ad industry-specific factors have a strong and significant impact on bank profitability.

Propst (2012) examines the profitability performance of banks in European Union through a cross-country analysis over the period 2009-2010. Due to the financial crisis the liquidity was restricted
affecting significantly and negatively bank profitability. However, when Baltic States and Ireland were included into the sample, variables related to crisis were insignificant. Net interest income, Net Foreign Assets/GDP and credit growth/GDP of the private sector have a significant impact on profitability in 2009. Afterwards, in 2010 the relationship altered with non-interest income affecting significantly the profitability development.

Borio, Gambacorta and Hofmann (2015) made a study for the Bank for International Settlement to investigate how the monetary policy affects profitability. After collecting data from 109 large international banks with headquarters in 14 major developed economies over the period 1995-2012, they defined how changes in the interest rate structure affect all man components of income statement and bank profitability of the whole which was measured by RoA. They found a positive correlation between the level of interest rates and bank profitability. Higher short-term interest rates increase bank’s net interest income through greater bank interest margins and returns from maturity transformation. On the contrary, higher rates can lead to higher loan loss provisions with an impact on debt cost services and higher default probabilities and limit non-interest income. Moreover, profitability is affected significantly by deposits. Lower interest rates can cause a significant reduction on deposits that may lead to a downturn of banks’ profitability. In the field of macroeconomic effects, pre-crisis the impact of monetary policy boosted profitability but during 2011-2014 turned to be negative. As a result, we can see that the efficiency of the monetary policy that controls interest rates plays a major role for bank profitability.

3.1 Banking System in the UK

The aggregate of assets held by banks on their balance sheets is usually the criterion to measure the size of a banking system. These assets include loans to firms and households, as well as securities, like equities and bonds, and different assets. The way the different types of assets are calculated, among different factors, may have a fabric impact on estimates of banking industry size. Banking assets are regularly expressed as a portion of the nominal Gross Domestic Product. Whereas the two variables are not mechanical linked, a clear view of the scale of the banking sector associated to the overall economic activity is given.

Widely speaking, two definitions are usually used to describe a banking system’s size. Connected to the United Kingdom, these are:

- **Ownership basis**: the total assets of UK-owned financial institutions are regularly included, including the assets that come from their subsidiaries and their non-resident branches, whereas the assets of foreign-claimed banks’ UK subsidiaries and branches are excluded.

- **Settlement basis**: this includes all the assets that come from financial institutions and organizations located in the United Kingdom unconcerned of the origin of their major owner. UK-claimed banks’ UK assets are included as well as the assets of external banks’ UK sections and subsidiaries.

While diverse definitions produce contrasting sizes, there are three key elements of the UK banking system that rise despite the definition utilized. First, the United Kingdom banking industry is massive. UK has the largest banking sector on a settlement basis comparing to Japan, United States and the ten biggest countries of the European Union. Respective to GDP, in 1975 it was at the level of 100% compared to 450%
in 2013. At the second place, banks from abroad compose a large part of the UK banking system. This is seemingly its characterizing highlight. 56 different nations locate around 150 deposit-taking branches and 98 deposit-taking subsidiaries in the United Kingdom. About half of the UK banking sector assets are aggregated by foreign banks, mentioning that if the ten largest foreign subsidiaries combine their assets the total value will be around £2.75 trillion. (Deposit-taking subsidiaries from abroad constitute 15% of the total UK-resident banking assets). A third of UK lending between banks is formed by foreign branches in addition to the 30% of gross UK-resident banking assets. About a fifth of worldwide keeping money movement is reserved in the United Kingdom, and UK-settled banks’ foreign resources and liabilities represent more than 350% of UK GDP, around 4 times higher than the middle figure for OECD countries.

Third, non-loan assets play a major role in the composition of total UK banking assets. Loans to non-bank borrowers consist just around the half of the UK-claimed banks’ assets. When it comes to the largest subsidiaries from abroad this figure is even lower: under 10% of assets are credits to non-bank borrowers, with reverse repos and derivatives speaking to around 60% of assets. Customer deposits consist around half of the UK-claimed bank’s liabilities with derivatives and deposits between banks coming as next largest liabilities. As a result, there is a critical contrast between the gross size of the UK banking industry and the net size once risks and exposures between banks are considered.

To evaluate the potential effect of the size of the UK banking system on money related dependability it is critical to distinguish what components have driven the UK banking system to its present size, and which of them may influence its future development. One element behind the presence of worldwide financial centers, including the UK, is liable to be the benefits from clustering, when companies and individuals situate close to each other in urban areas and modern groups (Glaeser (2010)). The advantages of grouping incorporate higher efficiency and wages and also an upper hand in world exchange for enterprises inside the agglomeration (Crafts and Wolf (2013)). It is conceivable that agglomeration benefits have exacerbated the pattern towards bigger and all the more topographically concentrated, worldwide financial centers. The local access to particular labor, the local access to particular information sources and the administrations and learning overflows are three elements that are thought to clarify picks up from clustering.

One explanation of UK being a financial center might be that UK is capable to offer banking services more effectively than other nations. As such, it might have a comparative advantage in giving universal managing and banking services. The wellsprings of this favorable position may incorporate the UK’s focal time zone area between the USA and Asia, perhaps its language, its openness to capital streams and its hearty lawful and administrative structure.

However, the comparative advantage is unrealistic to be the single reason behind the existence of a global financial center in the United Kingdom. A specific area for a cluster can get to be favored over time, regardless of the fact that there was no unmistakable motivation to incline toward one area over another before the business created. The part of history in forming current results in once in a while called “path dependence”. The pre-distinction of the UK monetary system can, to some extent, be followed back to the ascent of London as a financial focus in the eighteenth and nineteenth hundreds of years.

Another conceivable element behind the development in the UK and some other banking systems is that they have profited from a certain administration appropriation. This is a case of a business sector grinding-something which, as per monetary hypothesis, prompts the over or undersupply of a product or service in respect to the sum that would be valuable for the society. The definite government appropriation emerges in light of the fact that a few banks get insurance from the government without completely paying for it. In
contrast to firm-owners, individuals who hold certain banks’ debt, have truly not confronted adequate risk of loss as they anticipate the government to save the banks from failing, as they have done in various cases in the late financial crisis. The fact that creditors and banks do not have to pay for this insurance-guarantee, it can be viewed as a certain endowment (Noss and Sowerbutts (2012)).

In this point a consideration arises on the relation between the size of the banking system and the financial stability outcomes, tracing on the situations experienced by different countries between 2005 and 2014. The main questions tried to be answered were if the size of the banking system was a strong indicator of the crisis, if the countries with larger banking sectors suffered larger crisis and last but not least if a larger banking system of a country automatically was leading to greater direct fiscal costs.

Laeven and Valencia (2012) using two sets of regressions tried to give an answer to the aforementioned questions. In the first set, the dependent variable could take the value 1 or 0 depending on the fact that the systemic banking crisis occurred or not in the country in question. On the other set, the dependent variable used was the minimum market-based leverage ratio, which is described as banks’ market cap as a portion of total assets. The results show that banks which escaped from systemic banking crises and with a higher market-based leverage ratio were inclined to have smaller banking sectors.

Marques, Correa and Sapriza (2013) as well as Gropp, Gruendl and Guettler (2013) showed that this relationship could be misleading if determinants of banking crisis that are correlated with banking system assets exist. Two other variables also included: a measure of capital resilience and a measure of credit prosperity. When credit booms and leverage ratios taken into account the relations between the size of the banking system and the crisis measures stopped to exist. That means that banking system size could not have helped to predict the countries experienced a crisis.

Furthermore, the relationship between the direct monetary costs of the crisis and the size of the banking system was investigated, Laeven and Valencia (2012). Using the costs of recapitalizing banks and purchases of impaired assets, in contrast to the aforementioned results, showed that there is a positive connection between the banking system assets and the direct monetary costs of the crisis, advocating that banking sector size might have raised the fiscal costs of the crisis.

Kosmidou, Tanna and Pasiouras (2008) with their study, investigated the influence of bank-specific characteristics, financial industry structure and macroeconomic surroundings on UK-owned banks’ profits, with commercial operations. By using an unbalanced panel data set of 224 banks, they covered the period from 1995 to 2002 and presented an econometric analysis. Based on previous academic works they decided on two conventional measures of profit performance. The first was the return on assets (ROAA) and the second was the net interest margin (NIM). Five internal measures were considered as possible determinants of UK banks’ performance and another four measures to display the influence of both the market and external conditions. The internal variables used were: cost to income ratio, ratio of liquid assets to customer and short term funding, ratio of loan loss reserves to gross loans, ratio of equity to total assets and the total assets. Concentration in the banking system and stock market capitalization are the variables describing the market structure. According to the results, equity to assets ratio is the predominant determinant of UK banks’ profits operating as a cornerstone to the question that high capitalized banks reduce their costs and enhance their profits due to the lower costs of external financing they meet. Bank size and cost-to-income ratio, the other 2 important determinants, had a negative influence on bank profits. The roles of liquidity and loan-loss-reserves are not so categorical, depending on the measure of
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profitability used. Finally, concerning the macroeconomic factors, if chosen separately, they seem to have an indicative influence on banks' profitability.

Kosmidou, Pasiouras, Doumpos, Zopounidis (2004) with their study attempt to research the performance of the UK banking industry targeting on the efficiency of the domestic banks in contrast to the foreign banks, for the purpose of testing the hypothesis of over performing of the domestic banks in a refined market. The sample is consisted of 32 foreign and 26 domestic banks operating in the UK from the year 1998 to 2001. The study is focused on efficiency and profitability ratios yet ratios calculating risk and liquidity also used in the examination. The performance of both domestic and foreign banks were measured by ten ratios some of which being: return of equity, return on assets, profits before taxes to loans and securities, net interest margin, pre-provision return on assets and the ratio of non-interest expenses to total assets. The results obtained submit that UK-claimed banks display higher performance in comparison to the foreign banks that operate in the United Kingdom. More accurately, profit before taxes to loans and securities and net interest revenue to total earnings assets are higher when it comes to domestic banks, while on the other hand, loan loss provision to total assets is higher for the foreign banks. Besides, home GDP growth and market concentration are able to influence the performance of foreign banks in a greater level than domestic ones.

The aforementioned authors the next years continued their analysis concerning the performance and effectiveness of UK banks and, with their study: “Assessing Performance Factors in the UK Banking Sector: A multicriteria Approach” (2006) they tried to determine the major factors that define the classification of a financial institution as small or large and provide the banking decision makers for approaching adaptations. A set of twenty-one financial ratios and many testing methods and approaches were used to obtain robust results. The evidence of that study signify that small banks display higher overall efficacy than large ones, amplifying the initial hypothesis of the Financial Stability Review (2002).

Ekpu and Paloni (2015) using a sample of 83 UK banks and the time period from 2005 to 2009, employ a panel data to construct their econometric analysis. Their purpose is to investigate whether the process of business lending is an essential source of bank profits in the United Kingdom banking industry. Return on average equity is used as a measure of profitability, while corporate and commercial lending to total assets is the ratio measuring the business lending. Credit risk and quality of loan portfolio were investigated by 3 indicators while liquidity risk by five. The equity to asset ratio is used to calculate the solvency and capital strength together with two indicators for cost efficiency. To conclude, GDP rate growth and Bank of England’s discount rates were the two macroeconomic variables. Their results show that although business lending is a significant root of banks’ profits in a statistically way, its quantitative distinction alters across bank size, and also that the profitability of business lending calculated on the banks’ size and not on their origin.
3.2 Studies on the Financial Crisis

There have been many studies on the impact of economic downturns on bank profitability. Such an economic downturn broke out in 2008, the well-known globalized financial crisis that was worse than the Great Depression of 1930s. The recent banking crisis points out the sensitivity of bank profits to the business cycles. Due to poisoned assets, particularly subprime mortgages of US banks and afterwards the crash of global stock markets, a large portion of the financial worth of bank assets worldwide melted down and the global real economy suffered from that deep recession and the bank credit crunch. A number of macroeconomic (excessive liquidity creation mainly by FED and ECB and an ex-ante international saving overabundance) and microeconomic (lustful securitization, constitutional imperfections in the rating agencies’ model, the Basel capital adequacy and marked-to-market leverage) systemic missteps were among the pathologies in charge of that financial downturn. The major economies globally have significant arrangements for clearing up distressed banks that differ from the simple corporate insolvency law, because financial institutions are sensitive and should rapidly stabilized and revive when a failure emerges.

There have been studies worldwide that focused on the phenomenon of financial crisis. However, crisis broke out very closely to our days and thus the outcomes need further investigation. As years pass, the impacts of crisis through models of analyses would be more definite. Beck, Demirguc-Kunt and Levine (2002) were among the first investigators of the recent crises that broke out in the last quarter of our century. They focused on the impacts of bank concentration, bank regulation and national institutions on the probability of a region suffering a banking crisis. They used data from 69 countries over the period 1980-1997 and the main outcomes were that countries with more concentrated banking systems are less vulnerable to crises, shocks to the economy, macroeconomic conditions and competition are affected by national institutions and finally regulatory policies that frustrate competition are strongly related to the fragility of the systemic banking system. Bolt, Haan, Hoeberichts, Oordt and Swank (2010) investigated the bank profitability of the OECD and comprise 17 countries during recessions over the period 1979-2007. They took into consideration the bank’s lending history, losses on outstanding loans and amortization. They concentrated on total profits of the bank such as net interest income and its components, and on costs such as net provisioning. Their analysis indicates that net provisioning and other costs as well are the main protagonists of the variability in profitability in most countries. Net interest income has a positive and significant impact on bank profitability, but due to recession and the decline of it, bank profitability falls too. Moreover, in the macroeconomic field, GDP affects positively bank profitability too. Each percent reduction of real GDP during the period of recessions causes a 0.24 decrease in RoA.

Cases of analyzing single-countries models related to banking or financial crises on the whole had been investigated by many analysts. Rachdi (2013) illustrated the determinants of bank profitability in Tunisia during and after the global financial crisis. He tried to identify the impact of bank-specific, macroeconomic-specific as well as industry-specific components on bank performance which was performed by NIM, RoE and RoA after having subdivided the period to be analyzed into before crisis period (2000-2006) and during the crisis period (2007-2010). On the one hand, capital adequacy, bank size, liquidity and real GDP growth (annually) had a positive impact on ban performance in the pre-crisis sub-period, though inflation, cots-to-income rates and
growth of deposits had the opposite impact on bank performance. On the other hand, during crisis inflation, operational efficiency and GDP growth determined mainly bank profitability. The case of Tunisia also illustrated that a country with a low integration in global financial markets and strict regulations is not affected seriously by financial crisis.

Working on a similar topic, Dietrich and Wanzenried (2010) again through two sub-periods identified the determinants of bank performance in Switzerland. It was a longer period of investigations (1999-2008) on 453 commercial banks located in Switzerland. They used ROAA and ROAE as measures of profitability. The main finding is that the better capitalized a bank is, the higher the ROAA and consequently the better performance it will have. On the one hand, cost-income ratio is significant only before the crisis for ROAA. On the other hand, loan loss provisions respective total loans have a stronger and negative impact on profitability during the crisis. Furthermore, before the crisis the volume of loans grows faster than the market and only then affects positively bank profitability, though the interest income share has a negative impact on bank performance. In the industry and macroeconomic field, at least before the crisis the impact of market capitalization is positive, though GDP growth does not affect Switzerland’s bank performance.

Lindblom, Olsson and Willesson (2010) analyzed in their study the impact of financial crisis on bank profitability in Sweden with RoE as a measure of profitability, but broken down into two components: ROIF and ROFL. All in all, the Swedish banking system performed well during that period with the exceptions of credit losses due to credit positions in the Baltic countries. The central bank imposed a guarantee program that helped banks with liquidity problems stemming from the creditworthiness of components. Net interest income and other operating profits especially in the second quarter of 2008 had risen. This economic boom is related to the finance of banks’ long-term borrowing with short term credits. Finally, there are different bank categories and the impact of crisis on them differs as a consequence.

In our study we focus on the impact of crisis on the United Kingdom examining the pre-crisis period and during crisis period. The UK, as an open and integrated economy with the rest of the world is unavoidably affected not only by domestic developments but from economic events taking place around the world too. There are different sources that could be evolved into shocks for the UK economy. The weakened demand for UK exports, the rise of the UK imports’ prices, tighter supply of credit and the increasing volatility in asset prices and the uncertainty of the survival of other economies related to the UK can be named as the major pathologies of the global and domestic financial system leading to great shocks. In response to that shocks, monetary policy in the UK was loosened in order UK output and inflation to be supported in an attempt further and deeper damages to be avoided. The main injured determinant of economic growth, annual UK GDP, reduced over 6 percentage points at the height of recession. This entire uncertain financial environment caused many dominos effects. The most important was the bank-run related to the Northern Rock that broke out in September 2007. Northern Rock was among UK mortgage banks that depended on retail funding. It was an opportunity afterwards to recall many of the economic principles that had been used such as short-term borrowing to finance long-term assets.

Logan (2001) analyzed the leading indicators of bank failure related to the small banks’ crisis of the early 1990s in the UK by the use of two cross-sectional regressions. It is commonly known, when
liabilities exceed the assets of a financial institution then definitely fails. But in many cases authorities and bank regulators keep a bank afloat for their purposes. He found that an important indicator in his regressions is loan growth that has a negative impact on bank performance and can lead it to failure. Furthermore, net interest income is positively related to bank failure because it may depict the cut off in risk gained from venture activities that bring in uncorrelated income streams which may be defined as highly volatile. On the other hand, deposit concentration, the size, length of authorization and the exposure to property are statistically insignificant in all models. Finally, the indicator of performance is statistically significant and defines that the higher the profitability, the lower the probability of a bank’s failure.

Muradoglu (2009) investigated theoretically what can be named real and what behavioral related to the UK crisis of 2008. The origins of the UK crisis are related to the sub-prime crisis of the USA and crisis was imported due to the well-developed and international British financial sector. Furthermore, the high leverage not only from the household but form the corporate sector too, the underestimation of risks and finally the insufficiency of the accounting systems were among the main reasons the financial crisis was transferred rapidly to the UK and its impact were invisible in all financial and mainly banking activities. In the following section through regressions we will define analytically the impact of crises on the determinants of bank profitability in the UK.
4 Determinants of Bank Profitability

4.1 Performance Measures

There had been different studies that examined the bank profitability and as a consequence different performance measures such as RoE (return on equity), RoA (return on assets), NIM (net interest margin), RAROC (risk adjusted return on capital), EVA (economic value added), ROAA (return on average assets) and other market-based measures. On the one hand, in many papers RoE is used as a measure of performance. However, RoE has failed during crisis to discriminate the best from the other banks in terms of sustainability and has exposed banks to higher levels of unexpected risk. On the other hand, though RoA performs the profits generated from bank assets, it may be biased because of off-balance-sheet activities. Consequently, we consider in our analysis ROAA and NIM as measures of bank profitability (e.g. Dietrich and Wanzenried, 2010; Abreu, 2011; Alper and Anbar, 2011; Kosmidou, Tanna and Pasiouras, 2008; Rachdi, 2013) ROAA is expressed as a percentage and calculated as net profit after tax divided by average total assets. This can be defined as the most important measure among others measuring the operating performance of a bank due to the use of average value “in order to control for differences that occur in assets during the fiscal years” (Kosmidou, Pasiouras and Tanna, 2008). Furthermore, it is essential in comparing operational performance and efficiency because it takes into account returns gained from assets financed by the financial institution (Kosmidou et al., 2006). NIM is expressed as a percentage of net interest income over interest bearing assets or just assets, defining the interest-earning business of banks. The difference between them is that the former reflects how well bank’s manager uses bank’s investment through per dollar earnings by the use of assets. Though the latter, performs profit gained from interest activities. Moreover, NIM indicates how cheap or expensive the funding of the bank could be. Higher margins perform a cheaper funding and are more preferable since assets’ quality is maintained too (Kosmidou, et al., 2006).

4.2 Independent Variables

According to the aforementioned studies on bank performance, it is suggested that determinants of bank performance are divided into two sub-categories: internal or bank-specific and external or industry-specific and macroeconomic determinants. These determinants are consisted of a comprehensive set of bank characteristics, macro and industry indicators. In the following parts all determinants used in our study are exhibited analytically.
4.2.1 Internal/ Bank Specific Variables

As internal or bank/firm-specific determinants that are defined by the decisions of the manager of the financial institution and policy objectives such as asset size, asset quality/credit risk, capital adequacy or strength, liquidity and operational efficiency, we use the following six firm-specific components as internal determinants of bank profitability: bank’s total assets in logarithm (LNSIZE) for the size of the bank, loan loss provisions to net interest revenue (LOSSPROV) and loan loss reserves to gross loans (LOSSRES) for credit risk or assets’ quality, equity to total assets (ETTA) capital’s strength, net loans to total assets (NLTA) and net loans to deposits and borrowing (NLDB) for liquidity and finally cost to income (COTI) for bank’s efficiency.

With reference to the independent variable of banks’ size, we use the natural logarithm of banks’ total assets (LNSIZE) instead of assets in order to minimize the scale effect (Staikouras and Wood, 2004) which is used in many papers examining the determinants of the performance of banks. The size of a bank as a determinant of bank profitability has been defined as an equivocal variable. On the one hand, large banks are managed difficulty have higher costs on the whole that affects negatively banks’ profitability. On the other hand, due to other parameters, bank profitability is affected positively by the size of the institution. Nevertheless, by most of the studies (e.g. Kosmidou, 2007) is suggested that there is a positive relationship between profitability and this variable due to economies of scales which is an advantage presenting reduced costs. Additionally, larger banks consequently have a higher degree of product and diversification related to loans and thus risk is reduced as Dietrich and Wanzenried (2010) had reported. Moreover, Kumbirai and Wedd (2010) report that according to Tarawneh (2006), bank profitability is strongly affected by bank’s size. Furthermore, Kosmidou, Tanna and Pasiouras (2008) had stated that smaller banks cannot enter markets that larger banks through product and loan diversification, as a result of scale or scope economies, can do.

From the asset quality category that depicts credit risk too we select the loan loss provisions to net interest revenue (LOSSPROV) that indicates the relationship between loss and provisions in the profit and the interest income gained during the same period. A high risk-tolerant bank, invest in assets with inflate profits or serve clients who are of low creditworthiness at higher interest rates. In case of customer’ default on their lending liabilities, will affect negatively bank’s profitability (Kosmidou, 2007). In order banks to avoid such negative cases, they should monitor credit risk via managerial policies and forecasts. Furthermore, central banks set specific standards for the maximum level of loan-loss provisions to be adopted by the financial institutions (Athanasoglou, 2005). Athanasoglou also reported that the higher exposure to credit risk, the higher the negative impact on the profitability of banks. Another variable selected from this category is the loan loss reserves to gross loan (LOSSRES) ratio. It indicates the reserve for losses as a percentage of gross loans. In other words, it is the portion of the whole portfolio that is written off but had been set aside (Kumbirai and Webb, 2010). If that ratio is high, a bad signal would be sent that indicates that there is a poor quality of loans and high risk related to loan portfolio. On the contrary, if the quality of loans is sound, the higher the ratio the higher the profits due to risk-return hypothesis (Kosmidou, Tanna and Pasiouras, 2008). In the same study, they found that (LOSSRES) has a positive and significant impact on NIM that resulted in higher margins supporting the aforementioned hypothesis, but there is no significant relationship between ROAA and this ratio.
As a measure of the strength of the capital we use the equity to total assets ratio (ETTA) which is considered as the main ratio for capital adequacy. Capital adequacy refers to the capital that a bank reserves in order to avoid any fluctuations due to probable shocks. As a result, a high equity to total assets ratio has a positive impact on bank profitability for two reasons: lower need of external funding and lower costs of going bankrupt (Kosmidou, Tanna and Pasiouras 2008). Furthermore, banks with high equity-to-assets ratios are considered safer and less risky and consequently their creditworthiness is increased that leads unavoidably to lower funding costs (Dietrich and Wanzenried, 2010). As a consequence, it is reported a positive impact of that ratio on bank profitability in the literature.

From the field of liquidity, we choose two ratios: net loans to total assets (NLTA) and net loans to deposits and borrowing (NLDB). Liquidity is a major determinant of bank profitability on the whole. Banks should always preserve a competent amount of cash and assets in order to be able to meet their current liabilities, or else there will be characterized as insolvent while facing the liquidity risk and its serious negative impacts. The impact of the net loans to total assets ratio cannot be stated as negative or positive. On the one hand, as Molyneux and Thorton (1992) reported, there is a negative relationship between liquidity risk and bank profitability. Furthermore, Staikouras and Wood (2004) stated that if the loan books of banks are increased rapidly, banks have to pay higher funding costs requirements that could lead to the reduction of bank profitability. On the other hand, Demirguc and Huizinga had found a positive relationship between this ratio profitability, since higher interest margins are associated with the riskiest asset classes, loans. Consequently, it is doubtful whether there is a positive or negative relationship. Another ratio from the category of liquidity is the ratio of net loans to deposits and borrowings (NLDB). Through this ratio we receive information whether banks’ liabilities are covered efficiently or not. In other words, too high NLDB ratio indicates that a bank may not be able to fulfill its requirements due to lack of liquidity, though too low ratio depicts that the bank does not earn as much profit as it could be. Kosmidou, Pasiouras and Tsaklangan8os (2007) suggested that many banks usually retain liquid assets in order to avoid lack of liquidity (cash). Nevertheless, those assets are related to lower returns and as a consequence to lower profitability. Again on the one hand Molyneux and Thorton (1992) found a negative relationship and on the other hand Bourke (1989) reported a positive relationship between profitability and this ratio.

Regarding the measure of the efficiency of banks we use the cost to income ratio (COTI). By this ratio are measured costs and the overheads of running the bank, including benefits, staff salaries and expenses on the whole as a percentage of income. In other words, manager’s ability to control costs is performed by this ratio (Kosmidou, Tanna and Pasiouras, 2008). Since higher profits means lower expenses and vice versa, COTI has a negative impact on banks; profitability. Goddard (2009) reported that higher deposit rates and lower loan rates results in the reduction of the profitability of banks, no matter how much the volume of them is. Dietrich and Wanzenried suggested that operating costs are the in other words the sot to income ratio so the higher the ratio the lower the profitability due to higher expenses.
4.2.2 Macroeconomic Variables

Except for the internal determinants we mentioned in the previous section, there are some macroeconomic and industry-specific determinants that define further banks’ profitability. The banking sector of a country is influenced from the political environment, the structure of the financial institutions and the local as well as global economy too. In our study we include the following determinants from this category: GDP growth (GDPG), GDP per capita (GDPPC) and inflation (INFL).

The first macroeconomic determinant we try to investigate its impact is the GDP growth rate (GDPG). Demirguz-Kunt and Huizinga (1999), Athanasoglou et al. (2008), Kosmidou, Tanna and Pasiouras (2008) and Dietrich and Wanzenried (2011) had used this ratio in their studies and had found that (GDPG) affects positively bank profitability. This rate indicates the changes in the GDP and the state of economic cycle an economy may be. As a result, it would affect in a great extend bank performance and more specifically the demand for loans (Kosmidou, Tanna and Pasiouras, 2008). For instance, if the economy booms, which means GDP growth rate becomes higher and higher, the demand for lending to individuals and enterprises increases. Consequently, banks charge higher margins and their profitability blossoms too (Athanasoglou et al., 2006). On the other hand, if there is a downturn in the economy, GDP starts shrinking and banks’ portfolios as well as their profitability decrease too due to non-performing loans.

While GDP indicates the income of the whole economy, GDP per capita is the rate that depicts the average income of its individual according to the ratio GDP over midyear population. We use this ratio (GDPPC) in our analysis in order to define its impact on the profitability of the banks. As for GDP, a high GDP per capita indicates economic welfare and consequently it affects positively bank performance. The richer an individual becomes the more demand for loans he expresses or the more deposits he retains in banks. In both cases there is a positive impact on the performance of the bank and decrease the risk of default and its losses. Abreu (2003) found a positive impact of GDPPC on bank profitability. However, this positive relationship is ambiguous since Flamini, McDonald and Schumacher (2009) found that GDP per capita is insignificant and in some models had a negative impact on banks’ profitability.

Another external variable is the annual rate of inflation (INFL). Inflation has a significant impact on the real revenues and costs, thought its impact may be positive or negative, depending on the level of its anticipation (Kosmidou, Tanna and Pasiouras, 2008). In the same study, it was found that there is a positive relationship between inflation and banks’ profitability due to the high level of anticipation. This anticipation, derived from the fact that banks’ interest rates had been adjusted and revenues grew faster than costs resulting in higher profits. In the same way, Demirguc-Kunt and Huizinga (1999) and Athanasoglou et al. (2000) found the same positive relationship between inflation and the profitability of the banks.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Expected Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ROAA</td>
<td>The return on average total banks’ assets, measure of profitability.</td>
<td></td>
</tr>
<tr>
<td>NIM</td>
<td>Net Interest Margin, net interest income over total assets, measure of profitability.</td>
<td></td>
</tr>
<tr>
<td><strong>Independent</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LNSIZE</td>
<td>Banks’ total assets (logarithm).</td>
<td>+/-</td>
</tr>
<tr>
<td>LOSSPROV</td>
<td>Loan Loss Provisions over Net Interest Reserves, a measure of Credit Risk.</td>
<td>-</td>
</tr>
<tr>
<td>LOSSRES</td>
<td>Loan Loss Reserves over Gross Loans, a measure of Credit Risk.</td>
<td>-</td>
</tr>
<tr>
<td>ETTA</td>
<td>Equity over Total Assets, a measure of Capital Adequacy.</td>
<td>+</td>
</tr>
<tr>
<td>COTI</td>
<td>Cost to Income Ratio, a measure of efficiency.</td>
<td>-</td>
</tr>
<tr>
<td>NLTA</td>
<td>Net Loans over Total Assets, a measure of Liquidity Risk.</td>
<td>+/-</td>
</tr>
<tr>
<td>NLDB</td>
<td>Net Loans over Total Deposits and Borrowings, a measure of Liquidity Risk.</td>
<td>+/-</td>
</tr>
<tr>
<td>INFL</td>
<td>The annual change in average of consumer prices.</td>
<td>+/-</td>
</tr>
<tr>
<td>GDPG</td>
<td>The annual growth of GDP (in %).</td>
<td>+</td>
</tr>
<tr>
<td>GDPPC</td>
<td>Gross Domestic Product per Capita.</td>
<td>+/-</td>
</tr>
</tbody>
</table>

Table 1: Definition of Variables and expected effects
Determinants of Bank Profitability in the UK during 1999-2014: The impact of the Euro currency and the Financial Crisis

5 Data and Methodology

In this section are demonstrated the sources of our data and is explained the regression model we applied for our investigation. Moreover, there is an overview of the data as a whole.

5.1 Data Sample

In our thesis, we use a sample in the form of an unbalance panel data set of 32 commercial banks located in the United Kingdom. We used an unbalanced panel due to lack of some data from the banks we investigate for various reasons (Athanasoglou, 2005; Dietrich and Wanzendried, 2010 and Kosmidou, 2008). Overall, the amount of the observations included in our sample is 456 and covers a period of 16 years (1999-2014). This research includes detailed data obtained from the Bankscope Database of Bureau van Dijk’s company, in order to define the banks-specific variables that determine bank profitability. Furthermore, we used in our regression macroeconomic determinants too such as GDP growth, inflation and GDP per capita. These were obtained from the Bank of England database and the World Economic Outlook of IMF. We did not use industry-specific variables due to problems with the data (according to the literature review) tried to be obtained, though in other papers they had been included (Athanasoglou 2005 and Kosmidou, 2012).

We applied the following criteria in the Bankscope Database in order to form our sample of banks: 1) They have to be commercial banks, 2) they have to be active and lived banks, 3) they have to be located in the United Kingdom and 4) they should have accounting statements for as many years as possible from the period we examine. In the beginning of our research we found 38 commercial banks but we decreased their number to 32 due to lack of data.

Our aim is to determine the probable impacts of major financial events such as the global financial crisis and the circulation of the common currency in the EMU, EURO in the period we examine (1999-2014). In order to achieve this goal, by the use of dummies, we separate the period in four sub-periods related to each financial event. In the first case of the EURO currency, we examined the impact of EURO in the British banking sector before its circulation 1999-2001 and after its circulation 2002-2007. In the second case of the financial crisis, the two sub-periods are longer: 1999-2007 for the time before financial crisis broke out and the period between 2008 and 2014 after the financial crisis. Further analysis on the methodology we applied will be exhibited in the following section ‘Methodology’.

Descriptive statistics

By the use of descriptive statistics, the main characteristics of the data used in our study can easily be described through summaries about the measures and the sample.
Determinants of Bank Profitability in the UK during 1999-2014: The impact of the Euro currency and the Financial Crisis

<table>
<thead>
<tr>
<th>ROAA</th>
<th>NIM</th>
<th>LNSIZE</th>
<th>LOSSPROV</th>
<th>LOSSRES</th>
<th>ETTA</th>
<th>NLTA</th>
<th>NLDB</th>
<th>COTI</th>
<th>GDPG</th>
<th>INFL</th>
<th>GDPPC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>0.801941</td>
<td>2.504355</td>
<td>16994.14</td>
<td>24.56000</td>
<td>3.530705</td>
<td>4.07466</td>
<td>47.13336</td>
<td>58.17565</td>
<td>62.79488</td>
<td>1.789313</td>
<td>2.213687</td>
</tr>
<tr>
<td>Median</td>
<td>0.650000</td>
<td>1.840000</td>
<td>13792.75</td>
<td>15.75000</td>
<td>1.715000</td>
<td>6.970000</td>
<td>47.60000</td>
<td>56.99000</td>
<td>59.56000</td>
<td>2.240000</td>
<td>2.210000</td>
</tr>
<tr>
<td>Maximum</td>
<td>14.61000</td>
<td>23.66000</td>
<td>215053.7</td>
<td>0.05000</td>
<td>68.96000</td>
<td>87.74000</td>
<td>89.46000</td>
<td>633.5600</td>
<td>536.3600</td>
<td>4.362000</td>
<td>4.454000</td>
</tr>
<tr>
<td>Minimum</td>
<td>-9.89000</td>
<td>-0.05000</td>
<td>18.40000</td>
<td>-220.2100</td>
<td>0.060000</td>
<td>-8.75000</td>
<td>1.590000</td>
<td>1.680000</td>
<td>1.220000</td>
<td>-5.17000</td>
<td>0.867000</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>1.876482</td>
<td>2.574883</td>
<td>357773.0</td>
<td>42.31200</td>
<td>6.732818</td>
<td>9.302624</td>
<td>22.16797</td>
<td>37.98519</td>
<td>30.86278</td>
<td>2.221834</td>
<td>0.970359</td>
</tr>
<tr>
<td>Skewness</td>
<td>2.724995</td>
<td>3.877079</td>
<td>4.938952</td>
<td>2.569713</td>
<td>6.067158</td>
<td>4.064085</td>
<td>-0.03493</td>
<td>6.979151</td>
<td>7.720502</td>
<td>-1.82077</td>
<td>0.651792</td>
</tr>
<tr>
<td>Jarque-Bera</td>
<td>9685.413</td>
<td>10645.54</td>
<td>2607.820</td>
<td>6288.524</td>
<td>4280.367</td>
<td>11926.49</td>
<td>18.31839</td>
<td>227328.0</td>
<td>261850.5</td>
<td>543.4083</td>
<td>39.54858</td>
</tr>
</tbody>
</table>

Table 2: Descriptive Statistics

In the table above, are performed the descriptive statistics for all the variables used in our progress of defining the determinants of 32 commercial banks’ profitability in the United Kingdom over the period 1999-2014. Each variable’s mean, median, minimum, maximum, standard deviation and the number of its observations are contained in this table.

The findings of these statistics related to measures of bank performance, ROAA and NIM, indicates that on the whole the profitability of the banks are not so high. ROAA has a mean of 0.8% and a median approximately the same, around 0.65%. It is noticeable that there is a great difference between maximum and minimum and consequently the standard deviation, 1.87%, is greater than the mean. This is happening due to large differences among the banks we examine in their assets and other financial characteristics and defines that some banks perform better and some other worse in the same period we examine. The other measure of profitability, NIM depicts a better perform of banks due its value of 2.5% which is higher than ROAA. This derives from the fact that high interest rates affect more NIM than ROAA leading to higher profits for the banks in most cases. NIM’s median is higher too, 1.84% because of the same reason. As we can see, BIM has a higher maximum than ROAA due to higher profits gained due to interest rates. The difference between maximum and minimum and the variation that is approximately the same with the mean (2.57%) is a phenomenon due to high differences in the way banks perform. Furthermore, it is of great importance to mention the great gap between well-capitalized banks and the least-capitalized ones, since the maximum value of the equity to total assets ratio (ETTA) is equal to 87.74% though the minimum is only 0.06%. It is an indicative ratio that depicts clearly the origin of many problems in the banking sector due to differences in the institutions’ capital. Moreover, LOSSPROV ratio has the highest standard deviation 42.31%. This happens due to lack of observations, since it is the ratio with the lowest number of observations among the others. Generally speaking, the high levels of variability in our dependent variables are attributed, on the one hand to the inequality of the financial structure and different policies of the banks in our sample and on the other hand to the impacts of the financial crisis mainly and secondly to the circulation of the EURO currency. In the field of macroeconomic variables, GDPG, INFL and GDPPC the variations are not in a great extent than the other ratios referred to the internal environment, though the financial crisis and the circulation of EURO currency is related with that period.
Correlation matrix

The following table contains the correlation matrix of the independent determinants used in our study. The highlighted cells present the highest correlation whether this is positive or negative.

<table>
<thead>
<tr>
<th></th>
<th>LNSIZE</th>
<th>LOSSPROV</th>
<th>LOSSRES</th>
<th>ETTA</th>
<th>NLTA</th>
<th>NLDB</th>
<th>COTI</th>
<th>GDPG</th>
<th>INFL</th>
<th>GDPPC</th>
</tr>
</thead>
<tbody>
<tr>
<td>LNSIZE</td>
<td>1.000000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOSSPROV</td>
<td>0.133738</td>
<td>1.000000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOSSRES</td>
<td>-0.124867</td>
<td>0.083731</td>
<td>1.000000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ETTA</td>
<td>-0.279968</td>
<td>-0.195761</td>
<td>0.222119</td>
<td>1.000000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NLTA</td>
<td>-0.113330</td>
<td>0.075816</td>
<td>-0.139161</td>
<td>-0.009992</td>
<td>1.000000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NLDB</td>
<td>-0.109174</td>
<td>-0.045473</td>
<td>-0.078368</td>
<td>0.429442</td>
<td>0.683578</td>
<td>1.000000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COTI</td>
<td>-0.007944</td>
<td>0.179327</td>
<td>0.139426</td>
<td>-0.109771</td>
<td>-0.189947</td>
<td>-0.178733</td>
<td>1.000000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDPG</td>
<td>-0.109392</td>
<td>-0.363036</td>
<td>-0.008623</td>
<td>0.056523</td>
<td>-0.010911</td>
<td>0.032852</td>
<td>-0.018478</td>
<td>1.000000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INFL</td>
<td>0.186865</td>
<td>0.305320</td>
<td>0.008343</td>
<td>-0.066471</td>
<td>0.036014</td>
<td>-0.027119</td>
<td>0.140763</td>
<td>-0.397968</td>
<td>1.000000</td>
<td></td>
</tr>
<tr>
<td>GDPPC</td>
<td>0.171604</td>
<td>0.113256</td>
<td>-0.027099</td>
<td>-0.115174</td>
<td>0.075519</td>
<td>0.023639</td>
<td>0.049662</td>
<td>-0.233420</td>
<td>0.630932</td>
<td>1.000000</td>
</tr>
</tbody>
</table>

Table 3: Correlation Matrix of Independent Variables

As we can observe above, most of the independent variables have a low degree of correlation that does not exceed the value of 0.30. The highest correlation can be seen between net loans to total deposits and borrowings (NLDB) and net loans to total assets (NLTA), which is 0.68. The second highest correlation which is approximately the same with the previous is between inflation (INFL) and GDP per capita (GDPPC), which is 0.63. Other correlations that are over 0.30, negative or positive, are around 0.36 and 0.42 in absolute value, but they can be noticed only in few cases. The correlation matrix is very important in every analysis because we can investigate if there would be any problem in our analysis. In this case, due to low correlations we do not have any kind of problem related to correlation. In the next section, ‘Methodology’, we will use the correlation matrix to apply a simple check for multicollinearity.

5.2 Methodology

In order to examine the impacts of the internal and external factors on the bank profitability in the United Kingdom, we estimate the following regression with the form presented under:

\[ y_{it} = a + \beta_{b_{it}} X_{b_{it}} + \beta_{m_{it}} X_{m_{it}} + \beta_{d_{it}} D_{j_{it}} + \varepsilon_{it} \]

where \( y_{it} \) refers to the dependent variable of the \( i \)th bank at time \( t \) that is used to measure the profitability of the banks, either as ROAA or NIM. \( X_{b} \) and \( X_{m} \) are the vectors that represent the bank specific and market specific set of variables respectively. In order to avoid the evidence of non-normality and consequently to improve the error normality, we use the dummy variable \( D_{j_{it}} \), where \( j \) takes values from 1 to 2 according to the period of the major event it represents. 1 is for the case of the circulation of the EURO currency and 2 is for the financial crisis. In other words, dummies are used also as a method of separating our model in two periods that are under investigation. In the case of investigation the impact of EURO, \( D_{1} \), is equal with zero for the time period 1999-2001 and is equal with one for the period 2002-2014. \( D_{2} \), which is used to separate our sample into two sub-periods, takes the value zero for the pre-crisis period (1999-2007) and one
for the post-crisis period (2008-2014). We assume that $\varepsilon_t$, which represents the disturbance, is a variable that is normally distributed (Kosmidou, 2008).

We use EViews 7 program in order to help us with our calculations in our analysis. According to Dietrich and Wanzenried (2010) and Kosmidou (2008), the first step to be taken is to examine whether we are going to use in our analysis the fixed effects models or the random effects model in order to make the appropriate estimations. Due to the two measures of profitability, ROAA and NIM, and the two DUMMIES for the two major financial events, EURO currency and the global financial crisis, we have to estimate four regressions. As a consequence, we have to investigate in all four, whether we will apply fixed or random effects. After having estimated I all our four regressions the fixed effects model, we proceeded with the estimation of random effects models, but random effects related only to the firms and not over time. In order to define which of the two models the appropriate one is, we conduct the Hausman test. The Hausman test help analysts decide which model to be used after comparing the values of the p-value and Chi-squared statistics with the critical values. If p-value exceeds the confidence level and the Chi-squared statistic is lower than the critical value, we conclude that the random effects model is the appropriate one. If the results are different, we precede our analysis by applying the fixed effects model.

We executed the Hausman test for our four models. In the first case where we investigated the impact of EURO, we noticed for ROAA that the Chi-square statistic is $X^2_{0.5,11}=7.56$ though the critical value is higher, $X^2_{0.5,11}=10.341$. In addition, p-value is 0.75 which is far higher than every confidence level. In other words, we conclude that we will use the random effects model. Examining the impact of the same major event on NIM, according to our findings Chi-square statistic $X^2_{0.5,11}=6.72$ is lower than the aforementioned critical value and the p-value is 0.82, significantly higher than every confidence level. Consequently, again we state that the random effects model is the appropriate one. In the case of the financial crisis, referring to ROAA, Chi-square statistic ($X^2_{0.5,11}=8.22$), according to Hausman test, is lower than the critical value gained from the tables ($X^2_{0.5,11}=10.34$). When it comes to affection of financial crisis to NIM, again the Chi-square statistic ($X^2_{0.5,11}=7.73$) is lower than the aforementioned critical value. Moreover, in both cases p-value is 0.69 and 0.73 respectively that are both higher than every confidence level. Consequently, instead of using the classic OLS regression model, we indicate that the random effects model is the fitting method. All our results after having conducted the Hausman test, are contained in tables in the Appendix (Tables A-1, A-2, A-3, A-4).

According to Brooks (2008), a simple check for the probable evidence for multicollinearity in our model can be made through the examination of the correlation matrix. As we mentioned in the preceding section, the results do not indicate any significant correlations between any independent variable. So there is no evidence for multicollinearity. In the field of autocorrelation, things are not so clear again according to Brooks (2008). Autocorrelation may occur in certain types of cross-sectional data. The residuals from banks, even though from the same region (i.e.UK) may be correlated in a spatial sense due to difficulties in capturing the regional dimension of bank profitability. So we do not have to worry about this case because it is something commonly met and the tests for this are more complex than the simple case of time series.
6 Empirical Results

In this section, we are exhibiting and analyzing the findings from our model estimation. We are going to describe the impact of every major event separately on each measure of profitability. Before each analysis, there is a table that contains the results from the regressions estimated. As we declared before, we used dummies in our models because we had taken into consideration the two large-scale events as structural breaks in our models.

Empirical results for Return on Average Assets

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LNSIZE</td>
<td>6.46E-07</td>
<td>3.23E-07</td>
<td>2.001196</td>
<td>0.0460</td>
</tr>
<tr>
<td>LOSSPROV</td>
<td>-0.006718</td>
<td>0.001605</td>
<td>-4.185898</td>
<td>0.0000</td>
</tr>
<tr>
<td>LOSSRES</td>
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<tr>
<td>ETTA</td>
<td>0.034542</td>
<td>0.018652</td>
<td>1.855781</td>
<td>0.0658</td>
</tr>
<tr>
<td>NLTA</td>
<td>0.023156</td>
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<td>3.078784</td>
<td>0.0022</td>
</tr>
<tr>
<td>NLDB</td>
<td>-0.004136</td>
<td>0.002956</td>
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<td>0.1732</td>
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<tr>
<td>COTI</td>
<td>-0.009010</td>
<td>0.002148</td>
<td>-4.193777</td>
<td>0.0000</td>
</tr>
<tr>
<td>GDPPC</td>
<td>0.058427</td>
<td>0.027998</td>
<td>2.086825</td>
<td>0.0375</td>
</tr>
<tr>
<td>INFL</td>
<td>-0.240560</td>
<td>0.080747</td>
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<td>0.0030</td>
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<td>DUMMY1</td>
<td>-0.348729</td>
<td>0.247296</td>
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<tr>
<td>C</td>
<td>2.091702</td>
<td>1.816826</td>
<td>1.151295</td>
<td>0.2502</td>
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</table>

Effects Specification

<table>
<thead>
<tr>
<th></th>
<th>S.D.</th>
<th>Rho</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross-section random</td>
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<td>0.6286</td>
</tr>
<tr>
<td>Idiosyncratic random</td>
<td>1.148890</td>
<td>0.3714</td>
</tr>
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</table>

Weighted Statistics

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>R-squared</td>
<td>0.278847</td>
<td>Mean dependent var</td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.260980</td>
<td>S.D. dependent var</td>
</tr>
<tr>
<td>S.E. of regression</td>
<td>1.144215</td>
<td>Sum squared resid</td>
</tr>
<tr>
<td>F-statistic</td>
<td>15.60731</td>
<td>Durbin-Watson stat</td>
</tr>
<tr>
<td>Prob(F-statistic)</td>
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<td></td>
</tr>
</tbody>
</table>

Table 4: Estimation results for ROAA, the effect of EURO currency

While observing the table above, it is distinct that our regression is statistically significant due to the F-statistic that is 15.60 with a p-value 0.00000. The R-squared and adjusted R has an explanatory power that is equal to 27.88% and 26.09% respectively. These are very good values for our unbalanced panel model investigating such a long period consisted of 16 years. DUMMY1 had
been inserted due to the structural-break after the large-scale event of the circulation of common EURO currency in 2002. It on the edge statistically significant with 10% level of significance cause its value is around 0.15. The impact of EURO on the British banking system is negative as we can see form the negative value of the coefficient, decreasing ROAA by 0.348 units. Additionally, in the table are contained all the other dependent variables used in our model and is obvious that all variables except for GDP per capita (GDPPC) affect the movement of ROAA. On the one hand, LNSIZE, ET TA, NL TA and GDPG have a positive relationship with ROAA at 5% significance level. On the other, LOSSPROV, LOSSRES, COTI and INFL have a negative impact on ROAA at 5% significance level and NLDB at 10%.

### Table 5: Estimation results for ROAA, the effect of the Financial Crisis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LNSIZE</td>
<td>7.64E-07</td>
<td>3.23E-07</td>
<td>2.367742</td>
<td>0.0183</td>
</tr>
<tr>
<td>LOSSPROV</td>
<td>-0.006655</td>
<td>0.001589</td>
<td>-4.188429</td>
<td>0.0000</td>
</tr>
<tr>
<td>LOSSRES</td>
<td>-0.040630</td>
<td>0.011129</td>
<td>-3.650944</td>
<td>0.0033</td>
</tr>
<tr>
<td>ET TA</td>
<td>0.041913</td>
<td>0.016722</td>
<td>2.506416</td>
<td>0.0126</td>
</tr>
<tr>
<td>NL TA</td>
<td>0.024390</td>
<td>0.007466</td>
<td>3.26948</td>
<td>0.0012</td>
</tr>
<tr>
<td>NLDB</td>
<td>-0.004950</td>
<td>0.002983</td>
<td>-1.659474</td>
<td>0.0977</td>
</tr>
<tr>
<td>COTI</td>
<td>-0.008788</td>
<td>0.002127</td>
<td>-4.10721</td>
<td>0.0000</td>
</tr>
<tr>
<td>GDPG</td>
<td>-0.006152</td>
<td>0.035697</td>
<td>-0.172342</td>
<td>0.8632</td>
</tr>
<tr>
<td>INFL</td>
<td>-0.007961</td>
<td>0.108535</td>
<td>-0.703351</td>
<td>0.4916</td>
</tr>
<tr>
<td>GDPPC</td>
<td>-0.005162</td>
<td>5.90E-05</td>
<td>-2.750215</td>
<td>0.0062</td>
</tr>
<tr>
<td>DUMMY2</td>
<td>-0.716369</td>
<td>0.232272</td>
<td>-3.084181</td>
<td>0.0022</td>
</tr>
<tr>
<td>C</td>
<td>4.428955</td>
<td>1.336894</td>
<td>3.312869</td>
<td>0.0010</td>
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</tbody>
</table>

**Weights Specification**

<table>
<thead>
<tr>
<th>S.D.</th>
<th>Rho</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.48634</td>
<td>0.6310</td>
</tr>
</tbody>
</table>

**Weighted Statistics**

| R-squared | 0.291029 | Mean dependent var | 0.148763 |
| Adjusted R-squared | 0.273464 | S.D. dependent var | 1.330430 |
| S.E. of regression | 1.134277 | Sum squared resid | 571.2439 |
| F-statistic | 16.58906 | Durbin-Watson stat | 0.912576 |
| Prob(F-statistic) | 0.000000 |

Having examined the impact of EURO in bank profitability, we continue with the above table containing useful information from our research on the impact of financial crisis. as someone can define, our model is significant due to F-statistic is 16.56 with a p-value equal to zero. R-squared and adjusted R-squared are a bit higher than the previous case, 29.1% and 27.34%, presenting that
this model explains slightly better the movement of ROAA. Additionally, these values are high too as we mentioned in the previous paragraph. While examining the impact of the global financial crisis that broke out in 2008, we inserted the DUMMY2 variable as a structural-break. Financial definitely affected negatively the ROAA as we can notice from the results that exhibits the significance of DUMMY2 at 5% significance level with a p-value 0.002, decreasing bank profitability by 0.71 units. All the other dependent variables, except for GDPG and INFL, affect the movement of ROAA. LNSIZE, ETIA and NLTA with 1% level of significance affect positively ROAA, though LOSSPROV, LOSSRES, COTI and GDPPC at 1% significance level and NLDB at 10% significance level have a negative impact on ROAA. It is critical that all variable appear in both models at least once, but only six of them appear in both models having the same impact on ROAA: LNSIZE, ETIA, NLTA, LOSSPROV, LOSSRES and COTI.

Comparing our results with other studies, we notice that the size of the bank has a positive impact on the profitability and is in consistent with Athanasoglou et al. (2006) and Kosmidou (2008) who had stated that the larger the size the lower the credit risk. However, our findings are in concordance with Dietrich and Wanzenried (2010) and Kosmidou (2008) who found a negative relationship due to larger banks’ intention to earn lower profits and margins. Our findings referred to equity over assets and net loans over total deposits are in consistent with Abreu and Mendes (2001), Kosmidou (2007), Dietrich and Wanzenried (2010) and finally with Kosmidou (2008). Loan loss provisions and loan loss reserves over gross loans, have a negative impact on bank profitability because the lower the quality of loan portfolios the higher the credit risk. In addition, cost to income ratio has a negative effect in bank profitability because it represents the efficiency on management that leads to increasing costs. These findings are in consistent with Dietrich and Wanzenried (2010) and Kosmidou (2008). In the field of macroeconomic determinants, inflation depends on the level of its anticipation and thus our findings are in concordance with Kosmidou (2008) but in consistent with Rachdi (2013). GDP growth is in consistent with Kosmidou (2008), Dietrich and Wanzenried (2010) and Kosmidou (2008).
Empirical results for Net Interest Margin

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LNSIZE</td>
<td>-2.60E-07</td>
<td>4.54E-07</td>
<td>-0.573810</td>
<td>0.5664</td>
</tr>
<tr>
<td>LOSSPROV</td>
<td>-5.85E-06</td>
<td>0.002255</td>
<td>-0.002595</td>
<td>0.9979</td>
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<tr>
<td>LOSSRES</td>
<td>-0.004975</td>
<td>0.015779</td>
<td>-0.315253</td>
<td>0.7527</td>
</tr>
<tr>
<td>ETTA</td>
<td>0.042852</td>
<td>0.023403</td>
<td>1.831067</td>
<td>0.0678</td>
</tr>
<tr>
<td>NLTA</td>
<td>0.014032</td>
<td>0.010574</td>
<td>1.327012</td>
<td>0.1852</td>
</tr>
<tr>
<td>NLDB</td>
<td>-0.003635</td>
<td>0.004211</td>
<td>-0.863155</td>
<td>0.3885</td>
</tr>
<tr>
<td>COTI</td>
<td>-0.006371</td>
<td>0.003019</td>
<td>-2.109994</td>
<td>0.0354</td>
</tr>
<tr>
<td>GDPG</td>
<td>0.026199</td>
<td>0.039345</td>
<td>0.665881</td>
<td>0.5058</td>
</tr>
<tr>
<td>INFL</td>
<td>-0.149063</td>
<td>0.113472</td>
<td>-1.313653</td>
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</tr>
<tr>
<td>GDPPC</td>
<td>-4.98E-05</td>
<td>0.000117</td>
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<td>DUMMY1</td>
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<td>0.0427</td>
</tr>
<tr>
<td>C</td>
<td>4.242884</td>
<td>2.553354</td>
<td>1.661690</td>
<td>0.0973</td>
</tr>
</tbody>
</table>

As we can notice in the table, the regression’s F-statistic has a value of 4.69 and tests the null hypothesis that the parameters determining the slope are jointly zero. The p-value is closely to zero 0.000001, so our regression statistically significant and we reject the null hypothesis. The explanatory power of R-squared and adjusted R-squared are equal to 10.4% and 8.2% respectively. Though it is low, it has a normal value for an unbalanced panel investigating a large period such ours. DUMMY1 is statistically significant with 5% level of significance as we consider its p-value (0.042). It depicts the negative impact of the EURO on the NIM, decreasing its value by 0.7 units. Furthermore, the table contains useful information about the dependent variables. Someone can detect that LNSIZE, LOSSPROV, LOSSRES, NLDB, GDPG and GDPPC are statistically insignificant though ETTA, COTI are statistically significant with 5% confident level and NLTA and INFL are almost statistically significant with a confidence level approximately 10%. ETTA and NLTA have a positive impact on the bank profitability but COTI and INFL have negative affections, due to high costs and low levels of anticipation respectively.
In table above is exhibited the random effects model including the DUMMY2 related to the affections of the financial crisis in NIM. Relevant to the F statistic that is 4.59 and has a p-value again approximately equal to zero (0.000001), we reject the null hypothesis and our model is statistically significant. R-squared and the adjusted R-squared can explain the movement of NIM at 10.02% and 8% respectively. DUMMY2 is statistically significant only at 10% significance level and presents the negative impact of the financial crisis on the movement of NIM, decreasing it by 0.58 units. When it comes to the variables, again the same LNSIZE, LOSSPROV, LOSSRES, NLDB and INFL are statistically insignificant though ETTA, COTI and GDPPC at 5% significance level and NLTA at 10% significance level, are statistically significant. It is substantial to mention that between the two different events, the significance level changes in the way the variables are significant and that INFL plays no important role in the second case as while as GDPPC in the first. ETTA, NLTA and COTI have the same impact on NIM as previously and GDPPC has a slight but a significant negative impact.
Kosmidou (2008) found that the size of the banks and cost to income ratio are statistically significant with negative impacts on NIM, though loan loss reserves over gross loans indicates the liquidity, equity to total assets ratio that represents the capital adequacy of the institution, inflation and GDP growth have a positive and significant relation with NIM. Cost to income ratio that depicts banks’ efficiency was expected to have a negative coefficient due to the efficiency expenses management that is a potent determinant of bank profitability. Kosmidou (2007) and Dietrich and Wanzenried (2011) found the same negative relationship with NIM. Loan loss reserves over gross loans ratio has a positive coefficient due to higher risks that result in higher gains. Equity to total assets ratio as well as Demirguc-Kunt and Huizinga (1999) had stated, has a positive impact because well capitalized banks reduce the costs of a possible bankruptcy. Rachdi (2013) found that the size of the banks, cost to income ratio and inflation have a negative impact on NIM though net loans over total assets standing for liquidity and GDP growth have a positive and significant relationship with NIM, which results are in concordance with Kosmidou. Our findings that equity to total assets and net loans over total assets have a positive relationship with NIM and cost to income ratio and inflation have a negative impact on NIM are in consistent with the aforementioned studies.
7 Conclusion

During the last two decades two large-scale financial events took place: the circulation of the common EURO currency in 2002 and the global financial crisis broke out in 2008. These events affected especially the European continent and especially big economies such as the British economy and its major component, the banking sector. In this study we examined how these two events affected the profitability of the British banks over the period 1999-2014. Our sample was 32 commercial, active and lived banks located in the United Kingdom that helped us create an unbalance panel data that consisted of 456 observations. We used as measures of profitability ROAA and NIM for the aforementioned reasons in the literature review section. Furthermore, we have chosen 10 independent variables, 7 bank-specific and 3 macroeconomic.

This paper indicates that the results from our examinations are not always as the expected ones gained from the theory or other papers that had dealt with the same analysis. We used random effects model due to the results gained after executing the Hausman test, though in many other papers the fixed effects model had been the fitted one. Moreover, we implemented two dummy variables, one for each major event in order to investigate the probable impact of them on the profitability of the banks. All our models, according to F-statistic and its p-value, are statistically significant at the 1% significance level. We estimated four models; two for each profitability measure: one by the use of DUMMY1 as a structural break for the circulation of EURO and one by the use of DUMMY2 as a structural break for the financial crisis. In all cases our dummies were statistically significant but at different significant levels: DUMMY1 for ROAA at 10%, DUMMY2 for ROAA at 1%, DUMMY1 for NIM at 5% and DUMMY2 for NIM at 10%. In all examinations, all dummies had indicative negative impacts on bank profitability.

Between the two measures of profitability, there are differences in the variables they affect each. This happens because these two measures have a compelling difference: ROAA reflects how well a manager handles banks’ investment through per pound earnings by the use of their assets, though NIM indicates profits gained from interest activities. The size of the banks has a positive impact only in ROAA in both models while the equity to total assets ratio has on both ROAA and NIM positive impacts indicating that the big in size and the well-capitalized banks respectively, have on the one hand greater returns and on the other hand they can anticipate any credit risk due to financial crisis or changes in the interest margins due to the circulation of EURO. Net loans over total assets are positive and significant for ROAA while for NIM is on the edge to be significant cause their p-value is 0.18 in both cases. Due to the profits a bank gains from the loans, this is a positive relationship. Loan loss reserves over gross loans and loan loss provisions over net interest reserves, as indicators of the low quality loans portfolios that increase credit risk, consequently have a negative relationship with bank profitability. But only in the case of ROAA their coefficients are statistically significant. Cost to income ratio that determines the operating costs of banks to total revenues, has a negative and significant impact on both ROAA and NIM. Net loans over deposits and borrowings ratio, which is an indicator of liquidity like the net loans over total assets indicator, is only statistically significant for ROAA in the model that examines the impact of the financial crisis. Its impact is negative due to the low returns gained from liquid assets that result in lower profitability. In the macroeconomic field, inflation affects negatively only ROAA in the case of
EURO currency as a result of disability to anticipate the interest changes. The growth of GDP affects again only ROAA in the same model positively, though the GDP per capita affects negatively both ROAA and NIM in the model investigating the impacts of the financial crisis.

There is a number of limitations of our study. The lack of observations in some banks that lead us to exclude them from our sample decreasing the sample as a whole resulted in a narrower sample that maybe had restricted our investigation in this field. Moreover, by the use of potentially relevant explanatory determinants, our model would be enriched and the goodness-of-fit would be higher. Furthermore, we do not take into deep consideration the regional dimension to bank profitability that could lead to autocorrelation in a spatial sense. Finally, to overcome those limitations, further researches could incorporate industry-specific variables such as concentration ratio and banks’ ownership or variables related to quality measures of banks such as managerial skills.
## 8 Appendix

### Correlated Random Effects - Hausman Test

**Test cross-section random effects**

<table>
<thead>
<tr>
<th>Test Summary</th>
<th>Chi-Sq. Statistic</th>
<th>Chi-Sq. d.f.</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross-section random</td>
<td>7.563635</td>
<td>11</td>
<td>0.7518</td>
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*Table A-1: Hausman Test – ROAA and Euro*

<table>
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<tr>
<th>Test Summary</th>
<th>Chi-Sq. Statistic</th>
<th>Chi-Sq. d.f.</th>
<th>Prob.</th>
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</thead>
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<td>0.6926</td>
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*Table A-2: Hausman Test – ROAA and Financial Crisis*

<table>
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<th>Test Summary</th>
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<th>Chi-Sq. d.f.</th>
<th>Prob.</th>
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</table>

*Table A-3: Hausman Test – NIM and Euro*

<table>
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<tr>
<th>Test Summary</th>
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<th>Chi-Sq. d.f.</th>
<th>Prob.</th>
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<tr>
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<td>11</td>
<td>0.7365</td>
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</tbody>
</table>

*Table A-3: Hausman Test – NIM and Financial Crisis*
9 References


Determined of Bank Profitability in the UK during 1999-2014: The impact of the Euro currency and the Financial Crisis


