

The Impact of Credit Risk on Profitability of the Commercial Banks

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Abstract

This paper aimed to analyse the impact of credit risk on profitability of five big UK commercial banks. For measuring profitability, two dependent variables ROA and ROE were considered whereas two variables for credit risks were: net charge off (or impairments), and nonperforming loans. Multiple statistical analyses were conducted on bank data from 2007 to 2015 to cover the period of financial crisis. It was found that credit risk indicators had a positive association with profitability of the banks. This means that even after the deep effects of credit crisis in 2008, the banks in the UK are taking credit risks, and getting benefits from interest rates, fee, and commissions etc. The results also reveal that the bank size, leverage, and growth were also positively interlinked with each other, and the banks achieved profitability after the financial crisis and learned how to tackle the credit risk over the years.

Keywords: Credit risk; UK commercial banks; Bank profitability; Net charge off; Nonperforming loans; ROA; ROE

Introduction

The banking industry worldwide has been more complex over the years because of rapid development and growth of financial security market [1]. Consequently, the banks started to practice multiple compound operations without even perceiving the risks associated with these transactions. As a result, the risk attitude and risk exposure of banks became more composite and subject to system failure and thus they caused to break down to economic system of the country where they operate. The governments of various countries tried to control the situations by practicing regulatory reforms in order to stabilise the economy. However, it is worth to declare that these reforms did not work well and ended up with the similar outcomes such as financial volatility and economic downturn around the globe including UK, USA and other economies on which worlds' institutions are based to great extent. During all the circumstances the most exposed risk, which was difficult to discover, was the credit risk [2]. The significance of credit risk is enlarged by the reality that it is associated with the collateral problem. Hence, it becomes the most controversial topic to be discussed and explored. For dealing with credit risk, Basel II also practiced and adopted different credit risk management techniques [3]. The primary objective of these practices was to improve the quality of credit risk management without limiting the competitiveness of the banks worldwide.

Over the last 10 years, the quality of the loan and its portfolios across many economies worldwide stayed comparatively stable until the emergence of 2007-08 financial crises. Since then the quality of the bank assets declined quickly because of the world economic downturn. The reality is that the loan performance is closely associated with the economy of any country and decline in the loan performance was not yet standardised across the world economies [4]. For instance, some cross-country analyses and evaluations in terms of GDP performance during the time of crises reveal extensive enlargements in non-performance loans. In 2009, the economy of Latvia squeezed by 18 percent decline in GDP. Simultaneously, the economy of Germany also shrank by nearly 5% in terms of GDP and when it appears to non-performing loan ratio, it also contracted by great extent [5].

Banks face too many serious problems due to unsuccessful credit risk management but the credit lending remains the chief activity of the banking sector throughout the world. The core cause behind it that banks can no longer survive without this activity. This is the reason

that credit worth is considered as a key sign of financial health and soundness of financial institutions particularly the banks. The interests charged by the banks on advances and loans shape large part of the bank's assets and delays and defaults of credits and advances create solemn circumstances for both the lenders and borrowers and even the whole economy can be disturbed as evident in the 2008 financial crisis. Different studies in the context of banking crises across the world uncover the fact that poor credits (asset quality) are the primary cause of failure of the banks [6]. Stuart indicates that the ratio of non-performing loans (bad loans) all around the world was extremely high between 1999 and 2009 in commercial banking sector [7]. And this was due to a number of reasons such as absence or inadequate loan collaterals, poor loan processing, ineffective credit risks management, excessive intervention during loan lending procedure, and several negative impacts on bank profitability.

Therefore, by considering the importance of credits in the banking sector and their severe economic impact, it is extremely important to find the relation and impact of credit with/on profitability of the bank. The banking theory points out 6 major risks associated with the credit policy of banks. These risks are: credit risk (or repayment risk), credit deficiency risk, operating risk, portfolio risk, interest risk, and trade union risk [8]. However, credit risk is the most vital risk among them and thus, it requires special awareness and concentration. Hence, a sincere attempt is made in this dissertation to make the modest contribution to the credit risk literature by analysing the impact on UK banking sector with particular focus on five big UK commercial banks including HSBC, Barclays, Royal Bank of Scotland, Lloyds Banking Group, and Standards Chartered Bank.

Literature Review

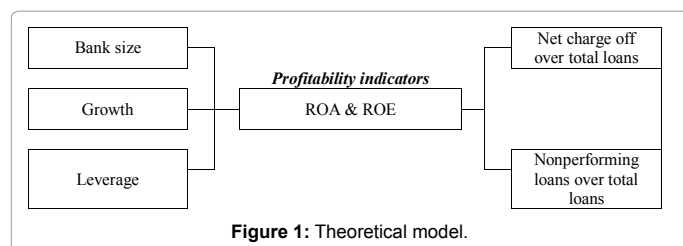
Figure 1 illustrates the proposed theoretical model of this study. The model consists of two profitability indicators (ROA and ROE)

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which are considered as dependent variables; and five independent variables (bank size, growth, leverage, and credit risks (ratio of net charge off and non-performing loans to total loan) (Figure 1).

There are several risks linked with the banking sector namely credit risk, earning risk, interest rate risk, market risk and liquidity risks are key risks. There are three dominant categories of these risks like, credit risk, operations risk and market risks. Among all types of risks the vigorous part is played by the credit risk without any suspicion that bank's biggest asset is loan which is normally consists of 50 to 70 per cent of banks value. Credit risk is well-defined by the Basel committee on Banking supervision as "potential that a bank borrower or counterparty will fail to meet its obligations in accordance with agreed terms" [9].

The credit risk based upon the obtainable internal data which is measured by investigating the adjustments in quality loans (medium or low) over total asset ratio. The credit risk can be controlled and dropped down by the chance provided by this ratio. However several scholars have stated the conventional ratios which can be employed to recognise the credit risk if no data about medium loan quality is available, for example;

- o Total loans to total deposits
- o Total loans to total assets
- o Nonperforming loans to the total loans
- o Nonperforming assets to total loans and advances
- o Loan loss reserves to the total loans
- o Net charge-offs of loans to total loans and advances [5,10-12].

Literature on non-performing loans has extended along with the attention towards investigating the major reasons behind the financial vulnerability over the last few years. Financial weakness is primarily because of critical role impaired assets have, proven by the evidence which shows the firm link between banking/financial crises and NPLs in Sub-Saharan African countries and East Asian countries during the 1990s. The prevailing literature to scrutinise the determinants of non-performing loans in Guyana is studied in the current section to formulate a theoretical framework.

Keeton and Morris made an examination on the causes of loan losses in their earliest study [13]. Latterly they estimated the 2470 losses insured by commercial banks in the US during the time period of 1975 to 1985. NPLs are used by them as the prime method of calculating loan gains and losses. The findings of their study indicate the variation in loan losses documented by banks is mainly described by the local economic situations and inadequate performance of particular industries.

The publication of Keeton and Morris is followed by several other studies which anticipated interrelated reasons for problems regarding credits in the United States. Another study was conducted by Sinkey

and Greenwalt on the loan gain/loss experience of major banks in the United States [14]. The results of their study postulate that Loan – loss rate is affected by both internal and external factors of these banks. The term loan loss rate refers to an addition of NPLs and net loan charge offs and dividing this sum by net charge offs plus total loans. The main findings of their study showing that internal factors namely High rate of interest, Excessive lending and volatile funds significantly and positively influence the loan-loss rate. Sinkey and Greenwalt also discovered that loss rate of banks is also based on the economic conditions. They used the data of giant banks in the US during the Time period of 1984 to 1987 by employing simple log-linear regression.

Another study on the effect of loan expansion in the United States is conducted by Keeton [13]. The author took the data from 1982 to 1996 by employing the regression model for empirical analysis. Evidence show that credit growth is strongly associated by impaired assets stated by the author. The major credit loss in particular US States is affected by the rapid credit growth that has a relationship with lower credit standards.

Many studies also provided similar results conducted other than US financial system. Kodan and Chhikara examined the Indian banking industry through statistical tools and techniques by analysing the trends and composition of NPAs [15]. The analysis of data showed the significant reduction in NPAs in Indian industry over the time.

Salas and Saurina conducted a study on the Spanish commercial and savings banks by using a comprehensive dataset and framework for 1985 to 1997 [16]. The key aim of this research was to explore the determinants of problem credits in Spanish banks. Their findings indicate that major variation in NPLs is mainly explained by market power, capital ratio, bank size, rapid credit expansion, and true GDP growth. Similarly in another study Spanish banking sector was investigated for the period of 1984 to 2003. The empirical evidence shows that loan terms, higher interest rates, and GDP growth are key determinants of NPLs. This study points out that managers in commercial banks provide more loans when economic conditions are excellent and trigger several issues such as agency problems, herd behaviour and disaster myopia.

Rajan and Dhal conducted a study on the commercial banks of India by utilising panel regression analysis [17]. They reported that encouraging economic situations and other financial indicators such as credit direction, bank size, credit terms, and maturity have significant influence on the NPLs of Indian commercial banks.

Fofack made an attempt to examine the determinants of NPLs in several countries of Sub-Saharan Africa by using a pseudo panel-based model [18]. The researcher found that NPLs are determined by many factors such as interest margins, interest rate, economic growth, interbank loans, and exchange rates etc. The NPLs and these economic factors have important role to play in the undiversified African countries.

The study of Hu et al. indicates the association between commercial bank's ownership structure and NPLs in Taiwan for the period of 1996 to 1999 using panel dataset [19]. The results indicate that Non-performing loans are negatively associated with higher government ownership and bank size while diversification seems indifferent and may not be a determinant.

Ratio analysis is used to measure and analyse the bank's profitability. Financial statements of banks demonstrate some ratios and some can be calculated based on requirements if needed. Koch and MacDonald

stated that relatively appropriate measures for measuring the bank's profitability level are Return on Assets (ROA) and Return on Equity (ROE) [20]. These measures are described in the light of the existing literature in this section.

ROA is calculated as a percentage of net income and total assets. ROA is used as main profitability measure in most of the organisations including banks and financial institutions. The ROA demonstrates the level of net income produced by the bank and also determines how the assets utilised by banks to generate profit over the years [6]. The competence and proficiency of banks in transforming their assets into profits is also indicated by it. Hence, to improve the performance of banks, they always attempt to achieve higher ROA. The ranking of banks is usually based upon the higher ROA ratio and total assets. As a general view, particularly in banking sector, ROA is known as good profitability multiplier for the reason that equity multiplier does not influence it [21].

A percentage of net income over shareholder's equity is termed as ROE. The net income comprised of all types of earnings like preferred stock income, surpluses, undivided profits and capital reserves. The difference between net assets and liabilities is termed as shareholder's equity on the other hand. The most common measure to determine the effectiveness of banks of generating revenue based on every element of shareholder's equity.

To attain sufficient level of profitability, Both ROE and ROA refer to bank's managerial ability. According to Golin and Delhaise, the ROE between 15 to 20 per cent is considered to be good for a banking institution [6].

The significant difference between ROA and ROE measures is debt. The total assets and shareholder's equity will become equal in the absence of debt; consequently the results drawn from each measure would be equivalent. According to the Koch and MacDonald, a greater value of ROE is not always considered as inspirational indicator of good performance of the bank, consequently ROA is known as suitable measure of profitability and efficiency of the banks [20].

An extensive stock of earlier literature has discussed the ROE as a significant indicator to quantify the profitability of the banks. Foong revealed that ROE is used to measure the efficiency of banks which explains to make upcoming profits; the reinvested income is used to what extent [22].

According to Riks bank's Financial Report to define the profitability in the banks, the technique which is normally used is to associate profit with shareholder's equity [23]. Moreover, in the paper "Why Return on Equity is a Useful Criterion for Equity Selection", the author has found a very useful instrument for profit generating efficiency provided by ROE for its ability to measure the extent of company's earnings on the equity capital.

Company's after tax annual net income divided by shareholder's equity is termed as ROE. NI is the deduction of all expenditures and taxes from total earnings. Retained earnings added to capital invested in the company are called equity. Basically, the amount of earnings made from equity is termed as ROE. The higher value of ROE indicates that, without injecting new capital into the company profit is rising.

Each year shareholders are provided with more of their investment referred by a progressively growing ROE. Conclusively, the greater ROE is fruitful for them as well as for the growth of the company. Additionally, ROE guides the investors how efficiently the capital is reinvested by taking the retained earnings.

According to the study of Waymond, the indicators widely used with greater esteem for credit analysis in banks is profitability ratios, as results of management performance is associated with the profitability [24]. Most widely used ratios are ROE and ROA, and the ROE level of quality ranges from 15-30 percent and at least 1 per cent for ROA.

Joetta suggested that the aim of ROE as the investigation of total profit produced by the firm's equity. It is also mentioned that to engender profit from equity the ROE is used as a gauge of the efficiency [25]. This ability is associated with how accurately the collaterals are utilised to yield the earnings. The assets' quantity produced by the company against each equity dollar, considerably determined through the effectiveness of assets utilisation. Thus, after bringing the evidence of ROE used as the profitability indicator, the discussion can be moved towards credit risk management indicators.

Research Methodology

Research design

The research design embraces the methods on which the research work is founded on Saunders et al. [26]. In other words, it can be said that it is composed of the type of the study which is employed by the researchers to accomplish the objectives. The type of study covers various aspects such as hypotheses, variables, methods, and analyse framework. Descriptive and exploratory research designs are the two fundamental categories of research design. The use and adoption of both research designs is primarily based on the nature and requirements of the study [27].

The descriptive research design is inappropriate for this research because of scientific necessity such as laboratory experiment. The exploratory research design can better fit in this research because of highlighting the links (significant or insignificant) between credit risk and bank profitability. It is supposed that finding these links will help the UK banks to avoid credit risks in the future. In addition, the study's nature is elastic and distinct in answering the research questions. Therefore, the research objectives can be accomplished more explicitly while adopting exploratory research design [28]. Moreover, the results of this study are largely rooted in the quantitative data and thus careful and thorough investigation is needed which can be achieved by adopting exploratory research.

Population

The key aim of this research is to determine the links between bank profitability and credit risks associated with banks. The numerical data for analyses is acquired from five big UK banks for the period of eight years starting from 2007 to 2015. The big five UK banks refer top five UK commercial banks which include:

1. HSBC
2. Barclays
3. Royal Bank of Scotland (RBS)
4. Lloyds Banking Group (consists of Lloyds TSB, Halifax, and Bank of Scotland)
5. Standard Chartered Bank (SCB)

The updated list of top UK banks is acquired from the MarketCensus.com. The data required for selected variables is acquired from Bank Scope database which extracts information from the financial statements of the banks. The financial statements of some banks were

also considered to find double check the information/data extracted.

Data collection

The empirical data about study variables for the period of eight years (2007 to 2015) is collected from Bank Scope database which contains the data of all commercial UK banks. This period is important because it covers the financial crises of 2008 as well. Two types of empirical data (dependent variables and independent variables) are collected based on the theoretical model of the study (Figure 1). The dependents variables are ROE (Return on Equity) and ROA (Return on Assets) and conversely the independent variables are the factors that affect bank profitability including the credit risk. So the independent variables include credit risk variables, bank size, growth, and leverage as shown in Table 1.

Model

This study investigates the impact of credit risk on profitability of big five UK commercial banks. For this purpose, it is essentially required to find the relationship between credit risk and profitability indicators and that is why the regression model is used to declare dependent and independent factors. A general linear model of regression is outlined in equation 1 where ‘Y’ indicates the dependent variables and ‘X’ are the independent factors. ‘C’ shows the coefficient.

$$Y=c+f(X) \tag{1}$$

By putting the study variables in above equation, two equations 2 and 3 can be formed where ROE_{it} and ROA_{it} represent the profitability factors (i=1,...N, and t=1,...,T) which depend upon the independent factors such as credit risk factors including CRIMP (Credit risk calculated as impairments divided by total loans), CRNPL (Credit risk calculated as non-performing loans divided by total assets), BS (bank size), GR (growth in bank interest income), and LV (leverage ratio).

$$ROA_{i,t}=c_0+\alpha CRIMP_{i,t}+\beta CRNPL_{i,t}+\chi BS_{i,t}+\delta GR_{i,t}+\gamma LV_{i,t}+\epsilon_{i,t} \tag{2}$$

$$ROE_{i,t}=c_0+\alpha CRIMP_{i,t}+\beta CRNPL_{i,t}+\chi BS_{i,t}+GR_{i,t}+\gamma LV_{i,t}+\epsilon_{i,t} \tag{3}$$

Apart from the regression analysis, the descriptive and correlation analyses are also performed. The descriptive analyses indicate the calculation of fundamental statistical formulas such as central tendencies like mean, median, mode; and deviations like standard deviation. The central tendencies show the averages of the particular variables while standard deviation indicates the variability of data or the standard error.

The links or associations between credit risk variables and profitability indicators can be found through correlation analysis. The correlation analysis in this study is used to find the association of each profitability indicator (i.e. ROA and ROE) with all credit risk variables. The formula of correlation is as follows which is given by Karl Pearson.

$$r = \frac{\sum(x-\bar{x})(y-\bar{y})}{\sqrt{\sum(x-\bar{x})^2 - \sum(y-\bar{y})^2}} \tag{4}$$

The Karl Pearson’s formula of coefficient of correlation (r) is popular for finding correlations and according to its assumption the results should remain within the range of -1 to +1. The results near to +1 show stronger correlation or links between variables, and results close to -1 point out weaker relationships. Moreover, if the result of ‘r’ is perfectly zero then it shows that both variables have no relationships at all (Peck *et al.* 2011).

Results and Discussion

Regression results

The regression model considered two profitability measures ROA and ROE which depend upon 5 independent credit risk indicators including: CRIMP – Credit Risk due to net off-charge or impairments, CRNPL – Credit risk due to non-performing loans, BS – bank size, GR – growth and LV – leverage. Table 2 indicates independent variables as credit risk indicators which are entered into both regression equations (i) and (ii) (Table 2).

$$ROA_{i,t}=c_0+\alpha CRIMP_{i,t}+\beta CRNPL_{i,t}+\chi BS_{i,t}+\delta GR_{i,t}+LV_{i,t}+\epsilon_{i,t} \tag{i}$$

$$ROE_{i,t}=c_0+\alpha CRIMP_{i,t}+\beta CRNPL_{i,t}+\chi BS_{i,t}+GR_{i,t}+\gamma LV_{i,t}+\epsilon_{i,t} \tag{ii}$$

Two regression models are indicated in Table 3 showing the variability percentage of independent variables. The “R square” demonstrates the relationship between dependent and independent variables whereas “R” represents the square root of R. The value of R points out how independent variables are associated to ROA and ROE. Moreover, the “adjusted R square” mentions the statistical shrinkage of credit risk variables. Simply, adjusted R square refers the compatibility of independent variables with dependent ones in order to validate the decisions based on regression model [29].

In model 1, the value of R square is 0.281 which demonstrates a suitable level of association between all the variables. The shrinkage level for model 1 is 0.089 (8.9%) which is calculated by taking difference of R square and adjusted R square values. In fact, there is no hard and fast rule for assessing the shrinkage level; however, it is acceptable if lies between 10 and 15% [30]. The shrinkage level of model 1 is between this specific range and therefore accepted because it represents the significance of variables involved as predictors (Table 3).

The value of R square in model 2 is 0.154 and the shrinkage level is 0.106 (10.6%) which is relatively higher than model 1 but lies between 10 and 15% and thus accepted. Both models are similar in terms of R, R square and adjusted R square but standard error of the estimate of model 2 demonstrates high value as compared to model 1. This shows the significance of the effect of random changes [31].

The ANOVA analysis in Table 4 shows the statistical significance of predictors (or independent factors) and their unpredictability over ROA and ROE. This significance is shown in Table 4 using ‘F’ and “Sig.” values. The “Sig.” value is also known as P-Value. In model 1, the p-value 0.007 is below 0.01 and 0.05 standards which shows that the

	Measure	Formula	Impact	Source
Dependent variables	ROA	=Net income/Total assets		Bank scope
	ROE	=Net income/Shareholder equity		Bank scope
Independent variables	Credit risk	=Net Charge Off (impairments)/Total loans and advances (to customers and banks)	+/-	Bank scope
	Credit risk	=Non-performing loans/Total loans and advances (to customers and banks)	+/-	Bank scope
	Bank size	=Total assets	+	Bank scope
	Growth	=Growth in net interest income of bank	+	Bank scope
	Leverage	=Total debt/Total assets	+	Bank scope

Table 1: Study variables.

Model	Variables Entered	Variables Removed	Method
(i) and (ii)	CRIMP, CRNPL, BS, GR, LV ^a		Enter

Table 2: Variables entered/removed.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.530 ^a	0.281	0.192	4.01
2	0.391 ^a	0.154	0.048	16.801

a. Predictors: (Constant), CRIMP, CRNPL, BS, GR, LV.

Table 3: Summary of the models.

Model		Sum of Squares	Mean Square	F	Sig.
1	Regression	388.62	50.822	3.202	0.007 ^a
	Residual	1014.054	16.578		
	Total	1398.674			
2	Regression	3115.714	392.937	1.419	0.222 ^a
	Residual	17880.561	281.423		
	Total	20984.734			

^aPredictors: (Constant), CRIMP, CRNPL, BS, GR, LV.

^bDependent Variable: ROA.

^cDependent Variable: ROE.

Table 4: ANOVA^{b,c}.

Variables	ROA			ROE		
	Coefficients	t-value	Sig.	Coefficients	t-value	Sig.
Constant	76.514	1.690	0.095	109.811	0.572	0.573
CRIMP	0.069	1.27	0.894	0.715	1.202	0.247
CRNPL	0.210	0.370	0.722	0.713	-1.170	0.248
BS	0.059	0.521	0.610	0.138	1.050	0.300
GR	0.178	1.362	0.175	0.289	2.110	0.039
LV	0.340	1.491	0.134	0.134	0.570	0.633

Table 5: Coefficients.

relationship between predictor variables and dependent factors. The F-value 3.202 in Table 4 denotes an appropriate link between dependent and independent factors in model 1. However, model 2 demonstrates 0.222 p-value which is higher than 0.01 and 0.05 standards. This means that the association between dependent and independent variables is non-linear. In contrast, the F-value 1.419 indicates apt level of association between variables (Table 4).

Table 5 provides detail of beta coefficients of model 1 and model 2 of regression. Based on Table 5 coefficients, the following regression models of ROA and ROE are formed.

ROA=76.514+0.069 (CRIMP)+0.210 (CRNPL)+0.059 (BS)+0.178 (GR)+0.340 (LV) (Model 1)

ROE=109.811+0.715 (CRIMP)+0.713 (CRNPL)+0.138 (BS)+0.289 (GR)+0.134 (LV) (Model 2)

In both models, all credit risk variables have positive impact on ROA and ROE. These results are similar to various researchers including Sinkey and Greenwalt, Ahmed et al, Berríos and Ueda and Mauro (Table 5) [14,32-34].

Validity of regression results

Multicollinearity statistics is the reliable measure to calculate the validity of regression analysis and this is usually done through SPSS. Using multicollinearity statistics, the Variance Inflation Factor (VIF) and tolerance level are calculated (Table 6). The outcomes in Table 6 can be evaluated on the particular criteria. For instance, it is suggested

by Gujarati that the VIF value should be under 5 and the 1/VIF (or multicollinearity) value should be nearer to zero [35]. If these conditions are met then the regression analysis is considered to be validated. As shown in Table 6 that VIFs of variables is under 5 and 1/VIF values are also nearer to zero. This shows the absence of multicollinearity in regression analysis (Table 6).

Correlation analysis

The correlation analysis is done to correlate ROE and ROA profitability indicators with credit risk factors that are considered independent in this research. Therefore, this section is divided into two subsections:

- Correlating ROA with credit risk factors
- Correlating ROE with credit risk factors

The correlation matrix in Table 7 carries the correlation between ROA and credit risk variables having influence on bank profitability. Table 7 shows that all factors including Net off-charge impairments, non-performing loans, bank size, growth and leverage are positively correlated with ROA. However, bank size and leverage have weak association as compared to other factors. It is evident in Table 7 that all other factors are also positively correlated with each other apart from leverage and net-off charge impairments. These two have slightly negative relationship which is not a big issue. These correlation results are similar to various studies conducted in the past where Sinkey and Greenwalt and Berríos are prominent (Table 7) [14,33].

Like ROA, ROE is another measure to quantify profitability. The correlation matrix in Table 8 demonstrates the correlation between ROE and credit risk variables. It is shown in the Table 8 that all credit risk factors (apart from Net off-charge impairments – CRIMP) are positively correlated with ROE. However, they have no strong

Variables	Variance Inflation Factor (VIF)	1/VIF
CRIMP	4.848	0.206271
CRNPL	3.752	0.266525
BS	1.822	0.248847
GR	1.349	0.34129
LV	4.640	0.215517

Table 6: Multicollinearity Statistics.

	ROA	CRIMP	CRNPL	BS	GR	LV
ROA	1					
CRIMP	0.223	1				
CRNPL	0.211	0.98	1			
BS	0.015	0.036	0.054	1		
GR	0.429	0.095	0.116	0.171	1	
LV	0.082	-0.028	-0.044	0.77	0.558	1

Banks=5, Variables=6

Table 7: ROA relationships.

	ROA	CRIMP	CRNPL	BS	GR	LV
ROA	1					
CRIMP	-0.006	1				
CRNPL	0.041	0.704	1			
BS	0.155	0.043	0.126	1		
GR	0.176	0.048	0.137	0.271	1	
LV	0.087	-0.085	-0.019	0.782	0.45	1

Banks=5, Variables=6

Table 8: ROE relationships.

association with ROE in contrast to ROA. The key reason of positive correlation between ROE and bank size and gearing is when bank increases its activities, than it received greater opportunities of success in achieving profitability which consequently reflects increase in shareholder's equity [36]. It is interesting to see that leverage and credit risk of non-performing loans have weak association with ROE. This does not mean that they have lower impact on ROE; rather it shows weak relationships with the selected banks and their profitability. It is also indicated in Table 8 that credit risk of impairments (CRIMP) has negative correlation with ROE which is not a surprise because of its slightly negative association (Table 8).

As compared to ROA, Golin and Delhaise found ROE only 15 to 20 per cent relevant to banking institutions [6]. Similarly, ROA is also preferred by Koch and MacDonald and Waymond when evaluating the performance and profitability of a bank [20,24]. Joetta suggested that the aim of ROE as the investigation of total profit produced by the firm's equity [25]. Based on these observations and authentic references, it can be said that the results produced by ROA is preferable in both regression and correlation models.

Conclusion

Banks like other financial institutions face a number of risks and hazards including credit risks, liquidity risks, operational risks, exchange rate risks, interest rate risks, political risks, and all other internal and external risks. However, credit risk is considered as the most common and dangerous risk especially for the banks that can put them into deep trouble and even they may face bankruptcy. During the financial crisis of 2008, several banks passed through a deep recession due to mismanagement of credit risks and therefore, in this study 5 top UK banks are critical analysed to measure the level of relationship between credit risk and profitability of these banks and to find out what degree/extent credit risk obstructs the growth of the banks. The profitability in the banking sector is often measured through ROE and ROA indicators whereas the credit risk is measured in various ways. But in the light of literature, two variables (net off charge over total loans, and non-performing loans over total loans) are used for measuring credit risks of 5 topmost UK banks.

Although many banks learned a lesson after financial crisis of 2008, but still there is a need to improve the credit risk management system of banks to avoid credit risks. In this way, banks can effectively deal with credit and other risks that have severe impact on bank's profitability. Credit risk management is a crucial part of measuring the optimising profitability of financial institutions. A bank can improve the overall credit system by tackling asymmetrical information flow, and giving guarantee of loan repayment. Policies and strategies involved in appropriate credit management system (consisting of identification, quantification, analysing, and monitoring and controlling stages) clearly indicate the allotment of credit facilities in banks and the methods used for managing credit portfolio. This method is usually used to originate, appraise, supervise and collect loans. The most significant factors during the improvement of credit risk management are the development of a transparent procedure of approving new credit and extending the existing credit by observing credit rating of the borrowers. Banks in the UK and other developed countries use tools like credit rationing, collateral, covenants, and loan syndication and securitisation for monitoring credit losses. In this way, they ensure a successful management of credit risks in banks. However, this process is weak and needs a rapid improvement.

Interestingly, the credit risks calculated on the basis of

impairments (or net credit charge off) reveals risky positions of top UK banks particularly RBS and Lloyds. Similarly, RBS fell into crisis because of non-performing loans and the ratio of these loans which was comparatively higher than other banks. Besides RBS, Barclay and Lloyds also faced difficulties in managing non-performing loans during the period of financial crisis.

Based on regression models, it is interesting and quite surprising to find out that credit risk indicators have a positive association with profitability of the banks. This means that even after the deep effects of credit crisis in 2008, the banks in the UK are taking credit risks and earning benefits from interest rates, fee, and commissions etc. The results also reveal that the bank size, leverage, and growth are also positively interlinked with each other. It is also unveil that the banks achieved profitability and growth after the financial crisis and learned how to tackle the credit risk over the years. Thus, the results do not disclose any major negative association between bank profitability and credit risk variables. However, few minor negative relationships indicate that credit risk improves bank profitability. Hence, UK banks should be confident in minimising the lending rates, and also decreasing commission and fee charges. It is also important for the borrowers to repay their full loans on time settled in the beginning of the agreement.

References

1. Thiel M (2011) Finance and economic growth – a review of theory and the available evidence. European Communities.
2. Nijskens R, Wagner W (2011) Credit Risk Transfer Activities and Systemic Risk: How Banks Became Less Risky Individually but Posed Greater Risks to the Financial System at the Same Time. *Journal of Banking and Finance* 35: 1391-1398.
3. Hassan H, Maher A, Khalil L (2009) Credit Risk under Basel II. KPMG.
4. Gestel TV, Baesens B (2008) Credit Risk Management: Basic Concepts: Financial Risk Components, Rating Analysis, Models, Economic and Regulatory Capital: Basic Concepts: Financial Risk Components, Rating Analysis, Models, Economic and Regulatory Capital. OUP Oxford Publishing.
5. Beck R, Jakubik P, Piloju A (2013) Non-performing loans: what matters in addition to the economic cycle? European Central Bank, Working Paper Series 1515, Germany.
6. Golin J, Delhaise P (2013) The Bank Credit Analysis Handbook: A Guide for Analysts, Bankers and Investors. (2ndedn), John Wiley & Sons, p: 1056.
7. Stuart T (2005) New Players, New landscape: The Banker, special supplement. *Financial Times*.
8. Muraleedharan D (2009) Modern Banking: Theory and Practice. PHI Learning Pvt Ltd p: 428.
9. Glantz M (2003) Managing Bank Risk: An Introduction to Broad-base Credit Engineering. Academic Press, Business and Economics p: 667.
10. Casu B, Girardone C, Molyneux P (2006) Introduction to Banking. (2ndedn), Pearson Education Ltd, England.
11. Rose P (2002) Commercial Bank Management. (5thedn) Mc Graw-Hill/Irwin, USA.
12. Bratanovic SB, Greuning VH (2000) Analyzing Banking Risk: A Framework for Assessing Corporate Governance and Risk Management. (3rdedn) The World Bank, Washington D.C.
13. Keeton WR (1999) Does Faster Loan Growth Lead to Higher Loan Losses? *Economic Review* pp: 57-75.
14. Sinkey JF, Greenwalt MB (1991) Loan-Loss Experience and Risk-Taking Behaviour at Large Commercial Banks. *Journal of Financial Services Research* 5: 43-59.
15. Kodan A, Chhikara KS (2013) Analysis of Non-performing Assets in Indian Banking Industry. *Indian Journal of Finance and Economic Management* 1: 113-136.
16. Salas V, Saurina J (2002) Credit Risk in Two Institutional Regimes: Spanish

- Commercial and Savings Banks. *Journal of Financial Services Research* 22: 203-224.
17. Rajan R, Dhal S (2003) Non-performing Loans and Terms of Credit of Public Sector Banks in India: An Empirical Assessment. *Occasional Papers* 24: 81-121.
 18. Fofack H (2005) Non-performing loans in sub-Saharan Africa: Causal Analysis and Macroeconomic Implications. *World Bank Policy Research*.
 19. Hu J, Li Y, Chiu YH (2004) Ownership and Non-performing Loans: Evidence from Taiwan's Banks. *The developing Economics* 42: 405-420.
 20. Koch TW, MacDonald SS (2009) *Bank management*. (7th edn) Cengage Learning pp: 1-888.
 21. Grier WA (2007) *Credit Analysis of Financial Institutions*. Euromoney Books p: 333.
 22. Foong KK (2008) Return-on-equity ratio can show how efficient banks are. Malaysian Institute of Economic Research.
 23. Riksbank Financial Stability Report (2002) The major Swedish banks in an international comparison.
 24. Waymond AG (2007) *Credit analysis of financial institutions*. (2nd edn) Euromoney Books.
 25. Joetta C (2007) *Credit risk management: how to avoid lending disasters and maximize earnings*. (3rd edn) McGraw-Hill Professional, Business and Economics p: 372.
 26. Saunders M, Lewis P, Thornhill A (2009) *Research methods for business students*. (3rd edn) Prentice Hall.
 27. Creswell JW (2003) *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. SAGE pp: 1-26.
 28. Blanche MJT, Durrheim K, Painter D (2006) *Research in Practice: Applied Methods for the Social Sciences*. Juta and Company Ltd pp: 1-565.
 29. Cameron AC, Trivedi PK (1998) *Regression Analysis of Count Data*. Cambridge University Press p: 566.
 30. Slavkin ML (2000) *Juvenile Firesetting: An Exploratory Analysis*. Universal-Publishers p: 216.
 31. Hosmer DW, Lemeshow S, Sturdivant RX (2013) *Applied Logistic Regression*. John Wiley & Sons p: 528.
 32. Ahmed AS, Takeda C, Thomas SE (1998) Bank Loan Loss Provisions: A Reexamination of Capital Management, Earnings Management and Signaling Effects. SSRN pp: 1-39.
 33. Berrios MR (2013) The relationship between bank credit risk and profitability and liquidity. *The International Journal of Business and Finance Research* 7: 105-118.
 34. Ueda K, Mauro BW (2013) *Quantifying Structural Subsidy Values for Systemically Important Financial Institutions*. International Monetary Fund, Washington DC.
 35. Gujarati (2007) *Basic Econometrics*. Econometrics, Tata McGraw-Hill Education.
 36. Saeed MS (2014) Bank-related, Industry-related and Macroeconomic factors affecting bank profitability: A Case of the United Kingdom. *Research Journal of Finance and Accounting* 5: 42-50.