Banking sector profitability, before, during and after Global Financial Crisis: Evidence from a developing economy

Shoaib Nisar
Corresponding Author: School of Economics and Management, Harbin Institute of Technology, Shenzhen Graduate School, Shenzhen, China. Tel: 0086-13534144044

Ke Peng
School of Economics and Management, Harbin Institute of Technology Shenzhen Graduate School, Shenzhen, China

Susheng Wang
School of Economics and Management, Harbin Institute of Technology Shenzhen Graduate School, Shenzhen, China

Jaleel Ahmed,
Department of Management Sciences, Capital University of Science and Technology, Islamabad, Pakistan.

Abstract

This study grants empirical support to the fact that profitability of the Pakistani banking sector was reduced during 2008-2009 and among other factors this reduction was accredited to the global financial crisis and resulting increased investments portfolio in total assets. We have used panel data of all Pakistani scheduled banks during 2005-2012. We proved theoretically and empirically that fixed effects model is appropriate for this study. Second stage analysis confirms the above results and shows that the profitability of Pakistani banking sector was higher in pre and post crisis years than in financial crisis period. Profitability was relatively lower in the after crisis years then in before crisis years because of the residual effects of the global financial crisis. In third stage analysis we found that private and foreign banks were more affected by financial crisis than public sector, specialized and Islamic banks. Our results are robust to alternate measures of profitability. In context of developing countries this study will help bank managers and the regulators to stay better prepared to face any financial crisis in future.

Keywords: Global Financial Crisis, Investments, Banking Sector Profitability, Fixed Effects Model, Pakistan.

JEL classification: G01, G21
Introduction

In last quarter of 2007 with the burst of subprime mortgage bubble, in US the supply of liquidity by banks in interbank market dried up. Number of banks faced huge deterioration in capital. Substantial non-performing loans in US banks caused takeover of many banks. US Treasury announced $700 billion bailout package. Overall, the US Treasury invested in 707 financial institutions. During 2009, 140 banks in United States were closed, and the Bank Insurance Fund of the Federal Deposit Insurance Corporation went into deficit. By the start of 2010, much of the Federal Reserve funds advanced to financial institutions were re-paid by them, and majority of the financial markets came in to normal operation, although some small banks still continued to default. (Allen and Christa, 2013).

Meanwhile this financial crisis from the US and European Markets had gradually transferred to the developing economies in the form of liquidity crunch because of developed countries which were facing severe financial distress started calling back the foreign direct investment and lending in the developing economies. According to Frey, Kerland Lipponer (2016) banks with a greater risk aversion withdrew more from foreign lending during the financial crisis. The developing economies are the one which are easily hit by any international economic distress and slowest to recover because of their limited resources, fiscal deficit and dependence on the external funding and aid.

The direct impact of the global financial crisis on developing countries including Pakistan has been limited due to non-integration of the domestic financial sector with the global financial sector (IMF, March 2009). But indirect impacts like reduction in development aid, foreign direct investment, portfolio investment and reduced demand for exports from USA, Europe and other developed countries caused severe setback to the economy of Pakistan and eventually to the profitability of Pakistani banking sector.

Because of the underdeveloped capital markets, importance of the banking sector in the developing countries is twofold. Because banking sector is the only substantial source to generate savings in developing countries. Banking sector provides the essential financial assistance to the real sector of the economy for development and economic growth. This financial development and economic growth caused by the financial assistance from the banking sector is the only hope and sustainable way to provide relief to and upgrade the living conditions of the huge poor population of the developing countries (Nisar, Wang, Ahmed and Ke 2015). Owing to its significance it is essential to evaluate health and performance of banking sector of developing countries before, during and after global financial crisis, in order to take necessary corrective measures on part of the both banks and regulators.

Pakistan is also a developing country and there is no empirical evidence available on the impact of global financial crisis 2008-2009 on the profitability of banking sector of Pakistan. Pakistani banking sector provides us a unique opportunity to study the impact global financial crisis on a developing country. In this study we will try to bridge this gape in the current banking literature of Pakistan in particular and in developing countries in general. We will try to provide some insights into the effects of global financial crisis 2008-2009 and resulting continuously increasing investments (over total assets) on Pakistani banking sector profitability measured by return on assets and return on equity. Our study will be helpful for the regulators, managers and stakeholders in banking sector to stay well equipped in future, to face any such crisis.

Table 1 provides the profitability position of the overall banking sector of Pakistan in terms of percentage return on assets (ROA) and return on equity (ROE) during the sample period. Figure 1 and 2 are visually showing effect of the global financial crisis 2008-2009 on the profitability of Pakistani banking sector in percentage return on assets (ROA) and return on equity (ROE). We can clearly see the lowest profitability position in 2008 and 2009 both in terms of (ROA) and (ROE).

<table>
<thead>
<tr>
<th>Year</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROA (%)</td>
<td>1.80</td>
<td>1.86</td>
<td>1.51</td>
<td>0.77</td>
<td>0.74</td>
<td>0.99</td>
<td>1.39</td>
<td>1.23</td>
</tr>
<tr>
<td>ROE (%)</td>
<td>25.4</td>
<td>23.62</td>
<td>17.88</td>
<td>8.59</td>
<td>8.27</td>
<td>11.69</td>
<td>14.89</td>
<td>14.42</td>
</tr>
</tbody>
</table>
Figure 1. Graphical representation of percentage ROA of Pakistani banking sector for 2005-2012. Developed by authors, using data from SBP reports.

Figure 2. Graphical representation of percentage ROE of Pakistani banking sector for 2005-2012. Developed by authors, using data from SBP reports.

The rationale behind taking (2008-2009) as crisis period for Pakistani banking sector is, since there was no direct impact of global financial crisis, which actually started in US in the third quarter of 2007 on Pakistani banking sector. As there was no bank failure in Pakistan like in the developed countries. Because, Pakistani banks neither had substantial direct exposure in the developed financial market nor were involved in complex financial derivatives, securitization and other risky off balance sheet activities. Rather, there was a lagged effect in 2008 and 2009 in the form of increased cost of capital, reduced liquidity and profitability because of reduced economic activity and exports and an overall slowdown in the economy.

This impact was particularly higher for Pakistan because 60% of its exports were concentrated in textile sector and the main export markets were Europe and USA where there was a sharp decline in demand due to the financial crisis. According to economic survey of Pakistan, Pakistan witnessed a contraction of 6.4% in its exports in 2009. The foreign direct Investment was sharply declined from USD 5,026 million 2007 to USD 3,209 in 2009. Portfolio investment also reduced by USD 510.4 Million. For country like Pakistan which was already suffering from balance of payment problems, reduction in foreign direct investment and portfolio investment cast a spell on economic activity and exports (Amjadand Musleh, 2012 ). The reduced exports resulted in the declining profits, reduced wages and incentives of staff resulting in decreased spending, further slowdown in economic activity and reduced corporate and individual saving deposits in the banks. The reduced deposits, declining liquidity position of banks, falling demand for loans by the stagnant economy, increasing relative proportion of investments in total assets (IA) as compared to loans resulted into a sharp decline in profitability of the banking sector of Pakistan during the year 2008 and 2009.

For providing empirical evidence to the proposition of reduced banking sector profitability we applied three different econometric models namely, Fixed Effects, POLS and Random Effect regression models. After comparing results of three models finally we came to conclusion that Fixed Effects model gives the best results for the given data. In methodology section we also have proved theoretically that fixed effects model is most appropriate for the given study. To the best of our knowledge no empirical study till date has analyzed effect of global financial crisis 2008-2009 and particularly the rising proportion of investment in total assets (IA) as compared to loans, on profitability of Pakistani banking sector in such a manner by applying multiple models. The underlying wisdom in applying three models is to reach at a more appropriate and conclusive explanation of results from the available data and to show the robustness of results.
The rest of the paper will unfold as under; In the second section some literature review relating to effect of global financial crisis 2008-2009 on the banking sector will be provided followed by the hypotheses development. In the third section discussion on data and methodology to be used will be provided. Fourth section will be the results and discussion and conclusion will be provided in the fifth section followed by references at the end.

**Literature Review**

In this section we will review some of the existing literature on the effect of global financial crisis 2008-2009 on the banking sectors profitability of different developed and developing countries of the world.

As reported by (Ashraf, Kayani, and Rafiq, 2012) the leading factors to the global financial crisis in the report to congress committee of United States were “imprudent mortgage lending, housing bubble, global imbalances, securitization and lack of transparency and accountability in mortgage finance, rating agencies, deregulatory legislation, shadow banking system, off-balance sheet finance, government mandated subprime lending, failure of risk management systems, financial innovations, complexity, human frailty, bad computer models, excessive leverage, relaxed regulation of leverage, credit default swaps, over-the-counter derivatives, fragmented regulation, no systemic risk regulator, short-term incentives” (Jickling, M. 2009).

Wilko, Leo, Marco, Maarten and Job (2012) investigated the effect of economic activity (GDP) on the profitability of the banks of 17 countries including United States, England, Australia, Japan, New Zealand and others from Europe using panel data from 1979 to 2007. They found more significant effect of output growth on bank financial performance than usually present in the banking profitability literature. They conclude that long-term interest rates in earlier years of sample period are important prognosticator of bank profitability in times of higher economic development. They further contend that each percent of fall in real GDP in acute recessions results in to one fourth of a percentage point reduction in return on assets (ROA).

Andreas and Gabrielle (2010) used the GMM estimator technique to analyze the performance of 372 commercial banks of Switzerland from 1999 to 2009. To estimate the effect of the global Financial Crisis, they divided their sample in pre-crisis period (1999–2006), and the crisis period (2007–2009). They conclude that higher funding costs result in a lower profitability. Banks that heavily depend on interest income earn less profit than banks whose income is diversified. They proof that the global financial crisis 2008-2009 certainly had a significant effect on the profitability of banking sector of Switzerland. De Haas and van Lelyfeld (2006, 2010) find that lower solvency, liquidity and profitability of parent banks lead to lower credit growth among multinational banks’ subsidiaries located in Central and Eastern European countries. That is one mechanism how financial crisis traveled from USA to Europe and then gradually to Asia and South Asia.

Because of dominant public ownership Indian banking sector was firstly considered shielded from the effects of global financial crisis. But later in view of the instability of the global financial environment, Indian depositors started shifting their deposits from the private banks to the larger public sector banks specially State Bank of India. As a result of this flight of deposits the private sector banks were destabilized. Private Banks were forced to acquire more capital and maintain higher liquidity levels even at higher interbank market rates to regain depositor’s confidence Eichengreen and Gupta, (2013).

Malhotra, Raymond and Singh (2011) investigated the performance of Indian Public and Private Commercial Banks before and during global financial crisis from 2005-2009. They studied the impact of the current financial crisis on safety and soundness of banks in India by focusing on the factors of bank intermediation costs and profitability. They concluded that public and private commercial banks of India remained relatively healthy during the recent global financial crisis 2008-2009 and in the presence of capital adequacy and improved efficiency as a result of intensified competition the performance of the banks was not significantly impaired.

In wake of the global financial crisis 2008-2009 Pakistan witnessed a sharp decline in economic activity. Growth declined from an average of 7.3 percent during 2004-07 to 3.7 percent in 2008. It slowed down further to about 1.2 percent in 2009 as the adverse security environment emerged as new
constraint to economic growth. The external accounts were under slight pressure even before the crisis. The country’s imports being largely inelastic, the external accounts registered further deterioration after the crisis. The current account deficit in Pakistan grew to 8.4 percent of GDP in 2008 from 4.8 percent in 2007 and the deficit fell to 6 percent of GDP in 2009. Pakistan's exports were highly concentrated in the textile. The recession in United States and Europe, the main destinations of textiles exports from Pakistan, led to contraction in export of textiles. All above factors contributed to the reduced economic activity, which resulted in reduced business and profitability of banks in Pakistan (Amjad and Musleh, 2012).

There is sufficient literature available on the effects of global financial crisis 2008-2009 on the banking sectors of developed economies. But there is no empirical study in the banking profitability literature which has investigated the effect of global financial crisis 2008-2009 and resulting increased proportion of investments in total assets (IA) of banks on the Pakistani banking sector. In this research paper we will try to bridge this gape in literature by providing some empirical evidence.

**Research and Hypotheses**

**Hypotheses Development**

In this section we have developed hypotheses of our variables of interest global financial crisis 2008-2009 and relative proportion of investments in total assets (IA) regarding their effect on the profitability of Pakistani banking sector in during, pre and post crisis years, which will be later tested empirically using the appropriate econometric models. We formulate our first hypothesis regarding effect of global financial crisis 2008-2009 on the profitability of Pakistani banking sector as under.

**H1:** Pakistani banking sector profitability was negatively affected by global financial crisis 2008-2009.

In this study we will empirically investigate the effect of relative proportion of investments portfolio in the total assets on the profitability of Pakistani banking sector in context of the global financial crisis 2008-2009 which resulted in increased investment portfolio, due to slow economic activity and reduced demand for loans. In this paper to measure the effect of investments on profitability measured by both return on assets ROA and return on equity ROE we will formulate our second hypothesis as under.

**H2:** There was a negative impact of increasing investments over total assets (IA) on Pakistani banking sector profitability resulted from global financial crisis 2008-2009.

To reinforce our findings we also want to study the effect of pre and post financial crisis years on the profitability of Pakistani banking sector and form our third hypothesis as under.

**H3:** Pakistani banking sector profitability was higher in pre and post global financial crisis 2008-2009 years.

In order to gain deeper insights into how various Pakistani banking sub-sectors were affected by global financial crisis 2008-2009 we form our fourth and fifth hypotheses as under.

**H4:** Public sector, Specialized and Islamic banks in Pakistan were not significantly affected by global financial crisis 2008-2009.

**H5:** Private sector and Foreign banks in Pakistan were negatively and significantly affected by global financial crisis 2008-2009.

Coming to discussion of the control variables and their expected signs; capital adequacy is more important for financial institutions of developing economies, because it provides strength to survive in the financial crisis. We expect our control variable capital adequacy (CA) positively related to profitability Antonio (2013) and Deger and Adem (2011). The control variable LOA represents the size of the banks and is measured as natural log of the total assets of a bank. In this study we expect a positive relation of bank size with profitability. Cost of funds is important for banks profitability. We will expect the control variable funding cost to have a negative relation with the profitability. During global financial crisis 2008-2009 non-performing loans measured by NPLs to gross advances is also important indicator of the profitability. We expect NPLs inversely related to profitability, Nisar et. al.(2015). According to Andreas and Gabrielle (2010), and
Molyneux and Thorton (1992) liquidity is important but holding excess liquidity will decrease the profitability of a bank. So, we also expect a negative relation between liquidity and profitability.

**Data and Methodology**

In this section we will discuss the sources and detail of data and methodologies which we have used in this study.

**Data**

Data used in this paper are the panel data extracted from secondary sources, published by Statistics and Data Warehouse Department of State Bank of Pakistan (SBP). We have used the annual financial data of all scheduled Pakistani banks for eight years from 2005 to 2012 (operational by the end of 2012). We have sub-divided our sample period in to before (2005-2007), during (2008-2009) and after financial crisis (2010-2012) periods by using dummy variables. We have taken total existing sample by including all the scheduled banks in Pakistan which will provide conclusive and generalizable evidence for whole population. In this way we have discarded any possibility of sampling error.

In third stage analysis we have subdivided the sample in to two parts one contains data of Public sector, Specialized and Islamic Banks and the second part contains data of Private and Foreign banks. The reason behind classifying in to groups was to put similar banks in to two groups (which were similarly affected by GFC). Secondly data set is not large enough to run regression for all five types of banks separately.

Descriptive statistics of the data used are given in Table 2 which include mean, and standard deviation values. The descriptive statistics show that on average Pakistani banking sector is well capitalized and liquid with lower average funding cost.

<table>
<thead>
<tr>
<th>Table 2: Descriptive statistics sample 2005-2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROA</td>
</tr>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>Std. Dev.</td>
</tr>
</tbody>
</table>

The highest standard deviation is of bank size (LOA) which is because of the difference in the size of banks included in the sample because we have included all the banks in analysis; followed by return on equity (ROE) due to the difference in type and capital structure of the banks included in the sample. The standard deviations for most of the variables are low which shows the consistency of the overall data set.

Ahmed, Xiaofeng, and Khalid, (2014) have mentioned that using greater number of observations make a researcher able to get more efficient results and allow us to seize the variation in time and cross section components (Wang, 2009) and helps to reduce the problem of multi-co-linearity (Asimakopoulos et al., 2009). That’s why we have used panel data to have greater number of observations.
Methodology

Return on assets (ROA) and return on equity (ROE), are taken as dependent variables as these are the best measures of performance and extensively used in banking performance literature as measure of profitability (Chiorazzo, V., Milani, C., Salvini, F. 2008).

<table>
<thead>
<tr>
<th>Specification</th>
<th>Variable</th>
<th>Measured by</th>
<th>Notation</th>
<th>Expected sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent variable</td>
<td>Return on assets</td>
<td>Net Profit/Total assets</td>
<td>ROA</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Return on equity</td>
<td>Net Profit / Shareholders equity</td>
<td>ROE</td>
<td>NA</td>
</tr>
<tr>
<td>Control variables</td>
<td>Capital adequacy</td>
<td>Shareholders’ equity / Total assets</td>
<td>CA</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Bank size</td>
<td>Natural log of total assets</td>
<td>LoA</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Funding cost</td>
<td>Interest expenses / Total deposits + borrowing</td>
<td>FC</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Credit risk</td>
<td>Non-Performing loan / Gross advances</td>
<td>NPL</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Liquidity</td>
<td>Liquid assets/Total assets</td>
<td>LIQ</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Variable of interest</td>
<td>Investments / Total assets</td>
<td>IA</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Global financial crisis</td>
<td>Dummy variable for year 2008</td>
<td>GFC1</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dummy variable for year 2009</td>
<td>GFC2</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Pre-financial crisis</td>
<td>Dummy variable for year 2005</td>
<td>Pre1</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dummy variable for year 2006</td>
<td>Pre2</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dummy variable for year 2007</td>
<td>Pre3</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Post-financial crisis</td>
<td>Dummy variable for year 2010</td>
<td>Post1</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dummy variable for year 2011</td>
<td>Post2</td>
<td>+</td>
</tr>
</tbody>
</table>

In this paper our objective is to investigate whether global financial crisis 2008-2009 had some negative and significant effect on the profitability of banking sector of Pakistan, and under the effect of global financial crisis whether the unprecedented increase in investments over total assets (IA) have significant negative effect on the profitability during and after global financial crisis. Control variables used are capital adequacy (CA), bank size (LOA), funding cost (FC), credit risk (NPL), and liquidity (LIQ). Investment (IA) is our main variables of interest and GFC1 and GFC2 which are the dummy variables to represent global financial crisis years 2008 and 2009 respectively. Pre-1 (2005), pre-2 (2006), pre-3 (2007) and post-1 (2010), post-2 (2011) are variable of interest in the second stage of analysis. Post-3 which represents 2012 is taken as benchmark to avoid dummy variable trap. The dependent variable, control variables and variables of interest to be used, their formulas and expected signs are given in the Table 2.

Econometric Model for Effects of Global Financial Crisis 2008-2009 and Investments

In order to explore the effect of global financial crisis 2008-2009 and underlying increase in investments on the profitability of Pakistani banking sector following Ahmed, Xiaofeng, and Khalid (2014) we have applied three regression models Fixed Effects Model, Pooled Ordinary Least Squares Model POLS and Random Effects Model.

Theoretically speaking POLS method also known as common constant method is appropriate for a sample which is homogeneous, that's why it uses common constant for all cross sections included in the sample. As our data includes all the scheduled banks of Pakistan which include different bank types i.e commercial
banks, specialized banks, public sector and private sector etc. So, POLS method is not appropriate for our data set.

Now if we consider the choice between fixed effects and random effects models. Random effects model is suitable for a data set which is randomly selected from a large population of data. While our data set is not randomly selected from a large population, rather we are using a sample of all the scheduled banks of Pakistan which is neither randomly selected nor is from a large population. Rather we are using the whole population because the population is not very large. So, random effects model is also not appropriate for our data set. Theoretically, the fixed effects model is the best available choice for our data set.

But before going forward with analysis following Ahmed, Xiaofeng, and Khalid (2014) we will empirically prove our assumptions of the methodology being used. Simple regression method for pooled data is pooled ordinary least square (POLS), which tries to reduce the sum of squared residuals. As, simple linear regression model for panel data can be written as

\[ Y_{it} = \alpha + \beta X_{it} + u_{it} \]  

Where, \( Y \) is dependent variable in our case the return on assets (ROA) or return on equity (ROE) and "i" is representing ith bank at time t. \( X \) is a vector of control variables and "u" is an error term. Equation 1 is grounded on the assumption that “\( \alpha \)" is identical for all cross sections. By bringing some heterogeneity in above equation allows us for identical “\( \alpha \)" for all cross sections. Then, equation 1 can be written as:

\[ Y_{it} = \alpha_i + \beta X_{it} + u_{it} \]  

Where, \( \alpha_i \) is different for all cross sections. Now, this linear panel data model can be assessed by using common constant model, fixed effects model and random effects model. Common constant model also known as pooled OLS model, works on the assumption that the given data set is homogenous. It means this model estimate a single constant “\( \alpha \)" for all given cross sections.

On the other hand fixed effects model permit different constants for different sections. After allowing different constants for different sections it includes a separate dummy for all sections. That’s why it is also known as least square dummy variable estimator. General form of the least square dummy variable is as follows:

\[ Y_{it} = \alpha_i + \beta_1 X_{1it} + \cdots + \beta_k X_{kit} + u_{it} \]  

Equation three can be written in matrix form as:

\[ Y = D\alpha + X\beta + u \]  

Where, dummy variable allows taking different constants for different groups.

Before going into analysis we want to know whether we should allow separate constants for separate groups. F-test is a measure that can be used to evaluate whether we should use fixed effects model or POLS model, which allows for common constant. In order to diagnose which is the suitable model for our data we have developed the under mentioned hypothesis.
H0: \(a_1 = a_2 = a_3 = \ldots = a_n\) (POLS is suitable)

H1: Fixed Effects model is suitable

We calculated F-estimated by using following standard formula of F-statistic given by Dimitrios Asteriou and Stephen G. Hall in their book Applied Econometrics. (Asteriou and G. Hall, 2007)

\[
F = \frac{R_{FE}^2 - R_{CC}^2(N-1)}{1-R_{FE}^2/NT-N-K} \sim F(N-1, NT-N-K) \quad (6)
\]

Where, \(R_{FE}^2\) represents coefficient of determination of fixed effects model and \(R_{CC}^2\) is coefficient of determination of common constant model. N is the number of cross sections, T is the time period of the study and K is no of sub groups present. If the value of F-tabulated is smaller than F-calculated we will reject the null hypothesis. In our case F-calculated for ROA is 450.04 which is significantly greater than F-critical which is (1.7571) and F-calculated for ROE is 335.33 which is again greater than F-critical (1.6347).

So, we reject our null hypothesis and accept the alternate hypotheses and conclude that Fixed Effects model is suitable for our data set.

Before applying the fixed effects model we also investigated empirically its suitability as compared to random effects model. Random effects model is based on the assumption that constants of each section do not remain fixed. It assumes that constants of each group are random parameters. This variation in these constants originates from;

\[
\alpha_i = \alpha + \nu_i \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (7)
\]

Where \(\nu_i\) is standard random variable which has expected value equal to zero. In general, random effects model can be written in the following form

\[
Y_{it} = (\alpha + \nu_i) + \beta_1 X_{1it} + \cdots + \beta_k X_{kit} + u_{it} \quad \ldots \quad (8)
\]

\[
Y_{it} = \alpha + \beta_1 X_{1it} + \cdots + \beta_k X_{kit} + (\nu_i + u_{it}) \quad \ldots \quad (9)
\]

To identify the appropriate model for a given data set from fixed effects and random effects models Hausman test is used (Asteriou and G. Hall, 2007)

\[
H = (\beta^{FE} - \beta^{RE})' [\text{var} (\beta^{FE}) - \text{var} (\beta^{RE})]^{-1} (\beta^{FE} - \beta^{RE}) \sim \chi^2 (k) \quad \ldots \quad (10)
\]

We develop the following hypothesis to perform Hausman test:

H0: Random effects model is suitable

H1: Fixed effects model is suitable

After administering the Hausman test we have found the results given in Table 4.

<table>
<thead>
<tr>
<th>ROA</th>
<th>Chi Square statistic</th>
<th>Chi square df.</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross-section random</td>
<td>66.2690</td>
<td>8</td>
<td>0.0000</td>
</tr>
<tr>
<td>ROE</td>
<td>Cross-section random</td>
<td>39.1318</td>
<td>7</td>
</tr>
</tbody>
</table>

Following the highly significant values of chi square statistic we reject the null hypothesis of random effect and by accepting the alternate hypothesis, empirically conclude that Fixed Effects model is the best model to study the effect of global financial crisis 2008-2009 and Investments on the profitability of Pakistani banking sector as measured by return on assets ROA and return on equity ROE.

The following fixed effects regression models are used to investigate the effect of the control variables and variable of interest on the dependent variables.

To empirically verify hypotheses H1 and H2 we developed following two alternate models with ROA and ROE as dependent variable.
Model 1A

\[ \text{ROA}_{it} = \alpha_i + \beta_1 \text{CA}_{it} + \beta_2 \text{LOA}_{it} + \beta_3 \text{FC}_{it} + \beta_4 \text{NPL}_{it} + \beta_5 \text{LIQ}_{it} + \beta_6 \text{IA}_{it} + \beta_7 \text{GFC1}_{it} + \beta_8 \text{GFC2}_{it} + U_{it} \quad \ldots \ldots \quad (11) \]

Model 1B

\[ \text{ROE}_{it} = \alpha_i + \beta_1 \text{CA}_{it} + \beta_2 \text{LOA}_{it} + \beta_3 \text{FC}_{it} + \beta_4 \text{NPL}_{it} + \beta_5 \text{LIQ}_{it} + \beta_6 \text{IA}_{it} + \beta_7 \text{GFC1}_{it} + \beta_8 \text{GFC2}_{it} + U_{it} \quad \ldots \ldots \quad (12) \]

To empirically prove hypothesis H3 we developed following two alternate models with ROA and ROE as dependent variable. \( \text{ROA}_{it} = \alpha_i + \beta_1 \text{CA}_{it} + \beta_2 \text{LOA}_{it} + \beta_3 \text{FC}_{it} + \beta_4 \text{NPL}_{it} + \beta_5 \text{LIQ}_{it} + \beta_6 \text{IA}_{it} + \beta_7 \text{GFC1}_{it} + \beta_8 \text{GFC2}_{it} + U_{it} \quad \ldots \ldots \quad (13) \)

Model 2A

\[ \text{ROA}_{it} = \alpha_i + \beta_1 \text{Pre1}_{it} + \beta_2 \text{Pre2}_{it} + \beta_3 \text{Pre3}_{it} + \beta_4 \text{CA}_{it} + \beta_5 \text{LOA}_{it} + \beta_6 \text{FC}_{it} + \beta_7 \text{NPL}_{it} + \beta_8 \text{LIQ}_{it} + \beta_9 \text{IA}_{it} + \beta_{10} \text{Post1}_{it} + \beta_{11} \text{Post2}_{it} + U_{it} \quad \ldots \ldots \quad (14) \]

Model 3A

\[ \text{ROA}_{it} = \alpha_i + \beta_1 \text{CA}_{it} + \beta_2 \text{LOA}_{it} + \beta_3 \text{FC}_{it} + \beta_4 \text{NPL}_{it} + \beta_5 \text{LIQ}_{it} + \beta_6 \text{GFC1}_{it} + \beta_7 \text{GFC2}_{it} + U_{it} \quad \ldots \ldots \quad (15) \]

Model 3B

\[ \text{ROE}_{it} = \alpha_i + \beta_1 \text{CA}_{it} + \beta_2 \text{LOA}_{it} + \beta_3 \text{FC}_{it} + \beta_4 \text{NPL}_{it} + \beta_5 \text{LIQ}_{it} + \beta_6 \text{GFC1}_{it} + \beta_7 \text{GFC2}_{it} + U_{it} \quad \ldots \ldots \quad (16) \]

ROA

ROA\(_{it}\) Represents the dependent variable, return on assets of bank ‘i’ at time ‘t’

ROE

ROE\(_{it}\) Represents the dependent variable, return on equity of bank ‘i’ at time ‘t’

\( \alpha_i \) Represent constants.

Pre1, Pre2, Pre3 represent dummy variables for year 2005, 2006 and 2007 respectively before global financial crisis 2008-2009.

GFC1 and GFC2 represents dummy variable for the crisis years 2008 and 2009 respectively.


IA\(_{it}\) represents investments over total assets of bank ‘i’ at time ‘t’

The definitions and formulas of all control variables used in above models are given in Table 3.

\( U_{it} \) = error term
Results and Discussion

Profitability during Global Financial Crisis 2008-2009

Results of the fixed effects model, for effect of global financial crisis 2008-2009 and investments (IA) on the profitability measured by return on assets (ROA) and return on equity (ROE) are given in the Table 5. As proved theoretically in methodology section the empirical results obtained by econometric analyses also confirm that for the given study fixed effects model is the best among all three models. (For ROA we have also run POLS and Random Effects Model, for brevity results are not presented here, are available on demand). The adjusted R-squared (57.18%) value is attributing (57%) variation in the dependent variable to the control variables used in the model. F-statistic (8.3939) is highly significant which shows the appropriateness of the model for the given study. The Durbin-Watson stat. (2.004) is also ideal for the fixed effects model which confirms that there is no problem of autocorrelation while using fixed effects model. All the control variables are highly significant including Investments (IA) and their signs are also according to the expected signs in our hypotheses.

Table 5: Fixed Effects regression results during financial crisis

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Model 1A Dependent variable ROA</th>
<th>Model 1B Dependent variable ROE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-0.3161*** (0.0811)</td>
<td>-8.0197*** (2.6632)</td>
</tr>
<tr>
<td>Capital (CA)</td>
<td>0.0968*** (0.0231)</td>
<td>3.0837*** (0.7597)</td>
</tr>
<tr>
<td>Bank size (LOA)</td>
<td>0.0196*** (0.0044)</td>
<td>0.5287*** (0.1434)</td>
</tr>
<tr>
<td>Investments (IA)</td>
<td>-0.0490*** (0.0182)</td>
<td>-2.2437*** (0.5987)</td>
</tr>
<tr>
<td>Funding cost (FC)</td>
<td>-0.1451*** (0.0440)</td>
<td>-5.1628*** (1.4450)</td>
</tr>
<tr>
<td>Credit risk (NPL)</td>
<td>-0.0877*** (0.0199)</td>
<td>-1.2450*** (0.6530)</td>
</tr>
<tr>
<td>Liquidity (LIQ)</td>
<td>-0.1257*** (0.0294)</td>
<td>-6.7881*** (0.9667)</td>
</tr>
<tr>
<td>Global Financial Crisis (GFC1)</td>
<td>-0.0112*** (0.0037)</td>
<td>-0.2211* (0.1224)</td>
</tr>
<tr>
<td>Global Financial Crisis (GFC2)</td>
<td>-0.0122** (0.0035)</td>
<td>-0.3695*** (0.1159)</td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.5718</td>
<td>0.4825</td>
</tr>
<tr>
<td>F-statistic</td>
<td>8.3939***</td>
<td>6.1620***</td>
</tr>
<tr>
<td>Durbin-Watson stat.</td>
<td>2.0004</td>
<td>2.0421</td>
</tr>
</tbody>
</table>

Looking at the results in detail; when return on assets (ROA) used as dependent variable in Table 5, we find that among control variables, capital and bank size have positive relation with the profitability, in literature it is supported by Zhang and Daly (2013) and Deger and Adem (2011). Funding cost, credit risk and liquidity are showing negative and significant relation with return on assets (ROA). All these relations are proved as expected and are supported by the literature (Andreasand Gabriele, (2010); Antonio, (2013);nisar,et.al. (2015).

Global financial crisis years 2008 and 2009 are represented by dummy variables GFC1 and GFC2 respectively. Both the years are showing negative and highly significant relation with the profitability of Pakistani banking sector as measured by dependent variable return on assets (ROA). So, we accept hypothesis H1 and conclude that profitability of the Pakistani banking sector was significantly reduced during the years of 2008 and 2009 due to the effects of global financial crisis. Andreas and Gabrielle (2010) also found same results while investigating the profitability of Swiss banks during financial crisis that financial crisis actually had a significant impact on the profitability of Swiss banking sector.

Coming to investments; we can clearly see in Table 5 ROA results that investments is showing negative and highly significant relation with dependent variable return on assets ROA at 1% level of significance. So, we accept hypothesis H2 and conclude that higher relative proportion of investments in the total assets (as compared to loans which is the main business of banks) has a significant negative effect on the profitability of Pakistani banking sector during the global financial crisis 2008-2009. Conceptually we have proposed...
this negative relation in the hypothesis development and here in results it’s proved empirically using the appropriate methodology. Because the effect of investments (IA) is empirically studied first time in this study so, no prior empirical evidence is available.

This empirical result of negative relation of investments with profitability in context of global financial crisis 2008-2009 have important policy implication for the management of banks in Pakistan particularly and in other developing countries generally to revisit investments in their total portfolio as compared to loans and re-evaluate their impact on profitability. In this way if necessary they can shift some of their financial resources from low income fixed investments to high income commercial loans to improve their bottom line which is the ultimate goal of their existence. The resulting improved profitability will add to the stability of the financial system as a whole against any future financial crisis.

To endorse and re-enforce the findings in return on assets ROA model, we have re-confirmed the robustness of results by using an alternative measure of profitability, return on equity ROE which is also widely used in the literature. In the Table 5 results of the fixed effects model, for effect of global financial crisis 2008-2009 and investments on the profitability measured by ROE are given. Again in the case of ROE, fixed effects model proved to be the best model with highest adjusted R-squared (48.25%), highly significant F-statistic and most suitable D.Watson Stat. (for ROE we have also run POLS and random effects model, for brevity results are not presented here, are available on demand).

In fixed effects model results for ROE as dependent variable; again all the control variables have proved their relationship with the profitability according to the expected sign and highly significant at 1% level of significance except the NPL which is significant at 5% level and GFC1 is significant at 10%. Again Investments is showing negative and highly significant relation with dependent variable ROE at 1% level of significance. Overall with ROE, fixed effects model results, show the robustness of, and reinforce the results of ROA fixed effects model and concludes that profitability of the Pakistani banking sector was negatively and significantly affected by global financial crisis 2008-2009 and underlying increase in investments.

**Profitability in pre and post Global Financial Crisis period**

To empirically investigate the effect of pre-crisis and post-crisis years on the profitability of the Pakistani banking sector measured by ROA and ROE. The results of the fixed effects model 2A and model 2B are given in table 6. It is evident from the values in Table 6, in case of both ROA and ROE the fixed effects model is best in terms of adjusted R-squared, F-statistics, and Durbin-Watson Stat (we have also run POLS Model and Random Effects Model for pre and post crisis, results are not presented here for brevity).

All the control variables are according to expected signs in both cases when ROA or ROE is used as dependent variable.

In case of ROA all control variables are highly significant at 1% level of significance except Post-2 which is significant at 10% level of significance. Only pre-1 and post-1 are insignificant. Coming to our variables of interest investments is significant at 5% level, pre-2 (2006), pre-3 (2007) and Post-2 (2011) all are positively and significantly related to the profitability of the Pakistani banking sector. This means that the profitability of the Pakistani banking sector was higher, in pre and post global financial crisis 2008-2009 time period as compared to during financial crisis years. These results empirically show the robustness of our first stage results that profitability was reduced in the financial crisis years as compared to pre and post crisis years.

**Table 6: Fixed Effects regression results pre and post financial crisis**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 2A Dependent variable ROA</th>
<th>Model 2B Dependent variable ROE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-0.5787*** (0.0902)</td>
<td>-17.408*** (2.9155)</td>
</tr>
<tr>
<td>Capital (CA)</td>
<td>0.1295*** (0.0227)</td>
<td>4.3751*** (0.7365)</td>
</tr>
<tr>
<td>Bank Size (LOA)</td>
<td>0.0328*** (0.0048)</td>
<td>1.0093*** (0.1552)</td>
</tr>
<tr>
<td>Investments (IA)</td>
<td>-0.0340** (0.0163)</td>
<td>-1.8186** (0.5287)</td>
</tr>
<tr>
<td>Funding Cost (FC)</td>
<td>-0.1413*** (0.0412)</td>
<td>-4.8147*** (1.3343)</td>
</tr>
</tbody>
</table>
Credit Risk (NPL)  -0.0694*** (0.0193) -0.6054 (0.6247)
Liquidity (LIQ)  -0.1342*** (0.0277) -7.1853*** (0.8980)
Pre-Crisis (Pre1)  0.0063 (0.0068) 0.4588*** (0.1868)
Pre-Crisis (Pre2)  0.0280*** (0.0044) 0.9668*** (0.1441)
Pre-Crisis (Pre3)  0.0138*** (0.0037) 0.3862*** (0.1215)
Post-Crisis (Post1)  0.0006 (0.0049) 0.0303 (0.1442)
Post-Crisis (Post2)  0.0059* (0.0035) 0.0083 (0.1159)
Adjusted R-squared  0.6209 0.5565
F-statistic  9.8524*** 7.7833***
Durbin-Watson stat.  1.824983 1.9438

Standard errors are stated in parentheses. ***, ** and *, are representing 1%, 5% and 10% level of significance.

In case of ROE as dependent variable all the control variables are highly significant at 1% level except (NPL), pre-1, pre-2 and pre-3 all are positively and significantly related to profitability again implying that profitability was higher before the crisis years when the investment (IA) was relatively lower than in during and after crisis years when the IA was continuously rising. post-1 and post-2 are also positively but insignificantly related to profitability which means that the profitability was increasing after financial crisis but not significantly due to the residual effects of the global financial crisis 2008-2009 and under the effects of financial crisis the persistently rising proportion of investments in total assets (IA) which is still showing negative and significant relation with ROE is hindering the profitability of Pakistani banking sector to rise again to the levels prior to the global financial crisis 2008-2009 years.

How Global Financial Crisis affected different types of banks in Pakistan

Public Sector, Specialized and Islamic banks

From results in Table 7 under Model 3A we can see that GFC1 and GFC2 have shown negative but insignificant relation with profitability. With the help of this results we can accept our hypothesis H4 and conclude that Public Sector, Specialized and Islamic banks in Pakistan were not significantly affected by global financial crisis 2008-2009. The underlying reason is because public sector banks enjoy perceived confidence of customers that state owned banks will never default and in case they default the government will make good the loss of depositors (Eichengreen and Gupta, 2013). Majority of specialized banks in Pakistan are also owned by government like ZTBL (which is tasked to provide agricultural loans at discounted rates) and Industrial Development bank etc.

Secondly, specialized banks are not much prone to effects of financial crisis because they are not engaged in commercial banking like risky foreign exchange market, hedging and other derivative securities, and don’t take individual deposits; so, no risk of run on bank. Sufficient evidence is available in literature that Islamic banks were not much affected by financial crisis because of their business model, asset backed structure of financing and avoidance of fixed interest rates on deposits (Hasan and Dridi, 2010 ; Masood and Ashraf, 2012) From control variables CA and LOA has shown positive relation with profitability while IA, FC and LIQ are proved to be negatively related to profitability measured by ROA and ROE.
Table 7: Fixed Effects regression results, effect of Global Financial Crisis 2008-2009 on different types of banks

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 3A. Public Sector, Specialized and Islamic Banks</th>
<th>Model 3B. Private Sector and Foreign Banks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dependent Variable ROA</td>
<td>Dependent Variable ROE</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.539795***</td>
<td>-15.98471***</td>
</tr>
<tr>
<td></td>
<td>(0.189008)</td>
<td>(5.852388)</td>
</tr>
<tr>
<td>Capital (CA)</td>
<td>0.085466*</td>
<td>2.867842*</td>
</tr>
<tr>
<td></td>
<td>(0.051041)</td>
<td>(1.580413)</td>
</tr>
<tr>
<td>Bank size (LOA)</td>
<td>0.035083***</td>
<td>1.092903***</td>
</tr>
<tr>
<td></td>
<td>(0.010376)</td>
<td>(0.321277)</td>
</tr>
<tr>
<td>Investments (IA)</td>
<td>-0.105523***</td>
<td>-3.904263***</td>
</tr>
<tr>
<td></td>
<td>(0.041178)</td>
<td>(1.275028)</td>
</tr>
<tr>
<td>Funding cost (FC)</td>
<td>-0.657540***</td>
<td>-31.80383***</td>
</tr>
<tr>
<td></td>
<td>(0.158028)</td>
<td>(4.893118)</td>
</tr>
<tr>
<td>Liquidity (LIQ)</td>
<td>-0.130770***</td>
<td>-6.758512***</td>
</tr>
<tr>
<td></td>
<td>(0.052097)</td>
<td>(1.613106)</td>
</tr>
<tr>
<td>Global Financial Crisis (GFC1)</td>
<td>-0.005645</td>
<td>-0.010767</td>
</tr>
<tr>
<td></td>
<td>(0.007779)</td>
<td>(0.240861)</td>
</tr>
<tr>
<td>Global Financial Crisis (GFC2)</td>
<td>-0.008894</td>
<td>-0.238278</td>
</tr>
<tr>
<td></td>
<td>(0.008158)</td>
<td>(0.252593)</td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.628557</td>
<td>0.726561</td>
</tr>
<tr>
<td>F-statistic</td>
<td>7.857870***</td>
<td>11.76834***</td>
</tr>
<tr>
<td>Durbin-Watson stat.</td>
<td>2.262991</td>
<td>2.087387</td>
</tr>
</tbody>
</table>

Standard errors are stated in parentheses. ***, ** and *, are representing 1%, 5% and 10% level of significance.

Private and Foreign Banks

We can see from Table 7 results under Model 3B that GFC1 and GFC2 have shown negative and significant relation with profitability of private and foreign banks. So, we accept our hypothesis H5 and conclude that profitability of private and foreign banks was reduced in 2008-2009 due to the effects of global financial crisis. There were some rumors in the market that certain Pakistani commercial banks will default which created bank run like situation in some banks and other banks started holding their liquidity to counter any situation like this. Although with assurance from State Bank of Pakistan that there is no such problem and provision of liquidity by State Bank of Pakistan there was no bank failure in Pakistan. But for the time being, this situation created liquidity problem in the market which ultimately affected the profitability of all commercial banks. Foreign banks also suffered decreased profitability due to the overall slowdown of the global economy and decreased exports and due to the losses at their head offices in developed countries where they had placed some investments.

Conclusion

This study has bridged the gap in literature regarding the effects of global financial crisis 2008-2009 and underlying rising trend in investments (IA) on the profitability of banking sector of developing countries by taking data of Pakistani banks as sample. The empirical analysis has supported all the hypotheses. On the basis of empirical results we can say that the profitability of Pakistani banking sector was significantly reduced during 2008 and 2009 and among other factors this downfall in profitability was mainly due to global financial crisis 2008-2009 and underlying increased proportion of investments in total assets (IA). The control variables of capital (CA) and bank size (LOA) showed a positive relation with the profitability of
Pakistani banking sector while funding cost (FC), credit risk (NPL) and liquidity (LIQ) proved to be negatively related.

In the second stage analysis to check the robustness of our results, the impact of the Pre and Post crisis years on the profitability of Pakistani banking sector was investigated by using same control variables and using dummy variables for pre and post crisis years. The results of the fixed effects model for pre and post financial crisis years have shown positive and significant relation with profitability. This means that profitability of the Pakistani banking sector before and after the global financial crisis 2008-2009 was higher than in the crisis years. These results also reinforce our results in the first section that the profitability of Pakistani banking sector was lower in crisis years of 2008 and 2009 due to the global financial crisis, as it was otherwise higher in the years before and after the financial crisis. So, on the basis of above empirical results we conclude that this down fall in profitability was due to the reasons attributed to the global financial crisis 2008-2009.

When ROE used as dependent variable the dummy variables for year 2010 and 2011 showed positive but insignificant relation with profitability which means that the profitability was not increasing significantly in post crisis years due to the residual effects of the global financial crisis 2008-2009. Under the effects of financial crisis the persistently rising proportion of investments in total assets (IA) even after the crisis years has hindered the profitability of Pakistani banking sector to rise again to the levels prior to the global financial crisis years. This situation needs attention of the bank management and the regulator.

In third stage analysis we concluded that profitability of Private and Foreign banks was negatively affected by global financial crisis 2008-2009 while Public sector Specialized and Islamic banks were not significantly affected. Our results are robust to different measures of profitability. In context of developing countries this study will help bank managers and the regulators to stay better prepared to face any financial crisis in future. The limitation of the study is the small sample size. This study may be replicated by using other developing countries banking data like South Asian countries to generalize the findings.

Note: Part of this Paper (less than 20%) titled ‘Effect of Investments on Banking Sector Profitability during Global Financial Crisis: Evidence from an Emerging Market’ has been presented in and published as proceedings of 3rd International Conference on Social Science and Humanity (ICSSH 2015) on September 8-9, 2015, Singapore (Proceedings has been indexed by Web of Science, Conference Proceedings Citation Index- Social Science and Humanities CPCI-SH)

References


