Article

Loan Loss Provision and Risk-Taking Behavior of Commercial Banks in Pakistan: A Dynamic GMM Approach

Changjun Zheng 1, Shumaila Meer Perhiah 1,*, Naeem Gul Gilal 1 and Faheem Gul Gilal 2

1 School of Management, Huazhong University of Science and Technology, Wuhan 430074, China; zhchjun@hust.edu.cn (C.Z.); naeemgulgilal@yahoo.com (N.G.G.)
2 Department of Business Administration, Sukkur IBA University, Sukkur 65200, Pakistan; faheem.gul@iba-suk.edu.pk
* Correspondence: shumaila.meer@yahoo.com

Received: 13 June 2019; Accepted: 12 September 2019; Published: 23 September 2019

Abstract: The paper analyzes the determinants of the loan loss provision (LLP) of 22 commercial banks in Pakistan from 2010 to 2017. The motive of the research is that LLP is a measure of credit risk as a proxy for bank risk-taking behavior profits and banks’ sustainability. Especially after the occurrence of a global financial crisis. The quantitative research method of data collection from Bureau Van Dijk’s BankFocus portal and the World Bank’s World Development Indicators. Other than considering specific bank variables such as capital adequacy ratio, return on average equity, and government securities, the effects of macroeconomic variable inflation and lending interest rates are explicitly studied. The model of pooled ordinary least squares (POLS), fixed effect (FE), panel corrected standard error (PCSE), and panel data estimation in the form of a general method of moments (GMM) two-step system is used to find the risk-taking behavior of banks in Pakistan. The results obtained by the use of inflation (INF) as an instrumental variable of LLP are highly dependable with a negative impact on loan loss provision. Lending interest rate (LIR) has a positive and significant relationship with LLP and contribute in the study of macroeconomic variables for bank risk-taking, excessive amount of interest rate was not beneficial for banks to earn profits especially during the economic crises. Return on average equity (ROAE) significantly moderates LLP with a negative interaction and helped the bank with profitable operations and save bank from solvency. Capital adequacy ratio (CAR) and government securities (GOV) are insignificant to LLP. The result is robust by measure of endogeneity, and highlights the important role of commercial banks’ sustainability to explain risk-taking behavior in Pakistan with the intention to increase profits after the occurrence of financial crises. The study further contributes to future research on managerial policy and decision making. In summary, the paper on loan loss provision has the capacity to forecast commercial banks’ credit risk for risk-taking in an emerging country.

Keywords: commercial banks; dynamic general method of moments; loan loss provision; Pakistan; risk-taking behavior

1. Introduction

The global financial crisis raised questions about the sustainability of bank models and operating activities that retain loan loss provision to earn profits. The banking sector favors economic growth by loan loss provision (LLP), and the recent global financial crisis proves that banks with a level of stability can increase or decrease the impact of financial shocks on the economy of a country or can harm bank system sustainability [1]. An increasing number of studies show that loan loss provision positively and significantly impacts risk-taking behavior of a bank. Although LLP has a vital role to play in the
banking sector, this study was carried out to examine the impact of LLP use by Pakistani commercial banks as an example to measure bank risk-taking. The motive of this research is as commercial banks in Pakistan had some limitations of risk control to provide credit in the market and led to financing crisis for the firms. Therefore, it was critical to establish a loan loss provision model for the following reasons. First, credit risk allowed banks to empirically and broadly assess the risk of credit issue to firms; second, banks were able to gather information that was helpful to make lending decisions; and third, to study the organizing of commercial banks’ credit, the most important challenge for banks’ manager, and was the vital work in credit loan decision making and guaranteed banks’ credibility and sustainability. Researchers used a two-stage least square (2SLS) model, to forecast credit risk in commercial banks, the paper used a general method of moments (GMM) two-step system for robustness check to measure the accuracy of the model.

The results of pooled ordinary least squares (POLS) as the baseline empirical study show that bank-specific and macroeconomic variables impact LLP. Among these subcomponents, a lag of LLP and lending interest rates (LIRs) influence LLP positively and significantly, while inflation (INF) and return on average equity (ROAE) show a significantly negative relationship.

The possible presence of endogeneity of LLP is the main concern of the study. Thus, an instrumental variable (IV) is added to know the causal effect of variables on LLP. Particularly, we use INF to study the impact of independent variables on LLP. We assume that the instrumental variables critically determine LLP for a bank over the long term. A robustness check is done to have a deeper understanding of the findings by using an alternative estimation model for data obtained from Bureau Van Dijk’s BankFocus and the World Development Indicator (WDI) database for 2010 to 2017, and panel corrected standard error (PCSE) and two-step system general method of moments (GMM) as dynamic panel data estimation are also performed to measure the consistency of the results.

No previous study has researched Pakistan to evaluate LLP with INF, LIRs, CAR, ROAE, and GOV to fill the research gap and contribute to previous literature on bank risk-taking by commercial banks in developing countries. The study examines the relationship between the credit risk of a bank and bank-specific and macroeconomic variables for sustainability of each of the 22 commercial banks of Pakistan particularly for the reliability of credit risk. The research is intended to answer the following questions: (1) Does loan loss provision in the Pakistani economy fully measure credit risk in commercial banks? (2) If that is the case, what are the determinants of risk-taking behavior and financial regulatory policies?

In order to answer the above questions, the study make use of two important research approaches, which are different from the ones used in previous studies. First, data were collected for banks based in Pakistan. The State Bank of Pakistan dictates that commercial banks in the country must set loan loss provisions and increase the ratio requirements for LLP for commercial-based banks at 1.25% of credit risk-weighted assets in standard methods. As for an internal ratings-based (IRB) approach, the expected total loss amount is less than the total provision held and the difference of tier 2 capital should be 0.6% of credit risk-weighted assets. Therefore, the commercial banks of Pakistan provide an updated experimental setting to research the association of credit risk and risk-taking behavior to focus on the sustainability of a bank [2]. Second, an empirical test was conducted according to the maximum time span available for data of Pakistani banks on Dijk’s BankFocus portal according to the complete and reliable measurement of the proxies. This measure depends on a methodology that is comparatively more accurate than the ones used by other portals. The proxies are developed for LLP in an authentic manner by calculations based on formulae that are more robust.

The paper also addresses the issue of endogeneity. LLP ignoring the issue of endogeneity gives unreliable and impractical estimations and leads to the development of wrong banking policies.

Therefore, GMM is used with the IV approach to address the potential issue of endogeneity and analyze real estimations. In Pakistan, financial crises usually result in a huge buildup of loan loss provision containing a huge portion of total assets of banks and financial institutions. Microfinance banks (MFBs) need to maintain loan loss provision of about 1.0% of the proportion of net outstanding
advances, and the provision should not be set against losses in gold or any other form of cash set as collateral at a suitable margin. Banks deal in the business of borrowing and lending and are vulnerable to credit risk, and in reaction credit risk is created to lower the risk factor to accomplish sustainability [3].

The high capital level in efficient banks assigns fewer funds to watch on loans due to credit-carrying risk. Similarly, inefficient banks and less capital raise the credit risk to set a maximum level of revenue [4]. The State Bank of Pakistan assigned some guidelines to the country’s banks [5], among them, the capital adequacy ratio was set to calculate capital requirements according to the danger of risk to banks. Banks must fulfill the requirements on a stand-alone and consolidated basis. The requirement to increase or decrease the capital adequacy ratio measures the risk when a bank issue schemes of deposit insurance [6] to counteract risk [7]. The capital adequacy ratio is used to calculate bank capital, provide security to depositors, and provide backup and consistency to banks [8].

High inflation slows down the growth rate and erodes the quality of the loan loss provision ratio in Pakistan. Government securities, as a guarantee for assets, improve bank profits.

The return on average equity variable measures the performance of banks, to show the type of earning from maximum use of resources available to banks [9], and is the measure of owners’ return earned on the investment made in banks as a portion of shareholder equity and bank capital [10]. Lending interest rates carry some ceiling limits, and make it easy for banks to ask for high premiums and lend to risky businesses, leading to an increase in the rate at which banks can go solvent as nonperforming assets increase [11,12]. Sustainability and profitability are ensured by banks with the procurement of cheap funds for loans from customer deposits. The funds are further lent at high lending interest rates. Also, an accurate prediction of the return of loans in their full amount is necessary and involves credit risk. An increased lending interest rate lowers the banks’ ability to collect debts, and here the lending interest rate is important in inter-banking.

The rest of the paper is as follows: Section 2 consists of a literature review; Section 3 specifies the characteristics of commercial banks in Pakistan; Section 4 elaborates statistical tools used to run the specified model; Section 5 is based on the results; and Section 6 is the conclusion, with policy suggestions and recommendations for managers regarding beneficial risk management in the banking sector of Pakistan.

2. Literature Review

Loan loss provision as a proxy of assets linked to less systematic risk was studied in [13]. Loan loss provision, a disclosure variable, is used to show that if a bank statement has unpaid interest on the principal amount, then a high loan loss provision shows the credit risk taken by the bank at a high rate [14,15]. Loan loss provision is used to study capital management, huge accrual of commercial banks, and the impact on bank earnings and regulatory capital, and is a reflection of losses on the loan portfolio in the future. Investors consider an increase in loan loss provision as the strength of a bank [16].

The provisioning policy pertaining to credit loss accompanying loans during the lending cycle was studied in [17–19]. The provision is decided for loans according to losses that are expected instead of loans that are realized, and the policy provides safety funds to banks at times of financial crisis to attain sustainability.

The main reason to lower lending is to decrease the risk on assets and expand the profitability of a bank [20]. Banks that maintain less capital have knowledge of the risk associated with borrowers, resulting in a low loan loss provision level and lower interest rates from that bank. Some banks miscalculate lending risk and should maintain a high level of risk so that the actual lending risk is less than that of competitive banks with an accurate estimation of lending risk. Banks with low capital have hugely reduced expected risk as loan loss provision, and with the introduction of deregulation, the decreased rate of lending interest is stimulated by a decrease in risk. The negative coefficient
estimation of loan loss provision and banks that hold low capital are good in performance compared to banks holding a high ratio of capital [21].

An active policy of provisioning leads to coverage of losses incurred due to credit during the lending cycle. The policy is to set aside provisions of the loan according to losses that are expected, besides losses that are actual or realized. The policy is set to defend safety fund accumulation, which is helpful at times of financial crisis [17].

Return on average equity was studied in [22] regarding the financial theory of capital structure, bringing forward the concept that financing with equity is expensive compared to deposits and debts. As a result, there is less chance of a bank going bankrupt, and the high amount of capital may not grow the bank’s weighted average cost. The stability of a bank is ensured by a decrease in portfolio risk generated due to bank assets, as a tool for capitalization [23]. The return on equity correlated with loan loss provision was studied in [24], stating that a huge amount of capital is required if risk investment is needed and brings a high return on equity. Ultimately, high profits are earned and the risk is lowered.

The theory for substitution of assets given by [25] states that banks with a low ratio of equity have an incentive to take risks. The capital adequacy ratio requirement is used to reduce the risk taken by banks in assets that have a high risk [14]. When the capital adequacy ratio is decreased, ex-ante investment in assets prone to risk also decreases the bank’s credit risk. The capital adequacy ratio of state-owned banks has increased for rural and commercial banks but is still lower than that of other types of banks owned by the government and involves less risk-taking behavior. Banks with high ownership concentration have a lower capital adequacy ratio level and less risk, contrary to the above reference, however, state-owned banks maintain a high capital adequacy ratio according to the principle of prudence [26].

The capital adequacy ratio in previous research showed an inverse relationship with loan loss provision, indicating that when a bank is well capitalized, the organization tries to avoid risky projects [17,18,27–30]. The effects of loan loss provision and capital adequacy ratio were studied in [31]. Banks that hold less capital have lower loan loss provision and are willing to take risks and banks with low capital have high loan loss provision and are risk-averse and prevent insolvency by a recapitalization. Banks that maintain a capital adequacy ratio less than the ratio set by the regulatory authority are meant to modify the balance sheet. The policy is made to increase capital by keeping assets as constant or decreasing risk-weighted assets by holding capital as a fixed variable, eventually resulting in bank profitability and better performance [32]. The theory in [33] proves that minimum capital is increased with rising portfolio risk. Capital adequacy ratio of a bank decreasing loan loss provision was studied in [34].

A study on banks owned by the state government [35] shows that they have a high proportion of government securities to total assets as a result of recapitalizing banks that go insolvent. The cash flow return in a state-owned bank is less, and is high in a country that has high government intervention in the banking sector. Banks under state ownership have less asset growth in a heavy government involvement scenario [36]. The government’s securities are one of type of bank risk asset that is 0% risky and default-free [14].

Research shows that opportunities to diversify government bonds in emerging markets is an important strategy to reduce risk [37]. The real sovereign bond in long-term yield leads to increased debt, as payment of interest results in fiscal sustainability, different from bonds made on the basis of standard fiscal functions with taking the interest rate as a constant. Sovereign bonds yield in response to growth in public debt with high-interest payments, hurting the fiscal position of the country. One study [38] looked at endogenizing the government bond yield in the long term with the assumption that default risk increases with the amount of debt, especially for an emerging economy, and reacts to the performance of fiscal policy and public debt.

Over time, bond yields and interest rates in the money market respond according to demand and supply and interact with official banks in the regime of evolving a two-way interest rate. Issuing government bonds is a method to raise cash and increase bank profitability [39]. As banks purchase
bonds and lend money in exchange, bond issued as payments with fixed interest for a set number of years and a promise to pay the original price at the time of maturity are valuable for banks as a source of income in fixed amounts and have potential for the growth and sustainability of the bank [40].

A macroeconomic variable study [41] states that central banks make long-term monetary policy pertaining to the ratio of inflation, and growth causes savings and earns a profit, so banks lower the credit rate to facilitate loan demand. Another study [42] investigated the correlation between loan loss provision and inflation and postulated that an unannounced increase in inflation negatively impacts the recovery situation of loans for private investors and operators and harms the assets and equity of banks, and the position for interest rate becomes weak. Banking issues due to inflation result in monetary expansion policy with an increase in domestic credits. Inflation is responsible for the destruction of the real worth of net assets, and also has an impact on profits indirectly, by the trickle-down effect on spending by families and business, nominal interest rates, share prices, and real money supply [24].

A study about lending interest rates [43], mostly related to commercial banks, with loan loss provision data gathered from the International Monetary Fund (IMF), defined the rate as banks fulfilling the requirement of short-term and long-term financing used by the private sector, normally categorized by the creditworthiness of the borrowers and the main requirement of financing by the bank. Increased credit default risk leads to increased lending rates and reduces the lending practice of the bank. Commercial banks act as intermediators to issue loans at fixed rates, and in order to do so, the banks gather funds by short-term debt at a free interest rate [44].

As banks face excess loan demands, banks with updated regulations and adequate provision of loan losses will limit the amount of lending to borrowers with interest rates lower than the market. The rate of clearing in the market is not enough for banks, as the expected profit is less than the credit rationing level. There is a decrease in borrowers with the potential to repay, and the ratio of default risk increases. A situation of weak design or implementation of prudential regulation so much that the bank capital level based on risk assets and loan loss provision is not enough, unreliable banking practice is persistent, and as a result banks have a margin to give high-interest rates and risky loans. The banks are the beneficiaries in this situation, instead of the government, and keep extra profits in good economic conditions without having to pay the full cost of huge losses in bad times.

Another study [45] reported that the limit on increasing interest rates leads to a high volume of lending and a high-risk category of borrowers, and there is a low level of lending activity with a change in the quality of the group of borrowers. When there is a demand for loans of excessive amounts, the first action of a well-regulated bank with loan loss provisioning is to put limitations on lending and charge interest rates to attain maximum profit or net default. There is a danger of lower returns for two reasons: first, discouragement of creditworthy borrowers, who drop out of the market; and second, other borrowers would like to choose high defaulting projects that carry a high percentage of profit. Therefore, the possibility of interest rate of a bank after the expected return rate will decline. At that rate the demand for credit is built and the bank will not raise the interest rate to eliminate the demand.

3. Loan Loss Provision and Market Share of Banks in Pakistan

The characteristics of the banking market in Pakistan, especially related to the loan loss provision mechanism, i.e., institutional, legal, and regulatory, depends on aspects such as politics, culture, and history. The Pakistani banking sector is composed of operations in scheduled banks classified as public, domestic private, and foreign, and further divided into public sector commercial banks and specialized banks. The scheduled banks, according to the Banking Companies Ordinance 1962, Section 13, have to hold an essential amount of capital and balance reserve with regular revision that under the current scenario, banking surveillance department (BSD) circular No. 7 of 2009, should be a total of Rs 10 billion. The commercial banks in Pakistan are scheduled banks with the main function of credit extension by branch networking. The operation includes short-term collateralized lending for financing trade and overdrafts. Specialized banks, a form of commercial bank, are licensed for credit facilities such as small and medium enterprises (SME) [46].
Figure 1 plots the share of the market of analyzed banks as defined by Tobin’s Q ratio of market capitalization to total assets of the bank proposed by [47] for the years 2010–2017. A low Q value between 0 and 1 means the cost to replace the asset is higher than the value of capital. According to Table A1 in the Appendix A, no bank has value more than 1.

4. Research Materials and Methods

The quantitative data were collected from Bureau Van Dijk’s BankFocus portal [48] for dependent bank-level variables and from the World Bank’s World Development Indicators [49] for macroeconomic variables. The data are balanced panel or longitudinal, with multidimensional and multi-phenomenon impacts and study the sustainability of individual bank.

Covering the time period from 2010 to 2017, 22 active commercial banks were selected for analysis: the government-owned National Bank of Pakistan; local banks Habib Bank Limited, United Bank Limited, Muslim Commercial Bank, Allied Bank, Bank Al Habib, Habib Metropolitan Bank Limited, JS Bank Limited, Soneri Bank Limited, Allied Bank, Bank Al Habib, Habib Metropolitan Bank Limited, JS Bank Limited, Soneri Bank Limited, Faysal Bank, Summit Bank Limited, and First Women Bank Limited; microfinance banks Khushhali Microfinance Bank and SME Bank Limited; foreign banks Standard Chartered Bank, Bank Alfalah, Silk Bank Limited, Citi Bank NA Pakistan, and Samba Bank Limited; and state-level banks Bank of Punjab and Bank of Khyber. Also, 8-year dummies were created as the requirement of command, with a sample makeup of 176 observations. Here N > T, therefore the dynamic GMM model is used. The details of the dependent, bank-specific, and macroeconomic variables with the sources of data collection are given in Table 1.

Independent variables with a high correlation or autocorrelation matrix result in insignificant values [50]. The research methodology is pooled ordinary least squares (POLS) estimation of the equation with regression commands. The independent variables are not strictly exogenous; some correlation with past and present error terms is realized to address endogenous regression.

Dynamic panel data estimation in the form of 2-step system general method of moments in STATA software version 14, by xtabond2 commands with equation level code, is used [50–53]. The option of instrument collapse is used in the model to improve efficiency with drastic changes, and the issue of omitted variable biases is addressed with measurement error, with bank-specific unobserved panel endogeneity. The orthogonal deviation lowers the risk of data loss, and the collapse option in syntax helps to maintain a higher number of groups than instrumental variables. The balanced panel data estimation test is done for vector autoregression coefficient, and the technique is used for the analysis of dynamic relationships [54].
Table 1. Variable names and source of data.

| Variables | Indicators | Data Source |
|-----------|------------|-------------|
| Dependent Variables | Measures of Variables | |
| Loan loss provision (LLP) | Ratio of loan loss provision to average gross loans in USD 1000 | Annual data gathered from Bureau Van Dijk’s BankFocus and authors’ calculation |

| Independent Variables | |
|-----------------------|-------------------------------|
| Macroeconomic Variables | |
| Inflation (INF) | Annual percentage of a consumer price index, change in cost with respect to average consumers that acquire goods or services at fixed or changing costs over time | International Monetary Fund, International Financial Statistics, and data files |
| Lending interest rate (LIR) | Percentage of bank rate for short- and medium-term financing based on credit-worthiness of borrower and reason for finance; terms and conditions with rate based on country, and comparability is limited | International Monetary Fund, International Financial Statistics, and data files |

| Bank-Specific Variables | |
|-------------------------|----------------------------------|
| Capital adequacy ratio (CAR) | Ratio of tier 1 capital to total risk weighted assets in USD 1000 | Annual data gathered from Bureau Van Dijk’s BankFocus and authors’ calculation |
| Return on average equity (ROAE) | Proxy for bank profitability expressed as a percentage | Annual data gathered from Bureau Van Dijk’s BankFocus and authors’ calculation |
| Government securities (GOV) | Ratio of government securities to assets in USD 1000 | Bureau Van Dijk’s BankFocus |

As a generic model, GMM, a statistical model to estimate parameters, uses moment conditions that work as a function of model and data parameters, with the expectation of zero being the true value of parameters. The Hausman test of restriction of overidentifying instrumental variables is used to validate the exogeneity of individual effects among the explanatory variables within the panel and cross-sections, and also for the system GMM augmented estimator, and the validity of instrumental variable estimation, where the first part of the equation is written as level and instrumental variables are used as the first difference. The second part of the equation is written as first difference form and instrumental variables as level at first difference equation is transformation.

The Nodiffsaragan option in the command stops the report of some difference in statistics of Sargan and Hansen. The robust option caters the heteroscedasticity and autocorrelation consistent of the variance covariance matrix. The small option shows t-statistics. The Arellano–Bond (2) tests p-value, as reported in [55]. Here, GMM estimation was used to resolve the problem of endogeneity according to time series data variation and controlled group-specific variables and permitted the inclusion of lagged dependent variables. The endogeneity of dependent lagged variables as correlation may exist in the measurement of the error term and explanatory variables in the model. The use of panel data is beneficial for the research, as estimation makes it feasible to remove biases of aggregation, efficiency is improved as data become more variable, and there are fewer collinearity problems in testing complicated models of behavioral study.

The characteristics of country invariance measured by fixed effect may have a correlation with explanatory variables [56] and indicate the presence of autocorrelation [57,58]. As there is considerable difference in the results of FE and GMM estimation, as shown by the significance of correlation, the result of GMM analysis will be followed and is most reliable.

When the issue of heteroscedasticity and serial correlation is found among the variables, the use of 2-step system GMM is recommended as a weighing matrix, as exploited by the use of residual at the
first step. The data sample of Pakistan is finite and downward bias is observed for standard errors; the solution is the use of Windmeijer adjustment of small sample size bias correction [59].

**Empirical Model Specification**

According to [55], the endogeneity issue is resolved by developing variations in time series of the data to make room for lagged dependent variables. The empirical model is given as:

\[
LLP_{it} = \Phi LLP_{it-1} + \beta_1 INF_{it} + \beta_2 LIR_{it} + \beta_3 CAR_{it} + \beta_4 ROAE_{it} + \beta_5 GOV_{it} + \partial_t + \epsilon_{it}. \tag{1}
\]

Here \(LLP_{it-1}\) is lagged loan loss provision, where \(LLP\) is proxy for credit risk; \(CAR\) is capital adequacy ratio; \(ROAE\) is return on average equity; \(GOV\) is government securities; the control variable vector denoted by \(INF\) and \(LIR\); \(\partial\) is used to know the time trend; \(\Phi, \beta, \) and \(\partial\), are parameters; the number of cross-sections is denoted by \(i (= 1, 2, \ldots, 22)\); \(t\) is the number of time series (\(= 2010, 2011, \ldots, 2017\)); and \(\epsilon\) is the error term. The control variable is added to know if the effect of \(CAR, ROAE,\) and \(GOV\) on \(LLP\) is still applicable after considering the effect of covariates on \(LLP\). The statistical models are unable to showcase the effect of regressors on dependent variables in long and short run. Therefore, the dynamic model of system general method of moments estimator is run to know the tenacious nature of \(LLP\).

The issue of omitted variables, measurement error, and endogeneity of bank-specific variables is addressed. The accuracy of system GMM estimation is checked by specification tests. To know the overidentification restrictions, the Hansen test is run to validate the instrumental variables. The values fail to reject the null hypothesis, supporting the model [50,51,60]. The instrumental variables used are the lagged value of \(LLP\), and the others are \(INF\) and \(LIR\).

Figure 2 is a graphical representation of dependent variable loan loss provision in USD 1000. Khushhali Microfinance Bank (KM) has the highest level of loan loss provision at a value of 2.44. KM provides loans to small and medium enterprises to start or fund a business. Samba Bank has an accumulated loan loss provision with the lowest value of \(-0.02\) in the time frame 2010–2017.

![Loan Loss Provision and Bank](image-url)

**Figure 2.** Sample distribution of loan loss provision of commercial banks of Pakistan.
5. Results

Table 2 is a statistical summary of the sample data for commercial banks of Pakistan and gives descriptive statistics of the variables.

| Variable                        | Observations | Mean    | Std. Dev. | Min    | Max    |
|---------------------------------|--------------|---------|-----------|--------|--------|
| Loan loss provision            | 176          | 0.7649432 | 1.161932  | −0.75  | 5.16   |
| Inflation                       | 176          | 4.830068  | 1.14129   | 2.529328 | 5.652145 |
| Lending interest rate           | 176          | 11.60219  | 2.226531  | 8.21   | 14.41917 |
| Capital adequacy ratio          | 113          | 0.1236266 | 0.0424609 | −0.004740 | 0.2627004 |
| Return on average equity        | 176          | 8.584602  | 15.92327  | −42.33 | 30.70  |
| Government securities           | 145          | 0.3150345 | 0.1351857 | 0.02   | 0.59   |

There are 176 observations for loan loss provision with a mean of 0.76 and a standard deviation of 1.16, the minimum value is negative at −0.75 and the maximum value is 5.16, highly different from the mean value. Inflation also has 176 observations, with a mean of 4.83 and a standard deviation of 1.14, a minimum value of 2.53 and a maximum value of 5.65. The lending interest rate for the 22 banks has 176 observations with a mean of 11.61 and standard deviation of 2.23, a minimum value of 8.21 and the maximum value of 14.42. Capital adequacy ratio has 113 observations, due to some missing data for some banks and years, with a mean of 0.13 and a standard deviation of 0.04, a negative minimum value of −0.004 and a maximum value of 0.26. Return on average equity has 176 observations, as other variables, with a mean value of 8.58 and a standard deviation of 15.93, a negative mean value of −42.33 and a higher maximum value of 30.70. Government securities has 145 observations, as some banks do not benefit from government securities, with a mean value of 0.32 and a standard deviation of 0.14, a very low mean value of 0.02 and a maximum value of 0.59.

Table 3 is a matrix of correlation of dependent and independent variables, as given by Pearson correlation. The highest correlation is between LIR and INF at 72%, which is less than 80% and shows no issue of multicollinearity in the data, as stated in [61,62].

|         | LLP  | INF  | LIR  | CAR  | ROAE | GOV  |
|---------|------|------|------|------|------|------|
| LLP     | 1.0000 |      |      |      |      |      |
| INF     | 0.1725 | 1.0000 |      |      |      |      |
| LIR     | 0.3565 | 0.7222 | 1.0000 |      |      |      |
| CAR     | 0.0317 | 0.0457 | 0.1216 | 1.0000 |      |      |
| ROAE    | −0.3300 | −0.0615 | −0.0148 | −0.0102 | 1.0000 |      |
| GOV     | −0.0891 | −0.1620 | −0.0787 | 0.3116 | 0.3633 | 1.0000 |

There is a positive correlation of 17% between LLP and INF. Similarly, there is a positive correlation between LIR and LLP at 35%, between CAR and LLP at about 3.1%, between CAR and INF at 4.5%, and between CAR and LIR at 12%. ROAE, has a negative correlation with all the other variables: with LLP at 33%, with INF at 6.1%, with LIR at 1.48%, and with CAR at 1.0%. GOV has a negative correlation with LLP, INF, and LIR at 8.9%, 16%, and 7.8%, respectively. However, a positive correlation is seen between GOV and CAR at 31% and with ROAE at 36%.

Table 4 accounts for the estimation results of Equation (1). Model (1) shows the estimation results of LLP to measure the proxy of bank risk-taking to enable a comparison of results from the literature using a robust GMM estimation model, to check for the chance of bias in simultaneous equations of all models of Table 4. For the requirement of GMM estimation, the Wald test is performed with the null hypothesis stating dependent variables as exogenous. With rejection of the null hypothesis, the test confirms the bias of endogeneity, and GMM is used to estimate the equation. The z-values of
AR(1) and AR(2) and p-values of the Sargan–Hansen test, which is a diagnostic test used to check for correlation of IV with error term and overidentification of IV, do not reject the null hypothesis, hence the validity of IV is confirmed and the results are appended at the end of Table 4.

Table 4. Empirical results of panel regression pooled ordinary least squares (POLS), panel corrected standard error (PCSE), fixed effect (FE), and general method of moments (GMM) estimation.

|                | REG(1) | PCSE (2) | FE (3) | GMM-SYS (4) |
|----------------|--------|----------|--------|-------------|
| LLP            | LLP    | LLP      | LLP    | LLP         |
| LLP_L1         | 0.377  | 0.400    | 0.359  | 0.389       |
|                | (4.65) | (3.65)   | (2.54) | (2.11)      |
| INF            | −0.203 | −0.201   | −0.308 | −0.178      |
|                | (−2.04)| (−2.11)  | (−2.95)| (−2.53)     |
| LIR            | 0.187  | 0.182    | 0.488  | 0.176       |
|                | (3.37) | (3.21)   | (1.09) | (2.65)      |
| CAR            | −0.395 | −0.334   | 6.580  | −0.260      |
|                | (−0.19)| (−0.14)  | (1.85) | (−0.17)     |
| ROAE           | −0.0316| −0.0305  | −0.0721| −0.0375     |
|                | (−3.99)| (−2.74)  | (−2.29)| (−2.05)     |
| GOV            | 0.292  | 0.229    | −1.436 | 0.257       |
|                | (0.38) | (0.30)   | (−1.22)| (0.55)      |
| _cons          | −0.433 | −0.410   | −461.1 |           |
|                | (−0.84)| (−0.86)  | (−0.42)|            |

Number of observations: 113, Time dummies: yes, Number of groups/instruments: 20/18, F statistics: 31.85, GMM instrument lag: 1, Wald: 55.57, AR(1): 0.056, Z-value\( ^a \): −1.91, AR(2): 0.938, Z-value\( ^b \): 0.08, Sargan test: 0.061, Prob value: 5.61, Hansen test: 0.068, Prob value: 5.37. This shows the results of ordinary least squares (POLS) in model (1), diagnostic results of panel corrected standard error (PCSE) in model (2), fixed effect (FE) in model (3), and two-step system general method of moments (GMM) in model (4), indicating the implication of credit risk as measured by the proxy of loan loss provision, after macroeconomic and bank-specific variables are controlled for, * \( p < 0.01 \), ** \( p < 0.05 \), *** \( p < 0.10 \). t-statistics in parentheses based on heteroscedasticity-robust standard error; a test for first-order serial correlation and b test second-order serial correlation, p-values reported for AR(2) and Hansen statistics.

Table 4 shows the function of LLP with two macroeconomic variables and three bank-level variables. Model (1) represents POLS regression of the model. INF is negatively significant to LLP with 5% significance at 0.203. LIR shows a significantly positive correlation with LLP at the 1% level with a value of 0.187 for model (1), and also found in [43].

CAR is negatively and insignificantly correlated with LLP in models (1) with values of −0.395. High CAR and a practical policy of provisioning help to decrease the amount of loans issued, and result in lower exposure to credit [27]. ROAE is significantly and negatively correlated with LLP at 1% in model (1), GOV shows a positive insignificant correlation with LLP in models (1).

In Table 4 a robustness check shows that past LLP is significant at 0.359 in model (3) of fixed effect and 0.389 at 5% confidence level for both values, and the prediction of the present level of a dependent variable and representative LLP agrees to be path dependent for the following year. Regarding the effect of INF on LLP for model (3) is −0.308 at 1% confidence level and for model (4) the value is 0.178, a percentage change in INF is related to a 0.178% decline in the short run of LLP at a 5% significance level on average ceteris paribus and is significant to loan loss provision [63]. Regarding the effect of LIR on LLP for model (3) is 0.488 for no significant value and in model (4) the value is 0.176, a percentage change in LIR is linked to a 0.176% rise in LLP in the short run at a 5% significance level on average ceteris paribus [64]. CAR effect on LLP is about 6.580 at 10% confidence level but no significance is witnessed for model (4) in the table.
Regarding the ROAE effect on LLP in model (3) of fixed effect at $-0.0721$ with 5% confidence level and $-0.0375$ for model (4), a percentage change in ROAE is supplementary to a 0.037% decrease in LLP in the short run, at a 10% significance level on average ceteris paribus [65].

By the choice of one lag length of LLP, the result of AR(2) is 0.938, revealing that the model does not have the issue of serial correlation in the second order. Here, the Hansen test value of 0.068 means the instrument validity is not rejected at a significance level of 5%, proving that the number of instruments in the model is not overidentified and hence well defined. The main concern of the long-run GMM coefficient is significant variables in the system short-run coefficients in model with a long-run effects for $k^{th}$ parameter computed with formula:

$$\beta_k/ [1 - \Phi].$$

(2)

Here $\beta$ is significant variable in short run, and $\Phi$ is one lag of dependent variable defined as LLP_L1 in the command.

INF has a negative effect in the short run, significant at the 5% level. Similarly, LIR has a positive effect in the short run, significant at the 5% level.

In the long-run coefficient, z-statistics is the output, the effect of INF on LLP with a negative coefficient value of 0.29, a percentage change in INF is associated with a 0.29% decrease in LLP in the long run at a 1% significance level. INF has a larger negative effect on LLP in the long run (0.29) than in the short run (0.178).

The long-run effect of LIR on LLP with a positive coefficient value of 0.28, a percentage change in LIR is related to a 0.28% rise in LLP in the long run at the 1% significance level. LIR has a higher positive effect on LLP in the long run (0.28) than in the short run (0.175). The long-run effect of ROAE on LLP is associated with a $-0.06$% decrease in LLP in the long run at the 5% significance level. ROAE has a higher negative effect on LLP in the long run (0.061) than in the short run (0.037).

Figure 3 is a line plot of the year dummy for two-step system GMM model output. The LLP values for banks of Pakistan was highest in 2013 at more than 0.2 and lowest in 2016 at less than $-0.1$.

![Plot of Loan Loss Provision, 2010-2017](image)
6. Discussion and Policy Implications

The research is to analyze the loan loss provision and macroeconomic implications in Pakistan using the panel dynamic estimator GMM model from 2010 to 2017 covering the era after the global financial crisis defined by July 2007 to March 2009 [66]. A limited number of significant bank-specific variables in the data of commercial banks of Pakistan confirm and support the superiority of macroeconomic instability in the formation of loan loss provision [67]. Bank policies change regarding the issuance of fewer loans or loaning only to quality borrowers at times of increased inflation.

The negative relationship of inflation with loan loss provision in some models for banks is not impacted by fluctuations of inflation, political involvement in the management of banks, especially government-owned, enforcing regulations on lending interest rates to control inflation. On the other hand, small and medium-sized local and foreign banks are quick to implement rules and regulations in the management system. The results are according to economic theory proving that the concept of inflation leads to increased profits when more money follows fewer goods. The majority of borrowers are businesses that pass on the cost of inflation to consumers and customers. Excessive lending interest rates are dangerous for the earnings of financial institutions. Economically, when the interest rate gap is large, it helps banks earn more profits and ultimately improve their lending procedures and policies by the use of profits, a collection of debts. For banks, management following lending interest rate rules and the access amount of ratio is harmful to profits. The capital adequacy ratio is not significant for commercial banks in Pakistan. Although the ratio helps in bank capitalization issues, return on equity deteriorates in times of high inflation and loan loss provision accumulates, and government securities are not enough to support a failing bank in Pakistan.

None of the measures of capital adequacy ratio and government securities is significant for Pakistan. The empirical output proves that a higher capital adequacy ratio and the prudent policy of provisioning help to minimize the issues of banks’ loan capitalization [68], but for Pakistani commercial banks the ratio is insignificant to loan loss provision. The Basel Accord provides the theory for capital adequacy ratio as a base to check on excessive risk-taking, the sustainability of banks and help prevent bankruptcy by recapitalization. Every commercial bank in Pakistan is assigned a minimum requirement of capital adequacy ratio, and a bank that fails to meet the minimum level needs to adjust its balance sheets in accordance with the regulations in two ways: (1) increase capital with constant asset values, and (2) lower the level of risk-weighted assets with capital at constant value. The implication is that either of these two points provides benefits to financial institutions for better performance and soundness of banks.

At times of high inflation, commercial banks of Pakistan face erosion of equity and interest rates. Equity may be hazardous to banks when bank capital is at risk or shows less equity base. Banks are involved in interbank lending, a lower level of equity, especially for banks that are in trouble. Thus, the State Bank of Pakistan has issued a capital adequacy ratio policy to be maintained to increase bank equity. This results in risk issues when loans are concentrated in a small number of banks and financial institutions. Banks owned by the government of Pakistan have low capital ratios, as strong government securities are present. Government securities over assets for commercial banks of Pakistan are insignificant to loan loss provision. If Pakistani banks report many losses too big to be covered, then a banking crisis may occur, and here the government’s will and ability to secure and guarantee the liability is doubtful.

The findings have implications pertaining to regulations and policy-making for the sustainability of the bank [69]. Especially, profitability and inflation can serve as the main indicators of future issues related to loan loss provision. The regulatory authorities focus on management performance to detect potential LLP requirements. Moreover, regulations should emphasize a risk management system and methods used by commercial banks of Pakistan to avoid future instability in the financial sector. Bank supervision takes into consideration policy impacts on banks according to their structure of operation. The profitability of bank had implications for economy, a sustainably successful bank sector was the
The contribution of the paper was to provide information of organized effect of bank sector sustainability on credit risk [71] as follow: (1) the proposing of commercial banks’ credit risk model especially for Pakistan; (2) demonstration of credit risk performance prediction by pooled ordinary least squares (POLS), fixed effect (FE), panel corrected standard error (PCSE), and panel data estimation in the form of a general method of moments (GMM) two-step system to find the risk-taking behavior of banks in Pakistan.

The study can give bank management an idea of banking development in the proper utilization of returns of commercial banks in Pakistan. Sustainability is reinforced as credit risk, in the form of loan loss provision is maintained to produce sustainable long-term value for all the stakeholders of the bank. To achieve, sustainability, a balance should be acquired between risk and profits for the avoidance of risk-taking excessively due to non-alignment of bank strategy, as conventional risk portfolio destroys the ability to deliver market competitiveness [72].

7. Limitations

The results make an important contribution to the literature on loan loss provision and risk-taking behavior of commercial banks. There were some limitations pertaining to the study that can provide material for future research. The choice of macroeconomic and bank-specific determinants was based on the fact that Pakistan is an emerging country with 22 fully operating commercial banks with a substantial amount of available data, and the selection of more variables had some limitations and data availability constraints. Data could be included from other sources of banking methods, for example Islamic and Sharia banking methods, as a potential market for new business where there is an absence of such banking methods. More bank-specific and macroeconomic variables could be included in the study. This study was conducted on a developing country, Pakistan, and could be replicated in developed countries. We used loan loss provision as the proxy for credit risk, but impaired loan could be used as an alternative proxy to measure bank risk-taking in further studies.

Author Contributions: Supervision, C.Z.; Conceptualization, writing original draft, investigation, S.M.P.; Methodology, Formal analysis, N.G.G.; Writing review and editing, F.G.G.

Funding: The research is not funded by any source.

Acknowledgments: We want to convey gratitude to Shujahat Haider Hashmi for providing valuable suggestions and support.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

| No. | Series                        | Years 2017 | 2016 | 2015 | 2014 | 2013 | 2012 | 2011 | 2010 |
|-----|-------------------------------|------------|------|------|------|------|------|------|------|
| 1   | HABIB BANK LIMITED            | 0.09       | 0.16 | 0.13 | 0.17 | 0.13 | 0.09 | 0.1  | 0.1  |
| 2   | NATIONAL BANK of PAKISTAN     | 0.04       | 0.08 | 0.07 | 0.1  | 0.09 | 0.07 | 0.06 | 0.06 |
| 3   | UNITED BANK LIMITED          | 0.11       | 0.18 | 0.13 | 0.18 | 0.15 | 0.11 | 0.08 | 0.08 |
| 4   | MCB BANK LIMITED             | 0.18       | 0.25 | 0.24 | 0.36 | 0.35 | 0.25 | 0.17 | 0.17 |
| 5   | ALLIED BANK LIMITED          | 0.08       | 0.13 | 0.11 | 0.15 | 0.13 | 0.11 | 0.09 | 0.09 |
| 6   | BANK ALFALAH LIMITED         | 0.07       | 0.07 | 0.05 | 0.07 | 0    | 0    | 0    | 0    |
| 7   | BANK AL HABIB                | 0.07       | 0.09 | 0.07 | 0.09 | 0.09 | 0.07 | 0.07 | 0.07 |
| No. | Series                         | Years 2017 | 2016 | 2015 | 2014 | 2013 | 2012 | 2011 | 2010 |
|-----|-------------------------------|-----------|------|------|------|------|------|------|------|
| 8   | STANDARD CHARTERED BANK       | 0         | 0    | 0.19 | 0.22 | 0.24 | 0.12 | 0.09 | 0.09 |
| 9   | ASKARI BANK LIMITED           | 0.04      | 0.05 | 0.05 | 0.07 | 0.03 | 0.04 | 0.02 | 0.02 |
| 10  | BANK of PUNJAB               | 0.03      | 0.05 | 0.03 | 0.04 | 0.03 | 0.02 | 0.01 | 0.01 |
| 11  | HABIB METROPOLITAN BANK LIMITED | 0.05    | 0.07 | 0.07 | 0.1  | 0.08 | 0.06 | 0.06 | 0.06 |
| 12  | FAYSAL BANK LTD               | 0.06      | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| 13  | JS BANK LIMITED               | 0.02      | 0.04 | 0.04 | 0.04 | 0.04 | 0.08 | 0.03 | 0.03 |
| 14  | SONERI BANK LIMITED           | 0.05      | 0.07 | 0.07 | 0.06 | 0.07 | 0.05 | 0.02 | 0.02 |
| 15  | SILKBANK LIMITED              | 0         | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| 16  | CITIBANK NA PAKISTAN          | 0         | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| 17  | KHUSHHALI MICROFINANCE BANK   | 0         | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| 18  | BANK of KHYBER                | 0.06      | 0.08 | 0.07 | 0.08 | 0.07 | 0.08 | 0.07 | 0.07 |
| 19  | SUMMIT BANK LIMITED           | 0.02      | 0.04 | 0.02 | 0.03 | 0.02 | 0.02 | 0.02 | 0.02 |
| 20  | SAMBA BANK LIMITED            | 0.06      | 0.07 | 0.08 | 0.14 | 0.1  | 0.12 | 0.07 | 0.07 |
| 21  | FIRST WOMEN BANK LIMITED      | 0         | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| 22  | SME BANK LTD                  | 0         | 0    | 0    | 0    | 0    | 0    | 0    | 0    |

References
1. Disyatat, P. The bank lending channel revisited. *J. Money Credit Bank.* 2011, 43, 711–734. [CrossRef]
2. State Bank of Pakistan. Prudential Regulations for Microfinance Banks. Available online: http://www.sbp.org.pk/acd/2014/C3-Annex.pdf (accessed on 10 July 2019).
3. Ali, K.; Akhtar, M.F.; Ahmed, H.Z. Bank-Specific and Macroeconomic Indicators of Profitability-Empirical Evidence from the Commercial Banks of Pakistan. *Int. J. Bus. Soc. Sci.* 2011, 2, 235–242.
4. Tan, Y.; Floros, C. Risk, Capital and Efficiency in Chinese Banking. *J. Int. Financ. Mark.* 2013, 26, 378–393. [CrossRef]
5. State Bank of Pakistan. Instructions for Basel III Implementation in Pakistan BPRD Circular No. 6. Available online: http://www.sbp.org.pk/bprd/2013/Basel_III_instructions.pdf (accessed on 11 January 2019).
6. Agusman, A.; Cullen, G.S.; Gasbarro, D.; Monroe, G.S.; Zumwalt, J.K. Government Intervention, Bank Ownership and Risk-Taking during the Indonesian Financial Crisis. *Pac. Basin Financ. J.* 2014, 30, 114–131. [CrossRef]
7. Barrios, V.E.; Blanco, J.M. The Effectiveness of Bank Capital Adequacy Regulation: A Theoretical and Empirical Approach. *J. Bank. Financ.* 2003, 27, 1935–1958. [CrossRef]
8. Siddiqui, A. Financial Contracts, Risk and Performance of Islamic Banking. *Manag. Financ.* 2008, 34, 680–694. [CrossRef]
9. Kosmidou, K. The Determinants of Banks’ Profits in Greece during the Period of EU Financial Integration. *Manag. Financ.* 2008, 34, 146–159. [CrossRef]
10. Gul, S.; Irshad, F.; Zaman, K. Factors Affecting Bank Profitability in Pakistan. *Rom. Econ. J.* 2011, 14, 61–87.
11. Ngugi, R.W. An Empirical Analysis of Interest Rate Spread in Kenya. 2001, RP No. 106. Available online: https://www.africaportal.org/publications/an-empirical-analysis-of-interest-rate-spread-in-kenya/ (accessed on 15 January 2019).
12. Garcia-Herrero, A.; Gavilá, S.; Santabárbara, D. What Explains the Low Profitability of Chinese Banks? *J. Bank. Financ.* 2009, 33, 2080–2092. [CrossRef]
13. Anginer, D.; Demirgüç-Kunt, A.; Mare, D.S. Bank Capital, Institutional Environment and Systemic Stability. *J. Financ. Stab.* 2018, 37, 97–106. [CrossRef]
14. Ashraf, B.; Arshad, S.; Hu, Y. Capital Regulation and Bank Risk-Taking Behavior: Evidence from Pakistan. *Int. J. Financ. Stud.* 2016, 4, 16. [CrossRef]
15. Laeven, L.; Majnoni, G. Loan Loss Provisioning and Economic Slowdowns: Too Much, Too Late? *J. Financ. Intermed.* 2003, 12, 178–197. [CrossRef]
16. Ahmed, A.S.; Takeda, C.; Thomas, S. Bank Loan Loss Provisions: A Reexamination of Capital Management, Earnings Management and Signaling Effects. *J. Account. Econ.* 1999, 28, 1–25. [CrossRef]

17. Boulila, T.N.; Zouari, S.B.S.; Boudrira, A.K. Do Islamic Banks Use Loan Loss Provisions to Smooth Their Results? *J. Islam. Account. Bus. Res.* 2010, 1, 114–127. [CrossRef]

18. Anandarajan, A.; Hasan, I.; Lozano-Vivas, A. The Role of Loan Loss Provisions in Earnings Management, Capital Management, and Signaling: The Spanish Experience. *Adv. Int. Account.* 2003, 16, 45–65. [CrossRef]

19. Anandarajan, A.; Hasan, I.; Lozano-Vivas, A. Loan Loss Provision Decisions: An Empirical Analysis of the Spanish Depository Institutions. *J. Int. Account. Audit. Tax.* 2005, 14, 55–77. [CrossRef]

20. Jith, J.; Philip, E.S. Entry Restrictions, Industry Evolution, and Dynamic Efficiency: Evidence from Commercial Banking. *J. Law Econ.* 1998, 41, 239–274. [CrossRef]

21. Hao, J.; Zheng, K.K.C. Bank Equity Capital and Risk-Taking Behavior: The Effect of Competition. *SSRN Electron.* 2015, 1–47. [CrossRef]

22. Rahmana, M.M.; Zheng, C.; Ashraf, B.N.; Rahman, M.M. Capital Requirements, the Cost of Financial Intermediation and Bank Risk-Taking: Empirical Evidence from Bangladesh. *Res. Int. Bus. Financ.* 2018, 44, 488–503. [CrossRef]

23. Lee, C.C.; Hsieh, M.F. The Impact of Bank Capital on Profitability and Risk in Asian Banking. *J. Int. Money Financ.* 2013, 32, 251–281. [CrossRef]

24. Bikker, J.A.; Haixia, H. Cyclical Patterns in Profits, Provisioning and Lending of Banks and Procyclicality of the New Basel Capital Requirements. *BNL Q. Rev.* 2006. Available online: https://ojs.uniroma1.it/index.php/PSLQuarterlyReview/article/view/9907 (accessed on 15 February 2019).

25. Jensen, M.C.; Meckling, W.H. Theory of the Firm: Managerial Behaviour, Agency Costs and Ownership. *Strateg. Manag.* J. 1976, 3, 305–360. [CrossRef]

26. Lassoued, N.; Sassi, H.; Attia, M.B.R. The Impact of State and Foreign Ownership on Banking Risk: Evidence from the MENA Countries. *Res. Int. Bus. Financ.* 2016, 36, 167–178. [CrossRef]

27. Boudriga, A.; Taktak, N.B.; Jellouli, S. Banking Supervision and Nonperforming Loans: A Cross-country Analysis. *J. Financ. Econ. Policy* 2010, 1, 286–318. [CrossRef]

28. Shehzad, C.T.; Haan, J.D.; Scholtens, B. The Impact of Bank Ownership Concentration on Impaired Loans and Capital Adequacy. *J. Bank. Financ.* 2010, 34, 399–408. [CrossRef]

29. Archer, S.; Karim, R.A.A. On Capital Structure, Risk Sharing and Capital Adequacy in Islamic Banks. *Int. J. Theor. Appl. Financ.* 2006, 9, 269–280. [CrossRef]

30. Archer, S.; Karim, R.A.A.; Sundararajan, V. Supervisory, Regulatory, and Capital Adequacy Implications of Profit-Sharing Investment Accounts in Islamic Finance. *J. Islam. Account. Bus. Res.* 2010, 1, 10–31. [CrossRef]

31. Kim, M.S.; Kross, W. The Impact of the 1989 Change in Bank Capital Standards on Loan Loss Provisions and Loan Write-Off. *J. Account. Econ.* 1998, 25, 69–99. [CrossRef]

32. Seabright, P.; Fries, S.M.; Neven, D.J. Bank Performance in Transition Economies. *SSRN Electron.* J. 2005. Available online: https://deepblue.lib.umich.edu/handle/2027.42/39890 (accessed on 15 July 2019).

33. Michael, K.; Santomero, A.M. Regulation of Bank Capital and Portfolio Risk. *J. Financ.* 1980, 35, 1235–1244. [CrossRef]

34. Sinkey, J.F.J.; Greenawalt, M.B. Loan-Loss Experience and Risk-Taking Behavior at Large Commercial Banks. *J. Financ. Serv. Res.* 1991, 5, 43–59. [CrossRef]

35. Cornett, M.M.; Guo, L.; Khaksari, S.; Tehranian, H. The Impact of State Ownership on Performance Differences in Privately-Owned versus State-Owned Banks: An International Comparison. *J. Financ. Intermed.* 2010, 19, 74–94. [CrossRef]

36. Zhu, W.; Yang, J. State Ownership, Cross-Border Acquisition, and Risk-Taking: Evidence from China’s Banking Industry. *J. Bank. Financ.* 2016, 71, 133–153. [CrossRef]

37. Cifarelli, G.; Paladino, G. Volatility Co-Movements between Emerging Sovereign Bonds: Is There Segmentation between Geographical Areas? *Glob. Financ.* J. 2006, 16, 245–263. [CrossRef]

38. Ghosh, A.R.; Kim, J.I.; Mendoza, E.G.; Ostry, J.D.; Qureshi, M.S. Fiscal Fatigue, Fiscal Space and Debt Sustainability in Advanced Economies. *Econ. J.* 2013, 123, 4–30. [CrossRef]

39. Conway, P.; Herd, R.; Chalaux, T. Reforming China’s Monetary Policy Framework to Meet Domestic Objectives. 2010. Available online: doi:10.1787/18151973 (accessed on 10 July 2019).

40. Fouche, C.H.; Mukuddem-Petersen, J.M.; Petersen, M.A.; Senosi, M.C. Bank Valuation and Its Connections with the Subprime Mortgage Crisis and Basel II Capital Accord. *Discret. Dyn. Nat. Soc.* 2008. [CrossRef]
41. Aiyar, S.; Calomiris, C.W.; Wieladek, T. How Does Credit Supply Respond to Monetary Policy and Bank Minimum Capital Requirements? *Eur. Econ. Rev.* 2016, 82, 142–165. [CrossRef]

42. Fofack, H.L. *Nonperforming Loans in Sub-Saharan Africa: Causal Analysis and Macroeconomic Implications*; The World Bank: Washington, DC, USA, 2005. [CrossRef]

43. Glen, J.; Mondragón-Vélez, C. Business Cycle Effects on Commercial Bank Loan Portfolio Performance in Developing Economies. *Rev. Dev. Financ.* 2011, 1, 150–165. [CrossRef]

44. Freixas, X.; Rochet, J.-C. *Microeconomics of Banking*, 2nd ed.; MIT Press: London, UK, 2008; ISBN 978-0-26-206270-1.

45. Stiglitz, J.E.; Weiss, A. Credit Rationing in Markets with Imperfect Information. *Am. Econ. Rev.* 1981, 71, 393–410.

46. State Bank of Pakistan. Statistics on Scheduled Banks in Pakistan. Available online: http://www.sbp.org.pk/publications/schedule_banks/June-2018>Title.pdf (accessed on 9 July 2019).

47. Brainard, W.C.; Tobin, J. Pitfalls in Financial Model Building. *Am. Econ. Rev.* 1968, 58, 99–122. Available online: http://links.jstor.org/sici?sici=0002-8282%28196805%2958%3A2%3C99%3APIFMB%3E2.0.CO%3B2-C (accessed on 10 July 2019).

48. Bureau Van Dijk’s. Available online: https://www.bvdinfo.com/en-gb (accessed on 23 December 2018).

49. World Bank Open Data. Available online: https://data.worldbank.org/ (accessed on 28 December 2018).

50. Blundell, R.; Bond, S. Initial Conditions and Moment Restrictions in Dynamic Panel Data Models. *J. Econom.* 1998, 87, 115–143. [CrossRef]

51. Arellano, M.; Bover, O. Another Look at the Instrumental Variable Estimation of Error-Components Models. *J. Econom.* 1995, 68, 29–51. [CrossRef]

52. Altunbas, Y.; Carbo, S.; Gardener, E.P.M.; Molyneux, P. Examining the Relationships between Capital, Risk and Efficiency in European Banking. *Eur. Financ. Manag.* 2007, 13, 49–70. [CrossRef]

53. Roodman, D. How to Do Xtabond2: An Introduction to Difference and System GMM in Stata. *Cent. Glob. Dev.* 2006. [CrossRef]

54. Holtz-Eakin, D.; Newey, W.; Rosen, H.S. Estimating Vector Autoregressions with Panel Data. *Econom. J.* 1988, 56, 1371–1395. [CrossRef]

55. Beck, T.; Levine, R.; Loayza, N.; Beck, T.; Levine, R.; Loayza, N. Finance and the Sources of Growth. *J. Financ. Econ.* 2000, 58, 261–300. [CrossRef]

56. Beck, N.; Katz, J.N. Nuisance vs. Substance: Specifying and Estimating Time-Series-Cross-Section Models. *Polit. Anal.* 1996, 6, 1–36. [CrossRef]

57. Bond, S.R. Dynamic Panel Data Models: A Guide to Micro Data Methods and Practice. *Port. Econ. J.* 2002, 1, 141–162. [CrossRef]

58. Caselli, F.; Esquivel, G.; Lefort, F. Reopening the Convergence Debate: A New Look at Cross-Country Growth Empirics. *J. Econom. Growth* 1996, 1, 363–389. [CrossRef]

59. Windmeijer, F. A Finite Sample Correction for the Variance of Linear Two-Step GMM Estimators. *J. Econom.* 2005, 126, 25–51. [CrossRef]

60. Osabuohien, E.; Efobi, U.R.; Gitau, C.M. Environment Challenges in Africa: Further Dimensions to the Trade, MNCs and Energy Debate. *Manag. Environ. Qual.* 2015, 26, 118–137. [CrossRef]

61. Barako, D.G.; Tower, G. Corporate Governance and Bank Performance: Does Ownership Matter? Evidence from the Kenyan Banking Sector. *Corp. Ownersh. Control* 2006, 4, 133–144. [CrossRef]

62. Gujarati, D.N.; Porter, D.C. *Basic Econometrics*, 5th ed.; Douglas Reiner: New York, NY, USA, 2009; ISBN 978-0-07-337577-9.

63. Andries, K.; Gallemore, J.; Jacob, M. The Effect of Corporate Taxation on Bank Transparency: Evidence from Loan Provision. *J. Account. Econ.* 2017, 63, 307–328. [CrossRef]

64. Pool, S.; de Haan, L.; Jacobs, J.P.A.M. Loan Loss Provisioning, Bank Credit and the Real Economy. *J. Macroecon.* 2015, 45, 124–136. [CrossRef]

65. Abou, H.; Sood, E. Loan Loss Provisioning and Income Smoothing in US Banks Pre and Post the Financial Crisis. *Int. Rev. Financ. Anal.* 2012, 25, 64–72. [CrossRef]

66. Dungey, M.; Gajurel, D. Contagion and Banking Crisis—International Evidence for 2007–2009. *J. Bank. Financ.* 2015, 60, 271–283. [CrossRef]

67. Cui, Y.; Geobey, S.; Weber, O.; Lin, H. The Impact of Green Lending on Credit Risk in China. *Sustainability* 2018, 10, 2008. [CrossRef]
68. Lee, M.; Hwang, I.T. The Effect of the Compensation System on Earnings Management and Sustainability: Evidence from Korea Banks. *Sustainability* *2019*, *11*, 3165. [CrossRef]

69. Angori, G.; Aristei, D.; Gallo, M. Determinants of Banks’ Net Interest Margin: Evidence from the Euro Area during the Crisis and Post-Crisis Period. *Sustainability* *2019*, *11*, 3785. [CrossRef]

70. Nevin, C. *Irish Retail Bank Profitability 2003–2018*; Financial Stability Notes; Central Bank of Ireland: Dublin, Ireland, 2018; pp. 1–12.

71. Weber, O. Corporate sustainability and financial performance of Chinese banks. *Sustain. Account. Manag. Policy J.* *2017*, *8*, 358–385. [CrossRef]

72. Karl-Friedrich Raible, T.R. *Strategic Incentive Plan Designs Encourage Insurers to Take Smart Risks*; Willis Towers Watson: London, UK, 2016.

© 2019 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (http://creativecommons.org/licenses/by/4.0/).