Abstract

The effectiveness of the financial market is reflected in the financial crisis which mostly results in credit risk. The impact of credit risk in China is likely to affect the global economy since China is the fastest-growing economy as well as the second-best economy in the world in terms of gross domestic product. Using panel data for twenty-eight listed commercial banks in China from 1990 to 2020, the study explored the relationship between credit risk and business performance. The authors utilized the Generalized Methods of Moments (GMM) as the primary estimator while the Pooled Mean Group (PMG) was used as a robust estimator. A negative and statistically significant relationship was found between non-performing loan and return on equity, as well as loan loss provision and profitability of the bank. On the contrary, capital adequacy ratio revealed a positive and statistically significant relationship with bank performance. Credit growth on the other hand recorded positive but insignificant relationship with performance of banks. The findings will add up to existing literature on credit risk and business performance of commercial banks.

Keywords

business performance, Covid 19, China, commercial banks, credit risk, non-performing loans

JEL Classification

G21, G32

1 INTRODUCTION

Since the reform and opening up policy in the Chinese economy, China's banking industry has achieved rapid development. The banking industry gradually changed and opened up for domestic banks to operate in mainland China and be listed on Chinese stock market. The banking system in China is constantly expanding and is in line with the international outlook. Banks act as a credit intermediary and mainly deal with savings, loans, deposits among others. In relying on credit assets for profit, the credit business has high risk and high profit characteristics. Credit risk is one of the most important risks that must be faced by banks in an actual economic development. According to the World Bank Statistics, the borrowers from commercial banks in the Chinese economy were 270 per 1000 adults (Yang, 2019). This figure increased to 426 in 2017 and recently marked at 469 in 2018. This points to the fact that, as the economy increases, the number of borrowers also increase, and hence, makes credit risk very easy to occur in the various commercial banks (Jiménez and Saurina, 2004).

For a long time, China’s unswerving implementation of the economic transformation policy is to solve the problem of overcapacity and the elimination of backward enterprises. The important aspect is to strictly control the...
concentration of bank loans and prevent new credit from flowing to these enterprises on a large scale (Cucinelli, 2015). Statistically, from 2011 to 2016, the non-performing loan ratio of Chinese commercial banks has been on the rise channel and there is no sign of a decline. This eventually affects the bank performance in the long term (Wan, 2018). With regards to the expected occurrence of credit risk and its impact on the performance of businesses especially commercial banks, there is a crucial demand in analyzing this relationship. Therefore, the objective of this study is to explore the relationship between credit risk and commercial banks' performance in China.

Just as other sectors of the economy, the financial sector was also affected by the global pandemic. The economic turmoil associated with the coronavirus pandemic has wide-ranging and severe impacts upon financial sector including commercial banks. Due to lockdown and restriction of movements, borrowers who had taken facilities from commercial banks could not go about their normal businesses which led to default in resettling the loan facility and interest accrued. Hence, contributing to the increase of non-performing loans. In addition, depositors could not raise deposit their surplus from business activities since they could not perform their normal business activities in the first half of 2020 leading to limited credits available to borrowers. All these point out to the fact that, commercial banks also felt the economic impact of the new coronavirus global pandemic.

The main novelties in the study are the structural break analysis for two different periods, namely, the 2008–9 global financial crisis and the 2020 global pandemic. None of the previous studies on credit risk and bank’s performance have examined the structural breaks for two major global crisis. Our study set the pace in this regard. In addition, the rigorous reliability tests make our study unique from other studies. Previous studies on credit risk and bank performance in China mostly did not consider cross-sectional dependencies in their analysis. However, since cross-sectional dependency test helps in determining the best estimator, the authors performed CD test together with other reliability test before arriving at the estimator used for the regression analysis.

This study adopted a quantitative longitudinal research design using both panel and cross-sectional data extracted from secondary source for listed banks on both Shanghai and Shenzhen stock exchanges for the period 1990–2020. The authors utilized four panels by employing two models each for the four panels. Panel I was used to examine the impact of credit risk on banks’ performance before the 2008–9 global financial crisis. Panel II assesses the impact of credit risk on financial performance of commercial banks after the 2008–9 global financial crisis to the pre-Covid era. In Panel III, the effect of credit risk on commercial banks performance during the Covid 19 global pandemic is explored. Finally, panel IV examines the impact of credit risk on commercial bank's performance for the entire study span. The study utilized the Generalized Methods of Moments (GMM) panel cointegration technique in Model 1 and the Pool Mean Group (PMG) estimator in Model 2 for the long-run relationship analysis in Panel I, Panel II, and Panel IV. Since Panel III utilized cross-sectional data, GMM and PMG were not applicable estimators. Hence, in Panel III, the Dynamic Ordinary Least Squares (DOLS) and the Fully Modified Least Squares (FMOLS) were used in Model 1 and Model 2, respectively. Stata version 15.0 and EVIEWS version 12 statistical tools were employed for the analysis. The variables were used in their logarithm form since the unit of measurement was not uniform.

A negative and statistically significant relationship was found between non-performing loan and return on equity for all the four panels. Similarly, an inverse and statistically significant correlation was found between loan loss provision and return on equity at 10% significant level for all the four panels. On the contrary, capital adequacy ratio revealed a positive and statistically significant relationship with return on equity in Panel II and Panel IV. However, Panel I revealed a positive but insignificant relationship while Panel III revealed and inverse and significant relationship between capital adequacy ratio and return on equity. Credit growth on the other hand recorded positive but insignificant relationship with ROE in Panel I while for the other three panels, a positive and significant relationship was found between credit growth and return on equity. From the structural break analysis, the findings revealed that, the coefficients of the two linear regressions on distinct data sets are the same for the two global crisis.

The findings will enable stakeholders in credit risk management of commercial banks have a clue on how to improve credit risk management. Also, the findings will add up to existing literature on credit risk and business performance of commercial banks. There have been several studies on credit risk and bank performance in China over the last two decades. As a fast-developing nation, China’s commercial banks must be giving strict monitoring and supervision since persistence and uncontrolled credit risk could be a cause of a global crisis. This study therefore used current data to analysis the impact of credit risk on bank performance. The novelty in the research is how second-generation estimation techniques are used in the empirical analysis to ensure that, the findings are statistically accurate.
2 | LITERATURE REVIEW

2.1 | Concepts definitions

2.1.1 | Credit risk

Credit risk is defined as, the possibility that a bank will suffer losses due to the inability of the borrower to fulfill its obligation to pay principal as well as loan interest when it is due for repayment (Andriani and Wiryono, 2015). Credit has gradually become the basic condition of economic subject’s survival and development and credit risk evaluation starts getting more and more attention from the whole society. Although China has vast banking territory with generally good performance, credit risk still seems as a challenge. Credit risk shoulders various indicators and a few were used in this study. In the study of Kingu et al. (2018), the main indicators of credit risk were listed as non-performing loans, capital adequacy ratio, and loan-loss provision. Non-performing loans as credit risk indicator reveal loans and or loan interest that are overdue (Chortareas et al., 2020). Capital adequacy ratio is usually set by the regulatory authority of commercial banks. This is a backup ratio of the capital, set aside to settle customers should there arise a bank run as a result of credit crunch (Golubeva et al., 2019). As a requirement, financial institutions are to keep records for loans that are possible to be default. This enables the management to come to the awareness of the losses made due to unpaid loans. Loan loss provision projects the potential of credit risk as well as the general financial outlook of the bank (Balakrishnan and Ertan, 2019). As the volume of credit increases, it does so with credit risk. Since the main activity of banks is to give out credit and receive deposits, the risk that comes with the expansion of credit cannot be overlooked.

2.1.2 | Bank performance

Performance is a broad term, with different historical stages of development, different analysis targets, and different scholars have different meanings and evaluation systems. Some scholars believe that performance is the result (Căpraru and Ihnatov, 2014; Tan and Floros, 2012; Klein, 2013; Petria et al., 2015). Other scholars also believe that performance is the process of achieving results (Adam, 2014; Ahmad and Bashir, 2013; Abid et al., 2014; Ongore and Kusa, 2013). Others emphasize that performance should focus on the quality of employees and enterprises factors such as the vision and development strategy of the industry. The performance of a commercial bank is often described with the help of efficiency analysis (Grigorian and Manole, 2006).

2.2 | Basel Accords on credit risk

The Basel Committee which is an organization of the central banks of Group 10 (G10) countries was founded in 1974 to work in the direction of improving the observation system of Central banks and forms banking policies for members and non-members (Reis, 2016). The Basel Committee is authorized to strengthen and put up prudential policies to regulate the financial sector of the global economy (Ortino, 2017).

2.2.1 | Basel I

An initial attempt by the Basel Committee on Banking Supervision (BCBS) in 1988 to curb credit risk which had resulted into numerous banks failures, was to publish a set of standard principles which is known as the Basel I Accord (BIS, 2017). Various countries came into agreement to accept these principles as benchmarks and stipulated them to their banking system. The Basel I Accord seems to be primarily concerned with credit risk and asset risk-weighting. It is mainly concerned with the availability of capital to offset credit risk losses (Bermpei et al., 2018). According to the Accord, a ratio of 8% which is an equity ratio is deemed to be set by all banks that operate internationally as based on a percentage of their risk-weighted assets (Waheed et al., 2019). As time passed by, this has become a standard requirement for all banks risk weighted average (Reis, 2016).

The general purpose intended by the BCBS to implement the Basel I Accord was to establish a reliable and unbiased banking system for internationally operating banks and to make a healthy rivalry between them if not to eliminate this rivalry (Bashir et al., 2020).

2.2.2 | Basel II

A wide number of scholars argue that, the poor performance of banks and series of financial crisis over the years as a result of increasing non-performing loans which has led to high credit risk and inadequate credit risk management. Due to this assertion, Basel II Accord emphasizes most on Credit Risk Management practice and being in compliance with this Accord means that banks follow a sound approach to credit which ultimately results in improving their performance (Baud and Chiapello, 2017). Basel II can be seen as an amended form of Basel I. Basel II contains a set of a well-understandable and cultured norms and framework which point out the difficulties established in the new-day Bank Balance Sheet giving wide variety of
options to measure and manage operational, market and credit risks (Chang et al., 2018).

2.2.3 Basel III

In the quest for solutions to the global financial crisis, the BCBS decided to update and strengthen the Accords. The Basel III standard principles are essential elements of the Basel Committee’s response to the global financial crisis (BIS, 2017). In addressing the limitations of the pre-crisis Basel frameworks, Basel III was enacted and it stands strong for a buoyant banking system and supports the economy of countries observing these principles (Roulet, 2018). The framework is to enforce the regulation, supervision and risk management of banks. Banks in the countries that follow the Basel frameworks are expected to apply these principles in all aspects needed (Ortino, 2017). According to the Corporate Finance Institute, the major key principles of Basel III include the increment of the minimum capital requirement 2–4.5% of common equity, and an excess of #% leverage ratio to be held by banks.

2.2.4 Basel Accords impact on credit risk

The Basel Accords stipulates that, uncertain factors will cause various financial risk especially, credit risk. The creation, update and global acceptance of the Basel Accords signify its importance to the financial systems (Baud and Chiapello, 2017). The purpose of the Basel Accord is to prevent and defuse risks and improve the bank’s risk management capabilities and levels in addition to improving and to promoting the stability of financial institutions in order to achieve fair competition. Commercial banks can use the Accord to measure their capital adequacy, and increase or decrease assets in a timely manner; supervision and management departments can use the Basel Accords to evaluate their risk control capabilities and encourage the development of designs to improve their risk management level, develop appropriate risk management techniques and methods (Golubeva et al., 2019). Under the framework of the Basel Accord, commercial banks have made an in-depth study of the credit risk framework.

2.3 Credit risk in Chinese commercial banks

The China Banking Regulatory Commission announced a non-performing loan ratio of 1.67 percent at the end of 2015, but the incremental publication of mainland-listed Chinese commercial banks’ 2015 reports casts doubts on this figure (Kemal Avkiran and Mi, 2017). In China’s commercial banking sector, it is widely assumed that Chinese-listed commercial banks have a stronger corporate governance structure and asset management capabilities, and their asset quality is generally considered to be the highest (Lai, 2019). Even so, the downturn has had a significant effect on commercial banks’ credit assets, including those of publicly traded companies. China’s top six commercial banks, which are among the largest in terms of asset size and loan provisions, according to their 2019 financial reports, had a non-performing loan balance of nearly RMB 800 billion, accounting for 62.22 percent of all commercial banks’ non-performing loan balances (Hang et al., 2019).

The top six commercial banks’ total credit assets were 72 trillion yuan at the end of 2019, with a balance of 2 trillion yuan in non-performing loans and a ratio of 2.69 percent. The actual results indicated that the deterioration of commercial banks’ credit assets is greater than the China Banking Regulatory Commission’s estimates (Chen et al., 2020). According to various Chinese financial authors, China’s commercial banks’ non-performing loan ratio is on a nosedive. Commercial banks have implemented stringent measures for credit risk management.

According to the five-level classification of commercial bank credit assets in China, credit assets can be generally considered to be flawed and may be downgraded to non-performing loans over time. Commercial banks measure this downward risk by migration rates (Zhang et al., 2020). According to the information disclosed by these six commercial banks, the migration rate of non-performing loans is high. China Merchants Bank’s migration rate of concerned loans was as high as 50.17 percent, and the migration rate of the lowest Agricultural Bank’s concern loans reached 18.28 percent. The rising balance of non-performing loans will have a significant impact on the provision coverage and profitability of commercial banks (Zhang et al., 2016). Relying on the declining provision coverage, some state-owned commercial banks including ICBC, Agricultural Bank, Bank of China and China Construction Bank have struggled to achieve positive profit growth. Their net profits grew by .52%, .70%, 1.25%, and .28%, respectively. This was matched by a significant decline in provision coverage. With the exception of Agricultural Bank, the other three have provision coverage rates of just over 150 per cent, but Agricultural Bank has the highest non-performing loan balance of $212.8 billion (Cheng and Qu, 2020).

From the above data consolidation analysis, it can be seen that the authenticity of the non-performing loan on books needs to be improved, and the government’s disposition of non-performing loans of state-owned commercial banks has greatly influenced the judgment of the public on the real situation of banks. Since China’s reform and
opening up, the government authorities have made outstanding contributions in many aspects, but at the same time, the government intervenes in the direction of economic development on the basis of its own purpose. It is this intervention that causes the failure of the allocation of financial resources, consumes a lot of resources, and finally forms a large number of non-performing loans (Bousssemart et al., 2019).

2.4 Credit risk and commercial banks performance

Umar and Sun (2016), asserted that, the presence of non-performing loans (NPLs) could result in financial crisis in the Chinese economy with reference to the financial theory explained above. This is because, increment in credit retarded the growth of bank performance when bank is in default and affected the whole economy at a point in time. (Kani, 2017) made an analysis of credit risk management to study its effect on the profitability of commercial banks in WAEMU to measure bank performance. The results showed that credit appraisal, credit monitoring, debt collection and credit risk governance practices have strong influence on the banks’ profitability and credit risk governance has positive effect on profitability. This concludes that, ignoring credit risk management can increase the impact of credit risk in the banks and can negatively affect their capital structure as outlined in the explanation of the capital structure theory. According to Riaz and Mehar (2013), there exists a significant negative relationship between bank performance and non-performing loans.

According to researchers including (Oduro et al., 2019; Lotto, 2018; Robin et al., 2018; Karamoy and Tulung, 2020; Phan et al., 2019; Makri et al., 2014; Ruslim and Bengawan, 2019) capital adequacy ratio is expected to be related to high bank performance. Meaning, banks with well-structured capital face fewer bankruptcy costs, which reduces financing costs and potential credit risks. On the contrary, (Bitar et al., 2018; Bitar and Tarazi, 2019; Ryu et al., 2020; Begenau, 2020) revealed that banks with higher capital adequacy ratio may reduce their profitability.

Loan Loss Provision to Total Asset serves as a tool to measure the credit quality, probability of credit risk and capital risk of a bank. Banks operating in risky environment may not have the expertise to manage the loans issued. This can result into higher ratio to cover this risk (Nosheen and Rashid, 2019). In the works of Bouzgarrou et al. (2018) it was revealed that, a higher loan loss provision to-total assets ratio may not essentially reflect a higher level of commercial bank profitability. They found that, in the presence of competitive loan market, interest spread lowers and with a combination of a higher loan loss provision to total assets ratio, will lead to a lower profitability. Boateng et al. (2019) found a negative relationship between loan loss provision and bank performance of commercial banks in China. The authors further explained that, loan loss provision is an expense which reduces the profitability of banks. Additionally, the study conducted by Tan and Floros (2018) showed similar results. As indicators of credit risk, both non-performing loans and loan loss provisions revealed a negative relationship between ROE. Other studies that support the above assertion include (Javaid and Alalawi, 2018; Bawa et al., 2019; Riahi, 2019; Zhang et al., 2019; Abu-Serdaneh, 2018; Amedzro St-Hilaire, 2018) among others.

Fahlenbrach et al. (2018) found in their research that, from the year 1973 to 2014, US banks that had high loan growth during this period, was ineffective in the third year afterwards and saw a decline in their ROA. Moreover, Bayar (2019) conducted a study using emerging market economies, including Chinese banks as sample size. The study adopted the GMM Dynamic panel data estimator to examine the influencing factors of the banks’ performance and non-performing loans. ROE was used as performance indicator. The results of the research revealed that, credit growth had a negative relationship with ROE. Also, GDP, unemployment, capital adequacy, public debt as well as cost to income ratio all have a negative relationship with ROE. They concluded that, credit growth has a positive relationship with bank performance but this changes into a negative in the long run. The effect of credit growth on commercial bank performance was extensively reported in several literatures. The finding of Rossi et al. (2019) ascertained the positive impact of credit growth on profitability. However, (Kohlscheen et al., 2018; Yüksel et al., 2018; Salike and Ao, 2018; Bongini et al., 2019; Tan, 2019; Alihodžić and Ekşi, 2018) also found negative relationship between growth of credit and profitability.

With the above assertions, the hypothesis driven can be written as:

H1 There is a negative correlation between business performance and non-performing loans of listed commercial banks in China

H2 There exist a positive relationship between business performance and capital adequacy ratio for commercial banks listed in China.

H3 There is a negative relationship between business performance and loan loss provision to total assets for listed commercial banks in China.

H4 There is a negative correlation between business performance and credit growth for commercial banks listed in China.
3 | METHODOLOGY

A quantitative research design was employed in this study. China was selected as the study area because it is the fastest developing economy in the world. As the fastest developing economy, any financial shock caused by credit risk is likely to pose a negative impact on the global economy especially as four of Chinese listed banks are part of the top ten commercial banks in the world. There are twenty-eight (28) commercial banks listed on Shanghai Stock Exchange and eight (8) listed on Shenzhen Stock Exchange making a total of thirty-six (36) listed banks in the two stock exchanges as at 31 December, 2019. To get the sample size, only banks listed on or before 31 December, 2000 were selected. In effect, the final sample was made up of twenty-three (23) listed banks on the Shanghai Stock Exchange and five (5) listed commercial banks on the Shenzhen Stock Exchange. A total of twenty-eight (28) commercial banks listed were used for the study.

Secondary data for the empirical analysis was obtained from Ifind database. This database was chosen because it provides accurate and reliable details of listed companies on the Shanghai and Shenzhen stock exchanges. Based on the availability of the data, the study focused on thirty-one year period from 1990 to 2020. This is the highest and most recent study covering large study period in China.

The authors utilized four panels by employing two models each for the four panels. Panel I was used to examine the impact of credit risk on banks’ performance before the 2008–9 global financial crisis. Panel II assesses the impact of credit risk on financial performance of commercial banks after the 2008–9 global financial crisis to the pre-Covid era. In Panel III, the effect of credit risk on commercial banks performance during the Covid 19 global pandemic is explored. Finally, panel IV examines the impact of credit risk on commercial bank’s performance for the entire study span. The study utilized the Generalized Methods of Moments (GMM) panel cointegration technique in Model 1 and the Pool Mean Group (PMG) estimator in Model 2 for the long-run relationship analysis in Panel I, Panel II, and Panel IV, while Eq. (2) model was used for the regression analysis in Panel III.

In terms of data processing, descriptive statistics and correlation matrix analysis were performed to determine the nature of the dataset as well as how the pairs of the variables are correlated. Cross-sectional dependency test and stability test were then conducted to enable the authors to choose appropriate estimators for the analysis. After affirming the stability of the dataset, cointegration analysis was conducted to establish whether a long-run relationship exists between the explained and the explanatory variables. Finally, multiple regression analysis using GMM and PMG estimators were conducted. To validate the findings from the multiple regression analysis, post-diagnostic tests such as heteroskedasticity test, serial correlation test, and multicollinearity test were performed.

Table 1 below is the summary of variables used in the empirical analysis.

4 | FINDINGS AND ANALYSIS

4.1 | Descriptive Statistics

Table 2 contains the descriptive statistics of the various variables used in this research. The dependent variable, ROE, revealed an average of 17.8444% indicating that the
TABLE 1  Summary of variables

| Variable type  | Symbol | Name of variable | Explanation | Expected sign |
|---------------|--------|------------------|-------------|---------------|
| Dependent variable | ROE    | Return on equity | Return on equity | - |
| Independent variables | NPL    | Non-performing loans | Total non-performing loans divided by gross loans | - |
| | CAR    | Capital adequacy ratio | Tier 1 capital + Tier 2 capital divided by risk weighted assets | + |
| | LLP    | Loan loss provision to total assets | Loan loss provision divided by total assets | - |
| | CG     | Credit growth | Total loans of current year less total loans of previous year divided by total loans of previous year | - |
| Control variables | LEV    | Leverage | Total liability of the bank | - |
| | IR     | Interest rate of the bank | The proportion of a loan that is charged as interest to the borrower | + |

TABLE 2  Descriptive statistics

|          | ROE  | NPL  | CAR  | LLP   | CG    | LEV   | IR    |
|----------|------|------|------|-------|-------|-------|-------|
| Mean     | 17.8444 | .2010 | .7436 | .0688 | .5743 | 2.60E+12 | 6.7071 |
| Median   | 17.5650 | .1820 | .7400 | .0700 | .5700 | 6.90E+11 | 5.6895 |
| Maximum  | 41.1200 | .4350 | 2.0300 | .3100 | 2.7800 | 2.50E+13 | 21.1800 |
| Minimum  | 4.1800  | .0050 | .0700  | .0200 | .0200 | 1.60E+10 | .8750  |
| Std. Dev. | 5.2936 | .1264 | .3397  | .0230 | .2711 | 4.51E+12 | 3.9977 |
| Skewness | .6335 | .2313 | .3856  | 3.8707 | 1.7868 | 2.7011 | 1.1491 |
| Kurtosis | 4.4007 | 1.8481 | 3.5680 | 37.8940 | 16.5725 | 10.3449 | 3.9319 |
| Obs.     | 868   | 868   | 868   | 868   | 868   | 868   |

Overall level of ROE is high for all sample listed commercial banks and signals that most of the Chinese listed commercial banks perform very well. The median value for the ROE 17.5650 was found to be very close to the mean indicating that the dataset has a symmetrical distribution.

Considering the explanatory variables, NPL recorded mean and standard deviation of .2010 and .1264, respectively. The mean values indicate that, the non-performing loans of the listed banks is around 20% on average. This was above the loan loss provisions targeted by the commercial banks. Hence, it is clear that, non-performing loans in China is very high which needs urgent measures to curb it. As standard deviation measures how dispersed a data could be from its mean, the results from Table 2 shows a lower value of standard deviation as compared to the mean. This means that, the standard deviation is not widely dispersed from the mean. Regarding the median scores for NPL, the median was closer to the mean indicating that the dataset has a symmetrical distribution.

CAR recorded mean value of .7436 with median value of .7400, respectively. The median value’s closeness to the mean indicates a symmetrical distribution in the dataset. However, the standard deviation value recorded for CAR is .3397 indicating that, the dataset set is not widely dispersed from its average.

The average figures recorded for LLP was .0688 indicating that, the commercials banks listed in China have their loan loss provision below the actual non-performing loans. That is, the targets for the banks in terms of loan loss provisions were not achieved. The standard deviation values recorded indicates that the dataset set is not widely dispersed from its mean.

The mean value for CG was .5743. This implies that, credit growth rate for the commercial banks were high. That is, above 50% growth rate for the sampled commercial banks in China. The value for standard deviation recorded from Table 2 was .2711, respectively, indicating how dispersed the average values are from the dataset. The median value recorded was .5700 indicating a close relationship with the mean values recorded.

In terms of skewness, ROE recorded positive values less than 1.0 indicating that, the results of the analysis
for return on equity of commercial banks listed in China are approximately symmetric. Similarly, all the independent variables recorded positively skewed values. With the exception of LLP and CG which recorded values greater than 1.0 in some cases, all the other independent variables scored values less than 1.0 for the three panels. With reference to kurtosis, NPL recorded the least kurtosis values indicating that, the distribution of NPL is fewer than a normal distribution.

### 4.2 Correlation matrix analysis

From the Spearman correlation matrix results in Table 3, all the study variables revealed a mixture of weak and average correlation among the study variables. None of the coefficients was above .8 implying that, there is no multicollinearity among the study variables. From the VIF test of multicollinearity in Table 3, none of the variables scored a VIF value greater than 10, hence, there exist no multicollinearity among the variables.

### 4.3 Cross-sectional analysis

A cross-sectional dependency (CD) impact on estimate depends on many factors, including the magnitude and kind of cross-sectional correlations. Ignoring cross-sectional dependence may result in a substantial loss in estimation efficiency. Table 4 presents the results of Friedman's test of cross-sectional dependency.

With regards to the cross-sectional analysis, all the four test results were statistically significant at 1% level with the exception of CG for the Pesaran CD test which was significant at 5% level. Hence, it can be concluded that, cross-sectional dependency exists among the study variables. This indicates that, a shock in one of the commercial banks is likely to result in all commercial banks in China.

### 4.4 Stability test

The stationarity of the series is a prerequisite for the cointegration test. Hence, after obtaining the presence of CD among the study variables, the authors performed the Cross-sectional Im Pesaran Shin (CIPS) unit root test. The results of the stationarity test are presented in Table 5.

Table 5 illustrates the unit root test of the variables. The study variables are not integrated at level since some of their values were lesser than the critical value. For this reason, there was the need to perform first difference. After first differencing, all the study variables recorded values greater than the critical values, meaning that the null hypothesis of no existence of unit root in the variables is rejected. Therefore, it can be concluded that, the study variables are integrated at first difference.

### 4.5 Multiple regression analysis

The authors used four panels for the multiple regression analysis. In each of the panels, two estimators were used for the regression analysis. The Generalized Methods of Moments (GMM) panel cointegration technique was used as the primary estimator in Model 1 while the Pool Mean Group (PMG) estimation technique was used as the robustness estimator in Model 2 for Panel I, Panel II, and Panel IV. Since Panel III utilized cross-sectional data, GMM and PMG were not applicable estimators. Hence, in Panel III, the Dynamic Ordinary Least Squares (DOLS) and the Fully Modified Least Squares (FMOLS) were used in Model 1 and Model 2, respectively. In Panel I, the impact of credit risk on banks’ performance before the global financial crisis in 2008–9 is examined. Panel II explores the impact of credit risk on business performance for commercial banks for post global financial crisis to pre Covid era. Panel III assesses the impact of credit risk on bank’s financial performance during the 2020 post Covid 19 era. Finally, Panel IV examined the impact of credit risk on bank’s performance for the entire study span. With the exception of

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**Table 3**: Spearman correlation matrix and multicollinearity analysis

| Variables | ROE   | NPL   | CAR   | LLP   | CG    | LEV   | IR    | VIF  | 1/VIF |
|-----------|-------|-------|-------|-------|-------|-------|-------|------|-------|
| ROE       | 1.000 |       |       |       |       |       |       |      |       |
| NPL       | .0203 | 1.000 |       |       |       |       |       | 1.03 | .9706 |
| CAR       | .3879 | .0581 | 1.000 |       |       |       |       | 1.29 | .7769 |
| LLP       | -.4772 | .0540 | .0779 | 1.000 |       |       |       | 1.08 | .9225 |
| CG        | -.0742 | -.0337 | -.0502 | .0861 | 1.0000 |       |       | 1.04 | .9585 |
| LEV       | -.1305 | .0536 | .2728** | .1026** | .0700 | 1.0000 |       | 1.20 | .8307 |
| IR        | -.1261 | -.0993** | .1004* | .0283 | .1543*** | .1700*** | 1.0000 | 1.08 | .9287 |

***, **, * denote 1%, 5% and 10% significant level, respectively.
TABLE 4 Cross-sectional analysis

| Variables | Breusch-Pagan LM | Pesaran scaled LM | Bias-corrected scaled LM | Pesaran CD |
|-----------|-----------------|------------------|--------------------------|-----------|
| ROE       | 1273.4880***    | 32.5686***       | 31.4019***               | 27.3355***|
| NPL       | 395.3162***     | 80.6298***       | 50.5369***               | 31.0418***|
| CAR       | 1844.5530***    | 53.3380***       | 52.1713***               | 31.6629***|
| LLP       | 1354.3350***    | 35.5089***       | 34.3423***               | 22.9039***|
| CG        | 502.6861***     | 4.5348***        | 3.3681***                | 2.2339*** |
| LEV       | 4690.4020***    | 156.8405***      | 155.6739***              | 68.4712***|
| IR        | 1724.7000***    | 48.9790***       | 47.8123***               | 3.7769*** |

***, **, * denote 1%, 5% and 10% significant level, respectively.

TABLE 5 CIPS unit root test

| Variable | Level | Trend & Cons. | Trend & Cons. | Trend & Cons. |
|----------|-------|---------------|---------------|---------------|
| ROE      | −3.01 | −3.08         | −3.33         | −3.72         |
| NPL      | −3.90 | −4.07         | −5.14         | −5.10         |
| CAR      | −2.43 | −3.19         | −3.59         | −3.86         |
| LLP      | −2.53 | −2.98         | −3.74         | −3.85         |
| CG       | −2.54 | −2.44         | −3.47         | −3.72         |
| LEV      | −1.46 | −1.93         | −2.67         | −2.63         |
| IR       | −1.94 | −2.09         | −3.29         | −3.77         |

Panel III, the other three panels used panel data for the empirical analysis. Panel III used cross-sectional data for the year 2020 for the empirical analysis. The division of the data into panels helped in examining the structural breaks for two major periods, namely, the global financial crisis in 2008–9 and the global pandemic in 2020. The variables were used in their logarithm form since the unit of measurement was not uniform. Table 6 demonstrates the results from the multiple regression analysis.

From the Table 6, the Sargan and AR(2) for Model 1 in the four panels recorded an insignificant probability for Model 1 implying that the over-identifying restrictions in the model are valid. Since the higher p-value of the Sargan test shows how better the model is, the findings from Table 6 revealed high p-values of above .25, indicating that the model is appropriate for explaining the impact of credit risk on business performance for listed commercial banks in China. Similarly, in the robustness estimator in Model 2, the values for Wald chi2 were 621.11, 491.37, 237.66, and 1255 for Panel I, Panel II, Panel III, and Panel IV, respectively, implying that, a higher proportion of the variation on how the independent variables affect the dependent variables are well explained by the model. Hence, the model is fit for the empirical analysis. Therefore, both estimators well explained how the variation of the independent variables affects the dependent variable in the four panel...

els. Hence, both model is fit to explain the effect of credit risk on bank performance of listed commercial banks in China.

Using the primary model (Model 1), Non-performing loans was found to have a significant but negative relationship with ROE for all the four panels. This indicates that, a 1% increase in NPL will result in a decrease of .0053, .1157, .2729, and .0284 for Panel I, Panel II, Panel III, and Panel IV. The inverse relationship were statistically significant at 5% level.

CAR on the other hand revealed a positive but insignificant relationship with ROE in Panel I. This means that, a 1% change in the capital adequacy ratio for the commercial banks will reflect in .4989 change on average for ROE. In Panel II, and Panel IV, a positive and significant relationship was found between CAR and ROE. On the contrary, an inverse relationship that is statistically significant at 10% level was found between the two in Panel III. The positive relationship in Panel I, II, and IV means that, the supervisory requirement of adequate capital reserved by commercial banks, as stipulated by the Basel Committee could help curb the occurrence of credit risk in banks. However, during the global pandemic of Covid 19, an inverse relationship was recorded suggesting how the global pandemic affected the smooth activities of listed commercial banks.

Similarly, a negative and statistically significant relationship was revealed between LLP and ROE at 10% significance level for Model 1 in the four panels. This demonstrates a negative relationship between loan loss provision and return on equity. This result indicates that, a 1% increase in LLP will reflect in a decrease of .4736, .1702, .0316, and .3998 for Panel I, Panel II, Panel III, and Panel IV, respectively.

On the contrary, CG recorded a positive relationship with ROE. This implies that, a 1% increase in CG reflected in .3432% and .1958% change on average in ROE. With the exception of Panel I, the other three panels recorded a positive and significant relationship between the two. Only Panel I recorded a positive but insignificant relationship between the two.
TABLE 6  Multiple regression analysis

| Variables | Panel I Model 1 | Panel II Model 1 | Panel III Model 1 | Panel IV Model 1 |
|-----------|----------------|-----------------|------------------|----------------|
| LNROE1    | -.3418         | -.3418          | -.2831***        | -.2831***      |
| LNNPL     | -.0053*        | -.0149**        | -.0021**         | -.0021**       |
| LNCAR     | .4989          | .3460*          | .1779**          | .1779**        |
| LNLLP     | -.4736**       | -.5834***       | -.4019**         | -.4019**       |
| LNCG      | .1605          | .0171           | .3432***         | .3432***       |
| LNLEV     | -.2900**       | -.1356**        | -.3571***        | -.3571***      |
| LNIR      | .6730          | .2634           | .0736            | .0736          |
| Sargant Test/ Wald chi2 | 31.36 | 629.11 | 27.61 | 491.37 |
| AR(2) Test/Prob > chi2 | .58 | .0000 | .02 | .0000 |

**Observation** | 532 | 532 | 308 | 308 |

***, **, * denote 1%, 5% and 10% significant level, respectively.

In the robustness estimator (Model 2), NPL recorded negative and statistically significant coefficients at 5% level for all the four panels. This implies that, a percentage increase in NPL will reflect a significant decrease of .0149, .0021, .4626, and .0039 in ROE for Panel I, Panel II, Panel III, and Panel IV, respectively. The results affirm the findings from the GMM estimator. In terms of the relationship between CAR and ROE, the findings in Panel II and Panel IV revealed a positive and statistically significant relationship at 5% level implying that, a percentage increase in CAR will reflect an increase of .2740 and .2633 change in the ROE. The findings are similar to that of the GMM model. However, in Panel I, a positive and significant relationship was recorded in the robustness test while in the primary model, a positive but insignificant relationship was recorded. Also, during the Covid-19 global pandemic, the findings from Panel III revealed an inverse relationship between the two. Moreover, LLP recorded an inverse and statistically significant relationship with ROE for all the four panels. This finding is similar to the findings in the GMM estimator in Model I for the four panels. A positive and significant relationship between CG and ROE for Panel II and Panel III. However, in Panel I and Panel IV, a positive but insignificant relationship was found between the two which is contrary to the primary estimator in Model I for the four panels.

4.6  Post-diagnostic analysis

The Breusch-Pagan test, which assumes that the error terms are normally distributed, is a popular test for heteroscedasticity with a null hypothesis of constant variance in the error term. While the alternative hypothesis depicts that the variance of the error term is not constant. Table 7 presents the findings of the heteroscedasticity test. In addition, the idiosyncratic errors were also assessed for serial correlation, which would skew the standard errors and make the estimates less efficient. The authors employed the Wooldridge’s serial correlation approach. This technique includes regressing the residuals on their lags and finding whether the lagged residuals coefficient equals 0. The results of the autocorrelation are also presented in Table 7.

4.6.1 Heteroskedasticity and serial correlation test

Table 7 revealed no indication of heteroscedasticity in the data, as shown by the non-significant probability value of higher than .10. Therefore, the variance term is constant. Consequently, we reject the alternative hypothesis and accept the null hypothesis, because the null hypothesis assumes that the error term’s variance is constant.

The serial correlation test in Table 7, like heteroskedasticity, produced negligible probability, indicating that idiosyncratic errors, which skew standard errors and make estimates less efficient, were not present. This means the variables are not moving in lockstep. Hence, the null hypothesis of no first-order autocorrelation is accepted, and the alternative hypothesis is rejected.
4.6.2  |  Structural break analysis

The Chow test is the most frequent method of detecting a structural break. The chow test is a statistical method for comparing the coefficients of two linear regressions on distinct data sets. The authors employed the Chow test to examine the structural breaks during the global financial crisis in 2008–9, and the global pandemic of Covid 19. The Chow test was also used to see whether credit risk had any effect on banks’ performance during these two major global crises.

In assessing the impact of credit risk on performance before and after the global financial crisis, the results revealed that, at 10% the computed F statistics was greater than the F critical. Hence, the null hypothesis of no structural breaks is rejected while the alternative hypothesis of structural breaks is accepted. This suggest that, the coefficients of the two linear regressions on distinct data sets are the same. Similarly, in exploring the structural breaks before and after the global pandemic, the results suggest that, at 5% level, the computed F statistics was greater than the F critical. Therefore, the null hypothesis of no structural breaks is rejected while the alternative hypothesis of structural breaks is accepted.

4.7  |  Discussion

A nonperforming loan is one in which payments of either interest or principal have not been made for a set number of days, generally 90 days, for whatever reason. The increase in non-performing loans of a bank indicates that, the number of customers, individuals and firms that have difficulties in settling their credit facility is on the rise. This eventually have a great influence on its performance. The findings from the study revealed that, non-performing loans have an inverse relationship with credit risk for listed commercial banks in China. The findings from the study affirm the first hypothesis that assumed an inverse relationship between non-performing loan and credit risk. The findings affirm the findings of Riaz and Mehar (2013), who revealed that, there exists a significant negative relationship between bank performance and non-performing loans. Therefore, hypothesis one is accepted for all the four panels

Financial regulatory authorities generally have a commercial bank’s capital adequacy ratio regulation aimed at monitoring the banks’ ability to resist risks. Implemented in Chinese banks in 2004, capital adequacy ratio came into in 1988 for all banks to hold a ratio of 8% of their capital. In 2010, the Basel Accord strengthened the regulatory standards for bank capital adequacy ratio, and the total capital adequacy ratio of commercial banks remained unchanged at 8%. From the regression analysis, the study found a positive and statistically significant relationship between capital adequacy ratio and business performance for listed commercial banks in China. The findings in Panel IV are in line with Goddard et al. (2004) who used European banks and found a positive relationship between the capital adequacy ratio and performance. However, using Panel I which examined the impact of credit risk on bank’s performance before the 2008–9 global financial crisis, the second hypothesis was rejected. Similarly, the time series analysis revealed an inverse relationship between the two leading to the rejection of the second hypothesis using Panel III. This findings suggest that, during global crisis, the banking sector just like other sectors of the economy are affected negatively which affects the performance of banks.

The Loan Loss Provision to Total Asset ratio is used as an indicator to show how protected a bank is against future losses, especially credit risk. A higher ratio signifies that, the bank can survive losses from default loans including losses beyond the loan loss provision. In order to effectively serve the supply-side credit, commercial banks are urged to increase the disposition of non-performing loans to truly reflect asset quality and free up more credit resources to improve the ability to serve the real economy (Kiran and Jones, 2016). Similar to Cai and Huang (2014), who found a negative relationship between loan loss provision and bank performance of rural and cooperative banks in China, the results from the study also revealed an inverse and statistically significant relationship between loan loss provision to total assets and return of equity which was used as the indicator to measure the business performance of listed commercial banks in China. The results are in line with Radiivojević et al. (2019) who revealed that, both non-performing loans and loan loss provisions had a negative relationship between ROE. The results from the study affirm the third hypothesis of the study which assumed a negative relationship between loan loss provision to total assets and business performance of listed commercial banks in China.

Commercial banks are naturally profit-seeking enterprises, and profit maximization is the goal of their operations. The impulse to lend tends to expand the amount of credit to be issued and lower the standard of credit issuance during economic recession. With the aim of minimizing or avoiding risk, commercial banks mostly tighten the scale of credit and raise the threshold for loans. According to Koju et al. (2018), banks with slow credit growth tend to perform well than those with an immense growth. This implies that, high credit growth has an inverse relationship with business performance of commercial banks. Basing on this literature, this study also assumed an inverse relationship between high credit growth and financial performance of
commercial banks in China. From the results, the study, however, revealed that, high credit growth has a positive and statistically significant relationship with return on equity. This result is contrary to the initial fourth hypothesis. Hence, hypothesis 4 is rejected. According to the findings, credit growth positively affects Chinese commercial banks’ performance through various reasons which include, lending to expand markets. In China, banks take over prospects to lend more, in order to capture new and potential customers. This method helps banks to reach out to different geographical markets or penetrate into an existing market. Again, Chinese banks generate more income through lending interest rate charges and eventually reflect in the increase of their retained earnings. This earning is mostly invested as debt-finance or as new loan to borrowers without any impact on equity-to-total assets. Finally, loans produce interest revenue and, in this way, an increase in the volume of credit portfolio of these commercial banks should positively improve bank profits.

5 | CONCLUSION & RECOMMENDATIONS

5.1 | Conclusion

Since the reform and opening up policy, China’s banking industry has achieved rapid development, thus, it has gradually changed and opened up for domestic banks to operate in mainland China and be listed on Chinese stock market. The overall growth of the economy correlates with the health of the banking industry hence, the need to carefully examine credit risk which may hinder the growth of the economy. Credit risk in commercial banks is a global plague in both developing and developed economies. Subsequently, the depth of impact of credit risk must be well understood by management and therefore, measures to curb it must be well established. Just as other sectors of the economy, the financial sector was also affected by the global pandemic. The economic turmoil associated with the coronavirus pandemic has wide-ranging and severe impacts upon financial sector including commercial banks. Similarly, the global financial crisis in 2008–9 also affected the financial sector in China. This study adopted a quantitative research design using panel data for listed commercial banks on both Shanghai Stock Exchange and Shenzhen Stock Exchange. Since there was presence of cross-sectional dependency among the study variables in the three panels, appropriate estimation techniques were used for the empirical analysis.

The results from the correlation matrix showed that, in all the panels, there was a mixture of weak and average correlation among the study variables. Also, the results from the analysis showed that, there exist no multicollinearity among the variables, since none of the coefficients of the correlation was above .8. The CIPS Unit root test revealed that, the study variables were not integrated at I(0) but integrated at I(1) for all the three panels. From the Pedroni cointegration test, the results revealed the presence of long-run relationship among the study variables for the three panel. This eventually led to the estimation of the long-run relationship through regression analysis.

A negative and statistically significant relationship was found between non-performing loan and return on equity for all the four panels. Similarly, an inverse and statistically significant correlation was found between loan loss provision and return on equity at 10% significant level for all the four panels. On the contrary, capital adequacy ratio revealed a positive and statistically significant relationship with return on equity in Panel II and Panel IV. However, Panel I revealed a positive but insignificant relationship while Panel III revealed and inverse and significant relationship between capital adequacy ratio and return on equity. Credit growth on the other hand recorded positive but insignificant relationship with ROE in Panel I while for the other three panels, a positive and significant relationship was found between credit growth and return on equity. From the structural break analysis, the findings revealed that, the coefficients of the two linear regressions on distinct data sets are the same for the two global crisis.

5.2 | Recommendations

Based on the findings, it is therefore recommended to management of commercial banks in China to strictly review loan standards, strengthen risk knowledge training for business and personal loan, review personnel and improve their risk awareness. Additionally, management can implement a risk responsibility system, conduct strict pre-loan due diligence and strengthen post-loan supervision. In addition, commercial banks are recommended to control their credit issuance so as to ensure positive credit growth. Lastly, commercial banks are recommended to gradually establish a coordinated third-party outsourcing service mechanism such as cooperation with guarantee companies and insurance companies to prevent and control risks.

5.3 | Implications

From the results generated from this study, it can be concluded that, the persistent occurrence of credit risk in commercial banks can lead to their poor performance and as such, decrease in profitability. As bank failures and
financial crisis continue to be a challenge for commercial banks globally, national and international supervisory bodies, including the Basel Committee have established and implemented policies to help curb the consequences of credit risk, in order to enhance both industrial and economic development. Since China’s economy contributes to that of the global, management of Chinese commercial banks must put in place measures to reduce adverse selection and moral hazard possibilities related to borrowers so as to reduce the possibility of the occurrence of credit risk.

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