International Journal of Social Science Archives

ISSN: 2707-8892

Available at www.ijssa.com

International Journal of Social Science Archives, April - June, 2024, 7(2), 623-637

Impact of Market Competition on Profitability And Efficiency of Pakistani Banks: Does Credit Risk Mediates?

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***Abstract*:** This research has investigated the impact of market competition on efficiency and profitability in banking sector of Pakistan with mediating role of credit risk. Panel data of 19 conventional banks operating in Pakistan has been used for the time period of 2006-2016. By using Panel data techniques this study has found that market competition has significant impact on profitability and efficiency of Pakistani banks. Credit risk is positively and significantly related with market competition. Moreover, the impact of credit risk on banks profitability and efficiency is significant and negative. The empirical findings show that credit risk mediates the relationship between market competition and ROA as well as market competition and cost efficiency. The results of this study may help to suggest modifications in current banking principles to boost market competition, to certify financial stability and to increase banks efficiency and profitability.

Key words: Market Competition, ROA, ROE, Credit risk, Cost efficiency, Technical efficiency, Conventional banks.

1. Introduction

Economic growth is a common interest for each country in the world because a rise in investment and consumption not only improve quality of life but also increase disposable income and reduce unemployment rate. Financial institution plays important role in economic growth by transferring fund from one party having extra fund to other party who has better investment opportunities (Antunes, Hadi-Vencheh, Jamshidi, Tan & Wanke, 2024). The strength of financial sector is crucial element for good economic performance. Therefore it is very important that the financial sector of a country should work on sound lines (Soedarmono, Fouad &Tarazi, 2013). For economic growth, effective and efficient financial sector serves as a fuel for economic activities. Therefore, extra attention has been given on how well banks are performing. This demands for abundant studies on what motivates banking sector profitability within a region, a country and worldwide (Akinkunmi, 2017). A wide and firm financial sector proficient in improving the country's economic strength at the time of hostile economic conditions is stimulated by a solid, assertive and well-managed banking industry. Therefore, banks' profit-making ability is the security of the economic strength of whole country. It

is a generally believed assumption that performance of banks is imitated by its capability to attain and preserve high return levels (Al-Rdaydeh, Matar& Alghzwai, 2017).

From the last two decades, economic authorities all over the world have taken initiatives to relax the banking sector, through changing interest rates and reducing the entry barrier for foreign banks. It has changed the nature of competition and meaningfully affected efficiency and stability of banking sector (Koukia& Al-Nasserc, 2017). Tsionas, Malikov & CKumbhakar (2018) claimed that banking deregulation was started all over the world with the belief that it results in more efficient use of resources and increase productivity. Banking competition is expected to form more efficient banking system in countries with bank-based financial systems and with lesser cost of borrowing for businesspersons. Banking competition significantly affect bank performance and stability of banks by reducing market power of banks (Moussawi, & Mansour, 2022). Due to importance of banking competition authorities are trying to implement such policy that reduce market power and improve banking competition. Many countries adopted different policies such as interest rate liberalization, low entry barrier, freedom of branch expansion and foreign competition (Yin, 2021). Banking competition is still an open question and over the last three periods the happening of banking crises in both emerging and advanced countries has cast reservations on the banking competition (Tarazi etal. 2013).

It is a difficult process to manage the banking sector that includes connections of several factors. Risk taking and profitability are the most important factors of bank performance among all other factors. It is broadly believed that competition is an essential factor that stimulates all of innovation, risk-taking, and profitability. It is usually recognized that market competition changes a bank's operating conduct, which consequently influence bank risk-taking and profitability (Hu & Xie, 2016). Low barriers to enter in the market encourages banks to deliver more credit. In highly competitive markets, provision of credit by banks increases real economic growth but also rises bank risk taking increasing the chances of bank default (Carlson, Correia, and Luck 2020). For the efficient banking industry and proper understanding of its rules the association between market competition and financial firmness is important. However, in spite of its critical importance there is no clear-cut agreement on the influence of market competition on banks' risk taking and on the overall financial stability (Freixas & Ma, 2015). For the bigger economy, efficiency in banking actions has inferences. For example, the capacity of banks to use modern technology and lessen costs should be beneficial to both their shareholders and customers but, both theoretical and empirical work offer ambiguous positions on the relationship of efficiency and competition (Kumankoma, Abor, Anthony, Aboagye & Amidu, 2017). The connection between market competition and performance of banks (profitability and efficiency) is strong but this relationship is neglected by majority of past studies and most of studies are conducted in advance countries and very few studies have been conducted in emerging economies. Moreover, there is no agreement on the association between market competition and performance of banks so further study is required to explore this issue (Rahim 2016, Sarkar & Sensarma, 2016).

Structure Conduct Performance paradigm proposed by Bain (1951) also suggested that the market structure of the industry affects the performance of firms. In a concentrated market banks use market power that helps them to improve their profitability. According to SCP, the association is a causative between the structure of market (level & type of competition) in which an organization works, the organization's conduct (conduct in term of organizational behavior), and in performance of organization in terms of profitability and efficiency (Ramsey, 2001). According to SCP, in a low competitive market banks use market power and charge the high interest rates on loan and pay lesser interest on deposit and earn abnormal profit. In a less competitive market managers reduce their efforts to work efficiently because there is less pressure on banks to compete. As a result, increase in market concentration reduces competition which reduces productive efficiency. Moreover, intense market competition diminishes the market power of the banks, which compels them to improve innovative technical practices and abilities, thus enlightening their technical efficiency (Tan & Anchor, 2017). All of above studies showed that market competition has effected banks performance but less research is conducted in the context of Pakistan so this study is planned to check the influence of market competition on efficiency and profitability in conventional banks. Moreover, this study has used credit risk to check the channel through which market competition effect banks profitability and efficiency.

2. Literature Review

2.1 Market Competition and Efficiency

Schaek & Cihak (2008) based upon the Granger-type causality test among competition and efficiency revealed that competition has an impact on efficiency. Researchers found a bi-directional causality, which means efficiency affects competition and competition affects efficiency. In Indian banks increase in competition has a positive influence on efficiency (Arrawatia, Misra & Dawar, 2015). Casu & Girardone, (2006) have found that the association among efficiency and competition is not a direct one: more competitive EU banking systems are not ensured by an increase in efficiency but improved banking competition has required banks to develop more efficiency. With cost-efficiency, the researcher found that the effect of competition in the U.S is significant and positive. In early periods of reform efficiency decreased but in advance stages cost efficiencies improved because liberalization and banking competition forced banks toward innovations and more advanced technologies (Abid & Niazi, 2010). Bernini & Brighi, (2017) found that Banking competition and efficiency are negatively associated with each other as competition increase cost to maintain the uniqueness of borrowers and deter cost efficiency. Efficiency improves in low competition because high competition reduces the strength of customer relationships, raises the cost to the lender and result in a decrease in cost efficiency (Triki, Kouki, Dhaoua & Calicec, 2017). An increase in competition decreases the pure technical efficiency of Chinese commercial banks (Tan & Anchor, 2017).
Tsionas, Malikov & kumbhakar (2018) found that market power and efficiency are negatively related, provided empirical proof in support of the quiet life hypothesis. Abbas, Azid & Besar (2016) used the Herfindahl Index (HI) for measuring the market structure and found that HI has an insignificant effect on the efficiency of banks but significant effect on performance and effectiveness. The negative coefficient of HI and efficiency shows that the efficiency of bank decrease with increase in competition though the relationship is insignificant. Weill & Schobert (2016), examined the causality and association among competition and efficiency. The outcome of the study showed that competition and efficiency are negatively related and the outcomes of the causality test showed bi-directional connectedness.
Competition is the leading carter of effective and strong markets, improves firm's innovation, improves output, and resulted in the efficient distribution of funds (Mayo, 2018). Alves, Wanke, Antunes & Chen (2020) studied impact of competition and macroeconomic variables on efficiency using hidden Markov model (HMM) in Portuguese banks. The findings of this study showed relation between these variables and also confirmed that efficiency is the foundation of endogeneity. Moussawi & Mansour (2022) used system GMM to check the influence of competition on bank efficiency in MENA region and showed that competition has positive effect on cost efficiency and stability.

H_1: Market competition has significant impact on efficiency of banks.

2.2 Market Competition and Profitability

Tan, Floros & Anchor (2017) examined the banking competition and profitability in banking sector of China and found that there is no strong influence of market competition on profitability. Due to globalization the involvement of worldwide banks in local banking industry has increased that resulted in falling profit margins and growing market competition (Menicucci & Paolucci, 2016). The structure–conduct–performance (SCP) hypothesis debated that the banks inclined to collude with each other for an abnormal profit in an exceedingly concentrated banking market where competition is minor, (Tan, 2016)**.** Pasiouras & Kosmidou (2007) used GMM one-step system estimation to check the influence of concentration on bank profitability in European banking sector and the outcomes of research showed that profitability of international and domestic banks influenced by bank specific factors but also by financial market structure and macroeconomic situations.
Market concentration has positive and risk taking has negative association with the profitability of banks (Sufian, 2011). Herrero, Gavilá & Santabárbara (2009) used two-step GMM estimator for the period 1997-2004 to illustrate the low profitability of Chinese commercial banks. Outcomes presented that greater profitability could be grasped by the banks with greater portions of deposits, greater capitalization level, and greater X-efficiency. Hsieh & Lee (2010) used the data for 61 countries over the period 1992 to 2006 to explore the influence of banking competition on profitability. The results showed that the alteration in market structure, an advanced level of activity constraint increased banks' profitability. Secondly the positive association between banking competition and profitability deteriorated, due to limitations on non-banking-related business, limitations on the entrance of foreign banks into these markets and the rights of commercial

banks to involve in securities and insurance. Finally, the influence of banking competition on profitability might deteriorate or eradicate in superior competitive pressure faced by banks.

In a low competitive market, the profitability of Chinese banks was high, but the effect of risk taking and market competition on profitability was not strong in the Chinese banking industry (Tan, 2016). With the increase in market power, Profitability significantly rose, but this rise in profitability did not guarantee higher levels of profitability for islamic banking sector (Sahut etal, 2015). Mirzaei, Moore & Liu (2013) found negative relationship between banking competition and profitability by covering banks from emerging and advance economies for 1999-2008. Chinese commercial banks profitability and banking competition is negatively related (Tan, 2017).Simatele, Mishi and Ngonyama (2018) examined the effect of market concentration and banking efficiency on profitability in the South African. The results were significant for all variables and supported the traditional SCP hypothesis. The coefficient for the concentration (CONC) was positive and was negative for the market share. There is negative association between concentration ROA and ROE and these results rejected SCP hypothesis (Mensi & Zouari, 2010).Barua, Roy & Raychaudhuri (2017) studied the relationship between concentration and profitability and found negative association between the variables and thus rejected the SCP hypothesis.

H_2: Market competition has significant impact on profitability of banks

2.2 Market competition and credit risk

Arping (2014) examined the influence of market power on risk taking, capital ratios, and insolvency risk of banks. The researcher showed that in banks risk taking and insolvency risk increased with greater degree of market power. However, these findings did not prove correct during the period of Asian crisis (1997-1999). Beck (2008) found that bank risk taking and insolvency risk decreased with greater market power. Berger, Klapper &Ariss (2008) determined the influence of market power on measures of bank risk, bank equity and loan risk and their outcomes showed that banks have less total risk practice with a superior degree of market power. Zhao Casu, & Ferrari (2009) detected that as a result of reforms market competition increased, which also magnified risk-taking of banks. Yong & Anchor (2017) showed that within each bank ownership form superior competition resulted in superior risk-taking behavior (liquidity risk, capital risk and credit risk,) but, within each unlike type of bank ownership superior competition resulted in minor insolvency risk.

Market power and profit margins dropped with improved competition among banks, thereby growing their risk-taking (Sarkar & Sensarma, 2016) Freixas & Ma (2015) found that banking competition escalated total credit risk but reduced pure insolvency risk. Salim, Arjomandi & Dakpo (2017) concluded that when the private banks extended entrance to the market the banking sector's credit risk increased and deteriorated comparatively after the introduction of regulatory changes. High competition for deposits has affected on loan performance and financial stability of banks but the pathof this effect was depending on the degree of loan competition. In addition, there was a direct effect: severer deposit competition required lower margins, which elevated credit risk of banks. High deposit competition, made banks more willing to invest in risky assets that increased the bank credit risk (Arping, 2017).

More competition reduces insolvency risk and credit risk but intensifies liquidity risk (Tanand Floros, 2018). Alama, Hamid &Tan (2019) used sample of 149 conventional banks and 59 Islamic banks for the time period of 2006 to 2016. Lerner index is used to determine the banking competition. After adjusting country-specific and bank specific variables, the outcomes of the study showed that banking competition and risk taking of banks are positively associated for the whole banking system. Hussain & Bashir (2020) used panel data for 2000 – 2012 to explore the relationship between competition and risk taking. By using different measures of competition and risk taking the result of this study supported competition-fragility and competition stability hypothesis.

H_3: Market competition has significant impact on credit risk of banks

2.3 Credit Risk and Efficiency

Sarmiento & Galánc (2017) found that due to higher costs on administering and monitoring non-performing loans greater credit risk experiences led to lower cost efficiency. Researcher also found that big and

international banks benefited more from supposing related levels of credit risk and the credit risk was related with greater profit efficiency. The connection among technical efficiency and risk taking was positive. In the existing financial system of China, the enhancement of technical efficiency may have escorted an increase of banking risks in financial system (Hou, Wang & Zhang, 2014).Naceur & Omran (2011) found that bank-specific features, specially bank credit risk and capitalization, have a progressive and significant influence on, cost efficiency, profitability and banks' net interest margin In Chinese banking sector, there was a positive and significant association between credit risk and efficiency (Tan & Floros, 2013). Correlated with lesser credit transmission increases in bank risk taking might led to a drop in cost efficiency for a short period (Fiordelisi, Ibanez and Molyneux, 2010). Concerning the efficiency-risk association, the stability of conventional banks' as measured by z-score, enhanced the levels of technical efficiency, even though cost efficiency seemed to be too inclined in respect of the NPL increased (Louati, Louhichi & Boujelbene, 2016).Due to higher cost related to monitoring and administrating loans increased in credit risk decreased cost efficiency but this cost of monitoring and administrating was low for larger and domestic banks because of economies of scale and better information of borrowers respectively (Sarmiento & Galánc,2017).

Salim et al. (2017) found that the bank efficiencies improved over time but bank performance decreased with increase in credit risk. Rozzani & Rehman (2013) found that credit risk and size has no significant association with efficiency of banks but operational cost and efficiency has significant relationship with each other. Credit risk has negative and statistically insignificant relationship with technical efficiency (Řepková, 2015). Sufian (2009) reported that the association between credit risk and technical efficiency is statistically significant and negative. Berger etal. (2009) & Chen et al. (2013) also found that the relationship between credit risk and efficiency was negative. Adusei (2016) found that credit risk and technical efficiency was insignificant related. Insolvency risk and Credit risk are positively and significantly connected to efficiency (Tanand Floros2018).

H_{4a}: Credit risk has significant impact on efficiency of banks
H_{4b}: credit risk mediates the relationship between market competition and efficiency of banks

2.4 Credit Risk and Banks Profitability

Escalation in credit risk resulted in decline in profitability and the study showed that the association among credit risk and banking profitability was negative (Rwayitare, Shukla & Ruhara, 2016). The influence of market competition and risk taking on banks profitability was uncertain and the results did not show any strong findings for the influence of risk on profitability of banks (Tan, 2016). Tan, Floros, & Anchor (2017) found that credit risk has considerable effect on the Chinese commercial banks profitability and the credit risk was negatively and significantly associated with banks profitability. Saeed & Zahid (2016) found that credit risk was positively related with banks profit by studying the influence of credit risk of five big commercial banks in UK on their profitability, unrelated to the previous studies that showed negative association between credit risk and profitability. Interesting but quite unexpected outcomes from the study exhibited that credit risk has a positive and important association with profitability of banks. Al-Rdaydeh et al. (2017) demonstrated a significant negative effect of credit risks on profitability measures (ROA and ROE) for the conventional as well as for Islamic banks. Garcia & Guerreiro (2016) studied the influence of credit risk on profit on Portuguese banks for the period of 2002–2011 by using fixed effect estimator and found that the impact of capital and credit risk was negative and significant on bank profitability.

Tan et al, (2017) found that the effect of Credit risk on profitability was significant and negative in China and explained the reason that greater levels of non-performing loans of banks decreased the income and further decreased the bank profitability. Mendoza & Rivera (2017) found that though the efficiency of banks has enhanced over time, and credit risk has a negative effect on the banks performance. Researcher found out that credit risk has an adverse and statistically significant relationship with profitability of banks, they further found that the influence of credit risk was negative on both ROA and ROE but ROE is statistically insignificant. However, effect on net profit after taxes was negative and statistically significant.

Raza, Jawaid and Shafqat (2013) examined the banking sector of Pakistan and found adverse impact of credit risk on profitability in the banking sector of Pakistan. Noman (2015) found negative association of loan ratio, credit risk, capitalization and cost efficiency with profitability of the Islamic banks in Bangladesh. Noman,

Pervin, Chowdhury & Banna (2015) found negative and significant effect of credit risk on banks profitability.

H_{5a}: Credit risk has significant impact on profitability of banks
H_{5b}: credit risk mediates the relationship between market competition and profitability of banks

3. Methodology

Researchers used a Quantitative research design to examine the influence of market competition on banks profitability and efficiency by examining the mediating role of credit risk in Pakistan. It comprised of using an econometric model to check the relationships between the variables of interest. Sample size consists of 19 banks (out of total 28 representing 67% of total population). Data for this study has been acquired from the financial statement over the period of 2006 – 2016 located in Pakistan. The financial statements for the study have been obtained from the websites of each bank. The data for macroeconomic variables is collected from website of World Bank. Quantitative research design has been used to investigate the outcomes. All the amounts used are in Pakistani rupees and in thousands.

3.1 Market Competition

Competition is measured using Boone indicator. Boone (2001 & 2008) developed the Boone Indicator (BI). Following Schaeck & Cihák, (2014) BI is estimated as follow

$$(\pi)_i = \alpha + \beta ln(MC)_i + \varepsilon_i$$

Where π is the profitability measured by ROA for bank i, MC is the marginal cost of bank i, β is the Boone Indicator and ε_i is the error term. In assessing the marginal cost, we followed Griffith, Boone & Harrison (2005) and Schaeck & Cihak, (2010) who used the ratio of the average variable cost to earning assets as a proxy of marginal cost. Average variable cost consists of interest expenses and administration expenses. Earning assets consists of advances, investments, balance with other banks, and lending to financial institutions. If the β<0, it indicates a competitive banking market and shows that banks with inferior marginal cost have greater profitability through greater market share, and if β>0 it indicates a collusive and concentrated market.

3.2 Efficiency

Efficiency measurement is the one feature of exploring a firm's performance. Following Hou etal. (2014) and Arrawatia et al. (2015) Efficiency of banks is measured by using Data Envelopment Analysis (DEA) technique. The DEA technique compares several inputs and outputs to measures the comparative performance of organizations.

$$maxho = \sum_{r=1}^{s} uryro$$

Subject to: $\sum_{r=1}^{s} vixio$

$$\sum_{r=1}^{s} uryrj0 - \sum_{r=1}^{s} vixij0 \leq 0, j = 1,2 \dots \dots . . n$$

where yrj is the quantity of output r produced by bank j, and xij is the quantity of input i used by bank j ur and are weights chosen for output r and input i respectively

$$minho = \theta$$

Subject to: $\theta oxio = \sum_{j=1}^{n} (\lambda jxij \geq 0)$

$$\sum_{j=1}^{m} (\lambda jryrj \geq \text{yro})$$

This paper followed Haque & Tariq (2012) and used intermediation method for Description of Inputs and Outputs to conclude efficiency so 4 outputs and 3 inputs are used. Outputs are investment, financing, total income and liquid assets. Input are employee expenses operating fixed assets and total deposits. Prices of inputs are staff expenses including salaries and other staff expenses, depreciation of fixed asset and interest paid on deposits respectively.

3.3 Profitability

Banks profitability has been measured by return on assets (ROA) and return on equity (ROE); these are the most commonly used accounting methods for measuring profitability of banks. These methods are used as bank's performance measure in many past studies such as Achary et al, (2006) Menicucci & Paolucci, (2016) and Tan et al, (2017) used ROA and ROE to measure profitability. The equations for measuring ROA and ROE are given below;

$$ROA_{it} = \frac{\text{Profit After Taxation}}{\text{Total Assets}}$$

$$ROE_{it} = \frac{\text{Profit After Taxation}}{\text{Total Equity}}$$

3.4 Credit Risk

Credit risk is measured by using non-performing loans to total loans ratio as used by Belkhaoui et al. (2014)

$$Credit_{it} = \frac{Non - Performing\ Loan\ of\ Bank}{Total\ Bank\ Loans}$$

Where Non is non-performing loans and total loans included performing and non-performing loans.

Econometric models

$Y_{it} = \beta o + \beta_1 BI_t + \beta_2 SIZE_{it} + \beta_3 CAPITAL_{it} + \beta_4 LOAN_{it} + \beta_5 DEPOSITS_{it} + \beta_6 GDP_t + \beta_7 INFLATION_t + \varepsilon_{it}$ ..... **Model 1a**

$\Phi_{it} = \beta o + \beta_1 BI_t + \beta_2 SIZE_{it} + \beta_3 CAPITAL_{it} + \beta_4 LOAN_{it} + \beta_5 DEPOSITS_{it} + \beta_6 GDP_t + \beta_7 INFLATION_t + \varepsilon_{it}$ ..... **Model 1b**

$RISK_{it} = \beta o + \beta_1 BI_t + \beta_2 SIZE_{it} + \beta_3 CAPITAL_{it} + \beta_4 LOAN_{it} + \beta_5 DEPOSITS_{it} + \beta_6 GDP_t + \beta_7 INFLATION_t + \varepsilon_{it}$ ..... **Model 1c**

$Y_{it} = \beta o + \beta_1 RISK_{it} + \beta_2 SIZE_{it} + \beta_3 CAPITAL_{it} + \beta_4 LOAN_{it} + \beta_6 DEPOSITS_{it} + \beta_6 GDP_t + \beta_7 INFLATION_t + +\varepsilon_{it}$ ..... **Model 2a**

$\Phi_{it} = \beta o + \beta_1 RISK_{it} + \beta_2 SIZE_{it} + \beta_3 CAPITAL_{it} + \beta_4 LOAN_{it} + \beta_6 DEPOSITS_{it} + \beta_6 GDP_{it} + \beta_7 INFLATION_{it} + +\varepsilon_{it}$ ..... **Model 2b**

$Y_{it} = \beta o + \beta_1 BI_t + \beta_2 RISK_{it} + \beta_3 SIZE_{it} + \beta_4 CAPITAL_{it} + \beta_5 LOAN_{it} + \beta_6 DEPOSITS_{it} + \beta_7 GDP_t + \beta_8 INFLATION_t + \varepsilon_{it}$ ..... **Model 3a**

$\Phi_{it} = \beta o + \beta_1 BI_t + \beta_2 RISK_{it} + \beta_3 SIZE_{it} + \beta_4 CAPITAL_{it} + \beta_5 LOAN_{it} + \beta_6 DEPOSITS_{it} + \beta_7 GDP_t + \beta_8 INFLATION_t + \varepsilon_{it}$ ..... **Model 3b**

Model 1a,1b,1c shows impact of competition on profitability, efficiency and risk taking while model 2a and 2b shows that impact of credit risk on profitability and efficiency. Model 3a and 3b shows mediating role of credit risk Where Y_{it} represents the profitability measured by ROE and ROA. Φ_{it} is cost and technical efficiency measured by the DEA approach. BI_t is the Boone Indicator is the proxy for market competition and $RISK_{it}$ is the credit risk of banks.

Control variables included; Size is measured by the natural logarithm of total asset. capital is the capital adequacy ratio, loan is the loan ratio, deposits is the deposits ratio, GDP represents growth rate of gross domestic products, inflation is the percentage change in consumer price index ε_{it} is error term. i represents bank and t represents time period.

4. Results and Discussion

Unit root test is conducted to check stationarity of variables. The results of unit root test showed that all the variables are stationary at level. Moreover, variance inflation factor (VIF) test is conducted to check the issue of Multicollinerity. The results of VIF showed that there is no problem of multicollinearity. After checking stationarity panel data techniques are used (fixed effect and random effect). To decide between fixed effect and random effect Hausman test is used.

Table 1: Descriptive Statistics

Variable name	Mean	Standard deviation	Minimum	Maximum	No of observations
Boone indicator	-0.0413025	0.0225433	-0.082164	-0.002757	209
Cost efficiency (%)	0.7861877	0.166884	0.3353679	1	209
Technical efficiency (%)	0.8835959	0.1131397	0.540413	1	209
Credit risk (%)	0.1313804	0.1262571	0.0025925	0.5030166	209
ROA ratio	0.0062427	0.017727	-0.0802369	0.0398199	209
ROE ratio	0.053238	0.351608	-2.76530	0.3569065	209
Capital adequacy ratio	0.1002936	0.0785656	0.002868	0.543147	209
Deposits ratio	0.7418248	.0956307	0.397927	0.908547	209
Size	19.30163	1.201155	16.14357	21.64243	209
Loan ratio	0.4436996	0.1027157	0.134936	0.708602	209
Inflation (%)	0.0966636	0.5740694	-0.6500692	1.658311	209
GDP growth rate (%)	0.0414545	0.012398	0.017	0.068	209

ROE=profit after taxation/total equity and ROA = profit after taxation /total assets. Cost efficiency and technical efficiency are measured by DEA approach. Boone indicator is measured by $(\pi)_i = \alpha + \beta ln(MC)_i + \varepsilon_i$ is the proxy for market competition..Credit = Non − Performing loans/Total Loans . Size natural logarithum of total assets. Capital Adequacy Ratio Equity Capital/Total Assets. Loan Ratio = Total Loans/Total Assets. Inflation= Consumer Price Index.Deposits Ratio = Total Deposits/Total Assets.GDP_{it} = Gross Domestic Product.

Descriptive analysis of data is performed which gives the information on the basic statistics of the dataset. Table 1 presents the necessary details. Descriptive statistics shows mean standard deviation minimum and maximum of main variables used in this study. The mean value of Boone indicator -0.413025 with standard deviation of 2.25433% shows that on average banking industry of Pakistan is competitive. The minimum and maximum values are -0.082164, -0.002757 showing the value for the years in which competition was low and high. On average cost efficiency of Pakistani bank is 78% with the standard deviation of a 16.68% the least efficient bank value is 33.53% while the value of most efficient banks is 100%. On average Pakistani bank has 0.6% return on their assets with the standard deviation of 1.7%. The minimum and maximum values are -8.024% and 3.982% showing the banks having least and highest return on their assets.

The Variance Inflation Factor (VIF) has been used to check the degree of multi-collinearity of independent variables with each other. With VIF Rule of 10 is associated as a symbol of severe multicollinerity. When the value of VIF reaches to 10 or above researchers eliminate one or more variables from their analysis in order to reduce the collinearity (O'brien, 2007).

Table 2: Variance Inflation Factor

Variable name	Vif	Variable name	Vif
Boone indicator	1.80	Inflation	1.40
Capital	1.43	Loan	1.30
Credit risk	1.18	Size	1.31
Deposits	1.50	GDP growth	1.59

ROE=profit after taxation/total equity and ROA = profit after taxation /total assets. Cost efficiency and technical efficiency are measured by DEA approach. Boone indicator is measured by $(\pi)_i = \alpha + \beta ln(MC)_i + \varepsilon_i$ is the proxy for market competition..
Credit = Non − Performing loans/Total Loans . Size natural logarithum of total assets. Capital Adequacy Ratio Equity Capital/Total Assets. Loan Ratio = Total Loans/Total Assets. Inflation= Consumer Price Index. Deposits Ratio = Total Deposits/Total Assets.GDP_{it} = Gross

Domestic Product.

The variance inflation factor delivers valuable insights, especially related to the multicollinerity. The values of variance inflation factor in table 2 shows that the values of VIF for all variables are less than 5% which means no variable is correlated with other variables and all these variables can use all together in a regression analysis. VIF values range between 1.08 to 1.80 which is lower than critical value of 10 pointed by (O'brien, 2007). Thus, correlations among the variables in our model shows that there is no chance of multicollinerity biases

Table3. Regression Results

Dependent variable	ROA (Model 1a)	ROE (Model 1a)	Credit risk (Model 1b)	Cost efficiency (Model 1c)	Technical efficiency (Model 1c)
Independent variables	Coefficients	Coefficients	Coefficients	Coefficients	Coefficients
Boone indicator	0.13562 **	2.513482 **	0.155627***	-1.52079 ***	0.725029 **
	(0.0118)	(0.0489)	(0.0000)	(0.0014)	(0.0354)
Constant	-0.10404 *	-1.47782	-0.00378	0.241837	0.922442 ***
	(0.0592)	(0.2581)	(0.8831)	(0.3815)	(0.0002)
Controls					
Capital adequacy ratio	0.036322 **	1.268242 ***	0.003414	-0.063753	0.013054
	(0.0276)	(0.0013)	(0.656)	(0.6473)	(0.8990)
Deposit ratio	-0.06452 ***	-0.95771 **	0.219636 *	-0.77433 ***	-0.513848 ***
	(0.0001)	(0.0105)	(0.0765)	(0.0000)	(0.0000)
Size	0.007174 ***	0.108121 *	-0.003939 ***	0.059988 ***	0.024202 **
	(0.0059)	(0.0791)	(0.0013)	(0.0000)	(0.0341)
Loan ratio	0.047501***	0.489699	-0.01449 **	-0.42869 ***	-0.257980***
	(0.0002)	(0.1019)	(0.0144)	(0.0001)	(0.0013)
Inflation	-0.02525	-0.52652	0.068387	0.400268	0.443027**
	(0.471)	(0.5271)	(0.7066)	(0.1844)	(0.0319)
Gdp Growth	0.086265	-0.6399	-0.08717 *	2.485364***	-0.539809
	(0.3777)	(0.7829)	(0.0577)	(0.0024)	(0.3638)
R-square	0.584771	0.412278	0.273969	0.354504	0.234334
F-statistic	10.30881	5.134864	2.76221	15.69135	8.824737
Prob(F-statistic)	0.0000	0.0000	0.000053	0.0000	0.0000
No of obs	209	209	209	209	209

***,**,* represents significance level at 1%,5% and 10% respectively

ROE=profit after taxation/total equity and ROA = profit after taxation /total assets. Cost efficiency and technical efficiency are measured by DEA approach. Boone indicator is measured by $(\pi)_i = \alpha + \beta ln(MC)_i + \varepsilon_i$ is the proxy for market competition. $\text{Credit} = \text{Non} - \text{Performing loans/Total Loans}$. Size natural logarithum of total assets.
$\text{Capital Adequacy Ratio}$ $\text{Equity Capital/Total Assets}$. Loan Ratio $\text{Total Loans/Total Assets}$.
Inflation= Consumer Price Index.$\text{Deposits Ratio} = \text{Total Deposits/Total Assets}$.$GDP_{it}$ = Gross Domestic Product.

Table 4: Relationship of Profitability and Efficiency with Credit Risk

Dependent Variables	ROA (Model 2a)	ROE (Model 2a)	Cost efficiency (Model 2b)	Technical efficiency (Model 2b)
Independent variables	Coefficients	Coefficients	Coefficients	Coefficients
constant	-0.07081	-1.03531 *	0.315476	1.038292***
	(0.1841)	(0.0162)	(0.2789)	(0.000)

Credit risk	-0.03521***	-1.9273***	-0.23347 **	-0.20352 **
	(0.002)	(0.0000)	(0.0409)	(0.0155)
Controls				
Capital adequacy ratio	0.023993	0.399536	-0.10337	-0.04854
	(0.1393)	(0.214)	(0.4795)	(0.6381)
Deposits ratio	-0.022 *	-0.30442	-0.81598 ***	-0.43642***
	(0.0797)	(0.2111)	(0.0000)	(0.0000)
Size	0.005285**	0.089607***	0.062399 ***	0.017714
	(0.0324)	(0.0000)	(0.000)	(0.1002)
Loan ratio	0.03847 ***	-0.06727	-0.4577 ***	-0.29283***
	(0.0024)	(0.7701)	(0.0000)	(0.0002)
Inflation	-0.06313 **	-0.79215	0.783048***	0.20748
	(0.0345)	(0.1467)	(0.0016)	(0.2367)
Gdp Growth	0.058428	-2.43	1.074703	-0.72259
	(0.5441)	(0.2052)	(0.1993)	(0.2239)
R-square	0.607937	0.395703	0.326548	0.245738
F-statistic	11.28845	18.70901	13.85391	9.308561
Prob(F-statistic)	0.0000	0.0000	0.0000	0.0000
No of obs	209	209	209	209

***,**,* represents significance level at 1%,5% and 10% respectively.
ROE=profit after taxation/total equity and ROA = profit after taxation /total assets. Cost efficiency and technical efficiency are measured by DEA approach. Boone indicator is measured by $(\pi)_i = \alpha + \beta ln(MC)_i + \varepsilon_i$ is the proxy for market competition.

$\text{Credit} = \text{Non} - \text{Performing loans/Total Loans}$. Size natural logarithum of total assets.
Capital Adequacy Ratio Equity Capital/Total Assets. $\text{Loan Ratio} = \text{Total Loans/Total Assets}$.
Inflation=Consumer Price Index.$\text{Deposits Ratio} = \text{Total Deposits/Total Assets}$.$GDP_{it}$ = Gross Domestic Product.

Table 5: Mediating role of credit risk

Dependent variables	ROA (Model 3a)	ROE (Model 3a)	Cost efficiency (Model 3b)	Technical efficiency (Model 3b)
Independent variables	Coefficients	Coefficients	Coefficients	Coefficients
constant	-0.10273 *	-0.96705 **	0.340948	0.813519 ***
	(0.0598)	(0.0245)	(0.2371)	(0.0011)
Boone indicator	0.081684	2.595524 **	-1.60794 ***	0.326694
	(0.1615)	(0.0262)	(0.0008)	(0.3725)
Credit risk	-0.34657 **	-1.94991 ***	-0.21785 *	-0.21107 **
	(0.0279)	(0.0000)	(0.0515)	(0.0116)
Controls				
Capital adequacy ratio	0.035139 **	0.418251	-0.1202	-0.04046
	(0.0313)	(0.1898)	(0.3992)	(0.693)
Deposits ratio	-0.04022***	-0.37285	-0.74275 ***	-0.51992 ***
	(0.0045)	(0.1269)	(0.0000)	(0.0000)
Size	0.005809 **	0.093831 ***	0.055397 ***	0.019136 *
	(0.028)	(0.0000)	(0.0000)	(0.0942)
Loan ratio	0.052524 ***	-0.0671	-0.44853 ***	-0.2141 ***
	(0.0000)	(0.7691)	(0.0000)	(0.0072)
Inflation	-0.04967	-0.12748	0.319317	0.297013
	(0.1729)	(0.8362)	(0.2464)	(0.1552)
Gdp Growth	0.116475	-3.75991 *	1.775437**	-0.19263
	(0.2337)	(0.0595)	(0.0356)	(0.7468)
R-square	0.601455	0.408099	0.361416	0.2631

F-statistic	10.56389	17.15059	14.07836	8.925904
Prob(F-statistic)	0.00000	0.00000	0.0000	0.0000
No of obs	209	209	209	209

***,**,* represents significance level at 1%,5% and 10% respectively
ROE=profit after taxation/total equity and ROA = profit after taxation /total assets. Cost efficiency and technical efficiency are measured by DEA approach. Boone indicator is measured by $(\pi)_i = \alpha + \beta ln(MC)_i + \varepsilon_i$ is the proxy for market competition.$\text{Credit Non} - \text{Performing loans/Total Loans}$. $\text{Size} =$ natural logarithum of total assets.$\text{Capital Adequacy Ratio} = \text{Equity Capital/Total Assets}$. $\text{Loan Ratio} =$ $\text{Total Loans/Total Assets}$. Inflation= Consumer Price Index.$\text{Deposits Ratio} =$ $\text{Total Deposits/Total Assets}$.$GDP_{it}$ = Gross Domestic Product.

The results of table 3 (model 1a) has shown that the impact of market competition on bank profitability (ROA and ROE) is significantly positive at 5 percent significant level. The results are consistent with the results of Mensi & Zouari (2010) and Barua, et al (2017). With market competition, profitability of commercial banks increases in Pakistan. These results are against the SCP hypothesis which states that market competition decrease firm profitability. These results support our hypothesis 2 that there is significant association among market competition and banks profitability in Pakistan. The results in table 3 (model 1c) shows that the impact of market competition on cost efficiency is statistically significant and negative at 1 percent significant level. These results are consistent with Bernini & Brighi (2017), Triki,etal (2017), Ab-Rahim et al (2012) and Ajisafe & Akinlo, (2014) .Cost efficiency decreases with rise in market competition due to upsurge in monitoring costs and decline in length of customer relationship between borrower and bank. These results support our hypothesis 1 that there is significant association among market competition and Pakistani banks cost efficiency. These results are against the SCP hypothesis which states that market competition increases efficiency of firm.
The results in table 3 (model 1c) illustrate that the impact of market competition on technical efficiency is significantly positive at 5 percent significant level. These results are consistent with Ataullah etal, (2004) andHou etal, (2014). Strong market competition force banks to develop advance technical skills and experiences thus improve bank efficiencies. These result support our hypothesis 1 that there is significant connection among market competition and Pakistani banks technical efficiency. These results are in consistent with SCP hypothesis. Results in table 3 (model 1b) show that the impact of market competition on credit risk is significantly positive at 1% significant level. These results are consistent with Berger et al (2008) Arping (2017) Sarkar & Sensarma, (2016) and Beck (2008) who also found the positive and significant relationship between the two variables. This positive relation shows that in highly competitive market banks take more risk to earn profit that get decrease due to competition. These results support our hypothesis 3 that there is significant connection among market competition and credit risk.
The results of table 4 (model 2a) show that the impact of credit risk on bank profitability (ROA and ROE) is significantly negative at 1 percent significant level. These results are similar to the existing literature as proved by Rwayitare et al (2016) and Anchor et al, (2017). The negative relation is due to the fact that upsurge in non-performing loans increase banking sector cost and results in decline in banks profitability. These results support our hypothesis 5a that there is significant connection among credit risk and profitability. The results of table 4 (model 2b) exhibit that the impact of credit risk on cost efficiency is statistically significant and negative at 5 percent significant level. These results are consistent with Berger & DeYoung (1997) Sarmiento & Galánc, (2017) and Molyneux, et al (2010). Credit risk decreases the cost efficiency of banks due to increase in spending on monitoring bad loans. These results support our hypothesis 4a that credit risk significantly affects cost efficiency.
The results in table 4 (model 2b) shows that the impact of market competition on technical efficiency is significant and negative at 5 percent significant level. These results are consistent with Sufian (2009), Chen et al. (2013) & Berger et al. (2009) who also found negative and significant connection among credit risk and technical efficiency. Sufian (2009) found that bank having high ratio of nonperforming loans located far from the best practice frontier. These results support our hypothesis that credit risk is significantly related with efficiency. These results support our hypothesis 4a that credit risk significantly affects technical efficiency Credit risk mediates the relationship between market competition and ROA as shown in table 5 (model 3a) that when credit risk is used as a mediator the relationship between market competition and banks profitability become insignificant which shows the full mediation according to Baron &Kenny 1986 approach. These results support our hypothesis 5b that credit risk

mediates the relationship between market competition and banks profitability (ROA).
Credit risk does not mediate the relationship between market competition and ROE as shown in table 5 (model 4a) that when credit risk is used as a mediator the relationship between market competition and banks profitability remain significant which shows that credit risk does not mediate the relationship between market competition and profitability. Moreover, R square remain same that shows partial mediation is not possible in case of market competition and profitability according to Baron & Kenny 1986. These results reject our hypothesis 5b that credit risk mediates the association among market competition and banks profitability (ROE). Credit risk does not mediate the association among market competition and banks cost efficiency as shown in table 5 (model 4b) that when credit risk is used as a mediator the connection among market competition and Pakistani banks cost efficiency remain significant moreover R square also increased that shows partial mediation is not possible in case of market competition and cost efficiency according to Baron &Kenny 1986. These results reject our hypothesis 4b that credit risk mediates the association among market competition and Pakistani banks efficiency. Credit risk mediates the association among market competition and technical efficiency as shown in table 5 (model 4b) that when credit risk is used as a mediator the association among market competition and banks technical efficiency become insignificant which shows the full mediation according to Baron &Kenny 1986 approach. These results support our hypothesis 4b that credit risk mediates the relationship between market competition and banks efficiency (technical**).**

5. Conclusion, Limitations and Future Directions

This research is designed to check the relationship between competition, profitability and banking sector efficiency. This study also checked the mediating role of credit risk. Boone indicator is used for measuring banking competition while DEA technique is used to measure banking efficiency. Profitability and credit risk are measured using profitability and risk ratios respectively. By using the panel data for 2006-2016 the results of this study showed that the relationship between market competition and profitability is positive. These results shows that with market competition, profitability of commercial banks increase in Pakistan. The increase in profitability with competition is due increase in demand for banking product and services and banks use effective strategies to improve profitability. the influence of market competition on cost efficiency is statistically significant and negative and the impact of market competition on technical efficiency is statistically significant and progressive. This shows that in competitive market banks incurred monitoring cost but at the same time try to develop advance skills and techniques to improve performance. The association of market competition and credit risk is significant and positive. Which shows that in competitive market banks involve in taking risk at the same time due to increase in asymmetric information in competitive market credit risk increase. The outcomes also exhibited that credit risk is negatively related to banks profitability and efficiency.
The mediating role of credit risk in relationship between market competition and profitability and efficiency shows that credit risk fully mediates the connection among banking competition, ROA and technical efficiency but does not mediates the association among banking competition, ROE and cost efficiency. The result of this study will help regulatory authorities and policy makers in designing economic or financial policies in Pakistan. This research also suggests that in competitive market bank managers should also focus on managing cost of scarce resources along with improving skills and technology. This study has some limitations and also some potential future direction for future researchers. First, small sample is used for this study future researcher should study the same relationship by including large sample. Only one measure of market competition Boone indicator is used. Future researcher can use other measures of competition such as Lerner index and Herfindahl-Hirschman index along with Boone indicator for robust checking. Non-performing loan to total loan ratio is used to measure credit risk future researcher can use other ratios to measure credit risk. DEA approach is used for measuring efficiency. Future researcher can use other techniques such as SFA for measuring efficiency. Future researcher can also use different inputs and outs in efficiency measure techniques. Future researcher can also check market efficiency theory along with SCP theory in the context of Pakistan it may provide valuable information to the policy makers. To improve technical and cost efficiency managers of Pakistani banks should deal the inputs and outputs in operations of banks more properly. Pakistani banks should improve risk management practices, which will result an increase in bank efficiency and profitability.

References

Ab Rahim, R. (2016). Does competition foster efficiency? Empirical evidence from Malaysian commercial banks.

Asian Academy of Management Journal of Accounting and Finance, Vol 12(No 1), 1-23.

Abbas, M, Azid, T & Besar, M, H, (2016). Efficiency, effectiveness and performance profile of Islamic and conventional banks in Pakistan. *Humanomics*, Vol. 32 Issue: 1, pp.2-18,

Abid A. Burki& G. S. K. Niazi, (2010). Impact of financial reforms on efficiency of state-owned, private and foreign banks in Pakistan. *Applied Economics*, 42:24, 3147- 3160

Ab-Rahim, R., Md-Nor, N.G., Ramlee, S. and Ubaidillah, N.Z, (2012). Determinants of Cost Efficiency in Malaysian Banking. *International Journal of Business and Society*, Vol. 13 No. 3, 355 – 374

Acharya, v,V,Hasan,I&Saunders,A (2006). Should Banks Be Diversified? Evidence from Individual Bank Loan Portfolios. *The Journal of Business*, Vol. 79, No. 3 pp. 1355-1412.

Ajisafe, R. A. &Akinlo A. E., (2014). Competition and Efficiency of Commercial Banks: An Empirical Evidence from Nigeria. *American Journal of Economics*, Vol. 4 No. 1, 2014, pp. 18-22

Akinkunmi, M, (2017). Determinants of Banks' Profitability in Nigeria: Does Relative Market Power Matter? *Journal of Finance and Bank Management*, Vol. 5, No. 1, pp. 42-53

Alam, N., Hamid, B. A., & Tan, D. T. (2019). Does competition make banks riskier in dual banking system?. *Borsa Istanbul Review*, *19*, S34-S43.

Alves, A. B., Wanke, P., Antunes, J., & Chen, Z. (2020). Endogenous network efficiency, macroeconomy, and competition: Evidence from the Portuguese banking industry. *The North American Journal of Economics and Finance*, *52*, 101114.

Antunes, J., Hadi-Vencheh, A., Jamshidi, A., Tan, Y., & Wanke, P. (2024). Cost efficiency of Chinese banks: Evidence from DEA and MLP-SSRP analysis. *Expert Systems with Applications*, *237*, 121432.

Arping, S (2014): Does Competition make Banks more Risk-seeking? Tinbergen Institute Discussion Paper, No. 14-059/IV

Arping, S (2017). Deposit competition and loan markets. *Journal of Banking and Finance* 80 (2017) 108–118

Arrawatia, R, Misra, A & Dawar, V. (2015). Bank competition and efficiency: empirical evidence from Indian market. *International Journal of Law and Management*, Vol 57 (Issue: 3,), pp.217-231

Ataullah, A., Cockerill, T., & Le, H. (2004). Financial liberalization and bank efficiency: a comparative analysis of India and Pakistan. *Applied Economics*, *36*(17), 1915-1924.

Barua, R, Roy, M &Raychaudhuri, A (2017). , Structure, Conduct and Performance Analysis of Indian Commercial Banks .*South Asian Journal of Macroeconomics and Public Finance*. Volume: 5 issue: 2, page(s): 157-185 January 2, 2017

Beck, T. (2008) Bank competition and financial stability: Friends or foes? World Bank Policy Research Working Paper 4656, The World Bank, Development Research Group, Washington

Belkhaoui, S, Lakhal, L, Lakhal, F & Hellara, S (2014). Market structure, strategic choices and bank performance: a path model. *Managerial Finance*, Vol. 40 Issue: 6, pp.538-564

Berger, A & DeYoung R (1997). Problem loans and cost efficiency in commercial banks. *Journal of Banking & Finance*. 21 (1997) 849-870

Berger, A, Klapper, F & Ariss, R, (2009). Bank Competition and Financial Stability. *J Finance Serv Res*. 35:99–118

Bernini, C., &Brighi, P. (2018). Bank branches expansion, efficiency and local economic growth. *Regional Studies*, *52*(10), 1332-1345.

Carlson, M. A., Correia, S., & Luck, S. (2019). The effects of banking competition on growth and financial stability: Evidence from the national banking era. *Available at SSRN 3202489*.

Casu, B & Girardone, C (2006) Bank competition, concentration and efficiency in the single European market. *The Manchester School*. Vol 74 no. 4

Chen, Y, Wei, X, Zhang, L & Shi, Y, (2013). Diversification and the Banks' Return and Risk: Evidence from Chinese Listed Commercial Banks. *Procedia Computer Science* 18 (2013) 1737 – 1746.

El Moussawi, C., & Mansour, R. (2022). Competition, cost efficiency and stability of banks in the MENA region. *The Quarterly Review of Economics and Finance*, *84*, 143-170.

Fiordelisi, F, Ibanez, M, D & Molyneux, P (2010). Efficiency and risk in European banking, working paper series no 1211

Freixas, X &Ma, K (2015). Banking Competition and Stability: The Role of Leverage. Barcelona GSE Working Paper Series Working Paper no 78.

Garcia, M. T. M., & Guerreiro, J. P. S. M. (2016). Internal and External Determinants of Banks' Profitability: The

Portuguese Case. *Journal of Economic Studies*.

García-Herrero, A, Gavilá S & Santabárbara, D (2009). What explains the low profitability of Chinese banks? *Journal of Banking & Finance* 33 (2009) 2080–2092

Griffith, Rachel, Jan Boone, and Rupert Harrison. (2005). Measuring Competition. *Advanced Institute of Management Research* Paper No. 022, August (2005).

Haque, A., & Tariq, A. (2012). Efficiency of banks in Pakistan: A non parametric approach. *Business and Economic Research*, *2*(1).

Hou, X, Wang, Q & Zhang, Q, (2014). Market structure, risk taking, and the efficiency of Chinese commercial banks. *Emerging Markets Review* 20 (2014) 75–88

Hsieh, M and Lee, C, (2010). The Puzzle between Banking Competition and Profitability can be Solved: International Evidence from Bank-Level Data. *Journal of Financial Services Research*, 2010, vol. 38, issue 2, 135-157

Hu, T., & Xie, C. (2016). Competition, innovation, risk-taking, and profitability in the Chinese banking sector: An empirical analysis based on structural equation modeling. *Discrete Dynamics in Nature and Society*, *2016*.

Hussain, M., & Bashir, U. (2020). Risk-competition nexus: Evidence from Chinese banking industry. *Asia Pacific Management Review*, *25*(1), 23-37.

Kouki, A. Al-Nasser (2014). The implication of banking competition: Evidence from African countries. *Research in International Business and Finance*.

Kumankoma, S, E, Abor, J, Aboagye, Q, A & Amidu, M, (2017). Freedom, competition and bank efficiency in Sub-Saharan Africa. *International Journal of Law and Management*, Vol. 59 Issue: 6, pp.1359-1380

Louati, S, Louhichi, A& Boujelbene, Y, (2016). The risk-capital-efficiency trilogy: A comparative study between Islamic and conventional banks. *Managerial Finance*, Vol. 42 Issue: 12, pp.1226-1252.

Md. Noman, A, H, (2015). An Empirical Investigation of Profitability of Islamic banks in Bangladesh. *Global Journal of Management and Business Research: C Finance*. Volume 15 Issue 4 Version 1.0

Md. Noman, A, H, Pervin, S, Chowdhury, M, M &Banna, H (2015). The Effect of Credit Risk on the Banking Profitability: A Case on Bangladesh. *Global Journal of Management and Business Research: C Finance*. Volume 15 Issue 3 Version 1.0

Mendoza, R & Rivera, J, P (2017). The effect of credit risk and capital adequacy on the profitability of rural banks in the Philippines. *Scientific Annals of Economics and Business* 64 (1), 2017, 83-96

Menicucci E & Paolucci, G, (2016). The determinants of bank profitability: empirical evidence from European banking sector. *Journal of Financial Reporting and Accounting*, Vol. 14 Iss 1 pp.

Mensi, S & Zouari, A (2010). Efficient Structure versus Market Power: Theories and Empirical Evidence. *International Journal of Economics and Finance* Vol. 2, No

Mirzaei, A Moore, T &Liu, G (2013). Does market structure matter on banks' profitability and stability? Emerging vs. advanced economies. *Journal of Banking & Finance* 37 (2013) 2920–2937

Moyo, B. (2018). An analysis of competition, efficiency, and soundness in the South African banking sector. *South African Journal of Economic and Management Sciences*, 21(1), 1-14

Naceur, B, S & Omran, M (2011). The effects of bank regulations, competition, and financial reforms on banks' performance. *Emerging Markets Review* 12 (2011) 1–20

Pasiouras, F., & Kosmidou, K. (2007). Factors influencing the profitability of domestic and foreign commercial banks in the European Union. *Research in International Business and Finance*, 21(2), 222-237.

O'brien, R. M. (2007). A caution regarding rules of thumb for variance inflation factors. *Quality & quantity*, 41(5), 673-690.

Pasiourasa, F & Kosmidoua, K (2007). Factors influencing the profitability of domestic and foreign commercial banks in the European Union. *Research in International Business and Finance* 21 (2007) 222–237

Pruteanu-Podpiera, A., Weill, L., & Schobert, F. (2016). Banking Competition and Efficiency: A Micro-Data Analysis of the Czech Banking Industry. In Global Banking Crises and Emerging Markets (pp. 52-74). Palgrave Macmillan, London

Ramsey, J. (2001). The Resource Based Perspective, Rents, and Purchasing's Contribution to Sustainable Competitive Advantage. *Journal of Supply Chain Management*. 37(3), pages 38–47

Raza, S, A, Jawaid, S, T & Shafqat, J (2013). "Profitability of the Banking Sector of Pakistan: Panel Evidence from Bank-Specific, Industry-Specific and Macroeconomic Determinants," MPRA Paper 48485,

Řepková, I (2015). Banking efficiency determinants in the Czech banking sector. *Procedia Economics and*

Finance, 23, 191–196.

Rozzani, R & Rahman, A, R (2013). Determinants of Bank Efficiency: Conventional versus Islamic. *International Journal of Business and Management*. Vol. 8, No. 14; 2013

Rwayitare, B, J, Shukla, J & Ruhara, C, (2016). Credit risk and commercial bank profitability in Rwanda. *Int. J. Adv. Res*. 4(9), 294-325.2016.

Saeed & Zahid, (2016). The Impact of Credit Risk on Profitability of the Commercial Banks, *J Bus Fin Aff* , 5:2

Sahut, J Mili, M, Krir, M & Teulon, F (2015). Factors of Competitiveness of Islamic banks in the New Financial Order.2015working paper.

Salim, R, Arjomandi, A & Dakpo, K (2017) Banks' efficiency and credit risk analysis using by-production approach: the case of Iranian banks, *Applied Economics*, 49:30, 2974-2988

Sarkar, S & Sensarma, R. (2016). The relationship between competition and risk taking behavior of Indian banks. *Journal of Financial Economic Policy*, Vol. 8 Iss 1 pp

Sarmiento, M & Galan, J (2017). The influence of risk-taking on bank efficiency: Evidence from Colombia. *Emerging Markets Review*, 2017, vol. 32, issue C, 52-73

Schaeck, K. and Cihak, M. (2008), "How does competition affect efficiency and soundness in banking? New empirical evidence", ECB Working Papers Series, 932, September

Schaeck, Klaus, and Martin Cihak. (2010). Banking Competition and Capital Ratio. International Monetary Fund, IMF Working Paper WP/07/216

Simatele, M, Mishi, S and Ngonyama, N (2018). Structure and profitability in the banking sector. *Banks and Bank Systems*, 13 (1), 49-59

Soedarmono, W, Machrouh, F& Tarazi, A, (2013) Bank competition, crisis and risk taking: Evidence from emerging markets in Asia. *Journal of International Financial Markets, Institutions and Money*r, 2013, 23, pp.196 - 221.

Sufian F (2009). Determinants of bank efficiency during unstable macroeconomic environment: Empirical evidence from Malaysia. *Research in International Business and Finance* 23 (2009) 54–77

Sufian, F (2011). Profitability of the Korean banking sector: panel evidence on bank-specific and macroeconomic determinants. *J. Econ. Manage*. 7 (1), 43–72

Tan & Anchor, (2017). Does competition only impact on insolvency risk? New evidence from the Chinese banking industry. *International Journal of Managerial Finance*, Vol. 13 Issue: 3, pp.332-354

Tan, Y (2016). The impact of risk and competition on bank profitability in China. *Journal of International financial Markets, Institutions and Money* 40 pp 85_110.

Tan, Y, Floros, C & Anchor, J (2017). he profitability of Chinese banks: impacts of risk, competition and efficiency. *Review of Accounting and Finance*, Vol. 16 Issue: 1, pp.86-105

Tan, Y., & Floros, C. (2013). Risk, capital and efficiency in Chinese banking. *Journal of International Financial Markets, Institutions and Money*, *26*, 378-393.

Tan, Y., & Floros, C. (2018). Risk, competition and efficiency in banking: Evidence from China. *Global Finance Journal*, *35*, 223-236.

Triki, Thouraya& Kouki, Imen&Dhaou, Mouna Ben & Calice, Pietro, (2017). Bank regulation and efficiency: What works for Africa?, *Research in International Business and Finance*, vol. 39(PA), pages 183-205.

Tsionas, E. G., Malikov, E., & Kumbhakar, S. C. (2018). An internally consistent approach to the estimation of market power and cost efficiency with an application to US banking. *European Journal of Operational Research*, 270(2), 747-760

Yin, H. (2021). The impact of competition and bank market regulation on banks' cost efficiency. *Journal of Multinational Financial Management*, *61*, 100677.

Zhao, T., Casu, B. and Ferrari, A. (2009) Competition and risk taking incentives in the lending market: An application to Indian banking, Cass Business School, Centre for Banking Research, Working Paper Series, WP 02/09