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RESEARCH ARTICLE

Impact of capital adequacy, liquidity management and credit risk management on economic performance: Evidence from Pakistan

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Abstract

The main purpose of this study is to evaluate the relationship between capital adequacy, liquidity management, credit risk management, and financial performance with moderating role of bank ownership. This study used secondary data approach and collect 10 years panel data from 2012-2021 from the financial statements of the 15 Pakistani commercial banks. State software is used to analyze the data. Results show that there is a positive relationship between capital adequacy, liquidity management, credit risk management, and financial performance. But, on the other hand, there is not a strong moderating effect of bank ownership. The outcomes have been nearly the equal in all samples indicating that foreign ownership is not an important component of profitability in the quarter and as such a public coverage to encourage the presence of foreign banks might also, therefore, no longer yield any advantage in terms of financial institution profitability. This result is robust to the use of regulate- local measures whilst endogeneity concerns are controlled for. Furthermore, the findings imply that the stock liquidity issue of profits management is undoubtedly associated with future stock returns in Chinese corporations. Our outcomes reveal that the inventory liquidity thing of quick- termism in managerial choices performs a crucial role in figuring out destiny inventory returns.

Keywords: Capital Adequacy; Liquidity Management; Credit Risk Management; financial performance; Bank ownership; Pakistani Banks

Introduction

A bank's monetary value is a measure of capital adequacy, which is the amount of money a bank controls that is expressed as a percentage of its net assets (Abdul Karim et al., 2014). The Strategic Guidelines for Capital Adequacy set out three key factors that determine the adequacy of bank financing. These are; credit risks associated with exposure, market risk arising from banking activities and the form and quality of money held in support of this disclosure (Louati et al., 2015). Due to the strong influence of banks on the economy, plentiful pressure has been placed on the regulation and instruction of the banking sector (Okoye et al., 2017). The poor performance of the banking sector has created many problems, such as insufficient funds, high unemployment assets and so on, which have exacerbated the everyday stress in the banking sector and the collapse of other banks (Kosmidou et al., 2020). Bank adequacy plays a vital role in maintaining the security and stability of banking systems and the security of banking systems in general. It represents a protective gateway that prevents any unexpected losses that banks may incur, which may amount to bank deposits, given the banks' unpredictable performance (Chen et al., 2021).

Liquidity status is essential in reducing the expected or unexpected balance sheet movements and providing targeted growth resources (Huang & Ho, 2020). This type of risk is critical to meeting loan requests and having sufficient debt repayment that can be guaranteed when and at what amount in bank stability. Therefore, it covers a necessary type of risk in commercial banks. The ban on interest-based lending to banks has limited the ability of these banks to manage their financial positions as efficiently as regular banks. At the same time, the lack of sufficient Sharia-compliant tools such as secondary market debt instruments makes this type of risk critical for banks (Chen et al., 2021). In addition, banks are obliged to provide cash for liquidity if they need to invest only a tiny portion of the extensive portfolio of their accounts due to their flexible currency under the short-term sharia law (Vitkova et al., 2021). Credit risk management has become an integral part of the lending process in the banking business. Credit risk and potential cash flows or receivables from a failure of the

obligation to meet the terms of any contract with the bank (Ekinci & Poyraz, 2019). When banks offer loans, they expect customers to pay the principal and interest on the agreed date. The credit bureau is said to be effective if your principal and interest payment is timely in accordance with the agreed payment terms. NPLs represent bank loans that feel that it is possible to lose money due to NPLs. They are also classified as substandard, sceptical or lost. The bank debt in the lost category prevents the bank from achieving its intended objectives (Yuan et al., 2022).

The division of ownership and control reveals a potential conflict of interest between shareholders and executives who may have the opportunity to increase their wealth at the expense of shareholders. Therefore, business governance has emerged as a need to curb the opportunistic behaviour of senior management. The board of directors is regarded as the cornerstone of business governance; its role is to monitor and direct executives to act on behalf of shareholders (Habtoor, 2020; Ju & Zhao, 2009; Sadaa et al., 2020; ur Rehman et al., 2021). Among the characteristics of the board, the composition of the board is an indicator of the quality of the board as independent directors, directors, and non-executive directors, the dominant features of the board influencing its efficiency, as well as its robust performance (Ali et al., 2019).

Researchers have described capital adequacy, liquidity management, and credit risk management in many ways to embody environmental dimensions, dating with the society, ethical and voluntary dimensions, socio-economic factors, and relationships with numerous stakeholders (İncekara & Çetinkaya, 2019). There are various definitions of capital adequacies, liquidity management, and credit risk management. In essence, capital adequacies, liquidity management, and credit risk management may be considered as an extension of companies' efforts to ensure robust company governance using sound enterprise practices (Ekinci & Poyraz, 2019).

The objectives of the study are: (1) To investigate the impact of capital adequacy on the financial performance of Pakistani banks. (2) To investigate the impact of liquidity management on the financial performance of Pakistani banks. (3) To investigate the impact of credit risk management on the financial performance of Pakistani banks. (4) To investigate the impact of bank ownership on credit risk management and financial performance of Pakistani banks.

Literature Review

The following segment of the chapter formerly starts with the literature relevant to the study to realize the reasons that may impact financial performance. We discuss the variable used in the fundamental research.

Capital adequacy and financial performance

Capital adequacy, with the aid of definition, is visible as a quantum of the fund. Financial organizations must plan to maintain their enterprise's prudent behaviour (Sadaa et al., 2020). Bank's capital consequently relies upon some things along with the financial institution's length, the extent of credit in its operations, the market forces, the lending coverage, its control capabilities, and its portfolio (assets and coins) (Kabir Hassan et al., 2016). Capital adequacy also can see as a per cent ratio of a financial institution's primary capital to its (loan and investments), used as a degree of its economic power and balance (Ali et al., 2021; Ju & Zhao, 2009; Ongore & Kusa, 2013). Economic overall financial performance is an individual degree of how a firm uses assets from its primary mode of industry and makes sales (Kenneth, 2013). It's computing the result of a corporation's recommendations and procedure financial terms. A banking institution's financial performance is typically assessed by employing factor which includes income prepared within the year's route and the capacity to maintain it. The addition of subdivisions to the grass source, net earnings of the financial group, computerization of its numerous branches, internet income afterwards tariff proportion, the share of credit score rating in local loan.(Abdul Karim et al., 2014; Gupta & Kashiramka, 2020; Kosmidou et al., 2020; Munangi & Sibindi, 2020).

Control of capital includes all the picks that should be made if you want to ensure the superior quality of capital instruments. Banks, the various crucial establishments, provide liquidity to the markets (Bulgurcu, 2012). The top-quality degree of capital allotted by using the banks reconsiders the necessary controls imposed via regulators because banks are the maximum closely regulated industry, particularly concerning the capital adequacy requirement. Even though the capital adequacy requirement is ready as the minimum ratio to be accompanied by the banks, a bank can also optimally increase its capital ratios to offer a warranty that it's miles in a stable situation (Çam & Özer, 2022).

Tons of empirical studies focus on the effect of debt on a firm's profitability as a measure of financial performance.

Typically, most previous research concluded that firm profitability and capital structure have a negative relationship. Chebbi et al. (2021) compared the capital and ownership structure of manufacturing concerns in Japan and found that there is a negative effect of capital structure on profitability. Kenneth (2013) for the US companies reported the same results (Mizgier et al., 2015) in the G7 members, the evolving countries and China. In their study on Kenyan firms, Lin et al. (2005) showed a significantly negative effect of leverage on return on asset (ROA). More recently, the paper of Muiruri et al. (2015) points out the negative effect of capital structure by using return on assets (ROA), return on equity (ROE) and Tobin's Q as indicators for financial performance in Vietnamese firms. Goel et al. (2015) examined the relation between capital structure and firm performance of SMEs in UK, on manufacturing sector over the period from 1998 to

2008 and concluded that ROA and ROE of these firms are affected negatively by leverage.

In contrast, many other studies and articles show a positive correlation between firm performance and capital structure.

For example, ur Rehman et al. (2021) proposed the same pattern in changes in debt and profitability -in which companies that might have a large proportion of debt in capital funding are also highly profitable firms. Vitkova et al. (2021); Yuan et al. (2022) examine US manufacturing corporations and show that all liabilities (current and long-term) have a positive effect on return on equity (ROE).

H1: Capital adequacy positively impacts the financial performance of the banks

Liquidity management and financial performance

Capital controls have been planned to measure economic strategy to restrict market instability. As an illustration, Weber et al. (2010) suggested the practice of an identical worldwide tax on forex dealings. These measures were not explicitly unusual until the 80s (Umoru & Osemwegie, 2016). But, due to the non-stop effort through establishments and the IMF for extra-liberalized emerging markets, the use of capital controls decreased until the Asian disaster (Milcheva et al., 2019). Consequently, despite the talk about the usefulness of capital controls (Okoye et al., 2017), there is a bent on using these measures as a last answer during a financial crisis from a macroeconomic perspective (Ho & Hsu, 2010). For instance, throughout the Asian disaster, Malaysia used capital controls to decrease the results of the catastrophe (Huang & Ho, 2020). Corporations face coins liquidity troubles, which cause problems in manufacturing due to restricted entry to imported raw materials and troubles because of the high debts receivable. Apart from these first-order effects on companies, a difficulty with capital flows additionally influences the inventory market due to reduced market liquidity. As sulieman Alshatti (2015) argues, marketplace liquidity increases after the liberalization of markets and given that liquidity is an indicator of a long-run GDP boom (Lin et al., 2005) it can be asserted that the terrible impact of capital controls on market liquidity have actually to have a terrible impact at the actual economic system.

Our studies consider the impact of stock liquidity on income control, an effect that has been the difficulty of lots of discussion and debate. One view is that liquidity induces managers to interact in short-termism conduct and increases the hazard of a hostile takeover. Liquidity will increase this danger by reducing the transaction costs related to entering and exiting a role. Managers prevent transient inventory undervaluation because undervaluation complements the probability of an adverse takeover (Huang & Ho, 2020). Liquidity can also purpose an accelerated cognizance on quick-time period overall performance as it attracts transient investors. Shares are much less expensive to sell. Higher liquidity is related to greater use of equity repayment because higher inventory liquidity impounds non-public facts. This applies to performance measurement functions (Chen et al., 2021). Because higher liquidity can grow equity-based total compensation in addition to the profitability of personal trades, it could incentivize managers to enhance their corporations' short-term overall performance (İncekara & Çetinkaya, 2019). Some other view is that higher liquidity can weaken managers' recognition of brief-term performance by using magnifying shareholder tracking. Ample liquidity ends in extra first-rate direct supervision by using shareholders as it lets investors purchase larger blocks of shares at more favourable expenses (Vitkova et al., 2021). Liquidity can also lead to greater excellent oblique monitoring via growing the threat of investor exits because of the lower transaction prices that result from higher liquidity boom traders willing to sell if managerial opportunism is detected (Goel et al., 2015; Heuver & Berndsen, 2022).

H2: Liquidity management positively impacts the financial performance of the banks

Credit risk management and financial performance

CR and financial success of banks Credit against profits is a topic that is frequently discussed in financial books. However, some studies find a positive correlation between CRM and FP of commercial banks, while others find mixed relationships. Previous research shows 11 inconsistent conclusions. Therefore, it is vital to understand the impact of CRM on various performance indicators when banks make decisions about total profitability and risk reduction. Mizgier et al. (2015) conducted a study in Bangladesh "on the impact of credit risk management on the financial performance of Bangladesh commercial banks." Using data from ten banks took seventeen years (2002 to 2018). Researchers have extracted the second data from the bank's annual reports and analyzed it using aggregation, t-tests to find meaningful comparisons, and multiple retrospectives analyses (Chen et al., 2021). Return on assets (ROA) was used to assess financial performance, while capital adequacy ratio (CAR), nonperforming loans (npls), and advance deposit ratio (ADR) were used to determine credit risk." Although NPL and ADR have a negative and evident influence on ROA, NPL has a significantly higher impact on ROA than ADR.

Furthermore, the study indicated that "CAR has a good effect on ROA but is not statistically significant." IT -tests reveal that private commercial banks' ROA, ADR, and CAR were considerably more significant than those of state-owned commercial banks. "According to the study. "the non-performing interest rate (NPL) for private commercial banks is much lower than for state-owned commercial banks." The study proposes a CRM guideline to promote

sustainable profit and growth (Heuver & Berndsen, 2022; Kenneth, 2013; Kosmidou et al., 2020).

Lin et al. (2005)have considered the effect of RM on the FP of financial institutions. The sample contains ten banks and data for seven years from 2000 to 2006. The limitations used for CAR were automatic estimates, bad credit costs, and costs per loan asset, while ROA estimates profits. In addition, a sulieman Alshatti (2015) study conducted in Ethiopia on the effect of CAR on the financial performance of profitable banks, Ali et al. (2019), is directed in Egypt. The researchers found an affirmative connection between Financial Performance and CAR for commercial banks. In addition, a few studies have shown the importance of capital investment in the banking sector. According to a survey by Chebbi et al. (2021), large-scale financial satisfaction is paramount to l banks. He also said profitable banks have a lawful obligation to keep adequate funds. An organization needs to take multiple decisions in the lifetime of the business, and the most basic ones are related to money. These money-related decisions are termed 'Financing Decisions'. The three essential decisions that financial heads need to take are dividends, which are the distribution of profit earned by the organization. The manager's primary concern is whether to retain profit or distribute dividends to shareholders. In his study, the theory used by (Lee et al., 2022) demonstrates that rewards are irrelevant to firm performance. Firms paying large dividends reduce their risk and influence the stock; tips are considered a roadmap for future earnings or profit (Bulgurcu, 2012). Many kinds of research have been conducted to investigate the dividend policy, but the studies are ambiguous on the issue of corporate dividend policy. However, these policies provide strength and are a sign of prosperity for the development of an organization (Çam & Özer, 2022). This research gives emphasis on the dividend and firm performance relationship.

H3: Credit risk management positively impacts the financial performance of the banks

Bank ownership as a moderator

Agency theory indicates that managers' voting rights can grow tracking efficiency while minimizing business agency problems (Sadaa et al., 2020). Preceding research has also stated that control investors generally tend to boost corporation earnings, an excellent way to acquire blessings. Control investors have extra capacity to display a agency's overall performance and align their interests with other shareholders (ur Rehman et al., 2021). Auditors can also extensively lessen the chances of coping with income whilst there is a disproportionate percentage of managerial possession (Habtoor, 2020). A preceding observation noted that administrative control is essential in lowering discretionary blessings and enhancing EQ (Muiruri et al., 2015). A survey by Sadaa et al. (2020) used every day. It popularized least squares to look at the relationship between managerial ownership and discretionary practices of managers of 63 groups in Jordan in 2014. The outcomes confirmed that control investments significantly improved the first-rate economic reports. Ur Rehman et al. (2021) advised that centred ownership can reduce agency charges by employing growing to track and reducing opportunistic managerial conduct. Consistent with the manage hypothesis, ownership con- centration limits earnings control and improves overall financial performance (Ongore & Kusa, 2013). The examine observed that managing actual income decreases with dominant ownership. But, the organizations with focused possession are a concerned with conflicts of interest between fundamental and minor shareholders and sometimes dispossession of smaller percentage- holders (Ali et al., 2021). Consistent with the expropriation hypothesis, dominant shareholders can also impose their non-public alternatives even supposing they're opposite to minority rights. In step with previous studies (Ali et al., 2019; Ekinci & Poyraz, 2019; Gupta & Kashiramka, 2020), awareness of ownership may lead to inconsistency of records amongst investors, basically in growing international locations where company governance, regulatory laws, and safety of minority shareholder rights are susceptible. In this example, there can be incentives for most important shareholders to make the most these attitudes to achieve their goals and interact in manipulating profits. The evidence of the effect for ownership attention on income control turned into combined.

H4: Bank ownership moderates the role of capital adequacies, liquidity management, credit risk management and financial performance.

Research Methods

Data and Sample Description

Statistics of this study are acquired from the reviewed yearly reports and all instance banks from 2012 to 2021. Data is collected within Pakistan. Data is collected from 15 banks which are existed in Punjab, Pakistan.

Sample Size

The data for this education will come from audited yearly reports and Fitch attached for all sets sampled between 2012 and 2021. The study examined only fifteen commercial banks. Certain banks were omitted from the analysis due to a lack of critical information. The fifteen selected commercial banks in Pakistan represent the country's total number of banks in 2021; however, while there are twenty commercial banks in 2021, the number of banks varies by year due to acquisitions and mergers. The study's commercial banks are based on 2017 data due to the difficulty in obtaining data on which banks have already merged. The twenty chosen banks include twenty publicly

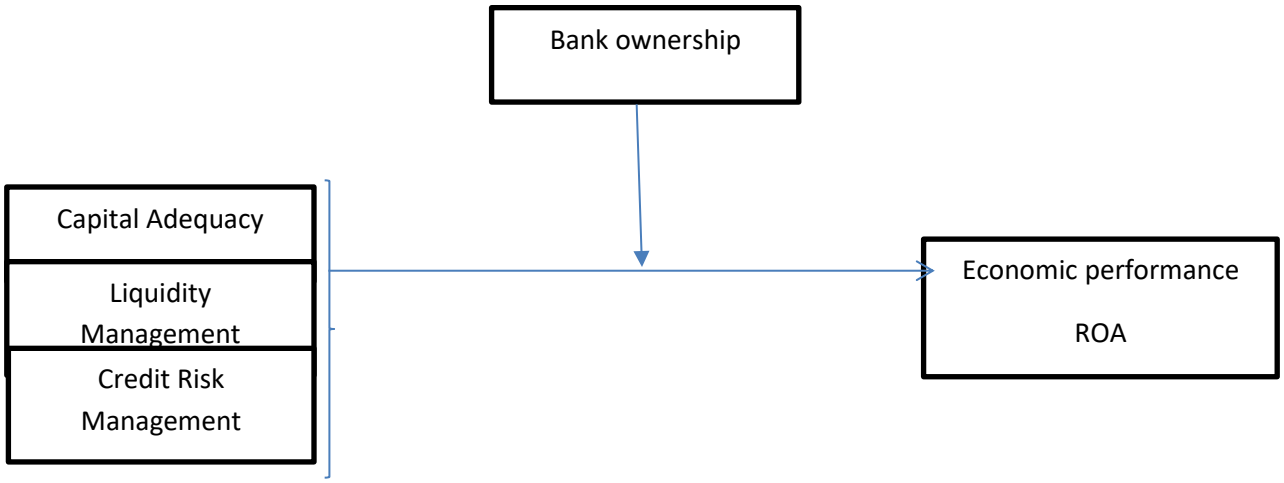

Fig1. Conceptual framework

traded banks on the PSX. Fifteen banks were selected for data collection using the procedure outlined above. The sample post is more appropriate for individuals who own twenty openly imported banks on the Pakistan Typical Exchange. The panel data study is used to ascertain the investigation's purpose. Milcheva et al. (2019) identify panel data that can account for heterogeneity in data, low-density line polymorphism, and track trends that time-bound data may not provide. To achieve the desired results in this study, a multidisciplinary approach was used. The financial statements of banks are analyzed using descriptive statistics, a standardization matrix, and retrospective models.

Measurement of the variables

Capital adequacy

This observation consists of one (1) unbiased variable: Capital adequacy. Capital adequacy became similarly decomposed into three components: Liquid Asset Ratio, loan Ratio, and Asset Turnover Ratio. Following ratios and formulas are adapted from (Ekinci & Poyraz, 2019; İncekara & Çetinkaya, 2019). It is determined as the relation of capital to a bank's risk-weighted assets, a measure of a set's money as a fraction of its credit-weighted exposure. It is the minimum capital ratio that a bank must maintain in accordance with regulatory standards. Maintaining a fixed interest rate is required to assess banks' ability to absorb losses and ensure that banks continue to incur acceptable failures in the worst-case scenario (Huang & Ho, 2020). Banks with a high-interest rate calculation rate are generally regarded as low risk and more likely to fulfil their financial responsibilities The higher the ratio, the greater the number of depositors. Are protected and the financial system is stable. Due to the fact that banks with sufficient capital can absorb possible losses and so avoid bankruptcy, this can be viewed as an increase in profitability. Most studies, however, recommend that CAR be stored in banks to avoid potential losses. As a result, a favourable correlation between capital sufficiency and profitability is anticipated. The CAR equation is calculated as follows.

3.1.1 Liquid Asset Ratio

This ratio is calculated through:

$$CAR = \frac{Capital}{Risk\ Weighted\ Assets}$$

3.1.2 Loan Ratios

Provisions for credit losses enable banks to recognize the estimated loss on an individual loan portfolio or portfolios in their income statements as events unfold, and loans are cancelled, even before the actual loss can be calculated with clarity and certainty. In other words, when banks anticipate future loan portfolio losses during recessions, loan loss reserves should result in a direct charge against earnings over the business cycle's ups and downs. Banks can utilize these reserves when expected credit losses occur, absorbing losses without endangering precious capital and allowing banks to continue growing the credit supply of the economy. Ideally, loan loss provisions should reflect the bank's management's assessment of the quality of the loan portfolio it holds, implying that they should be able to cover the full range of expected credit losses if necessary (Duggan, 2009). On the other hand, accounting frameworks permit the creation of a provision for losses that have already occurred at the financial statement's date of publication, which does not adequately address the concept of "expected losses" (Lee, 2009).

Loan ratios are examined by using the following formula:

$$LLP = \frac{(Pretax\ Income + Loan\ Loss\ Provision}{Net\ Charge - offs}$$

Liquidity Management

There are three main ratios to calculate the liquidity of the firms that are; current ratio, quick ratio, and cash ratio. To calculate the values of these ratios, we employed the following formulas. Ratios formulas are adapted from (Ali et al., 2019; Chebbi et al., 2021).
Liquidity in banks refers to their ability to manage sufficient funds in a short period, either by increasing their liability or by converting their assets to cash at a reasonable cost (İncekara & Çetinkaya, 2019). It refers to a bank's ability to finance all short-term liabilities as they mature. Loans, withdrawals from deposits, investment obligations, and debts accrual are all short-term obligations (Vitkova et al., 2021). It is quantified the ratio of recognition facilities to whole deposits (Goel et al., 2015). LR is the risk that a bank will suffer a loss due to its incapability to encounter its financing needs (Heuver & Berndsen, 2022). A high liquidity ratio indicates that the bank has significant liquid assets that can be invested in other profitable ventures.
The current ratio is calculated by using the following formula,

$$current\ ratio = \frac{current\ assets}{current\ liabilites}$$

Credit risk management

This section consists of NPLs; it includes bad debts and doubtful debts. Credit risk management is calculated by using (Muiruri et al., 2015; ur Rehman et al., 2021)

Bad debts

Debt is a substance, usually, money, borrowed from one party. Many organizations and individuals use debt to purchase large items that they could not control under normal circumstances. Debt settlement provides the borrower's share of the borrower's debt under the condition of repayment later, usually with interest.
This ratio is calculated as;

$$Debt = (Short - Term\ Debt + Long - Term\ Debt) - (Cash + Cash\ Equivalents)$$

Doubtful debts

Suspicious debt refers to debt that is impossible for a company or individual to recover. Thus, it avoids over-stating the company's assets as trade debtors report net of Doubtful debt. When there is no certainty that a debt is not collectable, the debt becomes bad.

This ratio is calculated as follows;

$$\frac{Total\ Amount\ Receivable}{Bad\ Debt} * 100$$

Bank ownership

Bank ownership is calculated through a dummy variable (Ju & Zhao, 2009).

Financial performance

In summary, the state's financial system plays a critical role in the CRM of banks and their management. Effective CRM helps banks avoid severe failures and improves their financial performance. Profitability compensates stockholders for their investment. This will boost economic development and investment. In turn, lousy banking performance can result in bank failures and crises, which can affect economic growth. Adeusi et al. (2014) examined the relationship between risk management techniques and bank financial performance using secondary data from ten Nigerian banks' annual reports and financial statements from 2006 to 2009. Their research is based on cross-sectional units observed across time. The authors employed as independent variables the cost of bad loans, delinquent loans, liquidity, the equity-to-total-assets ratio, the loan-to-equity ratio, and the debt-to-equity ratio. While (ROA) and (ROE) are employed as dependent variables (ROE). The study's findings indicate an inverse relationship between banks' financial success and the cost of non-performing and bad loans. However, there is a positive and strong correlation between the capital-to-assets ratio and bank financial success. The authors concluded that a strong correlation exists between banking performance and risk management. The authors recommend that banks improve their management of recognized credit risk indicators such as the cost of bad and problematic loans, debt-to-equity ratio, and funds under management. ROA and ROE are the bank's financial performance indicators. The findings of this study indicate that NPLs/total loans have a favourable effect on banks' financial performance.
ROA is a relation of net income to complete resources that indicates the amount of profit produced on each dollar of assets. It represents the management's ability to profitably invest the bank's existing investment resources (Ongore & Kusa, 2013). It is calculated by using the following formula;

$$ROA = \frac{Net\ Income}{Total\ Assets}$$

Econometric Models for data analysis

According to different studies Ali et al. (2019); Murdock (2017); and Sadaa et al. (2020), We will use the following models for data analysis of the study:

$ROA_{it} = \alpha_i + \beta_1 CA_{it} + \beta_2 LM_{it} + \beta_3 CRM_{it} + \varepsilon_{it}$ ------- (1)

Where,

ROA= to measure the financial performance of the bank

α = Intercept

CA= Capital adequacy of financial institutions

LM= Liquidity management of banks

CRM= Credit management ratios to calculate the loan payment of banks

β_s= coefficients of independent variables

It= i denotes bank and t denotes time

ε= error term

The second econometric model is used to analyze the moderation impact of the bank ownership:

$ROA_{it} = \alpha_i + \beta_1 CA_{it} * BO + \beta_2 LM_{it} * BO + \beta_3 CRM_{it} * BO + \varepsilon_{it}$ ------- (2)

Where all variables are the same that are also used in model 1, here, BO denotes bank ownership that is an extended model with multiplying independent variables.

Data Analysis

Secondary information for all the variable quantity involved in the learning were acquired for the 15 commercial banks from 2012 to 2021 due to the technique discussion and data description published in chapter 3. To determine the nature of the dataset, the unit root tests and descriptive statistics were used initially. Descriptive analysis and correlation regression multicollinearity analysis were also used to assess many hypotheses specified for this study. The following sections detail the results of the different tests

Table 1: Multicollinearity Test

Variable	VIF	1/VIF
CAR	1.21	0.862192
Doubtfulness	1.16	0.862192
CR	1.05	0.798524
LAR	1.08	0.973814
ROA	1.07	0.982063
LLP	1.09	0.994149
Baddebts	1.35	0.997166
Mean VIF	1.15	

Additionally, the Table demonstrates that neither model exhibits multicollinearity, as the adjustment rise issue (VIF) is all fewer than 10. Further, the outcomes indicate that the ROA typical is not heteroscedasticity and holds no omitted variables.

Table 2: Descriptive stats by using Stata

Variable	Obs.	Mean	Std. Dev.	Min	Max
ROA	150	-9.218554	254.8621	-1662.146	447.0417
CAR	150	10.00747	41.95595	-0.0788941	208.9303
LAR	150	0.7413204	2.230364	-4.094878	13.74655
LLP	150	162.7603	1210.632	-8264.321	6950.359
Bad debts	150	-221000000	235000000	-28700000000	152000000
Doubtfulness	150	60800000	643000000	-5543730	780000000
CR	150	117.9001	867.5907	-0.1887444	10161.71

The standard deviation column indicates how different the variance is in the definition. ROE and LR have slightly different variations, while ROA, CAR, and LLP have standard deviations. They developed the standard deviation; they formed the inconsistency of the variable. CAR is also an exploratory variable because it measures the financial capacity of the bank from the point of view of the regulator. It contains the financial capital considered reliable and liquid, especially the shareholders' equity. Banks with a reasonable rate of good interest rates have a good return. With suitable financial needs, local banks can get loans that do not go well. It arises when obligations meet the payment of disbursement or banks wish to take advantage of potential investment opportunities to finance existing debt. CR is the chance that loan payments may not be made on time or that the principal may not be developing on their own.

Percentage of NPLs measures the CR of TL (total loan) (Muiruri et al., 2015). ROA was used in earlier research (Mangena et al., 2020). It shows the effectiveness of management in operating the funds distributed by shareholders of a rural bank. The provision for the loss of a loan is the expense provided to allow for unpaid loans and loan repayments. Banks are expected to respond to credit crunch and costs to ensure they provide accurate assessments for the rest of their financial lives. Banks' sets mention to pay off bad debts - those that can be repaid in full because the customer makes a mistake or those that offer low-interest rates because the borrower negotiates at a lower rate.

Table 3: Correlation Analysis by using Stata

	ROA	Bad debts	CAR	CR	Doubtf~s	LAR	LLP
ROA	1						
Bad debts	-0.0071	1					
CAR	0.0093	0.016	1				
CR	0.0052	-0.005	0.1323	1			
Doubtfulness	0.0036	0.0062	0.3693	0.024	1		
LAR	0.1581	-0.0476	-0.0741	0.1898	-0.0294	1	
LLP	-0.0483	0.0016	-0.0326	-0.0197	-0.0126	0.1089	1

*P<0.01, **P<0.05 ***P<0.1

Table 4: Regression Analysis by using ROA as financial performance indicator

ROA	Coef.	Std. Err.	T	P>t	[95% Conf.	Interval]
Bad debts	0.00	0.00	0.01	0.993	0.00	0.00
CAR	0.15	0.55	0.27	0.787	-0.93	1.23
CR	-0.01	0.02	-0.38	0.705	-0.06	0.04
Doubtful debts	0.00	0.00	0.00	0.997	0.00	0.00
LAR	19.81	9.70	2.04	0.043	0.63	38.99
LLP	-0.01	0.02	-0.81	0.42	-0.05	0.02
_cons	-21.95	22.92	-0.96	0.34	-67.25	23.36

Table 5: Moderation effect (Bank ownership used as dummy variable Domestic=1 and Foreign=0)

ROA	Coef.	Std. Err.	T	P>t	[95% Conf.	Interval]
CAR	0.15	0.55	0.27	0.79	-0.93	1.23
1.domestic	0.00	0.03				
Domestic#c.CAR	1					
Foreign	0.00	0.04				
LAR	19.81	9.70	2.04	0.04	0.63	38.99
Domestic#c.LAR	1					
Foreign	0.00	0.13				
LLP	-0.01	0.02	-0.81	0.42	-0.05	0.02
Domestic#c.LLP	1					
Foreign	0.00	0.07				
CR	-0.01	0.02	-0.38	0.71	-0.06	0.04
Domestic#c.CR	1					
Foreign	0.00	0.23				
Baddebts	0.00	0.00	0.01	0.99	0.00	0.00
Domestic#c.baddebts	1					
Foreign	0.00	0.06				
Doubtfuldebts	0.00	0.00	0.00	1.00	0.00	0.00
Domestic#c.Doubtfuldebts	1					
Foreign	0.00	0.53				

_cons	-21.95	22.92	-0.96	0.34	-67.25	23.36

According to Table 3, there is a positive and significant relationship between firm performance and credit risk management at the 5% significance level. On the other hand, liquidity management has a positive connection with firm performance but a negative relationship with bad debts.

It is an indication that the company is profitable compared to the number of its assets. Return on assets (ROA) allows managers, investors or analysts to understand how a company's management uses its assets to create income.

According to table 4, bank ownership is used as a dummy variable by checking moderating impact. The dummy variable is donated with "Domestic=1, and foreign=0. According to the data analysis, domestic ownership existed in the results. The outcomes have been nearly equal in all samples, indicating that foreign ownership is not an essential component of profitability in the quarter. As such, a public coverage to encourage the presence of foreign banks might also, therefore, no longer yield any advantage in terms of financial institution profitability. This locating is diametrically in opposition to the argument that overseas banks bring with them higher understanding and technical ability, which then spills over to the relaxation of the banking machine and, consequently, improves profitability (Muiruri et al., 2015).

The benefit of the Heckman model is too accurate the endogenous issues resulting from self-selection and pattern choice bias. The version is usually divided into two degrees: the first stage is the probit model, which is used to estimate the probability of the incidence of selective bias variables and obtain the inverse mills ratio. The second stage is to regress the inverse mills ratio together with other variables to accurate the endogenous hassle due to choice bias. Consequently, it's far reasonable to undertake this model here. In this paper, the structured variable inside the first stage is the dummy variable, bank ownership.

Table 6: Heckman selection model -- two-step estimates

	Coef.	**Std. Err.**	**Z**	**P>z**	**[95% Conf.**	**Interval]**
ROA						
CAR	-0.08	1.63	-0.05	0.96	-3.28	3.12
LAR	14.40	29.07	0.50	0.62	-42.58	71.37
LLP	-0.02	0.05	-0.33	0.74	-0.12	0.08
Baddebts	0.00	0.00	0.05	0.96	0.00	0.00
Doubtfuldebts	0.00	0.00	-0.01	1.00	0.00	0.00
CR	-0.01	0.07	-0.15	0.88	-0.16	0.13
_cons	21.91	70.58	0.31	0.76	-116.43	160.25
CAR	21.04	6.50	3.24	0.00	8.30	33.78
LAR	2.12	1.36	1.56	0.12	-0.55	4.79
LLP	0.00	0.00	-1.55	0.12	0.00	0.00
Baddebts	0.00	0.00	-1.66	0.10	0.00	0.00
Doubtfuldebts	0.00	0.00	0.66	0.51	0.00	0.00
CR	11.54	12.02	0.96	0.34	-12.02	35.10
Mills						
Lambda	-765.23	175.91	-4.35	0.00	-1110.01	-420.45
Rho	-1.00					
Sigma	765.23					

Conclusion & Recommendations

Chapter 1 introduced and discussed the study's significance and purpose. As stated previously, the study's secondary objective is to determine the effect of CRM on the profitability of Pakistan's profitable banks. Chapter 2 summarized the many studies conducted in established and developing countries. Appropriate variables for analysis were chosen based on the review. Following that, each variable was defined, and the rationale for its selection was presented. Additionally, the control method and predictable symbol were deliberated. However, two new IVs were included in the final models that had not been included in previous studies. ROA and ROE were chosen as dependent variables indicating commercial bank profitability because they stood as the most frequently used variable star in the

literature. Credit risk management variables include CAR, LR, LLP, NPLR, CAR, bad debt, and full dough dept. Correlation regression and other tests were used to analyses data from all two hundred commercial banks in Pakistan from 2011 to the present. "What is the link between credit risk management and commercial bank profitability between 2011 and 2019?" was the second research question. The solution is based on the findings of several scientific investigations. According to the statistics, credit risk management and commercial bank financial performance appear to be connected; according to the statistics—the study attention to the issues that move the of profitable banks. According to the data, the capital adequacy ratio (CAR) appears to have a favorable and statistically significant impact on commercial bank profitability. The outcome agrees with forecasts and Gupta & Kashiramka (2020).

Furthermore, the bulk of the other research yielded mixed results and failed to demonstrate a connection between CAR and set profitability. This research, by contrast, avoids financial loss for the banks. Bank size (BS) positively and significantly affects commercial banks' financial performance. This finding is consistent with expectations and Huang & Ho (2020) findings but conflicts with (Ni et al., 2022). This finding supports the hypothesis that large commercial banks can earn a higher profit. The exposure ratio (CR) has been shown to have a significant positive link with the profitability of a commercial bank. The finding supports the theory. CR is one of two brand-new variables in this study since it has never been used. The evidence supports that commercial banks with a higher coverage ratio have a higher-quality loan portfolio with higher interest revenue, resulting in improved bank profitability. NPLR also has a statistically significant negative impact on commercial bank financial performance, according to the study (Teirlinck, 2017). This demonstrates that commercial banks have an efficient credit assessment process. The findings indicate that NPLs reduce loan payments in commercial banks, resulting in decreased income and available capital for investment, thereby reducing bank profitability. The leverage ratio (LR) has an undesirable and statistically significant effect on the financial performance of profitable banks. The conclusion is consistent with that of (Danso et al., 2019). The result, however, is inconsistent with the hypothesis that FBM has a helpful association with bank effectiveness. This variable was novel in this research because it had never been used.

Nonetheless, the study rejects the hypothesis that women in senior positions in Nepal's commercial banks improve bank performance. In summary, the study's findings indicate that Nepal's commercial banks practice sound credit risk management, as evidenced by the study's significant results for CAR, LLP, CR, and NPLR. The overall result indicated that credit risk management is an important predictor of bank financial performance, implying that a bank's profitability is contingent on risk management.

Recommendations

As the study's findings indicate, risk organization has a sizable impact on bank presentation. It is recommended that banks place a greater emphasis on RM. Generally, banks should maintain an optimal equal of CAR (or as required by regulation) to ensure that they can meet their financial obligations, protect their depositors' investments, and thus contribute to the financial system's stability. Banks must comprehend that their size also influences their presentation. More outstanding banks typically earn developed profits because they can differentiate their products and expand their risk in less modest markets. Additionally, the study mentions that banks switch and display NPLs, and seek to maintain them as low as possible by putting a more significant emphasis on the capacity to repay before issuing credit. This strategy will help banks achieve better results. Furthermore, banks must priorities coverage ratio, which means they must actively monitor all factors impacting loan interest income, such as interest rate fluctuations, loan quality, and resources and liabilities, as they disturb the bank. Additionally, banks should avoid excessive debt financing, as increased financial leverage results in increased liabilities, which negatively affects FP. Additionally, the set is optional to maintain a balance of capital between shareholder equity and debt when financing its operations. Although the study discovered no relationship between CRR and bank performance, this does not negate the importance of these variables. These variables must be taken into account when banks manage risk.

NPLs have a detrimental effect on the financial performance of the commercial banks chosen for this study. That is why this study advises bank managers to attempt to reduce NPLs to minimize credit risk and maximize profit. The manager must exercise extreme caution when disbursing loans. Additionally, the capital adequacy ratio has a negative relationship with the bank's profitability. Thus, it is prudent for a bank to maintain an optimal level of core and statutory capital to enhance financial performance and ensure its ability to fund its liabilities when required. The loan-to-deposit ratio has a beneficial effect on financial performance. This means that banks are generating revenue from their assets, and the investment that commercial banks deliver to customers is increasing at the same rate as deposit growth. This demonstrates that banks are reinvesting their assets in the market through loans or other forms of investment. There are numerous additional recommendations for the bank to mitigate credit risk, including the following: It should include the terms and conditions that borrowers must adhere to qualify for loans. Lending to CIB-registered businesses or known defaulters properly insured the security assets pledged. Banks should refrain from granting credit where their security position is weaker than any other financial institution.

Conclusion

Credit risk refers to the circumstance in which an investment's actual return falls short of its expected return. Credit risk exists for the lender when a borrower, counterparty, or debtor fails to meet their contractual obligations. Credit risk management is a multifaceted task that can be approached in several ways. Bangladesh's banking system is afflicted by financial crime. Banks continue to struggle with a significant volume of NPLs.

Risk management that is properly implemented can provide a significant advantage to the bank. It is critical to understand the influence of credit risk on various types of performance indicators. The researchers extracted secondary data from the bank's yearly reports and analyzed it using correlation, t-test for mean comparison, and multiple regression analysis. The return on assets, dispute resolution, and interest rate control of private commercial banks are much higher than that of state-owned commercial banks. NPL has a statistically significant effect on ROA.

Data were gathered from minor sources, specifically the annual reports of chosen sets from 2000 to 2015. NPLs include substandard, doubtful, and virtual loss and loss. If the borrower resumes payments on a non-performing loan, the loan becomes performing, even if the borrower has not repaid the entire amount owed. This study advises bank managers to attempt to use NPLs to minimize credit risk.

Managerial Implications

One implication of our findings is that popular-setters must enforce rules that cap the number of outside board seats that board administrators of listed corporations can maintain so one can shield firms' economic choices and shareholders' pursuits. Further, the observes findings advocate that corporations may pick out busy directors inappropriately for monetary decisions throughout life cycle stages in their company. Hence, regulators must keep in mind the dynamics of the corporate existence cycle to improve corporate governance systems in corporations. Destiny research should discover empirically whether or not and how demographic traits of busy administrators at exceptional tiers of the life cycle influence companies' market-threat disclosures, investment performance and accounting conservatism, among different factors. This can provide precious insights into strengthening corporate governance internationally.

This look does have a few obstacles. Because our sample is based on publicly listed corporations, our pattern may also have an availability bias. Further, the observation is region particular; hence, the findings might not be generalizable to other countries with specific cultural mores, backgrounds, and company-governance environments. Destiny studies may also yield notable results and offer coverage implications similarly. Moreover, because indexed financial companies have been excluded from our examination, destiny research ought to obtain new insights into those firms.

Limitations of the Study

As we all know, the world is currently battling coronavirus. Because it is a contagious disease, everyone is advised to maintain a social distance. As an intern student, this gave me an excellent opportunity to gain practical knowledge by working in an organization or valuable field. However, due to the pandemic, this could not occur. I needed to complete my report by gathering secondary data. There is a constraint on verifying data accuracy because no technique exists for doing so. Finally, as a student, I can state that I am currently in the process of completing a research paper of this nature. However, I concerted effort to cover every critical aspect of this study.

References

Abdul Karim, M., Hassan, M. K., Hassan, T., & Mohamad, S. (2014). Capital adequacy and lending and deposit behaviors of conventional and Islamic banks. *Pacific Basin Finance Journal*, *28*, 58–75. https://doi.org/10.1016/j.pacfin.2013.11.002

Ali, S., Rehman, R. U., Sarwar, B., Shoukat, A., & Farooq, M. (2021). Board financial expertise and foreign institutional investment: the moderating role of ownership concentration. *Review of International Business and Strategy*, *August*. https://doi.org/10.1108/RIBS-02-2021-0032

Ali, S., Zhang, J., Naseem, M. A., & Ahmad, F. (2019). Moderating Role Of Ownership In Relationship Between CSRD And Firm Performance. *The Journal of Developing Areas*, *53*(3). https://doi.org/10.1353/jda.2019.0048

Bulgurcu, B. (Kiran). (2012). Application of TOPSIS Technique for Financial Performance Evaluation of Technology Firms in Istanbul Stock Exchange Market. *Procedia - Social and Behavioral Sciences*, *62*, 1033–1040. https://doi.org/10.1016/j.sbspro.2012.09.176

Çam, İ., & Özer, G. (2022). The influence of country governance on the capital structure and investment financing decisions of firms: An international investigation. *Borsa Istanbul Review*, *22*(2), 257–271. https://doi.org/10.1016/j.bir.2021.04.008

Chebbi, K., Ammer, M. A., & Hameed, A. (2021). The COVID-19 pandemic and stock liquidity: Evidence from S&P 500. *Quarterly Review of Economics and Finance*, *81*(August 2020), 134–142. https://doi.org/10.1016/j.qref.2021.05.008

Chen, W. Da, Chen, Y., & Huang, S. C. (2021). Liquidity risk and bank performance during financial crises. *Journal of Financial Stability*, *56*(June), 100906. https://doi.org/10.1016/j.jfs.2021.100906

Danso, A., Lartey, T., Amankwah-Amoah, J., Adomako, S., Lu, Q., & Uddin, M. (2019). Market sentiment and firm investment decision-making. *International Review of Financial Analysis*, *66*(November 2018), 101369. https://doi.org/10.1016/j.irfa.2019.06.008

Ekinci, R., & Poyraz, G. (2019). The Effect of Credit Risk on Financial Performance of Deposit Banks in Turkey. *Procedia Computer Science*, *158*, 979–987. https://doi.org/10.1016/j.procs.2019.09.139

Goel, U., Chadha, S., & Sharma, A. K. (2015). Operating Liquidity and Financial Leverage: Evidences from Indian Machinery Industry. *Procedia - Social and Behavioral Sciences*, *189*, 344–350. https://doi.org/10.1016/j.sbspro.2015.03.230

Gupta, J., & Kashiramka, S. (2020). Financial stability of banks in India: Does liquidity creation matter? *Pacific Basin Finance Journal*, *64*(July), 101439. https://doi.org/10.1016/j.pacfin.2020.101439

HABTOOR, O. S. (2020). The Moderating Role of Ownership Concentration on the Relationship between Board Composition and Saudi Bank Performance. *Journal of Asian Finance, Economics and Business*, *7*(10), 675–685. https://doi.org/10.13106/jafeb.2020.vol7.no10.675

Heuver, R. A., & Berndsen, R. J. (2022). Liquidity coverage ratio in a payment network: Uncovering contagion paths. *Latin American Journal of Central Banking*, *3*(1), 100046. https://doi.org/10.1016/j.latcb.2022.100046

Ho, S. J., & Hsu, S. C. (2010). Leverage, performance and capital adequacy ratio in Taiwans banking industry. *Japan and the World Economy*, *22*(4), 264–272. https://doi.org/10.1016/j.japwor.2010.06.007

Huang, H. Y., & Ho, K. C. (2020). Liquidity, earnings management, and stock expected returns. *North American Journal of Economics and Finance*, *54*(April), 101261. https://doi.org/10.1016/j.najef.2020.101261

İncekara, A., & Çetinkaya, H. (2019). Liquidity Risk Management: A Comparative Analysis of Panel Data between Islamic and Conventional Banking in Turkey. *Procedia Computer Science*, *158*, 955–963. https://doi.org/10.1016/j.procs.2019.09.136

Ju, M., & Zhao, H. (2009). Behind organizational slack and firm performance in China: The moderating roles of ownership and competitive intensity. *Asia Pacific Journal of Management*, *26*(4), 701–717. https://doi.org/10.1007/s10490-009-9148-1

Kabir Hassan, M., Unsal, O., & Emre Tamer, H. (2016). Risk management and capital adequacy in Turkish participation and conventional banks: A comparative stress testing analysis. *Borsa Istanbul Review*, *16*(2), 72–81. https://doi.org/10.1016/j.bir.2016.04.001

Kenneth, O. (2013). Impact of Credit Risk Management and Capital Adequacy on the Financial Performance of Commercial Banks in Nigeria. *Journal of Emerging Issues in Economics, Finance and Banking (JEIEFB) An Online International Monthly Journal*, *2*, 703. www.globalbizresearch.com

Kosmidou, K., Kousenidis, D., Ladas, A., & Negkakis, C. (2020). Regulation of capital flows: Effects on liquidity and the role of financial reporting quality. *Journal of Economic Behavior and Organization*, *175*, 86–97. https://doi.org/10.1016/j.jebo.2020.04.005

Lin, S. L., Penm, J. H. W., Gong, S. C., & Chang, C. S. (2005). Risk-based capital adequacy in assessing on insolvency-risk and financial performances in Taiwan's banking industry. *Research in International Business and Finance*, *19*(1), 111–153. https://doi.org/10.1016/j.ribaf.2004.10.006

Louati, S., Gargouri Abida, I., & Boujelbene, Y. (2015). Capital adequacy implications on Islamic and non-Islamic bank's behavior: Does market power matter? *Borsa Istanbul Review*, *15*(3), 192–204. https://doi.org/10.1016/j.bir.2015.04.001

Mangena, M., Priego, A. M., & Manzaneque, M. (2020). Bank power, block ownership, boards and financial distress likelihood: An investigation of Spanish listed firms. *Journal of Corporate Finance*, *64*(May), 101636. https://doi.org/10.1016/j.jcorpfin.2020.101636

Milcheva, S., Falkenbach, H., & Markmann, H. (2019). Bank liquidity management through the issuance of bonds in the aftermath of the global financial crisis. *Research in International Business and Finance*, *48*, 32–47. https://doi.org/10.1016/j.ribaf.2018.12.003

Mizgier, K. J., Hora, M., Wagner, S. M., & Jüttner, M. P. (2015). Managing operational disruptions through capital adequacy and process improvement. *European Journal of Operational Research*, *245*(1), 320–332. https://doi.org/10.1016/j.ejor.2015.02.029

Muiruri, P. M., Memba, F. S., & Njeru, A. (2015). Moderating Effects of Bank Ownership on the Relationship between Securitization Uptake and Financial Performance of Commercial Banks in Kenya. *Academic Journal of Economic Studies*, *1*(2), 24–43.

Munangi, E., & Sibindi, A. B. (2020). An empirical analysis of the impact of credit risk on the financial performance of South African banks. *Academy of Accounting and Financial Studies Journal*, *24*(3).

Murdock, A. (2017). Governance and ownership. *Private Action for Public Purpose: Examining the Growth of Falck, the World's Largest Rescue Company*, 105–133. https://doi.org/10.1057/978-1-349-95214-4_5

Ni, Z., Fang, L., Liu, H., & Lu, X. (2022). Performance and risk of energy industrial firms with stock pledge in China. *Finance Research Letters*, *46*(August),

102410. https://doi.org/10.1016/j.frl.2021.102410

Okoye, A. N. N., Ikechukwu, E., & Leonard, N. C. (2017). The 2017 International Conference on African Entrepreneurship and Innovation for Sustainable Development (AEISD) EFFECT OF CAPITAL ADEQUACY ON FINANCIAL PERFORMANCE OF QUOTED DEPOSIT MONEY BANKS IN NIGERIA. *The 2017 International Conference on African Entrepreneurship and Innovation for Sustainable Development (AEISD)*, *57*, 841–862. https://www.researchgate.net/publication/319406230_EFFECT_OF_CAPITAL_ADEQUACY_ON_FINANCIAL_PERFORMANCE_OF_QUOTED_DEPOSIT_MONEY_BANKS_IN_NIGERIA

Ongore, V. O., & Kusa, G. B. (2013). International journal of economics and financial issues. *International Journal of Economics and Financial Issues*, *3*(1), 237–252. http://www.econjournals.com/index.php/ijefi/article/view/334

Sadaa, A. M., Ganesan, Y., & Ahmed, M. G. (2020). The effect of earnings quality and bank continuity: the moderating role of ownership structure and CSR. *Journal of Sustainable Finance and Investment*, *0*(0), 1–21. https://doi.org/10.1080/20430795.2020.1858690

sulieman Alshatti, A. (2015). The effect of credit risk management on financial performance of the Jordanian commercial bank. *Investment Management and Financial Innovations*, *12*(1), 338–345.

Teirlinck, P. (2017). Configurations of strategic R&D decisions and financial performance in small-sized and medium-sized firms. *Journal of Business Research*, *74*, 55–65. https://doi.org/10.1016/j.jbusres.2017.01.008

Umoru, D., & Osemwegie, J. O. (2016). Capital Adequacy and Financial Performance of Banks in Nigeria: Empirical Evidence Based on the Fgls Estimator. *European Scientific Journal, ESJ*, *12*(25), 295. https://doi.org/10.19044/esj.2016.v12n25p295

ur Rehman, R., Zhang, J., Naseem, M. A., Ahmed, M. I., & Ali, R. (2021). Board independence and Chinese banking efficiency: a moderating role of ownership restructuring. *Eurasian Business Review*, *11*(3), 517–536. https://doi.org/10.1007/s40821-020-00155-9

Vitkova, E., Vankova, L., & Kocourkova, G. (2021). Assessment of the Regional Current Liquidity in the Construction Industry of the Czech Republic. *Procedia Computer Science*, *196*, 699–707. https://doi.org/10.1016/j.procs.2021.12.066

Weber, O., Scholz, R. W., & Michalik, G. (2010). Incorporating sustainability criteria into credit risk management. *Business Strategy and the Environment*, *19*(1), 39–50. https://doi.org/10.1002/bse.636

Yuan, G. X., Zhou, Y., Liu, H., & Yan, C. (2022). ScienceDirect The Framework of CAFE Credit Risk Assessment for Financial The Framework of CAFE Credit Risk Assessment for Financial Markets in China Markets in China. *Procedia Computer Science*, *202*, 33–46. https://doi.org/10.1016/j.procs.2022.04.006