

Analyzing Factors Influencing Credit Risk in Pakistan's Commercial Banks: An Empirical Study

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Abstract: Credit risk, a key indicator of commercial banks' financial stability, is epitomized by the prevalence of non-performing loans (NPLs). NPLs serve as a direct reflection of this risk and are instrumental in evaluating the overall financial performance and stability of commercial banks. This empirical study focuses on Pakistani commercial banks, aiming to scrutinize selected factors influencing credit risk, measured through NPLs. Examining a balanced panel of 18 banks spanning 15 years (2006-2020), totaling 270 observations, the study employs the feasible generalized least square (FGLS) method to address panel data issues. Multiple linear regression analysis with random and fixed effects, facilitated by STATA 17, reveals that, with the exception of the unemployment rate, all identified factors significantly impact NPLs. Particularly noteworthy are inflation and management efficiency, identified as novel contributors to NPL variability. The study advocates for autonomous and responsible regulatory policies to adeptly control credit risk, emphasizing the necessity for commercial banks to adopt robust screening and control methods in lending. It further recommends a proactive role for the Pakistani government in fostering a conducive environment through attractive interest rates and inflation control, anticipating these measures to play a pivotal role in facilitating lending, mitigating credit risk, and indirectly enhancing the country's economic growth.

Keywords: Credit Risk, Nonperforming Loans, Interest Rate, Inflation, Management Efficiency

Article History: Received: 22 Dec 2023, Accepted: 28 Jan 2024, Published: 29 Feb 2024

INTRODUCTION

Credit risk represents a fundamental challenge confronting global banking and financial institutions. Credit risk can be defined as the likelihood of a borrower defaulting on the full or partial repayment of a loan, whether intentionally or due to circumstances such as a decline in the borrower's income, rendering them unable to fulfill the agreement with the lending institution. All notable financial crises such as the Southeast Asian crisis (1997), the global financial crisis (GFC) (2008), and the Eurozone crisis (2009) have witnessed that credit risk remained one of the major contributing factors. Furthermore, the downfall of entities like Enron and Lehman Brothers has heightened substantial apprehensions regarding the management of credit risk.

Banks employ credit risk assessment tools during the lending process to evaluate the likelihood of prospective borrowers defaulting on loans. Through credit risk analysis, the aim is to keep potential losses within a minimum tolerance level during credit appraisals (Gürgen & Dereliog, 2011). These losses manifest on the bank's balance sheet as non-performing loans (NPLs), calculated as a percentage of total gross loans. Since, past instances of bank crises have been attributed to inadequate and ineffective management of non-performing loans (Thiagarajan et al., 2011), therefore, in this study NPLs is used as a proxy for credit risk.

The primary source of risk in bank loan portfolios is commonly attributed to external factors, as noted by Llewellyn (2002). Notable among these are economic growth, reflected by the GDP growth rate,

fluctuations in the Consumer Price Index (CPI) indicating inflation rates (INF), interest rates (LIR), and the unemployment rate. Market analysts consider variations in the stock market index as a reliable indicator of economic health, which, in turn, mitigates credit risk. However, it's crucial to acknowledge that these assertions don't negate the connection between external factors and fundamental weaknesses, and adverse shifts in economic conditions were foreseen as precursors to financial crises.

Similarly, internal factors, such as ineffective management, liquidity, and profitability, are significant contributors to credit risk as well. Inefficient management impacts various aspects, with liquidity and profitability being particularly relevant in the banking sector. Mismanagement of these factors can lead to an increase in delinquent loans, reducing the ability to secure cost-effective capital and negatively impacting credit ratings due to a deteriorating financial position. Numerous studies have empirically demonstrated that inadequacies at the macro-environmental level can result in an ineffective financial system.

Nevertheless, several studies have substantiated the link between external and internal factors in influencing credit risk. A study by Aver (2008) in Slovenia supports the view that the stock market index, GDP, unemployment, inflation, and interest rates are determinants of asset quality in the banking system. Likewise, Das and Ghosh's (2007) study confirms that bank-specific factors play a crucial role in the accumulation of NPLs in state-owned banking institutions in India.

The recognition of conventional banks playing a somewhat enigmatic role in supporting the global economy has prompted stakeholders to reassess the factors that could trigger a banking crisis (Grauwe, 2008). Moreover, the magnitude of non-performing loans (NPLs) significantly influences the stability of a country's banking sector, with factors explaining NPLs providing crucial insights for banks (Khan et al., 2020). The robustness of the banking and financial system, particularly in emerging economies, is pivotal for ensuring economic growth (Aghion et al., 2004). Therefore, based on this premise, it is imperative to scrutinize factors that have the potential to impact credit risk in the conventional banking system.

As emphasized earlier, every financial crisis invariably impacts the global banking sector, and the banking sector in Pakistan is no exception. The aim of this current study is to investigate the factors influencing credit risk challenges arising from nonperforming loans faced by commercial banks in Pakistan. This research specifically aims to examine the managerial viewpoint on how credit risk affects a bank's profitability. The anticipation is that this study will make a positive contribution by furnishing valuable information to the management and other relevant authorities. Such insights are expected to guide them in implementing precautionary measures to prevent situations that could lead to economic downturns in developing countries like Pakistan.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Despite the relative weakness of the banking industry in Pakistan, commercial banks play a crucial role in the country's economy as the primary providers of credit in the absence of a robust capital market. Following privatization in the 1990s, the banking sector in Pakistan exhibited noteworthy performance in both balance sheet size and profitability. Privatization triggered a competitive environment among banks, fostering the introduction of innovative financial services and products, ultimately leading to increased profits for these institutions. Ahmad (2011) mentions that over 90% of the Pakistani financial sector is covered by banks and related financial services. Additionally, according to Ali et al. (2019), the asset size of commercial banks in Pakistan comprises 75% of the total assets of the financial sector, positioning the banking sector at the forefront to fill the existing gap resulting from underdeveloped financial markets. The ratio of the banking sector's total assets to GDP, on average, is about 55% (State Bank of Pakistan, 2018). Over the years, the total assets of banks in Pakistan have been growing, reflecting an increase in the size of their balance sheets and underscoring their heightened role in stimulating economic growth in the country.

The escalating growth rate of banking deposits necessitates active intervention by banks in directing these deposits towards loans. In 2015, loans constituted only about 50% of the total deposits. However, both the loan-to-deposit and non-performing loan (NPL) ratios are concurrently decreasing. This trend is attributed to the accumulation of NPLs surpassing a certain threshold. A study by Badar and Javid (2013) on Pakistani banks unveiled a sharp increase in NPLs over the past decade. Balgova et al. (2016) supported this finding in their research, identifying 32 countries with NPLs exceeding ten percent, ranking Pakistan at 25. By 2017, Pakistan's NPL ratio was approximately 9%, signaling a cause for concern. This situation could potentially lead to a series of crises within the banking system, ultimately resulting in a financial crisis and potential economic collapse. Undoubtedly, the size and impact of the Global Financial Crisis (GFC) in 2008 significantly accentuated the interdependence of financial institutions in economies worldwide (Agnello & Sousa, 2012). Similarly, as noted by Ghosh (2015), crises are often characterized by a surge in non-performing loans (NPLs) within banking sectors. As

delineated by Salina (2020), Kazakhstan presents an intriguing case for examining the financial stability of banks. The increase of nonperforming loans (NPL) in the country is notable, rising sharply from 2.4% in 2007 to 36% in 2013. This increase suggests that the repercussions of the 2007/8 financial crisis are persisting, as indicated by the International Monetary Fund (IMF, 2014). As indicated by Siddique et al. (2022), Asia holds paramount significance among all global continents, contributing 60% to worldwide growth. However, it confronts a significant challenge in the form of a high prevalence of nonperforming loans (NPLs). Furthermore, the Asian Development Bank's 2019 report reveals a substantial increase in nonperforming loans (NPLs) in the southern region, reaching approximately \$518 billion, which is notably higher than in previous years. This surge in NPLs places a considerable burden on the financial position of commercial banks, particularly affecting their lending processes. A low level of NPLs signifies a robust monetary system in a country, while a high NPL level indicates a precarious financial position. The escalating levels of NPLs initially impact commercial banks in the long run, eventually affecting the overall financial health of the country's economy (Souza and Feijo, 2011). Consequently, following the global crisis, NPLs drew significant attention from both government authorities and banking management due to their association with the failure and crises of the banking system.

Extensive research has delved into investigating the causes of bank crises and failures; however, there is a notable scarcity of work in South Asia at large, and particularly in Pakistan. Limited studies exist that comprehensively elucidate the intrinsic and extrinsic factors influencing banks' credit risk. In India, a study examined the variables of credit risk in public banks between 1995 and 2005 (Das & Ghosh, 2007). The findings from their research disclosed that both internal and external factors significantly affected credit risk in the public sector banks of India. The study further explored the substantial impact of bank-specific factors, coupled with macroeconomic factors, on credit risk. It revealed that excessive credit growth compromises a bank's ability to monitor its loan portfolio. Similarly, Aver (2008) conducted an empirical analysis of the Slovenian banking sector to assess the influence of macroeconomic factors on credit risk. This study concludes that certain variables, namely the stock market index, lending interest rate, unemployment rate, GDP growth rate, inflation, and exchange rate, have exerted a substantive impact on credit risk. Notably, the stock market index, interest rate, and unemployment have demonstrated a particularly noteworthy influence on credit risk. In contrast, GDP, inflation, and exchange rate were found to have an insignificant effect on credit risk.

Gross Domestic Product (GDP)

The literature on bank crises consistently underscores the robust correlation between these crises and macroeconomic conditions. The annual GDP growth rate stands out as a representative metric for overall economic activity. During economic upswings characterized by accelerated activities, both businesses and households experience increased income, enhancing their capacity to meet repayment obligations. Conversely, economic recessions, marked by slowed activities, lead to reduced income for households and businesses, making it challenging for them to prioritize loan payments amid essential survival expenditures. Consequently, favorable macroeconomic conditions contribute to improved repayment capabilities, resulting in a significant reduction in non-performing loans (NPLs) and a subsequent decrease in credit risk (Hamerle et al., 2011).

On the same note, Vazquez et al. (2012) assert that GDP functions as a comprehensive measure of economic activity, holding a pivotal role as the most influential external factor affecting credit risk. It establishes a fundamental relationship with all macroeconomic variables that influence non-performing loans NPLs. Notably, GDP demonstrate a strong inverse correlation with credit risk. Nevertheless, past studies highlight variations in credit risk levels among distinct business sectors, particularly noting the consumer sector's heightened sensitivity to fluctuations in GDP.

Lending Interest Rate (LIR)

The rate of interest holds immense importance for both those who save and those who borrow. Furthermore, the role of banks as intermediaries is closely tied to interest rates. Banks, through intermediation, facilitate the movement of funds from savers (entities with surplus funds) to borrowers (entities in need of funds) by employing interest rates. This involves aggregating savings (excess funds) and transforming them into various loan products tailored to the requirements of different business sectors, thereby mitigating the risk of losses resulting from multiple loan defaults (Ngugi, 2001). Siddiqi (2022) observes that numerous empirical studies have explored the relationship between the average lending rates set by banks. One such study, carried out by Adebayo et al. (2011), concentrated on the period from 2000 to 2010 in Nigeria with the objective of establishing the correlations between bank lending rates and performance.

Different interest rates exist based on lending tenure (short-term to long-term) and loan amounts. A higher cost of borrowing translates to a higher interest rate, often posing a challenge to the borrower's ability to fulfill loan repayment obligations. Consequently, the likelihood of default increases with higher interest rates. According to Aver (2008), there is an elevated risk of default when the cost of borrowing is high and vice versa. The central bank sets the basic interest rate (policy rate) as a macroeconomic tool for

ANALYZING FACTORS INFLUENCING CREDIT RISK IN PAKISTAN'S COMMERCIAL BANKS: AN EMPIRICAL STUDY

shaping and implementing monetary policy, influencing overall economic activity and credit risk. In summary, interest rates play a pivotal role in the dynamics of saving, borrowing, and economic stability.

In their study, Espinoza and Prasad (2010) explored that in an economic downturn with rising interest rates, there is an increased likelihood of Non-Performing Loans (NPLs). In the case of Pakistan, a developing country with fragile political stability, reliance on financial support from the International Monetary Fund (IMF) is significant to address its fiscal deficit. Consequently, Pakistan must adhere to IMF conditions, particularly those related to interest rate adjustments by the central bank (Rehman et al., 2016). The study of Ahmad and Bashir's (2013) demonstrated a strong connection between interest rates and credit risk, suggesting that any fluctuation in interest rates directly impacts the levels of NPLs in Pakistani banks. Additionally, Khan et al. (2020) identified high markup spreads, low credit principles, and a lack of borrower monitoring policy as key contributors to the elevated levels of NPLs. Likewise, Ghosh et al. (2020) conducted a scholarly investigation into the substantial influence of the 'lending interest rate' on the nonperforming loans (NPL) within the context of Bangladeshi banks.

Inflation (Infl)

Inflation serves as a metric for monitoring the rise in the average prices of goods and services. Banks provide loans as a financial product, and the dynamics of these loans are influenced by the prevailing inflation rates. Research indicates that non-performing loans (NPLs) exhibit an upward trend in correlation with escalating inflation rates. Makiyan (1994) contends that inflation establishes a direct association with credit risk, a relationship that transcends both Islamic and conventional banking systems. Consequently, heightened inflation leads to a reduction in the purchasing power within an economy, resulting in increased NPLs and subsequently diminished profits for banks. In their noteworthy study, Siddiqi et al. (2022) highlight the considerable impact of two pertinent control variables, namely, the size of the bank and inflation, on the financial performance of the banking institution.

Unemployment (Unemp)

In instances where businesses lack new projects or the operational costs of existing projects are prohibitively high, job opportunities become scarce, leading to an increase in layoffs and subsequently, a rise in the unemployment rate. This variable serves as a macroeconomic indicator delineating the external economic milieu. The heightened unemployment rate adversely impacts household income, impeding their ability to meet loan obligations and thereby elevating non-performing loan (NPL) levels. Unemployment emerges as a consequence of diminished demand, affecting industrial production levels. Reduced industrial output, in turn, negatively affects firms' income when operating below production capacity. Consequently, heightened unemployment, stemming from lower production levels, compromises firms' capacity to repay loans, thereby amplifying the credit risk faced by banks (Mileris, 2015).

Stock Market Index (SMI)

The stock market index serves as a barometer of economic activity within the financial market, reflecting the extent of trading activities therein. It plays a pivotal role in ascertaining the valuation of firms, thereby encapsulating the comprehensive performance of these entities. An ascending stock market index signifies favorable performance by firms. Consequently, there exists an inverse relationship between the stock market index and credit risk. The stock market, being an attractive avenue for investment with favorable liquidity, serves as an indicator of the liquidity position for both individual and corporate investors. Therefore, a robust stock market index, indicative of a healthy financial market, is associated with reduced credit risk and a lower incidence of non-performing loans (NPLs). Bonfim (2009) delved into the interconnections between credit risk and macroeconomic developments, elucidating the crucial link between the stock market index and the repayment capacities of firms listed in the index and the investors holding stocks of these firms in his research.

Management Efficiency (ME)

Bank-specific or internal factors form the focal point of discussions surrounding the proficient handling of tasks pertaining to a bank's costs and profits. Agency issues lie at the core of a bank's management, defining its risk appetite in the lending process. As posited by Tay (1991), inefficient management plays a pivotal role in instigating the banking crisis. The competence of management becomes crucial in determining how a bank adjusts its risk appetite, with incompetent management often failing to strike a balance and approving loans that subsequently transform into Non-Performing Loans (NPLs). In a related context, Siddiqi et al. (2022) emphasize the importance of effective bank management in assessing the viability of customers' repayment capabilities. Furthermore, the authors suggest that banks can provide expert guidance to professional loan recipients on adopting efficient strategies to prudently allocate borrowed funds, ensuring the attainment of the necessary return on the overall investment of the firms involved.

The State Bank of Pakistan (2010) risk management guidelines emphasize the daily monitoring of a bank's asset quality as an integral facet of comprehensive system oversight, ensuring sound bank management. A well-defined credit policy, characterized by explicit detailing on loan appraisal, approval, monitoring, and recovery, serves as a hallmark of efficient management, contributing to the reduction of

credit risk and its reciprocal relationship. The efficiency ratio, calculated as the total cost to total revenues of banking operations, serves as a proxy for evaluating the effectiveness of management within a specific timeframe.

Honohan (1997) substantiates that large banks are more susceptible to poor loan management compared to smaller counterparts due to enhanced monitoring capabilities. He advocates for bolstering managerial capacity before embarking on expansion and credit growth endeavors to mitigate risks associated with loan defaults. Moreover, Haneef et al. (2012) conducted an analysis of the impact of risk management practices on the profitability and credit risk of Pakistani banks. Their findings revealed that inefficient risk management practices led to an increased number of loan defaults, thereby adversely affecting the profitability of banks. Similarly, Jameel (2014) contends that both a burgeoning loan portfolio and heightened credit risk impede the profitability of banks. In essence, it can be concluded that effective control over credit growth contributes to the enhancement of asset quality, thereby resulting in lower incidence of defaults.

Given the distinctiveness of each country concerning its regulatory frameworks, political influences, and market and industry dynamics, the factors emanating from the overarching system would yield diverse outcomes in a study.

Based on the above discussion, this study posits the following hypotheses:

- H1: A significant relationship exists between the annual growth rate of GDP and Credit Risk.
- H2: The annual unemployment rate demonstrates a significant relationship with Credit Risk.
- H3: There is a significant relationship between lending interest rate and Credit Risk.
- H4: The inflation rate exhibits a significant relationship with Credit Risk.
- H5: The stock market index demonstrates a significant relationship with Credit Risk.
- H6: Management efficiency has a significant relationship with the Credit Risk.

METHODOLOGY

The study's objectives were pursued using a thorough analytical approach, which included both descriptive and regression analyses. Following diagnostic tests, the Feasible Generalized Least Square (FGLS) method was chosen. Additionally, the linear regression model was employed for the regression analysis of the gathered data.

As of June 2021, there were a total of 20 conventional banks operating in Pakistan, with 13 of them commencing operations between the years 2006 and 2019. The study adopted a convenience sampling design, aligning with the nature of the study and the available data for the study period. A judiciously selected sample of 18 banks was taken for the period 2006-2020, considering data accessibility and relevance. The analysis relied on empirical data sourced from audited annual reports, which were obtained from authoritative sources like the State Bank of Pakistan (SBP)'s Financial Statement Analysis, the World Bank's World Development Indicators (WDI), and the Pakistan Stock Exchange (PSX). These carefully collected datasets formed a strong basis for academic research, ensuring a thorough and well-organized analysis. In addition, the analysis employed STATA 17, a statistical software, using the specified econometric model for multiple linear regression as given below.

$$NPL_{it} = \beta_0 + \beta_1 GDP_{it} + \beta_2 INF_{it} + \beta_3 LIR_{it} + \beta_4 UR_{it} + \beta_5 SMI_{it} + \beta_6 ME_{it} + \epsilon$$

Where NPL_{it} denotes the NPL ratio for bank i in time period t . β_0 denotes the intercept. GDP_{it} represents the percentage annual growth in GDP for each individual bank in time period t . INF_{it} represents inflation for each individual bank in time period t . $Unemp_{it}$ denotes the unemployment rate for each individual bank in time period t . SMI_{it} represents stock market index (KSE 100 index in this case) for each individual bank in time period t . ME_{it} represents management efficiency of each individual bank in time period t . t represents the time period from 2006 to 2020 whereas $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ and β_6 show each of above-mentioned variables coefficient terms. These explain the relative predictive power, the sign, the strength and its significance. The summary of variables with their measurement is given in Table 1.

Table 1
Summary of variables and measures

S	Var	Name	Code	Measurement	Reference	Source
1	Dep	Credit Risk	NPL	Ratio of nonperforming loans to total advances	Khan et. al. (2020)	FSA (Financial) - SBP
2	Ind	Gross Domestic Product	GDP	Annual percentage growth rate of GDP at market prices based on constant Pak Rupee.	Khan et. al. (2020)	WDI

ANALYZING FACTORS INFLUENCING CREDIT RISK IN PAKISTAN'S COMMERCIAL BANKS:
AN EMPIRICAL STUDY

3	Ind	Inflation	INF	Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly	Makiyan (1994)	WDI
4	Ind	Lending Interest Rate	LIR	Lending rate is the bank rate that usually meets the short- and medium-term financing needs of the private sector.	Beck, Jakubik, and Piloiu (2015)	WDI
5	Ind	Unemployment Rate	UR	Unemployment refers to the share of the labor force that is without work but available for and seeking employment.	Konstantakis et al. (2016)	WDI
6	Ind	Stock Market Index	SMI	The average annual volume of trading in the Karachi Stock Exchange.	Bonfim (2009)	WDI
7	Ind	Management Efficiency	ME	The ratio of total cost to total revenues of banking operations.	Haneef et al. (2012)	FSA (Financial) - SBP
8	Con	Bank Size	Size	The natural logarithm of total assets of the bank.	Rahman et al., (2012)	Computed from WDI data
9	Con	Loan Loss Provisions	LnLLP	The natural logarithm of ration of loan loss provisions to total assets.	Simper et al., (2017)	Computed from WDI data

Source: Authors generated based on the literature review
The diagnostics (post estimation analysis) results are presented in the following Table 2.

Table 2
Tests for linearity, autocorrelation, heteroscedasticity and endogeneity

Test	P-value
Linearity Test	
Ramsey RESET test for omitted variables	0.7755
Heteroskedasticity Test	
Breusch-Pagan/Cook-Weisberg test for heteroskedasticity	0.1640
First Order Autocorrelation in panel data (ARI)	
Wooldridge test for first order autocorrelation in panel data	0.0000
Tests of endogeneity for GDP	
Durbin	0.5641
Wu-Hausman	0.5707
Tests of endogeneity for INF	
Durbin	0.8286
Wu-Hausman	0.8315
Tests of endogeneity for LIR	
Durbin	0.8377
Wu-Hausman	0.8405
Tests of endogeneity for UR	
Durbin	0.4749
Wu-Hausman	0.4823
Tests of endogeneity for SMI	
Durbin	0.3062
Wu-Hausman	0.3141
Tests of endogeneity for ME	
Durbin	0.7764
Wu-Hausman	0.7805
Test for Cross-Sectional Dependence	
Pesaran test of cross-sectional independence	0.0000
Friedman's test of cross-sectional independence	0.0001
Frees' test of cross-sectional independence = 3.455 > alpha values at 1% ,5% and 10%	
Group-wise Heteroscedasticity	
Modified Wald test for group-wise heteroskedasticity	0.0000

Source: Authors generated based on the collected data

RESULTS**Descriptive Analysis**

Descriptive analysis and variance inflation factor (VIF) values are shown in the summary statistics of the dependent variable NPL and independent variables GDP, INF, LIR, UR, SMI, and ME. Size and lnLLP are used as the control variables (see Table 3).

The findings revealed that, over the study period, the mean of Non-Performing Loans (NPL) for 270 observations of Pakistani commercial banks stood at 11.458. This suggests a substantial prevalence of high nonperforming loans in conventional banks within Pakistan during the specified timeframe. The standard deviation, indicated by a statistic of 8.837, further highlights significant variability in the accumulation of nonperforming loans among individual banks. These statistics highlight the persistent issue of nonperforming loans in Pakistani banks, raising concerns about the potential transformation into a banking and economic crisis in the near future. The significance of this concern is emphasized by the fact that a high NPL ratio, exceeding 10% in the banking system, is considered a threshold for a developed crisis (Demirgüç-Kunt & Detragiache, 1998). The scenario outlined in the background is not only validated by these statistics but also appears to escalate over time.

Table 3
Descriptive Statistics-all Variables

Variable	Mean	Median	Standard Deviation	Min	Max	VIF
NPL	11.45822	9.375	8.83795	.2726	63.050	
GDP	3.41533	3.7	1.87568	-.47	6.8	2.42
INF	9.15	7.92	4.52735	2.53	20.29	6.30
LIR	10.154	10.18	2.77507	6.15	14	3.94
UR	5.55867	5.87	0.58891	4.1	6.24	1.53
SMI	0.12742	0.06	0.21576	-.3403	.4755	1.50
ME	62.69896	55.135	34.21574	-2.0619	46.778	1.13
Size	19.60499	19.778	1.21866	15.5553	22.0163	1.23
lnLLP	16.12431	16.446	1.37779	-6.4541	-0.5822	1.19

Source: Authors generated based on the collected data

Table 3 outlines the characteristics of external and internal factors scrutinized in the study, affirming the context articulated in the study's background. As an illustration, the mean value of 3.42 for GDP indicates a notably modest economic growth of 3.7% in Pakistan, accompanied by a slight variance of 1.87 over the study period. Analogously, Table 3 provides the mean, median, and standard deviations for various other variables under consideration.

Normality & Multi-collinearity

Tabachnick and Fidell (2007) extended beyond the conventional large sample size threshold, opting for observations exceeding 200. In the present study, the sample size comprises 270 observations, surpassing the 200-mark, thereby allowing for a relaxation of assumptions related to normality. To assess the potential issue of multicollinearity among the independent variables (IVs), a Variance Inflation Factor (VIF) test was conducted, revealing no indication of multicollinearity. Additionally, in alignment with Pallant's (2011) recommendation, the examination of the correlation matrix of Pakistani conventional banks is presented in Table 4 to further verify the absence of multicollinearity concerns.

Ramsey RESET test was run to check the linearity of the model. This test also checks for omitted variables. The results showed that the model is linear and there are no omitted variables in the model. The Wooldridge test Wooldridge (2002) for autocorrelation in panel data was run and detected serial or first-order autocorrelation AR (1). The Breusch-Pagan test (Breusch & Pagan, 1980) was run and it showed that material heteroscedasticity is present in the residuals (See Table 2).

Table 4
Pearson Correlation Matrix

	NPL	GDP	INF	LIR	UR	SMI	ME	Size	lnLLP
NPL	1								
GDP	-0.0906	1							
INF	0.1469*	-	1						
		0.6329**							
LIR	0.1936*	-	0.8221*	1					
	*	0.4017**	*						
UR	0.1709*	0.4617*	-0.237**	-0.1042	1				
	*	*							
SMI	0.0620	0.2821*	-	-0.1290*	0.3088*	1			
			0.3985**		*				
ME	0.2732*	-0.0393	0.0463	0.0454	0.0014	-	1		
	*					0.0349			
Size	-0.3016*	-0.0444	-	-	-0.0969	-	-	1	
			0.2445**	0.2806**		0.0233	0.4335**		
lnLLP	0.1826*	-0.1157	-0.1267*	-0.1463*	0.0410	-	-0.2579*	-	1
	*					0.0044		0.8046**	

Note: *p<0.10, **p<0.05, ***p<0.01

The endogeneity tests of Durbin and Wu Hausman were run for each of the independent variables and results showed that all independent variables are exogeneous. The Pesaran (Pesaran, 2004) and the Frees tests (Frees, 1995) were used to check the cross-sectional dependence and both tests evidenced the presence of cross-sectional dependence in random effects specification in the model. The modified Wald test for group-wise heteroscedasticity was also run and identified to be present in the panel data. All these results are presented in Table 2.

Diagnostics Tests and Regression Analysis Results

Having satisfied the validity assumption for the random effects model (REM), the application of the Hausman specification test (Baltagi, 2013; Greene, 2008; Gujarati, 2004; Hausman, 1978) was pivotal in determining the model superiority between fixed effects (FEM) and random effects (REM). The outcome of the test indicated that the random effects model (REM) is more suitable for conducting multiple regression analysis in this context. Subsequent to the initial model selection, diagnostic tests were systematically applied to examine potential issues such as autocorrelation, heteroscedasticity, cross-sectional dependence, and group-wise heteroscedasticity and is reported in table 2.

Parks (1967) introduced the Feasible Generalized Least Square (FGLS) method, designed to handle potential deviations from the assumption of spherical errors, particularly in cases where N (the number of cross-sections) exceeds T (the number of time periods). In the current study, the FGLS method was employed to conduct multiple regression analysis, addressing challenges related to (a) first-order serial correlation, (b) heteroscedasticity, (c) group-wise heteroscedasticity, and (d) cross-sectional dependence, as previously mentioned.

The outcomes of the Feasible Generalized Least Square (FGLS) analysis are presented in Table 5. The coefficients (β) in the table signify the impact of independent variables on credit risk, with the inclusion of control variables such as the size of individual banks and annual loan loss provisions.

Table 5
Feasible Generalized Least Square Estimates

Variable	Expected Signs	Beta Coefficient	z-statistics	p-value
GDP	-	-0.0015	-1.92	0.055*
UR	-	9.05e-06	0.00	0.997
LIR	+	0.0014	2.31	0.021**
INF	-	-0.0013	-2.72	0.006***
SMI	-	0.0088	1.72	0.085*
ME	+	0.0136	4.20	0.000***
Size		-0.0838	-32.55	0.000***
lnLLP		0.0707	40.89	0.000***
Constant		0.6102	16.43	0.000***
R ²	0.6062			
Wald χ^2 - Statistics	2152.21			
Sig χ^2 - Statistics	0.0000			
Observations	270			

“Note: *p<0.10, **p<0.05, ***p<0.01

Derived from the results presented in Table 5, the χ^2 -statistic, elucidating the overall significance of the model, is found to be statistically significant at the 0.000 level. The R-squared value of 0.6406 indicates that the regression model, comprising GDP, INF, LIR, UR, SMI, ME, Size, and lnLLP, can account for 64.04% of the variation in Non-Performing Loans (NPL).

Furthermore, the predictor variables, including GDP annual growth rate, inflation rate (INF), lending interest rate (LIR), stock market index (SMI), management efficiency (ME), and control variables such as bank size (Size) and loan loss provision (lnLLP), were all identified as having significant and statistically meaningful impacts on nonperforming loans (NPL) in commercial banks of Pakistan. These findings provide support to nearly all hypothesized statements. However, it was observed that the unemployment rate (UR) in this model demonstrated an insignificant impact on the nonperforming loans (NPL) of Pakistani commercial banks. It is apparent that the motivations of the management of Pakistani commercial banks are directed towards factors that contribute significantly to the increase of 60.62% in nonperforming loans within their banks. Particularly, INF and ME (alongside control variables of Size and lnLLP) exhibit a noteworthy impact on nonperforming loans, signifying a substantial influence at the 1% level. This suggests that lower management efficiency and escalating inflation are contributing to the accumulation of nonperforming loans in Pakistani conventional banks throughout the study period from 2006 to 2020. When examining the external environment, the independent variable LIR demonstrates a positive impact on nonperforming loans at a 5% significance level. Additionally, the independent variables GDP and INF, along with SMI, exert a negative influence on nonperforming loans at significance levels of 1%, 5%, and 10%. This implies that, on the whole, the macroeconomic environment is exacerbating the situation of nonperforming loans in Pakistani banks.

DISCUSSION

The study findings regarding GDP align with the outcomes of several previous works (Farhan et al., 2012; Fofack, 2005; Konstantakis et al., 2016; Lee et al., 2019; Louhichi & Boujelbene, 2016; Qwader, 2019). These studies consistently reveal a significant negative correlation between GDP and nonperforming loans. The present results are consistent with Farhan et al. (2012) in the context of Pakistan and Fofack (2005) in Sub-Saharan Africa. This suggests that, during favorable economic conditions, nonperforming loans tend to decrease owing to a more conducive business environment, fostering opportunities for enhanced returns and remunerations. Such conditions facilitate the timely repayment of loans.

The Study findings concerning LIR is consistent with international evidence presented by the

ANALYZING FACTORS INFLUENCING CREDIT RISK IN PAKISTAN'S COMMERCIAL BANKS: AN EMPIRICAL STUDY

studies of Ghosh (2020), Beck et. al. (2015), Erdinç and Abazi (2014), and Muntean (2014). This alignment is also observed in Pakistani studies, as evidenced by Ashfaq et al. (2014), Jameel (2014), Mehmood et al. (2013), Waqas Karman et al. (2015), and Zaib et al. (2014). The theoretical underpinning of this alignment is rooted in the concept that a higher lending interest rate corresponds to elevated levels of nonperforming loans (NPL). This implies that a high-interest rate contributes to increased fund costs by raising debt servicing expenses and fosters a culture of high-risk behavior. Loans approved to high-risk borrowers at significantly high-interest rates are more likely to transform into problematic loans, consequently leading to the emergence of nonperforming loans.

The inflation rate results indicate a significant negative association with nonperforming loans, suggesting that during periods of higher inflation, nonperforming loans are lower. Regarding the SMI findings, there is a significant positive association between the stock market index and nonperforming loans. This implies that during a bullish stock market index, nonperforming loans tend to be higher and increase. The result aligns with hypothesis (H5).

The Cost-to-Income Ratio (CIR) is a measure of management efficiency in handling credit risk and reducing nonperforming loans. A higher CIR implies lower management efficiency, and vice versa. This implies that a higher CIR leads to lower management efficiency, resulting in elevated credit risk (Islam & Nishiyama, 2016). This study reinforces the same relationship, supporting the notion that a higher CIR is associated with lower management efficiency and, consequently, higher credit risk.

CONCLUSION

The study concludes with a nuanced interpretation of the results regarding the determinants of nonperforming loans in commercial banks in Pakistan. The findings underscore the imperative for regulators to formulate prudent policies aimed at mitigating the adverse effects of various factors such as GDP, lending interest rates, inflation, stock market indices, and management efficiency in lending facilities offered by commercial banks. Additionally, the study advocates for rigorous screening processes before credit approval to prevent the escalation of credit risk. Implementation of policies addressing these implications is crucial to reducing economic losses resulting from financial distress and minimizing the likelihood of failures due to an increase in nonperforming loans within the banking sector of Pakistan. The results suggest that an extensive and robust screening process before credit approval should be a focal point for banks. Policies and practices derived from these implications are anticipated to contribute to the reduction of economic losses and, consequently, the mitigation of failures stemming from an upsurge in credit risk (nonperforming loans) in the Pakistani banking sector during periods of financial distress. Two key recommendations emerge: firstly, the establishment of a systematic framework for continuous professional development in credit and risk management to effectively oversee nonperforming loan levels, and secondly, a cautious approach to the conflicting consequences of loan growth at the managerial level. While increasing the loan portfolio is desirable for potential higher income, conventional bank management must simultaneously exercise robust monitoring and control mechanisms to manage associated risks effectively.

MANAGERIAL IMPLICATIONS

The study's findings suggest that commercial banks have the opportunity to enhance their financial performance by implementing strategies and a risk-avoidance approach aimed at minimizing credit risk, as represented by nonperforming loans. These strategies may involve the establishment of a systematic framework for continuous professional development in credit risk management to effectively oversee and control nonperforming loan levels. Additionally, a vigilant approach is warranted regarding the potential conflicting consequences of loan growth at the managerial level.

In the context of Pakistan, where loan growth is notably significant but exhibits a negative correlation with credit risk, particularly in terms of nonperforming loans, there is a need for cautious management. While increasing the loan portfolio is inherently desirable for its potential to yield higher returns, it is crucial for banks to exercise a robust monitoring and control mechanism, coupled with a commitment to good corporate governance. This dual approach is essential for navigating the delicate balance between fostering loan growth and mitigating the associated credit risk effectively. The outcomes of this study are anticipated to instigate a resurgence in the establishment of a novel monitoring and control mechanism by bank management.

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ANALYZING FACTORS INFLUENCING CREDIT RISK IN PAKISTAN'S COMMERCIAL BANKS:
AN EMPIRICAL STUDY

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