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Deciphering Macroeconomic Threads: Unraveling their Impact on Credit Risk in Banks

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Abstract: The notion of risk is commonly understood by an individual, and its importance has been emphasized as a crucial instrument in the process of decision-making, especially in cases where it is possible to quantify and value a variety of situations. However, the changes in the global financial landscape have increased the vulnerability of Islamic banking institutions to risks. Therefore, the present study examines the determinants of credit risk in Islamic banks. The study uses secondary data from 5 full-fledged Islamic banks and 10 Islamic windows from the period from 2010 to 2022 in Pakistan. This study employed the Generalized Method of Moment (GMM) estimation technique to count the heteroskedasticity and potential endogeneity issue that is avoided in the OLS regression. The results of this study stated that an increase in gross domestic product and exchange rate has a positive and significant relationship with credit risk in Islamic banks. On the other side increments in inflation, unemployment rate, and government debt spur the ratio of credit risk in Islamic banks. Moreover, we find that bank size plays a moderating role in between macroeconomic factors and credit risk in Islamic banks. The findings of this will benefit the management and regulatory authority to assess the macroeconomic factors that greatly impact the credit risk in Islamic banks.
Keywords: Credit risk, Inflations, government debt, exchange rate, interest rate

1. Introduction

A powerful financial system is the base of success for every country. The overall economic prosperity of a nation and the expansion of the financial system are strongly intertwined (Aslam, Ur-Rehman, & Iqbal, 2021). The banking sector is an essential monetary services sector that aids in the expansion of plans through finance for effective purposes, the intermediary movement of funds from surplus to deficit units, and the government's monetary and financial rules (Bhattarai et al., 2016). Banking sectors are critical to an economy's growth. The development function of the banking sector determines the next stage of economic growth (Ahmad, Aslam, Haq, & Billah, 2019; Tahir, Hussain, Iqbal, Aslam, & Masri, 2020). As a result, the financial sector's stability is important to an economy's success. Banks' major job is to transfer deposits from surplus to deficit units through loans and advances to diverse sectors such as agriculture, industry and government. However, owing to non-performing assets, banks have grown more cautious in issuing loans in recent years (Aslam & Haron, 2021; Zolkifli, 2018).

Nonperforming loans (NPLs), a common indicator of credit risk for the banking sector, gained prominence in Asian nations following the 1997 financial crisis (Jain et al., 2023). Thus, banks' prime responsibility is to facilitate the between depositors and borrowers by acting as middlemen in an economy. Banks' traditional purpose in the economy is to assist the transfer of surplus units to deficit units by taking deposits (mostly from the domestic sector) and issuing credit to all sectors (Rajha, 2016). The deterioration of loan quality on the asset side of the balance sheet is one of the primary concerns facing the banking sector. Hence, a non-

performing loan (NPL) has fallen behind on payments. These non-performing loans were recognized as a major cause of the 2007–2009 global financial crisis, which impacted the US economy as well as the economies of many other nations (Hosen, Broni et al. 2020).

A number of factors, such as weak institutional capacity, ineffective credit policies, variable interest rates, poor management practices, inadequate legislation, low levels of capital and liquidity, extensive bank certifications, subpar loan underwriting, lax credit assessments, and inadequate lending practices, can all lead to credit risk. A broken collateral system, intervention from the government, and inadequate oversight by central banks also add to the complexity of credit risk Alshatti, 2015). Moreover, the consequences of credit default, which occurs when customers neglect their bank obligations, impact depositors as well as financial institutions. This emphasizes how closely credit risk and the financial well-being of lenders, and their customers interact. Country risk and concentration risk are closely related to credit risk (Aslam, Shahzad, & Rehman, 2020; Yüksel, 2017). Increased Non-Performing Loan (NPL) ratios indicate lower credit quality, which increases the likelihood that future debt losses will exceed income (Kingu, Macha et al., 2018).

Credit risk in Islamic banks in Pakistan does indeed warrant special attention due to the relatively high level of non-performing financing (NPF) (Aslam & Haron, 2020; Bhatti et al., 2023). The maximum allowable NPL ratio for the banking industry as a whole is 5%, as determined by the State Bank of Pakistan (SBP), the nation's central bank. But as of December 2022, Shariah Banks (SRBs) had an NPL ratio of 4.5%, which was marginally lower than the industry average. Therefore, these results emphasis the need to evaluate the credit risk determinants to mitigate the impact of non-performing assets on baking performance in Pakistan.

Literature Review

Banking systems both locally and worldwide have faced several obstacles throughout the years as a result of a variety of circumstances, one of which being non-performing loans. In recent decades, nonperforming loans (NPLs) have garnered more attention. NPLs have an impact on the bank's liquidity and profitability, which are both crucial aspects of overall efficiency. Income is reduced when the provision for nonperforming loans is increased. A mismatch in asset and liability maturities, once again, produces liquidity risk for banks, impacting both the bank's total credit rating and its image (Badar and Javid, 2013). Salim et al. (2017) Credit risk development was driven differently in conventional and Islamic banks by bank-specific credit risk indicators. Only loan loss provision, debt-to-equity ratio, size, and regulatory capital are significant predictors of credit risk for conventional banks, whereas risky sector financing and regulatory capital are major predictors of credit risk for Islamic banks (Aslam, Ur Rehman, & Iqbal, 2023; Kabir, Dulal Miah, & Huda, 2022). In addition, several prominent macroeconomic factors including GDP, inflation, government debt, and unemployment are the major factors that are affecting the credit quality of the bank (Abusharbeh, 2022; Ahmad, Amjad, Aslam, 2018)

2. Literature Review

İslamoğlu (2015) from 2002 to 2013 analyzes the influence of macroeconomic factors (commercial loan interest rates and state debt/GDP ratios) on non-performing loans in 13 banks in Istanbul's Borsa. According to the study, changes in interest rates contribute to excessive loan growth and an increase in non-performing loans in the long run. The study also revealed that growing public debt increases the number of non-performing loans. Alexandri et al. (2015) in India and Hertrich (2015) in Germany find that liquidity leads to credit risk deterioration is a mutual belief, the data extracted from German and Swiss companies and the result reveals that liquidity risk is considerably more likely to be poorly integrated than credit risk. He also found a positive relationship between inflation and NPL and argued that when the inflation high then the real value of the outstanding loan is falls and raises the borrower's loan repayment capability.

Shrestha (2017) Investigated the effects of credit risk on the performance of Nepalese commercial banks from 2010 to 2015. Credit risk indicators included the non-performing loan ratio, cost per loan asset, and cash reserve ratio, while return on asset served as a performance and capital adequacy ratio indicator. Nepalese commercial banks, according to the assessment, have poor credit risk management. This is supported by a low 'capital adequacy ratio' and a negative 'non-performing loan ratio' coefficient. Because the 'capital adequacy ratio' yielded an insignificant result, it cannot be regarded as an influential measure of bank performance.

Waqas, Fatima et al. (2017) investigated the impact of banking regulations on the magnitude of NPLs in Bangladesh by using data from four nationalized business banks, five government-owned advancement budgetary institutions, 30 private business banks, and ten outside business banks from 1990 to 2005. According to the study, a reduction in credit quality, bad court performance, poor law enforcement, and out-of-court settlement all had a beneficial influence on NPLs. The only way to resolve this problem is for all parties concerned to work together, be sincere, and take responsibility.

El-Maude, Abdul-Rahman et al. (2017) assert that non-performing loans have an impact on banks' overall profitability and stability. Khan, Ahmad et al. (2017) explore the connection between nonperforming loans and macroeconomic and bank-specific factors the findings revealed that banks with a high-risk tolerance have a high level of NPLs and a country's growth. A bank's overall performance may be significantly impacted by the enormous volume of NPLs. Azar and Maaliki (2018) define a non-performing loan as the amount of a past-due loan that cannot be paid off within the agreed-upon timeframe. The essential quality is offered by the financial industry, state-owned organizations, and private businesses with a high credit risk.

Panta (2018) demonstrates that bank failure high non-performing loans, lending without consideration for markets, goods, or borrowers' creditworthiness, and excessive loan exposure to real estate are additional factors in Nepal. When their NPLs approached 50% and their net worth plummeted below Rs 10 billion, Nepal Bank Limited and RBBL were on the edge of collapse. The outcomes of the study will allow the NRB to develop regulations for regulating and monitoring commercial banks' credit risk management operations in Nepal.

Mukolu, Adeleke et al. (2020) used the data of fifty banks between 1994 and 2011 due to a huge quantity of non-performing loans. According to the Central Bank of Nigeria, the industry's non-performing loan net of provision to capital ratio increased significantly from 5.9 percent in December 2015 to 30.9 percent in June 2016, reflecting the sector's capacity to deal with the negative impact of non-performing loans, (NPL) jumped 150% from N649.63 billion in December 2015 to N1.679 trillion in June 2016.

Several studies macroeconomic factors play a substantial role in shaping the credit risk landscape for Islamic banks. Among the main macroeconomic factors influencing credit risk are inflation, economic growth, and interest rates. Economic downturns and high inflation periods can raise the risk of borrower defaults, which would increase Islamic banks' non-performing loans (NPLs) (Aslam, Ashraf, & Iqbal, 2022; Naili & Lahrichi, 2022). In addition, several prominent macroeconomic factors including GDP, inflation, government debt, and unemployment are the major factors that are affecting the credit quality of the bank (Abusharbeh, 2022; Aslam, Asif, Sultan, Nasir, & Iqbal, 2023; Khan & Aslam, 2018). Based on the above discussion the following hypothesis is formulated.

H1: Higher GDP reduces the credit risk in Islamic banks.
H2: Higher Inflation enhances the credit risk in Islamic banks.
H3: A higher unemployment rate enhances the credit risk in Islamic banks.
H4: A higher exchange rate reduces the credit risk in Islamic banks.
H5: A higher government debt enhances the credit risk in Islamic banks.
H6: Bank size moderates the relationship between macroeconomic factors and credit risk in Islamic banks.

3. Research Methodology

3.1. The data and variables measurement

The study used panel data from 10 Islamic windows and 5 full-fledged banks in Pakistan between 2011 and 2022. This study chose to use secondary data sources because it was more economical in terms of both time and money. This method made it easier to obtain high-quality data, including macroeconomic indicators and specific banks. The annual statement and macroeconomic indicator data gathered from World Bank indicators were the sources of the bank-related data.

The purpose of this article is to identify the significant macroeconomic determinants of credit risk in Pakistan. This study used NPL for the credit risk. Moreover, the macroeconomic variables include gross domestic product per capita (GDPC), Inflation, unemployment, government debt, and exchange rate. The detail of the variables is given in Table 1.

Table 1. Definitions of Variables

Variable	Notation	Measurement
Credit Risk	CR	The ratio of non-performing loans to net loans
Gross Domestic Product	GDP	All types of production in the country
Inflation	INF	Percentage change in regional (CPI)
Unemployment	UNEM	Unemployment rate in Country
Foreign exchange rate	FER	A percentage change in dollar currency against the Pak rupee.
Interest rate	IR	Average interest rates weighted on loans and advance
Government debt/sovereign debt	GDEBT	The general government gross debt to GDP ratio.
Bank size	BKS	Total assets of banks

3.2. Balanced panel data estimates

This study uses a balanced panel data model, which is consistent with previous research that mostly used multiple regression models taking into account both macroeconomic and bank financial characteristics. The goal is to identify the factors that influence credit risk by combining cross-sectional data collected over a given period. The rationale behind the utilization of panel data analysis is its ability to mitigate multicollinearity concerns and augment the quantity of data observation points, consequently augmenting the strength and scope of the examination of the variables impacting credit risk. In this regard, this study employed the Generalized Method Moment (GMM) estimation technique. Thus, the regression equation is specified as follows:

$$CR_{it} = \beta_{\circ} + \beta_1 CR_{it-1} + \beta_2 GDP_{it} + \beta_3 INF_{it} + \beta_4 UEMP_{it} + \beta_5 EXR_{it} + \beta_6 GDEBT_{it} + \varepsilon_{it} - - - I$$

$$CR_{it} = \beta_{\circ} + \beta_1 CR_{it-1} + \beta_2 GDP_{it} * BKS_{it} + \beta_3 INF_{it} * BKS_{it} + \beta_4 UEMP_{it} * BKS_{it} + \beta_5 EXR_{it} * BKS_{it} + \beta_6 GDEBT_{it} * BKS_{it} + \varepsilon_{it} - - - 2$$

In above models 1 & 2, i represents the Islamic banks, t represents the years, and CR represent the credit risk. GDP represents the gross domestic product; INF represents the inflation rate; UEMP represents the unemployment rate; EXR represents the exchange rate; GDEBT represents the Government debt; BKS represents the bank size; and ε represents the error term.

3.3. Descriptive Statistics

Table 2 describes the summary of the dependent and explanatory variables. The minimum value of NPL is 0.0002, the highest limit is 0.4923, and the mean value is 0.079148. 0.095907 is the standard deviation. The GDP growth rate minimum value is 1164.979, the highest value is 148.213 while the standard deviation is 0.000365 and the mean value is 1297.284. The inflation rate figure is 111.9161 while the highest is 200.079 and the SD value is 0.0051868, which is a little high. The interest rate's mean value is 4.201, the lower figure is -4.37 while higher figure is 8.16 while SD is very low which is 0.007747 which is very low. The unemployment rate's lowest figure is 0.8 while the highest figure is 4.83 and S.D is 0.043273. The mean value of Unemployment is 3. 0225. The debt minimum value is 60.1 while the maximum value is 84.8 and the SD is 0. 011498. The mean value of debt is 66.8. The maximum value of Domestic credit is 18.82982 while the minimum value is 15.38607 and S.D is 0.021977 while the mean is 16.9806.

Table 2 Descriptive Matrix of variable

Variable	Observation	Mean	Std. Err.	Max	Min
Credit risk	180	1297.28	0.00037	1482.21	1164.98
GDP	180	150.879	0.00517	200.079	111.916
Inflation	180	3.0225	0.04327	4.83	0.8
Unemployment rate	180	55.0636	0.02143	62.3782	48.1001
Exchange rate	180	66.8	0.0115	84.8	60.1
Government debt	180	16.9806	0.02198	18.8298	15.3861
Interest rate	180	4.201	0.00775	8.16	-4.37
Bank size	180	0.07915	0.09591	0.4923	0.0002

3.4. Correlation Matrix

Table 3 describes the Pearson correlation coefficients of Islamic banks and Islamic windows with the credit risk and macroeconomic determinants. Most of the macro determinants variables have a negative correlation with credit risk and having positive correlation with all other variables. Hence, there is no serial co-relationship exists between them because all values are less than 0.8

Table 3. Correlation Matrix

Variables	Credit risk	GDP	inflation	unemployment rate	Exchange rate	Government debt	interest rate	bank size
Credit risk	1							
GDP	-0.1349	1						
inflation	-0.0265	0.5823	1					
unemployment rate	-0.1454	0.633	0.2764	1				
Exchange rate	-0.1287	0.6823	0.3953	0.7872	1			
Government debt	-0.1448	0.7451	0.4013	0.6592	0.7625	1		
interest rate	-0.1401	0.7079	-0.0783	0.7902	0.6862	0.5122	1	
bank size	-0.0768	0.3526	0.1608	0.2401	0.2093	0.2771	0.2643	1

3.5. Heteroscedasticity Result

The Likelihood Ratio (LR) was used in the study to test for panel-level heteroscedasticity, as indicated in Table 4. The chi-square result for the ratio test was = 0.0000 as the p-value of the null hypothesis of the test, that the error variance was homoscedastic, was represented by the chi-square value. Because the probability was statistically significant at the 1% level, the null hypothesis of constant variance was rejected, demonstrating the

presence of heteroscedasticity in the study data. As a result, the GMM estimation approach was used in the study to address this issue.

Table 4. Likelihood Ratio

Likelihood-ratio test LR = -178.9191	
(Assumption: homosk nested in hetero)	Prob> chi2 = 0.0000

5. Results and Discussion

As presented in Table 5, both the second-order autocorrelation AR (2) and the Hansen J-statistics of over-identifying restrictions are statistically insignificant and exhibit a good fit, These results suggest that the instruments used in the GMM estimation are valid. Moreover, the coefficient of lag credit risk variable has negative and significant effects on the credit risk in Islamic banks. This means that every 1% increase in credit risk in the last year will decrease the credit risk of the current year. The results are parallel with the findings (Priyadi, Utami, Muhammad, & Nugraheni, 2021). GDP has a negative and significant relationship with credit risk in terms of non-performing loans. The results indicate that as the GDP of the country increases it decreases the credit risk in banks. The present results support the findings (Abusharbeh, 2022) in Palestine.

Table 5: GMM estimation determinants of credit risk

Variable	Credit risk	Credit risk with Interaction
Credit risk	-0.0229911***	-0.103365***
Gross domestic product (GDP)	-0.0017089**	-0.205168**
Inflation	0.0119039**	0.043273***
Unemployment rate	0.1837223***	0.121434**
Exchange rate	-0.0915571*	-0.011498***
Government debt	0.0229911***	0.021977***
Interest rate	0.0290431*	0.143273**
Constant	11.06411***	9.03214***
N. of observations	180	180
AR (1) test statistics (p-value)	0.0371	0.0345
AR (2) test statistics (p-value)	0.5570	0.544

Inflation has a positive and significant relationship with credit risk in terms of NPL. Thus, H2 is accepted. The present results are parallel to the findings of (Naili & Lahrichi, 2022), Who stated that banks suffer from high inflation. This result shows that higher inflation often leads to an increase in interest rates set by central banks to control inflationary pressures. As interest rates rise, borrowing costs for businesses and individuals also increase which leads to low production and slow purchasing. Unemployment has a positive but insignificant relationship with credit risk in Islamic banks. Thus, H3 is rejected. The exchange rate has a negative and significant relationship with the credit risk of Islamic banks. Therefore, H4 is accepted. These results are in line with the findings (Abusharbeh, 2022) in Palestine. The present results depict that depreciation of the local currency exchange rate raises the cost of servicing debt denominated in foreign currencies, which could put borrowers in danger of running out of money. Additionally, it affects export-oriented companies, which stand to gain from a declining local currency as their products become more competitive in overseas markets. On the other hand, a weaker currency might result in increased costs for importers.

Government debt has a positive and significant relationship with the credit risk of banks. The present results support the findings of (Priyadi, Utami, Muhammad, & Nugraheni, 2021) in Indonesia. These results present that when the government absorb a large portion of the funds that are accessible, borrowing may be

crowded out. This might make credit less accessible to both individuals and enterprises, which might result in a decline in economic activity. Moreover, A decline in economic activity may affect businesses' cash flows and raise the possibility of loan defaults, which ultimately increase the credit risk in Islamic banks. Lastly, the interest rate has a positive and significant relationship with the credit risk of Islamic banks. Thus, H5 is accepted. The present results are in line with the findings of (Abusharbeh, 2022). The present results stated that high-interest rates increase, and both individuals and enterprises find borrowing more expensive. Because of this, borrowers might find it difficult to make their current debt payments, which raises the risk of default. As interest costs rise, businesses may see a decline in profitability, which will affect their capacity to pay off debt as a result it increases the credit risk in banks.

As for the proposed moderating effects in this study, large-size banks play moderating roles between macroeconomic determinants and credit risk in banks. Thus, larger banks are usually better equipped to handle more diverse and sizable loan portfolios. Diversification can help spread risk and lessen the impact of unfavourable developments in any particular sector by spanning different industries, geographical areas, and loan types. Moreover, larger banks can perform more thorough credit assessments because they typically have more advanced risk management systems and access to more data. They might use specialized teams with industry expertise and experience to assess borrowers' creditworthiness, which would improve the accuracy of risk assessments.

5. Conclusion

The goal of this study is to analyse the key macroeconomic factors that affect the credit risk of Islamic banks in terms of non-performing loans (NPLs). The study uses secondary data from 5 full-fledged Islamic banks and 10 Islamic windows from the period from 2010 to 2022 in Pakistan. This study employed the Generalize Method of Moment (GMM) estimation technique to count the heteroskedasticity and potential endogeneity issue that is avoided in the OLs regression. The results of this study stated that an increase in gross domestic product and exchange rate has a positive and significant relationship with credit risk in Islamic banks. On the other side increments in inflation, unemployment rate, and government debt spur the ratio of credit risk in Islamic banks. Moreover, we find that bank size plays a moderating role in between macroeconomic factors and credit risk in Islamic banks.

The findings of this study will be beneficial for the management and emphasize how crucial it is for financial institutions to put strong risk management procedures in place. Banks can be protected against possible credit risks by emphasizing scenario assessment, stress testing, and continual surveillance. Given that specific factors management can have an impact on credit risk, banks may want to strategically diversify their loan portfolios. Exposure to a variety of sectors, geographical areas, and loan kinds should be balanced to reduce concentration risk and improve portfolio resilience overall. Besides this, the knowledge of the significance of ongoing observation of economic conditions is highlighted by the impact of macroeconomic indicators on credit risk.

Financial institutions and central banks should maintain vigilance and adapt their policies and tactics in response to changing macroeconomic trends. Lastly, the responsible authority should implement effective macroeconomic policies to avoid the problem of bad loans, as well as better risk management systems, lending policies, and efficient borrower monitoring systems with a check for information symmetry to cure the problem of bad loans. Credit regulations that are vigilant and aggressive would include suitable client screening and punishment processes, as well as retrieval legislation. This study is limited in specific to the Islamic banks and Islamic windows. Thus, future studies can compare it with conventional banks and check this impact across the country.

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