

COMPARATIVE ANALYSIS OF FACTORS EFFECTING CREDIT RISK IN ISLAMIC AND CONVENTIONAL BANKS OF PAKISTAN: A GMM BASED APPROACH

Zahir Hussain Shah**

Abstract

This paper examines the relation between bank-specific variables and macroeconomic indicator towards credit risk. To determine this relationship, use dynamic panel data GMM method to find which factors affecting credit risk in Pakistani banks. The panel data is collected from 4 fully fledged Islamic banks and 5 conventional banks which have Islamic business window from 2011 to 2021, taking macroeconomic variable, GDP Growth, unemployment rate and inflation rate, bank-specific variable such as diversification, capital adequacy ratio, size, return on asset and total asset with log. Credit risk is computed by non-performing finance which is dependent variable. Various techniques and econometric tools used to find which variable positively affects credit risk (NPF). In order to effectively manage credit risk, it is hoped that the findings will highlight factors affecting credit risk in Islamic banks.

Keywords: Credit Risk, Islamic Banking, Conventional Bank, Bank Specific Variable, GMM.

1. INTRODUCTION

In Pakistan Islamic banking start from 2002 which is very short period, but now Islamic banking sector is growing rapidly in Pakistan even some banks are converting their operations into Islamic mode to see, which banks is stable to maintain credit risk (Non-Performing Finance). We do comparative analysis to find which factors affect the Credit Risk Management of Islamic bank of Pakistan. Credit risk is also affected by the possibility of payment delays, cancellations, or defaults on the side of counterparties.

To facilitate the growth of the Islamic economy, ensure the most efficient use of resources and a fairer distribution of wealth, and promote the spread of Islamic banking principles were the key motivations for the creation of Islamic banks (Al Rahahleh et al., 2019). The main difference between IBs and CBs is that IBs do not engage in interest (*Riba*), uncertainty (*Gharar*), or gambling as part of their business (*Maysir*). Interest of any kind is forbidden in Islam and is therefore deemed haram. The bank includes both material and nonmaterial kinds of gain (non-permissible). Haryono et al., (2016) Islamic financial institutions nevertheless have a big difficulty with problematic fundraising. When it comes to credit losses, Islamic banks are more at risk since they employ so many kinds of finance. Credit risk is also affected by the possibility of payment delays, cancellations, or defaults on the side of counterparties.

1.2. Islamic Banking in Pakistan

In Pakistan, there are several Islamic financial institutions. Pakistan has had an established financial system since independence, however Islamic banking is a relatively new phenomenon in Pakistan. As Pakistan's first Islamic bank, Meezan Bank Limited was granted a banking license and opened its doors in 2002 with five branches. Currently, in Pakistan there are 6 full fledged Islamic banks and 16 conventional banks providing Islamic banking services through specialized windows, both of which provide financing choices in accordance with Shariah law (IB Bulletin Jan to Mar, 2026). Strengthening the Shariah and legal systems, and fostering global collaboration have all been the goals of these endeavors, among others.

2. LITERATURE REVIEW

Ariffin et al., (2009) There is a literature survey credit risk may be broken down into two broad categories, systematic risk factors and unsystematic risk factors, according to a review of the relevant scholarly literature (idiosyncratic). Haryono et al., (2016) suggests that shifts in political goals, shifts in political leadership, and changes

*Corresponding Author, JS Bank, Karachi. Email: zahirshah199229@gmail.com



License Type: CC-BY

This article is open access and licensed under a Creative Commons Attribution 4.0 International License.
Published bi-annually by © Sindh Madressatul Islam University (SMIU) Karachi.

in macroeconomic conditions are all examples of the systematic elements at play. Contrarily, unsystematic elements are more client-centric and include things like clients' unique personalities, the strength of their financial positions, the availability of credit, and the terms and conditions under which they transact (Haryono et al., 2016). Most empirical studies, as stated by (Fakhrunnas, 2019), look on how the state of the economy impacts credit risk. Particularly, sources like (JAKUBÍK -Czech National Bank, 2007; Jiménez & Salas, 2004; Rinaldi & Sanchis-Arellano, 2006), others, concentrate their studies on the role of macroeconomic variables in the evolution of credit risk and stress the need of include these variables in the analysis due to their disproportionate weight in the outcome can bring up a variety of relevant studies (Haryono et al., 2016). Credit risk is a topic that has received a lot of attention in banking literature. Numerous research has highlighted features that are unique to certain financial institutions.

Berger et al., (1997) and Jiménez & Saurina (2004) have examined the impact of internal bank factors on credit risk (Ahmad et al., 2007). The latter school of thought recognizes both random and planned sources of credit risk. Impact of macroeconomic factors and bank-specific variables on bank credit risk; examples include (Ariffin et al., 2009; Moussa, 2015). Al Rahahleh et al., (2019b) Islamic banks operate under one set of standards for dealing with risk, while Islamic financial organizations operate under an altogether separate set of norms. Researchers have investigated the success of Islamic banks and referenced studies from places like Malaysia and Indonesia as evidence. The purpose of this research is to examine the factors affecting bank profitability and the banking industry (Ghosh et al., 2020; Siddique et al., 2022), with special attention to the role played by macroeconomic variables (Hassan and Bashir, n d; Ali et al., 2011). Fakhrunnas (2019) provided data to support their argument that there is a long-term link between macroeconomic indicators and risk-taking behavior in the banking business. According to the findings of Islamic banks are less vulnerable to the consequences of macroeconomic shocks. Credit risk analysis confirmed this to be the case (Delis, 2005).

Further, Fakhrunnas (2019) and al Rahahleh et al., (2019b) used time-series data to evaluate the protracted impact of insolvency risk on macroeconomic indices. Their research revealed that in the long run, macroeconomic metrics like GDP in Indonesia were linked to a company's propensity to go bankrupt. The more equity capital a company has in relation to its total assets, the worse off the banking industry is (Duho & Onumah, 2019). To offset the greater risk they take on, according to Ariffin et al., (2009) Islamic banks keep larger reserves of equity than their conventional counterparts. Additionally, banks will be obliged to participate in more equity capital, which will balance out the increasing lending risks that banks are exposed to found that banks with more equity capital on hand were better equipped to mitigate default risks when making loans. There is a great deal of diversity in the empirical results, that examines internal determinants typically employs variables such as size, capital, and risk management (Ali et al., 2011). Growing businesses tend to be more profitable, at least to some extent, according to the available evidence (Ghosh et al., 2020).

However, huge institutions may suffer from the size effect for several reasons, including increased bureaucratic red tape. to identify a favorable and statistically significant relationship between bank size and financial success. It is hypothesized that the extent to which financial, legal, and other difficulties (such as corruption) impair banks' profitability is inversely proportional to the size of the organization (Molyneux & Thornton, 1992). Furthermore, the author of (Ali et al., 2011) argues that a bank's proper capital is highly correlated with its size. The reason being that larger banks may attract cheaper funding, making them appear more successful. They all connect bank size to capital adequacy, which they assert is positively correlated with bank size, suggesting that as bank size increases, profitability does as well, particularly for smaller and medium-sized institutions.

3. RESEARCH METHDOLOGY

The quantitative research methodology is used in this study as secondary data of 11 years (2011-2021). Data set is balanced panel data which collect form 4 full fledge Islamic banks and 5 Islamic business unit bank (windows) in conventional banks operating in Pakistan. Using GMM approach, regression, and different econometric tools for testing data.

3.1. Description of Variables

3.1.1. Macro-Economic Indicator

GDP growth provides information about the economic development of a country. Increasing in GDP growth of country impact positively to repayment of loans. The unemployment rate shows how economic conditions affect people's ability to pay back loans. unemployment rate which has a positive impact on the problem loans. The country's ability to repay debt is impacted by the rate of inflation, which indicates an increase in the general price level of goods and services called inflation and decrease in repayment capacity is increase in inflation rate.

3.1.2. Financing Growth and RoA

In financing growth credit risk may be found in the concept of agency costs theory (Haryono et al., 2016). In a bank high growth of financing can reduce the quality of its financing. Change of loan is financing growth of each bank. ROA indicates that a bank can effectively manage its credit risk and keep its credit portfolio under supervision. It has also been argued that, since they are under less pressure to generate money, wealthier banks may be more willing to make riskier loan proposals. This is because there is less pressure on prosperous banks to continue making profits (Boudriga et al., 2009).

3.1.3. Capital Adequacy Ratio and Efficiency

The capital adequacy ratio is estimate from bank's ability to take high risk with maintain his financial stability (Boudriga et al., 2009). Koehn & Santomero (1980). Financial institutions with high capital adequacy ratios provide a safer environment for deposits. A bank's efficiency is by comparing its operating expenditures to its net income (Haryono et al., 2016). Unqualified managers in the loan acceptance and monitoring departments can damage a bank's reputation and encourage more hazardous for bank credit risk quality.

3.1.4. Size and Diversification

To get a sense of how big a bank is, how much money banks had that year. The probability of bad financing, often known as credit risk, is expected to decrease as a bank grows larger (Haryono et al., 2016). Bank Diversification opportunities are proxy by the proportion of a bank's total income that comes from sources other than loan interest is another indicator of its potential for diversification. the proportion of a bank's revenues that come from sources other than interest is shown by the ratio of non-interest revenue to total income (Louzis et al., 2012).

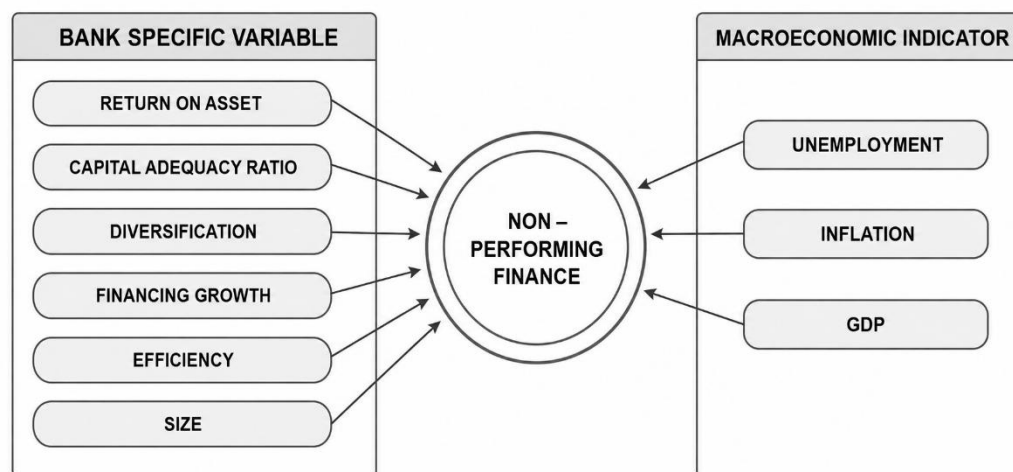
3.1.5. Non-Performing Finance

Finance alternatives provided by Islamic banks include profit and loss sharing, debt-based funding, and supplementary funding. Credit risk is assumed to be much greater for equity-based financing (PLS) in hypothesis (Moussa, 2015). An alternative measure of credit risk is "non-performing financing," often known as "NPF" Non-performing finance (NPF) is a measure of credit risk that is calculated as the proportion of all financing (Haryono et al., 2016).

3.2. Conceptual Framework

According to the relationship of variables (Figure 3.1), there is following conceptual framework show the relation of bank specific variable and Macroeconomic indicator towards non-performing finance.

Figure 3.1: Conceptual Framework



3.3. Model

These are the initial model of this research which regress independent variable on the dependent variable ap per its conceptual framework which was establish in the previous section.

Model for Conventional Bank

$$NPF_t = \alpha + \beta_1 ROA_t + \beta_2 CAR_t + \beta_3 G_t + \beta_4 SIZE_t + \beta_5 DIV_t + \beta_6 EFF_t + \beta_7 INF_t + \beta_8 UEMP_t + \beta_9 GDP_t + \mu_t \quad (\text{Eq. 1})$$

Where:

NPF is non-performing finance in percentage.

RoA is Return on asset in percentage.

CAR is Capital adequacy ratio in percentage.

G is Finance growth in percentage

SIZE is in percentage.

DIV is diversification in percentage.

EFF is efficiency in percentage.

INF is inflation rate in percentage.

UEMP is unemployment rate in percentage.

GDP is growth domestic product in percentage.

β_1 to β_9 slopes

μ is error term

According to the literature review of prior studies Return on asset (β_1) is negative affect to credit risk (NPF). The coefficient of capital adequacy ratio (β_2) also negative affect with credit risk, growth (β_3) is positively related with credit risk. The coefficient of Size (β_4) and diversification (β_5) both are negative related with NPF. The coefficient of Efficiency (β_6), inflation (β_7) and unemployment (β_8) is positively related with credit risk (NPF). The coefficient of Gross domestic product (β_9) is negative related with credit risk (NPF).

4. DATA ANALYSIS AND FINDINGS

Descriptive statistics and data normality are first investigated using descriptive analysis (Kurtosis, Skewness, and Jarque-Bera probability), followed by the Panel Unit root test, Correlation, Regression analysis, and Generalized methods of moments for find variables relations. All statistical tests are run using Econometric software (E-views 10).

4.1. Econometric Test and Techniques For Model 1

4.1.1. Descriptive Analysis

Initially descriptive statistics test for the variables is shown in Table 4.1. To find data normality. NPF J-B p-value is < 0.05 , then applied logarithm for data normality then skewness (1.37) and Kurtosis (7.43) also improved. ROA, EFF, and GDP are already normally distributed because J-B p-value is > 0.05 and their skewness, kurtosis is already normal. CAR J-B p-value < 0.05 means normally distributed and INF inflation also normally distributed, both variable skewness, kurtosis also normal. DIV variable is not normally so applied diagnostic test then find J-B P-value < 0.05 then skewness (0.95), kurtosis (4.82). UEMP variable J-B P-value < 0.05 , so after diagnostic test data is not distributed normally. SIZE variable is not normally distributed because their J-B p-value < 0.05 so applied diagnostic test their p-Value is remain > 0.05 but skewness and kurtosis are better. G variable is not normally distributed but there is negative value in data logarithm not applied also same treat GDP. According to Descriptive statistics test statistical model is revised which is equation 2.

$$\log(NPF_i) = \alpha + \beta_1 ROA_i + \beta_2 \log(CAR_i) + \beta_3 G_i + \beta_4 \log(SIZE_i) + \beta_5 \log(DIV_i) + \beta_6 EFF_i + \beta_7 INF_i + \beta_8 \log(UEMP_i) + \beta_9 GDP_i + \mu_i \quad (\text{Eq. 2})$$

Table 4.1: Descriptive Statistics

	ROA	SIZE	UEMP	DIV	G	GDP	INF	CAR	NPF	EFF
Mean	0.011	8.886	3.179	1.206	0.224	0.039	0.074	0.167	0.105	0.555
Median	0.010	9.170	3.570	0.960	0.102	0.044	0.076	0.161	0.068	0.525
Maximum	0.026	9.610	4.352	4.650	8.186	0.061	0.119	0.252	1.221	0.802
Minimum	0.003	5.670	0.800	0.380	-0.890	-0.013	0.025	0.116	0.019	0.408
Std. Dev.	0.005	1.004	1.136	0.749	1.105	0.020	0.030	0.031	0.166	0.096
Skewness	0.563	-2.645	-0.879	3.014	6.965	-1.395	-0.214	0.774	5.841	0.677
Kurtosis	2.631	8.453	2.438	13.509	50.830	4.532	1.672	2.943	38.813	2.680
Jarque-Bera	3.223	132.291	7.809	336.397	5687.593	23.233	4.461	5.503	3252.095	4.437
Probability	0.199	0.000	0.020	0.000	0.000	0.000	0.107	0.063	0.000	0.108

4.1.2. Stationarity Test

To find out if the variables have a unit root, the Augmented Dickey Fuller (ADF) panel unit root test is applied on data (see Table 4.2).

Table 4.2: Panel Unit Root Test (ADF)

Variable	Level	1 st Difference	2 nd Difference
LCAR	0.365	0.098	0.008
LDIV	0.024	-	-
LNPF	0.162	0.000	-
LSIZE	0.937	0.000	-
ROA	0.281	0.001	-
GDP	0.005	-	-
G	0.000	-	-
EFF	0.066	0.000	-
INF	0.479	0.025	-
LUEMP	0.338	0.000	-

To see the probability (P-value) of all variables at 5% to find stationarity of data, ADF panel unit root test of all variables, LCAR is significant in 2nd difference means data is stationary, LDIV significance at level, LNPF variable are significant at 1st difference. log SIZE stationary on 1st difference. ROA is significant at 1st difference also LUEMP. GDP and G are significant at level, EFF, INF is significant at 1st difference. The research equation is revised after ADF unit root test following equation 3.

$$\log d(NPF_t) = \alpha + \beta_1 d(ROA_t) + \beta_2 \log d_2(CAR_t) + \beta_3 G_t + \beta_4 \log d(SIZE_t) + \beta_5 \log(DIV_t) + \beta_6 d(EFF_t) + \beta_7 d(INF_t) + \beta_8 \log(UEMP_t) + \beta_9 GDP_t + \mu_t \quad (\text{Eq. 3})$$

4.1.3. Correlation Analysis

To diagnose collinearity in the data, the partial correlation between explanatory variables is initially examined. Correlation test is used to check relationship between variables there are two variables are highly correlated to each other log size and log unemployment variable. Rest of variables also correlated to each other. In different variables like CAR, DIV, NPF applied diagnostic test for normal distribution of data (see Table 4.3).

Table 1.3: Correlation

	LCAR	LDIV	LNPF	LSIZE	ROA	EFF	G	GDP	LUEMP	INF
LCAR	1									
LDIV	-0.282	1								
LNPF	-0.126	0.290	1							
LSIZE	0.523	-0.197	-0.007	1						
ROA	-0.029	-0.688	0.040	0.152	1					
EFF	-0.291	0.657	0.022	-0.329	-0.764	1				
G	0.137	0.061	0.059	0.078	-0.139	-0.092	1			
GDP	-0.214	0.102	-0.153	-0.008	0.016	-0.056	0.222	1		
LUEMP	0.444	0.087	-0.127	0.337	-0.429	0.162	0.121	0.123	1	
INF	0.032	-0.064	0.050	-0.059	-0.017	0.057	0.061	-0.529	-0.490	1

4.1.4. Regression Analysis

The results of this investigation were obtained by employing a pls model with a fixed effect and random effect (period). In table 4.4 estimated results are provided with random and fixed effect, also check autocorrelation with Durbin-Watson stat, adjusted R² values and check significance of model by F-statistic P-value. DV NPF, take D(LNPF), different models are run for better results, best model is shown at Table 4.4 for random effect used cross-section and period factor for results. Different regression models are also given in the appendix for more analysis.

Table 4.4: Regression Analysis

DV: LNPF	Pooled Ordinary Least Square Method		Fixed Effect		Random Effect	
Variable	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
CONSTANT	-3.632	-1.383	1.550	0.670	1.550	0.650
ROA	69.564	1.802***	66.928	1.973**	66.928	1.912
LCAR	-0.225	-0.322	-0.093	-0.113	-0.093	-0.110
LDIV	1.021	3.288*	0.325	1.075	0.325	1.043
LSIZE	0.111	0.136	-2.492	-3.193*	-2.492	-3.096*
LUEMP	0.098	0.316	0.464	1.770***	0.464	1.716***
G	0.093	1.061	-0.014	-0.198	-0.014	-0.192
GDP	-10.055	-1.818***	-5.439	-1.251	-5.439	-1.213
INF	-0.546	-0.119	2.942	0.816	2.942	0.791
EFF	-0.346	-0.205	-0.349	-0.247	-0.349	-0.239
Adjusted R ²	0.12		0.51		0.51	
F-statistic	0.081		0.000		0.000	
Durbin-Watson stat	1.52		2.07		2.07	

In this model DV LNPF and other variables are taken with differences and logarithm PLS model is not significant but fixed effect and random effect are significant, there F-stat P-value < 0.05 and there is no error of autocorrelation because D.W value more than (1.5) it accepted, R² is also good so overall conventional bank non-performing finance is affected by bank specific variable and macroeconomic factor because in Pooled ordinary effect, GDP, ROA, DIV these variables are significant as we compare in fixed effect in PLS model is accepted because of F-statistics p-value is significant less than 0.05, also autocorrelation is good (2.07). In random effect SIZE and UEMP is significant, model is also good macro-economic indicators coefficient is positive towards DV which is good for conventional banks.

4.1.5. GMM Dyanmic Panel Data Estimator

This research makes use of the dynamic panel data set to determine the most important elements that influence non-performing finance, Explanatory variable coefficient of return on asset positively related to non-performing finance, coefficient of log of capital adequacy ratio variable is negatively related credit risk (non-performing finance). The coefficient of log of SIZE variable is show negative relation same as Efficiency coefficient show but SIZE variable p-value is < 0.05 is significant. The coefficient LUEMP and inflation INF give a positive coefficient towards credit risk. Coefficient of LDIV is positively related whereas, coefficient of G and GDP is negatively related with DV. Autocorrelation is measured by D.W stat which (2.07) acceptable and R² also (0.51) also good, as seen in dynamic panel data estimator macroeconomic factor INF is positive because it reduces borrower repayment (see Table 4.5).

Table 4.5: GMM ESTIMATION RESULT

DV LNPF	2SLS Instrument Weighting Matrix	
VARIABLE	Coefficient	t-Statistic
CONSTANT	1.550	0.650
ROA	66.928	1.912***
LCAR	-0.093	-0.110
LDIV	0.325	1.043
LSIZE	-2.492	-3.096**
LUEMP	0.464	1.716***
G	-0.014	-0.192
GDP	-5.439	-1.213
INF	2.942	0.791
EFF	-0.349	-0.239
Adjusted R ²	0.51	
Durbin-Watson stat	2.07	

Note: *, **, *** indicate the significance level at 1, 5 and 10%.

Model for Islamic Bank

$$NPF_i = \alpha + \beta_1 ROA_i + \beta_2 CAR_i + \beta_3 G_i + \beta_4 SIZE_i + \beta_5 DIV_i + \beta_6 EFF_i + \beta_7 INF_i + \beta_8 UEMP_i + \beta_9 GDP_i + \mu_i \quad (\text{Eq. 4})$$

Where:

NPF is non-performing finance in percentage.

RoA is Return on asset in percentage.

CAR is Capital adequacy ratio in percentage.

G is Finance growth in percentage

SIZE is in percentage.

DIV is diversification in percentage.

EFF is efficiency in percentage.

INF is inflation rate in percentage.

UEMP is unemployment rate in percentage.

GDP is growth domestic product in percentage.

β_1 to β_9 slopes

μ is error term

According to the literature review of prior studies Return on asset (β_1) is negative affect to credit risk (NPF). The coefficient of capital adequacy ratio (β_2) also negative affect with credit risk, growth (β_3) is positively related with credit risk. The coefficient of Size (β_4) and diversification (β_5) both are negative related with NPF. The coefficient of Efficiency (β_6), inflation (β_7) and unemployment (β_8) is positively related with credit risk (NPF). The coefficient of Gross domestic product (β_9) is negative related with credit risk (NPF).

4.2. Econometric Test and Techniques For Islamic Banking

4.2.1. Descriptive Analysis

In this model DV LNPF and other variables are taken with differences and logarithm PLS model is not significant but fixed effect and random effect are significant, there F-stat P-value < 0.05 and there is no error of autocorrelation because D.W value more than (1.5) it accepted, R^2 is also good so overall conventional bank non-performing finance is affected by bank specific variable and macroeconomic factor because in Pooled ordinary effect, GDP, ROA, DIV these variables are significant as we compare in fixed effect in PLS model is accepted because of F-statistics p- value is significant less than 0.05, also autocorrelation is good (2.07). In random effect SIZE and UEMP is significant, model is also good macro-economic indicators coefficient is positive towards DV which is good for conventional banks (see Table 4.6).

Table 4.6: Regression Analysis

DV: LNPF	Pooled Ordinary Least Square Method		Fixed Effect		Random Effect	
Variable	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
CONSTANT	-3.632	-1.383	1.550	0.670	1.550	0.650
ROA	69.564	1.802***	66.928	1.973**	66.928	1.912
LCAR	-0.225	-0.322	-0.093	-0.113	-0.093	-0.110
LDIV	1.021	3.288*	0.325	1.075	0.325	1.043
LSIZE	0.111	0.136	-2.492	-3.193*	-2.492	-3.096*
LUEMP	0.098	0.316	0.464	1.770***	0.464	1.716***
G	0.093	1.061	-0.014	-0.198	-0.014	-0.192
GDP	-10.055	-1.818***	-5.439	-1.251	-5.439	-1.213
INF	-0.546	-0.119	2.942	0.816	2.942	0.791
EFF	-0.346	-0.205	-0.349	-0.247	-0.349	-0.239
Adjusted R2	0.12		0.51		0.51	
F-statistic	0.081		0.000		0.000	
Durbin-Watson stat	1.52		2.07		2.07	

Note: *, **, *** indicate the significance level at 1, 5 and 10%.

4.1.5. GMM Dyanmic Panel Data Estimator

This research makes use of the dynamic panel data set to determine the most important elements that influence non-performing finance, Explanatory variable coefficient of return on asset positively related to non-performing finance, coefficient of log of capital adequacy ratio variable is negatively related credit risk (non-performing finance). The coefficient of log of SIZE variable is show negative relation same as Efficiency coefficient show but SIZE variable p-value is < 0.05 is significant. The coefficient LUEMP and inflation INF give a positive coefficient towards credit risk. Coefficient of LDIV is positively related whereas, coefficient of G and GDP is negatively related with DV. Autocorrelation is measured by D.W stat which (2.07) acceptable and R^2 also (0.51) also good, as seen in dynamic panel data estimator macroeconomic factor INF is positive because it reduces borrower repayment (see Table 4.7).

Table 4.7: GMM Estimation Result

DV LNPF	2SLS Instrument Weighting Matrix	
VARIABLE	Coefficient	t-Statistic
CONSTANT	1.550	0.650
ROA	66.928	1.912***
LCAR	-0.093	-0.110
LDIV	0.325	1.043
LSIZE	-2.492	-3.096**
LUEMP	0.464	1.716***
G	-0.014	-0.192
GDP	-5.439	-1.213
INF	2.942	0.791
EFF	-0.349	-0.239
Adjusted R2	0.51	
Durbin-Watson stat	2.07	

Note: *, **, *** indicate the significance level at 1, 5 and 10%.

Model for Islamic Bank

$$NPF_t = \alpha + \beta_1 ROA_t + \beta_2 CAR_t + \beta_3 G_t + \beta_4 SIZE_t + \beta_5 DIV_t + \beta_6 EFF_t + \beta_7 INF_t + \beta_8 UEMP_t + \beta_9 GDP_t + \mu_t \quad (\text{Eq. 4})$$

Where:

NPF is non-performing finance in percentage.

RoA is Return on asset in percentage.

CAR is Capital adequacy ratio in percentage.

G is Finance growth in percentage

SIZE is in percentage.

DIV is diversification in percentage.

EFF is efficiency in percentage.

INF is inflation rate in percentage.

UEMP is unemployment rate in percentage.

GDP is growth domestic product in percentage.

β_1 to β_9 slopes

μ is error term

According to the literature review of prior studies Return on asset (β_1) is negative affect to credit risk (NPF). The coefficient of capital adequacy ratio (β_2) also negative affect with credit risk, growth (β_3) is positively related with credit risk. The coefficient of Size (β_4) and diversification (β_5) both are negative related with NPF. The coefficient of Efficiency (β_6), inflation (β_7) and unemployment (β_8) is positively related with credit risk (NPF). The coefficient of Gross domestic product (β_9) is negative related with credit risk (NPF).

4.2. Econometric Test and Techniques For Islamic Banking

4.2.1. Descriptive Analysis

Descriptive statistics for the variables of Islamic banking is shown in Table 4.8. NPF J-B p-value is < 0.05 , then applied logarithm for data normality then p- value (0.23) is normally distributed and skewness (0.07) and Kurtosis (1.75) also improved. ROA is normally distributed because J-B p-value is > 0.05 . GDP is not normally distributed, EFF variable applied diagnostic test, then their p-value (0.16) > 0.05 and kurtosis, skewness also better. CAR variable J-B p-value < 0.05 then take logarithm but data not normally distributed and INF inflation variable normally distributed, both variable skewness, kurtosis also normal. DIV variable is not normally so applied diagnostic test then find J-B p-value < 0.05 then skewness (-1.11), kurtosis (3.56). UEMP variable J-B

p-value < 0.05, so after diagnostic test data is not distributed normally same as SIZE variable. G variable is not normally distributed but there is negative value in data logarithm not applied also same treat GDP. According to Descriptive statistics test statistical model is revised which is equation 5.

$$\log(NPF_t) = \alpha + \beta_1 ROA_t + \beta_2 \log(CAR_t) + \beta_3 G_t + \beta_4 \log(SIZE_t) + \beta_5 \log(DIV_t) + \beta_6 \log(EFF_t) + \beta_7 INF_t + \beta_8 \log(UEMP_t) + \beta_9 GDP_t + \mu_t \quad (\text{Eq. 5})$$

Table 4.8: Summary of Statistics

	ROA	CAR	EFF	INF	UEMP	SIZE	G	GDP	NPF	DIV
Mean	0.005	3.674	0.041	0.074	3.179	6.812	0.239	0.039	0.050	0.045
Median	0.005	0.152	0.037	0.076	3.570	6.981	0.187	0.044	0.039	0.033
Maximum	0.017	17.820	0.097	0.119	4.352	8.545	0.993	0.061	0.163	0.235
Minimum	-0.009	0.101	0.022	0.025	0.800	4.769	-0.103	-0.013	0.014	0.000
Std. Dev.	0.005	6.288	0.018	0.030	1.138	1.361	0.225	0.020	0.034	0.050
Skewness	-0.077	1.267	1.668	-0.214	-0.879	-0.090	1.091	-1.395	1.105	1.948
Kurtosis	2.937	2.780	5.696	1.672	2.438	1.230	4.431	4.532	4.021	7.038
Jarque-Bera	0.051	11.872	33.734	3.569	6.247	5.802	12.497	18.587	10.876	57.727
Probability	0.974	0.002	0.000	0.167	0.043	0.054	0.001	0.000	0.004	0.000

4.2.2. Stationarity Test

Augmented Dickey Fuller (ADF) panel unit root test for Islamic model. It is shown in Table 4.9, LCAR variable is significant at 1st difference, LDIV, LEFF both are significant at level. LSIZE stationary at 1st difference. ROA is significant at level, LUEMP, G, GDP are significant at level. INF is significant at 1st difference. The research equation is revised after ADF unit root test following equation 6.

$$\log d(NPF_t) = \alpha + \beta_1 ROA_t + \beta_2 \log d(CAR_t) + \beta_3 G_t + \beta_4 \log d(SIZE_t) + \beta_5 \log(DIV_t) + \beta_6 \log(EFF_t) + \beta_7 d(INF_t) + \beta_8 \log(UEMP_t) + \beta_9 GDP_t + \mu_t \quad (\text{Eq. 6})$$

Table 4.9: Panel Unit Root Test (ADF)

	Level	1st Difference	2nd Difference
LDIV	0.001	-	-
G	0.001	-	-
GDP	0.010	-	-
LNPF	0.429	0.023	-
LEFF	0.029	-	-
LSIZE	0.823	0.000	-
LCAR	0.097	0.004	-
ROA	0.041	-	-
LUEMP	0.000	-	-
INF	0.467	0.037	-

4.2.3. Correlation

To diagnose collinearity in the data, the partial correlation between explanatory variables is initially examined. Correlation test is used to check relationship between variables. There are two variables that are highly correlated to each other log size and log unemployment variable. The rest of variables also correlated to each other. In different variables like UEMP, EFF, SIZE, CAR, DIV, NPF applied diagnostic test for normal distribution of data (see Table 4.10).

Table 4.10: Correlation Matrix

	LDIV	LEFF	LCAR	LNPF	LSIZE	LUEMP	G	GDP	ROA	INF
LDIV	1									
LEFF	0.482	1								
LCAR	0.191	-0.576	1							
LNPF	0.339	0.343	-0.157	1						

LSIZE	-0.667	-0.316	-0.415	-0.100	1					
LUEMP	-0.069	-0.188	-0.027	0.083	0.160	1				
G	-0.104	0.079	0.088	-0.081	-0.220	0.023	1			
GDP	-0.081	0.011	-0.029	-0.077	-0.011	0.123	0.251	1		
ROA	-0.180	-0.609	0.700	-0.387	-0.230	-0.042	0.040	-0.187	1	
INF	0.025	-0.118	0.050	0.008	-0.024	-0.490	-0.313	-0.529	0.250	1

4.2.4. Regression Test

In Islamic model regression analysis (Table 4.11), take dependent variable DD(LNPF), different models run but this model is good model for examine and others model are shown in appendix.

Table 4.11: Regression Test

DV: DDLNPF	Pooled Ordinary Least Square Method		Fixed Effect	
Variable	Coefficient	t-Statistic	Coefficient	t-Statistic
CONSTANT	-0.049	-0.229	-0.050	-0.218
DDL CAR	1.404	1.785***	1.394	1.656
DL DIV	0.165	2.088**	0.167	1.981***
DLEFF	0.192	0.307	0.225	0.332*
DDL SIZE	50.715	3.686*	50.754	3.448
DLUEMP	0.247	0.561	0.232	0.492
DDROA	-60.564	-2.414**	-59.547	-2.225**
DDINF	-3.383	-0.894	-3.399	-0.846
DG	-0.482	-0.988	-0.479	-0.922
GDP	2.224	0.438	2.300	0.427
Adjusted R2		0.41		0.34
F-statistic(P)		0.004		0.028
Durbin-Watson stat		2.91		2.93

Note: *, **, *** indicate the significance level at 1, 5 and 10%, respectively. Random effect is not applicable on the model as Random effects estimation requires number of cross sections > number of coefficients for between estimator for estimate of RE innovation.

Overall Islamic bank non- performing finance is affected by bank specific variable and macroeconomic factor because in Pooled ordinary effect, ROA, DIV, SIZE, CAR these variables are significant as we compare in fixed effect in PLS model is accepted because of F-statistics p- value is significant less than 0.05, also autocorrelation is better (2.93). In fixed effect SIZE and efficiency ROA variable is significant, model is also good macro-economic indicators coefficient is positive towards DV which is good for Islamic banks credit risk management.

4.2.5. GMM Dynamic Panel Data Estimator

In this Islamic model, table 4.12 explanatory variable coefficient of return on asset with 1st difference negatively related to non- performing finance, coefficient of log of capital adequacy ratio variable is positively related credit risk (non- performing finance). The coefficient of SIZE variable is showing positive relation same as log of diversification coefficient show but SIZE variable p-value is < 0.05 is significant. The coefficient of LUEMP and INF give positive coefficient towards credit risk (Boudriga et al., 2009). The coefficient of EFF is positively related whereas, coefficient of growth G and GDP is negatively related with DV. Macroeconomic factor INF is positively because it reduces borrower repayment efficiency which increases credit risk of Islamic banks.

Table 4.12: GMM Estiamtion Result

DV DLNPF VARIABLE	2SLS INSTRUMENT WEIGHTING MATRIX	
	Coefficient	t-Statistic
CONSTANT	-0.609	-2.092
DLCAR	1.759	1.770***
DLDIV	0.026	0.429
DDLEFF	-0.071	-0.257
DLSIZE	56.527	3.231**
DLUEMP	0.487	1.439
DROA	-66.886	-1.799***
DINF	0.487	0.129
DG	-0.469	-1.282
GDP	-1.654	-0.479
Adjusted R ²	0.25	
Durbin-Watson stat	2.28	

Note: *, **, *** indicate the significance level at 1, 5 and 10%.

5. DISCUSSION

In this study we use regression methos to examine the factors affecting the credit risk in Pakistani Islamic bank, used Generalized methods of moments to examine the relation of macro-economic factors and bank specific variable towards to non-performing finance. In Islamic bank have create positive impact on credit risk (NPF). Inflation and unemployment are positively related to increases credit risk of Islamic banking, from regressions analysis rapid expansion of non-performing financing by Islamic bank may lead positive in future in Pakistani Islamic banks but this analysis examine Pakistani Islamic banks have negative income which reflects negative financing towards credit risk management. Despite the various setbacks that confront the Islamic banks, there is evidence of a growing tendency. However, this growth may also culminate to enhanced practice in credit risk Management since the banks will gain depth in handling non-performing assets. is therefore a requirement for enhanced ways and means of risk evaluation in addition to the patterns to deal with the problems. This could comprise of the following: Enhanced matching of financing products to risk; Better monitoring commodities.

Conventional banks have created a positive impact on credit risk (NPF). Unemployment positively related to increases credit risk of conventional banking, GDP is created negative impact, which is good sign for conventional banking credit risk (NPF). Credit risk management for Conventional banking is good because as see bank specific variable is positive related to credit risk they earn more as compared to Islamic banks in Pakistan, Conventional banks appear to have better credit risk management techniques since their earning reflects more efficiency in this aspect. This may be due to their relatively more extended existence in the international and Gulf regional markets as well as understanding of the economic climate within the region more than the comparatively newer Islamic banking system. Some of the weaknesses might be that, as these banks gain experience and learn lessons from their experience then they may be able to improve their process of credit risk management, Policymakers and regulators can also play a vital role by promoting practices that enhance financial stability and reduce systemic risks in the banking sector. because Islamic banking is newly engaged in Pakistan, but we see their growth is increase day by day that is why credit risk management is also give positive impact towards macro-economic variable.

6. CONCLUSION

This study finds the result that this framework is useful for credit risk management of Pakistani Islamic banks and Conventional banks to improve their risk repayment framework. The provided empirical evidence on the key factors effecting credit risk in Pakistani Islamic banks as well as relationship between in a financing structure and credit risk, this study helps limited understanding on credit risk management of Pakistani Islamic banks insights of their credit risks, so limited literature on credit risk management framework. This study hasn't been done in Pakistan's Islamic banking credit risk management compared to conventional banking Islamic windows so this study would be act as a catalyst for other researchers for developing better and useful foundation for further research in this area. In addition, the findings may find that Islamic bankers and conventional bankers pursuing make better policies that in hence credit risk management practices for banks. Several contributions have policies and regulations which can be affect the results, so it is suggested to improve monetary policy feasible for overall economy, so credit risk management in Islamic bank and Conventional bank will more improve. As per previous research studies was limited for conventional banks and not more suitable for Islamic banks but this research is applied for both Islamic banks & Conventional banks by taking macroeconomic variable, in future this research model is used for doing comparison between conventional and Islamic banks by expanding sampling

size and number of years, so result will be more accurate and reliable. Moreover, this study related to only Pakistani banks, but this models also give idea to those country who transfer their banking sector into Islamic banks.

7. PRACTICAL IMPLICATIONS

The importance of developing a robust credit risk management framework for both Pakistani Islamic and conventional banks. Banks should use enhanced risk evaluation techniques that reflect individual macroeconomic indicators and correlation with credit risk. The scholars suggests that Islamic finance could be improved by fine-tuning the structure of the financing so that risk and possible defaults are managed properly. The empirical work should be considered by policymakers when developing measures that facilitate proper credit risk management. This ranges from having policies that will improve the abilities of the borrowers to understand financial issues as well as improving the polices that checks the monitoring on the banking institutions. To this end, the current supervisory and legal framework must promote the improvement of credit risk evaluation and risk management tools among the banks.

8. RECOMMENDATION AND LIMITATION

This research provides base for subsequent investigations in credit risk management and more especially in the difference between Islamic and conventional banking systems. Such studies in the future could increase the number of participants under study and accumulate data that would allow for a generation of more accurate results. It also challenges researchers to examine how the current credit risk management frameworks could be adopted to banks that are in the process of adopting Islamic banks as shown in the model above that can be used in different environments. This is limitations of the present study; the investigation is confined only to the banks of Pakistan; therefore, findings of this research cannot be generalized for the other countries or other banking systems. However, using the model is still quite abstract and its withstanding in different and distinct cultural or even economic environment remains to be seen.

References

- Ahmad, R., Ariff, M., & Skully, M. (2007). Factors Determining Mergers of Banks in Malaysia's Banking Sector Reform. *Multinational Finance Journal*, 11(1/2), 1–31. <https://doi.org/10.17578/11-1/2-1>
- al Rahahleh, N., Ishaq Bhatti, M., & Najuna Misman, F. (2019a). Developments in Risk Management in Islamic Finance: A Review. *Journal of Risk and Financial Management*, 12(1), 37. <https://doi.org/10.3390/jrfm12010037>
- al Rahahleh, N., Ishaq Bhatti, M., & Najuna Misman, F. (2019b). Developments in Risk Management in Islamic Finance: A Review. *Journal of Risk and Financial Management*, 12(1), 37. <https://doi.org/10.3390/jrfm12010037>
- Ali, K., Farhan Akhtar, M., & Zafar Ahmed, H. (2011). Bank-Specific and Macroeconomic Indicators of Profitability-Empirical Evidence from the Commercial Banks of Pakistan. In *International Journal of Business and Social Science* (Vol. 2, Issue 6). http://www.sbp.org.pk/f_links/index.asp
- Ariffin, N. M., Archer, S., & Karim, R. A. A. (2009). Risks in Islamic banks: Evidence from empirical research. *Journal of Banking Regulation*, 10(2), 153–163. <https://doi.org/10.1057/jbr.2008.27>
- Berger, A. N., Deyoung, R., Avery, B., Bauer, P., Benston, G., Burgess, J., Berg, A., Ferrier, G., Kane, S., Jacques, K., Jagtiani, J., Lang, B., Lutton, T., Lovell, K., Mason, J., Resti, A., Runkle, D., Shull, B., & Whalen, G. (1997). Problem Loans and Cost Efficiency in Commercial Banks. In *Journal of Banking and Finance* (Vol. 21).
- Boudriga, A., Boulila Taktak, N., & Jellouli, S. (2009). Banking supervision and nonperforming loans: a cross-country analysis. *Journal of Financial Economic Policy*, 1(4), 286–318. <https://doi.org/10.1108/17576380911050043>
- Delis. (2005). *Munich Personal RePEc Archive Bank-specific, industry-specific and macroeconomic determinants of bank profitability*.
- Duho, K. C. T., & Onumah, J. M. (2019). Bank diversification strategy and intellectual capital in Ghana: an empirical analysis. *Asian Journal of Accounting Research*, 4(2), 246–259. <https://doi.org/10.1108/AJAR-04-2019-0026>
- Fakhrunnas, F. (2019). The Effect of Macroeconomic and Bank-Specific Variables to Risk-Taking of Islamic Bank in Indonesia. *International Journal of Islamic Economics and Finance (IJIEF)*, 1(2). <https://doi.org/10.18196/ijief.129>
- Ghosh, R., Sen, K. K., & Riva, F. (2020). Behavioral determinants of nonperforming loans in Bangladesh. *Asian Journal of Accounting Research*, 5(2), 327–340. <https://doi.org/10.1108/AJAR-03-2020-0018>
- Haryono, Y., Ariffin, M., & Hamat, M. (2016). Factors Affecting Credit Risk in Indonesian Islamic Banks. *Journal of Islamic Finance*, 5(1).
- Hassan, M. K., & Bashir, A.-H. M. (n.d.). *Determinants of Islamic Banking Profitability*.

- JAKUBÍK -Czech National Bank, P. (2007). Macroeconomic Environment and Credit Risk. In *Czech Journal of Economics and Finance* (Vol. 57).
- Jiménez, G., & Salas, V. (2004). *Determinants of Collateral* *.
- Jiménez, G., & Saurina, J. (2004). Collateral, type of lender and relationship banking as determinants of credit risk. *Journal of Banking and Finance*, 28(9), 2191–2212.
<https://doi.org/10.1016/j.jbankfin.2003.09.002>
- Koehn, M., & Santomero, A. M. (1980). American Finance Association Regulation of Bank Capital and Portfolio Risk. In *Source: The Journal of Finance* (Vol. 35, Issue 5).
<http://www.jstor.orgURL:http://www.jstor.org/stable/>
- Louzis, D. P., Vouldis, A. T., & Metaxas, V. L. (2012). Macroeconomic and bank-specific determinants of non-performing loans in Greece: A comparative study of mortgage, business and consumer loan portfolios. *Journal of Banking and Finance*, 36(4), 1012–1027.
<https://doi.org/10.1016/j.jbankfin.2011.10.012>
- Molyneux, P., & Thornton, J. (1992). Determinants of European bank profitability: A note. In *Journal of Banking and Finance* (Vol. 16).
- Moussa, M. A. ben. (2015). The Relationship between Capital and Bank Risk: Evidence from Tunisia. *International Journal of Economics and Finance*, 7(4). <https://doi.org/10.5539/ijef.v7n4p223>
- Rinaldi, L., & Sanchis-Arellano, A. (n.d.). *N O. 5 7 0 / J A N U A R Y 2 0 0 6 HOUSEHOLD DEBT SUSTAINABILITY WHAT EXPLAINS HOUSEHOLD NON-PERFORMING LOANS? AN EMPIRICAL ANALYSIS*. http://ssrn.com/abstract_id=872528.
- Siddique, A., Khan, M. A., & Khan, Z. (2022). The effect of credit risk management and bank-specific factors on the financial performance of the South Asian commercial banks. *Asian Journal of Accounting Research*, 7(2), 182–194. <https://doi.org/10.1108/AJAR-08-2020-0071>

APPENDIX

CONVENTIONAL BANKS REGRESSIONS ANALYSIS MODEL – 1

MODEL - 1

DV: DLNPF	Pooled Ordinary Least Square Method		Fixed Effect		Random Effect	
Variable	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
CONSTANT	0.108	0.450	0.087	0.352	0.087	0.346
DROA	42.581	1.024	40.416	0.942	40.416	0.926
DLCAR	0.449	0.400	0.594	0.507	0.594	0.498
DLDIV	0.204	0.688	0.198	0.651	0.198	0.639
DLSIZE	-0.383	-0.267	-0.221	-0.144	-0.221	-0.141
DUEMP	0.280	1.762***	0.277	1.701***	0.277	1.672
G	-0.246	-3.339*	-0.272	-3.493*	-0.272	-3.432*
GDP	-3.921	-0.813	-3.430	-0.689	-3.430	-0.677
DINF	5.283	1.060	5.239	1.025	5.239	1.007
DEFF	0.248	0.174	0.261	0.179	0.261	0.176
Adjusted R ²	0.24		0.21		0.21	
F-statistic(P)	0.011		0.049		0.049	
Durbin-Watson	2.88		2.99		2.99	

MODEL – 2

DV: LNPF	Pooled Ordinary Least Square Method		Fixed Effect		Random Effect	
Variable	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
CONSTANT	-2.689	-1.331	-0.710	-0.420	-0.710	-0.401
ROA	36.273	0.873	65.963	2.019***	65.963	1.928***
CAR	-3.344	-0.828	-1.376	-0.307	-1.376	-0.293
DIV	0.356	2.052**	0.133	0.982	0.133	0.938
SIZE	0.041	0.355	-0.380	-3.353*	-0.380	-3.202*
UEMP	-0.013	-0.083	0.240	1.871***	0.240	1.787***
G	0.113	1.231	-0.015	-0.214	-0.015	-0.204
GDP	-10.474	-1.777***	-4.908	-1.104	-4.908	-1.054
INF	-1.966	-0.409	3.102	0.862	3.102	0.823
EFF	0.003	0.001	-0.017	-0.012	-0.017	-0.012
Adjusted R ²	0.02		0.51		0.51	
F-statistic(P)	0.330		0.000		0.000	
Durbin-Watson	1.39		2.03		2.03	

MODEL – 3

DV: DLNPF	Pooled Ordinary Least Square Method		Fixed Effect		Random Effect	
Variable	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
C	-0.056	-0.259	-0.372	-1.432	-0.372	-1.334
DLCAR	-0.470	-0.631	0.489	0.595	0.489	0.555
DLDIV	-0.045	-0.777	-0.020	-0.356	-0.020	-0.331
DLEFF	0.806	2.271**	0.720	2.112**	0.720	1.968***
DLSIZE	15.938	1.503	37.775	2.499**	37.775	2.328**
DLUEMP	0.170	0.628	0.190	0.741	0.190	0.691
DROA	-0.898	-0.035	-19.650	-0.773	-19.650	-0.721
DINF	3.280	0.868	2.128	0.590	2.128	0.550
DG	-0.044	-0.149	-0.300	-0.922	-0.300	-0.859
GDP	-2.773	-0.826	-1.524	-0.475	-1.524	-0.442
Adjusted R ²	0.16		0.25		0.25	
F-statistic(P)	0.099		0.050		0.050	
Durbin-Watson	2.07		2.37		2.37	

ISLAMIC BANKS REGRESSIONS ANALYSIS

MODEL:1

DV: DLNPF	Pooled Ordinary Least Square Method		Fixed Effect		Random Effect	
Variable	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
C	-0.056	-0.259	-0.372	-1.432	-0.372	-1.334
DLCAR	-0.470	-0.631	0.489	0.595	0.489	0.555
DLDIV	-0.045	-0.777	-0.020	-0.356	-0.020	-0.331
DLEFF	0.806	2.271**	0.720	2.112**	0.720	1.968***
DLSIZE	15.938	1.503	37.775	2.499**	37.775	2.328**
DLUEMP	0.170	0.628	0.190	0.741	0.190	0.691
DROA	-0.898	-0.035	-19.650	-0.773	-19.650	-0.721
DINF	3.280	0.868	2.128	0.590	2.128	0.550
DG	-0.044	-0.149	-0.300	-0.922	-0.300	-0.859
GDP	-2.773	-0.826	-1.524	-0.475	-1.524	-0.442
Adjusted R ²	0.16		0.25		0.25	
F-statistic(P)	0.099		0.050		0.050	
Durbin-Watson	2.07		2.37		2.37	

Notes: *, **, *** indicate the significance level at 1, 5 and 10%.