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**RESEARCH ARTICLE**

## The Impact of Loan Portfolio Management on Credit Risk: Evidence from Banking Sector of Afghanistan

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**ABSTRACT**

This article empirically examined the effects of loan portfolio diversification on commercial banks' credit risk in Afghanistan from 2007 to 2019. In this paper, the annualized data is used to run the regression model, and the least-squares method was followed; meanwhile, the Hirschman-Herfindahl index is used as a diversification index. Eventually, the estimation results in compliance with the traditional theory of portfolio management represent that loan portfolio diversification has a negative-significant impact on credit risk, while the capital adequacy ratio coefficient according to the moral hazard hypothesis indicates that the amount of non-performing loans decreases when the proportion of the shareholders' capital in the total capital of the bank's increases. Therefore, commercial banks have to promote their portfolio diversification and increase the proportion of shareholders' capital in the banks' financing resources to efficiently manage their credit portfolio and reduce the credit risks associated with their loan portfolios.

**KEYWORDS**

Credit Risk, Loan Portfolio, Diversification, Concentration, Traditional Theory of Portfolio Management, and Hirschman-Herfindahl Index.

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**1. Introduction**

Banking activities all across the world have changed dramatically throughout the years. Financial institutions have expanded and diversified their lending portfolios as a result of financial integration and competitiveness. A healthy and productive financial system allows the economy to maximize the value it provides to its stakeholders. In financial economics, resources shift from markets with lower marginal rewards to those that have higher marginal usefulness. Therefore, the financial system strives toward efficient and frictionless financial resource circulation. The major task of the banks in an economy is to provide credit, and Hasan and Ashfaq (2021) claim that banks' loans are an important source of firms' financing in an economy. Although banking services are important for the economic growth of a country, according to Todorovic (2013), having an unrealistic picture of banks' financial condition and establishment of an inadequate legal and institutional framework may lead the sector to crisis and complicate its control. Thus, it is required to empirically assess the real picture of the banking sector before the implementation of any regulations or related policies.

Banks have always been thought of as a means of decreasing transaction costs and information inequities. However, technological advancements, deregulation, and financial complexity have weakened banks' ability to use their intermediation advantages by cutting costs and information gaps. Banks have frequently responded by diversifying their sectors of investment to reduce their intermediation expenses. Moreover, intermediation theories urge diversification to increase efficiency and lower costs. Banks, on

the other hand, never maintain enough cash to guarantee full liquidity due to the nature of their operations. They risk incurring runs and portfolio losses if they don't accurately track and reclaim the advances (Mulwa, 2018).

Furthermore, it is widely believed that non-performing loans and financial crises have a direct link in both developed and developing countries. Non-performing loans, according to Reinhart and Rogoff (2010), can be seen as a forerunner or indicator of the banking crisis. A bank can provide services in one specific industry, or it can broaden its loan portfolio to include all or almost all industries and geographic areas, which is required based on the traditional theory of portfolio management. In addition, the bank's policies on how to manage the credit portfolio have a substantial impact on the bank's credit risk, as described in financial theories (Abbasian et al., 2016).

Banks, as the backbone of the financial system, provide a wide range of services to their customers, who are exposed to certain sets of risks, and banks frequently fail to reduce or control them. As a result, it will cause financial crisis. Among the hazards associated with financial activities, credit risk, which refers to the borrower's incapacity or unwillingness to fulfill contractual obligations, is the most crucial risk to the banks. In banking concepts, the ratio of non-performing loans to total loans (NPL ratio) is considered the credit risk indicator, and bank management is always willing to reduce it as much as feasible.

It is an important and fundamental decision of the bank's management to choose the loan portfolio management strategy and to specify whether the diversified lending portfolio according to traditional theory is appropriate or focuses on a specific business which the bank is familiar with. The case for risk diversification would be simple if a loan were a liquid asset with an exogenous payment. Loans, on the other hand, cannot be exchanged in a liquid market, and the bank has control over the loan's payoff, at least on its part. Depending on a financial institution's screening and monitoring skills, the financial institution can remove or at least mitigate the information asymmetry issues associated with the loan contract, decreasing the riskiness of the payout (Behr et al., 2007). Further, as Barbuski (2013) claims, the analysis and assessment of banks' operations is one of the important management tools that facilitate banks' management decision-making; therefore, it is important to be an analysis based on facts and figures before applying any policy or taking any decision. Moreover, it appears that there is a compromise between risk diversification and growing knowledge in specific areas, but it is unclear which way is the best. Both tactics are observed in the actual world: On one side, the banking law sets upper limits on exposure to a single borrower, which is a proponent of portfolio diversification (assumed). On the other hand, some banks have developed expertise in specific industries in which they have a superior understanding in the hopes of increasing risk-adjusted returns through their prior superior monitoring abilities (Behr et al., 2007).

It is worth mentioning that the Central Bank of Afghanistan's Large Exposure Regulation (2011) mandates that commercial banks pursue a diversification strategy and avoid concentrating their assets in specific geographic areas or sectors. According to this regulation, the concentration of credits in a single industry for foreign banks' branches in Afghanistan cannot exceed 12% of their total assets, and for local commercial banks, this limitation is 40% of their tier-one capital.

The banking business in Afghanistan began in 1933 with the foundation of Bank-e-Millie Afghan and has grown steadily. The financial system was also harmed as a result of the country's political crisis, which was followed by an economic crisis; nevertheless, the banking sector has undergone considerable improvements as a result of Afghanistan's new governance structure, which was implemented in 2001. According to the Central Bank of Afghanistan's annual report (2019), the country's banking system had 12 conventional and 1 Islamic bank. Recently, as proven by the Kabul Bank bankruptcy, the amount of non-performing loans has increased in recent years, reflecting the country's inefficient banking sector practices.

Since the number of scientific research related to Afghanistan's banking sector is limited, and the researchers were unable to find previous research on this issue related to Afghanistan, it was deemed necessary to conduct research regarding the impact of loan portfolio management on credit risk in the banking sector of Afghanistan.

Considering the above discussions, the impact of loan portfolio diversification on credit risk is the research problem dealt with in this paper. The main aim implies examining whether loan portfolio diversification has a significant effect on credit risk by using Afghanistan's banking sector data in the period from 2007 to 2019. Therefore, the research null-hypothesis that has to be tested in this paper using time series data reads as follows: "The loan portfolio diversification does not have any significant effect on credit risk in the banking sector of Afghanistan". For testing the stated null-hypothesis, it is required to calculate the diversification of loan portfolios in the banking sector using diversification indexes, which, in this paper, the Hirschman-Herfindahl index (HHI) is used. Meanwhile, the stationarity of data was checked using the Augmented Dicky-Fuller test, and the model coefficients were estimated following the Ordinary Least Squares (OLS) method.

The next chapter of this paper contains the literature, which is discussed briefly. The methodology and data, which include data, a diversification index, and an econometrics model, are covered in the third chapter of the study. The paper's analysis and findings are addressed in the fourth chapter, and the paper's conclusion is offered at the end.

## **2. Literature Review**

As discussed in the introduction, there are two major viewpoints on how to manage the credit portfolio in the banking industry, and both of them are supported by empirical facts as well. Because empirical investigations do not always support one of these ideas and provide diverse results based on investigations/findings in relation to the abovementioned strategies concerning the investment portfolio, in this part, the results of papers will be explained first, which comply with the traditional theory of portfolio management. Subsequently, the researchers' findings that emphasize the concentration approach of loan portfolio management will be explained.

According to Firestone and Wang (2014), loan portfolio diversification helps banks in credit risk management since diversified banks' loan loss provisions are better predictive of future net charge-offs than specialized banks in the United States. There is no link between geographical diversification and credit risk, according to Mokaya and Jagongo (2014); however, industry diversification and scale have a significant effect on commercial banks' credit risk management in Kenya. According to Foster and Bailey (2015), loan portfolio diversification enhances the banks' stability as evaluated by the Z-score index and improves revenue for Jamaican commercial banks. Ndambiri et al. (2017) investigated the impact of loan portfolio features on the rate of non-performing loans for savings and credit cooperative societies in Kirinyaga, Kenya. They suggested these organizations diversify loan portfolios by advancing a variety of products, considering adjusting loan payback lengths appropriately, avoiding focusing too much on interest rate modifications, and maintaining a high loan-to-shareholder equity ratio. According to Mulwa (2018), credit portfolio diversification has a positive and significant impact on banks' profitability in the East African Community. Credit diversification has a substantial effect on financial distress prediction and can minimize the likelihood of borrower default by offering new types of facilities, as per Chepkori et al. (2019).

In contrast to the previous studies, Acharya et al. (2002) found that manufacturing credit diversification seeks to mitigate bank return while endogenously generating riskier loans for all 105 Italian banks in their dataset from 1993 to 1999, with the effect being greatest for high-risk banks. Additionally, sectoral loan diversification benefits high-risk banks solely, whereas geographical diversity benefits low-risk banks. Overall, their findings show that diversity of assets does not ensure improved performance and/or greater safety for banks. According to Behr et al. (2007), specialized banks had somewhat higher returns, smaller relative loan-loss buffers, and smaller shares of non-performing loans than diversified banks. According to Langrin and Roach (2008), increased diversification does not guarantee decreased risk and/or higher returns, and conventional wisdom suggests that concentration rather than diversification of bank-level loan portfolios is more consistent with achieving minimal systemic risk. Diversification, according to Inder Singh (2014), has a negative impact on banks' return on assets and does not assist them in decreasing risk. Furthermore, Abbasian et al. (2016) found that increasing loan portfolio diversity increases credit risk for banks, which is independent of the effect of the ownership structure of the Iranian banks. Subsequently, Kumanayake et al. (2019) claim that loan portfolio diversification has a negative-significant impact on commercial banks' performance in Sri Lanka, and they have suggested commercial banks limit their diversification as much as possible to enhance their performance. Increased sectoral loan portfolio diversification affects Vietnamese banks' returns, according to Huynh and Dang (2021); however, not all banks are equally affected in Vietnam. Meanwhile, HUYNH and DANG (2020) claim that loan portfolio diversification has a significant and positive impact on the non-performing loan ratio.

As is reflected in the above paragraphs and can be considered easily, according to the experimental studies, the results will come up finally with one of the two well-known strategies in regard to loan portfolio management. Since there is no additional strategy in relation to the mentioned issue, it is required to empirically analyse the interaction of banks' performance in relation to the applied strategy in a specific geographical area. Therefore, considering the results of empirical investigations, the best fitted approach may be selected for policy making, and in that case, the selected policies and any other guidelines will be in line with the actual status of the banking sector. This means that the banking sector will experience extra and continuous success as a result of the implementation of the best fitted policies. Therefore, the findings of this paper, in coordination with the previous papers' findings, help to specify the applicability of diversified strategy according to the traditional theory of portfolio management in the banking sector of Afghanistan.

## **3. Methodology**

### **3.1. Econometrics Model**

As previously discussed, credit risk in banking refers to a borrower's unwillingness or inability to fulfill his/her responsibilities according to the terms of the agreement. Furthermore, the non-performing loans to total loans ratio (NPL Ratio) is used in this paper to show the credit risk level in the banking sector, and it is the dependent variable in the model. Therefore, as the NPL ratio is the dependent variable in the model, the Hirschman-Herfindahl Index (HHI) as an index of diversification in the loan portfolio is

the most important independent variable in the model. In addition, vectors or carriers of controlling variables ( $v$ ) have also been added to the model.

As it is known, the banks' credit risk is generally affected by two groups of internal and external factors: those that can be prevented by employing related policies and those that are beyond the control of the bank's management. Thus, a bank can mitigate or reduce its credit risk by developing and implementing certain effective plans, strategies, and policies. Finally, by considering the abovementioned points, two internal and external categories of controlling variables have been included in the model, which are capital adequacy ratio (CAR) and economic growth (GDPG), respectively.

Furthermore, based on the moral hazard hypothesis, it can be claimed that a low share of shareholders' capital in a bank's financing resources will lead it to highly risky activities. In other words, if the portion of shareholders' capital in the bank's total capital decreases, they will be encouraged to engage the banks in more risky activities. In contrast, if their capital share increases, they will proceed more cautiously and reduce their likely-risky activities. Therefore, the capital adequacy ratio (CAR) can be a good criterion for measuring the portion of shareholders' capital in the bank's financing resources and will affect the NPL ratio, which is the result of choosing high-risk activities.

In addition, the overall economic situation, as an uncontrollable and external factor, affects the amount of non-performing loans as well. For example, as a result of an economic boom, economic activities will increase, and the borrowers will be able to repay their payable installments at the exact time; but as a result of the recession or economic crisis, due to disability caused by the overall condition of the economy, the borrowers will not be able to pay the loan installments at a given time. Hence, it can be claimed that the overall economic situation as an external factor is effective on the level of the non-performing loans, and the economic growth can be a good indicator of the economic situation to include in the regression model. Therefore, considering the abovementioned introduced variables, the econometrics model will be formed as below:

$$NPLR_t = \alpha + \beta Div_t + \gamma V_t + \varepsilon_t \quad (1)$$

In equation 1, the (NPLR) stands for non-performing loans ratio (NPL ratio), which is introduced above, the (t) stands for time which is an indicator of time series data, ( $\alpha$ ), ( $\beta$ ) and ( $\gamma$ ) are coefficients of the model, (Div) stands for diversification of the loan portfolio which the HHI is its index in this paper, (V) stands for controlling variables of the model which are capital adequacy ratio (CAR) and gross domestic products growth (GDPG) respectively, and ( $\varepsilon$ ) is the representative of the residuals.

### 3.2. Concentration Index

According to Abbasian et al. (2016), there are two common approaches for measuring the diversification of an investment portfolio. First, the calculation of the simple indexes, and second, the calculation of the standard indexes. The most important ones among simple indexes are the Hirschman-Herfindahl, Gini, and Entropy indexes; in all of them, the maximum diversification index is achieved when the investment is allocated to all sectors/industries equally. In addition, standard indexes have been developed to solve the problem of simple indexes regarding the allocation of the same size to each industry when measuring the percentage of diversification in the investment portfolio. Furthermore, according to standard indexes, the first requirement is specifying each sector share in the banking sector loan portfolio. Next, the comparison of the actual loans awarded to the specified sector with its standard share.

However, the best method is standard indexes, as they have been proved by empirical studies. However, because of some troubles regarding data collection in Afghanistan, the Hirschman-Herfindahl index is used for measuring the banking sector's loan portfolio diversity in this paper.

The Hirschmann-Hirfindahl index is one of the most common methods among simple indexes in which the share of each sector within banks' loan portfolio will be specified at first, and then, the weight will be given to each sector based on its share. Therefore, if  $X_i^t$  is share of (i) sector from the banking sector loan portfolio in (t) time, the share ( $X_i^t$ ) of each sector from all loan portfolios in the specified time will be obtained through the below equation:

$$w_i^t = \frac{X_i^t}{\sum_{i=1}^n X_i^t} \quad (2)$$

The total square of each sector's share is used to calculate the Hirschmann-Hirfindahl index. Furthermore, usually, the mentioned index is used to calculate the concentration in the investment portfolio; thus, if the above function is revised to the below form, it will show diversification in the investment portfolio:

$$HHI^t = 1 - \sum_{i=1}^n (W_i^t)^2 \tag{3}$$

In the above function, the index ( $HHI^t$ ) shows the diversification of the investment portfolio in (t) time, ( $W_i^t$ ) shows the (i) sector share in (t) time, and (n) shows the sectors that use banking facilities.

Furthermore, if all sectors or industries use banking facilities equally, the index will experience its maximum limit and is equal to:

$$HHI^t = 1 - \sum_{i=1}^n \left(\frac{1}{n}\right)^2 = \frac{n-1}{n} \tag{4}$$

But in contrast, if a sector uses all loan portfolios, the HHI will be zero. At al, based on the above arguments, it can be claimed that greater HHI means much diversification in the loan portfolio, and the opposite indicates much concentration (Abbasian et al., 2016).

**3.3. Data**

The data regarding the included variables have been taken from the Central Bank of Afghanistan’s bulletins and the World Bank Database (World Development Indicators) that are available on their websites, and all the variables are in time series type.

Meanwhile, the non-performing loans ratio, capital adequacy ratio, GDP growth, and the quantity of loans distributed by commercial banks in Afghanistan to different sectors/industries from 2007 to 2019 are used in this study.

The loans disbursed to different sectors by commercial banks are collected from the Central Bank of Afghanistan’s bulletins, and the Hirschman-Herfindahl Index is used to calculate the diversification index with the usage of the abovementioned data. Moreover, the share of each sector from banking facilities from 2007 to 2019 by percentage is reflected in Table 1 below:

Table 1: Disbursed Loans to Different Sectors By Percentage

Years	Trade	Servi ce	Manufac turing& Industry	construct ion	Livesto ck	Agricult ure loans	Consu mer loans	Residen tial Mortga ge	Infrastruct ure	Othe rs
2007	50	8.14	1.13	9.54	0	0	2.17	2.28	20	6.74
2008	51	9	1	19	0	0	2	1	19	5
2009	32.29	4.84	1.22	19.92	0	0.88	1.33	7.3	28.51	3.69
2010	34.16	6.72	2.72	25.98	0	0.75	1.01	8.95	9.7	10
2011	27.84	11.95	13.32	2.85	0	2.06	0.82	15.65	12.85	12.65
2012	28.3	15.94	11.88	2.29	0	2.66	0.74	14.46	13.03	10.71
2013	29.84	22.1	9.35	2.02	0	2.38	0.24	10.83	13.81	9.41
2014	34.05	20.11	9.53	14.32	0.04	2.61	0.26	7.14	5.26	6.68
2015	41.18	27.69	10.62	9.44	0.03	2.67	0.3	2.68	5.4	0
2016	40.07	29.19	8.48	11.12	0.06	3.2	0.65	2.78	4.02	0.43
2017	42.5	27.49	9.35	8.7	0.23	3.94	0.86	0.71	5.66	0.57
2018	45.34	20.55	12.19	9.03	0.3	3.86	1.9	0	6.82	0
2019	44.36	22.15	11.03	7.51	0.5	3.07	2.63	0	8.75	0

Source: DAB’s bulletins available at: <http://dab.gov.af>

All observations reflected in the above table indicated the share of sectors within the banks` loan portfolios by percentage. Therefore, if the percentage for a certain sector is high, it means that the sector has more share in the banking facilities, and loans are more concentrated in that specific sector. Furthermore, if the value is lower, it will further mean that there is no concentration in a specific sector. Moreover, the data, which are represented in Table 2, is the input of the estimations for the given variables.

Table 2: Observations

Year	CAR	NPL Ratio	HHI(%)	GDP Growth
2007	31.77	0.68	69.31545	13.82631954
2008	29.81	1.15	70.21574	3.924983823
2009	25.81	0.5	76.66049	21.39052841
2010	-14.46	48.4	79.29388	14.36244146
2011	23.06	5.15	84.81322	0.426354793
2012	21.84	5.31	84.1247	12.75228708
2013	26.34	5.1	82.15221	5.600744661
2014	26.46	8.09	80.54774	2.724543365
2015	19.94	12.34	72.92553	1.451314655
2016	27.68	12.67	73.12219	2.260314205
2017	29.81	12.42	72.26636	2.665292046
2018	25.83	8.99	72.26178	1.840088543
2019	25.93	14.47	72.70353	2.901228964

Source: DAB`s bulletins and World Bank database

Available on: <http://dab.gov.af> and <https://databank.worldbank.org>

According to the above table, a low CAR (Capital Adequacy Ratio; according to Capital Adequacy Regulation which is established by the Central Bank of Afghanistan, the CAR is calculated by dividing total regulatory capital over the total risk weighted assets of the bank) percentage means that shareholders' capital couldn't contribute to a bigger amount of the bank's financing resources, whereas a high level of CAR means shareholders' capital had a major contribution to the financing resources of the bank. The NPL ratio represents the level of the non-performing loans in the total investment portfolio, as the higher ratio represents the worst case of loan management and the riskiness of the investments. While the lower ratio indicates better portfolio management and lower risks associated with the portfolio.

In addition, the HHI percentage indicates the level of diversification in the loan portfolio, which is represented in Table 2. The higher percentage for the HHI indicates a diversified portfolio. While the lower percentage is the indicator of a concentration in the loan portfolio in a specific industry.

The growth of GDP (Gross Domestic Product) is the level of the growth of production before the deduction of the depreciation, which is represented in Table 2.

Moreover, it will be better to have a primary analysis in this stage, using the estimation inputs by assessing the variables' descriptive statistics, which are presented in Table 3 below:

Table 3: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness	Kurtosis	Std. Error	Std. Error
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic
<b>CAR</b>	13	-14.46	31.77	23.0631	11.73704	137.758	-3.128	.616	10.555	1.191
<b>NPL Ratio</b>	13	.50	48.40	10.4054	12.38446	153.375	2.687	.616	8.454	1.191
<b>HHI</b>	13	69.32	84.81	76.1848	5.38294	28.976	.446	.616	-1.372	1.191
<b>GDP Growth</b>	13	.43	21.39	6.6251	6.63027	43.961	1.190	.616	.283	1.191

Source: Calculations using SPSS

The NPL ratio, with a Mean value of 10.41% yearly in the Afghanistan Banking sector, represents a higher number of non-performing loans, which are classified as riskier (doubtful & loss) portfolios. The Standard deviation value of 12.38% indicates that the banking industry remains unstable from 2007 to 2019 because a higher standard deviation value is representative of the instability in the relevant variable.

The HHI ratio, with a Mean value of 76.18%, represents high diversification in Afghanistan’s commercial banks’ loan portfolios and shows that the commercial banks in Afghanistan are following traditional theory regarding their portfolio management. The Standard deviation value of 5.38% represents that the commercial banks have followed the diversification approach from 2007 to 2019 closely.

Thus, by these indicators, it can be realized that the lending activities of the banking sector of Afghanistan are more diversified, and commercial banks have followed the DAB (Da Afghanistan Bank) Large Exposure regulation (2011) during the selected period. On the other hand, the CAR shows a 23.06% mean, which represents that the regulatory capital of banks covers 23.06% of total risk-weighted assets. In the meantime, the CAR should be at least 12% based on DAB’s capital adequacy regulation (2006), but the estimated mean of CAR is 23.06%, which is higher than the regulatory requirement.

In addition, the GDP growth has a 6.62% Mean for the selected period and a 6.63% standard deviation, which indicates instability in the overall economic condition in Afghanistan during selected years.

**3.4. Unit Root Test**

To test the assumption of variables stationarity, the Augmented Dickey and Fuller (ADF) test is used in this paper, and its equation is as below:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^m \alpha_i \Delta Y_{t-1} + \epsilon t \tag{5}$$

Where ( $\Delta$ ) is the difference operator and ( $\epsilon$ ) is the white noise error term of the equation (Azimi & Shafiq, 2020).

**4. Results and Discussion**

Since the type of data is time series, it is better to start our discussion by testing the data characteristics:

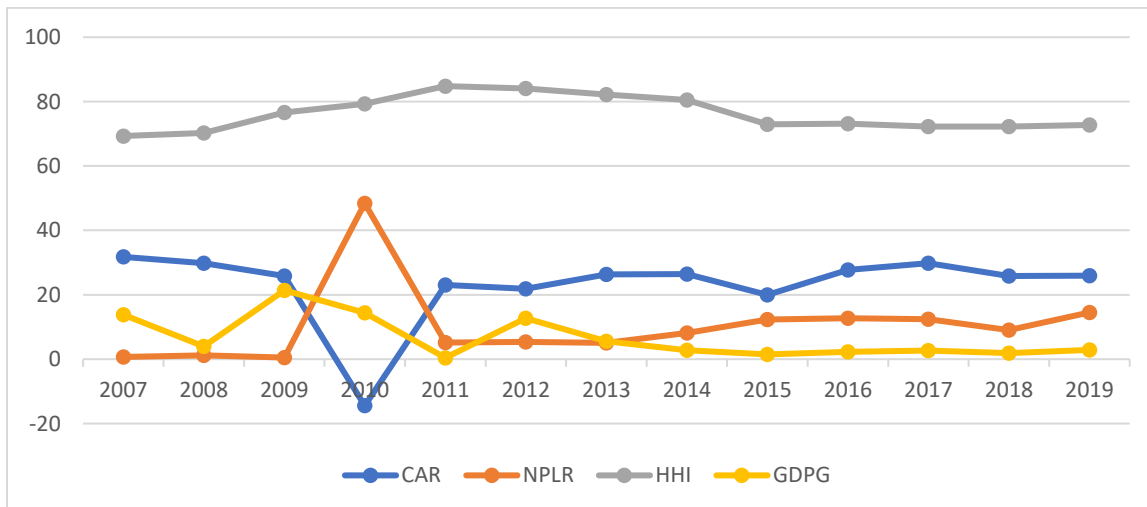


Figure 1: Variables’ Trends

As can be seen from the above graph, the economic growth and credit portfolio diversification index are almost stable over time, experiencing fewer ups and downs, but the lines related to the NPL ratio and CAR in 2010 show a structural failure/breakage, which can be considered as the backdrop of the country’s banking system crisis caused by the Kabul Bank crisis. Moreover, if we consider the loan portfolio diversification index only, the graph would have the shape as shown in Figure 2:

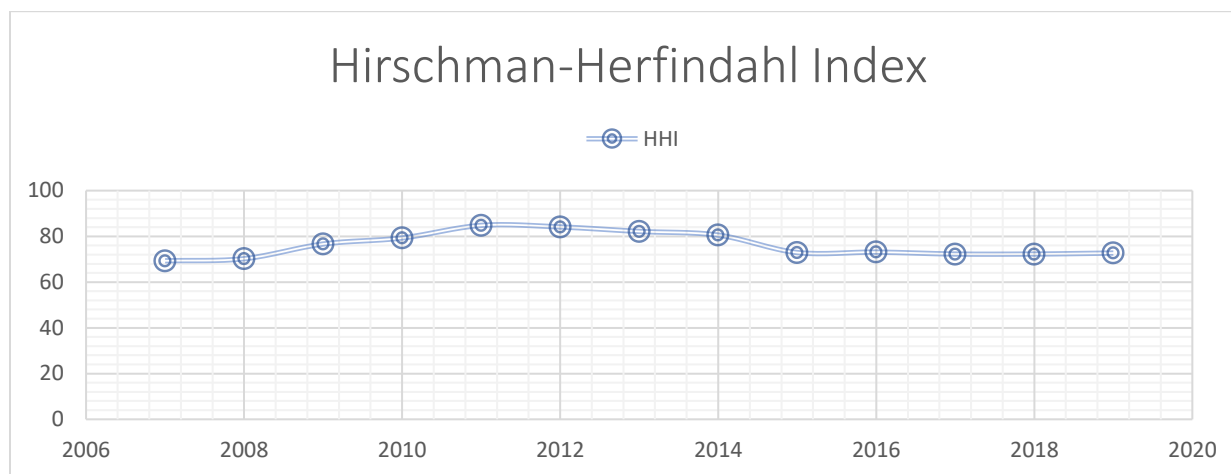


Figure 2: HHI

As it is clear from the above graph, the diversification index in the banking sector is somehow stable, and its index is usually between 70% to 80% from 2007 to 2019. Therefore, it can be assumed that the implementation of the Central Bank's Large Exposure regulation has paved the way for the diversification of the credit portfolio in the Afghanistan banking sector. In this stage, for further investigation, the discussion will be started with the test of the stationarity of the variables.

Table 4: Unit Root Test Using Augmented Dicky-Fuller Test

No	Variable	Variables and Hypothesis		At Level			At Second Difference		
		Hypothesis		T Stat.	P-Val	Con.	T Stat.	P-Val	Con.
1	HHI	Null	HHI is not stationary	-2.50	0.14	Accept	-5.81	0.00	Reject
		Alternative	HHI is stationary	-2.50	0.14	Reject	-5.81	0.00	Accept
2	NPL Ratio	Null	NPL ratio is not stationary	-4.27	0.01	Reject			
		Alternative	NPL ratio is stationary	-4.27	0.01	Accept			
3	CAR	Null	CAR is not stationary	-3.21	0.04	Reject			
		Alternative	CAR is stationary	-3.21	0.04	Accept			
4	GDP Growth	Null	GDP Growth is not stationary	-7.42	0.00	Reject			
		Alternative	GDP Growth is stationary	-7.42	0.00	Accept			

Source: Estimations Using Eviews

It can be realized from the above table that the estimation results, which have been calculated using Eviews, indicate that all variables are stationary at level except HHI, which is stationary at the second difference. Therefore, when most of the variables are stationary, the Ordinary Least Square (OLS) method can be a good approach to estimate the regression coefficients, and its results are reflected in Table 5.



Table 5: Estimation Results

Variable	Coe/Stat.	Sig.
HHI	-0.69	0.00
CAR	-0.74	0.00
GDP Growth	5.46	0.00
Intercept	12.57	0.56
Adjusted R <sup>2</sup>	0.93	
F Stat.	60.99	0.00
Durbin Watson	2.55	

Source: Estimation Results Using Eviews

The estimators of the model show that all engaged variables have a significant effect on credit risk, and their coefficients are in line with the theoretical views as well.

According to the estimation, the HHI has a significant-negative effect on credit risk, which is consistent with the traditional theory of portfolio management. Moreover, the estimated coefficient of this index explains that if the diversification of the credit portfolio increases by 1%, the level of credit risk will be decreased by 0.69%. Furthermore, as shown by the diversification index graph, the range of diversification in Afghanistan's banking sector's credit portfolio is mostly 70–80%, which is the result of Basel Committee guidelines and the Central Bank's Large Exposure regulation implementation. As a result, it can be concluded that the diversification strategy has acted successfully in reducing the amount of non-performing loans or lowering the level of credit risk in Afghanistan's banking sector. Moreover, as covered in the introduction section, the null-hypothesis in this paper argues regarding the failure of diversification strategy implementation, but as an estimation result, there are enough reasons to reject the null-hypothesis and accept the alternative one in this paper.

Besides, in line with the moral hazard hypothesis, the coefficient of capital adequacy ratio (CAR) seems to have a substantial negative influence on the amount of non-performing loans, and its coefficient demonstrates that a percent increase in CAR can reduce the level of credit risk by 0.74%. But in the meantime, only the estimated coefficient of economic growth is at odds with the usual theory. This may be justified since, as economic activities grow, investors seek more credit from banks, resulting in a rise in the amount of non-performing loans as a percentage of total loans.

Generally, as discussed above, the findings of the current paper are in line with the traditional theory of portfolio management and similar to the findings of some previous research as well. As reflected in the literature review section, some research conducted in the United States (2014), Kenya (2014), and East Africa Community (2018) show that the loan portfolio diversification strategy has a significant effect on the credit risk of commercial banks. Therefore, by considering a snapshot from previous research and current paper findings, it can be concluded that loan portfolio management strategies and level of economic development are not linked with each other and every country's authorities are required to conduct an empirical assessment before applying any policy in this regard.

Although it is better to use panel data in these types of research, considering the limitation of data collection in Afghanistan, it was impossible to collect all commercial banks' financial statements through their websites. Therefore, it was decided to collect sector-wise data via published bulletins of the Central Bank of Afghanistan. It is worth mentioning that, in collecting sector-wise data, there was another limitation, which is the non-existence of quarterly data for all time periods, and the published bulletins only contain annual sector-wise data for the period (2007-2019). Finally, it was unavoidable to use only annual data for running the regression and testing the hypothesis. But in the analyzing stage, all the Gauss-Markov assumptions were tested, and it was testified that the Ordinary Least Square Method is the most fitted. Since all the Gauss-Markov assumptions are according to the theoretical view, it can be concluded that the OLS result is acceptable for hypothesis testing and conclusion.

## 5. Conclusion

It is identified that nowadays, the soundness of the banking system and its optimal performance is one of the key indicators of the soundness of the overall economy, and the condition of the banking and financial systems in developed countries can be a good example in this regard. Therefore, students and researchers who are involved with economic studies have attempted to evaluate previous strategies and present new strategies for better arrangement and promotion of the banking system soundness. Following the previous investigations, this paper has examined the influence of loan portfolio diversification on credit risk in the Afghanistan banking sector from 2007 to 2019.

Banking activities in Afghanistan started with the establishment of the first bank called Bank-e-Millie Afghan in 1933, and it has already experienced many ups and downs. The financial system was also harmed as a result of the country's political crisis, which was followed by an economic crisis; nevertheless, the banking sector has undergone considerable improvements as a result of Afghanistan's new governance structure, which was implemented in 2001. According to the Central Bank of Afghanistan's annual report (2019), the country's banking system had 12 conventional and 1 Islamic bank. As proven by the Kabul bank bankruptcy, the amount of non-performing loans has increased in recent years, reflecting the country's inefficient banking sector practices.

The major goal of this paper is to evaluate the effect of the loan portfolio management approach in Afghanistan on credit risk. According to the theories, there is no clear view of how to manage the investment (loan) portfolio, and there are disagreements in this regard between theoreticians. Among the arguments, the Basel Committee guidelines are the most famous; the central bank of Afghanistan has also established a regulation by the name of "Large Exposure regulation" that compels commercial banks to diversify their credit portfolios accordingly. The mentioned regulation persuades commercial banks to prevent the concentration of investment in a specific sector or geographical area.

The model estimation results in this paper, in which coefficients have been obtained using the Ordinary Least-Squares method, indicate that loan portfolio diversification has negative-significant effects on credit risk, and commercial banks should strengthen the diversification in their loan portfolio to reduce their credit risk level. Therefore, it can be concluded that the stated null-hypothesis in the introduction section, which claims regarding the ineffectiveness of diversification approach implementation in Afghanistan, can be rejected, and there are enough reasons to accept the alternative hypothesis claiming that the traditional theory of portfolio management is applicable in banking sector of this country.

In addition, a major challenge encountered during the research process was the lack of sufficient studies on Afghanistan's banking sector, which limited the availability of relevant data. Previous research has indicated that panel data would be more appropriate for assessing the performance of commercial banks. However, due to restrictions and the absence of financial statements on the websites of all commercial banks, we had to rely on time series data for this study. Ideally, monthly or quarterly data would have been preferred for analyzing time series data and estimating regression coefficients. Unfortunately, we only had access to annual banking data from Afghanistan's Central Bank bulletins.

Given the challenges outlined in this paper regarding Afghanistan's banking sector, it is recommended that future researchers empirically test the accuracy and adaptability of all banking regulations, particularly in light of the recent government change in the country. This would ensure the development of useful and applicable banking regulations.

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