Impact of Bank Size on Performance of Nepalese Commercial Banks[1]

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Abstract

Banks play an important role in an economy. Bank size is one of the important factors of banks to perform and generate revenue and profits. This study aimed to analyze the types of relation between bank size and bank performance. This study was based on 10 years' hand collected secondary quantitative data from 20 commercial banks leading 200 observations. Descriptive, correlational, and causal-comparative research designs were employed. Descriptive statistics was applied to compute summarized values of study variables. Correlation analysis was applied to measure the association between dependent and independent variables. Factor analysis was employed to develop surrogate size variable. Finally, linear and nonlinear regression models were applied to measure causal relation between bank size variables and performance variables. The results showed that there was not a linear relationship between bank size variables and bank performance variables, but it found nonlinear relationship between them. It indicated that there was a threshold value of bank size variables that maximized the bank performance.

Keywords: bank, linear and nonlinear, performance, size

Introduction

Banks play crucial roles in enhancing overall economic activities, including mediation and financial operations that are necessary for a country's economic progress. The banking sector has a considerable impact on economic movements in all countries (Monnin & Jokipii, 2010). As a result, according to Albertazzi and Gambacorta (2010), a bank is a financial institution that invests the money of its clients and investors and serves as a financial intermediary between investors who have extra money (depositors) and investors who need to borrow money to fuel their investments (borrowers). Banks, on the other hand, are regarded as one of the most essential financial institutions as they invest investors' deposits to profit. This profit is determined as the difference between the interest paid to depositors and the interest paid to borrowers. Banks also provide their clients with other financial services such as credit services, cheque cashing, issuing letters of credit and letters of guarantee, safety deposit boxes, portfolio management, foreign currency exchange services, trading of commercial

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papers, bank acceptance, and underwriting of financial instruments (Bendi & D'Agnolo, 2008).

The profitability of commercial banks is a critical factor in assessing their performance and overall contribution to the economy. In Nepal, the banking sector plays a paramount role in facilitating economic growth and development. As the industry continues to evolve, one key aspect that warrants examination is the impact of a bank's size on the profitability of commercial banks. On this background, this article delves into the various aspects surrounding this relationship and explores the implications for the commercial banking sector in Nepal.

Bank size is a significant determinant of a bank's capabilities, resources, and market reach. Larger banks possess greater financial strength, broader customer bases, and expanded service offerings. These advantages can potentially translate into improved profitability. However, the size of a bank also presents challenges that need to be carefully considered.

Understanding the relationship between bank size and profitability is crucial for policymakers, regulators, and banking institutions alike. It helps shape effective strategies, decision-making processes, and regulatory frameworks that foster a stable and prosperous banking sector. By examining the impact of bank size on profitability in the context of commercial banks in Nepal, we can gain valuable insights into the unique dynamics and factors that play within the country's banking landscape.

The size of a bank can be divided into two categories: vertical and horizontal on the supply of a product or service across multiple entities. As a result, there is a continuous argument about the ideal bank size, management complexity, and exposures associated with activity ranges. Larger banks are becoming increasingly involved in market operations other than traditional lending, which has recently risen and grown dramatically. This shift in activity paradigm in the developed world has necessitated restrictions to decrease bank size vulnerability (Vinals et al., 2013). Financial deregulation and liberalization, as well as product innovation and technology, have resulted in the rise of financial supermarkets. As a result, larger banks have a weaker capital basis, less steady funding, engage in more market-based operations, and are more sophisticated than small banks. However, failures linked with larger banks are more damaging to the financial system than failures associated with small banks (Laeven et al., 2014).

The existing empirical studies found varied results regarding the relationship between firm size and profitability. Some researchers have discovered a positive association between firm size and profitability. Sritharan (2015) found that a firm's size is positively correlated with the profitability measure of return on assets. Arif, Khan, and Iqbal (2013) conducted a study on commercial banks and observed that all the size metrics they had examined had a positive impact on profitability. They concluded that commercial banks in Pakistan could enhance their profitability by pursuing

expansion strategies and implementing restructuring measures.

Other studies found a negative influence of firm size on profitability. Becker-Blease et al. (2010) and Banchuenvijit (2012) reported such negative relationships in their respective studies. Additionally, some researchers found insignificant effects of firm size on profitability. Kigen's (2014) findings, for example, demonstrated no significant relationship between profitability and total assets of insurance companies in Kenya.

Given the absence of a consistent conclusion, the impact of firm size on profitability remains debatable. Consequently, further empirical studies are necessary to bridge the gap in the size-profitability relationship. This study aims to address this issue within the context of Nepalese commercial banks, with the main motivation being the question: What kind of relation between bank size and performance (profitability) does exist in commercial banks of Nepal? So, the purpose of this study is to investigate the type of relationship (linear and nonlinear) between bank size and performance.

Review of Literature

Kesver (2020) had used return on equity (ROE) as the profitability indicator in the research. The independent variable of the research was the size of the bank. Bank size was represented by total assets, total equity, and number of employees. The control variables of the research were leverage ratio and liquidity. According to the results obtained from the analysis, it was found that total assets, total equity and number of employees had a positive effect on the ROE. In addition, the financial leverage ratio influenced ROE negatively while the liquidity ratio influenced ROE positively.

Econometric regression with the dependent variable being listed commercial banks' profitability results measured through ROA. The research methods used include descriptive statistics, IV regression and OLS regression analysis, and the authors carried out the model verification with Stata 14 software. The results showed that operating efficiency, loans size, retail loans ratio, state ownership, inflation rate, and GDP growth are factors that have a positive impact on profitability. On the other hand, variables such as capital size, credit risk, liquidity risk, bank size, and revenue diversification are statistically insignificant; hence, these variables are not statistically adequate to indicate the influence of those independent variable to banks' profitability (Phan et al., 2020).

A study conducted by Aladwan (2015) on Jordanian commercial banks to measure impact of bank size on profitability by dividing the banks in three categories by assets size found significant different in profitability of different size banks. Larger-sized banks had lower profitability as compared to medium and smaller-sized banks. It indicated a nonlinear relationship between bank size and profitability. Bank size was measured by total assets; and profitability was measured by return on equity. Neves, Proença, and Dias (2020) conducted a study on 66 Iberian banks, of which 13 were Portuguese and 53 Spanish, for the period from 2011 to 2016, and they reported nonlinear relationship between bank size and profitability of banks.

Mishra, Kandel and Aithal (2021) conducted a study aimed to assess the impact, contribution and relationship of size, loans and deposit, inflation, and capital on the profitability of the banks. Correlation and regression along with ratio analysis have been used to assure a contributory association among return on assets (ROA), return on equity (ROE) and net interest margin (NIM). There is a negative relation between ROA and ROE with loan ratio, deposit ratio, and capital ratio, while there is positive relation with bank size and inflation. However, in the case of NIM, bank size, loan ratio, deposit ratio and inflation exhibit a positive relation while the capital ratio shows a negative relationship with NIM.

Neupane (2020) revealed that the bank profitability measured by ROA of Nepalese commercial banks was significantly affected by concentration ratio, banking sector development, GDP growth, inflation, and exchange rate significantly in opposite direction rather it is not significantly affected by the internal factors like bank size, capital base, deposit, loan, off-balance sheet activities and number of branches. Another indicator of bank profitability, NIM, is significantly affected only by capital adequacy, absolute number of branches, and inflation rate.

Shrestha and Bhattarai (2018) examined the impact of bank size on profitability in Nepal using a sample of 27 commercial banks over a period of 10 years. The study employed regression analysis and found a positive association between bank size measured by total assets, and profitability measured by ROA and ROE. The findings indicated that larger banks enjoy cost efficiencies, higher interest income, and improved access to funding, contributing to their profitability.

Ghimire (2019) examined the impact of bank size on profitability in the South Asian region including Nepal. The study compared commercial banks in Nepal, India, and Pakistan. The findings revealed a positive relationship between bank size and profitability in all three countries, suggesting similar trends and factors influencing profitability across the region.

Many studies have been conducted to measure linear relation between bank size and performance in different countries including Nepal. A small number of studies have investigated the nonlinear relation of bank size with bank performance in other countries. Studies have investigated only linear relation between bank size and performance in Nepal. So, this study aims to fill this gap in Nepalese context.

Method

Research Design

This study was purely quantitative, so it was guided by positivist research philosophy. Because of the purely quantitative nature of the study, it applied descriptive, correlational, and causal-comparative research designs to deal with the issues associated with relationship between bank size and performance. The descriptive research design was used to summarize the study variables. It was useful to know the status of variables and explained the variables that were present at a given situation. The fundamental premise behind this approach was that the variables and problems had already been identified by the investigation.

The link or relationship between two variables was examined using a correlational study design. To determine the direction, amount, and kind of link, the study first determined if the variables were associated or not. According to Kothari (2004), variables may be related in the same direction, in the opposite direction, or not at all. Investigating potential cause and effect relationships between the variables was the goal of causal-comparative study design. It assessed the current effects of one or more variables on another variable.

The "ex-post facto research design" was also used. It was the kind of design where the independent variable(s) had already happened and where the investigation began with the observation of a dependent variable before observing the independent variable(s) or variables in retrospect for their potential relationship (Kerlinger, 1983). This methodology had also been used in this work to quantify the potential causal connections between several dependent and independent variables. More specifically, the study looked at the connections of total assets, total equity, and number of employees (measures of bank size) with net interest margin, return on assets, and return on equity (measures of bank performance) respectively.

Population, Sample, Nature, and Source of Data

The population of this study was 21 commercial banks running currently in Nepal, and the sample size was 20 commercial banks to investigate the impact of bank size on performance. The data were secondary, quantitative and hand collected from the annual reports of the banks and the data covered 10 years' period from mid-July 2012/13 to mid-July 2020/21 resulting into 200 observations.

Variables Selection

Bank size was measured by log of total assets, (LnTA), total equity (LnEquity) and number of employees (LnEM). Assets, equity, and employees are major factors of production and many past studies had used them as the measures of firm size (Kotey, Owusu-Sekyere & Amponsah, 2021; Tran & Phanb, 2020; Kevser, 2020). Bank performance was measured by return on assets (ROA), net interest margin (NIM) and return on equity (ROE). These variables are the indicators of bank profitability and many studies had used these indicators as the proxies of firm performance (Shehzad, De Haan, & Scholtens, 2013, Neves, Proença, & Dias, 2020, & Islam & Nishiyama, 2016).

Methods of Data Analysis

Data were analysed using statistical and econometric models. When presenting quantitative data, descriptive statistics were used to summarize and organize them. It made easier to manage a large amount of data in a simpler format, such as the average, standard deviation (SD), and minimum and maximum values of the variables used to explain the characteristics of the sample banks. Nonparametric correlation was used to quantify the relationship between two variables' magnitude and direction since the study variables were not normally distributed. Regression analysis was then used to assess the influence of independent variables on dependent variables both separately and in combination with other variables. It explained the many statistical

tests of significance, such as the t-test and the F-test, for validating models. The Statistical Package for Social Science (SPSS) was used to conduct a t-test to examine the individual impacts of each regression model. The next section contains a description of the models and statistical tests of significance.

Model Specification

The econometric models were used in the study that tried to look at how bank size variables (independent variables) affected the bank performance variables (dependent variables). The effects of independent variables on dependent variables of Nepalese commercial banks were examined using the linear and nonlinear regression models below.

Bank performance = f (bank size).

The linear regression models were:

$$NIM_{it} = \beta_0 + \beta_1 lnTA_{it} + \beta_2 lnEquity_{it} + \beta_{3Ln\ EMit} + eit, \ldots\ldots\ldots\ldots\ldots\ldots\ (1)$$

$$ROA_{it} = \beta_0 + \beta_1 lnTA_{it} + \beta_2 lnEquity_{it} + \beta_{3Ln\ EMit} + eit, \ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

$$ROE_{it} = \beta_0 + \beta_1 lnTA_{it} + \beta_2 lnEquity_{it} + \beta_{3Ln\ EMit} + eit, \ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

The nonlinear regression models were:

$$NIM_{it} = \beta_0 + \beta_1 Surrogate\ size_{it} + \beta_2 \text{Surrogate } size_{it}^2 + \beta_3\ Surrogate\ size_{it}^{\ 3} + eit, \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ (1)$$

$$ROA_{it} = \beta_0 + \beta_1 Surrogate\ size_{it} + \beta_2 \text{Surrogate } size_{it}^2 + \beta_3\ Surrogate\ size_{it}^{\ 3} + eit, \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ (2)$$

$$ROE_{it} = \beta_0 + \beta_1 Surrogate\ size_{it} + \beta_2 \text{Surrogate } size_{it}^2 + \beta_3\ Surrogate\ size_{it}^{\ 3} + eit, \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ (3)$$

The variables on the left-hand side denote the dependent variables in the regression models. Therefore, NIM, ROA, and ROE were dependent variables in equations 1, 2, and 3 of both models. Similarly, the right-hand side of the regression models denote the independent variables. Thus, total assets, total equity, and number of employees in log form were independent variables in the three linear models.

Surrogate size variable was created using factor analysis since three bank size variables were highly correlated to each other. It was conducted to avoid multicollinearity problem faced in the linear models, and to measure nonlinear relation of bank size with bank performance.

Where,

$LnTA_{it}$ = natural log of total assets, measured as the natural logarithm of the total assets reported at the end of the fiscal year of $bank_i$ in $year_t$.

$LnEquity_{it}$ = natural log of total equity, measured as the natural logarithm of the total equity reported at the end of the fiscal year of $bank_i$ in $year_t$.

$LnEM_{it}$ = natural log of number of employees at the end of the fiscal year of $bank_i$ in $year_t$.

NIM_{it} = net interest margin, measured as net interest income divided by yearend total assets of $bank_i$ in $year_t$.

ROA_{it} = return on assets, measured as net profit after taxes divided by yearend total assets of $company_i$ in $year_t$.

ROE_{it} = return on equity, measured as net profit after taxes divided by yearend total equity of $bank_i$ in $year_t$.

Surrogate $size_{it}$ = factor score of three bank size variables

Results and Discussion

This section deals with the results of the study that analysed data from 20 commercial banks over ten-year period to examine the relationship of measures of bank size such as total assets (TA), total equity (Equity), and number of employees (Employees) with various performance indicators such as return on assets (ROA), net interest margin (NIM), and return on equity (ROE). The data for this study were collected, evaluated, and interpreted; and the results were compared with the previous similar empirical findings.

Descriptive Statistics

The descriptive statistics applied in this study included the number of observations, minimum values, maximum values, mean values, and standard deviations of the variables under investigation. Descriptive statistics provide information in summarised and meaningful form, which is usually easier for interpretation and understanding. Table 1 shows the descriptive statistics of dependent and independent variables during the study period.

Table 1

Summary Statistics of Study Variables (Rs. In million)

Variables	Observations (n)	Minimum Rs.	Maximum Rs.	Mean Rs.	Std. Dev Rs.
Employees	200	231	3472	1155.39	700.82
Net Interest Margin	200	0.28	34.65	3.30	2.35
Return on Assets	200	-3.43	10.33	1.55	0.93
Return on Equity	200	-55.92	74.62	14.29	9.07
Total Assets	200	2822.57	419818.1	115301.09	75483.98

Equity	200	514.69	84031.55	13269.68	10642.95

Note. Annual reports of respective banks and authors' calculations

The descriptive statistics showed that average employees 1155.39 and standard deviation were 700.82. Similarly, NIM of sample banks during the study period showed 3.30 mean value and standard deviation of 2.35. Mean and standard deviation of ROA were 1.55 and 0.93 respectively with maximum value of 10.33 and minimum value of -3.43. The mean and standard deviation of ROE were 14.29 and 9.07 respectively. In addition, the mean and standard deviation of total assets were 115301.09 million and 75483 million respectively. The maximum, minimum, mean, and standard deviation values of total equity were 84031.55, 514.69, 13269.68, and 10642.95 million respectively. The summary statistics of the variables show that they are not normally distributed.

Correlation between the Variables

Table 2 presents the nonparametric correlation between the study variables. There was negative and significant relation of total assets with NIM, ROA, and ROE. Likewise, there was negative relation of equity with NIM, ROA, and ROE but the correlation with NIM and ROA were not statistically significant.

Table 2

Correlations Between the Study Variables

Variables	Total Assets	Total Equity	Employees	NIM	ROA	ROE
Total Assets	1					
Total Equity	.923**	1				
Employees	.721**	.687**	1			
NIM	-.212**	-0.104	0.003	1		
ROA	-.170*	-0.012	-.173*	.597**	1	.623**
ROE	-.283**	-.394**	-.349**	.328**	.623**	1

Note. ** indicates significant at 0.01 level and * indicates significant at 0.05 level.

The relation of number of employees with NIM was positive; but it was not significant. Equity was negatively and significantly related with ROA, and ROE. It indicated that size and performance were negatively related.

Linear Regression Analysis

Linear regression measures the causal relation between dependent and independent variables. The independent variables of the study are total assets, total equity and number of employees which are the proxies of bank size. The dependent variables are NIM, ROA and ROE which are the proxies of bank performance.

Table 3

Linear Regression of NIM on Assets, Equity, and Employees

Model	Constant	LnTA	LnEM	Lnequity	Adj. R^2	F
1	33.43	-1.14 (0.26)	-	-	13.01	1.3
2	4.48	-	-0.22 (0.60)	-	0.00	0.27
3	11.89	-	-	-0.37 (0.37)	1.00	0.80
4	38.79	-3.43 (0.20)	-	2.22 (0.20)	27.00	0.84
5	44.69	-2.04 (0.18)	1.46 (0.10)	-	20.00	2.51
6	12.52	-	0.17 (0.48)	-0.45 (0.27)	1.00	0.89
7	48.55	-4.07 (0.16)	1.30 (0.10)	2.11 (0.18)	33.00	1.90

Note. P-values are in parentheses.

The causal relationship between assets and NIM was found negative; but it was not statistically significant. The relation between equity and NIM was inconclusive since the sign of coefficient were not consistent across the models although they were not significant. Likewise, the relationship between employees and NIM was also found inconclusive; but all the coefficients were insignificant. This finding was similar with the results of Neupane (2020); but it did not match with the findings of Saad and El-Moussawi (2012).

Table 4

Linear Regression of ROA on Assets, Equity, and Employees

Model	Constant	LnTA	LnEM	Lnequity	Adj. R2	F
1	7.80	-0.25 (0.44)	-	-	31.90	0.60
2	-0.36	-	0.08 (0.59)	-	0.05	0.29

3	2.36	-	-	-0.12	0.08	0.64
				(0.43)		
4	1.07	-0.34	-	0.16	3.30	0.32
		(0.47)		(0.57)		
5	-1.52	-	0.23	-0.32	21	4.56*
			(0.15)	(0.003)		
6	10.53	-0.39	1.13	-	27.4	3.06*
		(0.05)	(0.02)			
7	11.13	-1.43	1.13	0.08	27.16	2.03
		(0.07)	(0.02)	(0.74)		

Note. P-values are in parentheses and * indicates F-value is significant at 0.05 level.

Table 4 reports the causal relation between ROA and bank size variables. It showed that assets negatively impacted ROA, but the result was not significant. Employees positively impacted ROA across the models, only two models (6 and 7) out of seven models were statistically significant. The impact of equity on ROA was inconclusive since the sign of coefficients were not consistent across the models. Only one coefficient (model 5) was statistically significant. This finding was consistent with the finding of Neupane (2020), but was inconsistent with the finding of Ghimire (2019), and Shrestha and Bhattarai (2018).

Table 5

Linear Regression of ROE on Assets, Equity, and Employees

Model	Constant	LnTA	Lnequity	LnEM	Adj.R^2	F
1	-4.35	7.93	-7.81	-0.28	10.99	2.89*
		(0.06)	(0.11)	(0.91)		
2	-2.23	7.79	-7.83	-	11.43	1.36
		(0.11)	(0.11)			
3	9.97	0.41	-	-0.87	0.00	0.91
		(0.84)		(0.71)		
4	65.93	-	-2.82	1.91	31.70	0.64
			(0.41)	(0.60)		
5	16.70	-0.10	-	-	0.00	0.01
		(0.93)				

6	17.96	-	-	-0.53 (0.68)	0.00	0.17
7	58.90	-	-1.94 (0.29)	-	26.80	1.10

Note. P-values are in parentheses and * indicates f-value is significant at 0.05 level.

Table 5 reports the causal relationship between ROE and bank size variables. Most of the coefficients of assets were positive, but not significant. Equity had negative impact on ROA, but none of the coefficients were significant. It indicated non-existence of relation between equity and ROE. The impact of employees on ROE was inconclusive and insignificant. In all models of above the values of adjusted R-square were low and most of them were statistically insignificant (out of 21 F- values only 3 were significant). From above analysis it was concluded that there was not linear relation between bank size variables and bank performance variables. This finding was not consistent with the finding of Kesver (2020), but consistent with the finding of Shrestha and Bhattarai (2018).

Table 6

Correlation Between Independent Variables

Variables	Total Assets	Total Equity	No of Employees
Total Assets	1		
Total Equity	0.923**	1	
No of Employees	0.721**	0.687**	1

Note. ** Indicates correlation is significant at 0.01 level.

Table 6 shows the inter-relationship between independent variables of the study. The three indicators of firm size variables (total assets, total equity and number of employees) were highly and positively related to each other; so, the regression using three independent variables simultaneously created multicollinearity. Creating single surrogate size variable using factor analysis solves the problem of multicollinearity.

Factor Analysis

The above linear regressions were unable to stablish relationship between size variables and performance variables of the commercial banks in Nepal. Table 6 shows high correlations between the independent size variables. So, factor analysis was performed to compute surrogate size variable as factor score of them which eliminated the problem of multicollinearity between the independent size variables since only one size factor/ variable was extracted which explained 73.90 percent variation of the three size variables (eigenvalue of extracted factor was 2.217 out of 3).

Table 7

KMO and Bartlett's Test, Factor Loading and Communalities

KMO	Cronbach's Alpha	Chi-square	Df	P-value
0.69	0.89	411.78	3	0.000

Variables	Factor Loadings	Communalities
Total Assets	0.948	0.898
Total Equity	0.844	0.712
No of Employees	0.926	0.858

Note. Authors' calculations using SPSS

The Cronbach's alpha coefficient was 0.89 which was above the lower limit of 0.70. The number of observations were 200 which exceeded 30 observations per variables, since there were six variables in this study. Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.69 which was above the minimum KMO of 0.50. The correlation matrix of three measure of bank size was appropriate for factor analysis since it was significant. The factor loadings of each variable were higher than 0.50 and communality of each variable was also higher than 0.60 (Chawla & Sondhi, 2016, Hair, Black, Babin & Anderson, 2017).

Regression Analysis on Surrogate Size Variable

The regression results of tables 3, 4 and 5 were not conclusive and the results of all most model were not significant, and sign of coefficients were not consistent across the models. So, it was suspected that the relation between size variables and performance variables was nonlinear.

In the table 8, NIM, ROA and ROE were dependent variables (indicators of bank performance) and factor score of total assets, total equity, and number of employees (surrogate size variable) was the independent variable. Linear, quadratic, and cubic models were estimated for each dependent variable. Surrogate size variable was statistically significant in linear, quadratic, and cubic models in case of NIM, but value of adjusted R square was higher in quadratic and cubic models which indicated nonlinear relationship between size and NIM. It indicates that there is a particular bank size that maximizes bank NIM. In case of ROA, linear model was not significant, but quadratic and cubic models were significant, but the value of adjusted R square was higher in cubic model. It also suggests bank size that maximizes bank ROA. Likewise, linear, and cubic model were not statistically significant in case of ROE, but the quadratic model was significant, and the value of adjusted R square was also higher of this model. Both coefficients of quadratic model were statistically significant, and the coefficient of squared surrogate size was higher than surrogate size which indicates that as the bank size increases ROE decreases by

higher rate than the size increases. It also confirms nonlinear relationship between ROE and bank size. These results were not consistent with the finding of Ozcan, Unal, and Yener, (2017); but these findings were consistent with the finds of Lee (2009), Gangakhedkar, PahiInder, and Yadav (2022), and Kotey, Owusu-Sekyere, and Amponsah (2021). Similar results were found by Tran and Phanb (2020 in Vietnam's commercial banks during 2009 to 2018. Haslem (1968) also claimed that the size relationships were frequently nonlinear with generalized concave or convex shapes and this claim was supported by the findings of Rawlin and Shanmugam (2013).

Table 8

Regression of Surrogate Size on NIM

Model	Constant	Surrogate Size	Surrogate Size^2	Surrogate Size^3	Adj. R^2	F
Linear	3.30	-0.49			3.90	9.14
		(0.003)				(0.003)
Quadratic	2.39	-0.15	0.91		23.9	32.26
		(0.34)	(0.000)			(0.00)
Cubic	2.94	1.75	0.14	- 0.90	67.7	140.29
		(0.000)	(0.88)	(0.000)		(0.009)
Regression of Surrogate Size on ROA						
Linear	1.55	-0.07			0.00	1.03
		(0.31)				(0.31)
Quadratic	1.44	-0.15	0.11		1.40	8.18
		(0.71)	(0.06)			(0.00)
Cubic	1.60	0.51	-0.14	-0.25	23.10	20.95
		(0.00)	(0.02)	(0.00)		(0.00)
Regression of Surrogate Size on ROE						
Linear	14.29	-0.74 (0.25)			0.20	1.34
						(0.25)
Quadratic	16.35	-1.53 (0.02)	-2.07 (0.00)		6.70	8.81
						(0.00)
Cubic	16.17	-2.16 (0.03)	-1.77 (0.007)	0.30 (0.41)	6.60	5.67
						(0.00)

Note. Authors' calculations using SPSS and parentheses indicate p-values.

The nonlinear relationship between size and firm performance supports diseconomies of scale theory of economics. It indicates that minimum level of assets, equity and employees are required to produce profits or performance; but as they increase performance does not increase steadily. These results confirm that a larger size will be able to perform better to increase revenues and to control costs, but too large size will make revenue generation and costs reduction process ineffective (negative impact).

Conclusion and Implications

This study does not find linear relationship between bank size and profitability of the banks in the Nepalese commercial banking industry since none of the linear regression models were statistically significant. This study finds a non-linear relationship between bank size and performance (profitability), suggesting that as bank size increased, profitability (NIM and ROA) increased until it reaches the certain threshold, after which profitability decreased, but this explanation is not in case of ROE since its both coefficients were negative indicating negative impact of size on ROE. Nepalese commercial banks should pay more attention on growing their size to be benefited from it. It has implications for policy makers (Nepal Government and Nepal Rastra Bank) while issuing license, formulating merger and acquisition policy, and regulating capital adequacy. It has also implications for investors for promotor shareholder, diversifying investment, and making portfolio decisions and to the management of banks for developing branch expansion policy, expanding services, and developing merger and acquisition strategies searching new market segment. This study applied ordinary least square method of regression analysis and it did not include control variable that impact bank performance. This finding can be improved by including control variables and using other methods of estimation like panel dynamic model, random effects method and generalized methods of movement. This study can work as a foundation for the future research to estimate nonlinear relation.

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